

Building a Smarter Hospital: HOW RFID CAN RELIABLY ELIMINATE RETAINED SURGICAL ITEMS LEFT IN PATIENTS AFTER SURGERY

“NEVER EVER” EVENTS

Since there has been human surgery, surgical items have been left in patients following the operation. Known as retained surgical items (RSI), these events have been reported globally, with surgical items left in practically every body cavity after every type of surgery.^{i,ii} These types of events are not hard to imagine given the sheer complexity of surgeries, with multiple surgeons and several nurses in the operating room at one time. This is especially true for patients with a high body mass index (BMI) and emergency surgeries where timing is critical.

Despite popular belief, and despite being referred to as “never ever” eventsⁱⁱⁱ, surgical items left in patients after surgery is a major problem in hospitals around the world. RSI events have been estimated to occur at a rate of approximately 1 in 8,000 to 18,000 of all in-patient operations.^{iv,v} This brings the number of US cases, in which surgical items are left in the patient following a procedure, to approximately 2,000-4,000 cases per year.^{viii} Another study estimated that retained surgical sponges occur in roughly a dozen patients a day in the U.S.^{viii} However, the incidence could be much higher, as items may not resurface for years.

Although retained items can be instruments or tools, the most common surgical item left in patients is sponges. This is likely because surgical sponges are used extensively during operations.^{ix} Surgical items, such as a sponge, may seem benign if left within a patient. But these items can have potentially harmful and life threatening consequences for the patient. Furthermore, RSI events typically require another operation in order to remove the item.^x

THE STAGGERING COST OF RSI EVENTS

RSI events have dire consequences, both medically and legally. RSI that are left in patients after surgery can cause physical harm, such as pain and infection. Although the consequences of RSI may manifest immediately after the operation, sometimes the consequences are not evident for months or even years following the operation. Patients may report pain and discomfort months or years after their procedure, especially in those cases where sponges were left behind. Even in patients who do not experience any discomfort and the item is inadvertently discovered, a second surgery, which would have been otherwise unnecessary, is now required.

In addition to patient suffering, hospitals are also afflicted by RSI events through lawsuits. Even if there is no overt harm to the patient (such as illness or infection), compensation may still be awarded. Patients

Retained Surgical Items (RSI)

who have been the victim of an RSI event have been awarded anywhere from \$37,041 to \$2,350,000 per incident, with an average cost per case estimated at \$95,000.^{xi} The Pennsylvania Patient Safety Authority estimated that the average total cost of care related to an RSI event is \$166,000.^{xii} This cost includes legal and surgical costs not reimbursed by the Centers for Medicare & Medicaid Services. Another study estimated the medical and liability costs to be approximately \$200,000 or more per case.^{xiii} On top of litigation costs, the hospital's reputation can also be heavily damaged for many years after the incident.

With the cost of error being so high, for both the patient and the hospital, it is imperative that effective guidelines and protocols be developed and implemented. Furthermore, hospitals and organizations must continually re-evaluate their strategies and constantly seek better ways of preventing these events.

PREVENTING RSI EVENTS

Broadly speaking, many RSI events occur when there is a miscommunication between the surgical staff. Typically this is when an incorrect “surgical count” occurs – that is, when all the items counted at the beginning of the operation are accounted for at the end of the operation. However, approximately 88% of RSI events had *correct* surgical counts at the end of the operation.^{xiv} This occurs because manual counting is prone to human error and counting items in a high-stress environment can be extremely difficult.

RSI cases are so prevalent in the US and around the world, numerous initiatives have been organized in order to alleviate this pervasive problem. The most notable being the “NoThing Left Behind” patient safety initiative. Started by a physician in 2004, the “NoThing Left Behind” initiative seeks to understand why surgical items are being left in patients and to develop protocols and best practices, by working directly with hospitals and health centers, to ensure RSI events become “never events”.

Additionally, hospitals have voluntarily developed their own protocols and best practices in order to eliminate RSI events. Below is a list of professional organizations that have recognized RSI events as a major problem in the healthcare system and have taken action to correct it^{xv}:

- [American College of Surgeons: ST-51 Statement on the prevention of retained foreign bodies after surgery](#)
- American Society for Healthcare Risk Management: Healthcare Risk Management Solutions for Top Reported Sentinel Events, [Tip 4: Count to Protect Against Foreign Bodies Left In Patients After Surgery](#)
- Association of PeriOperative Registered Nurses (AORN): [Recommended practices for prevention of retained surgical items](#)
- [Joint Commission Sentinel Event Alert 51](#)
- [Massachusetts Coalition for Prevention of Medical Errors](#)
- [NoThing Left Behind®: A National Surgical Patient-Safety Project to Prevent Retained Surgical Items](#)
- Society of Interventional Radiology Position Statement: [Prevention of Unintentionally Retained Foreign Bodies during Interventional Radiology](#) (PDF)

Retained Surgical Items (RSI)

In spite of the numerous protocols in place, RSI events still occur. Most hospital staff underestimate the chance that they will be involved in an RSI event (i.e., the “it won’t happen to me” mentality) and also fail to realize that manual counting practices are not sufficient or reliable. It is evident that greater measures are needed in order to end these “never ever” events, which is why many hospitals are looking to technology, specifically radio frequency identification (RFID) technology.

