REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
1	Steelman VM, Graling PR, Perkhounkova Y. Priority patient safety issues identified by perioperative nurses. AORN J. 2013;97(4):402-418. Accessed 20130327.	Nonexperimental	37,022 members, 3,137 usable completed surveys	n/a	n/a	Perioperative patient safety issues	61% of perioperative nurses identified the prevention of RSIs as one of the top priorities for perioperative patient safety.	IIIA
2	Kohn LT, Corrigan J, Donaldson MS, To err is human: building a safer health system. National Academy Press; 2000.	Consensus	n/a	n/a	n/a	n/a	Avoiding injuries from care that is intended to help patients was identified by the Institute of Medicine as one of six goals to achieve a better health care system.	IVA
3	Most Commonly Reviewed Sentinel Event Types. 2021. https://www.jointcommission.org/-/media/tjc/documents/resources/patient-safety-topics/sentinel-event/most-frequently-reviewed-event-types-2020.pdf.	Expert Opinion	n/a	n/a	n/a	n/a	Unintentionally retained items are one of the most common sentinel events reported to the Joint Commission.	VB
4	Gawande AA, Studdert DM, Orav EJ, Brennan TA, Zinner MJ. Risk factors for retained instruments and sponges after surgery. N Engl J Med. 2003;348(3):229-235. doi:10.1056/NEJMsa021721 [doi].	Nonexperimental	54 patients with 61 RSI, 235 controls	n/a	Cases matched to 4 random controls who underwent the same type of operation during the same 6-month period	Emergency procedure, unexpected change in procedure, >1 surgical team, change in nursing staff during procedure, BMI, est. volume of blood loss, counts of sponges and instruments performed, female sex	The risk of a retained sponge or instrument significantly increases in emergencies, with unplanned changes in procedure, and with higher BMI. Cases reviewed were reported from 1985-2001.	IIIA
5	Inaba K., Okoye O., Aksoy H., et al. The role of radio frequency detection system embedded surgical sponges in preventing retained surgical sponges: A prospective evaluation in patients undergoing emergency surgery. Ann Surg. 2016;264(4):599-604. http://journals.lww.com/annalsofsurgery/pages/default.aspx; http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emed17&NEWS=N&AN=611321271. doi: http://dx.doi.org/10.1097/SLA.0000000000001872.	Nonexperimental	2051 patients that had 2148 emergent trauma or nontrauma cavitary procedures using surgical sponges embedded with a radiofrequency detection system	n/a	Postoperative radiographic imaging was used as an internal control.	Rate of retained sponges	There were no retained sponges in the study period. All radiographic films taken after surgical closure were negative for all forms of RSIs. The technology reported 11 near-miss events. The sponge count when performed was not correct 36.4% of the time. Researchers recommend use of a radiofrequency detection system to prevent RSIs during emergent procedures. Cost data included.	IIIB
6	Rabie M.E., Hosni M.H., Al Safty A., Al Jarallah M., Ghaleb F.H. Gossypiboma revisited: A never ending issue. Int J Surg Case Rep. 2016;19:87-91. http://www.elsevier.com/wps/find/journaldescription.cws_home/723449/description#description; http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emed17&NEWS=N&AN=607377694. doi:http://dx.doi.org/10.1016/j.ijscr.2015.12.032.	Case Report	n/a	n/a	n/a	n/a	Case report of three instances of retained sponges after a cesarean section delivery procedure. All three patients had a second procedure. One patient required a colectomy. Supports use of adjunct technology in addition to counting processes.	VB
7	Cherara L, Sculli GL, Paull DE, Mazzia L, Neily J, Mills PD. Retained Guidewires in the Veterans Health Administration: Getting to the Root of the Problem. J Patient Saf. 2018. doi:https://dx.doi.org/10.1097/PTS.0000000000000475.	Nonexperimental	101 incidences of retained guidewires	n/a	n/a	Risk factors, contributing factors, and time to diagnosis.	Common root causes included lack of a checklist, distractions, inexperience, and lack of standardization. Human factors interventions such as checklist and devices that force the individual inserting the device to look for the guidewire before completing the procedure were recommended.	IIIA

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
8	Cima RR, Kollengode A, Garnatz J, Storsveen A, Weisbrod C, Deschamps C. Incidence and Characteristics of Potential and Actual Retained Foreign Object Events in Surgical Patients. J Am Coll Surg. 2008;207(1):80-87. https://doi.org/10.1016/j.jamcollsurg.2007.12.047. doi:10.1016/j.jamcollsurg.2007.12.047.	Nonexperimental	34 near miss, 34 retained foreign objects	n/a	n/a	Retained foreign objects identified on postoperative imaging and near misses	Cases reviewed were from 2003-2006. May have more RSI cases than expected at a facility that performs routine postoperative imaging for all operative procedures. 21/34 (62%) of RSIs had a correct count but were found on routine imaging. Adjunct technology is warranted to achieve reliable counts.	IIIB
9	Birolini DV, Rasslan S, Utiyama EM. Unintentionally retained foreign bodies after surgical procedures. Analysis of 4547 cases. Revista do Colégio Brasileiro de Cirurgiões. 2016;43:12-17.	Nonexperimental	2872 Survey responses from Brazilian surgeons regarding their experiences with RSIs	n/a	n/a	Prevalence and factors related to RSIs	Responses indicated that 43% of surgeons had left in an RSI and 73% had removed an RSI on one or more occasions. Most RSIs were soft goods and were discovered in the first year. Only 14% were asymptomatic. Elective and routine procedures were commonly mentioned. Reasons for the RSIs were emergency procedures, lack of counting, and inadequate work conditions. Only 54% of surgeons notified their patients about the RSI and of those 26% initiated law suits against the surgeon, institution, or both.	IIIC
10	Wallace SC. Retained Surgical Items: Events and Guidelines Revisited. PENN PATIENT SAF ADVIS. 2017;14(1):27-35. http://patientsafety.pa.gov/ADVISORIES/Pages/201703_RSI.aspx.	Expert Opinion	n/a	n/a	n/a	n/a	The different criteria between accreditation bodies lead to 16 additional RSI based on The Joint Commission definition compared to ethe National Quality Forum definition.	VB
11	Mehtsun Winta T, Ibrahim Andrew M, Diener-West Marie, Pronovost Peter J, Makary Martin A. Surgical never events in the United States. Surgery. 2013;153(4): 465-472.	Nonexperimental	9,744 paid malpractice claims	n/a	n/a	Payment amounts, patient outcomes, and provider characteristics	Estimated the cost of malpractice payments for a surgical retained foreign body to range from $51 to $3,988,829, with a mean of $86,247 and median of $33,953.	IIIB
12	Hempel S, Maggard-Gibbons M, Nguyen DK, et al. Wrong-Site Surgery, Retained Surgical Items, and Surgical Fires : A Systematic Review of Surgical Never Events. JAMA Surg. 2015;. doi:10.1001/jamasurg.2015.0301 [doi].	Systematic Review w/ Meta-Analysis	n/a	n/a	n/a	n/a	RSI occurs in 1:10,000 surgeries.	IIIB
13	Moffatt-Bruce SD, Cook CH, Steinberg SM, Stawicki SP. Risk factors for retained surgical items: a meta-analysis and proposed risk stratification system. 2014.	Systematic Review w/ Meta-Analysis	Included 3 studies, Lincourt, Gawande, and Stawicki	n/a	n/a	n/a	7 elevated risk factors for RSI in pooled data in case-control studies: Estimated intraoperative blood loss >500mL, incorrect surgical count, more than one subprocedure, more than one surgical team*, operative time, surgical count not performed*, and unexpected intraoperative factors*. (*p=0.001) There was not a statistically significant RSI risk with the following factors: BMI, emergency procedure, changes in nursing staff, operating after hours, and presence of surgical trainee. Recommend use of risk stratification for prevention methods.	IIIA

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
14	Chen Q, Rosen AK, Cevasco M, Shin M, Itani KM, Borzecki AM. Detecting patient safety indicators: How valid is "foreign body left during procedure" in the Veterans Health Administration?. J Am Coll Surg. 2011;212(6):977-983. Accessed 20110530.	Nonexperimental	93 cases flagged as PSI 5	n/a	n/a	Cases flagged as AHRQ's Patient Safety Indicator (PSI) 5, "foreign body left during procedure"	RSI cases found by AHRQ PSI 5 measure and corresponding ICD-9-CM codes. PSI 5 had a positive predictive value of 45% for identifying RSI, and included both medical and surgical procedures. Sponges were the most commonly retained item.	IIIB
15	Steelman V.M., Shaw C., Shine L., Hardy-Fairbanks A.J. Retained surgical sponges: A descriptive study of 319 occurrences and contributing factors from 2012 to 2017. Patient Saf Surg. 2018;12(1):20. http://www.pssjournal.com/; http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emed19&NEWS=N&AN=622786052. doi: http://dx.doi.org/10.1186/s13037-018-0166-0.	Nonexperimental	319 retained surgical soft goods	n/a	n/a	Rate of retained surgical soft goods, type retained, location of retainment, contributing factors, harm, and accuracy of counting practices.	The rate of surgical soft good retainment over a 5-year period voluntarily reported to the Joint Commission was 319. In incidents of retained soft goods, when a count was performed (77.4%) it was reported as correct 80.6% of the time. The correct use of low-frequency radiofrequency may have prevented up to 97.2% of the retained soft goods in the study, if it had been used.	IIIA
16	Tammelleo AD. Surgeon attempts to blame nurses for sponge left in mastectomy patient: Mitchell v. Baylor Univ. Med. Ctr., 2003 WL 21508493 S.W.3d -TX. NURS LAW REGAN REP. 2003;44(3):2]-2]. http://search.ebscohost.com/login.aspx?direct=true&db=ccm&AN=106686635&site=ehost-live&scope=site.	Case Report	n/a	n/a	n/a	n/a	Patient had a sponge left behind after a mastectomy and breast reconstruction procedure. Upon removal the sponge was not sent to pathology causing a question about whether it really occurred. The surgeon from the initial procedure stated that he did not have control over the nurses sponge count and had to rely on the count outcome unless it was not reconciled. The court did not issue a settlement because there was a lack of evidence about whether the sponge existed. The court also rejected the original surgeon's contention that he had no control over the RN sponge count.	VC
17	Sponge Left in Pt. - Dr. Settled: Hospital Sued for OR Nurses' Negligence. NURS LAW REGAN REP. 2012;53(7):1-1. http://search.ebscohost.com/login.aspx?direct=true&db=ccm&AN=85131798&site=ehost-live&scope=site.	Case Report	n/a	n/a	n/a	n/a	Patient has a sponge left after a hysterectomy. After discovery it requires a intestinal resection. The case went to trial twice and was ultimately awarded $65,968 for medical expenses, $2 million for past and future pain and suffering and $500,00 to her husband for loss of consortium.	VC
18	Tammelleo AD. Sponge left in patient's leg: infection & amputation result. NURS LAW REGAN REP. 2006;47(7):1]-1]. http://search.ebscohost.com/login.aspx?direct=true&db=ccm&AN=106253219&site=ehost-live&scope=site.	Case Report	n/a	n/a	n/a	n/a	Sponge was retained in the backside of a patient's knee after vascular surgery for an arterial bypass graft. Infection, gangrene and amputation result.	VC
19	Tammelleo AD. Sponge left in pt.: did required surgery delay treatment and cause death? NURS LAW REGAN REP. 2004;45(1):1-1. http://search.ebscohost.com/login.aspx?direct=true&db=ccm&AN=106556205&site=ehost-live&scope=site.	Case Report	n/a	n/a	n/a	n/a	Sponge was retained after a hysterectomy procedure performed for cancer. A second procedure was necessary to remove the sponge and complications from the second procedure resulted in delay of planned cancer treatments. A law suit was filed after the patient's death.	VC

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
20	Sponge Left in Pt. Who Sued 'After Limitations' but Right After 'Discovery' CASE ON POINT: Stone v. Coronado, 03-11-00243-CV TXCA3 (6/6/2012)-TX. NURS LAW REGAN REP. 2012;53(4):4-4. http://search.ebscohost.com/login.aspx?direct=true&db=ccm&AN=82180597&site=ehost-live&scope=site.	Case Report	n/a	n/a	n/a	n/a	Patient had a sponge left inside her abdomen after a c-section and hysterectomy procedure. The patient experienced lower abdominal pain and tenderness. No settlements occurred as the statue of limitations had run out.	VC
21	Cohen A, Lui H, Zheng M, et al. Rates of Serious Surgical Errors in California and Plans to Prevent Recurrence. JAMA netw open. 2021;4(5):e217058.	Nonexperimental	142 California Department of Public Health administrative penalty reports from over a 10 year period from 2007 to 2017.	n/a	n/a	Rates, consequences, and improvement plans	RSIs comprised 94 of 142 events (66.2%). 60.6% of RSIs were soft goods. Other retained items included parts of larger instruments (13.8%), clamps (8.5%), retractors (5.3%), wires (5.3%), and other (6.4%)(eg, bottles, drain caps, or cups). Revision or adoption of a checklist was the most recommended strategy. Other strategies included announcements of items placed in the body, announcements of the end of a count, written records of instrument counts, TeamSTEPPS training, use of adjunct technology, and use of a visual whiteboard.	IIIA
22	Soncrant C., Mills P.D., Neily J., Paull D.E., Hemphill R.R. Root Cause Analyses of Reported Adverse Events Occurring During Gastrointestinal Scope and Tube Placement Procedures in the Veterans Health Association. J Patient Saf. 2020;16(1):41-46. http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emexb&NEWS=N&AN=631030604. doi:http://dx.doi.org/10.1097/PTS.0000000000000236.	Nonexperimental	27 adverse event reports from gastrointestinal scope and tube placements in the Veterans Health Administration between January 2010 and June 2012.	n/a	n/a	Types of adverse events and associated harm	Of the 27 root cause analysis events reviewed RSIs were ~1/3. The items retained included instrument or instrument fragments, caps from rectal tube placements, and a sponge. Contributing factors for the RCAs included lack of standardized process and communication issues.	IIIA
23	Thiels CA, Lal TM, Nienow JM, et al. Surgical never events and contributing human factors. Surgery. 2015;158(2):515-21. doi: https://dx.doi.org/10.1016/j.surg.2015.03.053.	Organizational Experience	1.5 million procedures	n/a	n/a	n/a	Found a total of 628 human factors associated with 69 never events. Cognitive factors contributed to about half of the events. Retained items and wrong implants had more contributing factors per event than others. There were 2 cases of retained sponges despite a sponge detection system in place.	VB
24	Gibbs VC. Thinking in three's: changing surgical patient safety practices in the complex modern operating room. World Journal of Gastroenterology. 2012;18(46):6712-6719.	Expert Opinion	n/a	n/a	n/a	n/a	Described RSI prevention strategies.	VB

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
25	Lincourt AE, Harrell A, Cristiano J, Sechrist C, Kercher K, Heniford BT. Retained foreign bodies after surgery. J Surg Res. 2007;138(2):170-174.	Nonexperimental	30 cases, 131 control	n/a	Cases matched to at least 4 random controls who underwent the same type of operation during the same time period	Incorrect count recorded, total number of major procedures, multiple surgical teams, unexpected change in procedure, OR time, OR procedure performed after 5pm, and emergency procedure.	RSI was associated with multiple major surgical procedures being performed at the same time and an incorrect instrument or sponge count. Cases reviewed were from 1996-2005.	IIIB
26	Tammelleo AD. Nursing law case on point. Foreign object left in bypass pt.: why wasn't dr. responsible? NURS LAW REGAN REP. 2004;44(8):4-4. http://search.ebscohost.com/login.aspx?direct=true&db=ccm&AN=106771652&site=ehost-live&scope=site.	Case Report	n/a	n/a	n/a	n/a	A babcock clamp was retained after a procedure.	VC
27	Blade left in pt.: why didn't nurses notice bladeless scalpel? NURS LAW REGAN REP. 2009;50(4):1-1.	Case Report	n/a	n/a	n/a	n/a	Broken #11 blade left in patient after an arthroscopic procedure. Patient required reoperation and had persistent knee pain and limited mobility.	VC
28	Dr. allowed to testify as expert on nursing: was this error? NURS LAW REGAN REP. 2008;49(4):1-1.	Case Report	n/a	n/a	n/a	n/a	Intrauterine pressure catheter fragment left in patient after a non-emergent c-section procedure. It was found protruding from her vaginal wall. The hospital settled but the amount was not listed. Discussion about accounting for and inspection of items used during the procedure.	VC
29	Egorova NN, Moskowitz A, Gelijns A, et al. Managing the prevention of retained surgical instruments: what is the value of counting? Ann Surg. 2008;247(1):13-18.	Nonexperimental	153,263 operations	n/a	n/a	Count discrepancies	Retained items occurred more frequently in discrepant cases (one in 70) compared to all cases (one in 7,000). Sensitivity of counting was 77.2% and the specificity was 99.2%, but the positive predictive value was only 1.6%.	IIIA
30	Walter WR, Amis ES, Sprayregen S, Haramati LB. Intraoperative radiography for evaluation of surgical miscounts. J Am Coll Radiol. 2015;12(8):824-9. doi:https://dx.doi.org/10.1016/j.jacr.2015.03.005.	Nonexperimental	180 intraoperative radiographs for 183 miscounted items reviewed by 3 board-certified radiologists	n/a	n/a	Patient and surgery characteristics, type of surgery, complications, and item type.	Incidence of miscounts was 0.88% (183 or 20,820 procedures). Only 9% of miscounts were resolved. There were a few cases of false-negative intraoperative radiographs for suture needles. The false-negative rate of intraoperative radiography was 44% (4 of 9), however, it could be higher because 25% of miscount incidence had not follow up imaging. Suture needles were the most likely to be miscounted and retained. Intraoperative radiography was prone to false-negative results especially for small items like suture needles. Intraoperative radiography for a miscount involving small needles may be unnecessary.	IIIA

