A novel computer based stent registry to prevent retained stents: Will patient directed automated short message service and letter generator help?

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ABSTRACT

Objective: The objective of this study was to evaluate the feasibility of a computer based stent registry with patient directed automated information system to prevent retained double J stents.

Materials and Methods: A stent registry system was developed in collaboration with our Computerized Hospital Information Processing Service Department. This computer based stent registry with patient directed automated information system was integrated with the existing clinical work station. We reviewed the records retrospectively and assessed the feasibility of the system in reminding clinicians and patients regarding the stent and its date of removal.

Results: In a short run at our department, this new system appeared feasible, with patients promptly responding to the short message service and letter alerts.

Conclusions: Computer based stent registry with patient directed automated information system is feasible in a clinical setting. A prospective study is needed for evaluation of its efficacy in preventing retained stents.

Key words: Automated message generation, hospital information system, retained stent, stent registry

INTRODUCTION

Introduction of double J (DJ) stent in 1978 gave a new dimension to the practice of urology.[1] As the use of stents became common, complications of stent placement and retained stents came to light.[2,3] Thus, the need to have a system to avoid such complications was realized. These stents are temporary and have to be removed after a certain period. Though there have been several attempts in the past including stent registry

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and stent cards, forgotten DJ stents continue to be a hazard in urology.[4] Here, we detail a novel method designed to minimize the incidence of forgotten ureteral stents.

A 10 years retrospective audit (January 2002-December 2011) carried out at our department evaluating all retained foreign bodies in the urinary tract provided the impetus to this idea. A total of 21 cases were identified, out of which 16 were DJ stents. Various reasons for retained stents were identified including lack of documentation regarding the insertion, patient's unawareness about the presence of stent despite documentation in the discharge summary or medical reports, and rarely, patient being unaware of the fact that the stent needed to be changed or removed. This was especially common in surgeries performed in emergency setting and intraoperative consults from other departments.

Keeping these issues in mind, we have devised a stent registry program that addresses these problems, specifically.

MATERIALS AND METHODS

Set in a tertiary care hospital, we developed a novel

computer based stent registry. For all patient details, we use a hospital information system (HIS) and picture archiving and communication system, which includes a clinical work station (CWS) maintained by the Computerized Hospital Information Processing Service (CHIPS) Department. A stent registry program was built and incorporated into the existing CWS (CWS-Visual Basic 6.0, Crystal Reports for Visual Basic 4.6.1 Oracle 11 g Enterprise Edition Release 11.2.0). Access to CWS is authenticated by a password. To avoid duplication of data, details like postal address and phone number are automatically updated in the stent registry from the HIS. It also has a manual update option.

At the end of each surgery, the operative details are entered in the CWS as a routine in our hospital. To avoid missing the stent insertion information, a question was added at the beginning of the existing operation notes template; is this "stent case?" Answer and details were made mandatory to proceed onto the next page for operative details. In each "stent case", details such as size, length, manufacturer, date of its insertion and removal are entered [Figure 1]. Each detail has an automated as well as a manual update option. Once this is performed, the information is updated in the stent dashboard by itself. This information in the stent dashboard is available for audit and gives the entire information as per requirement with various search options. When a patient reports for stent removal, the entry is updated as "removed" in the stent dashboard, which is again password authenticated.

At the end of each month, a stent audit is performed from the easily available search options in the stent dashboard. All patients who fail to turn up for stent removal are immediately sent reminders in the form of automated short message service (SMS) generated by SMS gateway followed by letters through the stent registry [Figures 2 and 3].

Furthermore, an automated pop-up alert is generated against the patient's hospital number once the stent is inserted, detailing the information regarding the stent and its due date for removal [Figure 4]. This helps in reminding the clinician regarding the stent each time the patient's information is accessed in the CWS and redirecting the patient to us even if he reports to any other department in the hospital.

RESULTS

A total of 115 renal units were stented in 2 months, out of which 78 were removed within the due date at our institution. This included three patients being redirected to us from other departments in our institution because of the pop-up alerts. Out of the remaining 37, 18 were long duration stents inserted for various indications and will come back later for removal. The remaining patients

were sent reminders in the form of SMS initially, followed by letters if they did not respond. Among the remaining 19, nine have confirmed its removal elsewhere, six have come back for removal and two will report shortly. We have not heard from the remaining two patients, until date [Flow Chart 1]. The new computer based stent registry with patient directed automated SMS and letter generator appears
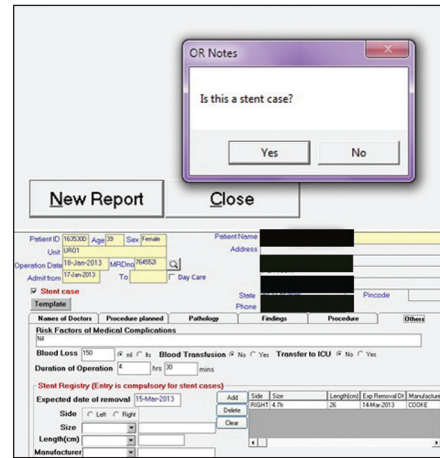

