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Management of urinary tract infections in the community; clinical audit and patient survey

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Title: Management of urinary tract infections in the community; clinical audit and patient survey.

Running title: UTI management by patients and clinicians

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Data availability: for queries regarding data please contact the corresponding author

Ethical standards: The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional guidelines on human experimentation (Health Research Authority, UK) and with the Helsinki Declaration of 1975, as revised in 2008. Study governance approval was obtained via Health Research Authority (reference 282035 and Research Ethics Committee (reference 21/SC/0205). Participants consented to participating in the study in line with Declaration of Helsinki on Good Clinical Practice.

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How this fits in

- UTI is managed differently depending on patient sex and age, due to differences in associated risk of complications.
- Males indicate to be less knowledgeable of UTIs, utilise self-management remedies less often and present later to a healthcare professional.
- For this cohort of patients, sub-optimal clinical management of UTIs was identified; this may compromise patient safety and antimicrobial stewardship.
- Public health interventions aimed at males are indicated to ultimately reduce the risk of UTI complications and sepsis.

Title: Management of urinary tract infections in the community; clinical audit and patient survey.

Abstract

Background

Urinary tract infection (UTI) is a common ailment but can develop into sepsis. The outcomes related to UTI may potentially be affected by both patient and clinician management of UTI.

Aim

To explore the circumstances around a single UTI episode, to determine if there are patient and clinician related variables that may contribute to differences in management.

Design and setting

Survey and clinical audit in 12 General Practices in England.

Methods

Patients, n=504, completed a bespoke survey and their corresponding index UTI consultation was audited . The TARGET (Treat Antibiotics Responsibly, Guidance, Education and Tools) UTI audit toolkit was utilised.

Results

Males self-manage their UTI symptoms – e.g. increased fluid intake (P < 0.001, Chi-squared test) and analgesics use (*P* 0.036, Chi-squared test) – and indicate they lack UTI knowledge when compared to females (*P* 0.002, Kruskal-Wallis test). Males also claimed to have waited significantly longer for a consultation appointment (*P* 0.027, Chi-squared test). Antibiotics

were prescribed in 98% of all cases, with adherence to clinical diagnostic guidelines lowest in females <65 years. Only 41% (89/221 of cases in this guideline sub-cohort) would have been a UTI - according to TARGET criteria - following a medical record audit.

Conclusion

UTI symptom management by clinicians is sub-optimal; (the lack of) symptoms are often insufficiently recorded in medical records. Additionally, suboptimal adhere to guidelines concerning urinalysis and microbiological investigation is common. Known increased clinical risks for males may be compounded by their more limited knowledge of (self)-managing UTI and their comparatively late presentation.

Keywords: urinary tract infection; UTI; health confidence; antibiotics; self-management; clinical guideline.

Introduction

Of all bacterial infections managed in primary care in developed countries, urinary tract infection (UTI) is one of the most common.[1,2] Serious complications due to sepsis can occur, so to mitigate that risk, the rate of antibiotic prescription tends to be high.[3,4,5]

The initial management of UTI by both patient and healthcare professional may influence clinical outcomes. Through interviews with a small cohort of patients, Lecky and colleagues[6] identified a need for enhanced patient-clinician shared decision-making with a focus on self-care, safety netting and preventative advice. If an accurate overview of the circumstances around initial UTI diagnosis and treatment can be established, key areas of focus may be determined to optimise (self-) care. Clinical guidance for UTI has been developed by the Royal College of General Practitioners (RCGP), including the TARGET initiative - which stands for Treat Antibiotics Responsibly, Guidance, Education and Tools – to aid GPs with management of UTIs in the community.[7] TARGET can be utilised to check for adherence to best practice.[8] The aim of this project was to evaluate the circumstances around a patient's own behaviour and initial management of their UTI symptoms. This evaluation was then matched with the resulting index consultation with a healthcare professional (audited using the TARGET tool) - to determine if there were any pre-consultation behaviours (e.g. self-help measures) that demonstrated a significant relationship with their presenting symptoms, management plan and illness outcomes. Together, this may highlight areas for improvement of care for patients and health care professionals alike.

