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Role of the operating room nurses in the ureteric stent register

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Abstract

In any urology practice, a minority of stents are 'forgotten' with ensuing clinical and medico-legal implications. This paper assesses the role of the scrub nurse and operating room in-charge as key resources who can significantly improve compliance in stent capture. We assess the impact of a double validation process where operating room nurses monitor compliance data entry in the stent register by the operating urologist. The study is a retrospective analysis of the computerized stent register maintained in our institute. Data was collected from January 2012 to December 2019. The number of entries missed by urologists in the stent register, the number of times the scrub nurse could identify the missed entries and the additional number picked up by the operating room in-charge were evaluated. A total of 2839 renal units were stented in 2488 patients during the study period. The operating urologist had not updated the stent register in 147 (5.4%) patients. The scrub nurse had rectified this error in 65 and the remaining 82 missed entries were detected by the operating room in-charge. A dual validation method of verifying stent deployment entries by the scrub nurse and operating room in-charge minimizes the chances of missed documentation.

KEYWORDS
compliance, forgotten stent, operating room in-charge, scrub nurse, stent register, urologist

Keypoints/highlights

Forgotten stents are a known problem. The active participation of operating room in-charge and scrub nurse can bring down the incidence of forgotten stents.

What is known about this topic

- A number of methods exist to prevent forgotten stents but none are foolproof.
- 3.5%–5.9% stents placed during urological procedures tend to be forgotten.
- Forgotten stents have clinical and legal implications.
- The need for diligent staff has been acknowledged in the published literature.

What this paper adds

- This paper studies a double validation method by the scrub nurse and a senior nurse respectively who verify entries made by the operating urologist.
- We evaluate if this process can significantly reduce the incidence of undocumented stents.

1 | BACKGROUND

Across the world there are various methods of recording and retrieving stents placed in patients by the operating surgeon. This is usually a single point of entry into any tracking system.[1–4] We propose that although the primary responsibility of documenting stent deployment is that of the urologist, a system of cross-checking by the operating room nursing teams at two levels will make the system more robust.

In most hospitals, patients with ureteric stents are verbally informed about the need for stent removal. Despite this, there are incidents of forgotten stents, which are often unreported. These stents may cause encrustations,[5] haematuria,[6] calcification[3] urinary tract infection, lead to nephrectomy,[7] renal failure or even mortality.[8] Removal of such stents entails additional procedures and costs.[9]

A variety of methods have been described in the literature to overcome the problem of the forgotten stent.[4,10,11] The simplest include using 'flashers' on the patient notes (these can be specific symbols, colour codes), theatre logs, stent logbooks and stent card-based systems. The other extreme could be a computer database, with appropriate alerts. This database can be linked to generate automated emails to the urologist, as a reminder to remove the stent, or in an even more sophisticated system, to generate automated reminder short message service (SMS) to the urologist as well as the patient.[2,12,13]

In an effort to reduce the possibility of the forgotten stent, the British Association of Urological Surgeons (BAUS) has gone a step further, by providing an online register for urologist placing stents. This is a combination of the above-mentioned methods and is probably the only Urological Society providing this service to its members. The BAUS stent register has the facility for single login which allows anyone from the department to enter the data of insertion but the reminder email goes only to the consultant. Here, there is no particular individual responsible for the entry and hence chances of missing entries are possible.

An audit of our practice led us to believe that the critical step missed in our stent register was the failure of the surgeon to document stent placement. The ideal method, therefore, would require a systematic monitoring of the surgeon's compliance. The scrub nurse and the operating room in-charge are very well positioned to monitor compliance and reduce the overall incidence of forgotten stents.

This analysis was aimed to assess the impact of a double validation system for preventing forgotten stents. In spite of a profusion of literature,[1–3,10] dealing with stent registers to monitor ureteric stent placement, none of the papers discuss the role of the operating room scrub nurse and the operating room in-charge in taking responsibility for this process.