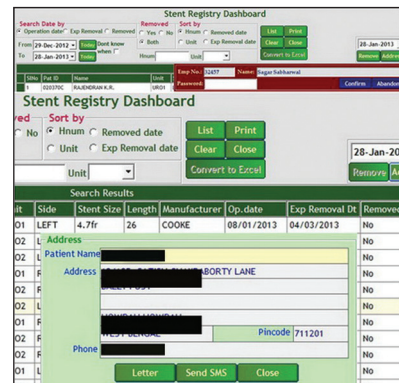**Figure 1:** Operation template and stent details

Figure 2: Password authenticated stent removal and automated short message service/letter generator
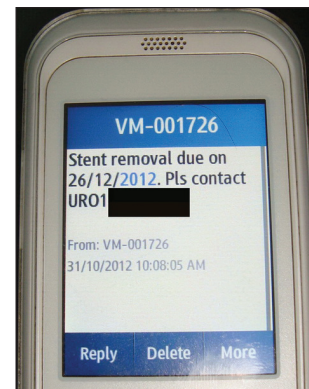

Figure 3: Short message service received by the patient regarding stent removal details
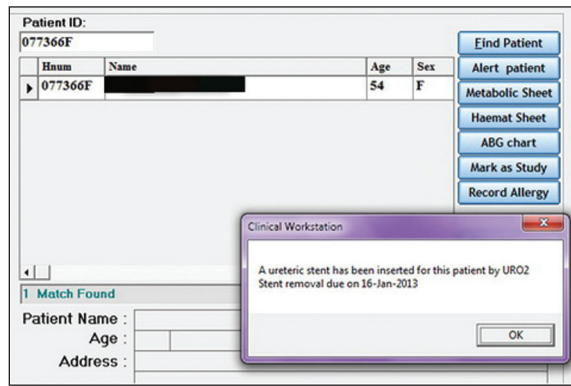
Figure 4: Pop-up alert in the clinical work station with stent details

Flow Chart 1: Result

feasible in the short run at our department. Patients who overshot their expected date of stent removal have been promptly responding to the SMS and letter alerts.

DISCUSSION

DJ stents remain an important part of the armory in endourology. However, retained stents not only cause increased morbidity, but can also be of significant medicolegal importance. Accurate record keeping in the form of well-maintained logbooks as well as stent cards issued to patients have been tried in the past.[4]

A computerized tracking registry was initially proposed by Monga *et al.* in 1995. Similarly, a computerized ureteric stent retrieval system was described by McCahy and Ramsden in 1996. However, their system depended on the transfer of data entered on paper by the operating surgeon to the computer database by a supervising secretary, which was reviewed monthly to track overdue stents for adequate action. They noted a reduction in delayed stent removal from 3.6% to 1.1% following the introduction of this method.[5,6]

Ather *et al.* also described a computerized system for tracking overdue DJ stents in 2000. All stent insertions were recorded and their last date for removal determined. Patients were sent reminders if they failed to return 2 weeks prior to the due date. Incidence of overdue DJ stents fell from 12.5% to 1.2%.[7] A web based stent registry with automatic recall application was proposed by Lynch *et al.* in 2007. Though similar in principle, the reminders were only sent to the clinical team in the form of e-mails in case of overdue stents until appropriate action was taken.[8]

Stent registry program developed by our CHIPS Department is user friendly and minimizes the chances of error as it is part of existing CWS. This avoids record keeping in the form of log books or stent cards and also avoids involvement of secretary in the record keeping as information is entered
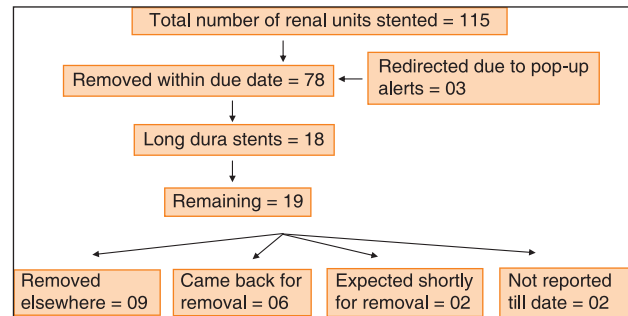
by the operating surgeon at the time of entering operative notes in CWS. Furthermore, multiple search options in stent dashboard at the time of monthly audit minimize the likelihood of missing any case. Our system directly interacts with patients and sends them automated SMS initially, followed by letters in case they fail to respond.

CONCLUSION

Computer based stent registry with patient directed automated SMS and letter generator holds promise to avoid the menace of retained DJ stents. A long-term prospective study is needed for evaluation of its efficacy in preventing the complication of retained stents.

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