Bar Code–Based Management to Enhance Efficiency of a Sterile Supply Unit in Singapore

MEH MEH GOH, *RN, BN*; **AGNES B. H. TAN,** *MBBS, FRCS*; **MIKE H. W. LEONG,** *PMP, ITIL*

ABSTRACT

Sterile surgical instruments are essential for successful surgical outcomes. The Singapore General Hospital's Theatre Sterile Supplies Unit (TSSU) has faced many challenges, including increasing demand for instruments and the need to maintain instruments of greater complexity. To address these challenges, stakeholders from key departments at Singapore General Hospital formed a multidisciplinary team to transform operations in the TSSU. The team adopted and implemented the TSSU Instrument Management System (TIMS) in three phases over five years. The project included standardizing instrument-naming conventions, implementing electronic integration of instrument tracking in the unit, extending traceability of instruments to the major ORs, initiating integrated web-based instrument ordering, and extending the system management of instruments at ambulatory surgery and specialized OR facilities. The implementation of TIMS has improved inventory, supply, and quality management; reduced instrument repairs; and led to savings through increased productivity and lower expenses.
AORN J 103 (April 2016) 407-413. © AORN, Inc, 2016. http://dx.doi.org/10.1016/j.aorn.2016.01.018

Key words: *surgical instruments, sterile supplies, information technology system, instrument inventory, supply management.*

Singapore General Hospital (SGH) is a 1,600-bed teaching hospital under the purview of the Singapore Health Services (SingHealth), the largest health care cluster in Singapore. Singapore General Hospital has a total of 38 ORs and more than 30 procedure rooms. Every year, SingHealth performs an average of 200,000 surgical procedures.[1] In addition to supplying sterile instruments to the hospital, the SGH Theatre Sterile Supplies Unit (TSSU) is also responsible for procurement and maintenance of a vast inventory of surgical instruments to support surgical procedures in the hospital and national centers of the same health care cluster.

KEY CHALLENGES

In 2008, SGH TSSU personnel faced an increase in surgical volume, compounded by an increase in the range and types of instruments being used as surgical techniques changed and instruments became increasingly complex. For example, minimally invasive surgery (MIS) became increasingly popular, given its benefits to patients; however, instruments for MIS often require highly specialized maintenance and reprocessing to render them safe for use.[2-4]

The TSSU staff members handle more than 4,000 kinds of instruments, which are used in more than 700 types of procedure sets. Unit personnel were tracking instruments manually with the use of paper forms, and they used different paper forms to request instruments, track instrument movement, and acknowledge the return of instruments after use. They also recorded the composition of instrument sets on paper. This approach resulted in instrument-set errors

http://dx.doi.org/10.1016/j.aorn.2016.01.018

when changes were not updated on time using the different paper forms. The manual, paper-based tracking process also failed to effectively and efficiently track the type and range of instruments in the hospital's inventory. As a result, instrument management and accountability became an issue as TSSU's inventory continued to expand and become more complex.

Inventory losses occurred because instruments could not be traced. Paper-based procurement made tracing instruments difficult, as different personnel were involved in product selection, purchase, and receipt, as well as the addition of new instruments into the sets. To correct these issues, the TSSU team undertook a three-phase project over five years. During the project, the TSSU team initiated various changes that relied on information technology (IT), including purchasing and implementing a new bar code management system, to improve the effectiveness and efficiency of the TSSU.

IDENTIFYING SYSTEM AND PROCESS SOLUTIONS

Any major managerial decision must take into account pros and cons when IT is used for an entire work process. Although the initial investment in a bar code management system is significant, members of the TSSU at SGH made a strong business case for the new system, given its benefits. Specifically, managers postulated that the new system would bring about increased productivity (eg, improved inventory management, streamlined work processes), quality (eg, improved instrument turnaround time, instrument-set completeness), and savings (eg, reduced manpower requirements, reduced loss of inventory).[5] This approach was in line with the recommendations from the Association for the Advancement of Medical Instrumentation (AAMI) for ensuring sterilization efficiency through proper personnel training, infection-control implementation, quality-control improvement, and appropriate documentation.[6]

To reduce the negative effects of implementing a new system, the team planned and carried out a phased migration. The TSSU might have experienced downtime in the event of a system breakdown. To mitigate this risk, the team performed regular preventive maintenance for the system during weekends to ensure optimal system health. Furthermore, as part of the contractual agreement, the system vendor was available around the clock to provide system support in response to any issues that might arise during system operation. Backup instrument bar code labels were prepared so that, in the event of any prolonged system unavailability such as a fire outbreak, the department could readily revert back to processing instruments manually.

DESCRIPTION OF THE PROJECT TEAM AND CHANGES

The TSSU assembled a multidisciplinary project team of 10 members to revamp the operations of the unit. The team included a project sponsor, nurse user champions, and key leaders from multidisciplinary departments including the OR, materials management, informatics, facilities management, and engineering. The project sponsor, who was also a surgeon champion, assisted with the overall management direction for the project. In addition, the team identified nurse user champions to provide user requirements that aligned with business needs and would not compromise the workflow of key stakeholders. The team also contributed to leading and driving project implementation. Key users including perioperative nurses were engaged in developing the project plan and executing the project activities. Other technical-staff members (eg, business process consultants, database administrator, technical specialists) assisted in the business and technical aspects of project implementation.

The project team used a bar code instrument-management system to standardize the TSSU workflow and ensure the traceability of instruments and sets (eg, location, sterilization, repair, storage, surgery history). Standardization eliminates the end-user variation in processing and record keeping that is associated with paper-based systems. The system links processing tools together to track day-to-day functions such as decontamination, assembly, sterilization record keeping, and loading and unloading of equipment.[7] Alerts are automatically issued if there is any deviation from the standard sterilization processes.[8] The new system also identifies each instrument and allows it to be traced, leading to a reduction in sterile-processing time.[7] The visibility of instrument demand and supply means that department personnel may prepare instrument sets before any request is made, thus improving the unit's efficiency.

BAR CODE INSTRUMENT-MANAGEMENT SYSTEM

The bar code instrument-management system, which the team called the *TSSU Instrument Management System* (TIMS), was adopted to automate the tracking of instruments.[9] The default bar code format used by the system was interleaved two of five (ITF), which is a continuous two-width bar code symbol with encoded digits.[9] The ITF format was used to generate unique serial numbers for the