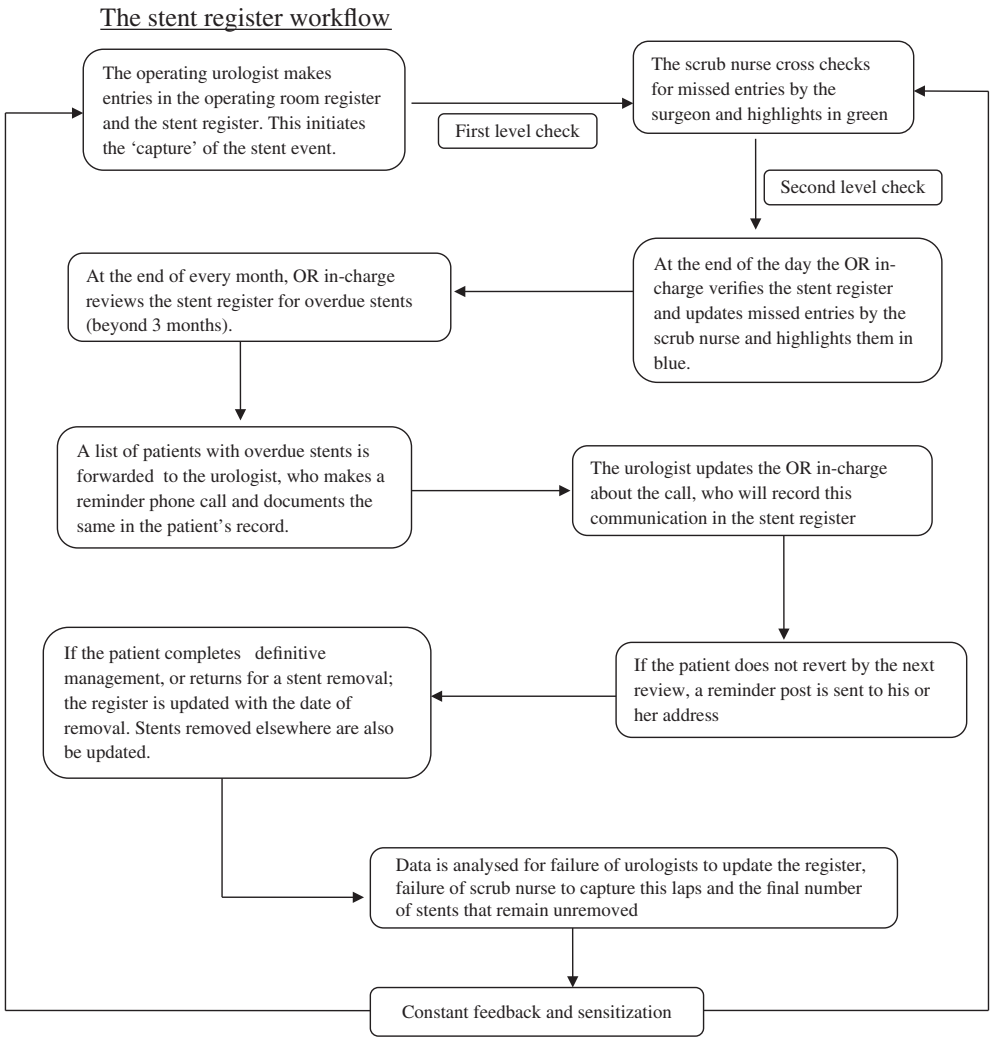

FIGURE 1 The stent register workflow

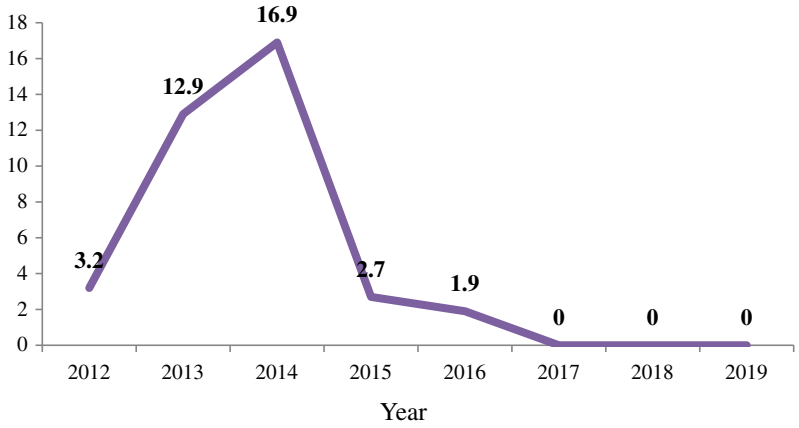

FIGURE 2 Missed entries by surgeon in percentages showed an initial increase followed by decline to no missed entries

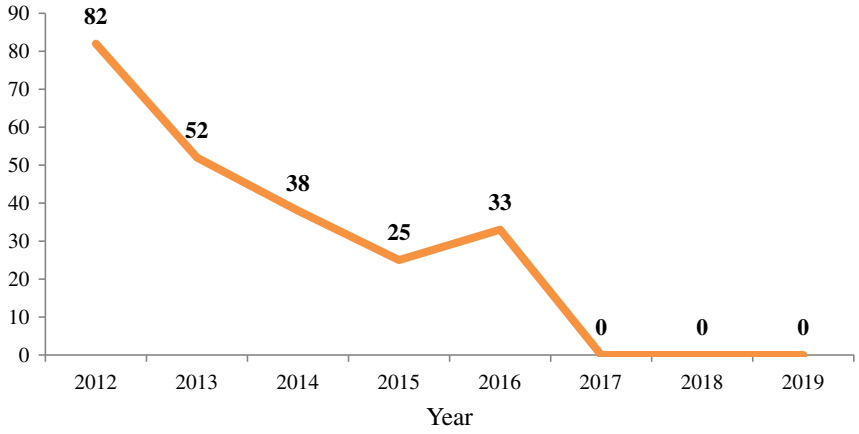

FIGURE 3 Pickup rates by the scrub nurse in percentages showed a gradual decline as the surgical entries improved

The aim of the paper was to assess the impact of a double validation process where operating room nurses monitor compliance with data entry in the stent register by the operating urologist.

2 | METHODS

The design of the study is a retrospective descriptive analysis of data available in our stent register. Ethics committee approval was obtained and a general consent was taken from all patients for use of data.

The inclusion criterion was all patients who underwent stent placement from January 2012 to December 2019. This was irrespective of stent placement being endoscopic, open or laparoscopic. Our hospital is a specialized nephrology and urology care centre performing over a thousand endourological procedures annually. There were no exclusion criteria.

Descriptive statistics were used to describe the data in percentages. In our hospital, we maintain a stent register in Microsoft excel. Each missed entry by the surgeon and scrub nurse is colour coded with different colours. Where the green colour indicates missed entry by the surgeon and the blue colour indicates missed entry by the surgeon and scrub nurse.

The stent register was analysed from January 2012 to December 2019. We evaluated the number of cases where the operating surgeon missed out on making appropriate entries in the stent register. Of these, the number of missed entries picked up at the first level of process validation by the scrub nurse was recorded. The missed entry is communicated to the operating surgeon over phone or email and the missed entry is updated in the stent register and appropriately colour coded.

The second level of validation was analysed by recording the additional number of missed entries identified by the operating room in-charge. Trends were analysed over a period of time after initiation of the stent register to see for improvements in the data entry by urologist, the first level cross-check by the scrub nurse and the second level cross-check by the operating room in-charge, who verified the stent register with the surgery register.

We also evaluated the data to evaluate the types of surgery where surgeons were more likely to miss entries in the stent register, the number of patients who needed a reminder for stent removal at 3 months and the number that remained untraceable. Our protocol mandates stent removal with in a period of three months because most stent manufactures state that maximum duration that a stent can be left indwelling is between 3 months to one year.

The stent register process is illustrated in the flow chart (see Figure 1).

