REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
1	Guideline for medication safety. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2018: 295–330. .	Guideline	n/a	n/a	n/a	n/a	Provides guidance for safe administration of medications in the perioperative setting.	IVA
2	Guideline for design and maintenance of the surgical suite. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2018: e49–e76.	Guideline	n/a	n/a	n/a	n/a	Provides guidance for the design and maintenance of the surgical suite.	IVA
3	Guideline for safe patient handling and movement. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2018: e1–e48.	Guideline	n/a	n/a	n/a	n/a	Provides guidance for safe patient handling and movement in the perioperative setting.	IVA
4	Guideline for transmission-based precautions. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2019 [in press].	Guideline	n/a	n/a	n/a	n/a	Provides guidance for prevention of transmissible infections in the perioperative setting.	IVA
5	Guideline for medical device and product evaluation. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2018: 183–190.	Guideline	n/a	n/a	n/a	n/a	Provides guidance for purchasing supplies and equipment in the perioperative setting.	IVA
6	Guideline for radiation safety. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2018: 331–366.	Guideline	n/a	n/a	n/a	n/a	Provides guidance for radiation safety in the perioperative setting.	IVA
7	Guideline for surgical smoke safety. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2018: 469–498.	Guideline	n/a	n/a	n/a	n/a	Provides guidance for surgical smoke safety in the perioperative setting.	IVA

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8	Cram N. Medical device alarm fatigue: a systems engineering perspective. J Clin Eng. 2015; 40(4): 189–194.	Expert Opinion	n/a	n/a	n/a	n/a	Patient deaths or inappropriate care have occurred relating to medical device alarm events. Actions to prevent medical alarm events are offered.	VC
9	Clinical Alarms Task Force. Impact of clinical alarms on patient safety: a report from the American College of Clinical Engineering Healthcare Technology Foundation. J Clin Eng. 2007; 32(1): 22–33.	Expert Opinion	n/a	n/a	n/a	n/a	The reported causes of injuries and near misses include disabled alarm systems (eg, blood bank refrigerators, code blue alarms, electrosurgical unit [ESU] alarms, ethylene oxide level alarms, fire alarms, water treatment alarms), distractions, and failure of personnel to hear or to act on clinical alarms.	VB
10	A Siren Call to Act: Priority Issues from the Medical Device Alarms Summit. Arlington, VA: Association for the Advancement of Medical Instrumentation; 2011.	Consensus	n/a	n/a	n/a	n/a	Recommendations for medical device alarms.	IVB
11	Criscitelli T. Alarm management: promoting safety and establishing guidelines. AORN J. 2016; 103(5): 518–521.	Expert Opinion	n/a	n/a	n/a	n/a	Personnel in ambulatory surgery centers must understand alarm fatigue and develop an approach for their specific facility that can include standardizing policies, identifying patient populations, individualizing polices based on patient needs.	VB
12	2008 ASA recommendations for pre-anesthesia checkout procedures. American Society of Anesthesiologists. https://www.asahq.org/resources/clinical-information/2008-asa-recommendations-for-pre-anes-thesia-checkout. Accessed August 21, 2018.	Guideline	n/a	n/a	n/a	n/a	Recommendations for pre-anesthesia checkout.	IVB

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13	Schmid F, Goepfert MS, Kuhnt D et al.. The wolf is crying in the operating room: patient monitor and anesthesia workstation alarming patterns during cardiac surgery. Anesth Analg. 2011; 112(1): 78–83.	Nonexperimental	25 elective cardiac procedures	n/a	n/a	Alarm sounds	In 25 consecutive elective cardiac procedures, an anesthesia alarm sounded an average of once every 1.2 minutes	IIIB
14	Brown JC, Anglin-Regal P. Patient safety focus. Clinical alarm management: a team effort. Biomed Instrum Technol. 2008; 42(2): 142–144.	Expert Opinion	n/a	n/a	n/a	n/a	Communicating changes to alarm settings prepares oncoming personnel to respond appropriately.	VA
15	Cheriyan S, Mowery H, Ruckle D et al.. The impact of operating room noise upon communication during percutaneous nephrostolithotomy. J Endourol. 2016; 30(10): 1062–1066.	Nonexperimental	20 words spoken by surgeon five times with various levels of background noise.	n/a	n/a	The frequency in which the first assistant, anesthesiologist, and circulator were able to correctly document the words spoken by the physician with various levels of background noise.	Noise pollution decreases effective intraoperative communication during percutaneous lithotripsy. Surgeons need to understand the effect noise can have on attempted communication and implement strategies to prevent errors due to miscommunication.	IIIB
16	Katz JD. Noise in the operating room. Anesthesiology. 2014; 121(4): 894–898.	Expert Opinion	n/a	n/a	n/a	n/a	Most common health consequence related to chronic noise exposure are tinnitus and hearing loss. Noise limits in the OR setting are consistently above the limits as set forth by the federal regulatory agencies. Strategies include 1) minimizing noise such as adapting the sterile cockpit environment used in aviation and 2) behavior modification program to educate staff.	VB