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
31	Arikan S, Kocakusak A. Retained Textile Foreign Bodies: Experience of 27 Years. Acta Med Port. 2015;28(4):494-500.	Nonexperimental	14 patients with retained sponges	n/a	n/a	Patient characteristics, time to diagnosis, treatment, and complications	Locations included the abdomen, inguinal wound, thyroidectomy neck wound, and bilateral axillary wounds in one patient. Symptoms and the mean time to diagnosis were described.	IIIB
32	Tammelleo AD. Gauze pad left in pt. during reversal of tubal ligation surgery. NURS LAW REGAN REP. 2004;45(7):4-4. http://search.ebscohost.com/login.aspx?direct=true&db=ccm&AN=106596643&site=ehost-live&scope=site.	Case Report	n/a	n/a	n/a	n/a	Patient had a kerlix pad retained after a procedure. The pad was not radiopaque or included in the count. The nurse may not have been informed about the placement of the pad.	VC
33	Wan W, Le T, Riskin L, Macario A. Improving safety in the operating room: a systematic literature review of retained surgical sponges. Curr Opin Anaesthesiol. 2009;22(2):207-14. http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=med7&NEWS=N&AN=19390247. doi:https://dx.doi.org/10.1097/ACO.0b013e328324f82d.	Literature Review	254 Gossypiboma	n/a	n/a	Retained surgical sponges	Systematic review of case reports. Gossypibomas most common in the abdomen, pelvis, and thorax. Complications included adhesion, abscess, and fistula. Average discovery time 6.9 years. Most cases occurred with a correct count.	VA
34	Zantvoord Y, van der Weiden RM,van Hooff MH,. Transmural migration of retained surgical sponges: a systematic review. Obstet Gynecol Surv. 2008;63(7):465-71.	Case Report	64 cases of transmural migration	n/a	n/a	Transmural migration of retained surgical sponges	Although retained surgical sponges may migrate transmurally and be expelled through the rectum spontaneously, 93% of cases required an intervention for removal.	VB
35	Patial T, Rathore N, Thakur A, Thakur D, Sharma K. Transmigration of a retained surgical sponge: a case report. Patient Saf Surg. 2018;12:21-018-0168-y. eCollection 2018. doi:10.1186/s13037-018-0168-y [doi].	Case Report	n/a	n/a	n/a	n/a	Transmigration of a surgical sponge into the small bowel after exploratory laparotomy for sterilization and subsequent re-canalization.	VB
36	Caetano FB, Duarte AF, Chahud F, Cintra MB, Cruz AAVE. Intraconal gauze mass: An unusual complication of orbital fracture repair - a case report. Orbit. 2018;37(2):91-93. doi:https://dx.doi.org/10.1080/01676830.2017.1383455.	Case Report	n/a	n/a	n/a	n/a	12 year old had a retained sponge after repair of an orbital blowout fracture 11 months prior.	VC
37	Mulay K., Sharma V., Honavar S.G. Forget Me Not: A Case of Gossypiboma (Textiloma) Mimicking an Orbital Tumor. Ophthalmic Plastic Reconstr Surg. 2016;32(1):e5-e7. http://journals.lww.com/op-rs; http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emed17&NEWS=N&AN=607801473. doi:http://dx.doi.org/10.1097/IOP.0000000000000406.	Case Report	n/a	n/a	n/a	n/a	Sponge removed from left orbit 11 months after proceeding surgery.	VC
38	Park CM, Choi KY, Heo SJ, Kim J. Unilateral otitis media with effusion caused by retained surgical gauze as an unintended iatrogenic complication of orthognathic surgery: case report. Br J Oral Maxillofac Surg. 2014;52(7):e39-40. doi:https://dx.doi.org/10.1016/j.bjoms.2014.04.014.	Case Report	n/a	n/a	n/a	n/a	Gauze sponge retained in left eustation tube and migrated to nasopharynx.	VC

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
39	Tsukamoto M., Hirokawa J., Yokoyama T. Retained Foreign Body in the Nasal Cavity After Oral Maxillofacial Surgery. Anesth Prog. 2018;65(2):111-112. http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emexb&NEWS=N&AN=628895081. doi:http://dx.doi.org/10.2344/anpr-65-01-07.	Case Report	n/a	n/a	n/a	n/a	Hydrocolloid material was found in the pharynx during intubation at a second procedure a year after the patient had bilateral orthognathic surgery. The authors speculate that during the original procedure it was placed between the nasal endotracheal tube and the patient's nostril to prevent a pressure injury. It may have been pushed into out of the nasal cavity and into the pharynx during the induction of anesthesia during the second procedure. Authors recommend these items are accounted for.	VC
40	Williams TL, Tung DK, Steelman VM, Chang PK, Szekendi MK. Retained surgical sponges: findings from incident reports and a cost-benefit analysis of radiofrequency technology. J Am Coll Surg. 2014;219(3):354-364. http://search.ebscohost.com/login.aspx?direct=true&db=ccm&AN=103842242&site=ehost-live&scope=site. doi:10.1016/j.jamcollsurg.2014.03.052.	Nonexperimental	428 RSIs, 9,467 count issues	n/a	n/a	Incorrect counts, RSI, cost-benefit analysis	Five organizations that implemented RF technology between 2008 and 2012 collectively demonstrated a 93% reduction in the rate of reported retained surgical sponges. By comparison, there was a 77% reduction in the rate of retained sponges at 5 organizations that do not use RF technology. The UHC cost-benefit analysis showed that the savings in x-rays and time spent in the operating room and in the medical and legal costs that were avoided outweighed the expenses involved in using RF technology.	IIIB
41	Nurse Left Sponge in Pt. During Preoperative Procedure: CASE ON POINT: Burke v. AnMedHealth, 4828 SCCA(4/27/2011)-SC. NURS LAW REGAN REP. 2011;52(3):4-4.	Case Report	n/a	n/a	n/a	n/a	In a legal case, a patient experienced discomfort and re-operation two months after an abdominal hysterectomy to remove a retained sponge that was left in her vagina during preoperative vaginal antisepsis. Was awarded $250,00 in damages.	VC
42	Steelman V.M., Shaw C., Shine L., Hardy-Fairbanks A.J. Unintentionally retained foreign objects: A descriptive study of 308 sentinel events and contributing factors. Jt Comm J Qual Patient Saf. 2019;45(4):249-258. https://www.journals.elsevier.com/the-joint-commission-journal-on-quality-and-patient-safety/; http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emexa&NEWS=N&AN=2001189807. doi: http://dx.doi.org/10.1016/j.jcjq.2018.09.001.	Nonexperimental	308 events of retained instruments, needles, blades, catheters, drains, specimens, implants, packing and other items that were retained and reported to the Joint Commission from 2021 to 2018.	n/a	n/a	Number, type, location, contributing factors, and harm for the retained item	Rates of retained items included instruments (33.1%), catheters and drains (16.9%), needles and blades (10.7%), packing (9.7%), implants (4.5%), specimens (1.9%), and other (23.1%). Of particular concern is orthopedic and uterine manipulator device fragments. The most frequently cited areas for retainment were the abdomen or pelvis. The second most common site is the vagina. Most retained items occurred in the OR. The OB/GYN specialty had the most occurrences of retained items. 1 to 12 contributing factors occurred in 302 reports equaling 1,156 contributing factors. Most contributing factors included human factors, leadership, and communication.	IIIA

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
43	Gibbs VC. Retained surgical items and minimally invasive surgery. World J Surg. 2011;35(7):1532-1539.	Expert Opinion	n/a	n/a	n/a	n/a	RSI prevention for minimally invasive surgery. Describes practices in the NoThing Left Behind Sponge ACCOUNTing system protocol.	VA
44	Arikan Y, Ozdemir O, Seker KG, et al. Gossypiboma: A Dramatic Result of Human Error, Case Report and Literature Review. Prague Med Rep. 2019;120(4):144-149. doi:https://dx.doi.org/10.14712/23362936.2019.20.	Case Report	n/a	n/a	n/a	n/a	Two incidences of retained sponges, 20 and 6 years after the initial procedure.	VC
45	Nazarinia M, Esmaeilzadeh E. Gauzoma in A Scleroderma Patient Following Open Heart Surgery: A Case Report. Curr Rheumatol Rev. 2019;15(1):79-81. doi:https://dx.doi.org/10.2174/1573397114666180423104410.	Case Report	n/a	n/a	n/a	n/a	Gauze sponge left in chest cavity after heart surgery 20 years prior.	VC
46	Kim DK, Hwang SK, Lee SC, et al. A 31-year-old pericardial textiloma. Cardiovasc j Afr. 2020;31(4):e5-e8. http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=mesx&NEWS=N&AN=31815276. doi:https://dx.doi.org/10.5830/CVJA-2019-068.	Case Report	n/a	n/a	n/a	n/a	Gauze sponge adhered to right atria and removed 31 years after heart surgery.	VC
47	Update on State Government Tracking of Health Care-Acquired Conditions and a Four-State In-Depth Review. Center for Medicare and Medicaid Innovation. Centers for Medicare & Medicaid Services; 2012.	Expert Opinion	n/a	n/a	n/a	n/a	Many states require public reporting when RSI events occur.	VA
48	Joint Commission, ed. Preventing unintended retained foreign objects. TJC: The Joint Commission; 2013.	Consensus	n/a	n/a	n/a	n/a	The Joint Commission recommends that facilities develop effective processes and procedures for preventing unintended retained foreign objects. Their recommendations include a standardized and highly reliable counting system; development of policies and procedures; practices for counting, wound opening, and closing procedures; performance of intraoperative radiographs; use of effective communication to include briefings and debriefings; documentation of counts; and assistive technologies (ie, RF tags, RFID, radiopaque, bar coding). Also, the hospital should define a process for conducting RCA for sentinel events, such as URFO.	IVB
49	Jarrett NM, Callaham M, Chu S(PO. Evidence-Based Guidelines for Selected Hospital-Acquired Conditions. Final Report. 2016;RTI Project Number 0213539.	Expert Opinion	n/a	n/a	n/a	n/a	Report on evidenced-based guidelines associated with hospital-acquired conditions sponsored by CMS.	VA
50	42 CFR 430, Subpart C—Grants; Reviews and Audits; Withholding for Failure To Comply; Deferral and Disallowance of Claims; Reduction of Federal Medicaid Payments. ; 2019.	Regulatory	n/a	n/a	n/a	n/a	Regulations pertaining to reductions in Medicaid payments.	n/a
51	Ricciardi R, Baxter NN, Read TE, Marcello PW, Schoetz DJ, Roberts PL. Surgeon involvement in the care of patients deemed to have "preventable" conditions. J Am Coll Surg. 2009;209(6): 707-711.	Nonexperimental	6,618,637 patient charts 286,509 had "preventable events"	n/a	n/a	"Preventable" conditions per CMS	Reviewed charts for preventable events, including retained foreign bodies. Surgeons were involved in the care of 96% of patients with retained foreign bodies. Nonpayment for “preventable” conditions may lead hospitals and surgeons to avoid complex procedures, refuse care to high-risk patients, or both.	IIIB

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
52	Judson TJ, Howell MD, Guglielmi C, Canacari E, Sands K. Miscount incidents: a novel approach to exploring risk factors for unintentionally retained surgical items.. Joint Commission Journal on Quality & Patient Safety. 2013;39(10): 468-474.	Nonexperimental	23,955 operations	n/a	n/a	Surgical Service, Urgency of Surgery, Age of Patient, Incision Start Time, Incision Close Time, Case Duration, Procedure Type, Total # of people in room, Relief of Circulating Nurse or Scrub Nurse, and Time of Incorrect Count Safety Checklist Activation	The length of the case and the number of providers involved in the case were independent risk factors for miscount incidents. Miscounts triggered use of the Incorrect Count Safety Checklist, which can be used to determine whether a count completed at the procedure's conclusion is consistent across disciplines.	IIIA
53	Greenberg CC, Regenbogen SE, Lipsitz SR, Diaz-Flores R, Gawande AA. The frequency and significance of discrepancies in the surgical count. Ann Surg. 2008;248(2):337-341.	Nonexperimental	148 elective general surgery operations	n/a	n/a	Count Discrepancies	Counting activities involving a personnel change of either the RN circulator or scrub person resulted in a threefold higher risk of count discrepancy than in procedures with no personnel changes. They categorized discrepancies as being a result of miscounts (eg, incorrect baseline count, overcount, undercount), documentation errors (eg, addition), or misplaced items (eg, retained). The most common discrepancy was from a misplaced, or retained, item, which occurred in 59% of cases, whereas discrepancies from human error (ie, miscount [3%], documentation [38%]) accounted for 41% of discrepancies. In their study, count discrepancies occurred in one of eight cases, or one per 14 hours of operating time, and took an average of 13 minutes to resolve.	IIIA
54	Rupp CC, Kagarise MJ, Nelson SM, et al. Effectiveness of a radiofrequency detection system as an adjunct to manual counting protocols for tracking surgical sponges: a prospective trial of 2,285 patients.. J Am Coll Surg. 2012;215(4): 524-533.	Nonexperimental	2285 consecutive procedures at a hospital system	n/a	n/a	Miscounts	Use of a radiofrequency detection system assisted in the resolution of a near-miss event and the resolution of 35 surgical sponge miscounts.	IIIB
55	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.	Nonexperimental	Not Reported	n/a	n/a	RSS incidence and cost-effectiveness ratios	Predicted the cost-effectiveness of several RSI prevention strategies compared with standard counting procedures. They estimated that standard manual counting prevents 82% of retained sponges, and they found that barcoding may prevent 97.5% of retained sponges.	IIIB
56	Steelman VM. Sensitivity of detection of radiofrequency surgical sponges: a prospective, cross-over study. The American Journal of Surgery. 2011;201(2):233-237.	Quasi-experimental	210 subjects (101 morbidly obese), 840 wand readings	RF sponges	Plain sponges	Detection of RF sponges by wand	The sensitivity and specificity of detection of the RF sponges through the torsos of subjects of varying body habitus were 100%.	IIA

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
57	Steelman VM, Alasagheirin MH. Assessment of radiofrequency device sensitivity for the detection of retained surgical sponges in patients with morbid obesity. Arch Surg. 2012;147(10):955-960. doi:10.1001/archsurg.2012.1556 [doi].	Quasi-experimental	203 subjects (129 morbidly obese), 812 mat readings, 468 wand readings	RF sponges	Plain sponges	Detection of RF sponges by wand and mat	Overall, the sensitivity of the RF mat was 98.1%, and the specificity of the RF mat was 100.0%. In the subset of 117 participants in whom the RF wand was also used, the sensitivity and specificity of the wand were each 100.0%. The RF wand is more sensitive than the RF mat in individuals with morbid obesity.	IIA
58	Cima RR, Kollengode A, Storsveen AS, et al. A multidisciplinary team approach to retained foreign objects. Jt Comm J Qual Patient Saf. 2009;35(3):123-132.	Organizational Experience	n/a	n/a	n/a	n/a	Implemented a multidisciplinary team approach and educational campaign to reduce the incidence of RSIs. As a part of the program, they identified cultural barriers, communication problems, and lack of situational awareness as barriers to implementation, and they refocused their initiative to improve team communication.	VB
59	Stawicki SP, Cook CH, Anderson HL 3rd, et al. Natural history of retained surgical items supports the need for team training, early recognition, and prompt retrieval. Am J Surg. 2014;208(1): 65-72.	Literature Review	n/a	n/a	n/a	n/a	Post hoc analysis of a multicenter retrospective RSI study. 90% of RSI events were associated with either a team or systems error; they recommended team training as an intervention to prevent these types of errors.	VA
60	WHO guidelines for safe surgery 2009: Safe surgery saves lives. Geneva, Switzerland: WHO Press; 2009.	Guideline	n/a	n/a	n/a	n/a	International guidelines for safe surgery, including prevention of inadvertent retention of instruments and sponges in surgical wounds (objective 7).	IVB
61	Revised statement on the prevention of unintentionally retained surgical items after surgery. American College of Surgeons; 2016.	Position Statement	n/a	n/a	n/a	n/a	Stresses the importance of good communication and standard processes. Provides recommendations for prevention of RSIs.	IVB
62	Martindell Denise. Update on the Prevention of Retained Surgical Items. PENN PATIENT SAF ADVIS. 2012;9(3): 106-110.	Consensus	n/a	n/a	n/a	n/a	RSI data and guidance from the Pennsylvania Patient Safety Authority.	IVB
63	Unintentionally Retained Surgical Items. Operating Room Risk Management. 2012;Volume 2(Surgery 1).	Expert Opinion	n/a	n/a	n/a	n/a	Guidance from ECRI.	VC
64	Standards for sponge, needle and instrument procedures. AORN J. 1976;23(6):971-973.	Consensus	n/a	n/a	n/a	n/a	Original publication of the standards for preventing retained surgical items.	IVA

