UROpedia CANADA

REVIEW

Assessment of the economic relevance of the use of single-use digital flexible ureteroscopes

A systematic review

Francis Simard[1], Catherine McMartin[1], Daphnée Bédard Tremblay[1], Sylvain L'Espérance[2], Renée Drolet[2], Martin Coulombe[2], Alice Nourissat[2], Marc Rhainds[2], Bruno Turcotte[1], Jonathan Cloutier[1]

[1]Département d'urologie, Centre Hospitalier Universitaire de Québec-Université Laval (CHU de Québec), Quebec, QC, Canada; [2]Unité d'évaluation des technologies et des modes d'intervention en santé (UETMIS), Centre Hospitalier Universitaire de Québec-Université Laval (CHU de Québec), Quebec, QC, Canada

Cite as: Simard F, McMartin C, Bédard Tremblay D, et al. Assessment of the economic relevance of the use of single-use digital flexible ureteroscopes: A systematic review. *Can Urol Assoc J* 2024;18(12):425-32. http://dx.doi.org/10.5489/cuaj.8798

Published online July 15, 2024

Appendix available at *cuaj.ca*

ABSTRACT

INTRODUCTION: Breakages and repairs related to flexible digital reusable ureteroscopes (fIURS) are expensive. Thus, we aimed to assess the cost-effectiveness of single-use flexible digital ureteroscopes ureteroscopes (SUFDU).

METHODS: We conducted a literature review on MEDLINE and EMBASE until September 19, 2018. Systematic reviews and guidelines were assessed for methodologic quality by using standardized grids (R-AMSTAR and AGREE-II). Original studies were analyzed according to local customized grids. The Critical Appraisal Skills Program (CAPS) tool enabled the assessment of the economic aspects in the literature. We also collected local data over a year in 2017–2018 and conducted an economic evaluation by cost minimization, comparing SUFDU and fIURS in our center. By generating different fIURS breakage reduction scenarios, we aimed to demonstrate the budgetary impact SUFDU introduction would have in our center.

RESULTS: Five economic studies were included. Data on fIURS showed breakage rates between 6.4–13.2%, and mean numbers of interventions before breakage of 7.5–14.4. Four of the five economic analyses suggested a higher cost per intervention with SUFDU. Our local data demonstrated similar results (6.4% and 11.8 cases) and enabled us to estimate the annual number of ureteroscopies for which SUFDU would become profitable: 11–26 (depending on the chosen device). Furthermore, we illustrated how selective use of SUFDU can reduce annual costs by avoiding breakages in different scenarios.

CONCLUSIONS: The mean cost per intervention with SUFDU is usually higher than with fIURS in high-volume centers and exclusive use becomes unprofitable from a small number of cases.

INTRODUCTION

Ureteroscopy is a common minimally invasive procedure that enables diagnosis and treatment of upper urinary tract conditions like urolithiasis and upper tract urothelial carcinoma;[1,2] however, flexible ureteroscopes, especially digital models, are fragile devices associated with high breakage rates that can occur during the surgical procedure itself but also during the reprocessing, transport, and storage phases.[3-6]

Recently, single-use flexible digital ureteroscopes (SUFDU) have been commercialized and could represent an interesting alternative to reusable digital flexible ureteroscopes (fIURS), particularly in terms of material resource management. Several models are currently available in Canada, such as LithoVue™ (Boston Scientific), Uscope (Pusen Medical, Clarion®), and Neoflex (Neoscope®). In our tertiary medical center, *Centre Hospitalier Universitaire de Québec-Université Laval (CHU de Québec)*, digital fIURS have been used since 2015 and are mostly performed in one affiliated hospital, *Hôpital St-François d'Assise* (HSFA). Considering the high costs related to their use and the risk of service breakdown, SUFDU have been introduced and tested by local urologists.

Despite a few articles in the literature, SUFDU appears to be as effective as fIURS in treating urolithiasis.[5,7-10] Nevertheless, this review aimed to assess the economic relevance of SUFDU. Another purpose of this study was to evaluate if SUFDU could be a cost-effective alternative

KEY MESSAGES

- Breakages of flURS, which are fragile devices, are associated with expensive repair costs.
- According to results from economic studies, the mean cost per intervention is generally higher with SUFDU than with flURS.
- In our current context, it may be possible that selective SUFDU usage in targeted high-risk interventions reduces breakages and repair-related costs, but with a high degree of uncertainty.

