Management of infected indwelling ureteral stents

An international survey of urologists

Ioana Fugaru[1], Naeem Bhojani[2], Sero Andonian[1,3], Wael Sameh[4], Nader Fahmy[1]

[1]Division of Urology, McGill University, Montreal, QC, Canada; [2]Department of Urology, Université de Montréal, Montreal, QC, Canada; [3]Institute of Health Sciences Education, McGill University, Montreal, QC, Canada; [4]Department of Urology, Alexandria University, Faculty of Medicine, Alexandria Governorate, Egypt

Cite as: Fugaru I, Bhojani N, Andonian S, et al. Management of infected indwelling ureteral stents: An international survey of urologists. *Can Urol Assoc J* 2023;17(3):E95-9. http://dx.doi.org/10.5489/cuaj.7994

Published online October 25, 2022

ABSTRACT

INTRODUCTION: There are no clinical guidelines for the manipulation of chronic indwelling ureteral stents. The goal of this study was to survey, through a simulated case, how urologists initially manage a patient with a chronic ureteral stent presenting with urosepsis.

METHODS: An online questionnaire was shared from July 1 to August 31, 2021, through social media (Twitter) and email lists. The scenario described a 50-year-old female, known for a chronic indwelling ureteral stent, presenting to the emergency department with fever, tachycardia, and flank pain. In the scenario, the stent was in adequate position and the last exchange had been performed one month prior. Respondents could choose between treating with antibiotics and keeping the same exchange schedule, urgent stent exchange, or an alternative management that they defined. P<0.05 was considered significant.

RESULTS: A total of 396 participants completed the survey. Responses from 48 countries were collected, with 135 (34.1%) respondents from Canada. Half (50%) of respondents had more than 10 years of experience. Most (79.3%) respondents opted for initial empiric antibiotic therapy, while 16.2% opted for urgent stent exchange. A total of 19 (4.9%) medical specialists completed the survey. Non-urologists opted more frequently than urologists (42.1% vs. 16.2%) for urgent stent exchange (p=0.0111).

CONCLUSIONS: This questionnaire allowed us to explore the various managements proposed by urologists in a patient with urosepsis and chronic indwelling ureteral stent. Most urologists opted for initial medical management. Further clinical studies could help determine the necessity for ureteral stent manipulation in urosepsis, and, if present, its ideal timing.

INTRODUCTION

It has been established that 60–80% indwelling ureteral stents form a biofilm, yet only 5% will result in a urinary tract infection (UTI).[1-3] There is debate among specialists whether indwelling ureteral stents should be treated in the same fashion as central lines, which are frequently exchanged in patients with bacteremia/sepsis.[4,5]

We surveyed international urologists on their management strategy for patients with well-positioned, non-obstructed, chronic indwelling ureteral stents presenting with urosepsis. The clinical scenario submitted to specialists was designed by the authors based on the frequent clinical dilemma encountered at our center and interdisciplinary discussions with other medical specialists, such as emergency physicians and internists.

METHODS

An online questionnaire was shared using social media (Twitter) and urological email lists (e.g., alumni lists, conference email lists, Quebec Urological Association members, etc.). Responses were collected between July 1 and August 31, 2021, on a Google form electronic platform (link to survey: https://forms.gle/b9qwT9D8i4KWhwSN9). The survey was bilingual (French/English) and contained four questions. The first three questions required the participants to provide their country of practice, their current type of practice, and level of experience.

The fourth question comprised the main clinical question of this

KEY MESSAGES

- In comparing differences in a simulated scenario of a patient with well-positioned, chronic indwelling ureteral stent presenting with urosepsis, 80.6% of urologists would opt for initial antibiotic therapy and 16.2% for urgent stent exchange.
- In the same scenario, 57.9% of medical specialists would opt for initial antibiotic therapy and 42.1% for urgent stent exchange.
- Prospective research should help orient the necessity of exchanging urgently indwelling ureteral stents in the setting of acute urosepsis.

study: "A 50-year-old female with a right chronic indwelling ureteral stent, presents febrile to the emergency department with right flank pain and tachycardia. A computed tomography (CT) scan done in the ED demonstrates the stent is in good position and that there is no right hydronephrosis. Urine analysis is positive for bacteria (no fungus). The last stent exchange was one month ago. The urology service is consulted to obtain an opinion on the next step in managing this patient. What is your preferred management?

