Original Article

The trials of urine specimen collection when diagnosing a urinary tract infection in the adult female population

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Background: The urinary tract consisting of the kidneys, ureters, urethra and the bladder are commonly invaded with a urinary tract infection. Frequently caused by uropathogenic Escherichia coli (UPEC) and recognized as the offending microbe responsible for a urinary tract infection. The objective of this study was to explore the perspectives relating to the challenges of collecting a midstream urine specimen when diagnosing a urinary tract infection.

Methods: A descriptive-interpretive qualitative research approach was adopted, and thirty female participants enrolled into the study were recruited from a specialist center for acute and chronic urinary tract infections. Semi-structured interviews were conducted as part of a wider study, and the NVivo™ software was used to organize and group the data into thematic insights.

Results: The experiences of producing a midstream urine specimen were challenging, but despite the trials, it was regarded as the most adequate method that would diagnose the presence of a urinary tract infection.

Conclusions: Exploring the perspectives relating to the challenges of collecting a midstream urine specimen when diagnosing a urinary tract infection was fundamental. The interview data provided diverse perceptions of the trials and challenges encountered during urine specimen collection and the diagnostic process.

Keywords: Midstream; specimen; trials; urinary; infection

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Introduction

The urinary tract consisting of the kidneys, ureters, urethra, and the bladder are commonly invaded with a urinary tract infection (1). The infection is frequently caused by uropathogenic *Escherichia coli* (UPEC) recognized as the offending microbe responsible for a urinary tract infection (2). Urinary tract infections are defined as two episodes of acute bacterial cystitis, accompanied by symptoms within 6 months or three episodes within a year (3). Antibiotic treatment is the first line management

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protocol (4), and sophisticated urinalysis utilizing digital imagery has become widely available for urine testing (5). The complexities of a urinary tract infection are paramount, and the advancement of effective treatment interventions is fundamental (6). The female population are frequently blighted with this disease, accounting for more than 60% (7), this is due to the anatomical placement of the female urethra, and it being shorter in length in comparison to the male urethra (8). Lower urinary tract symptoms (LUTS), as evidenced by urinary hesitancy (slow to start urinary stream), urinary frequency, dysuria (painful urination), and urinary urgency (urgent need to urinate), are commonly expressed symptoms (9). The diagnosis of a urinary tract infection begins when the urine specimen has been collected for examination and bacterial culture (10), however the trials of collecting a flawless urine specimen have been questioned.

Urine specimens are often collected by midstream urine (11), a method favored more than a catheter specimen method (12) due to it's non-invasiveness. The perspectives on the midstream urine method has been evident when it comes to sexual health screening procedures (13), but not so with regards to urinary tract infections. The need for patient attitudes and perspectives as part of clinical guidelines, service reports, and health systems management is essential when it comes to collaborative and integrative care (14). The objective of this study was to explore the trials of urine specimen collection when diagnosing a urinary tract infection.

This study explored the perspectives relating to the challenges of collecting a midstream urine specimen when diagnosing a urinary tract infection. Patients with acute and chronic urinary tract infections frequently provide urine specimens for testing, but their perspectives on the trials and mishaps are not overtly explored. We present this article in accordance with the SRQR reporting checklist (available at https://aoi.amegroups.com/article/view/10.21037/aoi-23-7/rc) (15).

Highlight box

Key findings

- Urine specimen collection is an important diagnostic procedure that requires an optimal urine specimen, especially for women experiencing symptoms of a urinary tract infection. Healthcare providers play an important role when disseminating information regarding urine specimen collection techniques and the importance of urine specimen collection.

What is known and what is new?

- It was recommended that an optimal urine specimen is essential for diagnosing a urinary tract infection. New evidence has emerged through varying perceptions of what constitutes a quality midstream urine specimen, and it is essential that patients obtain a urine specimen that captures the true diagnostic properties of their urinary tract infection for urinalysis.

What is the implication, and what should change now?

- The effective stewardship of nursing interventions is paramount. Thus, nurses are to ensure an optimal, midstream urine specimen technique is followed by patients, through evidence-based patient education, when a urine specimen for culture has been ordered.

Methods

Study design

A descriptive-interpretive qualitative research approach was adopted. According to Bradshaw *et al.* (16), this qualitative method is suited for exploring perceptions and experiences that have relevance to the study objective.

Study setting and population

A specialist center in London, UK, caring for patients with acute and chronic urinary tract infections was the clinical setting where patients were identified and invited to participate in the study. The patients invited to participate in the study were female, aged eighteen and over, being treated for acute and chronic urinary tract infection and presented with LUTS such as urinary incontinence, painful bladder syndrome (PBS), overactive bladder (OAB), and urinary hesitancy. The female patients were cared for by a multi-professional team and were required to prepare a midstream specimen of urine for diagnosing the presence of a urinary tract infection.