Table 1. Selection criteria and limits

Inclusion criteria	
Population	Adults and children undergoing a ureteroscopy
Intervention	Use of a SUFDU or a semi-reusable URS
Comparison	Use of a flURS

Outcomes	– Cost per intervention, considering:
	  - Purchase costs of flURS and SUFDU
	  - Repair costs of flURS
	  - Costs and human resources related to sterilization and preparation of flURS
	– Frequency and reasons of breakage related to any components of the flURS
	– Mean number of interventions before flURS breakage or elimination

Study designs ranked in order of strength	1. ETMIS reports, systematic reviews (SR) with or without meta-analysis, practice guidelines 2. RCT 3. Observational studies 4. Case reports 5. Case studies 6. Laboratory studies 7. Notice or expert consensus
Limits	**Exclusion criteria**
Language: French or English **Period: From the beginning of indexed database until September 19, 2018**	Summaries of congress, publicity material, and editorials

ETMIS: Évaluation des Technologies et des Modes d'Intervention en Santé; flURS: flexible digital reusable ureteroscope; SUFDU: single-use digital flexible ureteroscope; URS: ureteroscope.

in a high-volume center to reduce flURS breakages in selected high-risk cases. To carry out this review, we collaborated with a local multidisciplinary team of research professionals called *Unité d'évaluation des technologies et des modes d'intervention en santé* (UETMIS).

METHODS

Literature review

The research strategy was based on the methodologic guide of the UETMIS.[11] An interdisciplinary group of individuals concerned with the decisional question was assembled. Globally, UETMIS participated in an economic evaluation plan, data collection, and results analysis, as well as in understanding our local clinical, practical, and economic context.

A review of the scientific publications was conducted on two indexed databases — EMBASE and MEDLINE — from their beginning until September 19, 2018. Research strategies are presented in Supplementary Table 1 (see online Appendix at *cuaj.ca*). The document research was performed in accordance with the study designs hierarchy and was restricted to French and English. Table 1 summarizes the selection criteria. In order to identify economic analyses of interest, we also consulted Internet websites, including the Toronto Health Economics and Technology Assessment Collaborative (*http://theta.utoronto.ca/home*), the Program for Assessment of Technology in Health of McMaster University (*http://www.path-hta.ca/Home.aspx*), the Institute for Clinical and Economic Review (*www.icer-review.org*), the Institute for Health Economics (*www.ihe.ca*), and the economic studies database of the Centre for Reviews and Dissemination (*http://www.crd.york.ac.uk/CRDWeb/*) (Supplementary Table 2; see online Appendix at *cuaj.ca*).

Two independent reviewers (SL and RD) participated in the study selection, methodologic quality assessment, and data extraction. Systematic reviews and practical guidelines were evaluated by following the R-AMSTAR[12] and AGREE-II[13] standardized grids; however, original studies were evaluated according to a customized grid from the UETMIS.[11] In case of disagreement, a third evaluator was consulted (AN). To achieve an economic evaluation of the studies, we used the Critical Appraisal Skills Program (CAPS) tool from the *Institut national d'excellence en santé et en services sociaux* (INESSS).[14]

Investigation about the local practical use of flURS

Between February 13 and May 9, 2018, we conducted semi-directive interviews with key stakeholders who had

specific roles in the fIURS lifecycle. We aimed to get information from the contributors who were either involved in the clinical use, reprocessing, purchasing, or maintenance of the fIURS in our center. The interview guide is presented in Supplementary Table 3; see online Appendix at *cuaj.ca*).

Subsequently, we consulted the register of the medical devices reprocessing unit (MDRU) between May 28, 2017, and May 27, 2018, to estimate the number of fIURS used and the frequency of breakage over a year. In cases of breakage, with the agreement of the Director of Professional Services, we accessed patient electronic records to collect information about the clinical and technical context of the incidents. Moreover, with the collaboration of the assistant head nurse of the operating facility, we collected data from September 1, 2017, to May 31, 2018, concerning the purchasing of SUFDU and the context of their clinical uses (indications).

