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REVIEW

Flemish consensus statement on the prevention, diagnosis and treatment of urinary tract infections in older nursing home residents

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ABSTRACT

Background: Urinary tract infections (UTIs) are one of the most commonly reported infections in Belgian nursing home residents. In older adults, UTI diagnosis and management is complex, often leading to over-diagnosis and irrational antimicrobial use, stressing the need for a guideline approach.

Objectives and methods: A consensus statement on the prevention, diagnosis and treatment of UTIs in older adults residing in nursing homes was developed in a collaborative effort between the Flemish Hospital Outbreak Support Teams, the Flemish Agency for Care and Health, the Association of the Flemish Coordinating and Advising General Practitioners, the Belgian Association of Urology, the Belgian Society for Gerontology and Geriatrics and PhD researchers based on a combination of clinical expertise, (inter)national guidelines and peer-reviewed studies.

Results: Optimizing fluid intake, appropriate toilet behaviour and posture, mobilization and local estrogen therapy in women are of proven value in UTI prevention, whereas the use of cranberry and probiotics is not to be advocated. The importance of avoiding bladder catheterization is stressed. In older nursing home residents, the diagnosis of UTIs remains challenging, mostly due to atypical systemic symptoms. A consensus diagnostic algorithm for UTI among residents with and without a urinary catheter was developed, including the presence of suggestive clinical symptoms and a positive urine culture. Urine dipsticks have a high negative but a low positive predictive value. C-reactive protein point-of-care testing is not recommended. Asymptomatic bacteriuria should not be screened for, in order to avoid unnecessary triggers for treatment. In cystitis, nitrofurantoin is the primary choice for treatment, with fosfomycin as an alternative; in prostatitis and uncomplicated pyelonephritis a fluoroquinolone is the advocated empirical antimicrobial.

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Urinary tract infections; asymptomatic bacteriuria; nursing homes; infection prevention; antimicrobial stewardship

Introduction

Urinary tract infections (UTIs) are one of the most commonly reported infections in older nursing home residents [1–4]. The approach of UTIs in older adults remains challenging [1]. These challenges include ambiguous preventive measures and above all diagnostic difficulties. The latter refers to the frequent presence of atypical symptoms, complex underlying medical conditions, deterioration in mental and physical state, the inappropriate culturing of urine samples and inaccurate interpretation of urine dipstick tests. These can contribute to over-diagnosis and unnecessary antibiotic use for presumed UTIs [1–6].

Preventive measures, such as increasing fluid intake, mobilization and accurate toilet behaviour are not self-evident in institutionalized older adults that often have an impaired mental and physical state [7,8]. Furthermore, the evidence for in this setting widespread UTI prevention practices such as cranberry extract and probiotics is conflicting [9–13].

Atypical symptoms, such as changes in mental state up to delirium, in combination with a positive urine dipstick often represent the basis for a presumed diagnosis of UTI

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in older adults. This clinical practice, however, is not in accordance with diagnostic criteria from Belgian and international guidelines, leading to a significant overestimation of UTI diagnoses [4]. Besides the difficult interpretation of clinical symptoms, the collection of urine without contamination is not straightforward in older adults with incontinence and/or impaired mental and physical state [14–16]. Additionally, most older adults have asymptomatic bacteriuria (ASB) or atypical symptoms not related to a UTI which do not necessarily require antibiotic treatment [16,17].

Misdiagnosis leads to unnecessary and irrational use of antibiotics. Overuse of antibiotics for presumed UTIs is common in Belgian nursing homes and can lead to increasing resistance rates and recurrent infections [18–20]. In 2016, UTIs accounted for 50.4% of all antimicrobial prescriptions in Belgian nursing homes, of which 28.4% served as UTI prophylaxis [19,21]. As such, in nursing homes antimicrobial therapy is often not prescribed according to national guidelines, highlighting the need for future interventions to promote the rational use of antimicrobials in this setting [18].

Our aim was to develop a practical consensus statement for the prevention, diagnosis and management of UTIs in older Flemish nursing home residents combining clinical expertise with supporting guidelines and peer-reviewed studies.

