Original Article
Özgün Araştırma

Endourol Bull. 2025;17(3):111-118. doi: 10.54233/endourolbull-1701002

Factors Affecting Forgotten Ureteral Stents

Unutulmuş Üreteral Stentleri Etkileyen Faktörler

Çağrı Coşkun [1], Uğur Aydın [1], Kayhan Tarım [1], Engin Dereköylü [2]

[1] Department of Urology, Ağrı Training and Research Hospital, Ağrı, Türkiye
[2] Department of Urology, Muğla Sıtkı Koçman University, School of Medicine, Muğla, Türkiye

ABSTRACT

Objective: Ureteral double-J (DJ) stents are frequently used in urology. Overdue or forgotten DJ stents are associated with many complications. This study will examine the factors affecting the stent forgetting period of patients with forgotten DJ stents.

Materials and Methods:
It was reviewed by Ağrı İbrahim Çeçen University Scientific Research Ethics Committee and approved with the decision numbered 108 dated 27.03.2025. Data from 12 patients with DJ stent indwelling longer than 6 months between January 2017 and December 2024 at Ağrı Training and Research Hospital, a rural tertiary center in Türkiye, were examined. Two groups were formed according to the median stent indwelling time: short-term (group 1) and long-term (group 2). The patient's age, gender, DJ stent placement indication, additional endourological procedure need and duration, restenting rates, and distances to the hospital were compared.

Results: There was no difference between the two groups regarding gender, indication for stent placement, additional endourological procedures, and restenting rate after additional endourological procedures. The mean age was 43.5 years (SD: 11) in group 1 and 61.3 years (SD : 9.5) in group 2 (p: 0.012). Median additional endourological procedures' duration was 37.5 minutes (IQR:27.5-40) in group 1 and 67.5 minutes (IQR: 52.5-87.5) in group 2 (p = 0.005). Median distance to the hospital was 38.5 kilometers (IQR: 19.25-77.75) in group 1 and 85.5 kilometers (IQR: 75.75-91.5) in group 2 (p = 0.037).

Conclusion: Our study concluded that patients whose DJ stents were forgotten for longer were older and resided in a center farther from the hospital. It would be beneficial to be careful, especially in this patient group.

Keywords: distance, encrustation, forgotten ureteral stent

Cite As: *Coskun C, Aydin U, Tarim K, Derekoylu E. Factors Affecting Forgotten Ureteral Stents. Endourol Bull. 2025;17(3):111-118.* https://doi.org/10.54233/endourolbull-1701002

Corresponding Author : *Çağrı Coşkun, Ağrı Training and Research Hospital, Ağrı, Türkiye*
e-mail: drcagricoskun@gmail.com
Received : May 17, 2025 ***Accepted*** : July 30, 2025

ÖZET

Amaç: Üreteral double-j (DJ) stentler ürolojide sıklıkla kullanılır. Gecikmiş veya unutulmuş DJ stentler birçok komplikasyonla ilişkilidir. Bu çalışmada unutulmuş DJ stentli hastaların stent unutma süresini etkileyen faktörler incelenecektir.

Gereç ve Yöntemler: Ağrı İbrahim Çeçen Üniversitesi Bilimsel Araştırmalar Etik Kurulunca incelenmiş olup, 27.03.2025 tarih ve 108 sayılı karar ile onaylanmıştır. Türkiye'de perifer bir üçüncü basamak merkez olan Ağrı Eğitim ve Araştırma Hastanesi'nde Ocak 2017 ile Aralık 2024 arasında DJ stent kalma süresi 6 aydan uzun olan 12 hastanın verileri incelendi. Ortanca stent kalma süresine göre iki grup oluşturuldu: kısa süreli (grup 1) ve uzun süreli (grup 2). Hastaların yaşı, cinsiyeti, DJ stent yerleştirme endikasyonu, ek endoürolojik prosedür ihtiyacı ve süresi, tekrar stentleme oranları ve hastaneye olan mesafeleri karşılaştırıldı.