Economic evaluation in CHU de Quebec

To compare costs between SUFDU and fIURS in our center, we performed an economic evaluation by cost minimization. Indeed, we estimated the mean cost per intervention and the total annual cost for each device. According to a one-year period of local data collection (between May 28, 2017, and May 27, 2018), we took into account the costs related to the purchase, repair, reprocessing, and sterilization. Initial purchase costs were provided by the Supply Operations Service. We applied a six-year amortization to our calculations. This period corresponds to the useful life of a fIURS. To estimate the mean cost per intervention of a fIURS specifically, we used the purchase costs of the Karl-Storz and Olympus devices. Our formula is presented in Supplementary Table 4 (see online Appendix at *cuaj.ca*). Concerning the SUFDU, we considered the purchase costs of the LithoVue™ and Uscope devices.

Our calculations represent our practical context, corresponding to a collection of five fIURS in a high-volume center. To reflect other centers' reality better, we proceeded to calculations considering a collection of one or two fIURS.

More interestingly, we also aimed to demonstrate the budgetary impact of the selective use of SUFDU by reducing annual repair costs. According to our collection of five fIURS, we calculated several total annual costs depending on the proportion of SUFDU usage and the proportion of prevented breakages (25, 50, 75, and 100%).

RESULTS

Our research strategy yielded 357 publications; after revision of the selection criteria, five articles were retained.[15-19] Figure 1 represents the schematization of our document selection. The main characteristics of the five economic studies are demonstrated in Supplementary Table 5 (see online Appendix at *cuaj.ca*).

These studies were published between 2017 and 2018 in tertiary medical centers or academic centers, in either the U.S.,[16,18] Germany,[15,19] or Australia.[17] Most of the ureteroscopies were performed in the context of urolithiasis treatment.[16-19] All of them evaluated the LithoVue™ model. The comparator was either an optic reusable ureteroscope,[18,19] a digital reusable ureteroscope,[16,17] or both.[15] The followup period varied from two weeks to four years. Data concerning flexible reusable ureteroscopes were extracted between January 2013 and December 2016 on a prospective basis[15-18] or retrospectively.[19]

Concerning SUFDU, the number of cases executed was only reported in two studies.[15,18] For fIURS, between 14 and 423 interventions were reported. The frequency of breakage for reusable ureteroscopes varied from 6.4–13.2%, and the mean number of cases before breakage was 7.5–14.4.

Cost estimation method

Purchase costs, repair costs, and costs related to reprocessing-sterilization were considered. Taguchi et al also added the costs related to the device recycling and the use of the operating room, where the mean duration

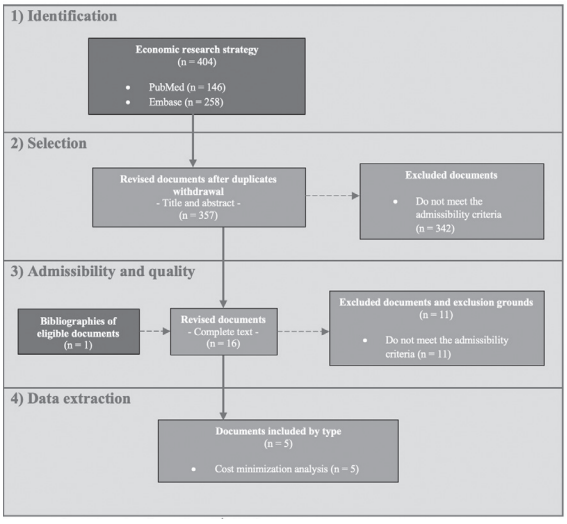

Figure 1. Schematization of document selection concerning economic analysis of single-use flexible digital ureteroscope (SUFDU).

Table 2. Estimations of mean costs per intervention with the use of a flURS according to study results

Authors (year)	flURS							Total mean cost per intervention ($ CAD)[a]	
	Total purchase costs ($ CAD)[a]	Number of ureteroscopes	Number of cases	Mean cost per intervention ($ CAD)[a]					
				Purchase	Repair	Reprocessing-sterilization	Others	flURS	LithoVue™
Martin et al (2017)[16]	84 716	4	160	530	1059	64	N/A	1 652	1986
Taguchi et al (2018)[18]	NR	12	~1000[e]	154	1268	142	2 144 (operating room)	3 707	3777[f]
Ozimek et al (2017)[19]	77 717	10	423	183	373	221	N/A	779	1548[b]
Mager et al (2018)[15]	69 903[b] 93 203[c]	6	68	1021[b] 1370[c]	434[b] 794[c]	143	N/A	1604[b] 2308[c]	1721[b] 211[c]
Hennessey et al (2018)[17]	24 792	1	28	886[d]	653	25	N/A	1154[d]	1 128[b] 1156[c]

