

BMJ Open Antimicrobial prophylaxis for endourological procedures in Jordanian hospitals: a multi-centre qualitative study

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ABSTRACT

Objectives To explore urologists' perceptions of barriers to, and facilitators of, adherence to international antimicrobial prophylaxis (AP) guidelines for endourological procedures in Jordan and to identify strategies to optimise guideline-concordant AP prescribing.

Design The present study is a qualitative study undertaken through semi-structured interviews and inductive thematic analysis. Study results are reported per Consolidated Criteria for Reporting Qualitative Research.

Setting Secondary and tertiary care across multiple public, private and academic hospitals in Jordan.

Participants Nineteen practising urologists (all male; median age 32 years, IQR 8; nine residents, 10 specialists) who routinely prescribe AP for endourological procedures. Participants were recruited via convenience snowball sampling and interviewed until thematic saturation was reached.

Interventions Not applicable.

Primary and secondary outcome measures The main outcomes were themes describing perceived barriers to guideline adherence and potential facilitators to support appropriate AP use.

Results Participants identified several barriers: (1) patient level, strong expectations for antibiotics post-procedure and concerns about procedure-site hygiene; (2) clinician level, fear of postoperative infections and litigation, lack of familiarity with updated guidance and doubts about applying international guidelines locally; (3) system level, hierarchical prescribing dynamics, referral communication gaps, high workloads and time pressures, and concerns over sterilisation practices. Facilitators included targeted professional training and regular guideline updates for urologists, development of local AP guidelines informed by local resistance data, enhanced patient education campaigns and active involvement of clinical pharmacists in preoperative antibiotic review and auditing.

Conclusions Urologists in Jordan face multifaceted barriers to AP guideline adherence. Future stewardship programmes can use insights from this study to develop locally tailored guidelines, targeted clinician training and pharmacist-led audits. Pilot testing with metrics such as prescribing rates, guideline concordance, antibiotic consumption and postoperative infection incidence will be essential to validate their impact before wider implementation.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ The study employed a qualitative design, enabling in-depth exploration of urologists' views across diverse healthcare settings, enhancing contextual relevance.
- ⇒ Findings identified actionable strategies that can inform antimicrobial stewardship programmes.
- ⇒ The use of convenience snowball sampling may have introduced selection bias.
- ⇒ All participants were male, which restricts the exploration of potential gender-based differences in perspectives.

BACKGROUND

Endourological procedures have evolved primarily as diagnostic tools and later became therapeutic procedures used to treat many urological conditions, such as nephrolithiasis or urolithiasis, and benign prostatic hyperplasia.¹ They allow access to the entire urinary tract using an endoscope through natural or artificial orifices in the body without requiring a surgical parietal incision.^{1,2} In this regard, surgical site infections are not considered an issue in endourological procedures. However, the development of urinary tract infections (UTIs) and bloodstream infections is still problematic after these procedures.²

Antibiotics are routinely used to prevent postoperative UTIs, which are common healthcare-associated infections.³ Nevertheless, such benefits should be carefully weighed against antimicrobial resistance, which compromises surgical procedures' safety and efficacy, increasing morbidity, mortality and healthcare costs.⁴ Antimicrobial resistance rates are high among urological patients.^{5,6} For instance, one study revealed that *Escherichia coli* isolates from urological patients were significantly less susceptible to ciprofloxacin compared with isolates from non-urological patients.⁶ This could be related to inappropriate use of antibiotics,

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including prescribing AP when it is not indicated for prolonged periods.⁵

Jordan's healthcare system comprises a diverse mix of sectors, such as the public, private and academic institutions that routinely perform endourological procedures. In these settings, antimicrobial prophylaxis (AP) is implemented to prevent postoperative complications; however, there is considerable variation in practice. While antimicrobial stewardship (AMS) programmes exist in some Jordanian tertiary and teaching hospitals, they are not universally implemented across all healthcare institutions. While clinical pharmacists can receive training in AMS, their role in urology and surgical prophylaxis remains limited, with only a few hospitals integrating pharmacist-led interventions such as prescription audits and antibiotic recommendations.