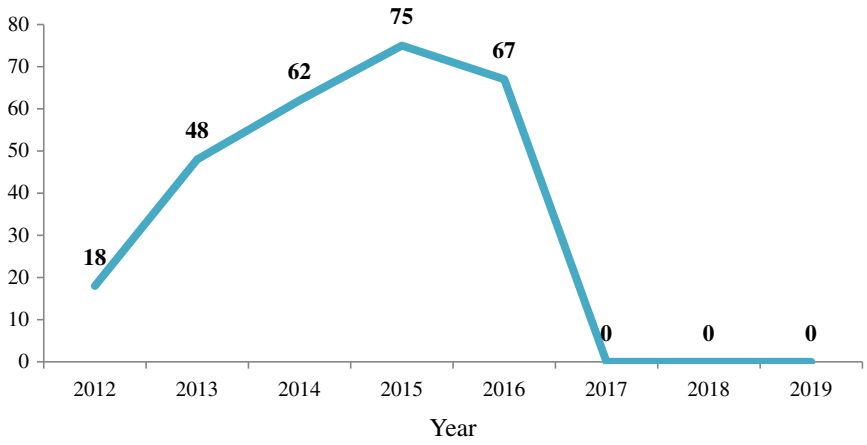

FIGURE 4 Pick- up rates by the operating room in-charge in percentages mirrored improvements in entries at the previous two levels

3 | RESULTS

A total of 2839 renal units were stented in 2488 patients during the study period. The operating urologist missed making entries in the stent register in 132/2488 (5.4%) patients. Of the missed entries, only 45.4% (60/132) were detected by the scrub nurse. The remaining 54.5% (72/132) were picked by the operating room in-charge. One hundred and seventy-two (6.9%) patients failed to report within the stipulated 3 months for stent removal. One hundred and ten (4.4%) reported for stent removal to our institute after a telephonic reminder. Sixty-two (2.4%) underwent removal elsewhere. Thirty-five (1.4%) patients expired with the stent in situ. Twenty (0.8%) patients have not returned for stent removal. Of these, 14 are aware of indwelling stents, but refuse to return for removal. Six patients remained untraceable.

After a single training and feedback session to the operating surgeons and scrub nurses, the number of missed entries by urologists was 3.2% in 2012. With new batches of urological residents and nurses, the number of missed entries went up to 12.9% in 2013 and 16.9% in 2014. A continuous feedback and training programme was initiated which brought down the number of missed entries to 1.9% in 2016 (Figure 2).

The data of the scrub nurses showed a similar trend to that of the operating surgeons. After the initial training, 82% of entries missed by the operating surgeon were detected. This had deteriorated to 33% in 2016. Since 2017, there have been no missed entries by the operating surgeon (Figures 3 and 4).

Surgeons were more likely to miss stent entries in open and laparoscopic surgeries (9.7%) than after endoscopic procedures (5%).

4 | DISCUSSION

The aim of the paper was to assess the impact of a double validation process where the operating room nurses monitor compliance in the data entered in the stent register by the operating urologist. The placement of a ureteric stent can in some situations lead to both morbidity and mortality[1,6,8,9] Once a stent is placed it is imperative to remove the stent within a pre-defined time period. The clinical and medico-legal ramifications of a forgotten stent are ultimately the responsibility of the urologist and the hospital. The medico-legal importance was emphasized by Duty who found that 4 out of 585 claims against the urologists in New York State were due to retained ureteric stents. Failure to arrange proper follow-up resulting in retained stents was alleged in 27% of dismissed cases.[14]

Osman and Collins reviewed data on urological litigations against the National Health Service in the United Kingdom.[15] From 1995 to 2009, out of a total of 168 claims, 23 were due to forgotten ureteral stents. We therefore designed and incorporated a stent register suitable to our needs and strengths. The scrub nurse and operating room in-charge are eminently suited to monitor and augment the efforts of the operating urologist.