[a]Conversion into Canadian dollar ($ CAD) according to the conversion rate of Bank of Canada into force in November 13, 2018 ($1 USD = $1.3241 CAD). Costs rounded to the nearest dollar. [b]Costs of an ureteroscope according to the negociated price. [c]Costs of an ureteroscope according to the manufacturer's suggested price. [d]Estimation realized according to available data in the study. [e]Non-reported activity data on a 3-year period (n=331 during the last year). [f]Purchase: $1986 CAD, operating room: $1786 CAD, recycling: $5 CAD. flURS: flexible digital reusable ureteroscope; N/A: not applicable; NR: not reported.

Table 3. Number of breakages, mean number of cases before breakage, and mean duration of repair according to the flURS model in HSFA between May 28, 2017, and May 27, 2018

Indicators	flURS		
	Karl-Storz (n=224)	Olympus (n=104)	Total (N=328)
Breakage, n (%)	12 (5.4)	9 (8.7)	21 (6.4)
Mean number of cases before breakage	13.3	9.6	11.8
Mean duration of repair in days (range)	9 (1–21)	22 (2–55)	14 (1–55)

flURS: flexible digital reusable ureteroscope.

was inferior to 20 minutes in cases using SUFDU.[18] The studies divided the purchase cost of all reusable ureteroscopes by the number of cases completed during the observation period[15,19] or during their useful life, which was estimated at three years.[18] In two studies, the purchase cost per intervention of reusable ureteroscopes was instead considered as an initial investment in profitability scenarios, in accordance with the number of cases completed in their center.[16,17] Calculation methods of the mean repair cost per intervention varied from one study to another (Supplementary Table 6; see online Appendix at *cuaj.ca*). SUFDU unit cost was either determined by the manufacturer,[18] the market price,[16,19] or both.[15,17]

Main results

Mean costs per intervention of SUFDU and flURS were estimated according to data reported in the studies (Table 2). The number of available reusable ureteroscopes was 1–12, and the number of ureteroscopies considered for calculations varied from 28–1000. For the reusable ureteroscopes, the average acquisition cost per intervention ranged from $154–1370 CAD. The mean repair cost per intervention was between $373–1268 CAD, and the mean costs per intervention related to reprocessing and sterilization ranged from $25–221 CAD.

Globally, four studies suggest that the mean costs per intervention related to the use of the LithoVue™ device are higher than for reusable ureteroscopes. By considering costs related to operating time, Taguchi et al concluded that the mean costs per intervention were equivalent.[18]

Contextualization and local investigation results

According to available data in our center, 900–1000 ureteroscopies are performed yearly (Supplementary Table 7; see online Appendix at *cuaj.ca*). We observe a growth in activity over the years. Currently, a total of 21 flexible reusable ureteroscopes are available in our tertiary medical center, where five are digital models from the Karl-Storz (n=3) and Olympus (n=2) companies. Most of the flURS are in one of our affiliated establishments (HSFA) (n=11).

Between May 28, 2017, and May 27, 2018, 938 fIURS were reprocessed in HSFA and 35% of those were digital models (n=328). Of the digital models reprocessed, two-thirds were from the Karl-Storz company (n=224). During the followup period, 21 breakages (6.4%) were observed by the MDRU or the operating room staff. The mean number of cases before breakage was estimated at 11.8 (Table 3). The breakage rate was higher with Olympus models (8.7%) than with Karl-Storz models (5.4%).

Between September 2017 and May 2018, nine interventions with a SUFDU were reported, two of those being in an antegrade fashion. In seven cases they were used in the context of the treatment of urolithiasis and the two others for ureteric strictures management. A laser was used in almost half of the cases (n=4).

Considering a total of 328 ureteroscopies with fIURS, we estimated many components of the costs. Regarding purchasing costs and by considering a six-year amortization, the total annual costs of ureteroscopes were calculated at $12 948 and the mean cost per intervention was $39 (Supplementary Table 8; see online Appendix at *cuaj.ca*). The estimation of costs related to repair is presented in Table 4.