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17	Way TJ, Long A, Weihing J et al.. Effect of noise on auditory processing in the operating room. J Am Coll Surg. 2013; 216(5): 933–938.	Nonexperimental	n=15, simulated OR	Surgeon wearing a mask in an OR with background noise.	Surgeon wearing a mask in an OR without background noise.	Surgeons ability to understand and repeat words	Findings demonstrate that the addition of a tasks leads to communication breakdown. The most important factor that affects communication is OR noise. Noise levels decrease communication performance. Noise negatively affects communication for both HP and LP words. Should be aware of the dangers of noise in the OR an d to determine barriers to effective communication in the OR to produce safe environments for patients and staff.	IIIC
18	Mentis HM, Chellali A, Manser K et al.. A systematic review of the effect of distraction on surgeon performance: directions for operating room policy and surgical training. Surg Endosc. 2015;30:1713–1724.	Systematic Review	17 articles	n/a	n/a	Impact of auditory, visual, and mental distractions on surgical performance.	Operating room protocols should be put into place to significantly reduce distractions from intermittent auditory and mental distractions. Surgical residents would benefit from training for intermittent auditory and mental distractions.	IIIA
19	Antoniadis S, Passauer-Baierl S, Baschnegger H, Weigl M. Identification and interference of intraoperative distractions and interruptions in operating rooms. J Surg Res. 2014; 188(1): 21–29.	Nonexperimental	n=65	n/a	n/a	Interruptions	There is a large amount of interference in an OR and the OR environment should be designed to reduce unnecessary interruptions and distractions.	IIIB
20	Plaxton H. Communication, noise, and distractions in the operating room: the impact on patients and strategies to improve outcomes. ORNAC J. 2017; 35(2): 13–22.	Literature Review	n/a	n/a	n/a	n/a	Strategies to decrease noise and distractions should be implemented. Strategies include educating all team members to limit conversations during critical times, perform a team huddle to decrease noise levels, limit opening and closing of doors, posting signs, minimize visitors, and reducing answering phone calls during cases especially during induction, incision, and emergence.	VB

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21	Sentinel event data - event type by year (1995- Q2-2016). The Joint Commission. https://www.jointcommission.org/se_data_event_type_by_year_/. Published August 1 , 2016. Accessed August 21, 2018.	Expert Opinion	n/a	n/a	n/a	n/a	Listing of sentinel events.	VB
22	Chen L, Brueck SE, Niemeier MT. Evaluation of potential noise exposures in hospital operating rooms. AORN J. 2012; 96(4): 412–418.	Nonexperimental	n=9 perioperative team members	n/a	n/a	Noise exposure measured by noise dosimeters	None of the full-shift noise measurements exceeded OSHA or NIOSH noise exposure limits. Pneumatic surgical instruments generated the highest noise levels in the OR. Recommend noise reduction efforts on using surgical instruments that make less noise.	IIIB
23	Keller S, Tschan F, Beldi G, Kurmann A, Candinas D, Semmer NK. Noise peaks influence communication in the operating room. An observational study. Ergonomics. 2016; 59(12): 1541–1552.	Nonexperimental	109 abdominal surgeries	n/a	n/a	The impact of noise peaks on surgical teams' communication.	Noise peaks impair communication in the OR and should be minimized.	IIIA
24	Ford DA. Speaking up to reduce noise in the OR. AORN J. 2015; 102(1): 85–89.	Expert Opinion	n/a	n/a	n/a	n/a	Interventions to decrease noise in the OR include restricting talking to clinical conversations, set music volume low enough to not interfere with communication, and not turning off alarms in the OR. Perioperative staff should be educated about noise and its effects.	VB
25	Hogan LJ, Harvey RL. Creating a culture of safety by reducing noise levels in the OR. AORN J. 2015; 102(4): 410. e1–410.e7.	Organizational Experience	118 surgical procedures	60 minute educational inservice	n/a	Noise levels pre and post educational program.	Noise levels during anesthesia induction and emergence were significantly reduced after staff education and the implementation of noise reduction strategies, including signage, prominent noise meters, and specific suggestions to staff members.	VA

