Treating urinary tract infections in public sector primary healthcare facilities in Cape Town, South Africa: A pharmaceutical perspective

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Background. Antibiotic resistance is a global healthcare burden complicating the management of infections. Urinary tract infections (UTIs) are commonly treated in primary care. Managing UTIs appropriately in primary care can combat antibiotic resistance. The treatment practices for UTIs in primary care in Western Cape Province, South Africa, are not well described.
Objectives. To describe treatment of UTIs in adults in primary care in the Cape Town metropole public sector of the Western Cape.
Method. A retrospective multicentre medical records review of patients diagnosed with UTIs was conducted during 1 October 2020 - 28 February 2021. Six public sector primary healthcare facilities were included in the study through random selection from three of the four substructures in the Cape Town metropole. Medical records of adult patients diagnosed with UTIs, through clinical diagnosis or microbiological testing, were identified via a selective sampling process. Data were collected from medical records using a standardised data collection tool.
Results. A total of 401 UTI episodes occurred in 383 patients during the study period. The majority of UTI episodes (84.3%) occurred in females, complicated UTIs (74.1%) were more common than uncomplicated UTIs, and nitrofurantoin (57.1%) was frequently prescribed, followed by ciprofloxacin (39.7%). Compliance with urine microscopy recommendations was low (6.7%), and antibiotics were appropriately selected in 75.0% of uncomplicated and 70.0% of complicated UTI episodes.
Conclusion. Interventions are required to improve compliance with treatment recommendations as per the standard treatment guidelines, especially when selecting the appropriate antibiotic, duration of therapy and urine microscopy.

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Antibiotic resistance is one of the greatest global healthcare threats the world is facing.[1] Failure to respond with appropriate action may lead to a post-antibiotic era in which ordinary infections will be untreatable.[2] Irrational prescribing is one of the factors fuelling antibiotic resistance.[3,4] Approximately 80% of antibiotic prescribing occurs in the primary healthcare setting,[5] where almost 30% of prescribed antibiotics are unnecessary.[6] Antibiotic stewardship programmes have been identified as a key strategy to optimise antibiotic use in an attempt to reduce antibiotic resistance at both hospital and community level.[7] Low- and middle-income countries face various challenges to successfully implement antibiotic stewardship programmes.[8] Implementation of stewardship programmes in primary care in South Africa (SA) is still developing.[9,10] The Antimicrobial Resistance National Strategy Framework 2014 - 2024 was developed to support antibiotic stewardship in SA.[11]

In the Western Cape Province primary care setting at the time of the study, prescribing was guided by the 2018 Primary Healthcare Standard Treatment Guidelines and Essential Medicines List (PHC EML 2018).[12] In a study conducted by Gasson *et al.*,[13] adherence to the Standard Treatment Guidelines (STGs) for infections in primary care (2014 edition) was investigated. Urological infections accounted for 7.5% of infections, and compliance with primary care guidelines for treating urological infections was the lowest. In terms of treating urological infections, the duration of antibiotic therapy and antibiotic selection were inappropriate in 51.2% and 17.1% of the cases, respectively. Adherence to guideline recommendations for ciprofloxacin prescribing was poor.[13] Urinary tract infections (UTIs) are among the most commonly treated primary healthcare conditions requiring antibiotic therapy,[14,15] which may increase the healthcare burden as antibiotic resistance increases.[16] UTIs affect a patient's quality of life, and the sequelae of UTI complications may include urosepsis, recurrence, pyelonephritis, sepsis, renal damage, bacteraemia, preterm birth, and even *Clostridioides difficile* infections.[17,18] If asymptomatic bacteriuria in pregnancy remains untreated, it may lead to pyelonephritis, preterm birth and low birthweight.[19,20] The goals of UTI treatment are to eradicate the infection and prevent complications and recurrence, as well as limiting antibiotic resistance.[21]