Bulgular: Cinsiyet, stent yerleştirme endikasyonu, ek endoürolojik prosedürler ve ek endoürolojik prosedürlerden sonra tekrar stentleme oranları açısından iki grup arasında fark yoktu. Grup 1'de ortalama yaş 43,5 yıl (SD: 11) ve grup 2'de 61,3 yıl (SD: 9,5) idi (p: 0,012). Ortanca ek endoürolojik prosedür süresi grup 1'de 37,5 dakika (IQR: 27,5-40) ve grup 2'de 67,5 dakika (IQR: 52,5-87,5) idi (p = 0,005). Hastaneye olan ortanca uzaklık grup 1'de 38,5 kilometre (IQR: 19,25-77,75) ve grup 2'de 85,5 kilometre (IQR: 75,75-91,5) idi (p = 0,037).

Sonuçlar: Çalışmamızda DJ stentleri daha uzun süre unutulan hastaların daha yaşlı olduğu ve hastaneye daha uzak bir merkezde ikamet ettiği sonucuna varılmıştır. Özellikle bu hasta grubunda dikkatli olmak faydalı olacaktır.

Anahtar Kelimeler: enkrustasyon, unutulmuş üreteral stent, uzaklık

INTRODUCTION

Ureteric double-J (DJ) stents are commonly used to manage obstructions resulting from urolithiasis, ureteral strictures, ureteropelvic junction (UPJ) obstruction, intraluminal ureteral lesions, and external compression. They are also indicated in cases of urine extravasation due to ureteral injury or to maintain ureteral patency following ureteral reconstructive procedures (1). Since their introduction in 1978, many improvements have been made in the design and biomaterials used (2). Nevertheless, ureteral stents remain associated with many morbidities. The most common complications include pain, urinary tract infection, hematuria, migration, encrustation, and fragmentation (3-6). In addition, prolonged stent indwelling may lead to more serious complications, increasing both morbidity and mortality risk (7). Delayed or forgotten stent removal carries a significant risk of obstruction and infection, particularly due to stent encrustation or fracture (4). The literature has emphasized that forgotten DJ stents not only pose serious health risks to patients but also carry medicolegal implications for physicians (8). Considering all these risks, it is seen that forgotten stents remain a significant clinical problem.

This study retrospectively evaluates the data of patients with forgotten DJ stents, aiming to identify the factors that influence the duration of stent retention.

MATERIALS AND METHODS

A retrospective review was conducted on data from patients who underwent DJ stent placement at Ağrı Training and Research Hospital, a tertiary care center in a peripheral region of Türkiye, between January 2021 and December 2024. The stent removal times of all patients were reviewed. Based on the manufacturer's recommendations, a maximum stent indwelling time of 6 months was determined, and this threshold was used as the inclusion criterion. Seventeen patients with indwelling stents exceeding 6 months were identified. Patients with missing surgical records, incomplete address information, or those who had undergone additional surgeries were excluded. Consequently, complete data were obtained for 12 patients. All patients' age, gender, indication for DJ stent placement, duration of stent retention, presence of encrustation, whether an additional endourological procedure was required, the type and duration of the auxiliary procedure, need for re-stenting afterward, and the distance between the patients' district of residence and Ağrı Training and Research Hospital were recorded. The residential distance was calculated using Google Maps (https://www.google.com/maps), based on the address registered in the hospital system. All data were analyzed to investigate the factors associated with prolonged DJ stent retention time.

Statistical Analysis

SPSS version 28.0.0.0 (IBM, Chicago) was used in statistical analysis. Two groups were created according to the median stent length of stay. Group 1 was designed for those who stayed for less than 290 days, and Group 2 for those who stayed for more than 290 days. Binomial variables between these two groups were compared with the chi-square test, and continuous variables were compared with the independent student t-test. Pearson correlation test was used to determine the correlation between distance and DJ stent length of stay. $p<0.05$ was considered statistically significant.