Methods

Study design & patients

This study concerns a combination of a patient postal survey and a subsequent clinical audit of the index UTI episode for those patients returning a completed survey (see Supplementary Figure S1). The study was conducted between September 2021 and October 2022 in 12 different GP practices in England. Invited patients, aged 18-80 years with diagnosis of (suspected) community-acquired UTI or use of nitrofurantoin, trimethoprim or pivmecillinam antibiotics for UTI recorded in their medical records within the last six months. Exclusion criteria: included lack of mental capacity, ~~or~~ other significant medical (e.g. acute hospitalisation, palliative) or social issues (e.g. care home resident) and the use of a urinary catheter. Informed consent comprised of the patient returning the completed survey and acknowledging their medical records would be audited for index UTI episode.

Survey and audit outcome measures

The patient survey included questions regarding self-management prior to presenting to a healthcare professional, symptoms associated with the UTI, and interaction with the healthcare professional. The Health Confidence Score was included to measure patients' self-reported UTI knowledge; it has been applied previously in a genitourinary patient population.[9,10] The clinical audit of the index UTI episode for participating patients was performed with TARGET UTI (TARGET, 2019).[7] NICE guidelines advising antibiotic choice for UTI were also consulted.[5] The relevant audit tool and guideline was used for men, women <65 years and women ≥ 65 years. All audits were undertaken by two General Practitioners.

Statistical analyses

A minimum overall survey sample of 167 responses was required to achieve a confidence level of 99% and a margin of error of 10%. Data was initially processed using Excel (Microsoft) and analysed with Statistics Package for the Social Sciences (SPSS, v24; IBM).

Inferential analyses were applied as indicated in the Results section (*P* of <0.05 deemed statistically significant). For binary and nominal data, Chi-squared tests were applied. For ordinal data from the health confidence score categories, Kruskal-Wallis test was applied. Binary logistic regression was used to evaluate if any variables were associated with the binary result of the outcome variable, with Nagelkerke R^2 (maximum achievable value is 1, i.e. 100%) used to determine the variance contributed by the variables to the outcome variable. All inferential statistical tests were intended to explore and quantify any differences and associations between variables, rather than aimed at testing predefined hypotheses. Surveys with more than two missing answers were excluded; for a missing answer the mode (binary data) or median (ordinal data) answer was determined and imputed.

Results

An initial 2655 patients were initially identified, 1792 (68%) were deemed eligible and sent a postal survey. Of the invitees, 525 patients returned their survey (response rate 29%). Survey responders had a mean age of 61 years (84% female), whereas the mean age for invited patients was 53 years (85% female). The reasons for excluding 21 surveys were patients having left the GP practice (n=16) and incomplete returned surveys (n=5). For 50 out of 504 analysed surveys, the missing answer to $\leq$2 questions had to be added. Sex distribution was as follows: 81 males (30 <65 years and 51 $\geq$ 65 years) and 423 females (221 < 65 years and 202 $\geq$ 65 years, respectively). A total of 482 (96%) consulted a GP practice within office hours (of those, consultations were face-to-face 157 (31%), telephone 318 (63%), email/text 29 (6%)), whereas 17 (3%) consultations were during GP out-of-hours cover, and 5 (1%) attended Accident and Emergency. Doctors managed 336 (67%) patients

whereas nurses and allied health professionals managed 168 (33%) patients. A significant difference in distribution amongst sub-cohorts was observed for mode of consultation; females < 65 years were consulted relatively more via text and males were seen more frequently face-to-face (*P* <0.001 Chi-square test).

Table 1 outlines the self-management measures reported by patients. A significantly higher proportion of females, particularly those aged < 65 years, used self-management measures.

