

**Management of infected indwelling ureteral stents: An international survey of urologists**Ioana Fugaru<sup>1</sup>, Naeem Bhojani<sup>2</sup>, Sero Andonian<sup>1,3</sup>, Wael Sameh<sup>4</sup>, Nader Fahmy<sup>1</sup><sup>1</sup>Division of Urology, McGill University, Montreal, QC, Canada; <sup>2</sup>Department of Urology, Université de Montréal, Montreal, QC, Canada; <sup>3</sup>Institute of Health Sciences Education, McGill University, Montreal, QC, Canada; <sup>4</sup>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* 2022 October 25; Epub ahead of print. <http://dx.doi.org/10.5489/cuaj.7994>

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**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

Indwelling ureteral stents are part of the urologist's armamentarium to ensure flow from the upper to the lower urinary tract. The first ureteral stent was described in 1978 by Finney *et al.* with two silicone hooks at each end that secure the catheter in position.<sup>1</sup> It is known that 60-80% indwelling ureteral stents form a biofilm, yet only 5% will have a urinary tract infection.<sup>2-4</sup> There is debate amongst specialists whether indwelling ureteral stents should be treated in the same fashion as central lines, which are frequently exchanged in patients with bacteremia/sepsis.<sup>5-6</sup>

We performed a survey of international urologists as a first step towards exploring clinical management urosepsis in the presence of a chronic indwelling ureteral stent. The goal of this study was to survey the current management of 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 doctors and internists.

## METHODS

An online questionnaire was shared using social media (Twitter) and urological email lists (ex: alumni lists, conference email lists, Québec Urological Association members, etc). Responses were collected between July 1<sup>st</sup> and August 31<sup>st</sup> 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 study: "A 50 year old female with a right chronic indwelling ureteral stent, presents, febrile, to the ER with right flank pain and tachycardia. A CT scan done in the ER demonstrates that 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 in order to obtain your opinion on the next step in managing this patient.

What is your preferred management?

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-Square/Fisher test was 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 in the United States of America (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, infectious diseases and paediatrics) completed the online survey. Urology residents and fellows represented about one quarter of all respondents (23.2%). The years of clinical experience are presented in *Figure 1*, with 32.8% of respondents with an average experience of 0 to 5 years and with 26.5% of respondents with  $>20$  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 favoured 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 (12.9%) respondents 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 8 responses (2.0%) was 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 endo-urologists (n=106) to other urology specialists (including trainees, n=271) ( $p=0.0864$ ). A similar proportion of endo-urologists and general urologists, namely 84.0% and 80.5%, 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, paediatrics, family medicine) completed the survey. When comparing their preferred management to that of all urology respondents, 42.1% of non-urology specialists versus 16.2% of urology specialists ( $p=0.0111$ ) opted for urgent stent exchange (*Table 4*).

## 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, urinary tract infection 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, radio-opacity, biocompatibility and biodurability, as well as affordability and reduced rate of infection.<sup>3</sup>

A frequently expressed concern with the insertion of ureteral stents is the formation of biofilm on these foreign bodies, with the associated potential 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 urinary tract infection.<sup>7</sup> In a study of 102 stented patients, biofilm was found in about 30% of patients, however only 13.3% had bacteria (and not necessarily symptomatic urinary tract infection) identified on urine culture at the time of stent removal.<sup>8</sup> Other studies have however identified a range of biofilm formation of 58.5% to 82.9%, with a lower rate of biofilm in stents kept <1 month and a higher one in stents left indwelling > 3 months.<sup>2,4</sup> 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.<sup>9</sup> 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.<sup>3</sup> Interestingly, sepsis was documented in this cohort only in patients who underwent ureteral stent insertion for obstructive calculi.<sup>3</sup>

We have frequently encountered at our institution debate amongst specialists and urologists as to what is the ideal stent management for a patient presenting with infection and known for a chronic, well-positioned and 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.<sup>5</sup> 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.<sup>10</sup> 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 (or if 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 due to the fact that medical specialists are familiar with management of catheter-associated infections, which mandates urgent catheter exchange in severe infections.<sup>4,5</sup>

Our study has known methodological limitations. Indeed, 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 urine tract infections to severe sepsis. Future directions include prospective clinical trials where patients would undergo urgent exchange versus antibiotic therapy as first-line. Moreover, should there be a difference in the urgent stent management in a severe sepsis 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 initially a higher cost given the necessity of an intervention, but could reduce overall treatment cost if patients have less urine tract infections.

## CONCLUSIONS

Our survey of urologists from various countries allowed us to identify that in a simulated case of a patient with an infected indwelling stent, the majority of urologists (80.6%) would opt for antibiotic management initially. We 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 in order 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.

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## Figures and Tables

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

<sup>a</sup>Mexico, Dominican Republic, and Jamaica. <sup>b</sup>Argentina, Colombia, Peru, and Chile.

<sup>c</sup>Belgium, Spain, Italy, Switzerland, Bulgaria, Netherlands, Germany, Greece, Portugal,

France, Poland, Sweden, and Norway. <sup>d</sup>Lebanon, Kenya, and “*West Africa*.” <sup>e</sup>Russia,

Singapore, Iran, Bahrain, Jordan, Lebanon, United Arab Emirates, Sri Lanka, Iraq,

Indonesia, Thailand, Qatar, Hong Kong, and South Korea. <sup>f</sup>Australia and New Zealand.



<b>Table 2. Self-reported specialty of respondents</b>	
<b>Specialty</b>	<b>Number of respondents (%)</b>
<b>Urology</b>	
Endo-urology	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%)
Paediatrics	7 (1.8%)
Transplant	3 (0.75%)
Retired	1 (0.25%)
<b>Total urology respondents</b>	<b>377 (95.2%)</b>
<b>Medical specialties</b>	
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%)
<b>Total medical respondents</b>	<b>19 (4.8%)</b>

<b>Table 3. Management choice of respondents</b>	
<b>Management choice</b>	<b>Number of respondents (%)</b>
Antibiotics and same stent exchange schedule	314 (79.3%)
Urgent stent exchange and antibiotics	69 (17.4%)
Other answers	13 (3.3%)
Insert nephrostomy initially ± DJ removal	5 (1.3%)
Non-applicable answers	8 (2.0%)

<b>Table 4. Management choice of respondents by specialty</b>					
<b>Management</b>	<b>Endo-urologists</b>	<b>Community urologists</b>	<b>Urology trainees</b>	<b>Other urology specialists</b>	<b>Non-urology specialists</b>
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
<b>Comparison of management by specialty</b>					<b>p</b>
Endo-urologists vs. other urology participants					0.0864
Urology trainee vs. other urology participants					0.2862
Urology participants vs non-urology participants					0.0111

<b>Table 5. Features of specialists who opted for urgent stent exchange</b>			
	<b>Participants who exchange stent n=69</b>	<b>Other participants n=327</b>	<b>p</b>
<b>Country of origin</b>			
Canada	21 (30.4%)	114 (34.9%)	0.4633
Egypt	16 (23.3%)	69 (21.1%)	0.7471
<b>Years of experience</b>			
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