On 21 breakages, we calculated $95 635 in total repair costs, $4554 in mean cost per breakage and $292 in mean repair cost by intervention. Concerning reprocessing and sterilization, several components of the costs are shown in Supplementary Table 9 (see online Appendix at *cuaj.ca*). The estimated unit cost was around $22, which represents a total of $7216 per year for 328 ureteroscopies. By combining purchasing, repair, reprocessing, and sterilization-related costs of our five fIURS, we estimated total annual costs of $115 799 and a total mean cost per intervention of $353 $ (Table 5).

The unit purchase cost of SUFDU is $1500 $ for a LithoVue™ device and $800 for a Uscope device; total annual costs for 328 ureteroscopies are estimated at $492 000 and $262 400, respectively.

Table 4. Estimation of total costs related to reprocessing and sterilization of a fIURS in CHU de Québec

Cost components	Cost per reprocessing ($)
Enzyme-based cleaner, 150 ml ($33.75/gallon)	1.35
Single-use brush	2.50
Mechanical decontamination of the box	1.72
Packaging supplies	0.85
Low-temperature sterilization cycle with Sterrad 100 NX ($19.58 for two endoscopes)	9.79
Paid working time, 15 minutes ($21.21/h)	5.25
Total	21.46

fIURS: flexible digital reusable ureteroscope.

Table 5. Estimation of total annual cost and mean cost per intervention related to the use of fIURS in HSFA, between May 28, 2017, and May 27, 2018

	Total annual costs ($) (2017–2018)	Mean cost per intervention ($)
Purchase with a 6-year amortization	12 948	39
Repair	95 635	292
Reprocessing and sterilization	7216	22
Total	115 799	353

fIURS: flexible digital reusable ureteroscope; HSFA: Hôpital St-François d'Assise.

Scenarios comparing mean costs per intervention in accordance with the number of available ureteroscopes and the number of ureteroscopies performed per year

Considering the hypothesis where all interventions were solely and entirely performed with either our actual collection of five fIURS, LithoVue™, or Uscope SUFDU models, we managed to illustrate mean costs per intervention according to the annual number of ureteroscopies (Figure 2). It should be noted that the mean cost per intervention is a variable cost that was estimated by dividing the annual costs of five fIURS with a six-year amortization ($12 948) by the annual number of cases. Costs per intervention related to repair and reprocessing were fixed at $292 and $22. Our results indicate that the mean costs per intervention are equivalent between fIURS and SUFDU when 11 interventions per year are completed with a LithoVue™ model, or when 26 interventions per year are completed with a Uscope model. Beyond these thresholds, the fIURS becomes more cost-effective than the SUFDU.

To best represent the context in low-volume centers, we repeated the same exercise by considering the purchase of one or two fIURS (Supplementary Table 10; see online Appendix at *cuaj.ca*). The mean cost per intervention was higher when 2–4 interventions per year were done with the LithoVue™ device when compared to the use of one or two fIURS from Karl-Storz. Regarding the Uscope device compared to the same fIURS, the thresholds were estimated at six or 13 interventions per year.

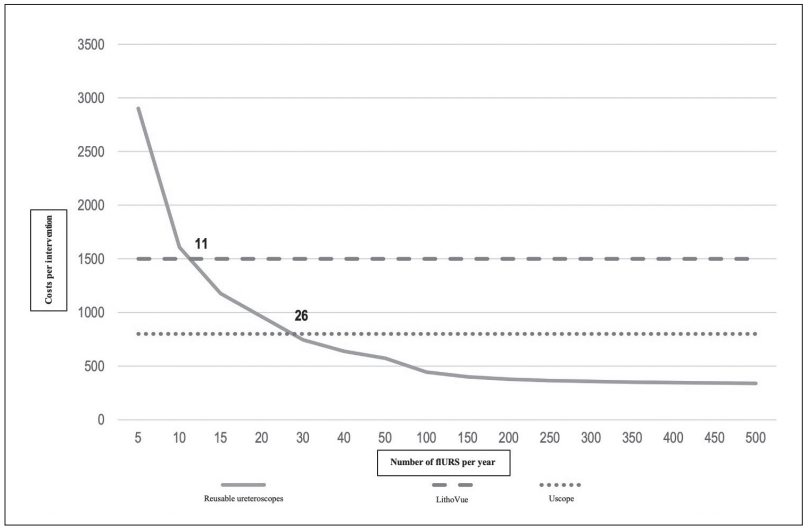

Figure 2. Estimation of the mean cost per intervention according to the number of ureteroscopies realized per year comparing five flexible digital reusable ureteroscopes (flURs) in CHU de Québec to a single-use flexible digital ureteroscope (SUFDU) (LithoVue™ or Uscope).