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
65	Committee opinion no. 464: patient safety in the surgical environment.. Obstetrics & Gynecology. 2010;116(3): 786-790.	Position Statement	n/a	n/a	n/a	n/a	Guidance from ACOG. Sponges, needles, and sharp instruments should be counted before and after surgery and vaginal delivery. Radiopaque sponges and soft goods should be used in sterile and delivery fields. If a count at the end of a procedure is incorrect or compromised, an abdominal or vaginal exploration must be done. If this does not reconcile the count, radiographic imaging needs to be obtained. Care should be taken to create checklists, systems, and routines to reduce the likelihood of retained foreign objects, and communication among surgical team members is crucial throughout the surgical process.	IVB
66	Reason J. Safety in the operating theatre - Part 2: human error and organizational failure. Qual Saf Health Care. 2005;14(1): 56-60.	Literature Review	n/a	n/a	n/a	n/a	Literature review about safety in the operating theatre. Errors involve some kind of deviation from routine practice. Dealing with individual errors rather than fixing a broken system will not stop unsafe acts from occurring.	VB
67	Duggan EG, Fernandez J, Saulan MM, et al. 1,300 Days and Counting: A Risk Model Approach to Preventing Retained Foreign Objects (RFOs). Joint Commission journal on quality and patient safety. 2018;44(5):260-269. https://pubmed.ncbi.nlm.nih.gov/29759259; https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7723035/. doi:10.1016/j.jcjq.2017.11.006.	Organizational Experience	n/a	n/a	n/a	n/a	Discussed a comprehensive interdisciplinary team process that included several bundled elements based on a probabilistic risk model. The interventions led to no RSI incidences for more than 1,300 days.	VB
68	Steelman, V. M., Thenuwara, K., Shaw, C., & Shine, L. (2019). Unintentionally retained guidewires: A descriptive study of 73 sentinel events. The Joint Commission Journal on Quality and Patient Safety, 45(2), 81-90. doi:https://doi.org/10.1016/j.jcjq.2018.08.003	Nonexperimental	Review of 73 incidences of retained guidewires or guidewire fragments reported to the Joint Commission	n/a	n/a	Type of device, location, contributing factors, time to discovery, and harm.	A total of 285 contributing factors were identified, most were in the human factors, leadership, and communication categories. Retention was identified after hospital discharge in 39.3% events. Unexpected additional care or extended stay were the most common harm categories.	IIIA
69	Bubric KA, Biesbroek SL, Laberge JC, Martel JA, Litvinchuk SD. Prevalence and Characteristics of Interruptions and Distractions During Surgical Counts. Jt Comm J Qual Patient Saf. 2021. doi:S1553-7250(21)00127-6 [pii].	Nonexperimental	36 procedures in 17 hospitals. In 28 procedures all counts were observed. In 8 procedures at least one count process was observed	n/a	n/a	Distractions or interruptions in count processes	Interruptions occurred in 10% to 33.3% of counts depending on the type (eg, initial, closing). Distractions occurred in 38.5% to 46.7% of counts depending on the type. The most common source (80.4%) of interruptions during closing counts was a surgeon asking the scrub person for an item.	IIIA

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
70	Loftus T, Dahl D, OHare B, et al. Implementing a standardized safe surgery program reduces serious reportable events. J Am Coll Surg. 2015;220(1):12-17.e3. https://doi.org/10.1016/j.jamcollsurg.2014.09.018. doi: 10.1016/j.jamcollsurg.2014.09.018.	Nonexperimental	683,193 procedures in the operating room and labor and delivery areas from one hospital system that included 22 hospitals and 8 ambulatory surgery centers over 4 years	n/a	n/a	Serious reportable event rates	Implemented a standardized safe surgery program, including a standardized 22-rule count protocol, with the goal of reducing serious reportable event rates (ie, RSIs; wrong site, wrong patient, wrong procedure surgeries) during a four-year period. Although the researchers did not observe a statistically significant reduction in RSIs alone, there was a marked reduction in RSI rates, and the overall serious reportable event rate was significantly reduced by 52%.	IIIA
71	Standards of perioperative nursing. AORN; 2015:693-708.	Consensus	n/a	n/a	n/a	n/a	AORN perioperative nursing standards.	IVB
72	Yang Y T, Henry Linda, Dellinger Mary, Yonish Kersten, Emerson Brett, Seifert Patricia C. The Circulating Nurse's Role in Error Recovery in the Cardiovascular OR. AORN J. 2012;95(6): 755-762. doi:10.1016/j.aorn.2011.09.022.	Organizational Experience	18 cardiac procedures observed	n/a	n/a	Surgical errors	Observed 18 cardiovascular procedures for potential and actual errors to conceptualize the role that the RN circulator plays in preventing error. Of 200 errors, 8% were attributed to counting errors. Had the RN circulator not caught these counting errors, they might not have been resolved and could have resulted in RSIs.	VB
73	Association of Surgical Technologists. Recommended Standard of Practice for Counts. 2006.	Guideline	n/a	n/a	n/a	n/a	AST count standards.	IVC
74	Camos V. Coordination process in counting. International Journal of Psychology. 2003;38(1): 24-36.	Nonexperimental	26 first graders, 26 adults	n/a	n/a	Error rates, pointing times, saying times per works, mean counting time per dot	Counting targets is more difficult with distractors. Increasing counting difficulty reduced speed and accuracy. Researchers found a facilitation effect; motor activity (pointing) facilitated verbal counting. This contradicts cognitive models that 2 tasks would take more time and increase errors.	IIIB
75	Camos V. Counting strategies from 5 years to adulthood: Adaptation to structural features. European Journal of Psychology of Education. 2003;18(3): 251-265.	Nonexperimental	153 children, 32 adults	n/a	n/a	Counting strategies, frequency of strategy use, efficiency of strategy	Counting strategies include counting by 1s, by n's, addition, and multiplication. Adults do not always count by 1s, use subitizing for subgroups. More strategies are used in adults than children. Arrangement and size effect performance. Larger sets, high density, and random assignment increase response time, error, and use of manual pointing. Errors reduce with ages 5-adult (67 to 10%). Counting by 1s used more than n's when the task became more difficult.	IIIA

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
76	Clark GJ. Strategies for preventing distractions and interruptions in the OR. AORN J. 2013;97(6): 702-707.	Organizational Experience	Implemented at a VA Medical Center	n/a	n/a	n/a	Implemented a "Pause for the Counts" campaign to minimize interruptions during surgical counts. As part of the multidisciplinary initiative, the RN circulator notified the team when it was time to count and asked whether any supplies would be needed on the sterile field. This communication to the team was intended to reduce interruptions for supplies during the count.	VB
77	AORN Position Statement on Managing Distractions and Noise During Perioperative Patient Care. ; 2020. https://www.aorn.org/guidelines/clinical-resources/position-statements.	Position Statement	n/a	n/a	n/a	n/a	Discusses management of noise and distractions in perioperative patient care.	IVB
78	Iwai T, Goto T, Matsui Y, Tohnai I. Endoscopic removal of throat-packing gauze swallowed during general anesthesia. J Craniofac Surg. 2012;23(5): 1547-1549.	Case Report	n/a	n/a	n/a	n/a	Case of swallowed throat pack after maxillofacial surgery. Created a checklist for insertion and removal of the throat pack to prevent retention. At their facility, they also tied a suture to the throat pack and taped it to the patient's cheek, and the surgeon was responsible for removing the pack at the end of the procedure. Also discussed other methods of managing throat packs that they found in their literature review.	VC
79	Jennings A, Bhatt V. Throat packs: in your face? Anaesthesia. 2010;65(3): 312-313.	Expert Opinion	n/a	n/a	n/a	n/a	Suggested that affixing a "throat pack in situ" label on the patient's forehead was not feasible. In their experience, the head and neck surgeons placed the throat pack after draping the patient, and the forehead was not visible. As an alternative solution, the label was placed on the surgical assistant's hat and was a visible reminder to the surgeon and anesthesia professional throughout the case. A limitation of this expert opinion report is that the risk of the sticker becoming detached from the assistant's hat and falling into the sterile field was not addressed.	VC

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
80	Smith M, Turnbull D, Andrzejowski J. Throat packs in neuroanaesthesia. Anaesthesia. 2012;67(7): 804-805.	Nonexperimental	208, 141 survey responses (68%)	n/a	n/a	Survey responses	Although some clinicians did not feel that throat packs were indicated or that the risks outweighed the benefits of placing the throat pack (n = 69), the remaining respondents reported the following practices for pack retention: following formal protocols, either leaving a portion of the pack outside the mouth or attaching it to the endotracheal tube; using pre-printed "throat pack in situ" labels; counting the throat pack with the sponge count; and documenting removal by checking a box on the anesthesia record.	IIIB
81	Colbert S, Jackson M, Turner M, Brennan PA. Reducing the risk of retained throat packs after surgery. Br J Oral Maxillofac Surg. 2012;50(7): 680-681.	Expert Opinion	n/a	n/a	n/a	n/a	Suggested that the anesthesia professional wear a red allergy band marked "throat pack" as a reminder to remove the throat pack. The authors alternatively suggested either placing a sticker on the patient's forehead or writing on the board that the throat pack is in place, although they discussed that these alternatives could be more prone to removal than the wrist band.	VC
82	Lyons VE, Popejoy LL. Meta-analysis of surgical safety checklist effects on teamwork, communication, morbidity, mortality, and safety. West J Nurs Res. 2014;36(2): 245-261. doi:10.1177/0193945913505782 [doi].	Systematic Review w/ Meta-Analysis	n/a	n/a	n/a	n/a	Examined the effectiveness of implementing a safe surgery checklist on the outcomes of teamwork, communication, morbidity, mortality, and compliance with safety measures. The authors found that use of the checklist significantly improved all outcomes, although they noted that the generalizability of this meta-analysis is limited and that further research is needed.	IIA
83	Collins Susan J, Newhouse Robin, Porter Jody, Talsma Akkeneel. Effectiveness of the Surgical Safety Checklist in Correcting Errors:ALiterature Review Applying Reason's Swiss Cheese Model. AORN J. 2014;100(1): 65-79. doi:10.1016/j.aorn.2013.07.024.	Literature Review	n/a	n/a	n/a	n/a	Examined the impact of culture on checklist implementation by applying Reason's Swiss Cheese Model to the use of checklists. They found that successful use of a checklist for prevention of medical errors included involvement of key perioperative stakeholders, an understanding of error occurrence, recognition of system and individual dynamics, and creation of a just culture in which there is a shared vision of patient safety.	VB
84	McDowell Diana Soule, McComb Sara A. Safety Checklist Briefings: A Systematic Review of the Literature. AORN J. 2014;99(1): 125-137. doi:10.1016/j.aorn.2013.11.015.	Literature Review	n/a	n/a	n/a	n/a	Review of surgical checklist use in the literature. Found themes of increased communication and enhanced patient safety from checklist use.	VB

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
85	Borchard A, Schwappach DL, Barbir A, Bezzola P. A systematic review of the effectiveness, compliance, and critical factors for implementation of safety checklists in surgery. Ann Surg. 2012;256(6): 925-933. doi:10.1097/SLA.0b013e3182682f27 [doi].	Systematic Review	22 articles	n/a	n/a	Checklist effectiveness	Found surgical checklists to be effective in reducing morbidity and mortality and stated that further research is needed to determine the influence of the organization's culture on checklist implementation.	IIIA
86	Haynes AB, Weiser TG, Berry WR, et al. A surgical safety checklist to reduce morbidity and mortality in a global population. N Engl J Med. 2009;360(5): 491-499. doi:10.1056/NEJMsa0810119 [doi].	Quasi-experimental	3733 patients (pre), 3955 patients (post implementation)	Surgical Safety Checklist	Pre-checklist implementation	Morbidity, Mortality	Landmark study. Found that implementation of a checklist significantly reduced morbidity and mortality in patients undergoing non-cardiac surgery. Completion of needle, sponge, and instrument counts were part of the checklist. Implementation of the checklist increased compliance with sponge count completion.	IIA
87	Marsh V, Kalisch B, McLaughlin M, Nguyen L. Nurses' Perceptions of the Extent and Type of Missed Nursing Perioperative Nursing Care. AORN.2020 September;112 (3):237-247.	Nonexperimental	1,693 survey responses from perioperative nurses who were AORN members	n/a	n/a	Missed perioperative nursing care	Overall, missed perioperative nursing care was not frequent. However, 10.5% of respondents indicated that surgical counts were not verified as correct during closing at occasionally, frequently, or always. Count discrepancies were not communicated to the surgeon occasionally, frequently, or always according to 2.5% of respondents.	IIIA
88	Rhee AJ, Valentin-Salgado Y, Eshak D, et al. Team Training in the Perioperative Arena: A Methodology for Implementation and Auditing Behavior. Am J Med Qual. 2017;32(4):369-375. http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=ohst6&AN=27516608; http://nz6nl3sq9m.search.serialssolutions.com/?url_ver=Z39.88-2004&rft_val_fmt=info:ofi/fmt:kev:mtx:journal&rfr_id=info:sid/Ovid:ohst6&rft.genre=article&rft_id=info:doi/10.1177%2F1062860616662703&rft_id=info:pmid/27516608&rft.issn=1555-824X&rft.volume=32&rft.issue=4&rft.spage=369&rft.pages=369-375&rft.date=2017&rft.jtitle=American+Journal+of+Medical+Quality&rft.atitle=Team+Training+in+the+Perioperative+Arena%3A+A+Methodology+for+Implementation+and+Auditing+Behavior.&rft.aulast=Rhee. doi:https://dx.doi.org/10.1177/1062860616662703.	Organizational Experience	1610 audits over 6 months	Implementation of TeamSTEPPS with a surgical safety checklist	n/a	Levels of performance and rates of adverse events	Performance of TeamSTEPPS criteria was either maintained at the desired level or improved. The audits did include real-time feedback and coaching. There was a 67% reduction in unintentional retained surgical items and wrong site/side/person procedures when 2012 was compared to 2014.	VB
89	Armour Forse R, Bramble JD, McQuillan R. Team training can improve operating room performance. Surgery. 2011;150(4): 771-778.	Organizational Experience	Not reported	n/a	n/a	Questionnaire, NSQUIP Measures, SCIP, Satisfaction	Implemented Team- STEPPS and found significant improvement in OR staff teamwork and OR communications; however, the authors noted a reduction in improvement after one year of implementation and suggested continued team training to sustain culture improvement.	VB
90	Papaspyros SC, Javangula KC, Adluri RKP, O'Regan DJ. Briefing and debriefing in the cardiac operating room. Analysis of impact on theatre team attitude and patient safety. Interactive Cardiovascular and Thoracic Surgery. 2010;10(1): 43-47.	Organizational Experience	Not reported	n/a	n/a	n/a	Implemented an element of Crew Resource Management, the briefing and debriefing, as part of a quality improvement (QI) initiative in their cardiac OR, and found a qualitative improvement in team communication.	VB

