



# An automated system to track and remind for timely ureteric stent removal (TRACER)

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## BACKGROUND

- Ureteric stents are commonly used in Urology; the department utilises around 300 – 500 stents a year.
- Stents however require timely removal to prevent complications of encrustation and obstruction. Such forgotten and encrusted stents require ureteroscopic intervention under general anaesthesia, which can be associated with ureteric injury and sepsis.
- The existing stent tracking system is based on manually filled forms managed by a single party, which are rigorously transferred to a REDCap stent registry for consolidation and triggered reminders.

## AIMS

- To develop an automated ureteric stent tracing system (TRACER) to ensure:
  - Comprehensive tracking of every stent inserted within patients.
  - Reliable uploading of tracing data to REDCAP for triggered reminders to clinicians.

## METHODOLOGY AND INTERVENTION

- The project team led the conceptualisation and implementation of the automated stent tracing system TRACER.
- TRACER uses a dual-prong system for stent tracking during each intra-operative insertion of ureteric stent:

- Input of stent used and side via **T-DOC instrument tracking system** by the **nursing team**:

Item	LOT	Last used	Expire date	Supplier/Manu	Remark
1	27335996	03/11/2021 11:5	17/05/2024	Boston Scientil	Left Side
2	27573060	16/11/2021 9:59	27/06/2024	Boston Scientil	
3	27056064	15/11/2021 10:4	28/03/2024	Boston Scientil	

**T-DOC instrument tracking system:** Lot number of the stent, date of use and laterality (left/right side) will be documented by nurses prior to use of each ureteric stent.

- Electronic medical records (EMR)** documented by the **surgical team**.

Summary of Operation	cystoscopy and insertion of left DJ stent
Type of Operation	Medical
Method of Operation	Min. Invasive (MIS)
Findings	stentL
RPG:	left small radioopaque stone at L4, left mild hydronephrosis bladder normal urethra slightly tight, but no stricture prostate not enlarged bilat UO normal

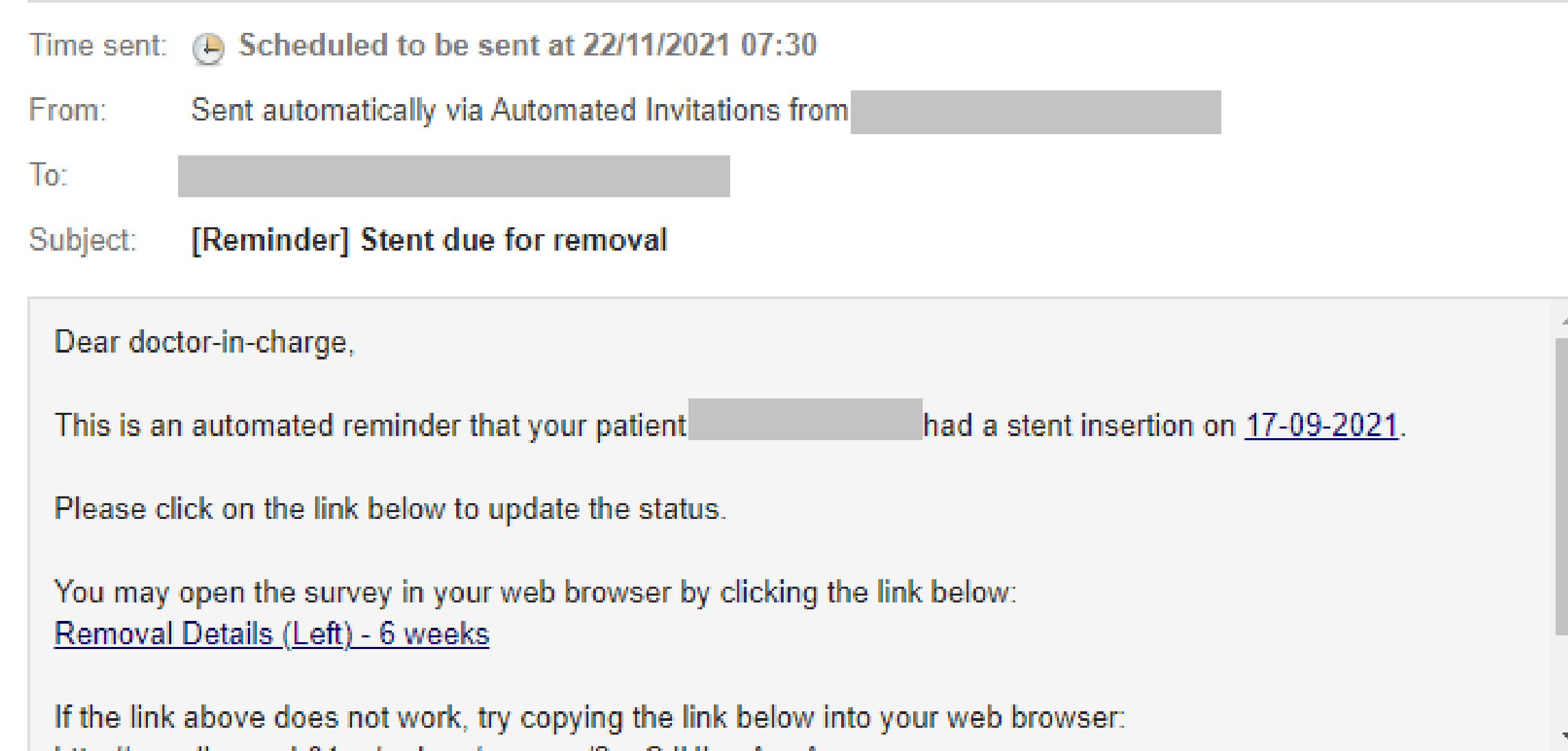
**Electronic Medical Records (EMR):** Maintained by surgeons – documentation of either “StentL”, “StentR”, or “Stent2” triggers registration on the TRACER system as a stent inserted on the left, right and both ureters respectively.