Scenarios comparing annual costs depending on the proportion of SUFDU usage

We aimed to assess if a targeted usage of SUFDU in high-risk cases could prevent breakage and reduce annual repair costs. We tested multiple scenarios by considering a collection of five flURS, a fixed number of 328 ureteroscopies, and the same annual costs related to repair and reprocessing. The annual costs depending on the proportion of SUFDU usage, and the percentage of avoided breakage is illustrated in Tables 6 and 7. For instance, using a LithoVue™ device in 5% of all interventions could reduce annual costs from $115 799 to $112 543 if 25% of flURS breakages are prevented. For the Uscope model and the same scenario considering 25% of breakages avoided, it could be possible to complete 10% of all interventions (33 ureteroscopes) and get a reduction of annual costs from $115 799 to $110 236.

DISCUSSION

Several studies evaluated the cost-effectiveness of a LithoVue™ device and reported a higher mean cost per intervention when compared to reusable ureteroscopes[15-17,19] except for one study, where costs were estimated equivalent;[18] however, this last study was financed by Boston Scientific.

Despite methodologic and contextual limitations, results from the literature may potentially be of interest for the external validation of our local economic analysis. The breakage rate and mean number of cases before breakage observed in our center (6.4% and 11.8 cases, respectively) are similar to those from the selected studies (6.4–13.2% and 7.5–14.4 cases). The mean cost per intervention with the flURS is also generally lower than with SUFDU in our analysis, whether it is a LithoVue™ or a Uscope device.

The estimation of the mean cost per intervention related to flURS is influenced by numerous factors, including the number of available flURS, the number of years considered for the purchase cost amortization, the consideration of negotiated unit costs, the number of breakages, the costs related to repair and reprocessing, and the healthcare organization of each country. This may

Table 6. Scenarios comparing annual costs according to the usage proportion of a LithoVueTM model (SUFDU) and the rate of avoided breakages

LithoVue™	Number of flexible digital ureteroscopies		Total annual costs according to the level of breakage reduction				
	flURS	SUFDU	0%	25%	50%	75%	100%
0%	328	0	**115 799**	**115 799**	**115 799**	**115 799**	**115 799**
5%	312	16	135 256	**112 543**	**101 063**	**67 117**	**53 511**
10%	295	33	154 714	133 196	**110 236**	**90 160**	**68 642**
15%	279	49	174 171	153 849	119 409	**113 204**	**92 882**
20%	262	66	193 629	174 502	128 582	136 248	117 121
30%	230	98	213 086	215 808	199 071	182 335	165 599
40%	197	131	271 459	257 113	242 768	228 432	214 078
50%	164	164	310 373	298 419	286 465	274 510	262 556

flURS: flexible digital reusable ureteroscope; SUFDU: single-use flexible digital ureteroscope.

Table 7. Scenarios comparing annual costs according to the usage proportion of a Uscope model (SUFDU) and the rate of avoided breakages

Uscope	Number of flexible digital ureteroscopies		Total annual costs according to the level of breakage reduction				
	fIURS	SUFDU	0%	25%	50%	75%	100%
0%	328	0	**115 799**	**115 799**	**115 799**	**115 799**	**115 799**
5%	312	16	123 776	**101 063**	**78 350**	**55 637**	**42 031**
10%	295	33	131 754	**110 236**	**88 718**	**67 200**	**45 682**
15%	279	49	139 731	119 409	**99 086**	**78 764**	**58 442**
20%	262	66	147 709	128 582	**109 455**	**90 328**	**71 201**
30%	230	98	155 686	146 928	130 191	**113 455**	**96 719**
40%	197	131	163 664	165 273	150 928	136 583	122 238
50%	164	164	171 641	183 619	171 665	159 710	147 756

fIURS: flexible digital reusable ureteroscope; SUFDU: single-use flexible digital ureteroscope.

explain why the difference between the two groups is substantially greater in our analysis than in the studies.[15-19]

No scenario in the literature seems representative of our local context, where a total of 1000 ureteroscopies are completed annually, of which around 30% are done with fIURS. Several scenarios with low-volume centers were also considered in this project and we found that, compared to fIURS, the mean cost per intervention with SUFDU remains higher even though a small number of interventions are done yearly.