Patients' confidence in relation to managing their UTI was explored with the Health Confidence Score that includes questions on knowledge ('I know enough about UTI'), self-management ('I can look after a UTI when I get one'), help-seeking ('I can get the right help for treatment of a UTI if I need it'), and decision involvement ('I am involved in decisions about managing and treating a UTI'). There was a significant difference in opinion between males, females < 65 years, and females ≥ 65 years when it concerned 'knowledge' (*P* 0.002, Kruskal-Wallis test; see Figure 1). Whereas there was no significant difference when comparing the remaining three themes: 'self-management' (*P* 0.063), 'help-seeking' (*P* 0.70) and 'decision involvement' (*P* 0.40).

Amongst the three sub-cohorts, there was no notable difference in number of days the symptoms were present before a patient decided to contact a healthcare professional. On a Likert scale of 'same day' / '1-3 days' / '4-7 days' / 'more than 7 days', the median time for each sub-cohort was 4-7 days (*P* 0.60, Chi-squared test). However, there was a significant difference in patient-reported waiting time for having the actual consultation (*P* 0.027, Chi-squared test), see Figure 2. Males claimed to have waited longer for an appointment.

The recording of presence/absence of UTI symptoms is an essential element of clinical diagnostics. There was a low degree of agreement between patients and clinical staff for four different hallmark UTI symptoms, see descriptive summary in Table 2. It should be

noted that the clinician's entry in the medical notes was prospective, whereas the patient's was a retrospective recall of a consultation up to six months' ago. According to the source medical records, patients were issued general information on how to manage their symptoms in 24% (121 out of 504) cases, patients were safety-netted 61% of the time (n = 308/504), and were issued the TARGET UTI patient information leaflet or weblink 2% of the time (n = 10/504).

Table 3 shows the audit of the patient medical records using TARGET and NICE guidelines; 60% of males (n=48/81), 41% of females < 65 years (n=89/221) and 69% of females ≥ 65 years (n=135/202) were correctly diagnosed as having a UTI. Pyelonephritis was adequately assessed in only 22% (n=112) of cases and sepsis in 32% (n=161) of cases. In females <65 years, urine dipsticks (urinalysis test strips) were often not conducted when indicated, for instance when the patient had ≤1 urinary symptom in order to appropriately diagnose a UTI (See Table 3). Conversely, urine dipstick was often performed in females ≥ 65 years when not indicated. Mid-stream urine (MSU) microbiological culture was frequently not submitted for analysis for both males and females ≥65 years when this was indicated (68% for both groups). Antibiotics were prescribed for 98% of all patients who consulted a healthcare professional for a possible UTI. When an antibiotic was prescribed (putting aside whether or not it was indicated according to the TARGET audit toolkit), which occurred in 495 out of 504 cases (98%), the choice of antibiotic was correct in 89% of cases (n = 439 out of 495), the dosage in 98% (484/495) and the course length in 85% of cases (422/495) respectively and in line with NICE antibiotic guidelines for UTI. The number of cases with correct antibiotic course length includes 29 justified deviations (7% of total number prescriptions).

Binary logistic regression analyses were conducted to further explore if certain outcome variables were associated with consultation-related variables. Table 4 shows the variables associated with the diagnosis of UTI based on adherence to clinical guidelines. The results indicate that clinical guidelines were followed less often by GPs, for patients <65 years and when the consultation was conducted by telephone. UTI was appropriately diagnosed in 50% (n = 168 out of 336) of GP consultations and 65% (109/168) of nurse / allied health professional (AHP) consultations respectively. Similarly, a written assessment for sepsis and pyelonephritis was conducted significantly less often by a GP compared to nurses/AHPs, and more often outside standard GP practice hours and settings. Furthermore, these assessments were most often made when the consultation was face-to-face (see Supplementary Table S1). Sepsis was assessed for in n = 81 out of 336 (24%) cases by GPs and in 80/168 (48%) cases by nurses/AHPs. The regression models for both sepsis and pyelonephritis as outcome variable showed weak associations, with the type of staff, consultation and patient accounting for 19% and 15% of the variance in sepsis or pyelonephritis respectively. Finally, Supplementary Table S2 shows that any associations between the abovementioned variables and the outcome variables 'correct urinalysis' and 'correct MSU microbiological culture' are very weak, based on the Nagelkerke R^2 values for the models (accounting for 11% and 6% of variance, respectively). Only the type of patient (as split by clinical guideline) is associated with difference in good practice on this front, as also shown in Table 3.