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
91	Young-Xu Y, Neily J, Mills PD, et al. Association between implementation of a Medical Team Training program and surgical morbidity. Arch Surg. 2011;146(12):1368-1373.	Nonexperimental	74 VA facilities, 119,383 procedures	n/a	n/a	Surgical morbidity	Participating in the Medical Team Training program (n = 42) had a significantly lower surgical morbidity rate than facilities that were not participating in the program (n = 32). This study demonstrated an important link between improvement of teamwork in the OR and improvement of a measurable patient outcome, surgical morbidity.	IIIA
92	Weaver SJ, Rosen MA, DiazGranados D, et al. Does teamwork improve performance in the operating room? A multilevel evaluation.. Joint Commission Journal on Quality & Patient Safety. 2010;36(3): 133-142.	Quasi-experimental	2 hospitals	TeamSTEPPS	No TeamSTEPPS	Trainee reactions, learning, behaviors in the OR, and answers on the Hospital Survey on Patient Safety Culture and the Operating Room Management Attitudes Questionnaire	Researched the effect of implementation of a TeamSTEPPS team training program on several outcomes. The researchers found that a group that underwent TeamSTEPPS training significantly improved their briefings, quality of teamwork behavior during procedures, perceptions of patient safety culture, and teamwork attitudes compared with a group that did not undergo TeamSTEPPS training.	IIB
93	Tibbs Sheila Marie, Moss Jacqueline. Promoting Teamwork and Surgical Optimization: Combining TeamSTEPPS With a Specialty Team Protocol. AORN J. 2014;100(5): 477-488. doi:http://dx.doi.org/10.1016/j.aorn.2014.01.028.	Organizational Experience	Number not reported, large military medical center	n/a	n/a	n/a	Implemented TeamSTEPPS and recommended that perioperative team members participate in team training to improve communication and team relationships.	VA
94	Johnson HL, Kimsey D. Patient safety: break the silence. AORN J. 2012;95(5): 591-601.	Organizational Experience	Number not reported, academic community hospital	n/a	n/a	n/a	Implemented a team training program focusing on TeamSTEPPS as part of a QI project. Their facility experienced a notable reduction in serious events, including RSIs, as a result of the initiative.	VB
95	Fearon MC, Spruce L, Conner R, Wood A. Guideline for Team Communication. Conner R, ed. AORN, Inc.; 2021.	Guideline	n/a	n/a	n/a	n/a	Recommended practices for team communication in the perioperative practice setting.	IVA
96	Steelman VM, Cullen JJ. Designing a safer process to prevent retained surgical sponges: a healthcare failure mode and effect analysis. AORN J. 2011;94(2): 132-141.	Organizational Experience	n/a	n/a	n/a	Counting failures	Identified 57 potential failures during the management of surgical sponges that effect counting procedures. Most frequent causes of failures were distraction, multitasking, not following procedure, and time pressure. Education is not likely to reduce failures, so technology adjuncts should be considered as controls.	VB
97	Rowlands A, Steeves R. Incorrect surgical counts: a qualitative analysis. AORN J. 2010;92(4): 410-419.	Qualitative	22 perioperative RNs and surgical technologists	n/a	n/a	N/A	Qualitative analysis of incorrect surgical count events and found themes of general chaos in the OR that included loud music, excessive talking, talking during critical moments of the count, fast pace, deafening noise levels, and idle chatter.	IIIB
98	Johnstone EM, Burlingame BL, Conner R. Guideline for a Safe Environment of Care. Conner R, ed. AORN, Inc.; 2021.	Guideline	n/a	n/a	n/a	n/a	Recommendations for a safe perioperative environment of care.	IVA

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
99	Smith Y, Burke L. Swab and instrument count practice: ways to enhance patient safety. Br J Nurs. 2014;23(11):590-3.	Organizational Experience	47 surveys and 15 observational audits	n/a	n/a	n/a	Most personnel felt that they followed the facility count policy (90%) but the observational audits found that only 20% followed the policy. Recommendations include observational audits, staff education and competency verification, and clinical supervision to provide motivation and accountability.	VB
100	Ortuño F, Ojeda N, Arbizu J, et al. Sustained attention in a counting task: Normal performance and functional neuroanatomy. Neuroimage. 2002;17(1): 411-420.	Nonexperimental	10	n/a	n/a	PET scan	Counting activates attention and working memory parts of the brain.	IIIB
101	Camos V, Barrouillet P. Adult counting is resource demanding. Br J Psychol. 2004;95(1): 19-30.	Nonexperimental	36, 36	n/a	n/a	Response time, errors, recall correctness	Counting is a resource demanding activity that required switching attention between memory and counting. Concurrent memory load increases counting times.	IIIB
102	Railo H, Koivisto M, Revonsuo A, Hannula MM. The role of attention in subitizing. Cognition. 2008;107(1): 82-104.	Nonexperimental	72, 40	Full attention	Divided attention, inattention	Accuracy, confidence ratings	Attentional demands increase as objects to be enumerated increase. Improving attention increased accuracy, whereas only numbers one and two were enumerated when attention was reduced.	IIIA
103	Butler Margaret, Ford Rosemary, Boxer Elaine, Sutherland-Fraser Sally. Lessons from the field: an examination of count errors in the operating theatre. ACORN. 2010;23(3): 6-6, 8, 10 passim.	Nonexperimental	151 surveys	n/a	n/a	n/a	Found that both the RN circulator and scrub person were rushed to complete the required count procedures by the fast pace of the perioperative environment, especially when handling urgent requests of the team. The researchers also identified time pressures from the surgeon or anesthesia professional to quickly finish the surgical procedure and move to the next patient as factors contributing to count errors.	IIIB
104	Edel EM. Surgical count practice variability and the potential for retained surgical items. AORN J. 2012;95(2): 228-238.	Organizational Experience	Number not reported, large urban hospital	n/a	n/a	Variation in count practices	Quality improvement project conducted to evaluate and eliminate variability in count practices during development of a new count policy. Ishikawa diagram created to show factors affecting the accuracy of counts.	VB

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
105	Norton EK, Martin C, Micheli AJ. Patients count on it: an initiative to reduce incorrect counts and prevent retained surgical items. AORN J. 2012;95(1):109-121.	Organizational Experience	Not Reported	n/a	n/a	n/a	Conducted a QI project to reduce RSIs that involved implementing standardized count practices at a large pediatric hospital. Their activities to standardize counts included policy revision and enforcement, education, standardizing dry-erase boards to document counts, streamlining instrument sets, and updating count sheets. As a result of their multiple-strategy approach, they found a 50% reduction in reported incorrect counts during the one-year project period.	VB
106	Grant-Orser A, Davies P, Singh SS. The lost sponge: patient safety in the operating room. CMAJ Canadian Medical Association Journal. 2012;184(11): 1275-1278.	Case Report	n/a	n/a	n/a	n/a	Case report of a retained surgical sponge. found in their incident analysis that there were communication failures between multiple teams and practices inconsistent with counting protocols. Recommended developing standardized protocols for RSI prevention and consistent count policies in addition to increasing communication among team members.	VA
107	Song JB, Vemana G, Mobley JM, Bhayani SB. The second "time-out": a surgical safety checklist for lengthy robotic surgeries. Patient safety in surgery. 2013;7(1):19-19. https://pubmed.ncbi.nlm.nih.gov/23731776; https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3689613/. doi:10.1186/1754-9493-7-19.	Expert Opinion	n/a	n/a	n/a	n/a	Proposes the use of a second time out 3-4 hours into lengthy robotics procedures as a way to reorient the team and focus on prevention of adverse events.	VA
108	Boisvert MJ, Abroms BD, Roberts WA. Human nonverbal counting estimated by response production and verbal report. Psychonomic Bulletin and Review. 2003;10(3): 683-690.	Nonexperimental	24, 12, 10	Subjects prevented from counting with a cognitive distraction task.	n/a	Errors	Verbal counting had less errors at higher levels. Manual (non-verbal) and verbal counting is accurate up to 30.	IIIB
109	Logie RH, Baddeley AD. Cognitive Processes in Counting. Journal of Experimental Psychology: Learning, Memory, and Cognition. 1987;13(2): 310-326.	Nonexperimental	24, 16, 16, 16, 16	n/a	n/a	Response times, errors	Suppression of count articulation increased errors. Memory is involved with keeping a running total of the count. Disruptions in counting increased with larger number of items.	IIIB
110	Nan Y, Knösche TR, Luo Y-J. Counting in everyday life: Discrimination and enumeration. Neuropsychologia. 2006;44(7): 1103-1113.	Nonexperimental	14	n/a	n/a	Behavioral performance, ERP results	Discrimination/identification occurs before enumeration and competes for spatial attention.	IIIB
111	Trick LM, Pylyshyn ZW. Why are small and large numbers enumerated differently? A limited-capacity preattentive stage in vision. Psychol Rev. 1994;101(1): 80-102.	Expert Opinion	n/a	n/a	n/a	n/a	Counting requires attention. Individuation is required to keep track of multiple objects by spatial attention.	VA
112	Goldfarb L, Levy S. Counting within the Subitizing Range: The Effect of Number of Distractors on the Perception of Subset Items. PLoS ONE. 2013;8(9).	Nonexperimental	16, 16	n/a	n/a	Response time, errors	Counting can only begin when target locations have been identified, even for very small values (1-4).	IIIB
113	Watson DG, Maylor EA, Bruce LAM. The efficiency of feature-based subitization and counting. Journal of Experimental Psychology: Human Perception and Performance. 2005;31(6): 1449-1462.	Nonexperimental	18/18, 10, 12, 12	n/a	n/a	Response time, accuracy	Enumeration requires individuating the item location.	IIIB

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
114	Mazza V, Pagano S, Caramazza A. Multiple object individuation and exact enumeration. J Cogn Neurosci. 2013;25(5): 697-705.	Nonexperimental	12	n/a	n/a	Behavioral performance, ERP results, response times	Individuation is required for exact enumeration to count each item once and only once. Individuation is the process of isolating objects from distractors and may be affected by attention.	IIIB
115	Edel EM. Increasing patient safety and surgical team communication by using a count/time out board. AORN J. 2010;92(4): 420-424. doi:10.1016/j.aorn.2010.03.013 [doi].	Expert Opinion	n/a	n/a	n/a	n/a	Described RSI prevention practices at St Luke's Episcopal Hospital	VB
116	Agrawal A. Counting matters: lessons from the root cause analysis of a retained surgical item. Joint Commission Journal on Quality & Patient Safety. 2012;38(12): 566-574.	Organizational Experience	Not reported	n/a	n/a	n/a	A root cause analysis was conducted following the discovery of a 27-year old female with a retained vaginal sponge after repair of a vaginal tear from a normal vaginal delivery. The error was determined to be failure to perform standard protocol of counting sponges before and after the repair of the vaginal tear by the obstetric physician and nurse. The sponge count sheet and the post-delivery note in the EHR were modified to include a sign-out process to serve as a reminder. Also, the TeamSTEPPS program was implemented in L&D to improve communication.	VB
117	Chagolla BA, Gibbs VC, Keats JP, Pelletreau B. A system-wide initiative to prevent retained vaginal sponges. MCN, American Journal of Maternal Child Nursing. 2011;36(5): 312-317.	Organizational Experience	32 hospital system	n/a	n/a	n/a	Implemented the NoThing Left Behind Sponge ACCOUNTing system protocol.	VB
118	Garry DJ, Asanjarani S, Geiss DM. Policy for prevention of a retained sponge after vaginal delivery. Case Reports in Medicine. 2012;2012: 317856.	Case Report	n/a	n/a	n/a	n/a	Case of a retained vaginal sponge following an uncomplicated spontaneous vaginal delivery. Delivery room policy resulted in the discovery of the sponge on X-ray when an incorrect sponge count occurred and physical exam did not find the sponge.	VB
119	Healy Patricia. Retained vaginal swabs: review of an adverse event in obstetrics through closed claims analysis. BR J MIDWIFERY. 2012;20(9): 666-669.	Nonexperimental	16 closed case claims	n/a	n/a	n/a	Cases of retained vaginal swabs were few. However, they represent a significant problem in that they are very difficult to defend in clinical negligence litigation. Maternity service providers must put measures in place to manage this preventable clinical risk.	IIIB
120	Lutgendorf MA, Schindler LL, Hill JB, Magann EF, O'Boyle JD. Implementation of a protocol to reduce occurrence of retained sponges after vaginal delivery. Mil Med. 2011;176(6): 702-704.	Organizational Experience	Large tertiary care military treatment facility	n/a	n/a	n/a	With appropriate pre-implementation training, protocols which incorporate post-delivery vaginal sweep and sponge counts are well accepted by the health care team and can be incorporated into the delivery room routine.	VB

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
121	Wattanasirichaigoon S. Transmural migration of a retained surgical sponge into the intestinal lumen: an experimental study. J Med Assoc Thai. 1996;79(7): 415-422.	Quasi-experimental	38 rats	Sterile cotton swabs placed in peritoneal cavity	n/a	n/a	Described the stages of transmural sponge migration into the intestine: • Stage 1 is foreign body reaction during which the sponge is encapsulated. • Stage 2 is secondary infection during which cytolysis occurs from the cotton interacting with enzymes in the intestinal lumen. • Stage 3 is mass formation during which a thick fibrous wall develops as part of the granuloma to prevent the infection from spreading in the abdomen and cotton filaments are released into the intestinal lumen. • Stage 4 is remodeling during which a fibrotic scar forms after the whole surgical sponge enters the intestinal lumen.	IIB
122	Hyslop JW, Maull KI. Natural history of the retained surgical sponge. South Med J. 1982;75(6): 657-660.	Literature Review and Case Report	n/a	n/a	n/a	n/a	Historical article. Retained surgical sponges estimated to be 1:1,000 celiotomies. If the sponge is not retained in a sterile environment or migrates to an unsterile location, such as the gastrointestinal tract, the tissue may react with an exudative inflammatory response that could result in an abscess or fistula.	VB
123	Kucuk C., Arda K., Turkkani M.H., Ata N. Intrathoracic gossypiboma. Hong Kong J Emerg Med. 2018;25(5):290-292. http://www.hkjem.com/; http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emexb&NEWS=N&AN=625544703. doi:http://dx.doi.org/10.1177/1024907918754951.	Case Report	n/a	n/a	n/a	n/a	Surgical sponge was removed from near the patient's left ventricle. Authors report that radiopaque sponges should be used and support wound exploration.	VC

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
124	Statler JD, Miller DL, Dixon RG, et al. Society of interventional radiology position statement: prevention of unintentionally retained foreign bodies during interventional radiology procedures.. Journal of Vascular & Interventional Radiology. 2011;22(11): 1561-1562.	Position Statement	n/a	n/a	n/a	n/a	The Society of Interventional Radiology recommends that steps be taken to avoid unintentionally retained foreign bodies during interventional radiology procedures performed by interventional radiologists in the interventional radiology suite. When IR procedures involve multidisciplinary teams, the wounds may be more extensive than typical IR procedures. Procedures in other areas of the hospital should be performed in accordance with the standard operating procedures of that area. Sponges smaller than 10cm x 10cm (4x4) should not be used for packing of wounds or incisions, and 4x4s should not be altered for this purpose. When using sponges in an incision or cavity, thorough visual and tactile inspections should be performed after sponge removal and before the incision is closed. If the wound does not permit thorough visual and tactile inspection, only radiopaque sponges should be used, and at the conclusion of the procedure either a final count or fluoroscopy should be performed to exclude a retained sponge. If there is concern for retention of a needle or instrument, fluoroscopy should be performed a the end of the procedure unless additional radiation is of greater concern.	IVC
125	Amr AE. A submandibular gossypiboma mimicking a salivary fistula: a case report. Cases journal. 2009;2: 6413.	Case Report	n/a	n/a	n/a	n/a	Case report of retained non-radiopaque sponge in the neck after submandibular gland excision.	VB
126	Baruah BP, Young P, Douglas-Jones A, Mansel R. Retained surgical swab following breast augmentation: a rare cause of a breast mass.. BMJ Case Reports. 2009;2009.	Case Report	n/a	n/a	n/a	n/a	Case report of retained non-radiopaque sponge in the breast after augmentation.	VB
127	Fouelifack FY, Fouogue JT, Fouedjio JH, Sando Z. A case of abdominal textiloma following gynecologic surgery at the Yaounde Central Hospital, Cameroon. The Pan African medical journal. 2013;16: 147.	Case Report	n/a	n/a	n/a	n/a	Case report of retained non-radiopaque sponge in the abdomen after hysterectomy.	VB
128	Gencosmanoglu R, Inceoglu R. An unusual cause of small bowel obstruction: gossypiboma--case report. BMC Surg. 2003;3: 6. doi:10.1186/1471-2482-3-6.	Case Report	n/a	n/a	n/a	n/a	Case report of retained non-radiopaque sponge in the abdomen after cholecystectomy.	VB
129	Irabor DO. Under-reporting of gossipiboma in a third-world country. A sociocultural view.. Nigerian Journal of Medicine: Journal of the National Association of Resident Doctors of Nigeria. 2013;22(4): 365-367.	Expert Opinion	n/a	n/a	n/a	n/a	Nigerian experience with gossypiboma and prevention methods.	VB
130	Joshi MK, Jain BK, Rathi V, Agrawal V, Mohanty D. Complete enteral migration of retained surgical sponge--report of two cases.. Tropical Gastroenterology. 2011;32(3): 229-232.	Case Report	n/a	n/a	n/a	n/a	Case report of retained non-radiopaque sponges in the abdomen after cesarean section and laparotomy.	VC
131	Kansakar R, Hamal BK. Cystoscopic removal of an intravesical gossypiboma mimicking a bladder mass: a case report.. Journal of Medical Case Reports [Electronic Resource]. 2011;5(1): 579.	Case Report	n/a	n/a	n/a	n/a	Case report of retained non-radiopaque sponge in the bladder after open cystolithotomy.	VC