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26	AORN Position Statement on Managing Distractions and Noise during Perioperative Patient Care. AORN, Inc. http://www.aorn.org/guidelines/clinical-resources/position-statements. Revised 2014. Accessed August 21, 2018.	Position Statement	n/a	n/a	n/a	n/a	Managing distractions and noise in the perioperative setting.	IVB
27	Wright MI. Implementing no interruption zones in the perioperative environment. AORN J. 2016; 104(6): 536–540.	Organizational Experience	30 outpatient general and GYN surgeries	No Interruption Zone education	n/a	Noise levels	After implementing a No Interruption Zone through an educational intervention, noise levels during critical phases of surgery were reduced.	VB
28	Panahi P, Stroh M, Casper DS, Parvizi J, Austin MS. Operating room traffic is a major concern during total joint arthroplasty. Clin Orthop. 2012; 470(10): 2690–2694.	Nonexperimental	80 primary total joint procedures and 36 revision total joint procedures	n/a	n/a	Door openings and causes of door openings, personnel category of those opening the door	Door opening averaged 60 in primary procedures and 135 in revision procedures and nurses and manufacturer's representative contributed to the majority of the door openings. Additionally 47% of door opening had no clear cause, leading researchers to question the necessity of opening the door. Since revision cases were significantly higher in traffic the researchers suggest strategies to reduce door opening such as storage of supplies and education of personnel, and limiting supply opening to right before the supply.	IIIB
29	Shambo L, Umadhay T, Pedoto A. Music in the operating room: is it a safety hazard? AANA J. 2015; 83(1): 42–48.	Literature Review	27 articles	n/a	n/a	n/a	Music in the OR contributes to a stressful environment, interferes with communication, inhibits the ability to safely perform tasks, and threatens patient and staff health and safety.	VA
30	Weldon S, Korkiakangas T, Bezemer J, Kneebone R. Music and communication in the operating theatre. J Adv Nurs. 2015; 71(12): 2763–2774.	Nonexperimental	2503 request/response observations during 20 procedures.	n/a	Request repetitions with and without music.	Number of request repetitions.	Music can interfere with team communication.	IIIA
31	Gibbs J, Smith P. A pathway to clinician-led culture change in the operating theatre. J Perioper Pract. 2016; 26(6): 134–137.	Organizational Experience	n/a	n/a	n/a	n/a	Created a behavioral noise-reduction tool that identified potential solutions, implementation, and evaluation of the tool.	VC

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32	Clark GJ. Strategies for preventing distractions and interruptions in the OR. AORN J. 2013; 97(6): 702–707.	Organizational Experience	n/a	n/a	n/a	Critical phases in the OR.	9 critical phases were discovered and 4 strategies were developed to limit distractions and interruptions: • minimizing anesthesia procedure disruptions, • implementing a hard stop during the time out, • minimizing distractions during closing counts, and • enhancing team expectations and communication.	VB
33	Yoong W, Khin A, Ramlal N, Loabile B, Forman S. Interruptions and distractions in the gynaecological operating theatre: irritating or dangerous? Ergonomics. 2015; 58(8): 1314–1319.	Nonexperimental	35 gynecology procedures	n/a	n/a	Frequency and impact of distracting events and interruptions on elective gynecology cases	Work that is interrupted can lead to deviations in planned activities therefore the sterile cockpit rule should be used.	IIIB
34	Jenkins A, Wilkinson JV, Akeroyd MA, Broom MA. Distractions during critical phases of anaesthesia for caesarean section: an observational study. Anaesthesia. 2015; 70(5): 543–548.	Nonexperimental	30 C-sections	n/a	n/a	Ambient noise and distracting events	Significant levels of distractions are present during various phases of C-section anesthesia and they are possibly more frequent and severs than in other types of cases. A concept such as the sterile cockpit rule should be instituted.	IIIB
35	Ginsberg SH, Pantin E, Kraidin J, Solina A, Panjwani S, Yang G. Noise levels in modern operating rooms during surgery. J Cardiothorac Vasc Anesth. 2013; 27(3): 528–530.	Nonexperimental	23 cardiac procedures	n/a	n/a	Noise levels	Increased sound levels during induction, emergence, & transport, may be controllable by the personnel in the room.	IIIB

