**TITLE: The management of urinary tract infections in older patients within an urgent care out-of-hours setting**

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**ABSTRACT:** This article critically analyses the prevalence, assessment and management of urinary tract infections (UTIs) in patients over the age of 65, in an urgent care out-of-hours service in order to enhance care. It is undertaken from the perspective of working as an Advanced Nurse Practitioner (ANP). A synopsis of UTI is presented, examining the epidemiology and aetiology. The process of assessment, diagnosis and management of UTI in older people is appraised based on current evidence. Difficulties associated with the recognition of UTI in elderly are evaluated. Finally, recommendations are made for the improvement of future practice as an ANP.

**MAIN TEXT**

Urinary tract infections (UTIs) are among the most frequent bacterial infections seen within primary care (National Institute for Health and Care Excellence (NICE), 2020a). They are caused by the presence of multiplying microorganisms in the urinary tract with infection being determined by a combination of bacteria in the urine plus clinical features (NICE, 2015). It is estimated that over 92 million people are affected worldwide and among older people, UTI is a substantial cause of mortality (NIHR Community Healthcare Medtech and In Vitro Diagnostics Cooperative, 2016). It is estimated that 1-3% of primary care attendances are due to UTI-related symptoms and they comprise the main reason for 13.7% of antibiotic prescribing (NIHR Community Healthcare Medtech and In Vitro Diagnostics Cooperative, 2016). The prevalence is approximately 20% in women aged over 65, compared with 11% in the overall population (Chu and Lowder, 2018). However, both genders are at risk of UTI in older age, with a male-to-female ratio of 1:2 (Cove-Smith and Almond, 2007). The risk increases substantially in patients over the age of 85 (Rowe and Manusga, 2014).

**Definitions and wider context**

UTI is defined as an infection of the urinary system, involving lower tract, upper tract or both (NICE, 2020a). The pathogens responsible for UTI include *Escherichia coli* (*E. coli*) which account for 70% to 95% of uncomplicated cases, with *Staphylococcus saprophyticus* responsible of 5% to 20% of cases (NICE, 2019). Less common pathogens in uncomplicated UTIs include *Proteus mirabilis*, *Klebsiella* species, *Citrobacter* genus, *Pseudomonas aeruginosa*, group B streptococci and enterococci (BMJ Best Practice (2020). UTI generally occur when uropathogens found in faecal flora contaminate the peri-urethral area; these then ascend into the bladder via the urethra causing a lower UTI. Uropathogens may migrate further from the bladder into the kidneys, via the ureters, resulting in pyelonephritis, an upper UTI (BMJ Best Practice (2020).

Bacteria present in the urine is known as bacteriuria, and the occurrence of bacteria in the urine without signs and symptoms of a UTI is defined as asymptomatic bacteriuria (Ninan et al, 2014). The prevalence of asymptomatic bacteriuria is high in older people, especially those living in long-term care, making diagnosis and treatment difficult because it does not essentially signify acute infection, and in isolation it is not an indication for antibiotics (Nicolle et al, 2005). These diagnostic challenges may lead to over-diagnosis, excessive antibiotic treatment and delay in making accurate diagnoses (Ninan et al, 2014)

**Antibiotic prescribing**

UTI is the second most frequent reason for the prescription of antibiotics within primary and secondary care, with over 50% of prescriptions in older adults believed to be unnecessary (Public Health England (PHE), 2020). Over-treatment can lead to adverse reactions from antibiotics, and with ever increasing antimicrobial-resistance (AMR) antibiotic reduction in this age group is essential (Mayne et al, 2019). AMR is a growing threat to public health; antimicrobial stewardship and national guidelines are aimed at opposing these challenges and must be adhered to in practice (Scottish Intercollegiate Guidelines Network (SIGN), 2012; NICE, 2018d; 2020a; 2020b; PHE, 2020b).