RESULTS

The median age of the patients was 54.5 years (40.8-61.8). The number of female patients was 7 (58.3%), while the number of male patients was 5 (41.7%). DJ stents were placed in 7 patients (58.3%) due to urolithiasis, one patient (8.3%) due to hydronephrosis during pregnancy, one patient (8.3%) due to external ureteral compression due to malignancy, and three patients (25%) due to iatrogenic injury during non-urological surgeries. There were 10 patients (83.3%) who required an additional urologic procedure during stent removal, while two patients (16.7%) did not require an additional urologic procedure. All 10 patients who needed an additional procedure underwent ureterorenoscopy and laser lithotripsy. The patients' median additional endourological procedure duration was 55 (37.5-80) minutes. Re-stenting was performed in 7 patients (58.3%) after the additional endourological procedure. The median distance of the patients to the hospital where the procedure was performed was 74.5 (35.3-87.5) kilometers. The median duration of stent indwelling in the patients was 290.5 (196.8-515.5) days (Table 1).

We divided the patients into two groups according to the median DJ stent indwelling time. While the stents of the patients in group 1 were forgotten for a relatively shorter time (<290.5 days), the stents of the patients in group 2 were forgotten for a longer time (>290.5 days). The mean age of the patients in group 1 was 43.5 (SD:11), while the mean age of the patients in group 2 was 61.3 (SD:9.5) ($p = 0.012$). The median additional endourological procedures duration was 37.5 (27.5 - 40) minutes in group 1 and 67.5 (52.5-87.5) in group 2 ($p = 0.005$). Median distance to the hospital was 38.5 (19.25-77.75) km in group 1 and 85.5 (75.75-91.5) km in group 2 ($p = 0.037$)(Table 2). There was no statistically significant difference between the two groups regarding gender distribution, indication for stent placement, need for additional endourological intervention, and re-stenting rate after the additional endourological procedure (Table 2). There was a positive correlation between the distance to the hospital and the DJ stent's forgotten time ($p = 0.04$) (Figure 1).

Table 1. Patient characteristics, demographic data, and operative data

Parameters (n=12)	
Age, year, median (IQR)	54.5 (40.8-61.8)
Gender, n (%)	
Female, n (%)	7 (58.3)
Male, n (%)	5 (41.7)
Indication for stent placement, n (%)	
Urolithiasis, n (%)	7 (58.3)
Hydronephrosis in pregnancy, n (%)	1 (8.3)
External compression (Malignancy), n (%)	1 (8.3)
Iatrogenic injury (during non-urologic surgery), n (%)	3 (25)
Additional endourological procedures, n (%)	
Yes	10 (83.3)
No	2 (16.7)
Additional endourological procedures duration (min), median (IQR)	55 (37.5-80)
Restenting rate after additional endourological procedure, n (%)	7 (58.3)
Distance to hospital (km), median (IQR)	74.5 (35.3-87.5)
Duration of stent indwelling (day), median (IQR)	290.5 (196.8-515.5)

Table 2. Comparison of two groups with short and long stent stays

Parameters	Group 1 (n=6) Stent duration is shorter	Group 2 (n=6) Stent duration is longer	p value
Age, year, mean (SD)	43.5 (11)	61.3 (9.5)	**0.012***
Gender, n (%)			
Female, n (%)	3 (50)	4 (66.7)	1
Male, n (%)	3 (50)	2 (33.3)	
Indication for stent placement, n (%)			
Urolithiasis, n (%)	5 (83.3)	2 (33.3)	0.242
Others, n (%)	1 (16.7)	4 (66.7)	
Additional endourological procedures, n (%)			
Yes	4 (66.7)	6 (100)	0.455
No	2 (33.3)	0 (0)	
Additional endourological procedures duration (min), median (IQR)	37.5 (27.5-40)	67.5 (52.5-87.5)	**0.005***
Restenting rate after additional endourological procedure, n (%)	3 (33.3)	6 (66.7)	0.181
Distance to hospital (km), median (IQR)	38.5 (19.25-77.75)	85.5 (75.75-91.5)	**0.037***