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36	Bell J, Collins JW, Dalsey E, Sublet V. Slip, Trip, and Fall Prevention for Healthcare Workers. DHHS (NIOSH) Publication Number 2011-123; 2010. Centers for Disease Control and Prevention. https://www.cdc.gov/niosh/docs/2011-123/pdfs/2011-123.pdf. Accessed August 21, 2018.	Expert Opinion	n/a	n/a	n/a	n/a	Provides tool for preventing slips, trips and falls.	VA
37	Gomaa AE, Tapp LC, Luckhaupt SE et al.. Occupational traumatic injuries among workers in health care facilities— United States, 2012-2014. MMWR Morb Mortal Wkly Rep. 2015;64(15): 405–410.	Expert Opinion	n/a	n/a	n/a	n/a	The primary causes of slip, trip, and fall injuries are floor contaminants and contact with objects; but the types of injuries are variable and each facility should use facility-specific data when creating prevention measures.	VA
38	Brogmus G, Leone W, Butler L, Hernandez E. Best practices in OR suite layout and equipment choices to reduce slips, trips, and falls. AORN J. 2007; 86(3): 384–394.	Expert Opinion	n/a	n/a	n/a	n/a	Best practice recommendations for preventing slips, trips, and falls in the OR.	VB
39	Bell JL, Collins JW, Wolf L et al.. Evaluation of a comprehensive slip, trip and fall prevention programme for hospital employees. Ergonomics. 2008; 51(12): 1906–1925.	Quasi-experimental	16,900 hospital employees	Slips, trips, and fall prevention programme	n/a	STF injury claims	The overall workers' compensation for slips, trips and falls injury claims rate for the hospitals declined significantly during the post-intervention time period.	IIB
40	Chang WR, Leclercq S, Lockhart TE, Haslam R. State of science: occupational slips, trips and falls on the same level. Ergonomics. 2016; 59(7): 861–883.	Literature Review	n/a	n/a	n/a	Risk factors related to slips, trips, and falls and injury prevention methods.	STFL prevention may be beneficial in reducing injuries. A systems approach may bring about prevention of STFL. Suggestions include looking at the design of the work environment and work/activity systems.	VA

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41	Hamel KD. Identifying same-level slip and fall hazards in the workplace. Occup Health Saf. 2014; 83(11): 52–53.	Expert Opinion		n/a	n/a	n/a	To determine rates and prevention measures the healthcare organization should review injury reports for specific problem areas, perform audits to determine walking surfaces that may contribute to a slip or fall injury, identify floor safety hazards, and be proactive for prevention of slips, trips, & falls.	VB
42	Leclercq S, Cuny-Guerrier A, Gaudez C, Aublet-Cuvelier A. Similarities between work related musculoskeletal disorders and slips, trips and falls. Ergonomics. 2015; 58(10): 1624–1636.	Literature Review	n/a	n/a	n/a	n/a	Workplace injury prevention strategies and approaches should be based on the individual setting with participation of the personnel.	VB
43	Apfelbaum JL, Caplan RA, Connis RT et al.. Practice advisory for the prevention and management of operating room fires: an updated report by the American Society of Anesthesiologists Task Force on Operating Room Fires. Anesthesiology. 2013; 118(2): 271–290.	Guideline	n/a	n/a	n/a	n/a	Provides guidance on the prevention of OR fires.	IVA
44	Bonnet A, Devienne M, De Broucker V, Duquennoy-Martinot V, Guerreschi P. Operating room fire: should we mistrust alcoholic antiseptics? Ann Chir Plast Esthet. 2015; 60(4): 255–261.	Case Report	4 patients who sustained burns from alcohol skin antisepsis in France	n/a	n/a	n/a	The risk for fire ignition and patient burns should be considered in the risk benefit analysis for use of alcoholic skin preps.	VB
45	Culp WC Jr, Kimbrough BA, Luna S. Flammability of surgical drapes and materials in varying concentrations of oxygen. Anesthesiology. 2013; 119(4): 770–776.	Nonexperimental	Five fuel sources in three levels of O_2.	n/a	n/a	Time to ignition and complete burn	Common material ignited and burned faster in an oxygen enriched environment.	IIIB