We used convenience sampling for participant recruitment (17), as the patients were known to the medical team and regularly attended the specialist center for urinary diagnosis and antimicrobial treatment. The inclusion criteria were female patients, presenting to the specialist center with LUTS. The presenting symptoms were urinary hesitancy, OAB, PBS, urinary incontinence and reduced quality of life as a result of their symptoms. Each participant was aged eighteen and over, of different ethnicities and all were fluent in English language for reading and writing. And each patient had longstanding experience of providing a midstream urine specimen. The exclusion criteria were

Table 1 Semi-structured interview questions and the justification

Question number	Question asked	Justification
Interview question 1	Tell me about the challenges of obtaining a midstream urine specimen?	Patients often share their concerns to healthcare providers regarding the challenges they face when providing a urine specimen for diagnostic testing
Interview question 2	What are your thoughts on the quality of a midstream urine specimen?	Perceptions on specimen quality shapes the way patients view the specimen that they provide to a healthcare provider

patients under the age of eighteen, unable to provide informed consent, male patients and patients who were not registered for treatment at the specialist center.

Patients who were interested in participating in the study were given further verbal information about the study, written information in the form of an information sheet and given the opportunity to ask questions about participating. Following an expression of interest to participate in the study, written informed consent and verbal consent were obtained prior to study enrollment, and each participant was allocated a participant number for anonymity. Thirty female participants were enrolled into the study with the opportunity to withdraw from the study at any time.

The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013) (18). Institutional Review Board (IRB) approval was granted by the National Research Ethics Service (NRES) (Ref-11/LO/1096).

Data collection and data analysis

Semi-structured interviews were conducted as part of a wider study. Semi-structured open-ended interviews allowed participants to answer questions in detail as their responses were discursive dialogues which facilitated an expanded interview process. We focused the data collection specifically on the perspectives relating to the challenges of collecting a midstream urine specimen when diagnosing a urinary tract infection. Two important questions from the wider study were explored in more detail for the purpose of understanding the trials of urine specimen collection when diagnosing a urinary tract infection in the adult female population. As part of the wider study, participants were given information on how to obtain a midstream urine specimen with sequential steps for completing the task as described by Dougherty and Lister (11). Interviews were conducted by an experienced doctoral level research nurse who participated in the care of the patients attending the specialist center. The interviews were conducted over a period of 2 months and took place in a quiet confidential meeting room within the specialist center. Semi-structured interviews were supported with the use of probing, patient reflections, and perspectives on providing a midstream urine specimen. Interview data were recorded, lasting between 30 and 45 minutes, later stored on an encrypted storage device and transcribed verbatim. Transcribed data were uploaded to the NVivo^{TM} software to identify thematic insight (19). The semi-structured interviews consisted of questions relating to urine specimen collection, with a primary focus on midstream urine specimen collection data (*Table 1*). The interview process stopped when there was no evidence of new emerging data.

Results

The trials of obtaining a midstream urine

When the participants were asked about the challenges of obtaining a midstream urine specimen for diagnostic testing, there was often a sense of uncertainty regarding the urine collection process. There were comments that were in favor of obtaining a midstream urine specimen accompanied with doubts.

'*I didn't like the midstream method because of the difficulty catching the middle part of the urine. However, I suppose the midstream would provide an optimal specimen as you have the ability to cleanse the genitalia before urinating, and the first part of the stream is voided enabling the washing out of the urethra and getting rid of all the bacteria that needs to be tested.*' (Participant 3861).

'*I still think the midstream is the awkward method of obtaining a urine specimen. I don't know when to gauge the middle part of the urinary flow. I'm always confused with this method. I believe it is easier to get an infection doing all these specimen collection steps. I hate this method of specimen collection because it's so awkward to collect.*' (Participant 3178).

'*Performing the midstream specimen collection method is not easy, although I don't mind the midstream process, it's not difficult.*' (Participant 2539).

'*The midstream urine specimen process was difficult, using the utensils to get the midstream urine was a challenge.*' (Participant 2576).

'*With the midstream, you often question whether you have done the procedure right.*' (Participant 2906).

'The midstream method I don't like, because of the tendency to loose the urine during the process of collection.' (Participant 3121).

The perceptions of urine quality from the midstream specimen

During the interviewing process, there were often times when the participants believed that the midstream urine specimen was an excellent diagnostic source for detecting the presence of a urinary tract infection. Despite the trials associated with the collection process, it was still regarded as an important method of diagnostic testing.

'*I think urinating a specimen into a container is reliable as you can detect whatever bacteria are there and it gives a true record of infection.*' (Participant 2365).

'*I do suppose the midstream urine would provide a quality specimen as you have the ability to cleanse before urinating into a container, and the first part of the urinary stream is voided which enables the washing out of the urethra and eliminating all the bacteria.*' (Participant 3861).

'*I believe the midstream urine specimen is of good quality, because the bacteria or cells that are present would come out right away at the beginning of the urinary flow.*' (Participant 2301).

'*The midstream urine sample is fresh and it does not sit stagnant before it is processed for testing.*' (Participant 4369).

'*I would presume the midstream is a quality urine specimen because I feel it is medically technical, the wiping gives a sensation that it is clean and you are likely to find what you're looking for in the midstream urine specimen.*' (Participant 3874).

