Original Article
Özgün Araştırma

Endourol Bull. 2026;18(1):12-19. doi: 10.54233/endourolbull-1744058

Urological Evaluation Processes of Patients with Microscopic Hematuria Identified in Primary Healthcare Services: A Retrospective Analysis

Birinci Basamak Sağlık Hizmetlerinde Mikroskobik Hematüri Saptanan Hastaların Ürolojik Değerlendirme Süreçleri: Retrospektif Analiz

Mehmet Uçar[1], **Halil İbrahim İvelik**[2], **Duygu İvelik**[3]

[1] *Department of Medical Services and Techniques, Muş Alparslan University, Varto Vocational School, Muş, Türkiye*
[2] *Department of Urology, Muş Varto State Hospital, Muş, Türkiye*
[3] *Department of Nursing, Muş Varto State Hospital, Muş, Türkiye*

ABSTRACT

Objective: This study aimed to investigate the diagnostic evaluation pathways, referral rates for advanced testing, final diagnoses, and follow-up outcomes of patients with microscopic hematuria (MH) identified through routine urinalysis in primary care settings.

Materials and Methods: In this retrospective cross-sectional study, clinical data were reviewed for 73 patients who presented to primary healthcare centers between 2022 and 2023 and had ≥3 red blood cells per high-power field (RBC/HPF) on urinalysis. Data included demographic characteristics, medical history, laboratory findings, imaging studies, specialist consultations, and treatment outcomes.

Results: The mean age of participants was 39.6 ± 14.3 years, with 63% being female. MH was classified as benign in 80.8% of cases. Urolithiasis accounted for 13.7%, while glomerular pathology and malignancy were each identified in 2.7% of patients. A follow-up-only approach was adopted in 60.3% of cases. During follow-up, hematuria resolved spontaneously in 84.9% of patients. The presence of malignancy was more common among high-risk individuals, particularly older adults and smokers.

Conclusion: Microscopic hematuria is most often benign but may signal serious underlying conditions in high-risk patients. Nurses in primary care play a vital role in the early identification and triage of such patients by interpreting urinalysis findings using a risk-based approach and ensuring timely specialist referrals.

Keywords: hematuria, nursing, oncology, primary healthcare, urology

Cite As: *Ucar M, Ivelik HI, Ivelik D. Urological Evaluation Processes of Patients with Microscopic Hematuria Identified in Primary Healthcare Services: A Retrospective Analysis. Endourol Bull. 2026;18(1):12-19.* https://doi.org/10.54233/endourolbull-1744058

Corresponding Author : *Mehmet Uçar, PhD, Assistant Prof. Muş Alparslan University, Varto Vocational School, Department of Medical Services and Techniques, 49100 Muş, Türkiye*
e-mail: mehmetucar0202@hotmail.com
Received : July 16, 2025 ***Accepted*** : January 6, 2026

ÖZET

Amaç: Bu araştırma birinci basamak sağlık hizmetlerinde rutin tam idrar tahlili sırasında mikroskobik hematüri (MH) saptanan bireylerin tanısal değerlendirme süreçlerini, ileri tetkiklere yönlendirme oranlarını, son tanılarını ve izlem sonuçlarını değerlendirmek amacıyla yapılmıştır.

Yöntem: Bu retrospektif kesitsel çalışmada, 2022–2023 yılları arasında birinci basamak sağlık hizmetine başvuran ve tam idrar tahlilinde ≥3 RBC/HPF saptanan toplam 73 bireyin klinik verileri incelendi. Demografik özellikler, tıbbi öykü, laboratuvar bulguları, yapılan görüntüleme ve konsültasyonlar ile tanı ve tedavi süreçleri değerlendirildi.

Bulgular: Katılımcıların yaş ortalaması 39,6 ± 14,3 yıl olup %63'ü kadın idi. MH olgularının %80,8'i benign olarak değerlendirildi. Taş hastalığı %13,7, glomerüler nedenler ve malignite ise %2,7 oranında saptandı. Hastaların %60,3'ü yalnızca izlem ile takip edildi. İzlemde hematürinin %84,9'unda geçici olduğu gözlendi. Riskli bireylerde (ileri yaş, sigara kullanımı) malignite görülme olasılığı daha yüksekti.