Response options were as follows:

1. Urgent stent exchange and antibiotics
2. Antibiotics and stent exchange as per the initial schedule
3. Other (please define)

Participation was voluntary and anonymous. No financial compensation was offered to respondents. The Chi-squared and Fisher test were used for categorical data analysis. Statistical analysis was performed using Prism 8.0 software. P-value was considered significant if <0.05.

RESULTS

A total of 396 respondents completed the online survey between July 2021 and August 2021. A total of 135 (34.1%) responses were obtained from Canadian participants. Responses from 48 different countries were collected (Table 1). A significant proportion of respondents practiced in Egypt (24.1%) and the U.S. (11.4%).

Table 2 presents the various areas of practice of respondents. A total of 377 (95.2%) urologists/urology trainees and 19 (4.9%) medical specialists (internal medicine, family medicine, nephrology, cardiology,

Table 1. Respondent geographic distribution

Country of practice	n=396
North America	
Canada	135 (34.1%)
United States of America	45 (11.4%)
Others[a]	6 (1.5%)
Central America	
Costa Rica	1 (0.25%)
South America[b]	4 (1.0%)
Europe	
United Kingdom	12 (3.0%)
Israel	11 (2.8%)
Others[c]	28 (7.1%)
Africa	
Egypt	85 (21.5%)
Others[d]	3 (0.75%)
Asia	
India	7 (1.8%)
Japan	8 (2.0%)
Turkey	7 (1.8%)
Kuwait	5 (1.3%)
Saudi Arabia	5 (1.3%)
Others[e]	24 (6.1%)
Oceania[f]	10 (2.5%)

[a]Mexico, Dominican Republic, and Jamaica. [b]Argentina, Colombia, Peru, and Chile. [c]Belgium, Spain, Italy, Switzerland, Bulgaria, Netherlands, Germany, Greece, Portugal, France, Poland, Sweden, and Norway. [d]Lebanon, Kenya, and West Africa. [e]Russia, Singapore, Iran, Bahrain, Jordan, Lebanon, United Arab Emirates, Sri Lanka, Iraq, Indonesia, Thailand, Qatar, Hong Kong, and South Korea. [f]Australia and New Zealand.

Table 2. Self-reported specialty of respondents

Specialty	Number of respondents (%)
Urology	
Endourology	106 (26.8%)
Community/general urology	87 (22.0%)
Resident	69 (17.4%)
Oncology	48 (12.1%)
Fellow	23 (5.8%)
Functional	16 (4.0%)
Reconstructive	9 (2.3%)
Infertility	8 (2.0%)
Pediatrics	7 (1.8%)
Transplant	3 (0.75%)
Retired	1 (0.25%)
Total urology respondents	377 (95.2%)
Other medical specialties	
General internal medicine	4 (1.0%)
Family medicine	1 (0.25%)
Cardiology	2 (0.5%)
Nephrology	9 (2.3%)
Infectious diseases	2 (0.5%)
Paediatrics	1 (0.25%)
Total other medical respondents	19 (4.8%)

infectious diseases, and pediatrics) completed the online survey. Urology residents and fellows represented about one-quarter of all respondents (23.2%). Regarding years of clinical experience, 32.8% of respondents had an average of 0–5 years,17.2% had 5–10 years, 23.5% had 10–20 years, and 26.5% had >20 years of clinical experience. One retired urologist completed the survey.