**Urosepsis**

*E. coli* can enter the bloodstream following a UTI, manifesting as urosepsis, with *E. coli* bacteraemia being the most common cause of sepsis in the UK (Thornton et al 2018). Urosepsis is increasing each year with studies revealing that only 18% of cases are hospital-based onset (PHE, 2020a). In England, 43,294 *E. coli* bacteraemia cases were reported in 2019/20, with 6,005 deaths reported (PHE, 2021). With no definite cause highlighted, it has been suggested that it could be related to delayed treatment of UTI in primary care, and antimicrobial stewardship initiatives (Thornton et al, 2018).

However, increasing incidence of older people with frailty and increasing resistance could explain the growing morbidity associated with UTIs (Allison and McNulty, 2019). Cases of *E. coli* bacteraemia increased by 35% over 2013–2017, with the highest rates in England noted among older people, with significant risk factors including recurrent UTIs, frequent antibiotic use and indwelling catheters (Abernethy et al, 2016). This presents challenges to working as an autonomous advanced nurse practitioner (ANP) in out-of-hours (OOH) care. The burden of UTI in older people is anticipated to grow due to an increase in the ageing population, in addition there are wide variations in presenting symptoms and management of UTI, with overall adherence to guidance varying between services (Philips et al, 2014). It is therefore essential to improve diagnostic, management and prevention approaches to enhance the health outcomes of older adults (Gharbi et al, 2019).

**ANP roles**

There is an increasing prevalence of ANP roles throughout the urgent care OOH service, including urgent care centres, walk-in centres, on-day home visiting services and urgent care home visiting. ANPs are well positioned to have crucial roles in the assessment and management of UTIs in patients aged over 65. In this age group, NICE stipulates that a full clinical assessment and examination is required prior to formulating a working diagnosis of UTI (NICE, 2015), including the completion of vital signs (SIGN, 2012). This is due to the complexity of assessment in older patients; various indicators can affect assessment and restrict the ability to assess for acute symptoms. For example, cognitive impairment may reduce the ability to communicate or give a history about symptoms and coexisting illnesses that present with nonspecific symptoms such as urinary incontinence (Ninan et al, 2014).

The clinical decision-making processes in urgent care OOH depends on quickly assessing whether a patient is presenting with an infection or displaying signs of sepsis or deterioration. ANP development requires acquisition of comprehensive assessment skills (Health Education England (HEE), 2017). It is crucial as an ANP to have the ability to assimilate information, formulate decisions and apply these decisions correctly into practice (HEE, 2017). Working within the HEE framework for Advanced Clinical Practice (HEE, 2017) it is vital to holistically assess patients, incorporating a comprehensive history and identifying risk factors.

To help obtain a clinical picture it is essential that a full and thorough history is taken (NICE, 2020a). If patients have reduced ability to give an exact history, clinical staff, carers, friends or relatives are asked whether cognitive decline, functional or behavioural changes are new, ongoing or acute (NICE, 2020a).

**Considerations in assessment and management**

**Symptoms of UTI**

Symptoms of UTI include dysuria, urgency, urinary frequency, changes to urine consistency or appearance, nocturia and suprapubic pain (NICE, 2020a). However, in older patients these features may not be present, also patients with UTI generally present with non-specific clinical features such as increased confusion or delirium, lethargy, reduced appetite, incontinence, reduced mobility or the inability to carry out normal activities of daily living (NICE, 2020a). Pyrexia, renal angle pain, loin pain, vomiting or rigors can indicate pyelonephritis (NICE, 2020a, 2020b). If undiagnosed, this can progress adversely to sepsis and renal failure (Kalra and Raizada, 2009). Importantly, it is essential to be aware that older patients are vulnerable and may have impaired immunity, therefore a low threshold for sepsis is assumed when a patient shows signs of UTI, plus acute disease (NICE, 2017; UK Sepsis Trust, 2019).

