

# Turkish Urologists' preferences regarding antibiotic prophylaxis for transrectal prostate biopsy

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## ABSTRACT

**Objective:** Antibiotic prophylaxis for transrectal prostate biopsy (PB) is very important in preventing infectious complications, and in this study, we aimed to evaluate the antibiotic preferences of Turkish urologist for transrectal PB.

**Material and methods:** The survey about PB and antibiotic prophylaxis behaviors was administered to urologists working in Turkey who had previously participated in at least one international and one national congress.

**Results:** A total of 237 urologists were included in the study. Antibiotic prophylaxis prior to PB was performed by 234 (98.7%) participants. Rectal swabbing prior to PB was not performed by 227 (95.8%) participants. The most common complication associated with PB was prostatitis (63%), followed by urinary tract infection (29%). Only 25.7% of Turkish urologists reported a single dose of antibiotic prophylaxis. Our participants often administered antibiotic prophylaxis for a period of 3, 5, or 7 days (16%, 21.1%, 35.9%, respectively). The most common antibiotic agent preferred for prophylaxis was ciprofloxacin (65%).

**Conclusion:** The biopsy behavior of Turkish urologists was mostly compatible with the literature, but it was revealed that Turkish urologists do not prefer single-dose antibiotic therapy, and their practice patterns regarding the administration of pre-biopsy rectal swabbing are inconsistent with the literature.

**Keywords:** Antibiotic; biopsy; prophylaxis; prostate.

## Introduction

The incidence of prostate cancer in the general population is increasing every day.<sup>[1]</sup> Prostate cancer is the most common cancer in men and the second leading cause of cancer death following lung cancer.<sup>[2]</sup> Prostate cancer screening is often performed using the serum prostate-specific antigen and digital rectal examination. Transrectal ultrasound-guided prostate biopsy (TRUS-PB) is the most common approach for the histopathological diagnosis of prostate cancer.<sup>[3]</sup>

Common complications associated with prostate biopsy (PB) include pelvic pain, urinary retention, hematuria, rectal bleeding, and hematospermia.<sup>[3]</sup> Additionally, other complications including asymptomatic bacteriuria, acute bacterial prostatitis, pyelonephritis, sep-

sis, and septic shock can also be observed.<sup>[4,5]</sup> Therefore, antibiotic prophylaxis should be performed prior to PB in each patient.<sup>[6]</sup> However, the choice of antimicrobial agents for prophylaxis remains controversial, and this choice is often dependent on the impact of resistance.<sup>[7,8]</sup>

This survey study included the urologists working in Turkey who had previously participated in at least one international and one national congress to investigate their practice patterns regarding the administration of TRUS-PB and their preferences related to antibiotic prophylaxis.

## Material and methods

The 13-item survey was administered between June 2018 and October 2018 to 281 urologists

working in Turkey who had previously participated in at least one international and one national congress. The questionnaire (see Appendix 1-<https://doi.org/10.5152/tud.2019.19051>) was applied face to face to urologists. Descriptive characteristics including the type of hospital where the urologists were working (i.e., university, training, and research, or state hospital); total number of beds in the urology clinic; and the average number of biopsy procedures performed in a month were recorded for each participant. The survey items related to the components of the PB procedure (e.g., antibiotic prophylaxis, mode and duration of prophylaxis, urine culture, rectal cleaning) were in the form of multiple-choice questions. The item probing the antibiotic agents preferred for prophylaxis included nine options: ciprofloxacin, levofloxacin, phosphomycin, ertapenem, ceftriaxone, trimethoprim/sulfamethoxazole, amoxicillin/clavulanate, piperacillin/tazobactam, and others.

### Statistical analysis

Data were analyzed using the SPSS for Windows version 22.0 (IBM Corporation, USA). Normal distribution of data was determined using the Shapiro–Wilk test. Parametric variables were expressed as mean±standard deviation (SD), and the non-parametric variables were expressed as median (25<sup>th</sup>–75<sup>th</sup> percentile). Independent parametric and non-parametric variables were compared using the independent samples t-test and Mann–Whitney U test, respectively. Categorical data were compared using the chi-squared test. A p-value <0.05 was considered statistically significant.