The preferred management of an infected indwelling ureteral stent clinical scenario by the various participants is presented in Table 3. Medical management, defined as antibiotics and keeping the same stent exchange schedule, was the most favored management of all respondents (79.3%). Urgent stent exchange and then antibiotic therapy was selected by 17.4% of respondents (n=69). A total of 51 respondents (12.9%) submitted a custom management in the comments section; however, when analyzed, 38 (9.6%) of these answers corresponded to the conservative management option. Indeed, these participants were opting for the conservative management and were adding that they perform stent exchange if the patient deteriorates after initial observation or after a 'cool-off' period. A minority of participants (1.3%) opted for an alternative derivation with nephrostomy. A total of eight responses (2.0%) were deemed non-applicable to the clinical scenario proposed in this study.

No significant differences were found between the management choices of the various urology respondent groups, as presented in Table 4. There was no significant difference when comparing the responses of endourologists (n=106) to other urology specialists (including trainees, n=271) (p=0.0864). A similar proportion of endourologists and general urologists, namely 84.0% and 80.5%, respectively, opted for antibiotics and keeping the same stent exchange schedule. When comparing the group of participants who opted for urgent stent exchange to other participants, there was no difference when comparing country of practice (Table 5). There were less young urologists, with 5–10 years of experience, who opted for urgent stent exchange (5.8% vs. 19.9% in other participants) (p=0.0046) (Table 5).

A total of 19 non-urology medical specialists (internal medicine, infectious disease, cardiology, pediatrics, family medicine) completed the survey. When comparing their preferred management to that of all urology respondents, 42.1% of non-urology specialists vs. 16.2% of urology specialists (p=0.0111) opted for urgent stent exchange (Table 4).

Table 3. Management choice of respondents

Management choice	Number of respondents (%)
Antibiotics and same stent exchange schedule	314 (79.3%)
Urgent stent exchange and antibiotics	69 (17.4%)
Other answers Insert nephrostomy initially ± DJ removal Non-applicable answers	13 (3.3%) 5 (1.3%) 8 (2.0%)

DISCUSSION

There are many patients who live with a chronic indwelling ureteral stent. Frequent ureteral stent complications include lower urinary tract symptoms, stent migration, encrustation, ureteric injury, forgotten stent, UTI, and sepsis. Important characteristics of the ideal ureteral stent include ease of insertion and exchange, resistance to migration, tolerability, patency, resistance to encrustation, ability to remain non-refluxing, radiopacity, biocompatibility, and biodurability, as well as affordability and reduced rate of infection.[2]

A frequently expressed concern with the insertion of ureteral stents is the formation of biofilm on these foreign bodies, with the associated potential

Table 4. Management choice of respondents by specialty

Management	Endourologists	Community urologists	Urology trainees	Other urology specialists	Non-urology specialists
Antibiotics and same stent exchange schedule	89 (84.0%)	70 (80.5%)	69 (75.0%)	76 (82.6%)	10 (52.6%)
Urgent stent exchange and antibiotics	17 (16.0%)	13 (15.0%)	19 (20.7%)	12 (13.0%)	8 (42.1%)
Other answers	0	4 (4.5%)	4 (4.3%)	4 (4.3%)	1 (5.3%)
Total	106	87	92	92	19
Comparison of management by specialty					p
Endourologists vs. other urology participants					0.0864
Urology trainee vs. other urology participants					0.2862
Urology participants vs non-urology participants					0.0111

Table 5. Features of specialists who opted for urgent stent exchange

	Participants who exchange stent n=69	Other participants n=327	p
Country of origin			
Canada	21 (30.4%)	114 (34.9%)	0.4633
Egypt	16 (23.3%)	69 (21.1%)	0.7471
Years of experience			
0–5 years	25 (36.2%)	105 (32.1%)	0.5728
5–10 years	4 (5.8%)	65 (19.9%)	0.0046
10–20 years	17 (24.6%)	76 (23.2%)	0.8759
>20 years	23 (33.3%)	81 (24.7%)	0.1748