*clinically significant

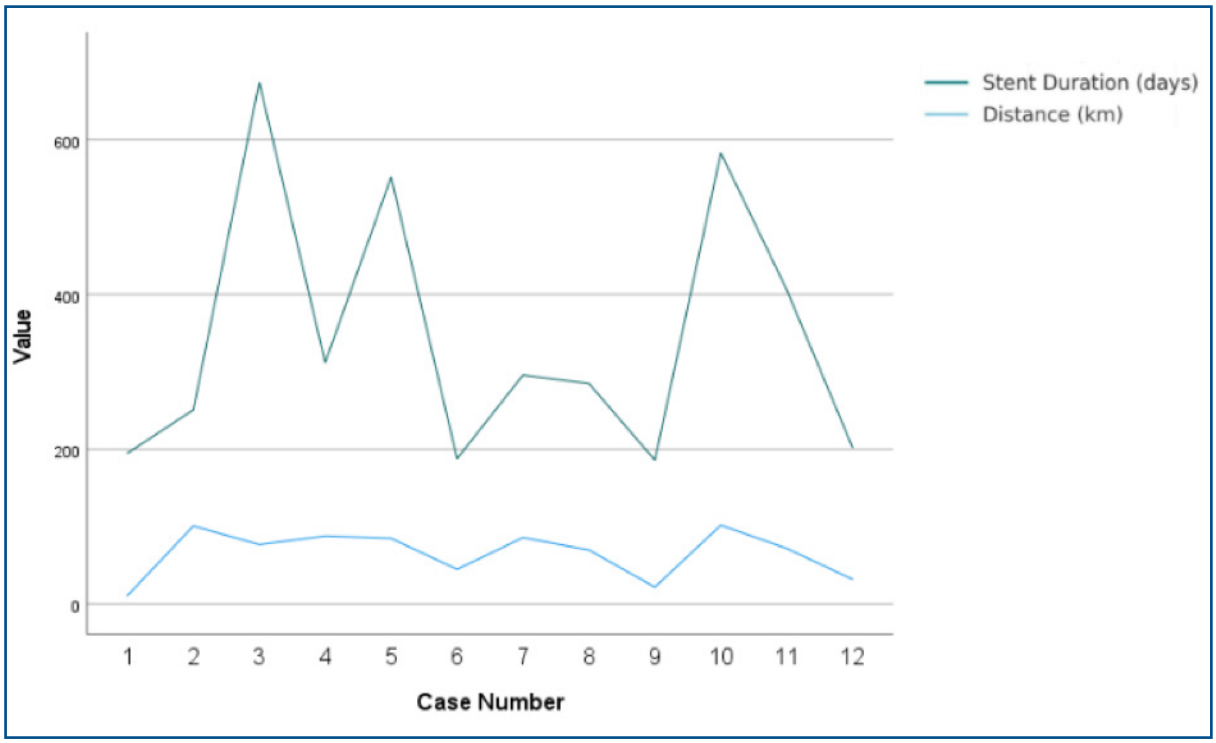

Figure 1. Correlation between distance to hospital and stent length of stay

DISCUSSION

Our study examined patients whose DJ stents were forgotten or removal was delayed. This study aimed to present the general data of these patients. In addition, when the DJ stent was forgotten, it was observed that it was forgotten longer in older patients and patients who lived farther from the hospital. In addition, it was concluded that the longer the DJ stent was forgotten, the higher the need for additional endourological interventions.

Keeping DJ stents for a long time for treatment purposes or forgetting to remove them accounts for 12% of all stents (9). Forgotten DJ stents lead to complications such as infection, fragmentation, or encrustation. In one study, the encrustation rate of stents removed before 6 weeks was 9.2%; however, when this period exceeded 12 weeks, this rate increased to 76.3% (10). In another study, encrustation rates increased from 42.8% in the fourth month to 75.5% in the sixth month (11). Considering that DJ stents have been reported to have a broad spectrum of complications ranging from renal failure to death and that the surgeon can be held medicolegally responsible, forgetting DJ stents is still a significant problem in urology practice (9,12).