Materials and methods

In response to the SARS CoV2 pandemic, 24 hospital Outbreak Support Team (HOST) pilot projects were initiated in 2021 by the Belgian Federal Health Authority in order to enhance collaboration within hospital networks and provide transmural support towards residential collectivities in infection prevention and control (IPC) and antimicrobial stewardship (AMS) [22]. Individual HOST teams concentrated on the problem of UTI over-diagnosis and overuse of antibiotics, especially among institutionalized older residents. These separate initiatives were integrated into a collaborative effort of a Flemish inter-HOST platform with all HOST teams, as unambiguous recommendations concerning the management of UTIs in nursing homes were recognized as a priority.

An inter-HOST working group was established in March 2023, joining different specialties such as medical microbiology, infectious diseases, clinical pharmacy and specialists in IPC from different Flemish hospitals as well as the Agency for Care and Health of the Flemish Government. This working group focused on obtaining a consensus among all the locally ongoing initiatives. The working group used both scientific evidence and their collective clinical expertise to develop a consensus statement with the goal of providing practical and comprehensive guidance on the prevention, diagnosis and treatment of UTIs in this target population of older residents. After a first input from individual Flemish Coordinating and Advising General Practitioners active in individual HOST initiatives, their representative organization (Crataegus) was included in a second phase to give feedback on the first draft of the consensus statement.

Finally, a broader expert group was organized in October 2023 to finalize the consensus document. The Belgian Association of Urology with nurse specialists in urology, geriatricians, urologists, general practitioners and nurses working in nursing homes were invited as important additional stakeholders. Furthermore, the consensus statement integrates AMS principles and answers practical bottom-up questions from nurses and other actors in the working field.

Results

Prevention of urinary tract infections

Non-pharmacological interventions

The importance of hand hygiene and standard IPC precautions cannot be overlooked in the prevention of infections in general, including UTIs [23,24]. It is recommended to stimulate the fluid intake in older adults to reduce the risk of UTIs [7,8,25,26]. Lean K et al. showed that an introduction of seven daily structured drink rounds in different nursing homes led to a 58% reduction of UTIs requiring antibiotics and a 36% reduction of hospital admissions due to UTI [8].

Intimate hygiene with water only or pH neutral soap should be performed preferably daily or according to individual needs. In women vaginal/genital hygiene products are associated with three times higher odds of reporting any adverse health condition, such as UTI, bacterial vaginosis or yeast infection [27].

Ensuring appropriate toilet behaviour, such as promptly addressing the residents' need to urinate, and correct toilet posture (knees bent at 90 degrees, back straight and feet on the floor) by, e.g., providing a footstool on which residents can rest their feet, are advocated to avoid post-void urinary residue and urinary incontinence, contributing to UTI prevention [25,28,29]. Wu C et al. and Newman DK et al. reported that delayed voiding was associated with post-void urinary residue, urgency and incontinence, which emphasizes the importance of promptly addressing resident need of urinating [28,29]. Improving mobility in general can reduce the risk of hospitalization for UTI by 38% to 80%, as shown in a large retrospective cohort study [30].

Urinary residue needs to be measured using a portable bladder ultrasound device (BladderScan) or through single-use urinary catheterization when urinary retention is suspected [23]. A bladder scan is an accurate and effective method to measure post-void urinary residue [31]. In spite

of the high cost of the device, studies indicate that the use of a bladder scan is cost-effective in long-term care facilities [32–34]. It avoids costs associated with catheterization equipment, saves nursing time, reduces catheter-associated complications as unnecessary catheterizations were avoided from 16% to 47%, while reductions in UTI ranged from 38–72% [32,33].

Residents with indwelling transurethral or suprapubic urinary catheters have an increased risk for catheter-associated urinary tract infection (CAUTI) [23,24,35]. Therefore, indwelling urinary catheters should be avoided as much as possible. External non-invasive urinary pouch systems are preferred unless there is a clear indication to catheterize [23,24]. Indications for external urinary pouch systems, single-use or intermittent catheterization and indwelling catheterization are summarized in Table 1.

A closed urinary catheter system in residents with an indwelling catheter needs to be ensured to avoid migration of micro-organisms into the bladder [23,24,36]. Changing this urinary catheter system (catheter and drainage bag) is necessary in case of obstruction, leakage of the catheter or when a UTI is suspected [23,24]. Other reasons for changing the drainage bag only and thus interrupting the closed system, such as a foul smelling drainage bag or changing the 'day bag' into a larger 'night bag', should be avoided.