BENEFITS OF RFID-ENABLED SURGICAL ITEMS

More often than not, when RSI are left in patients, the manual item count completed after the surgery matched the surgical count at the beginning of the surgery – referred to as a “false correct count”. For example, Brigham and Women’s Hospital reported that 41% of count discrepancies are due to human error.^{xvi} This shocking statistic further affirms that manual counting is an ineffective method of preventing RSI events. Fortunately, RFID technology has allowed hospitals to adopt a “counting” method that is free of human error, effortless, and can be completed in seconds.

RFID-enabled surgical items are quickly becoming the standard-of-care in many operating rooms. When equipped with tiny RFID tags, surgical items can be accurately accounted for very quickly. For example, a nurse can know within seconds how many soiled surgical sponges are located in a wastebasket. This could eliminate error-prone and time-consuming manual counts done by nurses multiple times during the course of a surgery, or eliminate costly and time-consuming X-rays that are done after surgery when there is an incongruent surgical count. This not only saves time, but it saves lives.

Benefits of Using RFID in the Surgical Suite

RFID-enabled surgical items are part of a larger RFID system that allows specific items to be tracked in the surgical suite. Each instrument (e.g., sponge, scalpel, etc.) is labeled with a small RFID tag that contains basic information about the item. These items are then read by a reader that is part of a cabinet, cart, or basket. Readers can also be in the form of a wand-type instrument that allows hospital personnel to scan bodies and specific areas. RFID-enabled surgical items provide significant benefits, such as:

- **REDUCTION OF HUMAN ERROR:** Unlike human eyes, no line of sight is necessary when tracking RFID-tagged items. That means that even if an item is not in direct contact of the RFID reader, it will still be counted.
 - **UNIQUE IDENTIFIER:** Each RFID tag uniquely identifies that particular item. So, for example, a pile of sponges that appear the same to the human eye, can each have a unique identifier. This eliminates the same item being counted twice.
- **TIME SAVINGS:** Manual counting requires time – especially if it’s done thoroughly and at multiple points during the surgical appointment. With RFID, hundreds of items can be accurately counted in seconds. This eliminates human error and allows hospital staff to spend their time on direct patient care.

Retained Surgical Items (RSI)

- **NO HARMFUL X-RAYS:** If a surgical item is suspected to be left inside the patient following surgery, that patient is typically brought in for an X-ray. This is expensive and potentially dangerous, as radiation exposure has shown to be problematic in humans.

These benefits make RFID technology an essential tool in the surgical suite, as it negates human error. RFID-enabled surgical items can provide immediate ROI with a minimal investment of time and IT resources, preventing these life-threatening and costly “never ever” events. This is why hospitals across the globe are adopting RFID-enabled equipment and instruments in order to increase both operational efficiency and patient safety.

CONCLUSION

Despite best efforts to prevent RSI events, they remain a persistent problem with costly implications to both the patient and the hospital. In most cases, inaccurate surgical counts of supplies are conducted at the end of the procedure, leaving the patient with an unknown fate that could resurface that night or years later. Although protocols and strategies have been implemented in hospitals across the globe, these manual processes are ineffective and extremely time consuming, sometimes occupying 14% of operative time.^{xvii} Operating rooms are extremely expensive to run, so every minute saved adds value.

Every year, thousands of patients are needlessly harmed or killed by RSI events. These events are completely preventable when traditional methods are partnered with modern technology. RFID-enabled surgical items allow real-time verification of manual counts. From scissors to sponges, small RFID tags placed on items can reduce the risk of RSI events and provide peace of mind to the patient undergoing surgery. RFID provides item-level accountability so hospitals can quickly and accurately account for all items used in surgery, ensuring that nothing is left behind.

A TRUSTED RFID PARTNER

Medical device engineers looking to embed RFID technologies into their equipment can benefit by partnering with companies that have deep RFID engineering expertise. Many suppliers can offer a wide variety of RFID products to choose from but, unlike most data collection manufacturers, JADAK has one of the broadest RFID product portfolios in the industry, backed by engineers with the resources and technical expertise to help OEMs implement solutions to meet their specific needs and requirements.

JADAK's deep knowledge of RFID, particularly in the medical industry, makes them uniquely positioned to solve many different types of challenges. By embedding RFID technology into new and existing products, OEMs can now gain the product differentiation and competitive advantage that RFID-enabled features and functions impart, while at the same time protecting revenue streams and brand integrity.