In older studies on ureteral stents that have been forgotten in the literature, patients generally required between 1.94 and 4.2 attempts to be free of stones and stents. (1,11,13). In our study, ureterorenoscopy and laser lithotripsy were performed on 10 patients who required additional interventions. Seven of these patients required re-stenting. As a result, three patients were rendered stone- and stent-free in one session, and seven in two. The reduced need for percutaneous nephrolithotomy, extracorporeal shock wave lithotripsy, or open surgery in these patients can be attributed to increased surgeon experience, augmented auxiliary equipment, and recent technological advancements in urological instrumentation, particularly in laser and scope technologies.

In our study, the additional endourological intervention time was higher in the DJ stent group and was forgotten for a longer time. We believe this is due to increased calcification and encrustation, especially in DJ stents, and waiting longer. In a study conducted by El-Faqih et al., the encrustation time of stents was examined, and it was reported that this rate was 9.2% in DJ stents that were waited for less than 6 weeks, 47.5% in those that were waited between 6 and 12 weeks, and 76.3% in those that were waited for more than 12 weeks (10). Kawahara et al. reported these rates as 26.8%, 56.9%, and 75.9% in the same time intervals (14). Considering this situation, it is expected that calcification and encrustation will be higher in the patient group with a longer DJ stent waiting time in our study and, therefore, require a more extended intervention.

Our study found no difference between the two groups regarding the indication for DJ stent placement. However, it is noticeable that there were more patients with non-urolithiasis in the group where DJ stents were forgotten for longer. Despite this, the lack of a statistically significant difference between the groups is due to the small number of our patients. The reason for the difference in surgical indications is that urologists do not perform the primary follow-up of patients with non-urological intraoperative iatrogenic injuries and external ureteral compression due to malignancy. The fact that physicians other than urologists are not familiar with DJ stent management may have led to DJ stents being forgotten for a longer time in this patient group.

One of the interesting results of our study is that the patient group who were forgotten for a longer time was farther from the hospital. To the best of our knowledge, no previous study in the literature has specifically investigated the relationship between forgotten DJ stents and factors such as distance to the hospital and the means of transportation used. Our study was conducted in a tertiary hospital in a peripheral region in Turkey. Distance to the hospital and transportation problems may affect hospital admission. Therefore, patients who live in settlements farther from the hospital may be at a higher risk of forgetting a DJ stent. Being more careful about these patients may be beneficial in preventing DJ stent forgetfulness. In addition, we concluded in our study that patients who were forgotten for a longer time had a higher average age. A higher average age may be associated with more comorbidities, mobility problems, and cognitive problems.

Various methods have been tried for years to prevent DJ stents from being forgotten. For this purpose, paper card

records (15), electronic stent records (16), short message reminder systems (17), web-based e-mail reminder systems (18), and reminder systems with smartphone applications (19) are the most important ones. In a study that aimed to reduce DJ stent forgetfulness through a computer-based database, the rate of forgotten DJ stents decreased from 12.5% to 1.2% (8). In another study that tried to prevent DJ stent forgetfulness through a database reviewed monthly by the staff, the rate of forgotten DJ stents decreased from 3.6% to 1.1% (20). Although many methods have been tried for years to prevent DJ stents from being forgotten, it cannot be said that it is still wholly preventable. Therefore, we think the risk factors for DJ stent forgetfulness should be well investigated. We believe that DJ stent forgetfulness can be prevented to the maximum extent if patients with risk factors are treated more carefully.

In our study, we aimed to present the data of patients with forgotten DJ stents and to define the conditions that may be risk factors for forgotten DJ stents. In a previous study, male gender and being uninsured were identified as risk factors for forgotten DJ stents (9). Our study observed that the patient group with forgotten DJ stents for a longer period was older and lived in a center farther from the hospital. Although we cannot directly define them as a risk factor for forgotten DJ stents, we think that these two parameters may prolong the duration of forgotten DJ stents. Therefore, we believe being more careful in these two patient groups would be beneficial. Although we did not obtain a significant difference in our study, caution should also be exercised in patients with DJ stents who are followed up by physicians other than urologists. Considering that these physicians are unfamiliar with DJ stent management, we believe the risk of forgotten stents may increase.