Discussion

Summary

Our study suggests that the degree of knowledge and familiarity that a a patient has of UTIs may influence how they self-manage and consult healthcare professionals. Here we have identified significant evidence suggesting male patients are less likely to try to manage symptoms themselves and they delay consulting a healthcare professional. Furthermore, across all patients, a lack of documentation of absence/presence of symptoms and an inappropriate use of both dipstick urinalysis and MSU microbiological culture by clinical staff appear to coincide, which may negatively impacts on clinical guideline adherence.

Strengths and limitations

A large sample of patients were invited to participate in this study and we were therefore able to stratify the cohort by sex and age specific UTI clinical guideline. The sample size for the male cohort was smaller, although UTIs are is less common in males than in females. Males were included in this study and the focus was on patients who were living independently and not living in a residential or care home, in contrast to previous studies.[4,6,11], The response rate of just under 30% for the surveys is lower than reported for studies conducted face-to-face in the GP practice but near-identical to a recent postal survey study conducted in the same GP practices.[12, 13] Non-responder bias may therefore be a risk and limit generalisability of our findings[14] ; the average age of survey responders, for instance, was higher than for those invited to complete the survey. The intention and strength of the study was to be able to cross-reference patient feedback and medical records for an index UTI episode. Validated measures were used where possible for the patient survey and the audit.[7,9] Reliance on GP documentation and patient's memory of their consultation (up to 6 months previously) may not give us the complete picture of what happened in real-time during the consultation. It is plausible GPs did adequately assess UTI symptoms but failed to document this, despite negative findings being as important positive

ones. Outcome measures used in previous papers on the topic were deployed too, such as self-treatment options used by patients, as described by Butler and colleagues.[4]

Comparison with existing literature

There is little available literature investigating the patient's circumstances prior to consulting about their UTI symptoms. Of patients presenting with UTI symptoms, Butler et al. recorded the use of cranberry juice, the number of days of symptoms and number of days off work but the corresponding discussion of these was limited.[15] The patient's view of having and managing a UTI has been explored in isolation in a number of studies. One – involving just females in the UK – found that virtually all women (95%) sought advice from a healthcare professional.[4] In that cohort, the majority of patients consulted a GP practice yet a substantial 13% contacted a pharmacist; the latter was also observed in our data. Our sub-cohort of female patients took similar self-management steps as reported previously for the female cohort in the Butler et al study. An assessment of the validity of these measures – which in the case of e.g. hydration and cranberry product consumption for the treatment rather than prevention of UTIs is debatable[16, 17] – was beyond the scope of this study. The TARGET patient information leaflets do recommend hydration to all patients and do highlight the lack of evidence for cranberry products.[18] The provision of the TARGET UTI patient information by clinical staff was very rare in this cohort and does not seem to be an established practice, as observed in another study.[19] The rates for clinical staff providing generic symptom management and also safety-netting advice were near identical to those observed by others.[4,19]

Poor recording of the absence/presence of UTI symptoms, as well as often inappropriate use of dipstick urinalysis and MSU microbiological culture, contribute to low level of compliance with antibiotic stewardship in this cohort. In another study that audited cases

using the TARGET tool, higher compliance was found.[19] Although our study commenced when there were still some SARS-CoV2 restrictions in place, meaning some consultations were not face-to-face when usually they would have been, it is recognised that variability in clinical practice is a long-standing issue.[20] Furthermore, the ability to record symptoms should not be affected by the mode of patient consultation. The finding that males are less knowledgeable about the UTI condition and are less pro-active to self-manage is concerning since (elderly) males are more prone to septicaemia.[21] We cannot conclude if the finding of more male patients being seen face-to-face in this study sample is an active mitigation practised by GP practice staff or if it is a result of male patients preferring to be seen in this manner (and it therefore inadvertently contributing to delays in being seen by a healthcare professional due to longer waiting times for face-to-face consultations).