Several guidelines have been published to set guidelines for urological procedures, such as the European Association of Urology (EAU) guidelines on urological infections published in 2020⁷ and the Best Practice Policy Statement on Urologic Surgery and Antimicrobial Prophylaxis, published by the American Urological Association (AUA) in 2019.⁸ One study found that compliance with EAU guidelines reduced antibiotic consumption, resistance among uropathogens and costs related to antibiotics and postoperative infections without increasing infection risk.⁹ Nevertheless, the literature implied that compliance with these recommendations for endourological procedures is often low.^{5 10 11}

Cultural and psychosocial factors, like social norms and beliefs, can influence physicians' antibiotic prescribing.¹² Guidelines and stewardship programmes often overlook these, but addressing them could reduce misuse and resistance.¹²

Many institutions rely predominantly on international guidelines, primarily those issued by the EAU and the AUA. Previous research in Jordan has highlighted gaps in guideline adherence, notably the prolonged use of broad-spectrum antibiotics.^{11 13} These findings underscore the need for context-specific investigations into the barriers and facilitators influencing AP practices. Our study aims to investigate, for the first time, urologists' perspectives on the barriers and facilitators to AP guideline adherence for endourological procedures and the potential strategies to optimise adherence to guidelines and recommendations within the Jordanian healthcare landscape.

METHODS

This study was reported following the Consolidated Criteria for Reporting Qualitative Research checklist.¹⁴

Patient and public involvement statement

Patients or the public were not involved in the design, conduct, reporting or dissemination plans of the present research.

Sample recruitment

Urologists prescribing AP for endourological procedures were recruited using a convenience snowball sampling

method. The researcher primarily targeted hospitals where urologists frequently perform these procedures to ensure the relevance of participants' experiences. Selection was also influenced by the accessibility and willingness of institutions to allow research activities. A female clinical pharmacist researcher (SA) with no prior relationships with participants visited clinics to explain the study's aims. It was clarified that the research team aimed to assess antibiotic use for endourological procedures inductively. Eligible urologists were invited for face-to-face or online interviews, with written informed consent obtained beforehand, and they participated voluntarily and received no financial or material compensation for their involvement in the study. At the end of each interview, participants were asked to recommend colleagues for the study. Data collection and analysis occurred simultaneously. The sample size was based on data saturation when successive interviews (3–4) did not produce new themes.

Data collection and study procedure

The interviews were conducted using a pre-formulated interview guide (online supplemental material 1) developed by reviewing the existing literature^{15 16}; it was anticipated that the interview would take 15–30 min to complete. After developing the initial interview guide, it was reviewed by the research team and piloted on one physician (excluded from the final analysis). The guide was continually adjusted to address new issues raised by participants, with probing questions used to gather further information.

The interviews were conducted in Arabic by SA, who is trained in qualitative research and conducting studies involving human subjects as part of her master's programme. Participants were informed that the study was conducted as part of SA's Master's project in Clinical Pharmacy. The interviews were conducted at hospitals/clinics or via Zoom. The sessions were audio-recorded, with notes taken simultaneously.

At the start of each interview, SA introduced herself, explained her role in the study as a trained interviewer with a background in clinical pharmacy and provided an overview of the interview objectives and themes. They were informed that this research was conducted to understand and improve the practice of antibiotic prescription in endourological procedures. Participants were then asked about their demographics, clinical experience, antibiotic practices (choice, duration, and factors considered when administering antibiotics like age, comorbid diseases and others), knowledge of global guidelines, local guidelines, barriers to applying guidelines and facilitators for their implementation. No individuals other than the participants and researchers were present during data collection. No interviews were repeated with the same participants. Interviews occurred concurrently with data analysis.