Retained Surgical Items (RSI)

In addition to surgical products, JADAK RFID solutions are engineered for applications such as smart medical cabinets and carts, equipment tracking, sterilization tracking, access control, patient monitoring, sample tracking, and more. To learn more about JADAK's full line of HF/UHF RFID products and services, contact them at 315-701-0678 or info@jadaktech.com.

ABOUT JADAK:

JADAK, a business unit of Novanta, is a market leader in machine vision, RFID, barcode, printing, and color and light measurement products and services for original equipment manufacturers. The company designs and manufactures embedded detection and analysis solutions that help customers solve unique inspection, tracking, scanning and documenting challenges. The company is ISO 9001 and ISO 13485 registered.

Novanta is a trusted technology partner to OEMs in the medical and advanced industrial technology markets, with deep proprietary expertise in photonics, vision and precision motion technologies.

ThingMagic is JADAK's RFID line of products and services.

www.jadaktech.com

Retained Surgical Items (RSI)

ENDNOTES:

- ⁱ Gibbs VC ; Coakley FD ; Reines HD. Preventable errors in the operating room: retained foreign bodies after surgery-- part I. *Curr Probl Surg*. 2007; 44: 281-337.
- ⁱⁱ Zantvoord Y, van der Weiden RF, van Hooff MH (2008) Transmural migration of retained surgical sponges: a systematic review. *Obstet Gynecol Surv* 633:465–471.
- ⁱⁱⁱ Hariharan, D, and DN Lobo. "Retained Surgical Sponges, Needles and Instruments." *Annals of The Royal College of Surgeons of England* 95.2 (2013): 87–92.
- ^{iv} Hyslop JW and Maull KI. Natural history of the retained surgical sponge. *South Med J*. 1982; 75: 657–660.
- ^v Patterson P. Preventing retained surgical items: what role does technology play? *OR Manager*. 2009; 25: 8–11
- ^{vi} Gawande, AA, Studdert DM, Orav EJ, Brennan TA, Zinner MJ. Risk factors for retained instruments and sponges after surgery. *New England Journal of Medicine*. 2003; 348(3):229–35. <https://doi.org/10.1056/NEJMsa021721>.
- ^{vii} "NoThing Left Behind" website (2010) <http://www.nothingleftbehind.org> . Accessed 16 Apr 2018.
- ^{viii} Eisler, P. "What Surgeons Leave Behind Costs Some Patients Dearly." *USA TODAY*. March 8, 2013.
- ^{ix} Lincourt AE, Harrell A, Cristiano J, Sechrist C, Kercher K, Heniford BT. Retained foreign bodies after surgery. *J Surg Res*. 2007; 138(2):170–4. <https://doi.org/10.1016/j.jss.2006.08.001>.
- ^x Jason RS, Chisolm A, Lubetsky HW. Retained Surgical Sponge Simulating a Pancreatic Mass. *Journal of the National Medical Association*. 1979;71(5):501-503.
- ^{xi} Hariharan, D, and DN Lobo. "Retained Surgical Sponges, Needles and Instruments." *Annals of the Royal College of Surgeons of England* 95.2 (2013): 87–92.
- ^{xii} Beyond the count: preventing retention of foreign objects. *Pennsylvania Patient Safety Advisory*, June 2009; 6(2):39-45.
- ^{xiii} Regenbogen SE, Greenberg CC, Resch SC, et al. Prevention of retained surgical sponges: a decision-analytic model predicting relative cost-effectiveness. *Surgery*. 2009; 145(5):527-535. doi:10.1016/j.surg.2009.01.011.
- ^{xiv} Gawande, AA, Studdert DM, Orav EJ, Brennan TA, Zinner MJ. Risk factors for retained instruments and sponges after surgery. *New England Journal of Medicine*. 2003; 348(3):229–35. <https://doi.org/10.1056/NEJMsa021721>.
- ^{xv} AORN (Association of perioperative Registered Nurses) Website. <https://www.aorn.org/education/staff-development/prevention-of-sentinel-events/retained-surgical-items> Accessed 16 Apr 2018
- ^{xvi} Greenberg, C et al. "The Frequency and Significance of Discrepancies in the Surgical Count." *Annals of Surgery*. 248:2. (Aug. 2008): 337-41.
- ^{xvii} Christian CK, Gustafson ML, Roth EM *et al* A prospective study of patient safety in the operating room. *Surgery* 2006; 139: 159–173.



JADAK
A Novanta Company

USA Office

phone:+1 315.701.0678
email: info@jadaktech.com
web: jadaktech.com

European Office

phone:+31 (0)76.522.5588

Asia Pacific Office

phone: +86 512.6283.7080