Implications for research and/or practice

Both patient and clinician behaviours regarding general self-help measures and knowledge of points of care access, along with the distribution of UTI-health education materials would benefit from improvement. Different initiatives to improve self-management by males have already shown to have a degree of effectiveness, and may therefore have scope as a wider public health initiative.[22] Female patients in particular apply self-management measures such as increased fluid intake, cranberry product and over-the-counter cystitis product use despite limited evidence that these may alleviate or treat acute UTI symptoms.[16, 17] During consultation, clinicians can improve information provision to patients, such as distributing the TARGET UTI information leaflets. Adjunct professions such as pharmacies could contribute in a similar fashion, though we identified that unfortunately males presently visit such locations less frequently than females.

The different approach required to diagnose and manage UTI depending on patient age and sex appears to be a challenge for healthcare professionals in primary care, despite age- and sex-specific national clinical guidelines having been in place for a number of years. Antimicrobial stewardship will be sub-optimal if younger females continue to be prescribed antibiotics when they are not indicated; a delay in prescribing may be prudent, as demonstrated in a past randomised controlled trial.[23] Conversely, although there is increasing evidence to prescribe immediate antibiotics for male patients, insufficient MSU microbiological culture sampling may potentially increase the inappropriate prescription of antibiotics.[21, 24] How feasible it is to achieve improvements in clinical practice in GP practices will be the challenge, since it is known that time pressure erodes adherence to clinical guidelines.[6,25]

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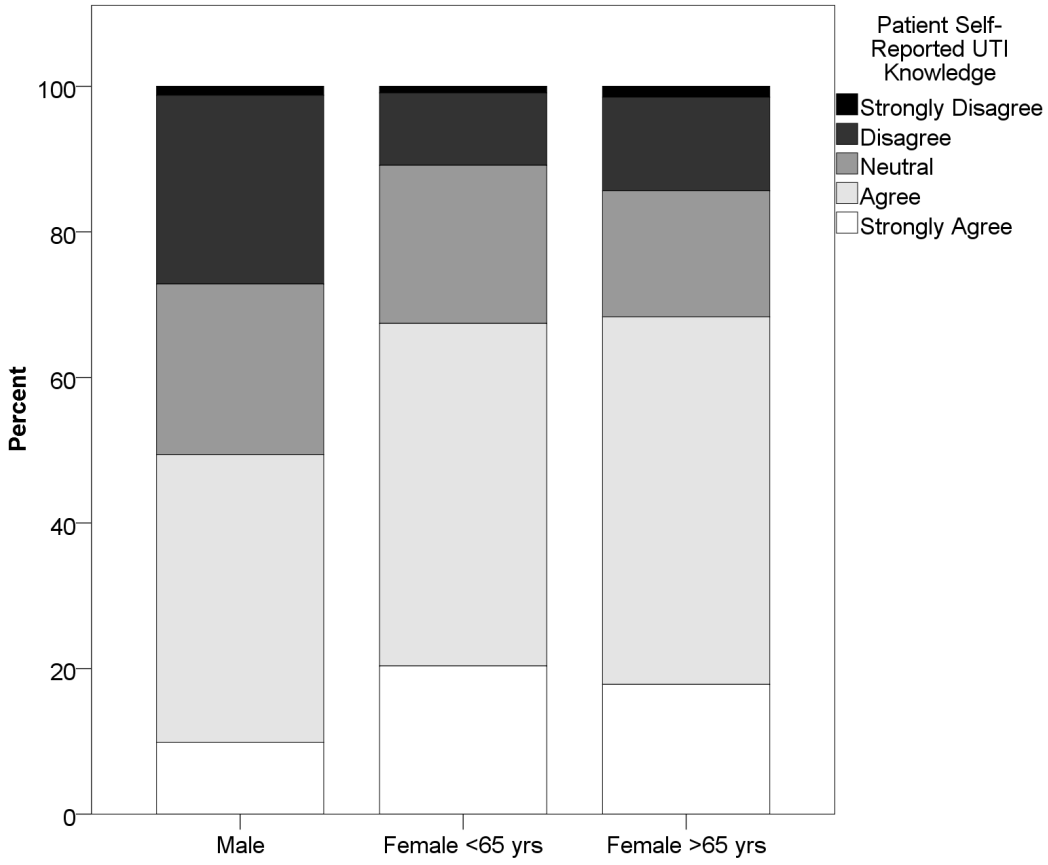
Table 1, patient self-management and hygiene control