Bladder irrigations are discouraged and can cause UTIs [23]. Continuous bladder irrigation is only indicated in case of significant haematuria with clotting or after prostate/bladder surgery and should be performed using a closed system [23,37].

Assessing the current medication schedule of the residents can be helpful to understand possible causes of recurrent UTIs. Anticholinergics, opioids and anaesthetics, alpha-adrenoceptor agonists, benzodiazepines, NSAIDs, detrusor relaxants and calcium channel antagonists can cause urinary retention and thus increase the risk of UTI. [38]

Non-antimicrobial prophylaxis

Controversy and contradiction surround non-antibiotic prophylaxis. Vaginal hormonal estrogen therapy has proven benefits in the prevention of recurrent UTI in older women [20,25,39]. In a randomized-controlled trial, with postmenopausal women having recurrent UTIs, 61% of the women treated with vaginal estrogen had a UTI within 6 months compared to 94% of the control group receiving placebo [39].

Table 1. Indications for external non-invasive urinary pouch systems, single-use or intermittent catheterization, indwelling catheterization.

	External non-invasive urinary pouch systems or condom catheter	Single-use or intermittent catheterization	Indwelling catheterization (transurethral or suprapubic)
Incontinence	X		(X) Only in female residents with an open extensive sacral or perineal wound
Urine collection for culture	(X) Only if midstream or aseptic collection of urine is impossible	(X) Only if midstream or aseptic collection of urine is impossible	(X) Only if the resident already has an indwelling catheter. Renew the catheter before collecting urine.
Acute urinary retention (or in case of suspicion if bladder scan is missing/ impossible)		X	
Chronic urinary retention			X
Required prolonged immobilization	X	X	X
Untreatable bladder voiding dysfunction or neurogenic bladder		X	X
Palliative comfort	X		X

Table 2. Empirical antibiotic treatment of UTIs.

Renal function	Empirical antimicrobial	Treatment duration
Asymptomatic bacteriuria		
No antibiotic treatment		
Acute cystitis		
eGFR >30 mL/min	Nitrofurantoin 100 mg t.i.d.	5 days
eGFR 15-30 mL/min	Fosfomycin 3 g single dose	Single dose
	Trimethoprim 80 mg b.i.d.	3 days (women)
Acute bacterial prostatitis		
	Ciprofloxacin 500 mg b.i.d.	2 (to 4) weeks
	Levofloxacin 500 mg once daily	2 (to 4) weeks
Uncomplicated pyelonephritis		
	Ciprofloxacin 500 mg b.i.d.	1 week
	Levofloxacin 500 mg once daily	1 week
Candiduria (urinary candidiasis)		
	Fluconazole 400 mg on day 1, followed by 200 mg once daily from day 2 onwards	1 (to 2) weeks

The use of cranberries as UTI prevention in older adults remains controversial. A Cochrane review from 2023 refers to several limitations in many studies [9]. In most studies, the dose of the active ingredient, type A proanthocyanidins (PACs), is not reported, imlying that many products might not have enough potency to be effective [9]. A double-blind randomized controlled trial showed that 2 × 18.5 mg daily of PACs was associated with a non-statistically significant 24% reduction in the risk of symptomatic UTI compared to a daily dose of 2 × 1 mg PACs during a 24-week follow-up period [40]. However, among women who experienced less than five infections in the previous year, the high dose PACs resulted in a significant 43% reduction of symptomatic UTIs compared to the lower dose [40]. Due to methodological weaknesses of most studies, there is insufficient evidence to recommend the use of cranberries to prevent UTI in older adults [9]. More randomized controlled trials with products with a high dose of the active ingredient are necessary to evaluate the benefits and be able to give recommendations.