### Results

A total of 281 urologists consented to participating in the study. Of these, 44 (15.6%) were excluded since they had never performed TRUS. As a result, a total of 237 urologists were included in the study. In the institutions where the urologists were working (Figure 1), the median number of beds in urology clinics was 28 (21–32), and the average number of biopsies performed in a month was 15 (10–20). Figure 2 presents the number of hospital beds and the average number of biopsies in each hospital type. A routine urine culture was performed by 232 (97.9%) participants, while no urine culture was performed by the remaining 5 (2.1%) participants. Antibiotic prophylaxis prior to PB was performed by 234% (98.7%)

participants, while no antibiotic prophylaxis was performed by 3 (1.3%) participants. Rectal swabbing prior to PB was not performed by 227 (95.8%) participants. Rectal cleaning prior to PB was performed by 47.7% (113/237) of the participants, while no rectal cleaning was performed by 52.3% (124/237) of the participants. The incidence of infection after PB was declared to be 0%–1% by 65 (27%) and 1%–5% by 172 (73%) participants. The most common complication associated with PB was declared as prostatitis (63%) followed by urinary tract infection (UTI) (29%). Only 25.7% of Turkish urologists reported a single dose of antibiotic prophylaxis. Our participants often administered antibiotic prophylaxis for a period of 3, 5, or 7 days (16%, 21.1%, 35.9%, respectively). The most common antibiotic agent preferred for prophylaxis was ciprofloxacin (65%). Figure 3 presents the antibiotic agents preferred for prophylaxis based on the hospital type.

The median professional experience of the urologists was 10.0 (7.0–16.0) years. Participants were divided into two groups according to the duration of their urological experiences [Group 1: 0–14 years (n=151), Group 2: ≥15 years (n=83)]. There was no significant difference between the groups in terms of antibiotic preferences (Table 1).

When the participants were divided into two groups as those working in a university hospital and those not working in a university hospital, it was found that those working in the university hospital applied antibiotic prophylaxis for a shorter time (p<0.001). The rate of ciprofloxacin preference was higher in urologists working in a university hospital (Table 2).

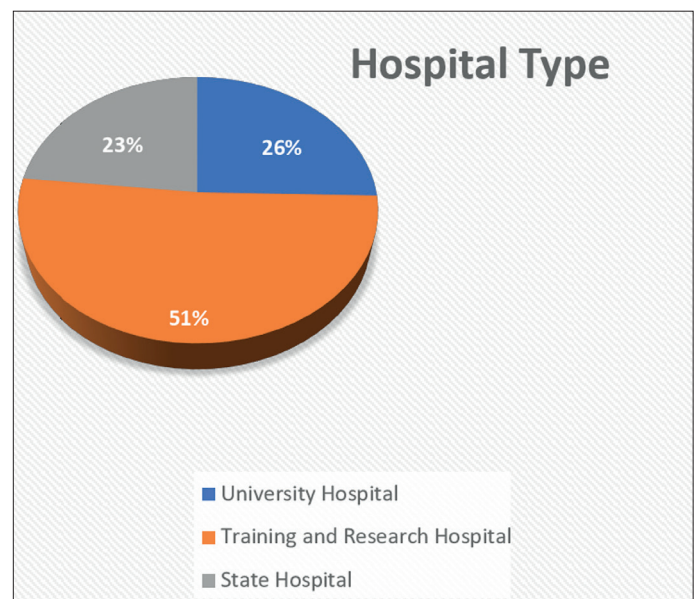


Figure 1. Hospital types of study groups

#### Main Points:

- The rate of single dose antibiotic prophylaxis is not common among Turkish urologists (25%).
- The most common type of prophylaxis is 7-day prophylaxis; the most commonly used agent is ciprofloxacin.
- Contrary to the literature suggestion, Turkish urologists do not prefer to take a rectal swabbing before biopsy.