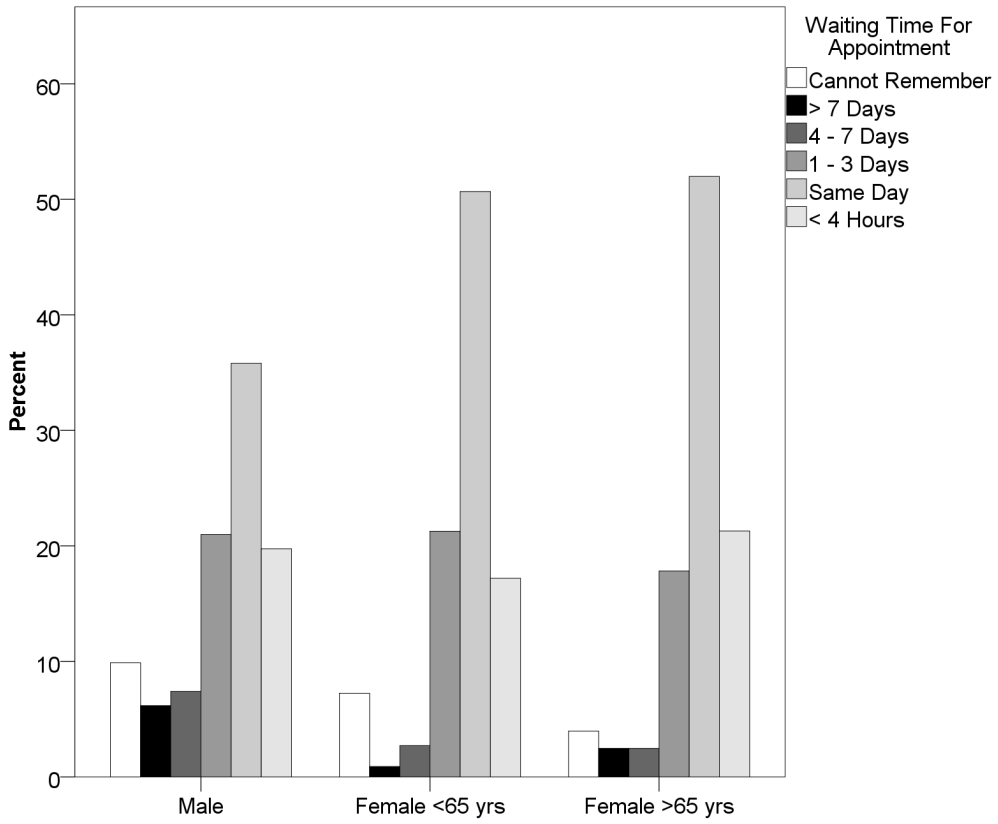
Item	Male [n = 81], yes (% total)	Female <65 yrs [n = 221], yes (% total)	Female ≥ 65 yrs [n = 202], yes (% total)	*P* (Chi-squared)
Increase in fluid intake	43 (53%)	172 (78%)	144 (71%)	<0.001
Use of over-the-counter cystitis remedies	6 (7%)	89 (40%)	56 (28%)	<0.001
Use of Analgesia	29 (36%)	111 (50%)	82 (41%)	0.036
Use of Cranberry products	16 (20%)	95 (43%)	68 (34%)	0.001
Sought advice from a pharmacist	5 (6%)	28 (13%)	17 (8%)	0.16