Practising antibiotic stewardship in primary care can optimise patient health outcomes and reduce antibiotic resistance. Appropriate empirical therapy is vital to ensure treatment success and to prevent complications; however, antibiotics should be considered carefully in view of the current antibiotic resistance dilemma.[22,23] Local antimicrobial susceptibility patterns will assist in guiding empirical therapy for UTIs in the emerging setting of resistance.[22] A few surveillance studies have been conducted in SA,[22,24-26] and it is evident that surveillance data are area specific and that continuous monitoring is needed to recommend appropriate empirical therapy. Surveillance data in the Western Cape could guide prescription of the appropriate antibiotic therapy for treating UTIs. Classifying UTI in terms of complicated and uncomplicated infections requires

standardisation[27] to promote rational antibiotic use and to optimise patient health outcomes.

Various communications[28,29] on the potential risks of fluoroquinolones led to the National Department of Health (NDoH) amending the STGs for UTIs in 2019, recommending that ciprofloxacin should not be used for uncomplicated UTIs (Circular H53/2019[30]). To our knowledge, treating UTIs and prescribing practices in the primary care setting of the Western Cape public sector has not been described.

The objectives of this study were to describe how UTIs are treated in primary healthcare and to determine compliance with current local guidelines.

Methods

Study design and setting

A retrospective multicentre medical records review of patients with UTIs was conducted in the primary healthcare setting of the Western Cape public sector for the period 1 October 2020 - 28 February 2021.

Study population and sampling

Adult outpatients (≥18 years of age) diagnosed with UTIs, either clinically or with microbiological confirmation, at community day centres (CDCs) or community healthcare centres (CHCs) in the Cape metropole were included. These facilities were identified through a random selection process using Excel 2016 (Microsoft Corp., USA) to identify two facilities per substructure from the following three substructures in the Cape metropole: Northern/Tygerberg, Klipfontein/Mitchell's Plain and Eastern/Khayelitsha. The fourth substructure had to be excluded owing to different operating procedures. For anonymity, the data presented in the manuscript would not be presented according to the substructures' specific names.

A prevalence was set at 50% to calculate the sample size.[31] Medical records were identified through a selective sampling process following a pragmatic approach. Pharmacists daily identified all folders of adult patients who presented with UTIs. Data were collected by the researcher (NK) on a continuous basis until a minimum of 100 records per substructure or a total of 400 records had been reviewed. Patients who were referred to a higher level of care were excluded from the study.

Collecting and analysing data

A data collection tool was designed by the research pharmacists and a physician to collect the following data from patient medical records: demographics, diagnosis, results of diagnostic investigations, antibiotic regimen prescribed, concurrent conditions, concurrent medicines prescribed, and dispensing data. The PHC EML 2018[12] and Circular H53/2019[30] were used to inform on the criteria for the data collection tool. To test the data collection tool and study process, a pilot study was conducted using 10 patient folders from a facility not included here. The pilot study followed the same procedures. Data were analysed using descriptive statistics and MS Excel 2016 (Microsoft Corp., USA).

Current guidelines in place at the time of the study were used to assess appropriate management of UTIs, i.e. the PHC EML 2018[12] and Circular H53/2019,[30] which provided updated antibiotic treatment recommendations after notification of ciprofloxacin safety warnings. At primary healthcare level, it is expected that management of UTIs should predominantly conform to STGs.

Classification of UTIs is not clear in the literature, and for the purpose of this study, UTIs were categorised into complicated and uncomplicated infections based on national and international guidelines.[12,21,32,33] Table 1 provides a summary of the classification, recommended investigations and treatment of complicated and uncomplicated UTIs. UTIs in healthy, premenopausal, non-pregnant females (18 - 45 years of age) were categorised as uncomplicated, and all other UTIs were categorised as complicated.[21]

Ethical considerations

Approval was granted by the University of the Western Cape's Biomedical Research Ethics Committee (ref. no. BM20/5/17) and Western Cape Government Health (ref. no. WC_202006_038). This was a retrospective medical record review and data were anonymised before analysis, so no informed consent was required from patients.