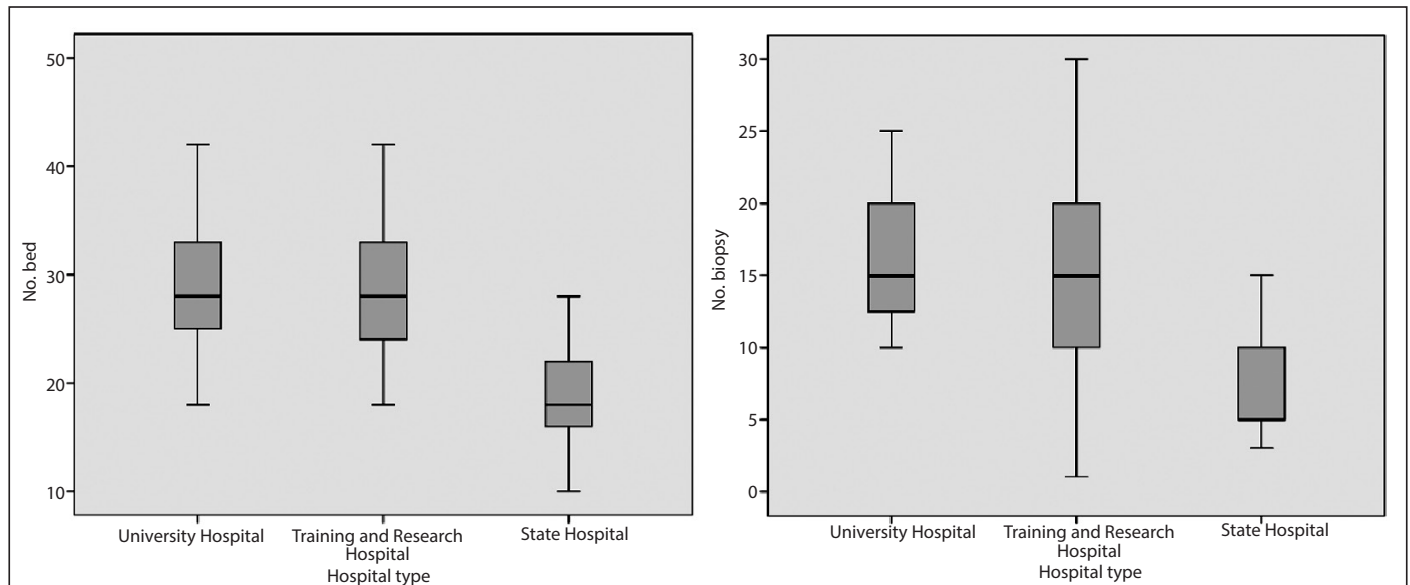


Figure 2. Number of median beds and biopsies per month according to the hospital types

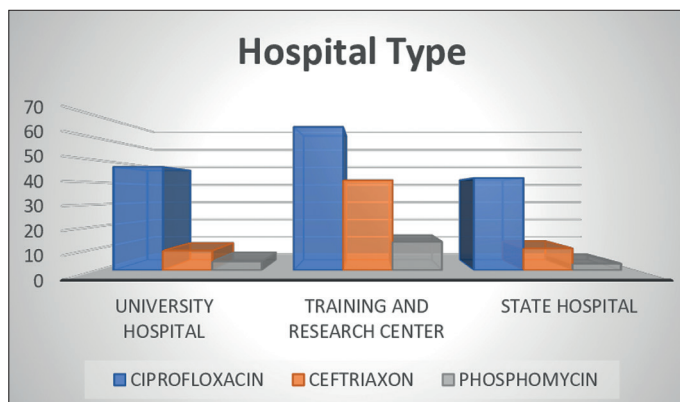


Figure 3. Antibiotic agents preferred for prophylaxis based on the hospital type

## Discussion

This survey study demonstrates PB behaviors of Turkish urologists. According to our PubMed scan, to the best of our knowledge, this is the first survey study to investigate the antibiotic prophylaxis of Turkish urologists in transrectal PB. It was revealed that Turkish urologists do not prefer single-dose antibiotic therapy, and their practice patterns regarding the administration of pre-biopsy rectal swabbing are inconsistent with the literature. These are the most important results for our survey study.