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
132	Karasaki T, Nomura Y, Nakagawa T, Tanaka N. Beware of gossypibomas. BMJ Case Reports. 2013;2013.	Case Report	n/a	n/a	n/a	n/a	Case report of retained non-radiopaque sponge in the abdomen after cesarean section.	VC
133	Kim KS. Changes in computed tomography findings according to the chronicity of maxillary sinus gossypiboma. J Craniofac Surg. 2014;25(4): e330-3. doi:10.1097/SCS.0000000000000594 [doi].	Case Report	n/a	n/a	n/a	n/a	Case report of retained non-radiopaque sponge in the maxillary sinus after treatment for the fracture of the orbital floor.	VC
134	Kohli S, Singhal A, Tiwari B, Singhal S. Gossypiboma, varied presentations: a report of two cases.. Journal of Clinical Imaging Science. 2013;3: 11.	Case Report	n/a	n/a	n/a	n/a	Case report of retained non-radiopaque sponges in the abdomen after hysterectomy and cholecystectomy.	VC
135	Lundin K, Allen JE, Birk-Soerensen L. Gossypiboma after breast augmentation. Case Reports in Surgery. 2013;2013: 808624.	Case Report	n/a	n/a	n/a	n/a	Case report of retained non-radiopaque sponge in the breast after augmentation.	VC
136	Naama O, Quamous O, Elasri CA, et al. Textiloma: an uncommon complication of posterior lumbar surgery. Journal of Neuroradiology.Journal de Neuroradiologie. 2010;37(2): 131-134.	Case Report	n/a	n/a	n/a	n/a	Case report of retained non-radiopaque sponge in the spine after posterior lumbar surgery.	VB
137	Ogundiran T, Ayandipo O, Adeniji-Sofoluwe A, Ogun G, Oyewole O, Ademola A. Gossypiboma: complete transmural migration of retained surgical sponge causing small bowel obstruction.. BMJ Case Reports. 2011;2011.	Case Report	n/a	n/a	n/a	n/a	Case report of retained non-radiopaque sponge in the abdomen after gynecologic laparotomy.	VC
138	Ozkan Orhan Veli, Bas Gurhan, Akcakaya Adem, Sahin Mustafa. Transmural migration of a retained sponge through the rectum: a case report. BALKAN MED J. 2011;28(1): 94-95.	Case Report	n/a	n/a	n/a	n/a	Case report of retained non-radiopaque sponge that migrated to the rectum and was defecated following a myomectomy.	VC
139	Quraishi AH. Beyond a gossypiboma.. Case Reports in Surgery. 2012;2012: 263841.	Case Report	n/a	n/a	n/a	n/a	Case report of retained non-radiopaque sponge in the abdomen after emergency cesarean section.	VB
140	Sumer A, Carparlar MA, Uslukaya O, et al. Gossypiboma: retained surgical sponge after a gynecologic procedure.. Case Reports in Medicine. 2010;2010.	Case Report	n/a	n/a	n/a	n/a	Case report of retained non-radiopaque sponge in the abdomen after cesarean section.	VC
141	deKay K. Guideline for Preoperative Patient Skin Antisepsis. Kyle E, ed. AORN, Inc.; 2021.	Guideline	n/a	n/a	n/a	n/a	Guidance for preoperative skin antisepsis.	IVA
142	Cho SW, Jin HR. Gossypiboma in the nasal septum after septorhinoplasty: a case study. Journal of Oral & Maxillofacial Surgery. 2013;71(1): e42-4.	Case Report	n/a	n/a	n/a	n/a	Sponges used for rhinoplasty should be appropriate size and attached to a thread, and should be counted. The nasal cavity should be thoroughly explored.	VB
143	Yuki K, Shiba D, Ota Y, Ozeki N, Murat D, Tsubota K. A new method to prevent loss of mitomycin C soaked sponges under the conjunctiva during trabeculectomy.. Br J Ophthalmol. 2010;94(8): 1111-1112.	Case Report	n/a	n/a	n/a	n/a	Clinician reported use of sponges with attached thread to reduce the number of missing ophthalmic sponges during trabeculectomy.	VC
144	Srivastava A, Kataria K, Chella VR. Prevention of gossypiboma. Indian J Surg. 2014;76(2): 169.	Expert Opinion	n/a	n/a	n/a	n/a	Clinician reported use of laparotomy sponges tied together in packs of five sponges so that no single sponge was in the surgical wound when the peritoneum was open.	VC

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
145	McIntyre LK, Jurkovich GJ, Gunn ML, Maier RV. Gossypiboma: tales of lost sponges and lessons learned. Archives of Surgery. 2010;145(8): 770-775.	Organizational Experience	3	n/a	n/a	n/a	Inconsistency in documentation found and the health care organization's policy on packed sponges was changed to facilitate a standardized approach to communication of packing. Cases: 1- Packing left in. Saw on x-ray. 2- Packing left in, x-ray negative, count correct. Found on CT. Incomplete imaging due to obese patient. 3- Incomplete imaging. New policy- image from diaphragm to symphysis (complete body cavity radiographs). Also added to policy to announce and document packing.	VA
146	Cockburn T., Davis J., Osborne S. Retained Surgical Items: Lessons from Australian Case Law of Items Unintentionally Left Behind in Patients after Surgery. J Law Med. 2019;26(4):841-848. http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emexa&NEWS=N&AN=629752749.	Expert Opinion	n/a	n/a	n/a	n/a	Discussion of the findings in 10 legal cases in Australia involving RSIs. Accountability is a shared team responsibility. Clear and accurate documentation is important. Current methods of counting are not fully effective to prevent RSIs. The numbers of court proceedings is decreasing and therefore the importance of patient experience measures may increase.	VB
147	U.S. Food and Drug Administration. FDA public health notification: Unretrieved device fragments. https://wayback.archive-it.org/7993/20170111190519/http://www.fda.gov/MedicalDevices/Safety/AlertsandNotices/PublicHealthNotifications/ucm062015.htm. Published 2008. Updated 2015. Accessed 12/21, 2020.	Expert Opinion	n/a	n/a	n/a	n/a	Public health notification from the US Food and Drug Administration (FDA) on patient risk for injury from retained unretrieved device fragments.	VA
148	Pokharel K., Biswas B.K., Tripathi M., Subedi A. Missed central venous guide wires: A systematic analysis of published case reports. Crit Care Med. 2015;43(8):1745-1756. http://journals.lww.com/ccmjournal/pages/default.aspx; http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emed16&NEWS=N&AN=606190775. doi: http://dx.doi.org/10.1097/CCM.0000000000001012.	Literature Review	n/a	n/a	n/a	n/a	Review of all reported cases of whole guidewire retainment up to December 2016. Reports of whole guidewires being retained are increasing. It is important to check the catheter insertion tray at the end of insertion. Insertion of catheters by trainees without adequate supervision, distractions during the procedure, and a high workload are the main risk factors.	VA
149	Tateishi M, Tomizawa Y. Intravascular foreign bodies: Danger of unretrieved fragmented medical devices. Journal of Artificial Organs. 2009;12(2):80-89.	Literature Review	n/a	n/a	n/a	n/a	Review of intravascular unretrieved device fragments. Many preventable device-fracture complications are related to inappropriate use of intravascular devices, including use of devices for off-label purposes and reuse of single-use devices.	VB
150	Al-Moghairi AM, Al-Amri HS. Management of retained intervention guide-wire: A literature review. Current cardiology reviews. 2013;9(3):260-266.	Literature Review	n/a	n/a	n/a	n/a	Intervention guide-wire fracture and entrapment may lead to RSI during vascular procedures.	VA

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
151	Johnson C, Alomari AI, Chaudry G. Detachment of introducer sheath radiopaque marker during retrieval of G2 filter. Cardiovascular & Interventional Radiology. 2011;34(2):431-434.	Case Report	n/a	n/a	n/a	n/a	16-year old male with retained sheath radiopaque marker in chest found on incidental x-ray for other clinical symptoms. Recommend fluoroscopy during removal and confirmation of the marker on the sheath upon its removal.	VB
152	Williams T, L., Bowdle T, A., Winters B, D., Pavkovic S, D., Szekendi M, K. Guidewires unintentionally retained during central venous catheterization. J ASSOC VASC ACCESS. 2014;19(1):29-34. doi: 10.1016/j.java.2013.12.001.	Organizational Experience	42 retained guidewire events	n/a	n/a	n/a	Clinicians should be educated on prevention of guidewire retention. Recommended confirming removal of the guidewire and inspecting its integrity, withdrawing the guidewire together as a unit with the needle, and to replace bent wires immediately. Also, devices should be designed so that the clinician is alerted that the end of the guidewire is near. Reviewed cases from 2008-2012.	VA
153	Cohen SB, Bartz PJ, Earing MG, Sheil A, Nicolosi A, Woods RK. Myocardial infarction due to a retained epicardial pacing wire. Ann Thorac Surg. 2012;94(5): 1724-1726.	Case Report	n/a	n/a	n/a	n/a	20-year old man experienced cardiac arrest due to myocardial infarction from retained epicardial pacing wire after surgery as an infant to repair ASD defect. Pacing wires should be managed and accounted for intraoperatively.	VB
154	Kelly RJ, Whipple OC. Retained anvil after laparoscopic gastric bypass. Surgery for Obesity & Related Diseases. 2011;7(5): e13-5.	Case Report	n/a	n/a	n/a	n/a	Case report of the anvil of a stapler retained in the abdomen after a laparoscopic gastric bypass.	VB
155	Magalini S, Sermoneta D, Lodoli C, Vanella S, Di Grezia M, Gui D. The new retained foreign body! Case report and review of the literature on retained foreign bodies in laparoscopic bariatric surgery. European Review for Medical & Pharmacological Sciences. 2012;16(Suppl 4): 129-133.	Case Report and Literature Review	n/a	n/a	n/a	n/a	Case of a patient with lung abscess from a retained specimen bag containing bowel. Change in technology causes types of RSI to change. Lap procedures have restricted visual field. Check every item after removed, leave wire outside.	VA
156	Stephens M, Ruddle A, Young WT. An unusual complication of a dropped clip during laparoscopic cholecystectomy. Surg Laparosc Endosc Percutan Tech. 2010;20(3): e103-4.	Case Report	n/a	n/a	n/a	n/a	Case report of biliary obstruction from retained free stable in the abdomen. Free clips should be removed from the abdomen.	VC
157	Chepla Kyle J, Wilhelm Scott M. Delayed mechanical small bowel obstruction caused by retained, free, intraperitoneal staple after laparoscopic appendectomy. SURG LAPAROSC ENDOSC PERCUTAN TECHNIQ. 2011;21(1): e19-20. doi:10.1097/SLE.0b013e3182051ffe.	Case Report	n/a	n/a	n/a	n/a	Case report of retained free staple in abdomen causing bowel obstruction. Unfired staples free floating in abdomen should be removed.	VB
158	Ozsoy M, Celep B, Ozsan I, Bal A, Ozkececi ZT, Arikan Y. A retained plastic protective cover mimicking malignancy: Case report. International Journal of Surgery Case Reports. 2013;4(12): 1084-1087.	Case Report	n/a	n/a	n/a	n/a	Case report of retained plastic foreign bodies following nephrectomy.	VC
159	Toubia T, Sangha R. Retained Vaginal Foreign Body in Minimally Invasive Gynecological Surgeries. CRSLS MIS Case Reports. 2014.	Case Report	n/a	n/a	n/a	n/a	Case report of retained Asepto bulb after a robot-assisted total laparoscopic hysterectomy, and case report of a retained surgical sponge after a laparoscopic ovarian cystectomy.	VA
160	Sakhel K, Hines J. To forget is human: the case of the retained bulb. J Robotic Surg. 2009;3(1): 45-47.	Case Report	n/a	n/a	n/a	n/a	Case report of a forgotten asepto bulb in the vagina following a robot-assisted total laparoscopic hysterectomy.	VB

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
161	Barrow CJ. Use of x-ray in the presence of an incorrect needle count. AORN J. 2001;74(1):80-81.	Organizational Experience	Not Reported	n/a	n/a	n/a	Needles as small as 8-0 could be faintly visualized on both the anterior-posterior and lateral views.	VB
162	Macilquham MD, Riley RG, Grossberg P. Identifying lost surgical needles using radiographic techniques. AORN J. 2003;78(1):73-78. doi:S0001-2092(06)61347-1 [pii].	Organizational Experience	12 needles of commonly used sizes between #1 to 9-0	n/a	n/a	Correct identification of needles on a radiographic film.	All observers correctly identified needles larger than 19mm on at least one of the images. The smallest needle seen by 13% of observers was 13 mm. No participant correctly identified a needle smaller than 13mm. The smallest needle seen by the majority of observers was 17mm. The optimum detection method for needles was a mobile image intensifier. Obtaining a radiographic image for a needle count discrepancies for needles smaller than 13 mm is superfluous and exposes the patient to radiation for limited possibility of discovery. One limitation is the use of a Alderson phantom to simulate radiographic density (no humans were used).	VB
163	Ponrartana S, Coakley FV, Yeh BM, et al. Accuracy of plain abdominal radiographs in the detection of retained surgical needles in the peritoneal cavity. Ann Surg. 2008;247(1):8-12.	Nonexperimental	39 surgical needles	n/a	n/a	Detection of retained needles on radiograph	Abdominal radiographs have high sensitivity and interobserver agreement in the detection of retained surgical needles over 10 mm in length, but smaller needles are detected with significantly lower sensitivity and the utility of plain abdominal radiographs in this setting is more debatable.	IIIB
164	Kieval JZ, Walsh M, Legutko PA, Daly MK. Efficacy of portable X-ray in identifying retained suture needles in ophthalmologic cases. Eye. 2009;23(8): 1731-1734. doi:10.1038/eye.2008.320.	Nonexperimental	20 porcine eyes lab study	n/a	n/a	Detection of 10-0 nylon ophthalmic suture on plain films taken by c-arm fluoroscopy	The use of plain film radiographs to rule-out the presence of an intraocular surgical needle is neither a sensitive nor specific imaging modality.	IIIB
165	Hacivelioglu Servet, Karatag Ozan, Gungor Aysenur Cakir, et al. Is there an advantage of three dimensional computed tomography scanning over plain abdominal radiograph in the detection of retained needles in the abdomen?. INT J SURG. 2013;11(3): 278-281.	Nonexperimental	20 sheep	3D CT	Plain Abdominal Radiograph	Detection of surgical needles	Results suggest that both 3D CT and plain abdominal radiograph are effective and comparable in recognizing the retained surgical needles of various sizes.	IIIB
166	Horberry T, Teng YC, Ward J, Patil V, Clarkson PJ. Guidewire retention following central venous catheterisation: a human factors and safe design investigation.. International Journal of Risk & Safety in Medicine. 2014;26(1): 23-37.	Qualitative	n/a	n/a	n/a	n/a	Qualitative analysis of retained guidewires in surgical patients. Highest rated solutions by clinicians were better training, active checking for guidewire removal, and streamlining of central line sets.	IIIB
167	Moffatt-Bruce SD. Ellison EC. Anderson HL 3rd. Chan L. Balija TM. Bernescu I. Cipolla J. Marchigiani R. Seamon MJ. Cook CH. Steinberg SM. Stawicki SP. OPUS 12 Foundation,Inc.Multi-Center Trials Group. Intravascular retained surgical items: A multicenter study of risk factors. J Surg Res. 2012;178(1):519-523.	Nonexperimental	13 cases, 14 controls	n/a	Cases matched to a control who underwent the same procedure type within a 6-month period	Unexpected procedural factors, equipment failure, urgent procedures, bleeding >500mL, evening procedures, and trainee involvement.	Unexpected procedural factors and equipment failure are significantly associated with intravascular RSI (ivRSI). The reviewers were concerned that over half of the ivRSIs were missed on confirmatory imaging after the procedure.	IIIC
168	Ren S, Liu P, Wang W, Yang Y. Retained foreign body after laser ablation. Int Surg. 2012;97(4): 293-295. doi:10.9738/CC155.1 [doi].	Case Report	n/a	n/a	n/a	n/a	Two case reports of retained fiber optic sheaths after laser ablation.	VB