Sonuç: Mikroskobik hematüri genellikle benign nedenlere bağlı olmakla birlikte, özellikle risk grubundaki bireylerde ciddi patolojilerle ilişkili olabilir. Birinci basamak sağlık hizmetlerinde görev yapan hemşirelerin TİT sonuçlarını risk temelli şekilde değerlendirmesi ve gerekli yönlendirmeleri yapması, erken tanı açısından kritik öneme sahiptir.

Anahtar kelimeler: birinci basamak sağlık hizmetleri, hemşirelik**,** hematüri, üroloji, onkoloji

INTRODUCTION

Microscopic hematuria (MH) is a clinical finding that is often asymptomatic and typically detected incidentally during routine urinalysis. It is defined as the presence of three or more red blood cells per high-power field (HPF) on microscopic examination (1). The significance of MH lies in its broad etiological spectrum, ranging from benign causes to serious malignant neoplasms (2). According to the updated clinical guidelines of the American Urological Association (AUA), individuals with microscopic hematuria should undergo further diagnostic evaluation once transient and benign causes such as menstruation, urinary tract infections, urolithiasis, or recent strenuous exercise have been ruled out (1). However, in primary care settings, MH is often overlooked, or diagnostic algorithms are not followed, which may lead to delayed diagnosis of malignancies (3,4).

The evaluation of MH in female patients may be more complex compared to males. Factors such as menstrual contamination, vaginal atrophy, urethritis, or cystitis may result in false-positive findings and complicate the diagnostic process (5). Especially in postmenopausal women, careful assessment is essential to differentiate between true and false positives (6). The prevalence of microscopic hematuria in the general population varies between 2% and 31%, depending on age, gender, and associated risk factors (7). In older adults, the presence of MH is associated with a higher risk of urinary tract malignancies (8). Conversely, in younger individuals, urolithiasis and glomerular pathologies are more commonly identified (9). The diagnostic process typically involves urine cytology, imaging modalities (such as ultrasonography, computed tomography, or cystoscopy), and nephrology or urology consultations when necessary (10). However, adherence to these diagnostic pathways in primary care remains low. Some studies report that only 30–40% of individuals diagnosed with MH are referred for further evaluation (11). Primary care nurses and family physicians play a pivotal role in the timely identification and appropriate referral of patients with MH (12). Their awareness in interpreting urinalysis results is especially critical for the early detection of malignancies, thereby contributing significantly to public health. The extent to which diagnostic algorithms are followed, the adequacy of imaging and consultation procedures, and the final diagnoses all serve as key indicators of healthcare system efficiency (4,6). Moreover, cost-effective screening strategies for MH have been the subject of recent debate. It has been reported that early imaging in older individuals and those with a history of smoking can facilitate the early diagnosis of bladder and kidney cancers, offering long-term economic benefits to the healthcare system (12,13). In recent years, the use of clinical decision support systems (CDSS) integrated with electronic health records has aimed to standardize the evaluation of MH. The broader application of such digital tools in primary care may reduce unnecessary testing and enable timely diagnosis for high-risk patients (14).

This study aims to retrospectively examine the diagnostic evaluation processes of individuals diagnosed with microscopic hematuria through routine urinalysis in primary care settings. The findings are expected to highlight

the clinical risk associated with MH and the potential adverse outcomes of neglecting this condition. Furthermore, based on the results, it is anticipated that the referral behaviors of primary care professionals will be reassessed and supported with appropriate diagnostic algorithms. The study seeks to raise awareness among primary care personnel by emphasizing the clinical implications of microscopic hematuria and the importance of its proper management. This research was conducted to retrospectively analyze the urological evaluation processes of patients diagnosed with microscopic hematuria in primary healthcare services. It is believed that the study will contribute to the literature and serve as a foundation for future research. A significant proportion of individuals identified with microscopic hematuria during routine health screenings in primary care are found to have pathological findings following further diagnostic evaluation.

MATERIALS AND METHODS

This retrospective and cross-sectional study was conducted in a district-level primary healthcare setting. The study population consisted of individuals who presented to primary healthcare centers in a district with a population of approximately 10,000, located in eastern Turkey, between January 2022 and December 2023. A total of 73 individuals were identified as having microscopic hematuria (MH). In accordance with contemporary guideline definitions, microscopic hematuria was defined as the presence of ≥3 red blood cells per high-power field (RBC/HPF) on microscopic urinalysis. Persistent microscopic hematuria was defined as ≥3 RBC/HPF on at least two separate microscopic examinations performed 3–6 months apart. In the present cohort, repeated urinalyses were generally performed during secondary care urology assessments; therefore, persistence was confirmed at the level of specialist evaluation rather than in primary care follow-up. These individuals comprised the study sample.