Literature indicates that there are various applications regarding the type of antimicrobial agent used for prophylaxis and the duration of prophylaxis.<sup>[9]</sup> However, most of the recent reports suggest that performing antimicrobial prophylaxis for a period of >24h results in no significant difference compared to a period

Table 1. Comparison of antibiotic preferences according to professional experience

Antibiotic	Groups by ages		p
	Group 1 (n=153)	Group 2 (n=81)	
Ciprofloxacin	106 (69.3%)	49 (60.5%)	0.176
Ceftriaxone	36 (23.5%)	23 (28.4%)	0.415
Phosphomycin	11 (7.2%)	9 (11.1%)	0.307

Table 2. Comparisons of the beds in urology clinics, number biopsies performed in a month, prophylaxis duration, and rate of ciprofloxacin use between participants working in a university hospital and those not working

	University Hospital	Non-university Hospital	p
Number of beds	29.83±5.93	25.78±8.11	<0.001
Number of biopsies (per month)	16.50±5.31	13.46±6.38	0.001
Prophylaxis duration (day)	1.0 (1.0–3.0)	5.0 (3.0–7.0)	<0.001
Ciprofloxacin rate (n, %)	47/60 (78.3%)	107/177 (60.5%)	0.012

of <24 h.<sup>[10-12]</sup> Moreover, there are numerous authors suggesting that single-dose antibiotic prophylaxis is sufficient prior to biopsy.<sup>[13-15]</sup> In fact, some studies report that long-term fluoroquinolone administration prior to biopsy increases post-biopsy infection rates.<sup>[16]</sup> Contrary to these original clinical trials, a German study revealed that only 10.1% of the urologists considered that

single-dose antibiotic prophylaxis would be sufficient.<sup>[17]</sup> Similarly, only 25.7% of our participants contended that single-dose antibiotic prophylaxis would be sufficient. In addition, we also found that our participants often administered antibiotic prophylaxis for a period of 3, 5, or 7 days (16%, 21.1%, 35.9%, respectively). These findings implicate that although the effectivity of single-dose antibiotic prophylaxis has been demonstrated in original clinical trials, the urologists in Turkey seem to prefer long-term antibiotic prophylaxis, which could be attributed to the fact that single-dose antibiotic prophylaxis is not sufficiently trusted in clinical practice.

There is no consensus as to which antimicrobial agents should be used for antibiotic prophylaxis; however, fluoroquinolones have been shown to be the most common agents preferred by urologists. Wagenlehner et al.<sup>[6]</sup> reported that fluoroquinolones were preferred by 92.5% of the participants, and another study revealed that fluoroquinolones were preferred by 89.5% of German urologists.<sup>[17]</sup> Similarly, in our study, fluoroquinolones were frequently preferred by the participants, although at a lower rate compared to the literature (65%). According to a recent meta-analysis, phosphomycin was found to be more effective in PB prophylaxis than fluoroquinolones.<sup>[3]</sup> However, according to results of our study, only 8.4% of urologists in Turkey prefer phosphomycin. Moreover, it has also been shown that most of the participants using phosphomycin for prophylaxis consider that single-dose prophylaxis will be sufficient. Furthermore, our study revealed that 18 (90%) out of 20 participants who used phosphomycin for prophylaxis contended that single-dose prophylaxis would be sufficient. This lower preference for fluoroquinolones could be attributed to the fact that the differences in regional antibiotic resistance could be directing Turkish urologists toward different preferences. Zowawi et al. reported that fluoroquinolone resistance varies regionally and that the resistance rate varies between 4.2% and 70%.<sup>[18]</sup> In addition, recent reports indicate that the incidence of fluoroquinolone-resistant *Escherichia coli* infections in Turkey has increased to 32%.<sup>[19]</sup> Therefore, the studies reporting on the use of pre-biopsy rectal swab for the determination of antimicrobial agents for prophylaxis have recently emerged as popular studies.<sup>[20–22]</sup> In a previous systematic review, Scott et al.<sup>[20]</sup> reported that the antibiotic prophylaxis performed after the determination of antibiotic agents via rectal swabbing prior to PB was more efficacious and also led to lower infection rates compared to empirical antibiotic prophylaxis. Tukenmez et al.<sup>[21]</sup> found that the prevalence of post-biopsy UTI was higher in the male patients that were detected with extended-spectrum  $\beta$ -lactamase-producing *Enterobacteriaceae* via rectal swabbing prior to PB and concluded that performing rectal swabbing prior to PB is highly essential. In our study, it was revealed that only 4.2% of the participants performed rectal swabbing prior to PB, which is a major issue emphasized in the

present study. Therefore, as clinicians who routinely perform rectal swabbing prior to PB, we believe that Turkish urologists should be made aware of this issue.