In the literature, physicians have been given a serious medicolegal responsibility for forgetting DJ stents (8). However, leaving this to the surgeon alone will not prevent DJ stents from being forgotten. Patients should also share this responsibility. One study stated that 80% of patients were not satisfied with the information given about DJ stents (21). It would be wise to inform patients better and involve them in the process. Patients should be encouraged to participate actively in stent follow-up with methods such as cards (22), as in other specialties. We believe the rate of forgotten DJ stents will be minimized this way.

Our study had some significant limitations. Our limitations are the retrospective nature of our study, the small sample size, and the single-center nature. Additionally, the small number of patients may have made statistical analysis difficult and reduced its significance. Moreover, some of our patients were under primary follow-up by non-urology departments. This may pose a problem in terms of sample homogeneity. Therefore, larger, multicenter prospective studies are needed to confirm these associations and develop evidence-based interventions to improve stent management and patient safety.

CONCLUSION

The retention of forgotten DJ stents remains a serious clinical issue, associated with increased risks of encrustation, infection, additional surgical interventions, and even life-threatening complications. Our study observed that older age and longer distances between the patient's residence and the treating hospital were significantly associated with prolonged stent indwelling times. Given the preventable nature of such adverse outcomes, our results emphasize the importance of implementing structured follow-up protocols and patient education strategies, especially in high-risk groups. We believe that it would be beneficial to provide better information about forgetting a ureteral stent, especially for patients in peripheral and rural areas, those living in places where it is difficult to reach the hospital, those living far from the hospital, and those of advanced age who may have difficulty with transportation. Nevertheless, multicentric prospective randomized controlled studies with larger sample sizes and more effective preventive strategies are needed to support these results.

Data Availability Statement: Data available on request.

Funding: The authors have no relevant financial or non-financial interests to disclose.

Conflict of Interest: There is no conflict of interest in this study.

Ethics Committee Approval: This study was approved by the Ethics Committee of Ağrı İbrahim Çeçen University, on 2025/03/27 with approval number 108.