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46	Engel SJ, Patel NK, Morrison CM et al.. Operating room fires: part II. Optimizing safety. Plast Reconstr Surg. 2012; 130(3): 681–689.	Quasi-experimental	20 patients having upper and/or lower lid blepharoplasty under conscious sedation with one of three methods of supplemental oxygen delivery	Nasopharyngeal system	Two common styles of nasal cannulas	O2 concentration at 24 locations around the face	The use of the nasopharyngeal system may reduce the incidence of OR fires when supplemental O2 is used during facial surgery.	IIB
47	Fisher M. Prevention of surgical fires: a certification course for healthcare providers. AANA J. 2015; 83(4): 271–274.	Quasi-experimental	10 anesthesia providers	Educational module for surgical fires	Pretest/posttest scores	50 question, multiple-choice exam	The educational course increased knowledge of surgical fire prevention for anesthesia providers.	IIC
48	Flowers J. Fire safety in procedural areas. J Radiol Nurs. 2012; 31(1): 13–19.	Expert Opinion	n/a	n/a	n/a	n/a	All team members should participate in fire prevention, fire drills, use of fire extinguishers, fire-fighting equipment, and hospital alarm systems.	VB
49	Huddleston S, Hamadani S, Phillips ME, Fleming JC. Fire risk during ophthalmic plastic surgery. Ophthalmology. 2013;120(6):1309.e1.	Quasi-experimental	Eye surgery patients; 17 nasal cannulas, 11 face masks, 5 intubated.	n/a	n/a	Oxygen levels with three different types of O2 applications during .	For open oxygen delivery, a nasal cannula should be used to help prevent surgical fires.	IIB
50	Sibia US, Connors K, Dyckman S et al.. Potential operating room fire hazard of bone cement. Am J Orthop. 2016; 45(7): E512–E514.	Case Report	n/a	n/a	n/a	n/a	To decrease fire related to bone cement, bone cement products should be appropriately selected and use, set time should be assessed, and electrocautery near cement application sites should be avoided.	VC
51	Tao JP, Hirabayashi KE, Kim BT, Zhu FA, Joseph JM, Nunery W. The efficacy of a midfacial seal drape in reducing oculofacial surgical field fire risk. Ophthal Plast Reconstr Surg. 2013; 29(2): 109–112.	Quasi-experimental	n=1, SimMan patient simulator	Midface seal drape	n/a	Oxygen concentration outside the drape	A midfacial seal drape may reduce O2 concentrations in the surgical field and therefore may reduce fire risk.	IIB

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52	Bansal A, Bhama JK, Varga JM, Toyoda Y. Airway fire during double-lung transplantation. Interact Cardiovasc Thorac Surg. 2013; 17(6): 1059–1060.	Case Report	64 year old male with COPD who underwent double lung transplant	n/a	n/a	n/a	Ignition flame was seen arising from left bronchus and laparotomy sponge caught fire. Fire during airway surgery is rare but may result in serious airway injury and possible death. Preventative measures should be taken whenever surgery involves the airway.	VB
53	Connor MA, Menke AM, Vrcek I, Shore JW. Operating room fires in periocular surgery. Int Ophthalmol. 2017: 1–9.	Nonexperimental	n=168 surgeons surveyed from American Society of Oculoplastic and Reconstructive Surgeons	n/a	n/a	n/a	44% of the surgeons experienced at least one OR fire. O2 was administered, monopolar cautery were the inciting agents. Almost half of the patients experienced complications from the fire. Proactive measures may reduce the incidence of periocular surgery, but a fire can occur at any time. All members of the OR team must be vigilant to prevent OR fires.	IIIB
54	De Almeida CED, Curi EF, Brezinscki R, De Freitas RC. Fire in the surgical center. Rev Bras Anestesiol. 2012; 62(3): 432–438.	Case Report	50 year old female patient undergoing bilateral blepharoplasty, Brazil	n/a	n/a	n/a	The use of additional oxygen via spectacle-type catheter was used at a flow rate of 4 L. per min. and use of local anesthesia. The use of a monopolar electric scalpel ignited a fire in the surgical drapes and burned the patient's face. As a result of the fire, recommendations are suggested to prevent surgical fires.	VB
55	Haith LR, Santavasi W, Shapiro TK et al.. Burn center management of operating room fire injuries. J Burn Care Res. 2012; 33(5): 649–653.	Case Report	5 patients who sustained thermal injuries related to fires during surgical procedures in a 5-year period	n/a	n/a	n/a	These were MAC anesthesia cases. All five cases had surgery of the head, neck, upper torso, that involved a mask or nasal O2. Suggestions O2 discontinuation, using moist sponges, and compressed air instead of O2, or using a different tool such as a harmonic scalpel to prevent future injuries.	VB
56	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; 150(8): 796–805.	Systematic Review	n=138 studies	n/a	n/a	n/a	16 analyses of surgical fires. Electrocautery was ignition source in 93 claims out of 103 fires. Common fuel sources were ET tubes, drapes/towels, & O2. Risk of fire increased with face & neck procedures. Root cause analysis associated with lack of staff awareness and failure to communicate.	IIIA