When the participants were divided into two groups as university and non-university urologists, it was observed that urologists working in the university applied antibiotic prophylaxis for a shorter time than suggested by the literature. Similarly, the use of ciprofloxacin was more common among urologists who work in university hospital. We believe that these results are due to the fact that the participants working in the university follow the current literature more closely.

Batura and Rao<sup>[23]</sup> reviewed 72,500 biopsies in the United Kingdom and reported the incidence of UTI following PB to be 2.15%–3.6%. Similarly, Wagenlehner et al.<sup>[6]</sup> reported that the incidence of fever and hospitalization following PB was 3.1%. In two studies that were conducted in Turkey<sup>[24]</sup> and Italy<sup>[25]</sup>, the incidence of infections requiring hospitalization was 2%. A previous systematic review reported the incidence of UTI following PB to be 2%–6%, and the incidence of infections and sepsis to be around 1%.<sup>[6]</sup> In line with the literature, most of our participants (73%) reported that the incidence of UTI following PB was 1%–5%. However, contrary to the literature, our participants revealed that the majority of these infections were acute prostatitis (63%) rather than febrile UTI. This difference could be attributed to the fact that the responses provided by our participants were based on objective data, that it is difficult to distinguish acute prostatitis from febrile UTI, and that the rate of hospital admission is relatively lower among the patients with simple UTI.

Performing antibiotic prophylaxis both before and after PB is essential due to the risk of post-biopsy PB.<sup>[3]</sup> A systematic review evaluated 19 original reports with a total of 3,599 patients and indicated that the administration of antibiotic prophylaxis prior to PB significantly reduced the incidence of bacteriuria, fever, and UTI, as well as the duration of hospital stay.<sup>[26]</sup> Similarly, another meta-analysis noted that antibiotic prophylaxis decreased the incidence of bacteriuria.<sup>[27]</sup> Moreover, professional guidelines recommend the administration of antibiotic prophylaxis prior to PB.<sup>[28]</sup> A global prevalence study indicated that antibiotic prophylaxis prior to PB was administered in 98.2% of the patients.<sup>[6]</sup> A recent study investigating the practice patterns of 478 German urologists revealed that antimicrobial prophylaxis prior to PB was performed by 98% of the participants.<sup>[17]</sup> In line with the literature and the guidelines, our results indicated that antimicrobial prophylaxis prior to PB was performed by 98.7% of the urologists in Turkey.

Our results also revealed that no rectal preparation was performed by 124 (52.3%) participants. However, of the remaining 113 (47.7%) who used rectal preparation, most of them (82.3%) used



the povidone iodine rectal preparation (PIRP). Literature reviews indicate that there are numerous studies reporting on pre-biopsy rectal preparation.<sup>[3,29]</sup> According to the European Association of Urology (EAU) guidelines, the use of pre-biopsy rectal enema does not have a significant effect on the prevalence of post-biopsy infections, while PIRP leads to a significant reduction in the prevalence of post-biopsy UTI. Therefore, the EAU guidelines recommends the use of PIRP.<sup>[30]</sup> In our study, it was revealed that almost half of the participants performed no rectal cleaning. Moreover, it was also found that the preferences of the majority of the participants who performed rectal cleaning were consistent with the recommendations reported in the literature.

In our study, urologists were divided into two groups according to their professional experience (0–14 years or >14 years). There was no change in antibiotic preference according to professional experiences, and the most preferred antibiotic was ciprofloxacin. Wagenlahner et al.<sup>[6]</sup> showed that the urologists who applied and did not perform biopsy were at a similar age. Although this issue is controversial, and there are not enough data in the literature, we can say that professional experience does not affect the biopsy preferences according to the available data.