**National Early Warning Score**

To assist in the detection of deterioration in adult patients the National Early Warning Score 2 (NEWS2) tool is used (Royal College of Physicians (RCP), 2017). NEWS2 comprises the physiological readings of patients including systolic blood pressure, heart rate, temperature, oxygen saturation respiratory rate, and consciousness level, with adjusted scoring when there is a need for oxygen therapy (RCP, 2017). The values are measured, recognising that patients with a high score are more at risk of deterioration (RCP, 2017). For patients with a NEWS2 score of five or more, the local sepsis protocol is adhered to and a 999 transfer to secondary care is made (NHS England, 2017).

PHE (2019) indicates that UTI is likely in patients above 65 years that have new onset dysuria with two or more of the following: new urgency or frequency, new incontinence, new or worsening delirium, new suprapubic pain, visible haematuria or an increased temperature 1.5°C higher than the patient’s normal temperature. However, if fever and delirium or debility are present, other sources of infection and causes of delirium other than UTI must be excluded before making a diagnosis of UTI (NICE, 2020a; PHE, 2020b). Other sources of infection may include respiratory, gastrointestinal, skin and soft tissue, and should be investigated and treated in line with local guidance (PHE, 2020b).

**Delirium**

A systematic review analysed the association between UTI and delirium and found that in patients without a UTI, delirium rates were 7.7% to 8% compared with patients who had a confirmed UTI, where delirium rates were 30% to 35% (Balogun and Philbrick, 2014). However, with methodological flaws and bias being noted, more research is needed in this area (Balogun and Philbrick, 2014). Nevertheless, it is practical to accept the association between symptomatic UTI and delirium just as it is with delirium and numerous other conditions and infections (Balogun and Philbrick, 2014). It is noted that the presence of asymptomatic bacteriuria, without frequency, dysuria, pyrexia or suprapubic discomfort, is a doubtful cause of delirium, and other contributing factors are always considered and investigated (Gau et al, 2009).

For the assessment of delirium or new confusion, PHE (2020b) recommends the use of the mnemonic PINCH ME, which stands for: pain, other infection, reduced nutrition, constipation, hydration, medications and environmental changes. This is applied in practice when assessing older patients and is a useful tool for the review of possible causes for delirium. Another tool used for the rapid assessment of delirium is the Arousal, Attention, Abbreviated Mental Test 4, Acute change tool (4AT) (MacLullich, et al, 2011). It is quick to apply in practice with high sensitivity and no training is required for its use (Healthcare Improvement Scotland, 2019). With patients that have no new signs of UTI, when other infections have been ruled out, PHE (2019) advice that ‘watchful waiting’ is employed, whilst investigations for further causes are completed.

Patients with symptoms of a UTI who have a urinary catheter in situ are checked for signs of blockage and removal or replacement is considered (NICE, 2019; PHE, 2019). Competing differentials are considered during assessment including, urethritis, prostatitis, vulvovaginal atrophy or genitourinary syndrome of menopause, and sexually transmitted diseases, as all of these can cause symptoms of UTI (Portman and Gass, 2014; Michaels and Sands 2015).

**Urinalysis**

For the diagnosis of patients over the age of 65 the use of urine dipsticks is not recommended (PHE, 2020b). Most patients with catheters and half of older patients will have asymptomatic bacteriuria in the bladder without infection (PHE, 2020b). Although asymptomatic bacteriuria is not harmful to patients it will create a positive dipstick reaction, thereby misleading the results (PHE, 2020b). The diagnosis of asymptomatic bacteriuria without UTI symptoms is made by a midstream urine sample indicating bacterial growth greater than 10⁵ colony-forming units per millilitre (cfu/ml) in one single sample in men and two consecutive samples in women (Bonkat et al, 2019).

Diagnosis of UTI in all patients over the age of 65 is based on taking a full history including associated symptoms, previous episodes of UTI, risk factors, past medical history, prescribed medications, previous antibiotics and a full examination including vital signs and abdominal examination (SIGN, 2012; NICE, 2019). Change to urine colour or smell is also not a diagnostic tool but may be specifically related to dehydration, so a history of fluid intake is essential (Ninan et al, 2014). If either non-visible or visible haematuria continues following treatment of a UTI, it requires further investigation to rule out the cause, with referral to secondary care as required (NICE, 2017).