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57	Vancleave AM, Jones JE, James D, Saxen MA, Sanders BJ, Walker LA. Factors involved in dental surgery fires: a review of the literature. Anesth Prog. 2014; 61(1): 21–25.	Literature Review	44 articles	n/a	n/a	n/a	Recommendations include FiO2 should not exceed 30% when supplemental O2 is used and to exhaust surgical environment of O2 with the use of an intraoral suction during dental procedures to reduce the risk of dental surgical fires.	VA
58	Steelman VM, Graling PR, Perkhounkova Y. Priority patient safety issues identified by perioperative nurses. AORN J. 2013; 97(4): 402–418.	Nonexperimental	n=3137 AORN members	n/a	n/a	n/a	Top 10 safety issues include RSIs, wrong site surgery, surgical fires, hypothermia, etc. There are differences between hospital & ASC centers. Resources are available to for educators, nurses in leadership should prioritize quality improvement initiatives in practice setting.	IIIA
59	Hudson DW, Guidry OF, Abernathy JH 3rd, Ehrenwerth J. Case 4— 2012: intrathoracic fire during coronary artery bypass graft surgery. J Cardiothorac Vasc Anesth. 2012;26(3): 520–521.	Case Report	54 year old male patient who experienced intrathoracic fire during thoracotomy for CABG	n/a	n/a	n/a	Gas leak from the anesthesia circuit identified. Authors confirm the need that a fire risk assessment should be part of the Time Out before every procedure. Suggestions include 1) using minimum FiO2, 2) request surgeon to use saline-soaked sponges & laps, 3) vigilant of ventilator parameters on anesthesia equipment, 4) Immediately notify surgeon detecting circuit leak, 5) further decrease FiO2 until leak is sealed.	VB
60	Raghavan K, Lagisetty KH, Butler KL, Cahalane MJ, Gupta A, Odom SR. Intraoperative fires during emergent colon surgery. Am Surg. 2015; 81(2): E82–E83.	Case Report	31 year old morbidly obese man who underwent emergency surgery for perforation of transverse colon	n/a	n/a	n/a	Patient had free intraperitoneal air and fire occurred during incision into the peritoneum with ESU. Methane gas & ESU were the factors that contributed to the OR fire. As a result of this case, the surgeons recommend not to use ESU as emergent GI cases are high risk for OR fires. Extinguishing a GI fire should be performed with saline. ESU should not be used on distended colons.	VB
61	Di Pasquale L, Ferneini EM. Fire safety for the oral and maxillofacial surgeon and surgical staff. Oral Maxillofac Surg Clin North Am. 2017; 29(2): 179–187.	Expert Opinion	n/a	n/a	n/a	n/a	Fire prevention recommendations focus on implementing safe practices, good communication among surgical team members, location of fire extinguishers, to minimize the risk of preventable surgical fires.	VB