There are three different types of hospitals in the Turkish health system. These can be listed as the university hospitals, training and research hospitals, and state hospitals. While the university hospitals and training and research hospitals serve as a tertiary care, state hospitals generally provide health services as a second step. According to the results, the number of monthly biopsy applications was similar in university hospitals and training and research hospitals. However, fewer biopsies were performed in state hospitals. In all hospital types, the most preferred antibiotic for biopsy prophylaxis was ciprofloxacin. In a study conducted by German urologists, and similar to our results, it was found that the most commonly used antibiotics in all hospital types was fluoroquinolones.<sup>[6]</sup>

Our study was limited since it had a relatively small number of participants, the participants were not surveyed about their biopsy experiences, and it had a survey design and therefore did not contain a lot of datasets that would enable statistical comparisons. The dose administered in antibiotic prophylaxis is important. The participants were not asked in what doses they applied the prophylaxis, and this is the other limitation of the study. Our study included some bias in the patient selection. One of the congresses where the questionnaires were applied was the urooncological congress. This may have led to the inclusion of urologists who are more interested in PB.

In conclusion, it was revealed that Turkish urologists do not prefer single-dose antibiotic therapy, and their practice patterns

regarding the administration of pre-biopsy rectal swabbing is inconsistent with the literature. We believe that the TRUS-PB procedure should be parallel with the practices accepted in the literature to increase its success rates and to decrease the rate of infection.

**You can reach the questionnaire of this article at <https://doi.org/10.5152/tud.2019.19051>.**

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## References

1. Allemani C, Weir HK, Carreira H, Harewood R, Spika D, Wang XS, et al. Global surveillance of cancer survival 1995–2009: analysis of individual data for 25,676,887 patients from 279 population-based registries in 67 countries (CONCORD-2). *Lancet* 2015;385:977–1010. [\[CrossRef\]](#)
2. Torre LA, Bray F, Siegel RL, Ferlay J, Lortet-Tieulent J, Jemal A. Global cancer statistics, 2012. *CA Cancer J Clin* 2015;65:87–108. [\[CrossRef\]](#)
3. Roberts MJ, Scott S, Harris PN, Naber K, Wagenlehner FME, Doi SAR. Comparison of fosfomycin against fluoroquinolones for transrectal prostate biopsy prophylaxis: an individual patient-data meta-analysis. *World J Urol* 2018;36:323–30. [\[CrossRef\]](#)
4. Lundström KJ, Drevin L, Carlsson S, Garmo H, Loeb S, Stattin P, et al. Nationwide population-based study of infections after transrectal ultrasound guided prostate biopsy. *J Urol* 2014;192:1116–22. [\[CrossRef\]](#)
5. Bruyere F, Malavaud S, Bertrand P, Decock A, Cariou G, Doublet JD, et al. Probiotic: a multicenter, prospective analysis of infectious complications after prostate biopsy. *J Urol* 2015;193:145–50. [\[CrossRef\]](#)
6. Wagenlehner FME, van Oostrum E, Tenke P, Tandogdu Z, Çek M, Grabe M, et al. Infective complications after prostate biopsy: outcome of the Global Prevalence Study of Infections in Urology (GPIU) 2010 and 2011, a prospective multinational multicentre prostate biopsy study. *Eur Urol* 2013;63:521–7. [\[CrossRef\]](#)
7. Cuevas O, Oteo J, Lázaro E, Aracil B, de Abajo F, García-Cobos S, et al. Significant ecological impact on the progression of fluoroquinolone resistance in *Escherichia coli* with increased community use of moxifloxacin, levofloxacin and amoxicillin/ clavulanic acid. *J Antimicrob Chemother* 2011;66:664–9. [\[CrossRef\]](#)