In addition, probiotics have not been proven to be effective in the prevention of UTIs [13]. A Cochrane systematic review found no significant reduction in the risk of recurrent symptomatic bacterial UTIs between patients treated with probiotics and placebo [13]. This result is confirmed by a more recent systematic review and meta-analysis. [41]

Antimicrobial prophylaxis

Antimicrobial prophylaxis for recurrent UTI raises many concerns. Prescriptions for antimicrobial prophylaxis often lack a stop or re-evaluation date in Belgian nursing homes, possibly leading to too prolonged and even life-long antimicrobial intake with increased risks of selection of resistance and (serious) side effects [19]. The possible advantages of antimicrobial prophylaxis in older adults do not outweigh the harms of a long-term antimicrobial exposure [42]. Recurrent UTIs (i.e. ≥3 episodes in one year or ≥2 episodes in 6 months) need to be treated properly. If symptoms persist and an increased burden of disease is observed, one should seek advice from an infectious diseases/urology-specialist in order to exclude underlying conditions before prescribing antibiotic prophylaxis (nitrofurantoin 50 mg once daily or 3 g of fosfomycin once weekly) for a maximum of three months with planned reassessment [20,25,43–46].

Box 1 is an overview of recommendations regarding UTI prevention.

Diagnosis of urinary tract infections

The diagnosis of a UTI can be made based on a combination of clinical symptoms and a positive urine culture. A urine culture should only be performed when clinical symptoms are present [1].

UTI clinical symptoms

Two flowcharts were developed for the diagnosis of UTI in nursing home residents without and with an indwelling urinary catheter, respectively, making use of different evidence-based guidelines supplemented with clinical expertise [4–6,14,15,20,23–25,36,46–48] (Figures 1 and 2).

The diagnosis of a UTI is extremely difficult in residents with severe deterioration in mental state. Typical urinary symptoms may be absent, increasing clinical decision-making difficultly. Symptom interpretation should always be performed by physicians. To justify a strong assumption of UTI, it may be necessary to question the caregivers about the symptoms and the behaviour of the resident and to perform a complete clinical investigation. Antimicrobial treatment can be initiated after a urinary sample has been obtained, the culture results preferably are available and when other possible (non-)infectious causes have been excluded.

Point-of-care testing

A urine dipstick for nitrites and leukocytes is only useful in ruling out UTIs in residents without an indwelling catheter [48]. A positive test cannot confirm nor substantiate a suspicion of UTI [18]. In Belgian nursing homes, the use of dipsticks often leads to an over-diagnosis of UTI and is therefore not recommended [4,48–51]. Interventions in restricting dipstick use have shown to lead to a reduction in antimicrobial

Box 1. Recommendations regarding UTI prevention in older adults living in nursing homes

Follow national guidelines regarding hand hygiene and other standard precautions for IPC
Stimulate fluid intake
Stimulate an appropriate toilet behaviour and posture to prevent post-void urinary residue
Mobilize the resident
Perform intimate hygiene with water only or pH neutral soap
Perform a post-void residue measurement when urinary retention is suspected
Avoid indwelling urinary catheters, use them only when indicated and ensure an aseptic placement
Avoid bladder irrigations
Assess medication schedules on a yearly basis
Avoid cranberry and probiotics
Consider hormonal therapy (local estrogen) in older women with recurrent UTI
Avoid long-term antibiotic prophylaxis. Contact a specialist in infectious diseases/urology when an increased burden of disease is observed.