Results

A total of 401 UTI episodes from 383 patients were reviewed from six primary care facilities across three substructures in the Cape metropole. Facilities comprised CDCs (*n*=5/6; 83.3%; 323 UTI episodes, 80.5%) and CHCs (*n*=1/6; 16.7%; 78 UTI episodes; 19.5%). The majority of UTI episodes occurred in females (*n*=338/401; 84.3%). Seventy-five pregnant women (*n*=75/321; 23.4%) presented with 84 UTI episodes during the study period. In terms of age, UTIs occurred more frequently in younger premenopausal women (18 - 39 years age category) compared with men (50 - 69 years age category). Table 2 provides more details.

Fifty-two patients (*n*=52/383; 13.6%), 44 females and 8 males, had been exposed to an antibiotic during the preceding 90 days. Penicillin (41.1%), nitrofurantoin (20.5%) and ciprofloxacin (19.2%) were the most common antibiotics patients had been exposed to previously.

Allergy status was reported in the majority of patient folders (88.3%). Hypertension (37.6%) and diabetes mellitus (16.7%) were common comorbid conditions. Analgesics were the most frequent medicines prescribed concurrently (Table 3). The study included 8 wheelchair-bound patients (2.1%), 1 patient with tetraplegia due to a spinal injury (0.3%), and 5 patients with a catheter (1.3%). A urine alkaliser was prescribed in 53 UTI episodes and concurrently with ciprofloxacin in 22 episodes.

The majority of UTI episodes occurred in females (84.3%), and 74.1% of all episodes were complicated. Antibiotics were prescribed in all male and 98.5% of female episodes, and in all uncomplicated episodes and in 98.3% of complicated episodes. Of the 729 nitrofurantoin issues recorded on the electronic dispensing system during the study period, 229 nitrofurantoin prescriptions from patient records were reviewed. Similarly, 4 fosfomycin issues were recorded; however, no prescriptions were reviewed for the study period. Nitrofurantoin was prescribed in the majority of UTI episodes (57.1%), followed by ciprofloxacin (39.7%). Nitrofurantoin was more frequently prescribed in uncomplicated (75.0%) than complicated (50.8%) UTI episodes, and in episodes in women (63.9%). Ciprofloxacin was mostly prescribed in episodes in men (79.4%) and in complicated episodes (45.1%). A urine dipstick test was performed in the majority of episodes (88.0%), while urine microscopy was conducted in only 6.7% of complicated episodes. In terms of complying with STG recommendations, nitrofurantoin was appropriately selected in 75.0% of uncomplicated episodes. However, for complicated UTIs, compliance in terms of antibiotic choice was better for ciprofloxacin (44.4%) than for nitrofurantoin (25.6%). An appropriate total daily dose of the selected antibiotic was ordered for ~99% of prescriptions of nitrofurantoin and ciprofloxacin, while appropriate duration of antibiotic with correct

Table 1. Classification, recommended investigations and treatment for complicated and uncomplicated UTIs[12,21,30,32-34]