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
169	Ellett L, Maher P. Forgotten surgical items: Lessons for all to learn: Case report and 3-year audit of retained surgical items at a tertiary referral centre. Gynecological Surgery. 2013;10(4): 295-297.	Case Report	n/a	n/a	n/a	n/a	Case report of a retained KOH cup used in laparoscopic vaginal hysterectomy that was found 14 months later.	VB
170	Ogg MJ. Guideline for Sharps Safety. Wood A, ed. AORN, Inc.; 2021.	Guideline	n/a	n/a	n/a	n/a	Clinical practice recommendations for perioperative sharps safety.	IVA
171	29 CFR 1910.1030. Bloodborne pathogens. ; 2019.	Regulatory	n/a	n/a	n/a	n/a	Bloodborne pathogen standard.	n/a
172	Parelkar SV, Sanghvi BV, Shetty SR, Athawale H, Oak SN. Needle in a haystack: Intraoperative breakage of pediatric minimal access surgery instruments. J Postgrad Med. 2014;60(3):324-6. doi: https://dx.doi.org/10.4103/0022-3859.138823.	Case Report	n/a	n/a	n/a	n/a	Two case reports of retained objects in pediatric minimally invasive procedures. Surgeon waited to remove item, then had a hard time finding it. Suggested magnetic tip probe or grids for x-ray to locate lost items. Check instruments when removing from cavity.	VB
173	Ruscher KA, Modeste KA, Staff I, Papasavas PK, Tishler DS. Retained needles in laparoscopic surgery: open or observe? Conn Med. 2014;78(4): 197-202.	Nonexperimental	255 surveys	n/a	n/a	n/a	Surveyed surgeons and residents regarding how to manage retained needles in laparoscopic surgery. 89.4% of respondents believed that converting to laparotomy created a greater risk than the RSI itself. However, 92.6% of the respondents also agreed that an intraperitoneally retained needle put the patient at some degree of future risk.	IIIB
174	Barto W, Yazbek C, Bell S. Finding a lost needle in laparoscopic surgery. Surg Laparosc Endosc Percutan Tech. 2011;21(4): e163-5. doi:10.1097/SLE.0b013e3182203b49 [doi].	Nonexperimental and Case Report	n/a	n/a	n/a	n/a	Study to investigate the application of a new device (laparoscopic magnet) to retrieve lost needles intraoperatively using a pig and various size needles. Researchers found the laparoscopic magnet to be the safest and most efficient way of retrieving lost needles intraoperatively.	IIIB
175	Small AC, Gainsburg DM, Mercado MA, Link RE, Hedican SP, Palese MA. Laparoscopic needle-retrieval device for improving quality of care in minimally invasive surgery. J Am Coll Surg. 2013;217(3): 400-405. doi:10.1016/j.jamcollsurg.2013.02.035 [doi].	Nonexperimental	Not reported	n/a	n/a	Not reported	In vivo testing of a novel articulating laparoscopic magnet in a porcine model. Recovery of lost surgical needles during porcine laparoscopic surgery is safe and feasible with a simple articulating magnetic device.	IIIB
176	Jayadevan R, Stensland K, Small A, Hall S, Palese M. A protocol to recover needles lost during minimally invasive surgery. J Soc Laparoendosc Surg. 2014;18(4). doi:https://dx.doi.org/10.4293/JSLS.2014.00165.	Nonexperimental	305 surveys	n/a	n/a	n/a	Survey was administered to minimally invasive surgeons across the US to gather data on the incidence of lost surgical needles and recovery techniques. Developed protocol for recovering lost needles during minimally invasive surgery and recommended using a magnetic device, if one is available. Also recommended halting the procedure to survey for the lost needle and conduct a systematic search.	IIIB

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
177	Kumar S, Chandra A, Kulkarni R, Maurya AP, Gupta V. Forgotten biliary stents: ignorance is not bliss. Surg Endosc. 2018;32(1):191-195. doi:https://dx.doi.org/10.1007/s00464-017-5657-z.	Nonexperimental	21 retained biliary stents	n/a	n/a	Patient and incident characteristics	Biliary stenting is common but intended as a short-term implant for 3-6 months to aid in biliary drainage. The stents were discovered after a mean of 3.53 years. 76.2% of patients required an operation for removal.	IIIB
178	Hussain Z., Malik S.M., Rasool A., Mattoo S. Rare causes of foreign body in CBD: A retrospective study. JK Science. 2015;17(4):209-211. http://www.jkscience.org/archives/volume174/12-Originial%20Article%20of%2017(4)%202015.pdf; http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emed16&NEWS=N&AN=609973859.	Case Report	12 patients with a foreign body in the common bile ducts.	n/a	n/a	n/a	Case report of 12 foreign bodies found in the common bile duct. Most of the items (9/12, 75%) were items intentionally placed during a previous procedure. These items included a t-tube fragment, biliary stent, dormia basket, and metal clips.	VC
179	Ipaktchi K, Kolnik A, Messina M, Banegas R, Livermore M, Price C. Current surgical instrument labeling techniques may increase the risk of unintentionally retained foreign objects: A hypothesis. Patient safety in surgery. 2013;7(1):31-31. https://pubmed.ncbi.nlm.nih.gov/24079615; https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3849939/. doi: 10.1186/1754-9493-7-31.	Expert Opinion	n/a	n/a	n/a	n/a	Reported a near-miss event in which an instrument label fragment was discovered in the surgical wound during closing. They recommended inspecting instruments after use in their entirety, including the label, to prevent the unintentional retention of instrument label fragments.	VC
180	Bansal M, Heckl F, English K. Retained broken outflow cannula recovered 6 years post-knee arthroscopy.. Orthopedics. 2011;34(12): e945-7.	Case Report	n/a	n/a	n/a	n/a	Case report of a retained outflow cannula fragment found six years after a knee arthroscopy. The patient presented with acute pain, and radiographs showed a retained metallic object in the operative knee. The retained fragment was removed by arthroscopy and the patient subsequently developed deep vein thrombosis. The authors advised diligent inspection of instruments that have been used on a patient, even if the risk for complication is low.	VB
181	Teixeira PG, Inaba K, Salim A, et al. Retained foreign bodies after emergent trauma surgery: incidence after 2526 cavitary explorations. Am Surg. 2007;73(10): 1031-1034.	Nonexperimental	3	n/a	n/a		An 8 yr study of 2526 cases revealed 3 cases of retained sponges. For emergency procedures, recommend radiographic evaluation before final cavity closure even with a correct sponge count.	IIIB
182	Murdock D. Trauma: when there's no time to count. AORN J. 2008;87(2): 322-328.	Expert Opinion	n/a	n/a	n/a	n/a	The nature of trauma places the patient at a higher risk for retained foreign objects and, as professionals and patient advocates, the perioperative team must help reduce these risks.	VB
183	Kyle E, Wood A. Guideline for Care and Cleaning of Surgical Instruments. Kyle E, ed. AORN, Inc.; 2021.	Guideline	n/a	n/a	n/a	n/a	Perioperative recommendations for care and cleaning of surgical instruments.	IVA

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
184	Yasuhara H, Fukatsu K, Komatsu T, Murakoshi S, Saito Y, Uetera Y. Occult risk of broken instruments for endoscopy-assisted surgery. World J Surg. 2014;38(11):3015-3022.	Nonexperimental	39,817 procedures performed from 2007 to 2011. Robotic surgery was not performed during this period. Loaned instruments were excluded.	n/a	n/a	Rate of instrument breakage.	441 instruments reported broken intraoperatively and 7,541 instruments found to be broken upon inspection. MIS instruments were broken significantly more frequently than regular surgical instruments. Two of the most likely causes of instrument breakage were inappropriate use and being worn out. Adverse events associated with broken instruments falling off were related to inappropriate use.	IIIB
185	Abe T, Murai S, Nasuhara Y, Shinohara N. Characteristics of medical adverse Events/Near misses associated with Laparoscopic/Thoracoscopic surgery: A retrospective study based on the japanese national database of medical adverse events. Journal of Patient Safety. 2019;15(4):343-351. doi: http://dx.doi.org/10.1097/PTS.0000000000000422.	Nonexperimental	746 adverse events or near misses from laparoscopic or thorascopic procedures reported to the Japanese Council for Quality Healthcare	n/a	n/a	Number of retained foreign bodies.	The rate of RSIs was 9.1% (68/746). It was the second most common adverse event. Overall, more surgical instruments were retained than sponges. Incidental discovery of the RSI occurred over a year later 20.6% of the time. Instrument breakage was strongly associated with an increased risk for a RSI. Suggested a checklist may help reduce laparoscopic instrument device fragments.	IIIA
186	Matsuda S., Yoshimura H., Yoshida H., Sano K. Breakage and migration of a high-speed dental hand-piece bur during mandibular third molar extraction: Two case reports. Medicine. 2020;99(7):e19177. https://journals.lww.com/md-journal/pages/default.aspx; http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emexb&NEWS=N&AN=631054319. doi: http://dx.doi.org/10.1097/MD.0000000000019177.	Case Report	n/a	n/a	n/a	n/a	The dental burrs selected may have not been appropriate for the cutting that was done and may have necessitated more force on the instrument leading to fragmentation.	VB
187	Reece M, Troeleman ND, McGowan JE, Furuno JP. Reducing the incidence of retained surgical instrument fragments. AORN Journal. 2011;94(3):301-304. https://doi.org/10.1016/j.aorn.2011.05.014. doi: https://doi.org/10.1016/j.aorn.2011.05.014.	Organizational Experience	323 instruments were found to be retired or repaired in one audit from July to December of 2010.	n/a	n/a	n/a	Description of program to reduce the incidence of instrument fragments at one hospital. Sterile processing personnel disinfect and tag all damaged instruments and store them for a minimum of one year. The retired instrument is then logged into a database and monitored by the perioperative quality council.	VB
188	Fischer RA. Danger: Beware of unretrieved device fragments. Nursing. 2007;37(11):17. doi: 10.1097/01.NURSE.0000298180.71588.13 [doi].	Expert Opinion	n/a	n/a	n/a	n/a	Expert advised inspecting intravascular devices for breakage or manufacturing defects to minimize the risk for retained device fragments.	VB
189	Omar HR, Sprenker C, Karlnoski R, Mangar D, Miller J, Camporesi EM. The incidence of retained guidewires after central venous catheterization in a tertiary care center. Am J Emerg Med. 2013;31(10):1528-1530.	Case Report	n/a	n/a	n/a	n/a	During the 26-month period, 16 cases with retained foreign bodies requiring IR or vascular surgery for extraction were found	VB
190	Pillarisetti J, Biria M, Balda A, Reddy N, Berenbom L, Lakkireddy D. Integrity of vascular access: The story of a broken sheath! J Vasc Nurs. 2009;27(3):75-77. doi: 10.1016/j.jvn.2009.07.001.	Case Report	n/a	n/a	n/a	n/a	Case report of a retained sheath following cardiac catheterization.	VB
191	DerDerian T, Ascher E, Hingorani A, Jimenez R. A rare complication of a retained wire during endovascular abdominal aortic aneurysm repair. Ann Vasc Surg. 2013;27(8):1183.e11-1183.e15.	Case Report	n/a	n/a	n/a	n/a	Case report of entrapped guidewire during AAA repair. At 1- year of follow-up, the patient has been asymptomatic with no obvious sequelae.	VB

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
192	Torre M, Lechpammer M, Paulson V, et al. Embolic Foreign Material in the Central Nervous System of Pediatric Autopsy Patients With Instrumented Heart Disease. J Neuropathol Exp Neurol. 2017;76(7):571-577. doi:https://dx.doi.org/10.1093/jnen/nlx037.	Nonexperimental	24 autopsied children that had cardiac catheterization, heart surgery on cardiopulmonary bypass	n/a	n/a	Number of patients with embolic material in the central nervous system	Of the 24 patients, 8 had embolic material in the CNS and was associated with cellular inflammatory reaction.	IIIB
193	Endicott KM, Friedrich R, Custer JW, Sarkar R, Rowen L, Anders MG. Preventing retained surgical items during endovascular procedures: Bridging the gap between guidelines and practice. AORN J. 2020;112(6):625-633. https://doi.org/10.1002/aorn.13250. doi: https://doi.org/10.1002/aorn.13250.	Organizational Experience	Not Reported	n/a	n/a	n/a	Describes an interdisciplinary team review of ivRSI events and proposed solutions put into place within the organization.	VB
194	Endicott K.M., Drucker C.B., Orbay H., et al. Intraoperative fragmentation and retention of endovascular devices: Clinical consequences and preventative strategies. Vasc Endovasc Surg. 2020;54(2):118-125. http://70.107.241.254/index.htm; http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emexa&NEWS=N&AN=2003552626. doi: http://dx.doi.org/10.1177/1538574419886193.	Organizational Experience	34 OR RNs surveyed	n/a	n/a	n/a	Authors found a significant difference between the perceived benefit of the in-service presentation compared with the visual tool for identification of broken catheters and sheaths used during endovascular procedures. Nurses felt having the visual aid available in the OR was more helpful. This finding was only significant for nurses who were not typically involved in endovascular procedures.	VC
195	Mariyaselvam MZA, Catchpole KR, Menon DK, Gupta AK, Young PJ. Preventing retained central venous catheter guidewires: A randomized controlled simulation study using a human factors approach. Anesthesiology. 2017;127(4):658-665. doi: 10.1097/ALN.0000000000001797 [doi].	RCT	20 participants	10 using a locked central line insertion kit	10 using a standard central line insertion kit	Identification of a retained guidewire.	Use of the locked central line insertion kits prevented the guidewire from being retained compared to 20% in the standard group. Use of the forced-error simulation helped the study evaluators understand if participants would identify the missing guidewire.	IB
196	Kava BR, Burdick-Will J. Complications associated with retained foreign bodies from infected penile implants: proposal for the use of an implant-specific checklist at the time of device removal.. Journal of Sexual Medicine. 2013;10(6): 1659-1666.	Case Report	n/a	n/a	n/a	n/a	Retained fragments from complex penile prosthesis removals. Recommend checklist of implant parts.	VA
197	Felder SI, Liou DZ, Gangi A. Gastric adjustable band as a retained foreign object: A case report. Bariatric Surgical Patient Care. 2013;8(4): 166-168.	Case Report	n/a	n/a	n/a	n/a	Case report of retained adjustable gastric band following elective conversion to a gastric sleeve that was not recognized for over 12 months.	VB
198	Augello M, von Jackowski J, Gratz KW, Jacobsen C. Needle breakage during local anesthesia in the oral cavity--a retrospective of the last 50 years with guidelines for treatment and prevention. Clin Oral Investig. 2011;15(1): 3-8.	Literature Review	n/a	n/a	n/a	n/a	In a majority of cases, needle breakage during local anesthesia in the oral cavity occurred during an inferior alveolar nerve block. This was found to be due mostly to improper technique or needles that are too thin. The risk of a retained fragment includes needle migration or injury to surrounding anatomical structures (eg, blood vessels, nerves).	VB

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
199	Malamed SF, Reed K, Poorsattar S. Needle breakage: incidence and prevention. Dent Clin North Am. 2010;54(4): 745-756.	Literature Review	n/a	n/a	n/a	n/a	Although rare, dental needle breakage can, and does, occur. After review of the literature and personal experience the authors recommend not using thin or short needles, not benign the needles and not inserting them to the hub during the injection unless it is absolutely essential for the success of the injection to minimize the risk of needle breakage and retained fragments.	VB
200	Pogrel MA. Broken local anesthetic needles: a case series of 16 patients, with recommendations.. J Am Dent Assoc. 2009;140(12): 1517-1522.	Case Report	n/a	n/a	n/a	n/a	Case series of 16 patients with broken local anesthetic needles. Recommended avoiding 30g for alveolar block, short needles, bending the needle, and burying the needle in to hub.	VA
201	Catelani C, Valente A, Rossi A, Bertolai R. Broken anesthetic needle in the pterygomandibular space. Four case reports. Minerva Stomatol. 2013;62(11-12): 455-463.	Case Report	n/a	n/a	n/a	n/a	Report of 4 cases of needle breakage. Recommended checking needle before use, not inserting to the hub, avoid bending the needle, avoid changing the angle of the needle during injection, and using high quality products.	VB
202	Kim SH, Huh K, Jee YS, Park MJ. Breakage of growth hormone needle in subcutaneous tissue. Journal for Specialists in Pediatric Nursing: JSPN. 2011;16(2): 162-165.	Case Report	n/a	n/a	n/a	n/a	Case report of needle breakage during subcutaneous growth hormone administration. Recommend checking the needle before using it, do not use dull or deformed needles, do not reuse needles, keep muscles in the injection area relaxed when injecting, inform the patient about possible pain, pinch the skin at the injection site, and do not change the direction of the needle during the injection.	VC
203	Stein KM. Use of intraoperative navigation for minimally invasive retrieval of a broken dental needle. J Oral Maxillofac Surg. 2015;73(10):1911-6. doi: https://dx.doi.org/10.1016/j.joms.2015.04.033.	Case Report	n/a	n/a	n/a	n/a	Report of a retained hypodermic needle fragment from an inferior alveolar nerve block.	VC
204	Alexander G, Attia H. Oral maxillofacial surgery displacement complications. Oral and Maxillofacial Surgery Clinics of North America; Complications in Dentoalveolar Surgery. 2011;23(3):379-386. http://www.sciencedirect.com/science/article/pii/S1042369911000987. doi: https://doi.org/10.1016/j.coms.2011.04.001.	Expert Opinion	n/a	n/a	n/a	n/a	Discussed that needle fracture retrieval is more complicated when the hub is buried in the tissue, which places the patient at increased risk for an invasive procedure to remove the fragment. Advised against burying the needle to the hub because of the certainty of difficult retrieval in the event of breakage. Recommended that repeated use of the same needle should be avoided because this practice increases the risk for breakage. If a needle is broken, recommend to immediately discontinue the procedure and attempt to retrieve the material before it becomes inaccessible.	VA