Outcomes analysis

The recordings were transcribed verbatim and cross-checked for accuracy by SA and RH. The transcripts were

not returned to participants for review. Thematic analysis was applied to explore patterns within the data. Initially, the transcripts were read multiple times by SA and RH to ensure familiarisation with the content. Data coding was conducted inductively by SA and rechecked by RH, allowing key themes and subthemes to emerge from the data. SA conducted all interviews and recognised her preconception that extended antibiotic courses were a key problem in the Jordanian healthcare setting. She also acknowledged the risk of interpretive bias whereby she might inadvertently prioritise participant statements that aligned with her emerging themes and underweight contradictory views. To counteract these influences, SA adhered strictly to a structured interview guide, kept brief analytic notes after each session and engaged in regular peer-debriefing meetings with the research team to deliberately seek and discuss disconfirming evidence. Finally, RH independently rechecked all coding and theme assignments to ensure the analysis accurately reflected participants' perspectives rather than the interviewer's preconceptions.

A table was used to organise the data. Themes were identified based on the frequency of recurrence or their significance in explaining AP practices. No predefined framework was used, and themes were refined through an iterative process of coding and reviewing. Between-case comparisons were also performed to explore variations and similarities across participants. The research team ensured that the analysis remained grounded in the data. No software was used in the analysis, and all coding was done manually. Participants were not involved in reviewing the research findings after the data analysis.

RESULTS

A total of 50 participants were approached, and 19 agreed to take part in the study. All interviews were conducted face-to-face, except two which were conducted through Zoom meetings online. The sample was diverse in terms of participants' professional experience levels and work settings, as shown in table 1.

Barriers to adherence to guidelines

Table 2 highlights reported barriers that could prevent urologists from adhering to guideline recommendations.

Barriers related to patients

Many urologists reported patients' insistence on getting an antibiotic prescription following the procedure and lack of hygiene as barriers to guideline compliance, as shown in the following quotes.

...my understanding is that many patients don't need antibiotic prophylaxis as in patients undergoing diagnostic cystoscopy; however, patients' understanding is totally different. They consider the prescription of antibiotics following any medical procedure is a must... and any decision against patients' desire would impact the doctor's reputation... Urology Specialist-11

Table 1 Demographic characteristics of healthcare professionals

Characteristics	N (%)
Gender	
Male	19 (100)
Female	0 (0)
Age group (median=32, IQR=8)	
25–34	11 (57.9)
35–44	6 (31.6)
≥45	2 (10.5)
Rank	
Resident	9 (47.4)
Specialist	10 (52.6)
Years of experience in the field	
1–5	9 (47.4)
6–10 years	7 (36.8)
>10	3 (15.8)
Number of endourological procedures per month	
1–10	7 (36.8)
11–29	2 (10.5)
≥30	10 (52.6)
Healthcare organisation	
Teaching hospital	4 (21.0)
Public hospital	3 (15.8)
Private hospital	12 (63.2)

...some patients come to the procedure with poor hygienic status, specifically at the site of the procedure, so in this case, we decide to prescribe antibiotics regardless of adherence to guidelines... Urology Specialist-12

Barriers related to healthcare professionals

Fear of the consequences of potential post-surgical complications

Interview findings showed that urologists often prescribe broad-spectrum antibiotics for extended periods due to concerns about post-surgical complications and potential blame from colleagues or patients.