8. Loeb S, Carter HB, Berndt SI, Ricker W, Schaeffer EM. Complications after prostate biopsy: data from SEER-Medicare. *J Urol* 2011;186:1830-4. [\[CrossRef\]](#)
9. Smyth LG, Mulvin DW. Antibiotic prophylaxis for transrectal ultrasound biopsy of the prostate in Ireland. *Ir J Med Sci* 2012;181:33-5. [\[CrossRef\]](#)
10. Rhodes NJ, Gardiner BJ, Neely MN, Grayson ML, Ellis AG, Lawrentschuk NT, et al. Optimal timing of oral fosfomycin administration for pre-prostate biopsy prophylaxis. *J Antimicrob Chemother* 2015;70:2068-73. [\[CrossRef\]](#)
11. Kalkanlı A, Gezmiş CT, Özkan A, Çilesiz NC, Yanaral F, Aydın M, et al. Comparison of Single and Prolonged Fluoroquinolone Prophylaxis and Risk Factors for Infectious Complications After Transrectal Prostate Biopsy. *Balkan Med J* 2018;35:373-7. [\[CrossRef\]](#)
12. Bulut V, Şahin AF, Balaban Y, Altok M, Divrik RT, Zorlu F. The efficacy of duration of prophylactic antibiotics in transrectal ultrasound guided prostate biopsy. *Int Braz J Urol* 2015;45:906-10. [\[CrossRef\]](#)
13. Briffaux R, Coloby P, Bruyere B, Ouaki F, Pires C, Doré B, et al. One preoperative dose randomized against 3-day antibiotic prophylaxis for transrectal ultrasonography-guided prostate biopsy. *BJU Int* 2009;103:1069-73. [\[CrossRef\]](#)
14. Farag M, Riddell S, Daffy J, Wong LM. Comparing infective complications from transrectal ultrasound guided prostate biopsy following transition to single dose oral ciprofloxacin prophylaxis. *Investig Clin Urol* 2019;60:54-60. [\[CrossRef\]](#)
15. Pepdjonovic L, Tan GH, Huang S, Mann S, Frydenberg M, Moon D, et al. Zero hospital admissions for infection after 577 transperineal prostate biopsies using single-dose cephazolin prophylaxis. *World J Urol* 2017;35:1199-203. [\[CrossRef\]](#)
16. Roberts MJ, Williamson DA, Hadway P, Doi SA, Gardiner RA, Paterson DL. Baseline prevalence of antimicrobial resistance and subsequent infection following prostate biopsy using empirical or altered prophylaxis: A bias-adjusted meta-analysis. *Int J Antimicrob Agents* 2014;43:301-9. [\[CrossRef\]](#)
17. Boehm K, Siegel FP, Schneidewind L, Kranz J, Spachmann P, Frank T, et al. Antibiotic Prophylaxis in Prostate Biopsies: Contemporary Practice Patterns in Germany. *Front Surg* 2018;5:2. [\[CrossRef\]](#)
18. Zowawi HM, Harris PN, Roberts MJ, Tambyah PA, Schembri MA, Pezzani MD, et al. The emerging threat of multidrug-resistant Gram-negative bacteria in urology. *Nat Rev Urol* 2015;12:570-84. [\[CrossRef\]](#)
19. Bozcal E, Eldem V, Aydemir S, Skurnik M. The relationship between phylogenetic classification, virulence and antibiotic resistance of extraintestinal pathogenic *Escherichia coli* in İzmir province, Turkey. *Peer J* 2018;6:e5470. [\[CrossRef\]](#)
20. Scott S, Harris PN, Williamson DA, Liss MA, Doi SAR, Roberts MJ. The effectiveness of targeted relative to empiric prophylaxis on infectious complications after transrectal ultrasound-guided prostate biopsy: a meta-analysis. *World J Urol* 2018;36:1007-17. [\[CrossRef\]](#)
21. Tukenmez TE, Tandogdu Z, Ergonul O, Altinkanat G, Gunaydin B, Ozgen M, et al. Outcomes of Fecal Carriage of Extended-spectrum beta-Lactamase After Transrectal Ultrasound-guided Biopsy of the Prostate. *Urology* 2014;84:1008-15. [\[CrossRef\]](#)
22. Salomon G, Prues S, Saul J, Schneider M, Budäus L, Tilki, et al. Antimicrobial lubricant reduces rectal bacteria at transrectal prostate biopsy. Results from a large prospective randomized trial. *Eur Urol Suppl* 2017;16:e1090-1. [\[CrossRef\]](#)
23. Batura D, Rao GG. The national burden of infections after prostate biopsy in England and Wales: a wake-up call for better prevention. *J Antimicrob Chemother* 2013;68:247-9. [\[CrossRef\]](#)
24. Cam K, Kayikci A, Akman Y, Erol A. Prospective assessment of the efficacy of single dose versus traditional 3-day antimicrobial prophylaxis in 12-core transrectal prostate biopsy. *Int J Urol* 2008;15:997-1001. [\[CrossRef\]](#)
25. Carmignani L, Picozzi S, Spinelli M, Di Pierro S, Mombelli G, Negri E, et al. Bacterial sepsis following prostatic biopsy. *Int Urol Nephrol* 2012;44:1055-63. [\[CrossRef\]](#)
26. Zani EL, Clark OA, Rodrigues Netto Jr N. Antibiotic prophylaxis for transrectal prostate biopsy. *Cochrane Database Syst Rev* 2011;11:CD006576. [\[CrossRef\]](#)
27. Yang M, Zhao X, Wu Z, Xiao N, Lu C. Meta-analysis of antibiotic prophylaxis use in transrectal prostatic biopsy. *Zhong Nan Da Xue Xue Bao Yi Xue Ban* 2009;34:115-23.
28. American Urological Association. Best practice policy statement on urologic surgery antimicrobial prophylaxis. American Urological Association Web site. [https://www.auanet.org/guidelines/antimicrobial-prophylaxis-\(2008-reviewed-and-validity-confirmed-2011-amended-2012\)](https://www.auanet.org/guidelines/antimicrobial-prophylaxis-(2008-reviewed-and-validity-confirmed-2011-amended-2012)). Accessed November 16, 2018.
29. Lee JE, Shin SS, Kang TW, Kim JW, Heo SH, Jeong YY. Comparison of Different Rectal Cleansing Methods for Reducing Post-Procedural Infectious Complications After Transrectal Ultrasound-Guided Prostate Biopsy. *Urol J* 2019 Mar 18. DOI: 10.22037/uj.v0i0.4583. [Epub ahead of print]
30. European Association of Urology. Urological Infections. Prostate Biopsy. European Association of Urology web site. [http://uroweb.org/guideline/urological-infections/#note\\_360](http://uroweb.org/guideline/urological-infections/#note_360). Accessed November 15, 2018.