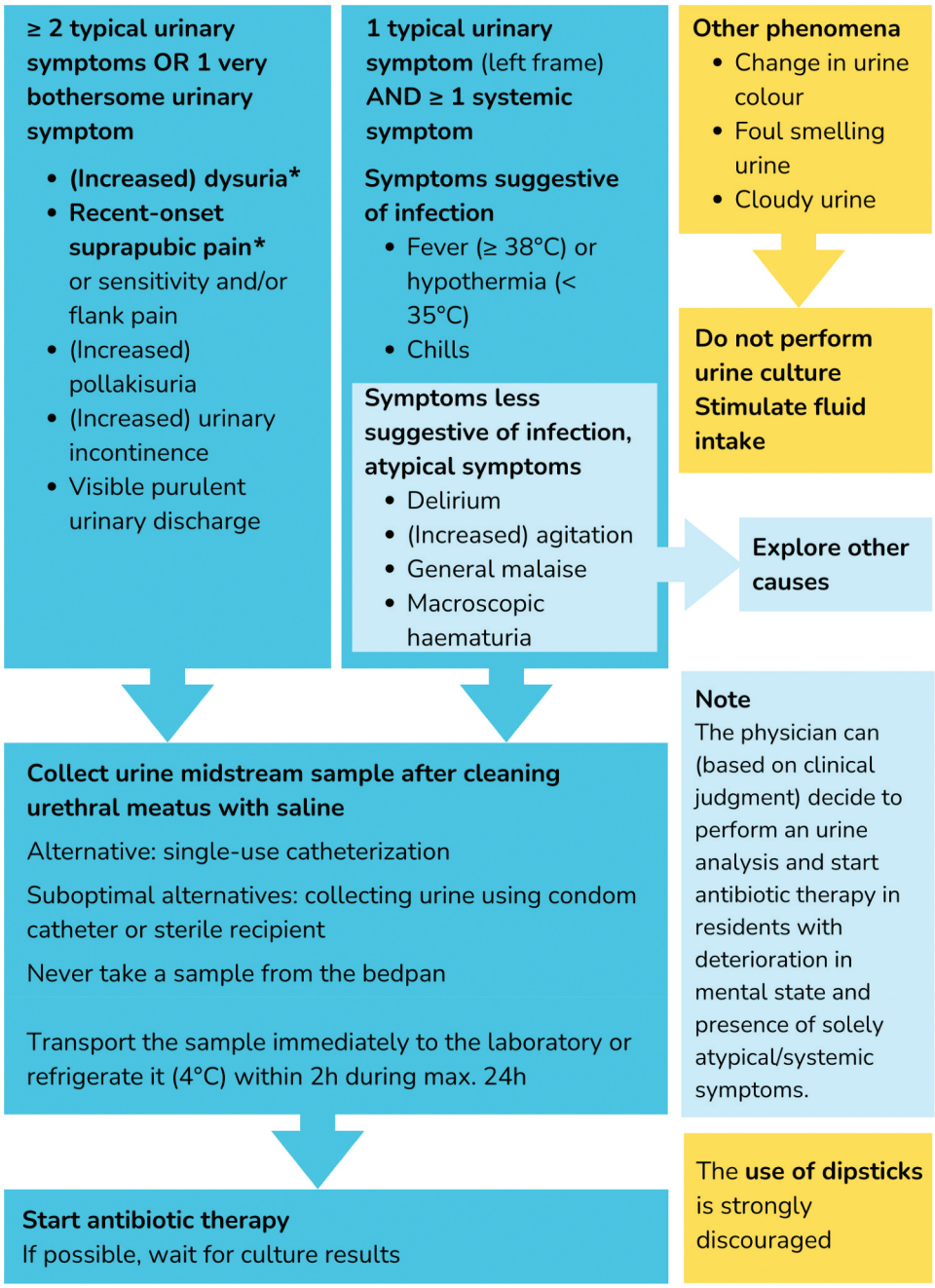

Figure 1. Flowchart for the diagnosis of UTIs in older nursing home residents without an indwelling catheter. *Dysuria and suprapubic pain are significant predictors of a confirmed UTI in elderly.[4]

prescriptions for UTI without an increase of the clinically relevant endpoint of admissions for urinary sepsis [51].

Earlier guidelines showed a lack of evidence for the use of C-reactive protein point-of-care testing in the diagnosis of a UTI [25]. A complete blood count and biochemical analysis can be useful to rule out invasive or systemic infection [25].

Urine sampling

Sampling of urine needs to be performed before antimicrobial therapy is initiated and after intimate hygiene. In a resident without an indwelling catheter, a midstream collection is preferred [23]. Due to the profile of the residents (deteriorated mental state, physical state, incontinence ...), obtaining a midstream urine specimen is often challenging and not always