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
205	Bydon A, Xu R, Conte JV, et al. Surgical mystery: Where is the missing pituitary rongeur tip? Spine. 2010;35(17). https://journals.lww.com/spinejournal/Fulltext/2010/08010/Surgical_Mystery__Where_Is_the_Missing_Pituitary.24.aspx.	Case Report	n/a	n/a	n/a	n/a	61-year old woman with a broken rongeur tip during a spine procedure retained in her heart. The rongeur tip was missing when it was withdrawn from the surgical site. An intraoperative C-arm fluoroscopic radiograph showed that the tip had migrated through a vascular injury. After consulting with the vascular team, the surgical team made the decision to complete the spine procedure given the patient's hemodynamic stability. After surgery, the patient underwent an abdominal CT scan, chest radiograph, transthoracic echocardiogram, cardiac catheterization, and thoracic CT scan over the course of two days before the rongeur tip was localized to the left ventricle. The patient then underwent a sternotomy for removal of the rongeur tip and closure of a previously undiagnosed patent foramen ovale. Afterwards, the patient recovered in the cardiac intensive care unit in stable condition. Emphasized the need for rapid diagnosis and collaboration to treat a potentially devastating complication from a retained device fragment.	VB
206	Centers for Medicare & Medicaid Services, ed. State operations manual appendix A: Survey protocol, regulations and interpretive guidelines for hospitals. Rev. 200 ed. Centers for Medicare and Medicaid (CMS); 2020.	Regulatory	n/a	n/a	n/a	n/a	CMS manual for hospital facilities.	n/a
207	Centers for Medicare & Medicaid Services, ed. State operations manual appendix L-guidance for surveyors: Ambulatory surgical centers. Rev. 200 ed. Centers for Medicare and Medicaid Services (CMS); 2020.	Regulatory	n/a	n/a	n/a	n/a	CMS manual for ambulatory facilities.	n/a
208	Stawicki SP, Moffatt-Bruce SD, Ahmed HM, et al. Retained surgical items: a problem yet to be solved. J Am Coll Surg. 2013;216(1): 15-22.	Nonexperimental	59 cases, 118 controls	n/a	Cases matched to 2 controls who underwent the same procedure type within a 6-month period	BMI, procedure factors, unexpected intraoperative events, safety omissions/variances, and trainee presence.	RSI risk increased with longer duration of surgery, safety variances, and incorrect counts. Recommend zero tolerance approach for safety variances and enhancing reporting systems. Cases reviewed were from 2003-2009.	IIIB
209	Rowlands A. Risk factors associated with incorrect surgical counts. AORN J. 2012;96(3): 272-284.	Nonexperimental	22	n/a	n/a	Incorrect surgical counts	Six variables were significantly associated with an incorrect surgical count: a higher surgical risk, a lower body mass index, a complicated procedure, an unplanned procedure, an increased number of perioperative personnel involved, and an increased number of specialty teams involved.	IIIB

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
210	Weprin S, Crocerossa F, Meyer D, et al. Risk factors and preventive strategies for unintentionally retained surgical sharps: a systematic review. Patient Safety in Surgery. 2021;15(1):24.	Literature Review	n/a	n/a	n/a	n/a	Literature review focused on preventing retention of sharp objects including needles, blades, instruments, wires, and fragments. Discussion and comparison of varied related technologies.	VB
211	Ward EP, Yang J, Delong JC, et al. Identifying lost surgical needles with visible and near infrared fluorescent light emitting microscale coating. Surgery. 2018;163(4):883-888. doi:S0039-6060(17)30759-6 [pii].	Quasi-experimental	52 coated needles in both open and laparoscopic procedures	Identification of the needle location in open and laparoscopic procedures using a near infrared camera or ultraviolet light	Standard methodical wound exploration performed for a missing needle.	Needle identification	All the dual dye coated needles were located in the allotted time. Comparatively, 9 needles searched for using standard methods were not located in the allotted time. Use of dye coated needles were more likely to be discovered and the time to discovery was less than conventional search methods.	IIB
212	Joseph M, Relano R. A typical day in cardiac theatres... or was it? Expect the unexpected. J Perioper Pract. 2014;24(9):194.	Case Report	n/a	n/a	n/a	n/a	Third suture needle found attached to a 4-0 prolene double armed needle.	VC
213	Hariharan D, Lobo DN. Retained surgical sponges, needles and instruments. Ann R Coll Surg Engl. 2013;95(2): 87-92.	Literature Review	n/a	n/a	n/a	n/a	The overall incidence of RSI is low although its incidence is substantially higher in operations performed on open cavities. Sponges are the most commonly retained item when compared with needles and instruments. Clinical presentation is varied, leading to avoidable morbidity, and the error is indefensible medicolegally. Risk factors include emergency operations, operations involving unexpected change in procedure, raised body mass index, and a failure to perform accurate sponge and instrument counts. The existing strategy for prevention is manual counting of sponges and instruments undertaken by surgical personnel. This, however, is fallible. Computer assisted counting of sponges using barcodes and gauze sponges tagged with a radiofrequency identification device aiding manual counting have been trialed recently, with success.	VB
214	Tofte J.N., Caldwell L.S. Detection of Retained Foreign Objects in Upper Extremity Surgical Procedures With Incisions of Two Centimeters or Smaller. Iowa Orthop J. 2017;37:189-192. http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emed18&NEWS=N&AN=622253947.	Quasi-experimental	29 simulated hand procedures involving incisions of 2cm or less	Placement of a sponge in the wound.	No placement of a sponge in the wound.	Visual identification of a sponge in the wound from varying distances in the OR.	In a wound that was 2 cm or less the maximum amount of sponge that could be contained in the incision was 3 cm. All the sponges placed in the wound could be visualized both from across the room and when standing at the OR bed. Use of RF adjunct technology for prevention of retained sponged is not necessary if the sponge can be reliably detected using visualization.	IIC
215	Cousin G, Markose G. The incidental finding of a retained 'throat pack'. Ann R Coll Surg Engl. 2020;102(6):e125. doi:https://dx.doi.org/10.1308/rcsann.2020.0047.	Case Report	n/a	n/a	n/a	n/a	Authors noted that a metal-reinforced hair tie mimicked retained throat pack on a postoperative radiographic film following bimaxillary osteotomies.	VC

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
216	Sencimen M, Bayar GR, Gulses A. Removal of the retained suture needle under C-arm fluoroscopy: a technical note. Dental Traumatology. 2010;26(6): 527-529.	Case Report	n/a	n/a	n/a	n/a	Case report of a suture needle, accidentally retained in the pterygomandibular space during the extraction of upper wisdom third molar that was removed via intraoral route using C-arm fluoroscopy.	VC
217	Huang J, Bouvette MJ, Chari R, Vuddagiri V, Kraemer MC, Zhou J. The detection of a retained sponge in the aorta by transesophageal echocardiography. Journal of Cardiothoracic & Vascular Anesthesia. 2010;24(2): 314-315.	Case Report	n/a	n/a	n/a	n/a	Case report of a retained sponge in the distal aortic arch proximal descending aorta diagnosed by TEE.	VC
218	Hunter TB, Gimber LH. Identification of retained surgical foreign objects: policy at a university medical center. Journal of the American College of Radiology. 2010;7(9): 736-738.	Organizational Experience	n/a	n/a	n/a	n/a	Described a radiograph reference guide that was created for the radiologist reviewing radiograph screening images for RSI.	VB
219	Gayer G, Lubner MG, Bhalla S, Pickhardt PJ. Imaging of abdominal and pelvic surgical and postprocedural foreign bodies. Radiol Clin North Am. 2014;52(5): 991-1027. doi:10.1016/j.rcl.2014.05.006 [doi].	Expert Opinion and Literature Review	n/a	n/a	n/a	n/a	Explained various imaging presentations of RSIs and the complexity of identifying retained items amid other patient care items, such as packing, drains, and implants.	VA
220	Use of x-rays for incorrect needle counts. Pa Patient Saf Advis. 2004;1(2):5-6.	Consensus	n/a	n/a	n/a	n/a	The clinical literature provides conflicting evidence for when x-rays may be useful in locating lost surgical needles.	IVC
221	510(k) Clearances. https://www.fda.gov/medical-devices/device-approvals-denials-and-clearances/510k-clearances. Updated 2018. Accessed 5/3, 2021.	Regulatory	n/a	n/a	n/a	n/a	Discussion of medical device clearance.	n/a
222	Medical Devices. Exemptions From Premarket Notification and Reserved Devices; Class I. Vol 63. Government Publishing Office; 1998.	Regulatory	n/a	n/a	n/a	n/a	Exemptions from premarket notification of class 1 medical devices.	n/a
223	Establishment Registration & Device Listing [Database[. https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfRL/rl.cfm. Updated 2021. Accessed 5/3, 2021.	Regulatory	n/a	n/a	n/a	n/a	Federal database of medical devices.	n/a
224	Johnstone EM, Conner R. Guideline for Medical Device and Product Evaluation. Conner R, ed. AORN, Inc.; 2021.	Guideline	n/a	n/a	n/a	n/a	Perioperative practice recommendations for medical device and product selection.	IVA
225	Conner R, Kyle E. Guideline for Sterilization. Conner R, ed. AORN, Inc.; 2021.	Guideline	n/a	n/a	n/a	n/a	Recommended practices for sterilization of surgical instruments.	IVA
226	deKay K. Guideline for Environmental Cleaning. Wood A, ed. AORN, Inc.; 2021.	Guideline	n/a	n/a	n/a	n/a	Recommendations for perioperative environmental cleaning.	IVA
227	SALCEDO JD, PRETORIUS VG, HSU JC, et al. WILEY compatibility of radiofrequency surgical sponge detection technology with cardiac implantable electronic devices and temporary pacemakers. Pacing and Clinical Electrophysiology. 2016;39(11):1254-1260. https://doi.org/10.1111/pace.12938. doi: https://doi.org/10.1111/pace.12938.	Nonexperimental	50 patients, 40 undergoing implantable cardiac generator replacement and 10 undergoing pulmonary thromboembolectomy that had temporary pacing systems used.	n/a	n/a	Changes in programed device settings, changes to measured parameters (eg, inhibition)	There was no electromagnetic interference (EMI) or inhibition of permanent devices. There was two cases of inhibition in 10 of the temporary pacemaker patients. The authors suggest placing temporary pacemakers in asynchronous mode when the wand is used.	IIIC
228	Williams MR, Atkinson DB, Bezzerides VJ, et al. Pausing with the gauze: Inhibition of temporary pacemakers by radiofrequency scan during cardiac surgery. Anesth Analg. 2016;123(5):1143-1148.	Nonexperimental	Three temporary pacemaker models	n/a	n/a	Pacemaker inhibition	Normal operation of the RFID system caused pacemaker inhibition in three temporary pacemaker models. Use asynchronous mode to prevent oversensing and inhibition in pacemakers.	IIIB

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
229	Electromagnetic compatibility(EMC) > radio frequency identification (RFID). http://www.fda.gov/Radiation-EmittingProducts/RadiationSafety/ElectromagneticCompatibilityEMC/ucm116647.htm. Accessed 7/28/2015, 2015.	Expert Opinion	n/a	n/a	n/a	n/a	Harms to the patient from RFID technology may include the potential to interfere with pacemakers, implantable cardioverter defibrillators, and other electronic medical devices, or the potential hazard of electromagnetic interference (EMI) to electronic medical devices from RF transmitters.	VA
230	Steelman VM, Schaapveld AG, Perkhounkova Y, Storm HE, Mathias M. The Hidden Costs of Reconciling Surgical Sponge Counts. AORN J. 2015;102(5):498-506. doi:https://dx.doi.org/10.1016/j.aorn.2015.09.002.	Nonexperimental	13,322 procedures over 9 months involving 212 surgical sponge counts that required additional time and effort to reconcile	n/a	n/a	Time spent reconciling sponge counts, actions taken, type of sponge and location of discovery.	The total annual cost of sponge searches and radiography to rule out a retained sponge was $219,956. The time spent searching was from 1 to 90 minutes involving a total of $70,266 in unproductive OR time. Fifty-two patients required radiographs.	IIIA
231	Steelman V.M., Schaapveld A.G., Storm H.E., Perkhounkova Y., Shane D.M. The Effect of Radiofrequency Technology on Time Spent Searching for Surgical Sponges and Associated Costs. AORN J. 2019;109(6):718-727. http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emexb&NEWS=N&AN=628048832. doi:http://dx.doi.org/10.1002/aorn.12698.	Nonexperimental	27,637 procedures over the pre and post implementation period	n/a	n/a	Effect of radiofrequency adjunct technology on the time spent searching for the sponge and associated costs.	Implementation of adjunct technology reduced the time spent searching for sponges by 79.58%, unreconciled counts by 71.28%, time spent using radiography by 46.31%, and costs.	IIIA
232	Rogers A, Jones E, Oleynikov D. Radio frequency identification (RFID) applied to surgical sponges. Surg Endosc. 2007;21(7):1235-1237.	Nonexperimental	Not reported	n/a	n/a	Detection and durability of tagged sponges	Assessed the feasibility of identifying RFID-tagged surgical sponges and durability of the device in water and body fluids.	IIIB
233	Macario A, Morris D, Morris S. Initial clinical evaluation of a handheld device for detecting retained surgical gauze sponges using radiofrequency identification technology. Arch Surg. 2006;141(7):659-662. doi:10.1001/archsurg.141.7.659.	Quasi-experimental	8 patients undergoing abdominal or pelvic surgery	RFID sponges	n/a	Detection of sponges	Tested an RFID wand device in eight patients undergoing abdominal surgery as part of an experimental trial with blinding. The RFID wand detected all sponges correctly in less than three seconds. However, the study was limited by a very small sample size.	IIC
234	Norton E. Using technology to prevent retained sponges. AORN J. 2014;99(4):C5-6.	Organizational Experience	Not reported	n/a	n/a	n/a	Discusses how a retained surgical sponge led facility process improvements and implementation of adjunct technology and has eliminated retained sponges.	VC

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
235	Primiano M, Sparks D, Murphy J, Glaser K, McNett M. Using Radiofrequency Technology to Prevent Retained Sponges and Improve Patient Outcomes. AORN J. 2020;112(4):345-352. http://search.ebscohost.com/login.aspx?direct=true&db=ccm&AN=146138347&site=ehost-live&scope=site. doi:10.1002/aorn.13171.	Organizational Experience	38,485 procedures prior to implementation and 40,833 procedures after implementation	n/a	n/a	n/a	Details a retrospective review of an adjunct technology implementation project. Rates of retained sponges (68%), near misses, and miscounts decreased. Reported cost savings of $424,292 per year of adjunct technology use. A retained sponge was defined as any sponge that was unaccounted for at the end of the final closing count. There were still retained sponges (18 in 2 years) after implementation but the suspected reasons that sponges were still retained after RF adjunct technology implementation were not discussed. Retained sponges were defined as any sponge that was not accounted for at the end of the procedure.	VC
236	Greenberg CC, Diaz-Flores R, Lipsitz SR, et al. Bar-coding surgical sponges to improve safety: a randomized controlled trial. Ann Surg. 2008;247(4):612-616. [IB].	RCT	300 general surgery procedures	Barcoded sponge system	Traditional count protocol	Primary: number of incidents of miscounted or misplaced sponges detected. Secondary: total time devoted to counting activities, the number of miscounts, and the number of misplaced or retained sponges, the number of operations with any discrepancy and each type of discrepancy, and the number of x-rays required to resolve discrepancies. Qualitative: assessments of the counting protocol, team performance, and confidence that the count was correct.	RCT compared a barcoded sponge system (ie, 2D matrix) to a traditional count protocol and found that the barcoding system identified significantly more count discrepancies than the traditional manual count protocol, although the system increased the time spent counting. The researchers discussed that the introduction of technology and the associated learning curve may have influenced the study results, as a qualitative survey showed that some personnel struggled while most easily adapted to the technology. A limitation of the study is that it was not statistically powered to detect a reduction in retained surgical sponges, which is a rare event requiring a very large sample size.	IB