**Appendix 1.** Survey form of antimicrobial prophylaxis before transrectal prostate biopsy

1. Country:
2. Institution:
3. Experience in urology (years):
4. Experience in urooncology (years):
5. Number of beds in institution:
6. Number of beds in the urology clinic:
7. Number of prostate biopsies per month:
8. Do you get urine culture before prostate biopsy?
  - a. Yes
  - b. No
9. Do you use antimicrobial prophylaxis before prostate biopsy?
  - a. Yes
  - b. No
10. Do you culture the rectal swab before prostate biopsy?
  - a. Yes
  - b. No
11. When do you start antimicrobial prophylaxis?
  - a. One week before biopsy
  - b. One day before biopsy
  - c. One hour before biopsy
12. How long are you continuing antimicrobial prophylaxis?
  - a. Only dose-before biopsy
  - b. Three days after biopsy
  - c. Five days after biopsy
  - c. One week after biopsy
13. Which antibiotic is used for prophylaxis?
  - a. Ciprofloxacin
  - b. Levofloxacin
  - c. Ceftriaxone
  - d. Fosfomycin
  - e. Trimethoprim–sulfamethoxazole
  - f. Amoxicillin/clavulanate
  - g. Ertapenem
  - h. Piperacillin/tazobactam
  - i. Other.....
14. Is rectal cleaning done before the procedure?
15.
  - a. Yes
  - b. No
16. What agent is used for rectal cleaning?
  - a. Enema
  - b. Povidone Iodide
  - c. Other
17. What is the rate of urinary tract infection after the prostate biopsy in your institution?
  - a) 0%
  - b) 1–5%
  - c) 6–10%
  - d) >10%
  - e) Not known
16. What is the most common urinary system infection in your clinic?
  - a) Uncomplicated urinary system infection
  - b) Prostatitis
  - c) Pyelonephritis
  - d) Urosepsis
  - e) Not known