Data were obtained from family health centers, the national e-Nabız health information system, and relevant hospital information management systems. Anonymized data were transferred to a pre-designed data collection form. The variables collected were classified as follows:

- **Demographic data:** Age, sex, body mass index (BMI), smoking history
- **Medical history:** Hypertension, diabetes mellitus, history of radiotherapy/chemotherapy, family history of kidney disease
- **Urinalysis findings:** RBC/HPF, proteinuria, leukocyturia
- **Diagnostic evaluations:** Ultrasonography (USG), computed tomography (CT), magnetic resonance imaging (MRI), cystoscopy, cytology
- **Clinical outcomes:** Final diagnosis, time to diagnosis, treatment type, follow-up status, outcome

Data Analysis

The data were analyzed using IBM SPSS Statistics software (version 25.0). Descriptive statistics were presented as mean ± standard deviation (SD) for continuous variables and as frequency and percentage for categorical variables.

Ethical Compliance

This study was conducted by the ethical principles outlined in the Declaration of Helsinki. The study protocol was reviewed and approved by the Scientific Research and Publication Ethics Committee of Muş Alparslan University (Approval Date and Number: 08.05.2025/-193286 Decision number: 63/32). All data were retrospectively obtained from institutional records and were anonymized prior to analysis; therefore, no additional written informed consent was required according to the ethics committee decision.

RESULTS

The mean age of the 73 patients included in the study was 39.6 ± 14.3 years (range: 17 to 74). Regarding gender distribution, 63% of the participants were female (n = 46) and 37% were male (n = 27).

Among the patients diagnosed with microscopic hematuria, 80.8% (n = 59) were found to have benign etiologies. The most frequently identified pathological causes were urolithiasis (13.7%, n = 10), glomerular causes (2.7%, n = 2), and malignancy (2.7%, n = 2) (Table 1).

All patients in the cohort were referred from primary care to a urology outpatient clinic for further evaluation. A bedside renal and bladder ultrasonography was performed by the attending urologist in all cases. Additional imaging was obtained based on clinical suspicion: six patients underwent non-contrast abdominal computed tomography (CT), and two patients underwent contrast-enhanced abdominal CT. Two individuals were referred to nephrology due to suspected glomerular pathology. Among patients with recurrent or persistent microscopic hematuria, cystoscopic evaluation under local anesthesia was performed in several cases. Recurrent hematuria was ultimately attributed to urothelial malignancy in two patients, cystoscopic findings were normal in the remaining recurrent cases. Two patients (2.7%) were diagnosed with urothelial malignancy. One patient, an active smoker over the age of 50 years, had a T1 high-grade papillary bladder tumor, while the second patient, a 42-year-old smoker, had a 1 cm Ta papillary bladder tumor. In both cases, the diagnosis was established by cystoscopic evaluation and transurethral resection of bladder tumor (TURBT).

A follow-up approach was recommended for 60.3% (n = 44) of the patients, while 23.3% received medical treatment, 8.2% underwent surgical intervention, and lifestyle modification was advised for 8.2% (Table 2). During the follow-up period, microscopic hematuria was observed to be transient in 84.9% (n = 62) of patients. In the remaining 15.1% (n = 11), hematuria persisted (Table 3).

Both patients diagnosed with malignancy were over the age of 50 and active smokers. In patients with glomerular causes, proteinuria and the presence of red blood cell casts were notable findings. Among those diagnosed with urolithiasis, the majority (70%) were male patients with a history of smoking. However, despite initial ultrasonographic evaluation, many patients classified as having benign microscopic hematuria did not undergo further advanced diagnostic investigations, such as contrast-enhanced computed tomography or cystoscopic examination.