	Uncomplicated UTI	Complicated UTI
Classification of UTI	UTI in healthy premenopausal women (18 - 45 years)	Catheter-associated UTI UTI during pregnancy UTI in men UTI in postmenopausal women (>46 years) UTI in patients with urinary tract abnormalities UTI in patients with concomitant immunocompromised conditions, e.g. diabetes mellitus, HIV Recurrent UTI Upper UTI
Primary Healthcare Standard Treatment Guidelines and Essential Medicines List 6th edition – 2018 [12]		
Treatment recommendations		
Cystitis	Ciprofloxacin 500 mg po 12-hourly for 3 days	Ciprofloxacin 500 mg po 12-hourly for 7 days Pregnant/adolescent: nitrofurantoin 100 mg po 6-hourly for 7 days
Pyelonephritis	-	Ciprofloxacin 500 mg po 12-hourly for 7 - 10 days Pregnant: ceftriaxone 1 g IV single dose
Recommended investigations	Urine dipstick	Urine dipstick Urine microscopy and sensitivity
Referral	Pyelonephritis with vomiting, sepsis or fever and in patients with diabetes; pregnancy; women beyond reproductive age; men; women with >3 UTIs in 1 year; men with >1 UTI; cystitis in pregnancy with no response to therapy; resistant organisms detected	
Updated treatment guidelines: Circular H53/2019[30]		
Cystitis	Nitrofurantoin 100 mg po 6-hourly for 5 days OR Fosfomycin 3 g po single dose OR Gentamicin 5 mg/kg IM single dose	Ciprofloxacin 500 mg po 12-hourly for 7 days
Pyelonephritis	-	Ciprofloxacin 500 mg po 12-hourly for 7 - 10 days

UTI = urinary tract infection; po = orally; IV = intravenous; IM = intramuscular.

Table 2. Demographics of the patients with UTIs

	Total	Female	Male
Age (years)			
Minimum	19	19	19
Maximum	89	89	84
Mean (SD)	45 (18.13)	44 (18.02)	54 (16.01)
Median	43	38	59
Categories (years), *n* (%)			
19 - 29	96 (25.1)	91 (28.3)	5 (8.1)
30 - 39	82 (21.4)	74 (23.1)	8 (12.9)
40 - 49	46 (12.0)	39 (12.1)	7 (11.3)
50 - 59	54 (14.1)	39 (12.1)	15 (24.2)
60 - 69	62 (16.2)	44 (13.7)	18 (29.0)
70 - 79	32 (8.4)	24 (7.5)	8 (12.9)
80 - 89	11 (2.9)	10 (3.1)	1 (1.6)
Patients, *n* (%)	383 (100)	321 (83.8)	62 (16.2)
UTI episodes, *n* (%)	401 (100)	338 (84.3)	63 (15.7)

UTI = urinary tract infection; SD = standard deviation.

total daily dose were lower. In complicated UTIs, appropriate duration of antibiotic and total daily dose were lowest for ciprofloxacin (68.9%). Overall compliance in prescribing was greater for uncomplicated UTIs (61.5%) than for complicated UTIs (52.9%). Overall compliance in uncomplicated UTIs was greater with nitrofurantoin, but for complicated UTIs, compliance was greater with ciprofloxacin. Failure to comply with STG recommendations was mostly due to inappropriate antibiotic selection for complicated UTIs and duration of therapy (Table 4).

Table 3. Documented allergies and comorbid conditions in the patients with UTIs (*N*=383), and concurrent medicines prescribed

	n (%)
Allergy status noted in patient folder	338 (88.3)
Allergy to an antibiotic	14 (3.7)
Allergy to another medicine*	19 (5.0)
No allergy	309 (80.1)
Comorbid conditions	
Cancer	9 (2.3)
Diabetes mellitus	64 (16.7)
HIV	20 (5.2)
Hypertension	114 (29.8)
Pregnancy	75 (19.6)
Osteoarthritis	49 (12.8)
Spinal injury	2 (0.5)
Benign prostate hypertrophy	6 (1.6)
Urinary incontinence	3 (0.8)
Other	232 (60.6)
Concurrent medicine	
Analgesics†	324 (80.8)
Antimicrobials	33 (8.2)
Contraceptives‡	31 (2.1)
Supplements§	66 (16.5)
Urine alkaliser	53 (13.2)

UTI = urinary tract infection.
*Non-steroidal anti-inflammatories, iodine, opioids.
†Paracetamol, ibuprofen, tramadol.
‡In women of childbearing age.
§Iron, folic acid, calcium, vitamin D.