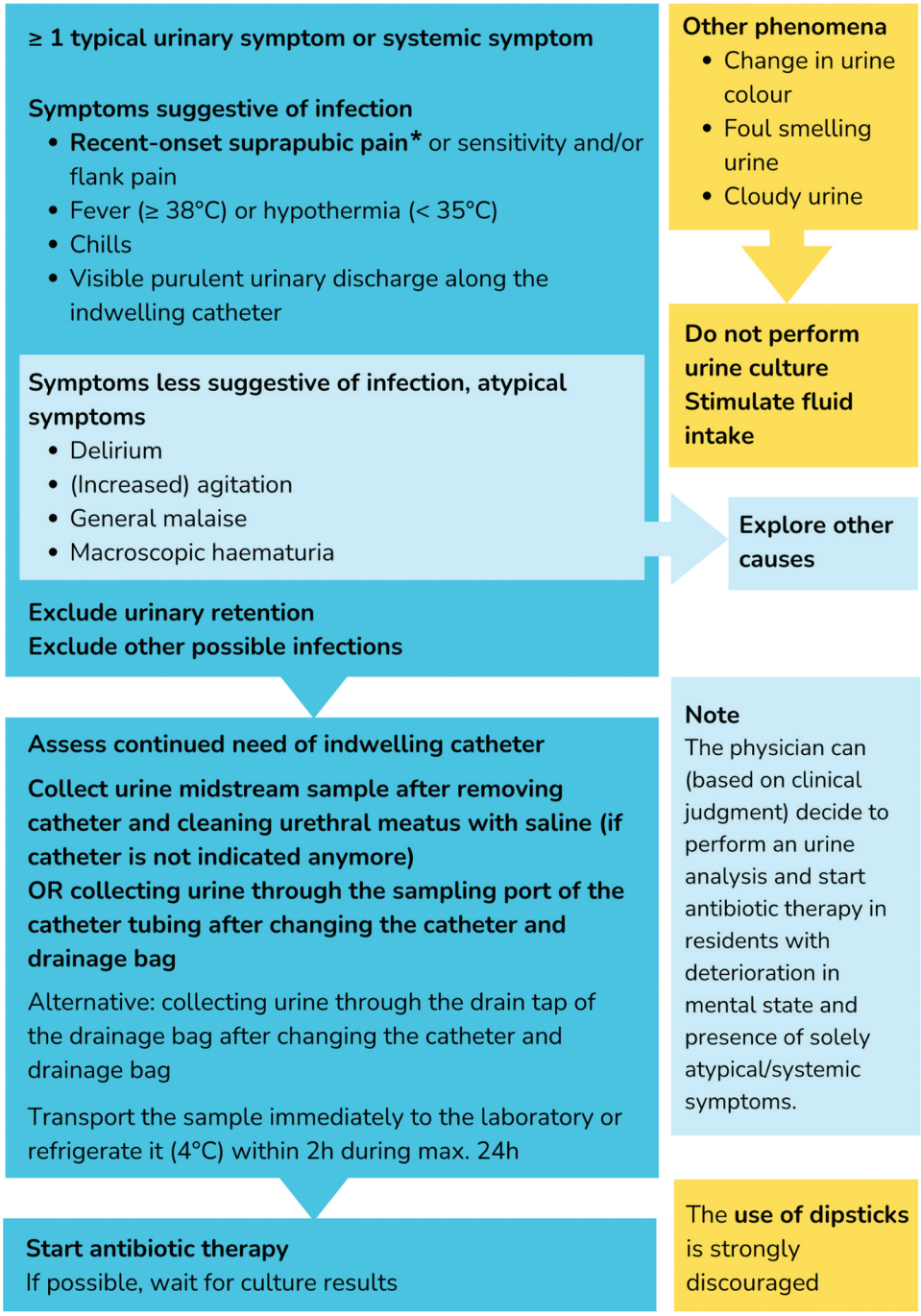

Figure 2. Flowchart for the diagnosis of UTIs in older residents with an indwelling catheter. *Suprapubic pain is a significant predictor of a confirmed UTI in elderly.[4]

possible [14]. The aseptic collection of urine in a sterile recipient or a urine collection container can serve as an alternative whenever midstream collection is unfeasible. In male resident,s a condom catheter can be used to obtain urine for culture (Figure 1) [14,23]. A single catheter or in-and-out catheterization is appropriate if an aseptic urine collection is not possible in a non-invasive manner [23].

Urine sampling in a catheterized resident is challenging as well. One needs to change the closed urinary catheter system before a sample can be taken, in order to discriminate between actual bladder infection and mere catheter biofilm colonization [23]. A urine sample can be obtained through the sampling port in the drainage tubing (Figure 3), or through the drain tap of the drainage bag when the drainage tubing has no sampling port. Disconnecting the catheter from the drainage bag can increase the risk of developing a CAUTI and needs to be avoided. Therefore, a closed system needs to be ensured.