for developing infection and sepsis as a consequence; however, multiple studies have not been able to show a correlation between the presence of biofilm on indwelling ureteral stents and the development of UTI.[6] In a study of 102 stented patients, biofilm was found in about 30% of patients but only 13.3% had bacteria (and not necessarily symptomatic UTI) identified on urine culture at the time of stent removal.[7] However, other studies have identified a biofilm formation rate of 58.5–82.9%, with a lower rate of biofilm in stents kept <1 month and a higher one in stents left indwelling >3 months.[1,3] Moreover, the presence of bacterial biofilm has not been associated with the presence of stent symptoms, and long-term stenting is still a viable treatment option for some patients that require urinary derivation.[8] In a retrospective cohort of 529 patients who underwent stent insertion for a variety of indications over a period of 12 months, sepsis occurred in 4.3% of patients.[2] Interestingly, sepsis was documented in this cohort only in patients who underwent ureteral stent insertion for obstructive calculi.[2]

At our institution, we have frequently encountered debate among specialists and urologists as to the ideal stent management for a patient presenting with infection and known for a chronic, well-positioned, non-obstructed indwelling ureteral stent. While there are clear guidelines for the management of catheter-associated infections in patients with central access, there is no equivalent for ureteral stents.[4] It is important to note that while central venous access is directly in contact with the bloodstream, the indwelling ureteral stent should, provided there is no infection or obstruction, be within an impermeable system (the urothelium). Indwelling ureteral stents cannot mimic entirely the ureter's natural properties, and one feature that could impact the development of urosepsis in stented patients is the lack of an anti-refluxing mechanism in these stents. Considering this, exchanging the ureteric stent cannot control the infection. Arguments for urgently exchanging the stent include the fact that presence of a biofilm cannot allow for complete bacterial eradication and that stent malfunction cannot always be detected with conventional imaging. For suspected stent malfunction, there may be a role for diuretic renogram assessment, for instance. Another important element that should be considered is if the initial indication for the ureteral stent is still valid.

A concern that may arise with urgent exchange in the context of urosepsis in a patient with a ureteral stent is the potential for clinical deterioration, secondary to instrumentation of an infected urinary tract. For example, it is well known that endourologists defer management of stones presenting with urosepsis due to concern for dissemination of the infection in the bloodstream.[9] Currently, there is no literature guiding or exploring the factors that can guide decision-making in these circumstances.

Our survey identified that the initial preferred management of urologists in a clinical simulated case of a patient presenting with urinary infection and well-positioned indwelling ureteral stent is a conservative approach (80.6%). Up to 12.9% of respondents commented that they would prefer to treat the patient with antibiotics initially as a means of 'cooling off' the infection, and then to proceed with stent exchange (unless the patient deteriorates clinically); however, since our survey was aimed at determining the initial approach of specialists, these responses were compiled with the conservative approach. Two urologists commented that their decision of proceeding with a semi-urgent stent exchange (after initiating antibiotics) would be influenced by the culture results, and that they would proceed with stent exchange in the case of *Staphylococcus aureus* or *Candida*.

Interestingly, this study was not initially aimed at medical specialists, yet 19 responses from medical specialists were received. As this survey was circulated on Twitter and through emails, it reached medical specialists that may have frequent interactions with the practice of urologists. A total of 42.1% medical specialists chose urgent stent exchange, compared to 16.2% urology specialists and trainees (p=0.0111), who may feel more at ease observing a stented patient before deciding to proceed with an exchange, depending on the clinical evolution. We suspect that this difference in preference may be because medical specialists are familiar with management of catheter-associated infections, which mandates urgent catheter exchange in severe infections.[3,4]

Limitations

Our study has known methodological limitations. Due to the use of Twitter to distribute the survey, we cannot calculate a response rate of urologists. More importantly, a main limitation is that it presented a simulated scenario and as such, a limited amount of clinical information was presented to participants; however, we aimed to produce the simplest scenario possible so as to determine the first-line management offered by specialists. The timing of indwelling ureteral stent exchanges is often decided by urologists on a case-by-case basis. Some patients have exchanges every two months, while others, yearly, in the absence of clear guidelines.