More interestingly, our analysis combining multiple scenarios demonstrates that if a selective use of SUFDU in high-volume centers managed to avoid breakage and related repair costs, we could reduce annual total costs related to fIURS usage; however, these estimations are based on hypotheses and breakages depend on many factors, which are not always foreseeable.

If no breakage is prevented, total annual costs may increase depending on the number of SUFDU used. Since no study demonstrated that targeted use of SUFDU could reduce breakage rates, our observations should be interpreted with caution.

To date, no guideline exists to identify risk factors for breakage or clear indications guiding the use of a single-use ureteroscope; however, it is recognized in the literature that extreme and repeated deflection poses a high risk of breakage. In fact, Ozimek et al determined retrospectively that a steep angle of the infundibulopelvic junction (60 degrees or less) was associated with significantly higher rates of breakage and postoperative complications.[20]

In our opinion, it is also reasonable to consider SUFDU usage in harder and larger stones, as well as for expected longer cases, due to intensive instrumentation and risk of breakage associated with the working channel.

Also, we did not estimate the impact of adding another fIURS in our collection, as this would have required more advanced techniques of economic analysis. Furthermore, we did not consider many components of the costs related to SUFDU usage, including acquiring a video monitor, transport, storage, and breakage during interventions. Indirect costs related to SUFDU and fIURS were also not taken into account, although they may have a significant impact. These include service breakdowns and management fees related to purchasing and repair of ureteroscopes.

Results based on our collection of five fIURS suggest that the total annual cost would increase with a relatively low number of SUFDU usage per year, which is between 10 and 30, depending on the type of ureteroscope. This number could be even lower (<8 interventions per year) in low-volume centers with only one or two available fIURS.

Other study limitations

Due to our retrospective design, information bias and bias related to classification errors may be possible. Also, data were manually collected in registers from the MDRU, so it may be possible that some interventions with fIURS or breakages were not documented. Moreover, during the study period, nine SUFDU were used, which may have

influenced the breakage rate and total annual costs. Thus, we cannot state with certainty that our data collection is representative of the past years.

CONCLUSIONS

This study aimed to assess the economic relevance of implementing SUFDU in our high-volume center. With similar breakage rates as observed in the literature, our mean cost per intervention is generally higher with SUFDU than with fIURS. Also, our economic analysis suggests that the targeted use of SUFDU in selected high-risk cases may have a beneficial budgetary impact by potentially reducing the breakage rate of fIURS and repair-related costs; however, this hypothesis must be interpreted with a high degree of uncertainty, considering that breakage can also occur during phases of reprocessing and maintenance.

In the absence of sufficiently precise data, we cannot be 100% certain that SUFDU usage to ensure continuity of service would be the best option in financial and organizational terms. Other alternatives could be explored, including the possibility of expanding the number of available fIURS in each establishment of our center according to their reality of practice. Pending the results of emerging studies, it appears reasonable to limit the use of SUFDU by conducting a pilot study aiming to evaluate the financial and organizational impacts on the institution.

COMPETING INTERESTS: Dr. Cloutier is a consultant for Boston Scientific. The remaining authors do not report any competing personal or financial interests related to this work.

FUNDING: This project was financed by the operating budget of the UETMIS.

This paper has been peer reviewed.

REFERENCES

1. de la Rosette J, et al. The clinical research office of the endourological society ureteroscopy global study: Indications, complications, and outcomes in 11,885 patients. *J Endourol* 2014;28:131-9. https://doi.org/10.1089/end.2013.0436
2. Lechevallier E, Saussine C, Traxer O. Ureteroscopy for upper urinary tract stones. *Prog Urol* 2008;18:912-6. https://doi.org/10.1016/j.purol.2008.09.022
3. Doizi S, Traxer O. Flexible ureteroscopy: Technique, tips and tricks. *Urolithiasis* 2018;46:47-58. https://doi.org/10.1007/s00240-017-1030-x
4. Doizi S, Traxer O. Comment entretenir son urétéroscope souple ? *Prog Urol* 2014;24:F95-102. https://doi.org/10.1016/j.fpurol.2014.09.002
5. Doizi S, et al. First clinical evaluation of a new single-use flexible ureteroscope (LithoVue): A European prospective multicentric feasibility study. *World J Urol* 2017;35:809-18. https://doi.org/10.1007/s00345-016-1936-x
6. Lasselin J, et al. [Flexible ureteroscope damages. Evaluation of university hospital service equipment]. *Prog Urol* 2015;25:265-73. https://doi.org/10.1016/j.purol.2015.01.010
7. Dale J, et al. Evaluation of a novel single-use flexible ureteroscope. *J Endourol* 2021;3:903-7. https://doi.org/10.1089/end.2016.0237
8. Marchini GS, et al. In vitro evaluation of single-use digital flexible ureteroscopes: A practical comparison for a patient-centered approach. *J Endourol* 2018;32:184-91. https://doi.org/10.1089/end.2017.0785
9. Proietti S, et al. Comparison of new single-use digital flexible ureteroscope versus nondisposable fiber optic and digital ureteroscope in a cadaveric model. *J Endourol* 2016;30:655-9. https://doi.org/10.1089/end.2016.0051
10. Talso M, et al. Comparison of flexible ureterorenoscope quality of vision: An in vitro study. *J Endourol* 2018;32:523-8. https://doi.org/10.1089/end.2017.0838
11. Unité d'évaluation des technologies et des modes d'intervention en santé. Guide méthodologique: démarche d'évaluation et étapes de réalisation d'un projet d'ETMIS, UETMIS du CHU de Québec-Université Laval, novembre 2015, 26 pages.
12. Kung J, et al. From systematic reviews to clinical recommendations for evidence-based health care: Validation of revised assessment of multiple systematic reviews (R-AMSTAR) for grading of clinical relevance. *Open Dent J* 2010;4:84-91. https://doi.org/10.2174/1874210601004010084
13. Brouwers MC, et al. AGREE II: Advancing guideline development, reporting and evaluation in health care. *CMAJ* 2010;182:E839-42. https://doi.org/10.1503/cmaj.090449
14. Tom WR, et al. Next-generation single-use ureteroscopes: An in vitro comparison. *J Endourol* 2017;31:1301-6. https://doi.org/10.1089/end.2017.0447
15. Mager R, et al. Clinical outcomes and costs of reusable and single-use flexible ureterorenoscopes: A prospective cohort study. *Urolithiasis* 2018;46:587-93 https://doi.org/10.1016/S1569-9056(18)31821-9
16. Martin C, et al. The economic implications of a reusable flexible digital ureteroscope: A cost-benefit analysis. *J Urol* 2017;197:730-5. https://doi.org/10.1016/j.juro.2016.09.085
17. Hennessey DB, et al. Single-use disposable digital flexible ureteroscopes: An ex vivo assessment and cost analysis. *BJU Int* 2018;121:55-61. https://doi.org/10.1111/bju.14235
18. Taguchi K, et al. Micro-costing analysis demonstrates comparable costs for LithoVue compared to reusable flexible fiberoptic ureteroscopes. *J Endourol* 2018;32 :267-73. https://doi.org/10.1089/end.2017.0523
19. Ozimek T, et al. Retrospective cost analysis of a single-center reusable flexible ureterorenoscopy program: A comparative cost simulation of disposable fURS as an alternative. *J Endourol* 2017;31:1226-30. https://doi.org/10.1089/end.2017.0427
20. Ozimek T, Cordes J, Wiessmeyer JR, et al. Steep infundibulopelvic angle as a new risk factor for flexible ureteroscope damage and complicated postoperative course. *J Endourol* 2018;32:597-602. https://doi.org/10.1089/end.2018.0147

CORRESPONDENCE: Dr. Francis Simard, Département d'urologie, Centre Hospitalier Universitaire de Québec-Université Laval (CHU de Québec), Quebec, QC, Canada; francis.simard.3@ulaval.ca

Visit *https://www.cua.org/UROpedia* to complete the questionnaire associated with this article. This program is an Accredited Self-Assessment Program (Section 3) as defined by the Maintenance of Certification Program of RCPSC, and approved by the CUA. You may claim a maximum of 1 hour of credit.