The urine samples can be stored without stabilizing agents in the refrigerator (4°C) for maximum 24 hours, boric acid tubes can be stored at room temperature for maximum 24 hours, or the urine samples can be

Box 2. Recommendations regarding UTI diagnosis

Collect a urine sample only if suggestive clinical symptoms are present
Avoid dipsticks to confirm or substantiate suspicion of UTI
Do not consider UTI and do not perform additional examinations if urine is cloudy, concentrated or foul smelling without other urinary symptoms
Explore for other causes if atypical symptoms, such as delirium, agitation, general malaise occur or when macroscopic haematuria is observed

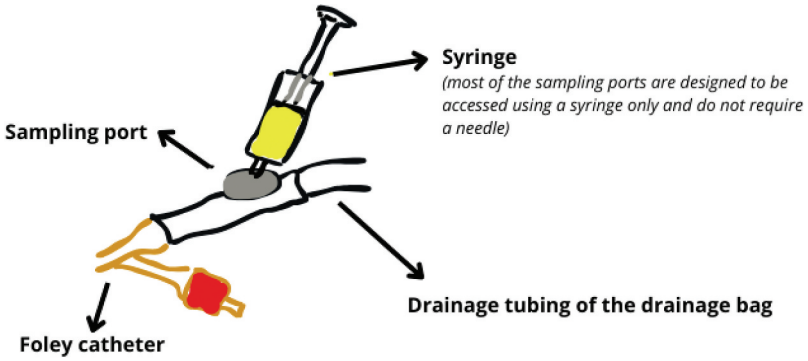

Figure 3. Urine sampling through the sampling port in the drainage tubing of the drainage bag.

transported immediately to the laboratory for further analysis [23].

Diagnosis of a positive urine culture in a non-catheterized resident is defined by the local laboratory and is dependent on the results from in lab dipstick, particle count and the isolated bacterial species and their quantitative count. The European Federation of Clinical Chemistry and Laboratory Medicine guidelines can serve as additional information [52].

A urine culture in a catheterized resident is considered positive if maximum two micro-organisms are found at a concentration of $\geq 10^5$ CFU/mL. [20]

Box 2 is an overview of recommendations regarding UTI diagnosis.

Antimicrobial treatment for urinary tract infections

Initiating antibiotic therapy

Empirical antibiotic therapy should be avoided in residents with mild-to-moderate symptoms. Targeted antibiotic therapy can be initiated when culture results are available.

Box 3. Recommendations regarding UTI antimicrobial treatment

Do not trace nor treat asymptomatic bacteriuria
Preserve fluoroquinolones for prostatitis or pyelonephritis
Document the etiological micro-organism
Adjust antimicrobial therapy as soon as culture results are known
Document an end or revision date of the antimicrobial therapy
Seek specialist advice if the micro-organism is multi-drug resistant or if therapy fails

Asymptomatic bacteriuria

ASB is defined as the presence of at least 10^5 CFU/mL of the same species isolated from two consecutive samples collected within 10–18 days from a person without signs or symptoms of a UTI and is common among older adults [17]. A Belgian study even reported an 80–90% prevalence in female nursing home residents with urinary incontinence or with a high degree of dependence and disorientation [53]. ASB does not require antibiotic treatment (Table 2). It has been documented that antimicrobials in ASB do not reduce the risk of death or sepsis and increase the risk of *Clostridioides difficile* infections and isolation of organisms with increased antimicrobial resistance [17,23,24].

Cystitis

Fluoroquinolones should be avoided in cystitis in order to reduce antibiotic selection pressure and because of increased baseline resistance rates in older adults. Fluoroquinolones should be reserved for more serious infections, such as prostatitis and pyelonephritis [54–57]. The susceptibility of *Escherichia coli* for Trimethoprim-Sulfamethoxazole (TMP-SMX) in adult women with uncomplicated cystitis decreased from 83.3% in 1995 to 76.3% in 2015, which indicates that TMP-SMX is no longer eligible as empirical therapy for acute pyelonephritis nor for acute uncomplicated cystitis, but can be useful in targeted situations based on proven susceptibility [54–59].