Four females were diagnosed with asymptomatic bacteriuria. Of these, two pregnant women were treated with antibiotics, amoxicillin-clavulanic acid and nitrofurantoin; an elderly patient with diabetes was treated with ciprofloxacin; and choice of antibiotics was unknown in one patient. Eighteen recurrent UTI episodes occurred in 17 patients during the 5-month study period. Fifteen women and one man experienced two UTI episodes, and one woman experienced three episodes. Urine microscopy was only conducted in three recurrent episodes. Nitrofurantoin was mostly prescribed in the first (70.6%) and second (58.8%) episodes.

Twenty-five urine samples were sent for urine microscopy and culture sensitivity analysis, with *Escherichia coli* being the most common organism identified (32.0%). It was unknown whether urine microscopy was conducted in 93.3% of complicated UTI episodes.

Discussion

We aimed to describe treatment of UTIs at primary healthcare level and to determine compliance with STG recommendations. This pragmatic study provides novel information and a broad overview on the treatment of UTIs at primary healthcare level in the Western Cape metropole public sector. Areas for improvement to optimise compliance with local guidelines and rational antibiotic use were identified.

According to the Pharmacy Information System, electronic data indicated that 729 prescriptions of nitrofurantoin and 4 prescriptions of fosfomycin were dispensed over the study period for all six facilities. This study had a good representative sample, including approximately a third (*n*=229/729; 31.4%) of nitrofurantoin prescriptions.

In previous SA studies,[22,24-26] *E. coli* was the most common causative organism (54.2 - 79.6%). Although urine cultures could only be analysed for 11 of our urine samples, *E. coli* was the most common organism detected (32.0%).

According to Wattengel *et al*.,[35] prescription of antibiotics for UTIs was suboptimal. Their retrospective analysis showed that 68% of patients treated for UTIs were treated inappropriately. Incorrect duration (50.9%) was the most common error, followed by inappropriate choice of antibiotics (35.1%) and incorrect dosing (12.4%).[35] An SA study by Gasson *et al*.[13] found that the duration of therapy was most often inappropriate (in 51.2% of urological infections), with inappropriate antibiotic selection in 17.1% of infections. The present study showed greater compliance in terms of overall antibiotic selection; however, antibiotic selection for treating complicated UTIs was mostly inappropriate, which was concerning in view of UTI complications and antibiotic resistance. Similar to the findings of Gasson *et al*.,[13] compliance with guideline recommendations for ciprofloxacin was poor. With regard to total daily dose of appropriately selected antibiotics, compliance was very high (98.7 - 100%); however, compliance was not as good for duration of treatment with appropriate antibiotics selected and total daily dose. Overall, compliance with STG recommendations was poor.

In a 2008 study by Bosch *et al*.[22] in Bloemfontein, the most common antibiotic prescribed for uncomplicated UTIs was found to be amoxicillin-clavulanic acid (36%), while ciprofloxacin was most commonly prescribed for complicated UTIs. In a Gauteng study conducted in 2011,[26] ciprofloxacin was the most common antibiotic prescribed (50.3%). The REWIND study,[36] conducted in Brazil, Belgium, Italy and Russia during 2016 - 2017, found that fosfomycin (21.6 - 39.7%) was the most common antibiotic prescribed, followed by ciprofloxacin (9.6 - 24.6%). In the present study, nitrofurantoin and ciprofloxacin were frequently prescribed. It is evident that antibiotic treatment selection varies, and it is therefore important to survey data to inform local STGs that recommend appropriate management of UTIs and to limit emerging resistance.

UTIs in male patients are categorised as 'complicated', and the recommended therapy is fluoroquinolones.[12,32] In the present study, 20.6% of male UTI episodes were treated with nitrofurantoin. There is conflicting evidence with regard to the use of nitrofurantoin in men.[37,38]

According to a Cochrane review,[39] there is insufficient evidence to recommend urinary alkalisers for symptomatic relief of uncomplicated UTIs. The PHC EML 2018 recommends against the use of alkalising agents.[12] Citro-Soda, a urinary alkaliser, was prescribed in 13.2% of UTI episodes in the present study. In 41.5% of these episodes, ciprofloxacin was concurrently used – the urinary alkaliser interfering with the effectiveness of ciprofloxacin.[40]

According to various guidelines, asymptomatic bacteriuria should not be treated in the elderly or in diabetic patients;[20,32] however, one elderly patient in the present study was prescribed antibiotic therapy for asymptomatic bacteriuria. Asymptomatic bacteriuria during pregnancy was appropriately treated with antibiotics. Therapy was unknown in one patient.