'*I think the midstream seems like a better option for a quality urine specimen, because it's more likely to be a cleaner specimen. It's important to get a good urine specimen.*' (Participant 4014).

Discussion

This study explored the perspectives relating to the challenges of collecting a midstream urine specimen when diagnosing a urinary tract infection. It was evident that perspectives were varied and unique to those who had experience of obtaining a midstream urine specimen. The interview data highlighted the various challenges with regards to technique, performing the task and collecting a urine specimen that was of quality for diagnostic testing. The main concern for most participants was the confusion as to whether they were collecting the urine specimen accurately, as they believed incorrect specimen collection hindered the diagnostic and screening process of their infection. Quick diagnostic screening of a urine specimen accelerates the results of urine cultures and is the determining reason for appropriate antibiotic treatment for patients with urinary tract infections (19). Losing a urine specimen due to incorrect method or technique was a concern expressed within the interview data.

The participants were of the assumption that the midstream urine specimen provided a quality and optimal urine specimen, despite the challenges they experienced whilst performing the specimen collection task. It was evident that the midstream specimen of urine was a reassuring diagnostic method for determining the presence of a urinary tract infection, and despite the mishaps in the collection process, the midstream method was hailed by the patients for producing a quality urine specimen. There continues to be gaps in patient understanding about how urine specimens become contaminated, which is often attributed to the difficulty of providing a quality urine specimen (20). However, it is also the responsibility of the healthcare provider to teach patient's on how to obtain a midstream urine specimen correctly for the purpose of diagnostic testing (21). Despite the differences in opinion regarding the trials of midstream urine specimen collection, the midstream has been recommended as the diagnostic sample of choice within primary care when using point-of-care testing (22).

Clinical recommendations

Urine specimen collection is an important diagnostic procedure that requires an optimal urine specimen, especially for women experiencing symptoms of a urinary tract infection. Healthcare providers play an important role when disseminating information regarding urine specimen collection techniques and the importance of urine specimen collection (20). Despite the varying perceptions of what constitutes a quality midstream urine specimen (23), it is essential that patients obtain a urine specimen that captures the true diagnostic properties of their urinary tract infection for urinalysis (24), accompanied by the assessment of symptoms displayed during the time of the urine specimen collection (25). Published evidence has revealed

that the midstream urine specimen is a method that effectively facilitates urinary diagnostics and antimicrobial treatment in the adult female population diagnosed with a urinary tract infection (26). However, the effective stewardship of nursing interventions are paramount, to ensure an optimal, midstream urine specimen technique is followed by patients, through evidence-based patient education, when a urine specimen for culture has been ordered (27).

Clinical implications

Urine specimen collection is an important part of diagnostic testing and is essential for revealing acute and chronic urinary tract infections. Incorporating patient experiences and challenges of any specimen collection process is fundamental (23). This provides insight into the pros and cons of what patient's experience when asked to perform a task for diagnostic testing. Further exploration on patient challenges and experiences when diagnosing and detecting the presence of a urinary tract infection, should be part of a continual analysis to aid service improvement, enhance patient experiences and improve triage processing times for emergency care (24).

Further insight of patient challenges and experiences would also support the assessment of specimen collection accuracy when patients provide specimens for diagnostics within community mobile healthcare (25).

Methodological considerations

Qualitative interviews were an appropriate method of data collection that supported the process of exploring patient experiences of the trials associated with obtaining a midstream urine specimen. During the interview process, it was evident that not all the patients verbalized their perspectives relating to the trials of obtaining a midstream urine, but focused more so on what they liked about the midstream specimen collection method. As a result, this reduced pertinent responses from the overall data. Despite this being a small-scale study of a wider investigation, it is important to ensure credibility. It is also fundamental that we address the aspect of rigor with regards to the sampling method used within this study (28). We used convenience sampling for participant recruitment, and this sampling method poses a potential lack of representation of the wider population diagnosed with a urinary tract infection. Participant recruitment from a larger and diverse patient population group may overcome this challenge in the future.

Conclusions

Exploring the perspectives relating to the challenges of collecting a midstream urine specimen when diagnosing a urinary tract infection was fundamental. This study highlighted the challenges patients have when undergoing clinical diagnostics and the importance of incorporating their concerns to influence changes in clinical practice (29). The interview data provided diverse perceptions of trials and challenges encountered during the diagnostic process of a urinary tract infection.

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Footnote

Reporting Checklist: The authors have completed the SRQR reporting checklist. Available at https://aoi.amegroups.com/article/view/10.21037/aoi-23-7/rc

Peer Review File: Available at https://aoi.amegroups.com/article/view/10.21037/aoi-23-7/prf

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at https://aoi.amegroups.com/article/view/10.21037/aoi-23-7/coif). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). Institutional Review Board (IRB) approval was granted by the National Research Ethics Service (NRES) (Ref-11/LO/1096). All participants were informed about the project verbally and in writing and were guaranteed anonymity with the allocation of a four-digit non-identifiable participant number. Written and oral informed consent was obtained from all participants prior to study enrolment and for publication of data.

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