Figure 1, Patient feedback on their agreement with the statement 'I know enough about urinary tract infections'



Footnote: Male patients agreed significantly less with the patient confidence question on the theme of 'knowledge' than female patients of any age (*P* 0.002, Kruskal-Wallis test; total n = 504)

Figure 2, Patient feedback on how long they had to wait for an appointment for their UTI



Footnote: Male patients indicated that they waited longer for an appointment than female patients of any age (*P* 0.027, Chi-squared test; total n = 504)

Table 2, Comparison of patient recall and clinician-recorded incidence of different symptoms associated with UTI

Symptom	**Patient recorded as symptom present?**	**Recorded in medical records (total n=504)**		
		Symptom not recorded (as either present or absent)	Symptom confirmed absent	Symptom confirmed present
Dysuria	No	47 (9%)	18 (4%)	62 (12%)
	Yes	106 (21%)	7 (1%)	264 (52%)[#]
New nocturia	No	223 (44%)	3 (0.6%)	26 (5%)
	Yes	200 (40%)	1 (0.2%)	51 (10%)[#]
Cloudy urine	No	257 (51%)	7 (1%)	24 (5%)
	Yes	153 (31%)	4 (1%)	57 (11%)[#]
Frequency	No	53 (11%)	3 (0.6%)	69 (14%)
	Yes	147 (29%)	2 (0.4%)	230 (46%)[#]

[#]Instances where both patient and clinician noted presence of the symptom.

Table 3, Clinical audit against TARGET UTI audit toolkit and NICE antibiotic (for UTI) guidelines

Item	Male [n = 81], yes (% total)	Female <65 yrs [n = 221], yes (% total)	Female ≥ 65 yrs [n = 202], yes (% total)	*P* (Chi-squared)
Genitourinary causes adequately assessed*	6 (7%)	24 (11%)	16 (8%)	0.49
Pyelonephritis adequately assessed*	23 (28%)	46 (21%)	43 (21%)	<0.001
Sepsis adequately assessed**	33 (41%)	68 (31%)	60 (30%)	<0.001
Correct UTI diagnosis otherwise made*	48 (60%)	89 (41%)	135 (69%)	<0.001
Correct urine dipstick analysis*	45 (56%)	102 (46%)	146 (72%)	<0.001
Correct MSU microbiological culture management*	55 (68%)	150 (68%)	107 (53%)	0.003
Antibiotics prescribed**	80 (99%), of which n=2 delayed	218 (99%), of which n=3 delayed	197 (98%), of which n=8 delayed	0.43

*In accordance with TARGET UTI audit guideline; **In accordance with NICE UTI antibiotic guidelines

Table 4, Binary logistic regression analysis to determine if variables are associated with correct assessment for UTI by clinical staff

Variable	*P*	Odds Ratio	95% CI	Interpretation
Staff role (GP versus nurse/AHP)	<0.001	0.46	0.30 to 0.71	GP consultation less often associated with correct UTI assessment
Setting (GP OOH/hospital versus GP in-hours)	0.13	2.15	0.79 to 5.85	nsa
Male patients	<0.001			Correct assessment of UTI more common in males and females ≥ 65 yrs compared with females < 65 yrs
Female patients <65 yrs	0.55	0.84	0.47 to 1.49	
Female patients ≥ 65 yrs	<0.001	0.37	0.24 to 0.58	
Consultation mode: text	0.018			Text message consultations more often associated with correct UTI assessment
Consultation mode: telephone	0.037	2.70	1.06 to 6.89	
Consultation mode: face-to-face	0.27	0.78	0.50 to 1.21	
Correct urine dipstick application	<0.001	0.27	0.18 to 0.41	Correct application of urine dipstick significantly linked to correct UTI assessment
Correct MSU microbiological culture management	0.15	1.35	0.90 to 2.03	nsa
Nagelkerke R^2 value for model	0.24			

GP, General Practitioner; AHP, Allied Health Professional; MSU, mid-stream urine; OOH, out-of-hours; 95% CI, 95% confidence interval; nsa, no significant association.