REFERENCES

1. Borboroglu PG, Kane CJ. Current management of severely encrusted ureteral stents with a large associated stone burden. *J Urol*. 2000;164(3 Pt 1):648-50. https://doi.org/10.1016/S0022-5347(05)67257-5
2. Finney RP. Experience with new double J ureteral catheter stent. *J Urol*. 1978;120(6):678-81. https://doi.org/10.1016/S0022-5347(17)57673-7
3. Joshi H, Stainthorpe A, MacDonagh R, Keeley F, Timoney A. Indwelling ureteral stents: evaluation of symptoms, quality of life and utility. *J Urol*. 2003;169(3):1065-9. https://doi.org/10.1097/01.ju.0000048980.33849.6d
4. Monga M, Klein E, Castaneda-Zuniga WR, Thomas R. The forgotten indwelling ureteral stent: a urological dilemma. *J Urol*. 1995;153(6):1817-9. https://doi.org/10.1016/S0022-5347(01)67451-5
5. Slaton JW, Kropp KA. Proximal ureteral stent migration: an avoidable complication? *J Urol*. 1996;155(1):58-61. https://doi.org/10.1016/S0022-5347(01)66565-4
6. Persky L, Lockhart JJ, Karp R, Helal M, Hakki S. The overlooked, retained Double J stent. *Urology*. 1990;36(6):519-21. https://doi.org/10.1016/0090-4295(90)80079-M
7. Richter S, Ringel A, Shalev M, Nissenkorn I. The indwelling ureteric stent: a 'friendly' procedure with unfriendly high morbidity. *BJU Int*. 2000;85(4):408-11. https://doi.org/10.1046/j.1464-410x.2000.00460.x
8. Biyabani FR. Physician responsibility for removal of implants: the case for a computerized program for tracking overdue double-J stents. *Tech Urol*. 2000;6(3):189-92. [DOI not available]
9. Divakaruni N, Palmer CJ, Tek P, Bjurlin MA, Gage MK, Robinson J, et al. Forgotten ureteral stents: who's at risk? *J Endourol*. 2013;27(8):1051-4. https://doi.org/10.1089/end.2012.0604
10. El-Faqih S, Shamsuddin A, Chakrabarti A, Atassi R, Kardar A, Osman M, et al. Polyurethane internal ureteral stents in treatment of stone patients: morbidity related to indwelling times. *J Urol*. 1991;146(6):1487-91. https://doi.org/10.1016/S0022-5347(17)38298-7
11. Bultitude MF, Tiptaft RC, Glass JM, Dasgupta P. Management of encrusted ureteral stents impacted in upper tract. *Urology*. 2003;62(4):622-6. https://doi.org/10.1016/S0090-4295(03)00574-6
12. Singh V, Srinivastava A, Kapoor R, Kumar A. Can the complicated forgotten indwelling ureteric stents be lethal? *Int Urol Nephrol*. 2005;37:541-6. https://doi.org/10.1007/s11255-004-7505-5
13. Mohan-Pillai K, Keeley FX Jr, Moussa SA, Smith G, Tolley DA. Endourological management of severely encrusted ureteral stents. *J Endourol*. 1999;13(5):377-9. https://doi.org/10.1089/end.1999.13.377
14. Kawahara T, Ito H, Terao H, Yoshida M, Matsuzaki J. Ureteral stent encrustation, incrustation, and coloring: morbidity related to indwelling times. *J Endourol*. 2012;26(2):178-82. https://doi.org/10.1089/end.2011.0430
15. Tang VC, Gillooly J, Lee EW, Charig CR. Ureteric stent card register–a 5-year retrospective analysis. *Ann R Coll Surg Engl*. 2008;90(2):156-9. https://doi.org/10.1308/003588408X242058
16. Lynch MF, Ghani KR, Frost I, Anson KM. Preventing the forgotten ureteric stent: results from the implementation of an electronic stent register. *BJU Int*. 2007;99(2):245-6. https://doi.org/10.1111/j.1464-410X.2006.06641.x
17. Sancaktutar AA, Tepeler A, Söylemez H, Penbegül N, Atar M, Bozkurt Y, et al. A solution for medical and legal problems arising from forgotten ureteral stents: initial results from a reminder short message service (SMS). *Urol Res*. 2012;40(3):253-8. https://doi.org/10.1007/s00240-011-0413-9
18. Lynch MF, Ghani KR, Frost I, Anson KM. Preventing the forgotten ureteral stent: implementation of a web-

based stent registry with automatic recall application. *Urology*. 2007;70(3):423-6. https://doi.org/10.1016/j.urology.2007.04.019

19. Molina WR, Pessoa R, Donalisio da Silva R, Kenny MC, Gustafson D, Nogueira L, et al. A new patient safety smartphone application for prevention of "forgotten" ureteral stents: results from a clinical pilot study in 194 patients. *Patient Saf Surg*. 2017;11:1. https://doi.org/10.1186/s13037-017-0140-1
20. McCahy P, Ramsden P. A computerized ureteric stent retrieval system. *Br J Urol*. 1996;77(1):147-8. https://doi.org/10.1046/j.1464-410X.1996.84913.x
21. Joshi H, Newns N, Stainthorpe A, MacDonagh R, Keeley Jr F, Timoney A. The development and validation of a patient-information booklet on ureteric stents. *BJU Int*. 2001;88(4):329-34. https://doi.org/10.1046/j.1464-410X.2001.02346.x
22. Eke T, Rom E, Castillo A. Patients with implants should be given implant cards: intraocular lens implant cards contain inadequate clinical data. *BMJ*. 1998;316(7139):1245. https://doi.org/10.1136/bmj.316.7139.1245