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
237	Cima RR, Kollengode A, Clark J, et al. Using a data-matrix-coded sponge counting system across a surgical practice: impact after 18 months. Joint Commission Journal on Quality & Patient Safety. 2011;37(2):51-58.	Organizational Experience	Not Reported	n/a	n/a	n/a	Implemented a data-matrix-coded (ie, 2D matrix) sponge system. They initially conducted two trials to assess the system before institution-wide implementation. In an 18-month period during which 87,404 procedures were performed, no RSIs were reported. The first trial measured time spent counting data-matrix coded sponges (n = 365) and control sponges (n = 335) for colon and rectal procedures. Although the initial time for counting data-matrix-coded sponges was 11 seconds, the time was reduced to five seconds after four days of implementation; the time to count control sponges was four seconds. This report is limited by the nature of an organizational experience report and may not be generalizable to other institutions.	VB
238	Retained Sponges Persist as a Surgical Complication Despite Manual Counts. Hazard #3—2019 Top 10 Health Technology Hazards. ECRI Institute; 2018.	Expert Opinion	n/a	n/a	n/a	n/a	Retained sponges names a 2019 ECRI Health Technology Hazard. Recommends considering use of adjunct technology.	VB
239	Gunnar W, Soncrant C, Lynn MM, Neily J, Tesema Y, Nylander W. The Impact of Surgical Count Technology on Retained Surgical Items Rates in the Veterans Health Administration. J Patient Saf. 2020.	Nonexperimental	137 Veterans Health Administration Surgical Programs with and without adjunct technology	n/a	n/a	RSI rates, RSI rates with and without adjunct technology, Root Cause Analysis findings.	Over 7 years, 124 RSIs occurred and 2,964,472 procedures were performed. The overall RSI rates was 1:23,908 procedures. Programs with adjunct technology (N=46) had significantly more RSIs than those without (N=91). RSI rates before and after adjunct technology was implemented were not significantly different. Root cause analysis identified 98 root causes of which human factors, failure of policy and procedure and communication were the most common. RSI rates were not separated out by type (eg, soft goods, instruments).	IIIC
240	Etchells E, Koo M, Daneman N, et al. Comparative economic analyses of patient safety improvement strategies in acute care: a systematic review. BMJ Quality & Safety. 2012;21(6):448-456.	Systematic Review	5 reports, 7 comparisons	n/a	n/a	Costs	Systematic review of cost-benefit analysis reports comparing various RSI prevention methods. Found that standard counting is the most economical strategy. More comparative economic analyses are needed.	IIIA

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
241	Seidman SJ, Brockman R, Lewis BM, et al. In vitro tests reveal sample radiofrequency identification readers inducing clinically significant electromagnetic interference to implantable pacemakers and implantable cardioverter-defibrillators. Heart Rhythm. 2010;7(1):99-107. doi:10.1016/j.hrthm.2009.09.071 [doi].	Quasi-experimental	15 implantable pacemakers and 15 implantable cardioverter defibrillators	Different frequencies tested (low, high, and ultra-high)	n/a	Electromagnetic interference	The researchers found that EMI was different among the different frequencies, with low frequency being the most susceptible to interference, high frequency to a lesser degree, and no EMI from the ultra-high frequency RFID devices that were tested. The researchers stated that they did not believe that the current situation reveals an urgent public health risk but advised caution with increasing use of RFID into the future because of the potential for clinically significant events for patients with implanted cardiac devices.	IIA
242	Plakke MJ, Maisonave Y, Daley SM. Radiofrequency scanning for retained surgical items can cause electromagnetic interference and pacing inhibition if an asynchronous pacing mode is not applied. A A Case Rep. 2016;6(6):143-145. doi: 10.1213/XAA.0000000000000229 [doi].	Case Report	n/a	n/a	n/a	n/a	Report of electromagnetic interference of a temporary pacemaker during use of adjunct technology with radiofrequency. Authors stated no warning was given prior to use of adjunct technology with radiofrequency.	VB
243	Yamashita K, Kusuda K, Ito Y, et al. Evaluation of Surgical Instruments With Radiofrequency Identification Tags in the Operating Room. Surg Innov. 2018;25(4):374-379.	Nonexperimental	15 patient who had inguinal hernia (N=2) or lumpectomy with axillary node dissection or sentinel lymph node biopsy (N=13) procedures.	n/a	n/a	Detection and usage of surgical instruments with radiofrequency identification tags.	Detection capability of the antenna on the Mayo stand was 95% and total detection rate was 100%. Interference from electrocautery device use impacted detection of the RFID tags. Researchers in this feasibility study concluded that instruments can be tracked but further development is warranted.	IIIC
244	Kranzfelder M, Schneider A, Fiolka A, et al. Real-time instrument detection in minimally invasive surgery using radiofrequency identification technology. J Surg Res. 2013;185(2):704-710.	Nonexperimental	10 laparoscopic cholecystectomy procedures	n/a	n/a	Detection of tagged instruments	Used RFID tagged instruments in 10 laparoscopic cholecystectomies and found that this technology was feasible for real-time, reliable instrument detection. However, some miscounts occurred during continuous application of electrosurgery current. This study is limited by a small sample size.	IIIB
245	Neumuth T, Meissner C. Online recognition of surgical instruments by information fusion. International Journal of Computer Assisted Radiology & Surgery. 2012;7(2):297-304. Accessed 20120302.	Nonexperimental	Not reported	n/a	n/a	Detection of tagged instruments	Used RFID information fusion technology and correctly identified instrument usage during surgical procedures 97% of the time.	IIIB

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
246	Yamashita K, Kusuda K, Tokuda Y, et al. Validation of cleaning evaluation of surgical instruments with RFID tags attached based on cleaning appraisal judgment guidelines. Conference Proceedings: ...Annual International Conference of the IEEE Engineering in Medicine & Biology Society. 2013;2013:926-929. Accessed 20131010.	Quasi-experimental	Not Reported	RFID tagged instruments	Washer disinfector vs. ultrasonic washer vs. no cleaning process	Cleanliness of RFID tagged instruments (residual protein)	Evaluated the effectiveness of a washer-disinfector for cleaning surgical instruments with attached RFID tags. The results showed that the washer-disinfector was effective in achieving recommended residual protein amounts after cleaning of instruments with RFID tags. Although the researchers concluded that secondary infection risk from surgical instruments with RFID tags attached was low, the study was not designed to assess patient outcomes and infection risk. A major limitation of this study was that the sample size and type of instruments were not reported.	IIC
247	Giarrizzo-Wilson S, Conner R. Guideline for Patient Information Management. Conner R, ed. AORN, Inc.; 2021.	Guideline	n/a	n/a	n/a	n/a	Recommendations for perioperative patient information management.	IVA
248	Brown J, Feather D. Surgical equipment and materials left in patients. Br J Perioper Nurs. 2005;15(6): 259-262.	Case Report	n/a	n/a	n/a	n/a	In a legal case, three circulating nurses were documented as participating in the surgery but it was not clear who verified the final count. They recommended that the name of each person performing the count be clearly documented.	VB
249	Burton JL. Health and safety at necropsy. J Clin Pathol. 2003;56(4): 254-260.	Expert Opinion	n/a	n/a	n/a	n/a	Counted sharps and instruments that are retained in the organ donor may cause injury at autopsy.	VC
250	Surgical towel left in pt.: were nurses responsible? NURS LAW REGAN REP. 2008;49(1):2-2.	Case Report	n/a	n/a	n/a	n/a	Surgical towel left in patient after surgery, A second procedure was required for removal and the towel had caused a blockage in the patient. The same surgeon performed both procedures and during the second procedure the nurse was instructed to dispose of the retained towel which she did and doing so lead to questions about evidence of the retainment. It is unclear if the initial $1.1 million dollars was eventually paid.	VC
251	Retained Sponge: Hospital and Surgeon Have Independent Duties to Remove Objects. ECRI Institute; 2019.	Expert Opinion	n/a	n/a	n/a	n/a	Discussion of court case, negligence, and *res ipsa loquitur* .	VC
252	Murphy EK. "Captain of the ship" doctrine continues to take on water. AORN J. 2001;74(4): 525-528.	Expert Opinion	n/a	n/a	n/a	n/a	The “captain of the ship” doctrine is no longer assumed to be true, and members of the entire surgical team as well as the health care facility can be held liable in RSI litigation.	VC
253	Patient's Discovery That Clamp's Presence Was Improper Started Statute-of-Limitations Clock. ECRI Institute; 2020.	Case Report	n/a	n/a	n/a	n/a	The question of when a statue of limitations time frame may start may change based on court opinion.	VC

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
254	CMS Proposes Additions to List of Hospital-Acquired Conditions for Fiscal Year 2009. Newsroom Web site. https://www.cms.gov/newsroom/fact-sheets/cms-proposes-additions-list-hospital-acquired-conditions-fiscal-year-2009. Published Apr 14, 2008. Accessed 4/9, 2021.	Regulatory	n/a	n/a	n/a	n/a	Estimated the average cost of removing an RSI to be $63,631 per hospital stay in 2007	n/a
255	Camp M, Chang DC, Zhang Y, Chrouser K, Colombani PM, Abdullah F. Risk factors and outcomes for foreign body left during a procedure: Analysis of 413 incidents after 1 946 831 operations in children. Archives of Surgery. 2010;145(11): 1085-1090.	Nonexperimental	413 cases patients with foreign bodies left during a procedure (PDI 3) and 1227 controls	n/a	n/a	Relationship between PDI 3 and procedure category, in-hospital mortality, length of stay, and total hospital charges	Among pediatric surgical admissions, a foreign body left during a procedure was observed to occur with highest likelihood during gynecologic operations. The occurrence of this adverse event was associated with longer length of stay and greater total hospital charges, but not with increased mortality.	IIIA
256	Shah RK, Lander L. Retained foreign bodies during surgery in pediatric patients: a national perspective.. J Pediatr Surg. 2009;44(4): 738-742.	Nonexperimental	103 reports of retained foreign bodies after surgery	n/a	n/a	Admission-related information, patient socioeconomic information, diagnosis codes, procedure codes, and discharge information	The rate of a retained foreign body is 0.0031% or approximately 1 in 32,672 pediatric cases and is associated with an increased charge of $42,077 for this complication.	IIIA
257	Elsharydah A, Warmack KO, Minhajuddin A, Moffatt-Bruce S. Retained surgical items after abdominal and pelvic surgery: Incidence, trend and predictors-observational study. Annals of Medicine and Surgery. 2016;12:60-64.	Nonexperimental	1144 patients that had major abdominal or pelvic surgery fit inclusion or exclusion criteria from the Nationwide Inpatient Sample (NIS) of the Healthcare Cost Utilization Project of the Agency for Healthcare Quality and Research.	n/a	A set of matched patients that also had major abdominal or pelvic surgery were used as controls.	RSI incidence was calculated as 13:100,000 procedures-years.	Elective procedures, morbid obesity, and rural hospitals were associated with increased risk for RSIs. After sample matching only elective procedures and rural hospitals remained risk factors.	IIIA
258	Riley R, Manias E, Polglase A. Governing the surgical count through communication interactions: implications for patient safety. Qual Saf Health Care. 2006;15(5): 369-374.	Qualitative	230h participant observation, 11 individual interviews, 4 group interviews	n/a	n/a	n/a	Qualitative, ethnographic study that studied communication and power in the OR. Increasing professional accountability may improve patient safety by minimizing the effects of normalization and complacency that may occur during the repetitive task of the surgical count.	IIIB
259	Karl R, Karl MC. Adverse events: root causes and latent factors. Surg Clin North Am. 2012;92(1): 89-100.	Expert Opinion	n/a	n/a	n/a	n/a	Two approaches to human error: individual and system are presented in two cases with recommendations using cause analysis.	VB

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
260	Elbardissi AW, Sundt TM. Human factors and operating room safety. Surg Clin North Am. 2012;92(1): 21-35.	Expert Opinion	n/a	n/a	n/a	n/a	Historically, surgical errors have been viewed as being determined primarily by the technical skill of the surgeon. However, focusing only on individual skill assumes that surgeons and other members of the surgical team perform highly and uniformly, regardless of the variable working conditions within the OR environment. Alternatively, a work systems approach recognizes that surgical skill alone is not sufficient to determine outcomes, because the process of delivering surgical care involves several interdependent variables, many of which vary across hospitals, ORs, or surgical cases, and most of which are not normally under the control of the surgical team.	VA
261	Boysen II PG. Just culture: A foundation for balanced accountability and patient safety. Ochsner Journal. 2013;13(3): 400-406.	Literature Review	n/a	n/a	n/a	n/a	Perioperative team members in a just culture are not only accountable for their own actions but are also accountable to each other in protecting patients.	VB
262	Chatzimichailidou MM, Ward J, Horberry T, Clarkson PJ. A comparison of the bow-tie and STAMP approaches to reduce the risk of surgical instrument retention. Risk Anal. 2018;38(5):978-990. doi: https://dx.doi.org/10.1111/risa.12897.	Expert Opinion	n/a	n/a	n/a	n/a	BTA was considered to represent the "big picture" while STPA may identify situations that increase risk and bypass safety constraints. Both methods were considered proactive and were recommended for use together. There may be quality issues with the use of these tools if team members are not experienced.	VB
263	Bell R. Hide and seek, the search for a missing swab: a critical analysis. Journal of Perioperative Practice. 2012;22(5): 151-156.	Expert Opinion	n/a	n/a	n/a	n/a	Reported a critical incident analysis of a near miss where the sponge was found in the drapes during count reconciliation procedures.	VA
264	Hospital-Acquired Conditions (Present on Admission Indicator). https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/HospitalAcqCond?redirect=/hospitalacqcond/06_hospital-acquired_conditions.asp. Updated 2019. Accessed 2/25, 2021.	Regulatory	n/a	n/a	n/a	n/a	List of CMS recognized hospital-acquired conditions	n/a
265	Serious Reportable Events In Healthcare—2011 Update: A CONSENSUS REPORT. 2011:1-15 [Plus Appendices A-C].	Expert Opinion	n/a	n/a	n/a	n/a	Discussion of serious reportable events from NQF.	VC
266	21 CFR 803.10: Generally, what are the reporting requirements that apply to me? U.S. Food and Drug Administration; 2020.	Regulatory	n/a	n/a	n/a	n/a	Regulations that outline serious adverse event reporting related to medical devices.	n/a
267	What is a serious adverse event? https://www.fda.gov/safety/reporting-serious-problems-fda/what-serious-adverse-event. Accessed 1/5, 2021.	Expert Opinion	n/a	n/a	n/a	n/a	FDA guidance on what constitutes a serious safety event. Document states that serious safety events should be reported.	VA
268	U.S. Food and Drug Administration. Product classification [database]. https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfPCD/classification.cfm. Updated 2021. Accessed 1/5, 2021.	Regulatory	n/a	n/a	n/a	n/a	This is the searchable FDA Medical Device Classification Database.	n/a

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
269	MedWatch: The FDA safety information and adverse event reporting program. https://www.fda.gov/safety/medwatch-fda-safety-information-and-adverse-event-reporting-program. Accessed 1/5, 2021.	Regulatory	n/a	n/a	n/a	n/a	FDA MedWatch program for safety information and adverse event reporting.	n/a
270	Jones M, Scarduzio J, Mathews E, et al. Individual and Team-Based Medical Error Disclosure: Dialectical Tensions Among Health Care Providers. Qual Health Res. 2019;29(8):1096-1108. doi:https://dx.doi.org/10.1177/1049732319837224.	Nonexperimental	91 nurses, physicians, and pharmacists participated in group training, simulation, and focus group discussions of medical error disclosures	n/a	n/a	Experiences and perceptions of team and individual disclosure of a medical error	Disclosures of a medical error can be a complicated process that may benefit from teamwork and planning before meeting with the patient.	IIIB
271	Swartwout E, Rodan M. The Development and Testing of the Psychometric Properties of the Emotional Response and Disclosure of Errors in Clinical Practice Instrument. J Nurs Meas. 2017;25(1):184-200. doi:https://dx.doi.org/10.1891/1061-3749.25.1.184.	Nonexperimental	497 survey participants	n/a	n/a	Evaluation of the psychometric properties of the Emotional Response and Disclosure of Errors in Clinical Practice Instrument	The tool was found to be a valid and reliable instrument.	IIIA

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE

AORN
SAFE SURGERY TOGETHER

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE