

Computerized System for Online Control of Ureteral Catheters Hosted on Google Drive: An Alert Tool

Pedro P. L. S. Polotto¹, João P. Fantin¹, Thiago L. Padilha¹, José G. F. Arruda², Pedro F. F. Arruda², Marcio Gatti², Thiago S. Antoniassi², Ana P. Bogdan², Lilian Castiglioni³, Fernando N. Facio Jr², Luís C. F. Spessoto²✉

¹Resident of the Urology Department - Hospital de Base/FAMERP

²Professor of the Surgical Specialties Department - Hospital de Base/FAMERP

³Department of Biostatistics – FAMERP

Abstract: BACKGROUND: Ureteral catheters are commonly used by different medical specialties more often in medical centers that have a considerable flow of patients making monitoring difficult. Furthermore, forgotten catheters can cause serious complications increasing hospital costs and the possibility of litigation. This study evaluated a Google Drive-hosted computer control system with color-coded warnings in an attempt to reduce the protracted use of ureteral catheters. METHODS: One month after implanting the program, 119 patients were enrolled in the double J ureteral catheter control system. RESULTS: After the implantation of the system, there was a 16.5% reduction in the length of use of ureteral catheters compared to one year earlier. Importantly, the percentage of patients using double J for six months or more decreased, thus the system has contributed significantly to reduce cases of forgotten catheters. The primary limitation was the relatively small number of patients who require prolonged use of ureteral catheters benefit from the use of this computerized warning system. CONCLUSIONS: This study showed that there was a reduction in the relative risk of forgotten catheters, a shorter mean time of catheter use and a decrease in the number of patients with excessively long catheter use.

Keywords: Computational Control System, Google Drive, Ureteral catheter

Introduction

Ureteral catheters are commonly used to drain the upper urinary tract and are associated with short- and long-term complications¹. In the short term, the most important symptoms in ‘catheter syndrome’ are hematuria, pain and lower urinary tract symptoms (LUTS)².

Generally, manufacturers set the time limit for ureteral catheter use at six months even though, in exceptional circumstances, this can be extended. Forgetting a catheter in the ureter for a period longer than that recommended by the manufacturer can cause serious complications such as obstruction, fragmentation, extrusion, sepsis, abscess and renal failure^{1,3,4}.

In relation to the medical complications caused by forgotten ureteral catheters, patients can generate

high hospital costs, often with prolonged hospitalizations. The forgotten catheter is a great challenge even for the most experienced urologist, with treatment often requiring multiple procedures with increases in the morbidity and mortality rates and financial cost⁵.

Several studies address the treatment of complications resulting from forgotten ureteral catheters, but few with methods that aim to facilitate the follow-up of patients and decrease the number of cases⁶⁻⁸.

This study proposes an easy-to-use, low-cost tool to improve the follow-up of patients using ureteral catheters, a Google Drive-hosted computer control system with color-coded warnings to facilitate the physician's recognition of prolonged catheter use.

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Luís Cesar Fava Spessoto (Correspondence)



lcsspessoto@gmail.com



+55 17 3201 5700. Fax: 55 17 3229 1777

Material and Methods

A computer control system was developed online using Google Drive in which patients were registered at the time of ureteral catheter placement using a device connected to the internet.

The system is based on Google Sheets, a spreadsheet hosted on Google Drive, where urologists can add patients submitted to catheter placement using their own login and password. Furthermore, all changes to the spreadsheet, such as the inclusion and removal of patients from the list and modification of data, are logged with the log file being accessed by the administrator. This worksheet includes all the details necessary to locate the patient and his medical records. Moreover, it uses a color-coded warning system to identify patients who are using catheters for a time longer than expected.

In order to avoid failure to include patients, all patients who are treated in the Outpatient Clinic or for urgent treatment in the hospital who are using a double J ureteral catheter are verified as to whether they have been registered on the spreadsheet. The patient's name is removed from the spreadsheet list on removal of the ureteral catheter.

If the patient cannot be contacted by the telephone numbers provided, or at the given address in hospital records, a registered letter is sent to document an attempt to contact the patient. An incident report is also prepared in order to legally safeguard the urology team and institution against any possible litigation.

The system was implanted In Hospital de Base in Sao Jose do Rio Preto, Brazil in July 2015. All patients with double J ureteral catheters were input into the system as of this date. This study evaluates the results one year after the implantation of the control system including changes in the use of ureteral catheters. For this, two timepoints were compared: the first in 2015, one month after establishing the system and the second 13 months later.

Data about the system were collected and input into an Excel spreadsheet. A descriptive analysis was performed from the calculations of measures of central tendency and dispersion, and a calculation of the frequencies. Frequencies were compared using the chi-square test with p-values ≤ 0.05 considered statistically significant. Statistical analysis employed the GraphPad InStat v. 3.10 computer program (GraphPad Software Inc, La Jolla, CA, U.S.A., 2009).

Results

In August 2015, one month after implanting the program, 119 patients were enrolled in the double J ureteral catheter control system. Of these, 15 (12%)

patients had been using a catheter for at least six months and four (3%) had a catheter for more than eight months (Figure 1). In August 2016, 135 patients were enrolled in the system. Of these, six (4.4%) had a catheter for at least six months and only one patient for more than eight months (0.7%; p-value = 0.0496) (Figure 1). The mean time of use of double J ureteral catheters was 2.84 months in 2015 and 2.37 months in 2016.

Legend of Figure

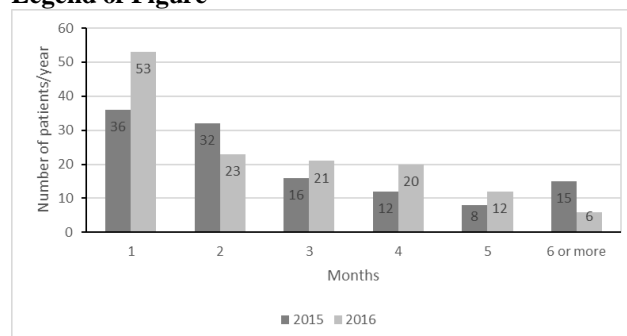


Figure 1 - Distribution of the number of patients according to the time of use of the double J ureteral catheters in the period from 2015 to 2016

The reduction in relative risk (efficacy) of patients using a ureteral catheter for six months or more was 66.6% (RR = 33.4) and for more than eight months it was 77.7% (RR = 22.3).

The reduction in the absolute risk of the patient using a catheter for six months or more was 8% thus the number of patients registered to avoid one catheter being forgotten is 12.

After the implantation of the system, there was a 16.5% reduction in the length of use of ureteral catheters compared to one year earlier. Importantly, the percentage of patients using double J for six months or more decreased by 40%, thus the system has contributed significantly to reduce cases of forgotten catheters.

Discussion

Since the introduction of the double J catheters into the urological practice in 1978, there has been a great improvement in the physical components of the catheter including the quality of the materials making them widely used^{6,9}. Frequent use of these catheters is associated with inconsistent follow-ups, especially in large centers where the high volume of patients makes it difficult to control the use of devices. Forgotten catheters result in increased morbidity and mortality rates^{6,10} with associated hospital and legal costs for the institution.

The literature indicates that the attending physician is responsible for the forgotten catheter¹¹ with significant financial and moral punishments being

imposed in cases of neglect with iatrogenic consequences in Brazil.

Tang et al.¹² emphasize that patients should take an active role in the monitoring and management of their catheters, a situation that is not always possible due to the socioeconomic and cultural conditions of patients due to the context in which the catheters are implanted, often after intraoperative complications of surgeries performed by specialties other than urology. Most of the catheters are placed in medical centers that have a considerable flow of patients where monitoring is frequently by other medical teams such as gynecology, proctology and oncology. In this setting, failure to contact a urologist can have serious consequences.

Currently, with the increased awareness of patients about their rights and the upsurge in the number of medical lawsuits, it is more likely that urologists will face litigation related to forgotten ureteral catheters.⁶ However, there are control measures such as a messaging system as was proposed by Tepeler et al.⁶ that alerts both doctors and patients through a short message service (SMS), thereby sharing the responsibility of monitoring.

An online system was developed in the current study that warns doctors of long-term catheter use and registers attempts to contact patients both by phone calls and by registered mail with records being filed together with the patient's records. This system can protect both the urologist and the institution against possible lawsuits. In our service, medical staff is often advised about the need for constant awareness.

In the year following implantation of this system, only one patient used a ureteral catheter longer than the time limit recommended by the manufacturer. This happened because the patient missed consultations and was not found using the given phone numbers or at the address provided as he had moved to another city. On becoming aware of the case, the hospital administration contacted the legal department that subsequently registered an incident report to protect the hospital in the event of future prosecution.

Conclusions

Patients who require prolonged use of ureteral catheters are benefited by the use of the computerized warning system. This study showed that there was a reduction in the relative risk of forgotten catheters, a shorter mean time of catheter use and a decrease in the number of patients with protracted catheter use.

In the current setting of technological development and the advances made in computer control systems hosted on Google Drive for online control, this easy-to-access system to control the use of ureteral catheters improves safety and is an important tool to avoid forgotten catheters. With this, the number of unnecessary procedures and hospital lawsuits are reduced.

Conflicts of interest: none

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