Antimicrobial resistance surveillance is a critical weapon in the fight against antibiotic resistance. Urine microscopy and sensitivity analysis could strengthen surveillance and guide empirical therapy. According to the PHC EML 2018 recommendations,[12] urine microscopy is recommended in complicated and recurrent UTIs, UTIs in men and pregnant women, and upper UTIs. In the present study, urine microscopy was conducted in 20 complicated UTI episodes (6.7%), 7.9% of episodes in men, and 7.1% of episodes during pregnancy. Urine microscopy frequency was relatively

Table 4. Prescribing patterns, investigations, and compliance with STGs and policy recommendations for UTIs

	Total, *N* or *n* (%)	Uncomplicated, *n* (%)	Complicated, *n* (%)
Patient gender	383	104 (27.2)	279 (72.8)
Female	321 (83.8)	104 (32.4)	217 (67.6)
Male	62 (16.2)	0	62 (100)
Episodes*	401	104 (25.9)	297 (74.1)
Female	338 (84.3)	104 (100)	234 (78.8)
Male	63 (15.7)	0	63 (21.2)
Investigations*			
Urine dipstick	353 (88.0)	95 (91.3)	258 (86.9)
Unknown	48 (12.0)	9 (8.7)	39 (13.1)
Urine microscopy	25 (6.2)	5 (4.8)	20 (6.7)
Unknown	376 (93.8)	99 (95.2)	277 (93.3)
Urine microscopy results			
Escherichia coli	8 (32.0)	1 (20.0)	7 (35.0)
Candida	1 (4.0)	0	1 (5.0)
Klebsiella pneumoniae	1 (4.0)	1 (20.0)	0
Proteus mirabilis	1 (4.0)	0	1 (5.0)
No growth	4 (16.0)	2 (40.0)	2 (10.0)
Mixed growth	4 (16.0)	1 (20.0)	3 (15.0)
Unknown	6 (24.0)	0	6 (30.0)
Antibiotic prescribed*			
Amoxicillin†	2 (0.5)	0	2 (0.7)
Amoxicillin-clavulanic acid†	6 (1.5)	1 (1.0)	5 (1.7)
Ciprofloxacin	159 (39.7)	25 (24.0)	134 (45.1)
Nitrofurantoin	229 (57.1)	78 (75.0)	151 (50.8)
Total	396 (98.8)	104 (100)	292 (98.3)
Unknown†	5 (1.2)	0	5 (1.7)
Compliance with STGs and Circular H53/2019[30]*			
Antibiotic choice			
Nitrofurantoin	154 (38.4)	78 (75.0)	76 (25.6)
Ciprofloxacin	132 (32.9)	0	132 (44.4)
Total	286 (71.3)	78 (75.0)	208 (70.0)
Total daily dose of antibiotic appropriate			
Nitrofurantoin	153 (38.2)	77 (98.7)	76 (100)
Ciprofloxacin	132 (32.9)	0	132 (100)
Duration of antibiotic and total daily dose appropriate			
Nitrofurantoin	130 (32.4)	64 (83.1)	66 (86.8)
Ciprofloxacin	91 (22.7)	0	91 (68.9)
Overall‡			
Nitrofurantoin	130 (32.4)	64 (61.5)	66 (22.2)
Ciprofloxacin	91 (22.7)	0	91 (30.6)
Total	221 (55.1)	64 (61.5)	66 (52.9)