...fear from post-operation complications and blame from specialists, colleagues, or the patient and his/her family in case a UTI or sepsis happens... I will be blamed for not giving broad-spectrum antibiotics... so to be on the safe side, I would always consider prescribing antibiotics... Urology Resident-06

...yes, the patient may develop infection or urosepsis after the operation, and he will prosecute me in the court...and the investigation committee, which doesn't have a medical background, begins to investigate whether the patient was prescribed an antibiotic... So, I give more account of being accused of medical negligence than the potential risk of

Table 2 Summary of reported barriers

Barriers main theme	Description of reported barriers
Barriers related to patients	▶ Patients insist on getting an antibiotic prescription following the procedure. ▶ Patients' poor hygienic status at the site of the procedure.
Barriers related to healthcare professionals	▶ Fear about being persecuted and responsible if any infectious complication happens after the procedure. ▶ Lack of familiarity with guidelines. ▶ Perceived limitation and inapplicability of the guidelines.
Barriers related to the healthcare system	▶ Hierarchy in prescription. ▶ Patient referrals from other hospitals. ▶ Time pressure and workload. ▶ Sterilisation status of the operating room.

developing resistance in the future... Urology Resident-18

Lack of familiarity with guidelines

Most urologists felt they were aware of updated AP guidelines. However, some were not updated and still viewed fluoroquinolones as a first-line option, as shown in the examples below:

... 80–90% of our decisions are based on European guidelines, which are updated yearly. Based on guidelines, we mainly prescribe fluoroquinolones before these procedures (endourological procedures)... Urology Resident-03

... in general, some urologists are not interested in updating their prescribing knowledge, and they consider the guidelines recommendations unnecessary... Urology Specialist-03

Perceived limitation and inapplicability of the international guidelines and lack of local guidelines

Many of the interviewed healthcare professionals stated clearly that there are no local guidelines in the hospitals where they work; others say that they do not know if it is present. Most interviewed urologists used international guidelines, mainly EAU and AUA, for prescribing AP but questioned their applicability to the Jordanian population in practice.

...sometimes I anticipate that these recommendations have been imposed on us... I mean, we have not formulated these guidelines. It's not as if we have conducted studies and examined the differences between administering antibiotics and refraining from doing so... I believe this is one of the factors at play. Urology Resident-04

Barriers related to the healthcare system

Hierarchy in prescription

Despite the fact that guideline-recommended antibiotics are available, junior urologists often follow the preferences of senior staff over the guidelines.

...more than 80–90% of our prescribing decisions are according to the specialist preference... Urology Resident-05

Patient referrals

Few urologists indicated that referrals are a barrier to effective communication of patient information that may influence prescribing decisions.

Most of them (patients) are often prescribed antibiotics by general practitioners without consulting specialists... In this scenario, there's no need to discontinue the ongoing antibiotic course. However, if I am the first observer, or if the general practitioner is initially referred to a specialist, the prescription of antibiotics will differ... Urology Specialist-17

Time pressure and workload

Time and workload pressure were perceived as barriers to optimal antibiotic prescribing decisions, as shown in the following quotes.

...we don't have the time to wait three days till the culture results come out, so in this case, we give the patient prophylactic antibiotic even if it seems unnecessary and not in compliance with recommendations from guidelines... Urology Specialist-13

...sometimes because of the pressure of work and the pressure of operations, it seems more likely to miss the prophylactic dose that is supposed to be given before the operation... and we tend to administer the antibiotic in the middle of the operation or after the operation or during the recovery period... Urology Resident-15

Sterilisation status of the operating room

While many urologists cited excellent sterilisation, others reported some concerns, which led to prolonged and broad-spectrum antibiotic use, deviating from guidelines.

...in a book, everything is ideal, but this is not the case in real practice... to be honest, we do not always trust sterilisation, sometimes we notice that tools are not sterilised correctly... to be honest, this is the most important thing that pushes you always to prescribe more antibiotic... Urology Specialist-13

Potential strategies to optimise the prophylactic antimicrobial decision-making process

Table 3 highlights reported facilitators that could optimise AP for endourological procedures.