To this day, there is no consensus or evidence to guide management of ureteral stents in infectious situations, which can range from UTIs to severe sepsis. Future directions include prospective clinical trials, where patients would undergo urgent exchange vs. antibiotic therapy as first-line treatment.

Moreover, should there be a difference in the urgent stent management in a severe sepsis patient compared to that of a patient with new-onset lower urinary tract symptoms, new-onset bacteriuria, and chronic stent? What is the ideal timeframe for urgent stent exchange, if it is required? We believe that the comments received during this exploratory study and the discussions it generated are of great value for designing future research. An interesting aspect to consider is the economical aspect of each option, as urgent stent exchange may represent an initially higher cost, given the necessity of an intervention, but could reduce overall treatment cost if patients have less UTIs in the future.

CONCLUSIONS

In our international survey of urologists, we showed that in a simulated case of a patient with an infected indwelling stent, most urologists (80.6%) would opt for antibiotic management initially. We also identified that non-urologists choose more often than urologists to offer urgent stent exchange as initial management in the proposed scenario.

We believe that further work is warranted to identify the factors that drive clinical decision-making in patients with urosepsis and chronic ureteral stents. Further clinical randomized clinical trials could help determine the necessity for indwelling ureteral stent manipulation in urosepsis and, if necessary, the ideal timing and economic implications.

COMPETING INTERESTS: The authors do not report any competing personal or financial interests related to this work.

This paper has been peer-reviewed.

REFERENCES

1. Forsi HM, Mosli HA, Al-Zemaity MF, et al. Bacteriuria and colonization of double pigtail ureteral stents: Long-term experience with 237 patients. *J Endourol* 1995;9:469-72. https://doi.org/10.1089/end.1995.9.469
2. Ilie VG, Ilie VI. Ureteric stent use — part of the solution and part of the problem. *Curr Urol* 2018;11:126-30. https://doi.org/10.1159/000447206
3. Zhang JM, Liu J, Wang K, et al. Observations of bacterial biofilm on ureteral stent and studies on the distribution of pathogenic bacteria and drug resistance. *Urol Int* 2018;101:320-6. https://doi.org/10.1159/000490621
4. Han Z, Liang SY, Marschall J. Current strategies for the prevention and management of central line-associated bloodstream infections. *Infect Drug Resist* 2010;3:147-63. https://doi.org/10.2147/IDR.S10105
5. Mermel LA, Allon M, Bouza E, et al. Clinical practice guidelines for the diagnosis and management of intravascular catheter-related infection: 2009 Update by the Infectious Diseases Society of America. *Clin Infect* Dis 2009;49:1-45. https://doi.org/10.1086/599376
6. Cormio L, Vuopio-Varkila J, Siitonen A, et al. Bacterial adhesion and biofilm formation on various double-J stent in vivo and in vitro. *Scand J Urol Nephrol* 1996;30:19-24. https://doi.org/10.3109/00365599609182343
7. Aydin HR, Irkilata L, Aydin M, et al. Incidence of bacterial colonisation after indwelling double-J ureteral stent. *Arch Ital Urol Androl* 2016;87:291-4. https://doi.org/10.4081/aiua.2015.4.291
8. Betschart P, Zumstein V, Buhmann MT, et al. Symptoms associated with long-term double-J ureteral stenting and influence of biofilms. *Urology* 2019;134:72-8. https://doi.org/10.1016/j.urology.2019.08.028
9. Ordon M, Andonian S, Blew B, et al. CUA guideline: Management of ureteral calculi. *Can Urol Assoc J* 2015;9:837-51. https://doi.org/10.5489/cuaj.3483

CORRESPONDENCE: Dr. Ioana Fugaru, Division of Urology, McGill University, Montreal, QC, Canada; ioana.fugaru@mail.mcgill.ca