**Midstream specimen of urine**

To confirm a diagnosis and guide antibiotic prescribing a midstream specimen of urine (MSU) must be sent for culture and sensitivity in patients over the age of 65 (PHE, 2020b).This diagnostic certainty is not always possible working within OOH urgent care, where there is no facility to send MSU samples for pathology, and delays in sending are unavoidable, however the a boric acid preservative may be used or refrigeration at 4°C is suggested and the sample can then be sent the following day (PHE, 2019). Difficulties arise when collecting an MSU from older people due to incontinence, and it is recommended to only take an MSU if a patient is symptomatic and capable of collecting a satisfactory sample (PHE, 2019). A clean catch in a disinfected container and for men the use of condom catheters may be feasible options for incontinent patients but there is poor evidence to support these techniques (Latour et al, 2013). MSU samples from patients with indwelling catheters should be taken from a newly inserted catheter using an aseptic technique (PHE, 2019).

It is recognised that within the guidance the diagnosis and management of UTI in older people uses the age of 65 years as a cut off (SIGN, 2012; PHE, 2020b), however in practice it is evident that this is not a standardised group and may include self-caring, fit and healthy older women, who may be managed similarly to those aged under 65 years, and they are assessed on an individual basis, to allow for patient-centered care (HEE, 2017). However, in males, management does not change and an MSU is always required (NICE, 2020b).

Culture results are interpreted alongside the severity of signs and symptoms that patients present with because false negatives can occur (PHE, 2020b). In patients that present with urinary symptoms, urine culture results may indicate a UTI if there is a growth of 10⁴-10⁵ cfu/ml, whereas in results that have a mixed growth or epithelial cells a retest may be required if symptomatic (PHE, 2020b).

**Antibiotic choice**

Best practice for the treatment of a lower UTI is to send an MSU prior to antimicrobial prescribing so that results can be tailored to sensitivities. However, this is only possible if the patient is systemically well, not considered high risk and it is deemed safe to wait for treatment. In an OOH setting, this is challenging, and safety of patients is paramount (HEE, 2017). If antibiotics are required, previous sensitivity, resistant patterns and previous treatments must be noted (NICE, 2018d), with narrow spectrum antibiotics prescribed where possible, to minimise the chance of clostridium difficile and AMR. In *E. coli* urine isolates 28.6% are resistance to trimethoprim, in comparison nitrofurantoin resistance is 2%, and pivmecillinam 6% within England (PHE, 2020b).

Nitrofurantoin is consequently the first-line antibiotic to consider in all patients (NICE and PHE, 2020). In patients with reduced renal function nitrofurantoin achieves low urinary concentration and if an estimated glomerular filtration rate (eGFR) is below 45 ml/minute other antibiotics must be considered (Joint Formulary Committee, 2021) including trimethoprim, pivmecillinam, or fosfomycin (NICE and PHE, 2020). The recommended treatment length for a lower UTI is 3 days for women and 7 days for men (NICE and PHE, 2020). There is good evidence to support the use of 3 days in women where a meta-analysis of 1644 older women proved that 3 to 6 days of antibiotics was comparable with 7 to 14 days, with no differences in patient satisfaction, re-infection rates, symptom duration or adverse events (Lutters et al, 2008). However, there is a poor amount of evidence in relation to antibiotic duration in older men and 7-day treatment is principally founded on expert consensus within national guidelines (SIGN, 2012; PHE, 2018d; Bonkat et al, 2019).

For the management of pyelonephritis referral must be considered if patients present as very unwell, with signs of sepsis, dehydration, are not taking fluids, have an increased risk of acquiring complications including structural or functional defect of the genitourinary tract, immunosuppression or diabetes mellitus (NICE, 2020b). For patients who are well and can be managed within primary care, latest guidance recommends cefalexin as first line treatment for 7–10 days, as it has a lower resistance than co-amoxiclav and ciprofloxacin, with randomised controlled trials demonstrating that it is similarly effective (NICE, 2018).