Table 1. Etiological Classification and Diagnostic Distribution in Cases of Microscopic Hematuria

Diagnosis	Number of Patients (n)	Percentage (%)
Benign	59	80.8
Urolithiasis	10	13.7
Glomerular cause	2	2.7
Malignancy	2	2.7

Table 2. Treatment Approaches in Patients Diagnosed with Microscopic Hematuria

Type of Treatment	Number of Patients (n)	Percentage (%)
Follow-up	44	60.3
Medical treatment	17	23.3
Surgical intervention	6	8.2
Lifestyle modification	6	8.2

Table 3. Hematuria Status During Follow-Up in Patients with Microscopic Hematuria

Follow-Up Status	Number of Patients (n)	Percentage (%)
Transient	62	84.9
Persistent	11	15.1

DISCUSSION

This study aimed to evaluate the diagnostic processes, referral patterns, final diagnoses, and follow-up outcomes of individuals in primary care settings who were incidentally diagnosed with MH during routine urinalysis. The findings provide important insights into how MH is approached in primary healthcare and highlight areas in which adherence to guideline-based evaluation can be strengthened.

In our study, 80.8% of patients diagnosed with MH were ultimately found to have benign causes, consistent with existing literature. According to updated American Urological Association (AUA) guidelines, the incidence of malignancy among patients with MH ranges between 2% and 5%. (15). Our malignancy rate of 2.7% parallels previously reported data from StatPearls and AAFP summaries (16,17).

Both malignancy cases in our cohort were active smokers, and one was over 50 years of age. This pattern aligns with current evidence demonstrating that age, male sex, smoking history, and hematuria persistence substantially increase the likelihood of detecting clinically significant pathology. According to the updated AUA/SUFU guideline, individuals who are older, smoke, or present with persistent MH fall into intermediate- or high-risk groups and therefore warrant a more comprehensive evaluation, including cystoscopy and appropriate upper-tract imaging (16, 17,18,19).

In patients with glomerular hematuria, the presence of proteinuria and red blood cell casts supported a nephrological etiology. These findings reinforce the need to consider glomerular diseases in the differential diagnosis of MH and are consistent with clinical recommendations emphasizing nephrology referral when hematuria coexists with proteinuria (15).

Among patients diagnosed with MH due to urolithiasis, male predominance and smoking history were more common, which is consistent with epidemiologic characteristics of stone disease, although smoking itself is not considered a direct lithogenic factor. Instead, microscopic bleeding in these individuals is likely related to mechanical or inflammatory irritation of the urothelium by calculi rather than systemic risk factors (20).

A notable observation was that 60.3% of patients were managed with follow-up advice alone, and many did not undergo further diagnostic evaluation. Although previous studies have reported low referral rates for patients with microscopic hematuria in primary care settings, all individuals in the present cohort were referred to urology clinics. This finding reflects local referral practices but does not necessarily indicate full adherence to guideline-recommended risk-based diagnostic algorithms, as advanced evaluations were selectively performed (21). This challenge may reflect both limited clinician familiarity with MH algorithms and the absence of standardized workflows in primary care.

Analysis of demographic and clinical risk factors in our cohort revealed trends consistent with the broader literature. Patients with non-benign etiologies—including urolithiasis, glomerular pathology, and malignancy—tended to be older and more frequently smokers compared with those with benign causes. All malignant cases clustered within recognized risk categories, and among seven patients with persistent MH, two were males over 50 years, four were active smokers, and two had biopsy-confirmed glomerulonephritis. Although the small sample size limits formal statistical analysis, these patterns support risk-stratified evaluation approaches recommended in contemporary guidelines.

In primary care settings, the initial evaluation and clinical decision-making regarding MH are performed by physicians, while nurses contribute by ensuring accurate urine collection, detecting documentation gaps, and reinforcing follow-up instructions. Increasing MH awareness among both physicians and nurses, as well as integrating standardized protocols or clinical decision-support tools, may enhance coordination of care, reduce unnecessary testing, and help prevent missed diagnoses (22,23).

From a urological perspective, our findings underscore the importance of strict adherence to contemporary risk-based algorithms. The AUA/SUFU guideline stratifies patients according to age, sex, smoking history, and hematuria

persistence and recommends tailored evaluation combining cystoscopy and upper-tract imaging. Most patients in our cohort with non-benign outcomes would have been categorized as intermediate- or high-risk, suggesting that systematic application of these criteria in primary care could facilitate earlier referral and improve diagnostic timeliness.

Recent large-scale cohort studies and guideline amendments further emphasize the low but non-negligible prevalence of genitourinary malignancy among patients with MH, particularly in older adults and smokers (13,23). These data collectively highlight the value of structured, risk-based MH evaluation pathways.