Table 3 Summary of reported facilitators

Facilitator's main theme	Description of reported facilitators
Addressing barriers related to the lack of patient awareness and communication	► Increase patients' awareness about their actual need for antibiotics based on the information delivered verbally by their healthcare providers. ► Conduct awareness campaigns about antibiotic use on TV, radio and social media.
Addressing barriers related to prescribing AP	► Provide training sessions for urologists involved in antibiotic prescribing. ► Developing national guidelines and conducting local clinical studies. ► Involving clinical pharmacists in the prescribing process of AP.
AP, antimicrobial prophylaxis.	

Enhancing patients' awareness about antibiotic use

Overall, participants reported a general need to increase patients' awareness about their need for antibiotics for endourological procedures based on the information delivered verbally by their healthcare providers and through awareness campaigns.

...I think having verbal communication with patients during clinic visits, explaining clearly the need for antibiotics following procedures would be beneficial... Urology Resident-02

...we need awareness campaigns...And it can be via advertisement or programmes on TV, radio, and social media, to avoid antibiotics misuse... Urology Specialist-08

Providing training sessions for urologists involved in antibiotic prescribing

Most urologists revealed that they did not receive specialised training sessions on AP for endourological procedures, suggesting they might have the potential to increase their knowledge and improve their antibiotic-prescribing practice.

...honestly, we need courses given by specialists, such as infectious disease specialists or clinical pharmacists, to optimise our practice and refresh our basic information about antibiotics ... many clinicians might forget this information with time... Urology Resident-06

Developing national guidelines and conducting local clinical studies

Many urologists indicated that the availability of local studies and a national guideline reflecting the actual bacterial resistance profile backed by authority for implementation in clinical practice would greatly influence their practice.

...I think we need a local study to show the real bacterial resistance profile in Jordan...so we can have our input when implementing international guidelines to our practice in Jordan... Urology Resident-15

...I think we need a local guideline that takes account of bacterial resistance and sensitivity here in Jordan... Urology Resident-05

Involving clinical pharmacists

Few urologists suggested that the involvement of clinical pharmacists in the prescribing process helps to guide the proper use of antibiotics, as evidenced below:

...from my previous experience, I noticed a big difference in our antibiotic prescribing practice when the clinical pharmacist was involved in decision-making. They usually have been active in providing us with the information needed to ensure proper antibiotic prescribing decisions... they also control antibiotic use by restricting the use of broad-spectrum antibiotics when there is no added benefit... Urology Resident-04

DISCUSSION

The present study is the first qualitative investigation in Jordan on barriers and facilitators to AP guideline adherence among urologists. Participants were recruited from teaching, public and private hospitals to ensure broad representation. The perceived barriers and facilitators were remarkably consistent across all settings, highlighting common challenges rather than setting-specific differences. Several factors can contribute to an inappropriate prescription of AP for endourological procedures. Among those factors is the patients' insistence on being prescribed antibiotics after the procedure. Research showed that patient expectations and desires could affect a surgeon's prescription of AP, even though this effect was less noticeable in surgical settings than in primary care settings.^{17 18}

Or previous research¹¹ investigated adherence to AP guidelines in 361 patients undergoing endourological procedures at a Jordanian teaching hospital. In this study, notable deviations from the guidelines' recommendations were the prolonged use of antibiotics in addition to the extensive use of broad-spectrum antibiotics after the procedure. In the present study, urologists attribute the need for prolonged treatment to factors such as the perception of inadequate sterilisation. Additionally, urologists reported deviating from guidelines due to inadequate patient hygiene and concerns about the urologists' responsibility for patients developing infectious complications after the procedure, especially for those patients having multiple risk factors for those complications. This is also consistent with the literature reporting inadequate aseptic techniques and sterilisation as barriers to compliance with guidelines recommendations,¹⁹ in addition

to concerns of healthcare professionals regarding post-surgical complications.²⁰

Fluoroquinolones have been among the most commonly used antibiotics in urology for many years.²¹ Interviews with urologists showed that fluoroquinolones were prescribed as the AP agents of choice, based on the urologists' perception that these agents are recommended by guidelines. This may be explained by the fact that the AUA recommended using fluoroquinolones as an agent of choice prior to endourological procedures in its 2014 version.²² The 2019 update, however, removed that recommendation, no longer advocating routine fluoroquinolone use for these interventions. This change was made due to the steady increase in *Escherichia coli* resistance to fluoroquinolones and the multiple boxed warnings associated with its use.⁸