For patients with an indwelling catheter and new signs of symptoms of a UTI, this should be treated with antibiotics and a catheter change if over 7 days old (NICE, 2018b) . Antibiotic treatment and management remain as per guidance as associated symptoms of lower UTI or pyelonephritis (NICE, 2018a, 2018d). However, in patients without new symptoms and who are well, treatment should not be commenced without MSU results (NICE, 2018b).

**Communication**

Communication is vital to the role of the ANP with verbal and written information given to the patient or their carer during the consultation, this includes actions to be taken if their condition fails to improve, changes or if they have further concerns about their health to aid the safe management of patients (HEE, 2017). Advice is provided regarding diagnosis and treatment, self-care including fluids and paracetamol, clear instructions regarding worsening symptoms or ongoing symptoms that are not improving within 48 hours of treatment and details of who they need to contact to access further care (NICE, 2018a). Patients’ or carers’ levels of understanding concerning safety netting advice are assessed, and related referrals are made as a duty of care for observational reasons (Nursing and Midwifery Council, 2018). Written advice is available from the Royal College of General Practitioners TARGET antibiotics toolkit website (https://www.rcgp.org.uk/TARGETantibiotics) regarding UTI for older adults and carers and is used in practice to allow for education regarding self-care and understanding of safety netting advice (PHE, 2018; <https://www.rcgp.org.uk/clinical-and-research/resources/toolkits/amr/target-antibiotics-toolkit/leaflets-to-share-with-patients.aspx> ).

Recognition of UTI in elderly patients is not always straightforward. Older women can exhibit signs of a UTI as a consequence of oestrogen deficiency and evidence supports the use of vaginal oestrogen cream or pessaries to reduce the risk of re-occurring UTI diagnosis (Perrotta et al, 2008). Elderly patients may have existing medical conditions such as benign prostatic hyperplasia disease, dementia and constipation that may predispose them to incontinence and UTIs (SIGN, 2012; NICE, 2012). A full history of patients’ prescribed medications is essential, since drugs such as antimuscarinics also may predispose patients to symptoms of UTI, as they are known to cross the blood–brain barrier, and may cause confusion, reduce bladder emptying and trigger or exacerbate constipation (NICE, 2012).

**National guidance**

Previous national guidance regarding UTI was not specifically aimed at patients over the age of 65, however, the latest guidance includes diagnostic flow charts for this age group (PHE, 2020b) and should be used in practice. This will aid diagnosis and treatment with potential to allow for improved prescribing alongside antimicrobial stewardship and result in improved outcomes for patients. Working as an ANP it is important to understand the necessity for changes to healthcare policy and guidance and to use leadership skills to influence junior staff and other members of the multidisciplinary team to promote best practice (Anderson, 2018).

**Conclusion**

The correct management of elderly patients who are seen within OOH urgent care with UTI is challenging for ANPs since the signs and symptoms might vary widely (PHE, 2020b). With a broad variation in practice, interpretation of symptoms, diagnostic tests, and commencement of antibiotic treatment, the diagnosis of UTI is extremely difficult in older patients, especially as they may have asymptomatic bacteriuria (Butler et al, 2015). To prevent variation in practice and unnecessary treatment, latest evidence-based guidance should be adhered to, with outdated practices such as urine dipstick tests only being used where guided, to reduce unwarranted antibiotics and reduce the emergence of AMR in the community. ANPs should educate patients about self-care measures regarding hydration, catheter and incontinence care to prevent re-occurring symptoms (PHE, 2019). Crucial knowledge regarding the signs and symptoms, assessment and management of patients presenting with symptoms of UTI allows patients to be safely managed, which is pertinent to the role of the advanced practitioner (HEE, 2017). Ensuring high-quality, safe, patient-centred care requires excellent communication skills, as well as education of staff and MDT, patients and relatives.

Declaration of interest: none

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