Ten Doesschate T et al. reported that treatment for uncomplicated cystitis with fosfomycin or trimethoprim was associated with more clinical failure as compared to nitrofurantoin in patients with estimated Glomerular Filtration Rate (eGFR) ≥60 mL/min (20.7%–20.8% and 14.6% respectively), while nitrofurantoin was associated with more clinical failure than fosfomycin in patients with eGFR <60 mL/min (23.3% and 16% respectively) [60,61]. Based on expert opinion and limited data, the use of nitrofurantoin up to a lower eGFR cut-off of 30 mL/min is defendable. Therefore, nitrofurantoin 100 mg three times a day for five days is the preferred regimen in residents with a renal clearance of at least 30 mL/min (Table 2) [54–62]. In residents with more pronounced renal impairment (eGFR 15–30 mL/min), a single dose of fosfomycin 3 g is recommended (Table 2). An inferior alternative to fosfomycin can be trimethoprim 80 mg twice a day for three days in women (Table 2)[54–64]. Cystitis in men can be considered as equivalent to prostatitis and needs to be treated with fluoroquinolones (see further).

Bacterial prostatitis

The diagnosis of acute bacterial prostatitis requires a clinical investigation and a urine culture. A blood culture has to be considered in the presence of systemic symptoms. Measurement of free and total PSA adds no practical diagnostic information in prostatitis [20].

Fluoroquinolones (ciprofloxacin 500 mg twice daily or levofloxacin 500 mg once daily for at minimum two weeks) represent the first-line empirical therapy in residents with prostatitis (Table 2) [20,65]. After the initial two weeks, antimicrobial therapy can be extended to four weeks if necessary based on a clinical reassessment [65]. Once the urinary culture results are known, antimicrobial therapy should be adjusted according to the susceptibility pattern of the isolated pathogen. With documented resistance to fluoroquinolones and documented sensitivity, TMP-SMX (160 mg TMP +800 mg SMX) twice daily may be an alternative [65].

Male patients with urinary symptoms that persist for ≥3 months and a positive urine culture are considered to suffer from chronic prostatitis. Microbiological documentation is required to initiate rational antimicrobial treatment. As in acute prostatitis, fluoroquinolones for 4–6 weeks are preferred as first-choice therapy [20,65]. TMP-SMX for 4–6 weeks or a prolonged treatment with fosfomycin at a dosing scheme of 3 g once daily for the first week followed by 3 g every 48 h for a total duration of 6–12 weeks are alternative options in case of fluoroquinolone, TMP-SMX or both fluoroquinolone and TMP-SMX resistant pathogens respectively or in therapeutic failure [65,66].

Pyelonephritis

Pyelonephritis requires microbiological documentation by an in lab dipstick/particle count and urinary culture combination in order to ensure rational and effective antimicrobial therapy. Fluoroquinolones (ciprofloxacin 500 mg twice daily or levofloxacin 500 mg once daily) for a duration of one week represent first line empirical therapy (Table 2) [20]. However, therapy should be adjusted as soon as pathogen susceptibility is known, with different options (amoxicillin-clavulanate, ceftriaxone, temocillin or TMP-SMX), guided on susceptibility pattern and baring possible tissue penetration problems in mind [20,67].

Residents with complicated pyelonephritis will require hospitalization for initial assessment. Outpatient Parenteral Antimicrobial Therapy (OPAT) can serve as a follow-up treatment modality in a clinically stable patient [20,67,68].

Candiduria

Asymptomatic candiduria does not require treatment in older residents [69]. However, risk factors, such as the presence of an indwelling catheter, need to be identified and eliminated if possible [69]. In the presence of symptoms, antifungal therapy with fluconazole 400 mg on day 1, followed by 200 mg from the second day onwards for 1 (to 2) weeks can be administered in case of azole-sensitive yeasts (Table 2) [69].

In case of azole-resistant micro-organisms, specialist advice is recommended.

Box 3 is an overview of recommendations regarding UTI antimicrobial treatment.

Conclusion

An inter-HOST consensus statement on prevention, diagnosis and treatment of UTI in older nursing home residents was developed based on clinical expertise, peer-reviewed publications, (inter)national guidelines and discussion rounds with involved experts and organizations. It allows for a common framework in the management of these highly prevalent infections in this specific population. This consensus approach, however, needs to be upgraded to the standard of an evidence-based guideline in order to achieve necessary steps towards broader acceptance, more uniform practices and higher implementation rates in the working field.

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Author contributions

The authors confirm contribution to the paper as follows: study conception and design: Jodie Langbeen, Dirk Vogelaers, Veroniek Saegeman; data collection: all authors; analysis: all authors; interpretation of results: all authors; draft manuscript: Jodie Langbeen. All authors reviewed the results and approved the final version of the manuscript.

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