- By having **two independent parties** trigger the tracking system, the **number of potentially missed entries are minimised**.
- The system can be **easily configured** to include new clinicians joining the department, or remove clinicians no longer in the department.
- This data is then uploaded onto REDCAP, which automatically sends an email reminder to the physician if stent removal has not been performed before a defined time period.

- The email reminder is **repetitive**, until data entry for stent removal is completed by the clinician, to further ensure timely removal of stents.

Record ID	Survey Identifier	NRIC	Visit ID	Patient Name	Date of birth	Gender	Race	Data entered by	URO Consultant-in-charge	URO Consultant-in-charge email
1	Insertion				25-08-	Male	Chinese	dr14294h	Palaniappan Sundaram	palaniappan.sundaram@singhealth.com

**REDCAP System:** Each stent inserted is linked to the primary clinician, and email reminders are triggered from this system, based on stent insertion date and date of expected stent removal.



**example of email reminder sent to clinicians:** Stent insertion date and patient's identifiers are sent to ensure timely removal of ureteric stents.

- The TRACER system was piloted in the Urology operating theatre between May and July 2021.
  - The total number of stents tracked with TRACER were compared to the number of urologic procedures on eHINTS involving stent insertion.
  - Manpower required and time spent implementing the TRACER system was compared to the existing system of manually uploading stent data to the REDCap stent registry.

## RESULTS

### 1. ACCURATE TRACKING

- All 135 ureteric stents used accurately tracked** with complete linkage of data between eHINTS and TRACER. 7 stents not accounted for by clinician documentation detected by the algorithm, and surgeons were automatically informed to update the records.
- All stents removed on time**, except 2 patients who were transferred to another hospital for continuation of care.

### 2. MANPOWER SAVINGS

- Time spent for uploading stent data to REDCap per patient shortened from an average of **4 minutes** (when performed manually) to **30 seconds**, equal to an **87.5% savings** in man hours spent tracing stents.

## CONCLUSIONS

- TRACER is a novel automated system with the ability to accurately track and remind clinicians on the status of ureteric stents used during surgery.
- Use of TRACER is associated with significant time and manpower savings.
- Future plans:**
  - TRACER is **scalable to the tracking of all medical implants** besides stents, and its use will soon be implemented in the department of **interventional radiology**.