This study has several limitations. It was conducted at a single center with a relatively small sample size, and some clinical data were incomplete due to the retrospective study design. Additionally, the absence of uniform follow-up and further diagnostic testing in all patients means that a small number of underlying conditions may not have been fully identified.

CONCLUSION

This study demonstrates that although microscopic hematuria detected in routine urinalysis is often benign, it may serve as an indicator of serious underlying conditions in certain cases. In particular, malignancy should be considered in high-risk individuals, such as older adults, smokers, and those with persistent hematuria, and cases should be evaluated within a structured algorithm rather than being dismissed. Accordingly, in-service training programs should be organized to improve the knowledge and awareness of primary healthcare providers—especially nurses and family physicians—regarding MH management. Furthermore, implementation of risk-based assessment protocols, integration of electronic decision support systems, and enhancement of interdisciplinary communication are recommended.

Funding: There was no funding for this study

Conflict of Interest: The authors declare that there is no conflict of interest.

Declaration of competing interest: The authors declare that they have no conflict of interest

Ethical Principles of the Research: Ethical approval for this study was obtained from the Scientific Research and Publication Ethics Committee of Muş Alparslan University on 2025-05-08 (Approval No: 2025-8/193286).

Author Contributions:

Study design: Mehmet Uçar, Halil İbrahim İvelik, Duygu İvelik
Data collection: Mehmet Uçar, Halil İbrahim İvelik
Data analysis: Mehmet Uçar, Halil İbrahim İvelik, Duygu İvelik
Manuscript writing: Mehmet Uçar, Halil İbrahim İvelik, Duygu İvelik

REFERENCES

1. Barocas DA, Boorjian SA, Alvarez RD, Downs TM, Grossfeld GD, et al. Microhematuria: AUA/SUFU guideline. J Urol. 2020;204(4):778–86. https://doi.org/10.1097/JU.0000000000001297
2. Birken SA, Matulewicz R, Pathak R, Wagi CR, Peluso AG, et al. Toward the deimplementation of computed tomography urogram for patients with low- to intermediate-risk microscopic hematuria: a mixed-method study of factors influencing continued use. Urol Pract. 2023;10(5):511–19. https://doi.org/10.1097/UPJ.0000000000000429
3. Elterman D, Li W, Hatiboglu G, Relle J, Zorn KC, et al. Relief of lower urinary tract symptoms after MRI-guided transurethral ultrasound ablation for localized prostate cancer: subgroup analyses in patients with concurrent cancer and benign prostatic hyperplasia. J Endourol. 2021;35(4):497–505. https://doi.org/10.1089/end.2020.0511

4. Hayden JP, Nelson J, Frankenberger E, Vanni AJ. Risk of hematuria-related complications associated with anticoagulant and antiplatelet medications: a single-institution retrospective cohort study. Urology. 2025;197:12–17. https://doi.org/10.1016/j.urology.2024.11.003

5. Heers H, Gut JM, Hofmann R, Flegar L, Derigs M, et al. Pilot study for bladder cancer detection with volatile organic compounds using ion mobility spectrometry: a novel urine-based approach. World J Urol. 2024;42(1):353. https://doi.org/10.1007/s00345-024-05047-5

6. Saha MK, Massicotte-Azarniouch D, Reynolds ML, Tsampalieros AK, Wald R, et al. Glomerular hematuria and the utility of urine microscopy: a review. Am J Kidney Dis. 2022;80(3):383–92. https://doi.org/10.1053/j.ajkd.2022.03.377

7. Lisanti CJ, Graeber A, Syed H, Moeck A, Rittel AG, et al. What is the relative risk of urologic malignancy in microscopic hematuria patients after negative evaluation? A long-term population-based retrospective analysis of 8465 patients. Abdom Radiol (NY). 2023;48(3):1011–19. https://doi.org/10.1007/s00261-022-03793-x

8. Sancı A, Oktar A, Gokce MI, Süer E, Gülpinar O, et al. Comparison of Microscopic Hematuria Guidelines as Applied in 1018 Patients With Microscopic Hematuria. Urology. 2021; 154:28-32. https://doi.org/10.1016/j.urology.2021.04.031