Various systems are being followed to aid timely removal of stents, and a review of the literature revealed three main categories of stent registers – stent card registers/stent logbooks, computerized stent registers and computerized registers with automatic reminder systems.[2,11,12]

Thomas et al.[10] noted 22.4% unaccounted stents in a stent logbook based system. The authors, therefore, concluded that a stent card register was labour intensive, did not provide an automatic tracking system and was probably inferior to a computerized system.

The role of the patient in managing their own stent was described by Tang.[11] Eleven percent of patients in their study, and 2.4% in ours, organized their own treatment and had the stents removed at local hospitals. Stent card registers involve completing a card for each stent placed, in addition to the regular theatre log. On follow-up, the stent card helps to identify the patients needing stent removal. Tang[11] noted a 94.1% success rate of 'capture' (the process of stent insertion being logged into a stent register). However, up to 5.9% stent insertions were missed in this process, and therefore 52 were overdue for removal. A review of the stent also revealed 25.1% of patients had no record of stent removal.

Computerized stent registers involve the urologist filling a form that has appropriate insertion and removal fields. A computerized log is then generated by filling the same in a database. A periodic review then allows the overdue stents to be identified and appropriately managed. Ramsden[4] reported a 4% rate of 'capture' loss if a logbook

system was used, they were able to reduce delayed stent removal from 6% to 3.5% ($p < 0.05$). In 11 of the 18 cases where stent removal was delayed, the cause was failure of the operating urologist to make appropriate entries in the form. Ather[16] also described a similar system with the reduction in incidence of overdue stents being reduced to 1.2% from 12.5%.

While the use of the computerized system did lead to a decrease in the incidence of the overdue stents, the advocates of the next level of stent registers – namely the registers with automated systems, feel that this process needs 'diligent staff'[2,10,12] failing which the whole effort would get negated. Our paper documents the significant additional numbers of entries ensured by the diligence of a formal system where the scrub nurse and the operating room in-charge provide a dual validation to ensuring stent entries.

The computerized systems with automated alerts are similar to computerized stent registers, except that the database is continuously monitored by the software for non-compliances. An email or an SMS is sent to the urologist and the patient reminding of an overdue stent. This process till an appointment is created for the patient and a follow-up visit occurs or stent removal is done. Another component of this system is escalation of the mail to higher level of staff in the clinical hierarchy till appropriate action is taken. Though all this process appears complex, the entire method is incorporated within the electronic patient record system and can be easily made to function using existing software.

Using the method described above, Lynch et al.[2,12] were able to identify 14% of overdue stents. They also described a method to reduce human error in 'capturing' the stent placement event by using the barcodes on the stent packaging. This led to a decrease in the number of stents not captured from 39% to 13%. They also stated that the reason for the failed capture was the unfamiliarity of staff working during odd hours, and believe that adequate training could overcome this issue. Sancaktutar et al.[13] described a system where need for stent removal was verbally discussed with the patients. Despite this, stent removal remained overdue from 3 to 56 days. This is probably the closest to what is commonly practiced in India and has obvious limitations. By introducing a computerized system, they were able to reduce the time to overdue stents to 1.5 days.

The cornerstone in prevention of the 'forgotten' stent is diligent data capture and none of the above methods address this issue adequately. Our system of a dual check on the operating surgeon has helped to bring down the error in capture from a high of 17% in 2014 to 0% in 2019: We believe that the continuous feedback to urologists by the nursing team in case of non-compliance has contributed to this in a large way. This compares well with data capture methods like barcode reading which make data acquisition easier but still lose 13% of stenting events.[2,12] The lack of improvement in the detection rate by the scrub nurse may be explained by our high rate of staff turnover with staff inexperience thwarting improvements. A simultaneous improvement in the performance of the operating room in-charge highlights the need for a second-level check in the system.

While in most other systems the urologist is a solitary, unsupported link in data acquisition, we have reduced data loss by setting up a two-step data validation process; crucially involving the scrub nurse and the operating room in-charge who are part of the patient care.