STGs = Primary Healthcare Standard Treatment Guidelines and Essential Medicines List 6th edition – 2018;[12] UTI = urinary tract infection.
*As per UTI episodes: total = 401 UTI episodes; uncomplicated = 104 UTI episodes; complicated = 297 UTI episodes.
†Amoxicillin, amoxicillin-clavulanic acid and unknown were considered non-compliant in terms of STG recommendations, so only nitrofurantoin and ciprofloxacin were assessed for compliance with STGs.
‡Overall compliance includes the correct antibiotic, total daily dose and duration.

low in view of the STG recommendations; reasons for this should therefore be considered, as well as access to urine microscopy services.

Recurrent UTIs are defined as UTI occurring at least three times during a period of 12 months or at least twice during a period of 6 months. Recurrent UTIs can be caused by reinfection or relapse.[21,32] It was not possible to determine true recurrence in our study, or to differentiate between reinfection and relapse. However, during the study period 16 patients experienced two UTI episodes and one female experienced three. Nitrofurantoin was the most frequently prescribed antibiotic during the first and second UTI episodes. In the case of the female with three UTI episodes, nitrofurantoin was prescribed for all three episodes. As stated above, urine microscopy frequency was low in recurrent UTI episodes.

This study identified recommendations for the multidisciplinary team for practice and future research to promote rational antibiotic prescribing and use. Interviews with pharmacists and prescribers would assist in understanding the knowledge on antibiotic use and prescribing to identify targeted interventions.

Recommendations

Differentiating between complicated and uncomplicated UTIs is critical, as it influences diagnostic investigations and antibiotic therapy. This differentiation must be clearly described in the

evidence-based guidelines of the NDoH (e.g. STGs) to optimise antibiotic therapy. Also, recommendations for managing asymptomatic bacteriuria should be explicitly described.

Considering the antibiotic resistance crisis, it is important to monitor resistance of uropathogens to nitrofurantoin and ciprofloxacin. Future research is needed to investigate and address the low compliance with urine microscopy to consider feasible and appropriate recommendations.

Prescribing patterns should be monitored on a continuous basis through collaboration between NDoH stakeholders and the Medicine Use Evaluation Committee, as this will highlight areas for improvement. Subsequent to this study (in 2020), the UTI recommendations were amended again.[41] Through this process, adoption of guidelines can be monitored and improved. Pharmacists form an integral part of the antibiotic stewardship programmes in primary healthcare.[42] The pharmacist's role in antibiotic stewardship includes, but is not limited to, educating and training other healthcare professionals as well as the public, reviewing antibiotic prescriptions on a daily basis, and determining compliance with STGs and evidence-based medicine recommendations.[13,42] The present study has shown that a collaborative, pharmacist-led investigation exposed inappropriate use of antibiotics and highlighted areas for improvement in managing UTIs, reflecting the important role pharmacists can fulfil at primary healthcare level in addressing antimicrobial stewardship.

Study strengths and limitations

This was a multicentre study with a reasonable sample size (power 80%) and limited missing data. Facilities were identified through a random selection process and objective measures were used for assessment. The study was conducted at six primary healthcare facilities, in the urban setting only, across three of the four substructures in the public sector of the Cape metropole in the Western Cape, and could not be generalised to rural and private settings. It was not possible to differentiate between cystitis and pyelonephritis owing to the inconsistent documented diagnoses in patient medical folders. Documented diagnoses varied; the researchers therefore categorised and analysed UTIs according to complicated and uncomplicated categories based on national and international guidelines and societies.[12,21,32,33] However, this classification did not compromise our assessment of compliance with UTI STG recommendations.

Conclusion

Interventions are required to improve compliance with prescribing antibiotics as per guideline recommendations, specifically selecting the appropriate antibiotic, duration of therapy and urine microscopy.

Declaration. The research for this study was done in partial fulfilment of the requirements for NK's MClinPharm degree at the University of the Western Cape.

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