9. Lee CU, Song W, Koo MJ, Boo Y, Chung J-H, et al. Utility of contemporary health screening in the diagnosis of bladder cancer. Diagnostics (Basel). 2022;12(5):1040. https://doi.org/10.3390/diagnostics12051040

10. Batha O, Aldolly A, Alsaffaf Y, Hamsho S, Atia M, et al. Carcinoma in situ within the bladder trigone with an isolated metastasis to the prostate without involvement of prostatic urethra: a unique case report. BMC Urol. 2024;24(1):127. https://doi.org/10.1186/s12894-024-01516-6

11. Rai BP, Dominguez Escrig JL, Vale L, Kuusk T, Capoun O, et al. Systematic review of the incidence of and risk factors for urothelial cancers and renal cell carcinoma among patients with haematuria. Eur Urol. 2022;82(2):182–92. https://doi.org/10.1016/j.eururo.2022.03.027

12. Jarimba R, Quaresma V, Pedroso Lima J, Eliseu M, Tavares da Silva, E, et al. Predicting bladder cancer risk in patients with hematuria: a single-centre retrospective study. Arch Ital Urol Androl. 2023;95(1):11026. https://doi.org/10.4081/aiua.2023.11026

13. Joukar F, Hassanipour S, Atefi A, Shafiee A, Gholipour K, et al. Prevalence and associated factors for asymptomatic microscopic hematuria in adults in the PERSIAN Guilan cohort study (PGCS). Sci Rep. 2024;14(1):3452. https://doi.org/10.1038/s41598-024-52162-6

14. Latta K, Boeckhaus J, Weinreich I, Borisch A, Müller D, et al. Clinical practice guideline: microhematuria in children and young adults. Dtsch Arztebl Int. 2024;121(14):461–466. https://doi.org/10.3238/arztebl.m2024.0147

15. Arafa SH, Alshehri WA, Organji SR, Elbanna K, Obaid NA, et al. Antimicrobial resistance, virulence factor-encoding genes, and biofilm-forming ability of community-associated uropathogenic Escherichia coli in western Saudi Arabia. Pol J Microbiol. 2022;71(3):325–39. https://doi.org/10.33073/pjm-2022-029

16. Parsons JK, Dahm P, Köhler TS, Lerner LB, Wilt TJ. Surgical management of lower urinary tract symptoms attributed to benign prostatic hyperplasia: AUA guideline amendment 2020. J Urol. 2020;204(4):799–804. https://doi.org/10.1097/JU.0000000000001298

17. Lucocq J, Ali A, Harrison W, Khalil T, Powar G, et al. Does non-visible haematuria require urgent assessment? A retrospective cohort study from a university teaching hospital. World J Urol. 2021;39(9):3393–33. https://doi.org/10.1007/s00345-021-03670-0

18. Leslie SW, Hamawy K, Saleem MO. Gross and microscopic hematuria. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2024.

19. Barclay ME, Renzi C, Harrison H, Harrison H, Torralbo A, et al. Cancer incidence and competing mortality risk following 15 presenting symptoms in primary care: a population-based cohort study using electronic healthcare

records. BMJ Oncol. 2024;3(1):e000500. https://doi.org/10.1136/bmjonc-2024-000500

20. Ben Muvhar R, Paluch R, Mekayten M. Recent advances and emerging innovations in transurethral resection of bladder tumor (TURBT) for non-muscle invasive bladder cancer: a comprehensive review of current literature. Res Rep Urol. 2025;17:69–85. https://doi.org/10.2147/RRU.S386026

21. Takeuchi M, McDonald JS, Takahashi N, Kline TL, Vrtiska TJ, et al. Cancer prevalence and risk stratification in adults presenting with hematuria: a population-based cohort study. Mayo Clin Proc Innov Qual Outcomes. 2021;5(2):308–19. https://doi.org/10.1016/j.mayocpiqo.2021.01.002

22. An C, Jeong J, Chiu C, Gaston E, Kennedy A, et al. Risk stratification and diagnostic evaluation of patients found to have microscopic hematuria by their primary care providers. J Gen Fam Med. 2024;26(1):73-78. https://doi.org/10.1002/jgf2.740

23. Gold SA, Kenigsberg AP, Lotan Y. Diagnostic and cost implications of the 2020 AUA microhematuria guidelines: modeling impact in a large public health care system. J Urol. 2022;207(1):52–60. https://doi.org/10.1097/JU.0000000000002175