The visual image of the stenting being done during endoscopic procedures and the short time lapse between the stenting and stent register entry probably contribute to fewer missed entries after endoscopy than other procedures. This comparison has not reported in the literature earlier.

5 | CONCLUSION

The process of putting any of the above-mentioned methods in place will not absolve the urologist of his responsibility when he is faced with the 'forgotten' stent or its complications, but will probably mitigate it to a large extent. A well maintained simple stent register in Microsoft excel with a double validation using other team members will eliminate the chances of a forgotten stent and can be put in place without need for expensive software or additional manpower.

The limitation of this study is that it was done in a single institution and the same process flow may not work in all hospitals. We would encourage the involvement of operating room personal other than the surgeon in maintaining and monitoring the stent registers. These will, however, need to be revalidated in other large organizations.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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REFERENCES

1. Lin K-J, Chen P-C, Fan Y-H, Huang WJS. Preventing forgotten double J ureteral stents in a high-volume service medical center: an autoregistration monitoring system. *J Chin Med Assoc*. 2020;83(4):382-385.
2. Lynch MF, Ghani KR, Frost I, Anson KM. Preventing the forgotten ureteric stent: results from the implementation of an electronic stent register. *BJU Int*. 2007;99(2):245-246.
3. Monga M, Klein E, Castañeda-Zúñiga WR, Thomas R. The forgotten indwelling ureteral stent: a urological dilemma. *J Urol*. 1995;153(6):1817-1819.
4. McCahy PJ, Ramsden PD. A computerized ureteric stent retrieval system. *Br J Urol*. 1996;77(1):147-148.
5. Chew BH, Lange D. Re: ureteral stent encrustation, incrustation, and coloring: morbidity related to indwelling times. *J Endourol*. 2013;27(4):506.
6. Pollard SG, Macfarlane R. Symptoms arising from double-J ureteral stents. *J Urol*. 1988;139(1):37-38.
7. Zahran MH, Harraz AM, Taha D-E, El-Nahas AR, Elshal A, Shokeir AA. Studying the morbidity and renal function outcome of missed internal ureteral stents: a matched pair analysis. *J Endourol*. 2015;29(9):1070-1075.

8. Singh V, Srinivastava A, Kapoor R, Kumar A. Can the complicated forgotten indwelling ureteric stents be lethal? *Int Urol Nephrol*. 2005; 37(3):541-546.
9. Richter S, Ringel A, Shalev M, Nissenkorn I. The indwelling ureteric stent: a "friendly" procedure with unfriendly high morbidity. *BJU Int*. 2000;85(4):408-411.
10. Thomas AZ, Casey RG, Grainger R, McDermott T, Flynn R, Thornhill JA. The forgotten ureteric JJ stent and its prevention: a prospective audit of the value of a ureteric stent logbook. *Ir J Med Sci*. 2007;176(2):117-119.
11. Tang VCY, Gillooly J, Lee EWY, Charig CR. Ureteric stent card register – a 5-year retrospective analysis. *Ann R Coll Surg Engl*. 2008;90(2): 156-159.
12. Lynch MF, Ghani KR, Frost I, Anson KM. Preventing the forgotten ureteral stent: implementation of a web-based stent registry with automatic recall application. *Urology*. 2007;70(3):423-426.
13. Sancaktutar AA, Tepeler A, Söylemez H, et al. A solution for medical and legal problems arising from forgotten ureteral stents: initial results from a reminder short message service (SMS). *Urol Res*. 2012;40(3):253-258.
14. Duty B, Okhunov Z, Okeke Z, Smith A. Medical malpractice in endourology: analysis of closed cases from the state of New York. *J Urol*. 2012;187(2):528-532.
15. Osman NI, Collins GN. Urological litigation in the UK National Health Service (NHS): an analysis of 14 years of successful claims. *BJU Int*. 2011;108(2):162-165.
16. Ather MH, Talati J, Biyabani R. Physician responsibility for removal of implants: the case for a computerized program for tracking overdue double-J stents. *Tech Urol*. 2000;6(3):189-192.

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