Furthermore, the interviewed urologists reported the lack of familiarity with the most updated recommendations as one of the barriers to guideline adherence.^{23–24} As part of the solution, many highlighted the need for training sessions about AP proper practice and the negative consequences associated with antibiotic misuse, with a focus on the cases that do not need any prescription of antibiotics. Such workshops, combined with other interventions, were effective in increasing adherence to guideline recommendations.^{25–27} For example, a prospective quasi-experimental study conducted in Pakistan which enrolled 450 patients from a tertiary care hospital found that pharmacists' educational training on the use of surgical AP, targeting physicians, increased the total adherence to correct antibiotic choice, dose and duration from 1.3% to 12.4% (p value=0.0005), with a significant reduction in the mean duration of AP by 17% (p value=0.003) and an average number of prescribed antibiotics by 9.1% (p value=0.014).²⁸

The urologists in this study emphasised the importance and the need for local clinical studies reflecting the actual bacterial resistance profile in Jordan that may differ from those found in Europe or the USA. The results of these studies should guide the development of national guidelines that improve the AP practice among physicians. In this regard, one study showed that developing and implementing evidence-based protocols for AP in patients undergoing outpatient cystoscopy, based on local bacterial resistance profiles and clinical guidelines, was associated with a significant decrease in total antibiotic consumption. Furthermore, fluoroquinolone-resistant organisms in patients who developed UTIs after the procedure decreased from 63.2% to 31.3% (p value=0.09).²⁹

The American Society of Health-System Pharmacists believes that pharmacists play a leading role in AMS and infection prevention and control programmes of healthcare systems.³⁰ Some interviewed urologists also suggested that an active role of clinical pharmacists in AP prescribing would decrease antibiotic misuse in Jordan; they mentioned that clinical pharmacists would limit the unnecessary use of antibiotics and restrict the use of

unnecessary combination or broad-spectrum antibiotics. In China, it was found that pharmacist interventions in the urological surgery department resulted in a significant reduction in the rate of unnecessary AP use, the rate of unnecessary broad-spectrum antibiotic use and the mean duration of AP.³¹

The primary limitation of this is the convenience sampling technique used, which could introduce selection bias. Another limitation is that all recruited urologists in the study were male, which reflects the gender distribution of urologists in Jordan. According to the Jordanian medical directory 'Tebcan', only one female urologist is listed, highlighting that the study's participant demographics parallel the composition of the Jordanian urology workforce. While gender-based perspectives on AP adherence may exist, we were unable to assess this due to the lack of female participants. This study reflects the Jordanian healthcare context but has broader implications. While barriers like outdated practices and workload constraints may be generalisable, variations in patient behaviour, regulations and healthcare infrastructure affect applicability. The findings align with global challenges in AP, though their impact varies by local policies, training and cultural factors.

CONCLUSION

In conclusion, non-compliance with AP guidelines was influenced by factors related to patients, urologists and the healthcare system. To address this, stewardship programmes should include locally adapted guidelines, continuous education for urologists and involve clinical pharmacists in auditing AP practices. Public awareness campaigns on antibiotic misuse are also crucial to increase public awareness about the negative consequences of antibiotic overuse.

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Patient consent for publication Consent obtained directly from patient(s).

Ethics approval This study involves human participants. The study protocol was approved by the institutional review board of the Ministry of Health (2021/169), the Jordan University Hospital (10/2020/19076), Islamic Hospital (788/2021/1), Ibn Al-Haytham Hospital and King Abdullah University Hospital (13/1/1985). Participants gave informed consent to participate in the study before taking part.

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