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62	Chung K, Lee S, Oh S, Choi J, Cho H. Thermal burn injury associated with a forced-air warming device. Korean J Anesthesiol. 2012; 62(4): 391–392.	Case Report	37 year old female who underwent arthroscopic left knee surgery	n/a	n/a	n/a	Patient was heated for 30 minutes in the PACU. The nozzle of the device was not connected to the disposable baffles designed specifically for use with forced air warming devices. Author recommendation to use the forced air warming device as specified in the manufacturer's instructions for use.	VB
63	Lalla RK, Koteswara CM. Fire in the operating room due to equipment failure. J Anaesthesiol Clin Pharmacol. 2013;29(1):141.	Case Report	45 year old female patient who underwent laparoscopic cholecystectomy	n/a	n/a	n/a	Electrical burning smell noted 20 minutes into procedure, then 1 ft high flames came from the Datex Ohmeda Anesthesia Ventilator. The fire was doused using carbon dioxide foam and dry sand. The machine power was switched on and all check procedures had been performed on the morning of the event. The patient remained safe.	VC
64	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	The OR environment is full of noise and distractions that can hinder the ability of the surgeon and other team members to concentrate on the task. Sources of noise can cause distraction and hinder the ability of the surgeon to concentrate. Recommend to reduce noise and distractions in the OR. Compromise such as limiting noise and distractions during critical phases during procedures may be achieved.	VB
65	Mehta SP, Bhananker SM, Posner KL, Domino KB. Operating room fires: a closed claims analysis. Anesthesiology. 2013; 118(5): 1133–1139.	Nonexperimental	n=105 OR fire-related claims in the American Society of Anesthesiologists Closed Claims Database since 1985	n/a	n/a	n/a	O_2 was the oxidizer in 95% of claims, including MAC anesthesia cases and O_2 administered via an open delivery system. Alcohol containing preps were present in 15% of OR fires. The risk of OR fires can be reduced by following the recommendations of the ASA practice advisory, the Anesthesia Patient Safety Foundation, and by the FDA to promote safer practices and share fire prevention resources. Includes team communication of fire risk & prevention, regarding timing of the use of electrocautery and discontinuing supplemental O_2. Avoid supplemental O_2, maintain O_2 saturation at an acceptable range, using a sealed gas delivery, ensure there are no leaks around the endotracheal tube.	IIIB

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
66	Preventing surgical fires. Bull Am Coll Surg. 2013; 98(8): 65–66.	Expert Opinion	n/a	n/a	n/a	n/a	Recommend informing staff of controlling heat sources and adhering laser/ESU safety practices. Develop, implement, test procedures to ensure all members OR teams are able to respond. Report to Joint Commission, ECRI, and FDA to increase awareness to prevent fires.	VC
67	Culp WC Jr, Kimbrough BA, Luna S, Maguddayao AJ. Operating room fire prevention: creating an electrosurgical unit fire safety device. Ann Surg. 2014; 260(2): 214–217.	Quasi-experimental	Five trials were performed	Prototype carbon dioxide fire safety device covering the tip of the ESU pencil	n/a	Fire ignition	OR fires remain a significant problem. The prototype led to a dramatic reduction in the absolute risk of fire ignition. The use of this device may reduce the incidence of OR fires.	IIB
68	Fuchshuber P, Jones S, Jones D, Feldman LS, Schwaitzberg S, Rozner MA. Ensuring safety in the operating room: the "Fundamental Use of Surgical Energy" (FUSE) program. Int Anesthesiol Clin. 2013; 51(4): 65–80.	Expert Opinion	n/a	n/a	n/a	n/a	Development of the FUSE educational program that includes a curriculum and a certification test. Passing the test results in FUSE certification that verifies knowledge related to the safe use of energy based devices in the OR.	VA
69	Kung TA, Kong SW, Aliu O, Azizi J, Kai S, Cederna PS. Effects of vacuum suctioning and strategic drape tenting on oxygen concentration in a simulated surgical field. J Clin Anesth. 2016;28:56–61.	RCT	Simulation center at a university-affiliated hospital	Vacuum suctioning and strategic drape tenting	No suction or strategic tenting	Oxygen concentration around the nasal cannula continuously, time required for oxygen concentration to reach 21%	The results of RCT suggests that O2 levels around the patient's face may be reduced with the use of a vacuum suction device. Clear and consistent communication about O2 delivery between the surgical team and anesthesiologist is critical to decreasing the risk of O2 fires.	IB
70	Fuchshuber PR, Robinson TN, Feldman LS, Jones DB, Schwaitzberg SD. The SAGES FUSE program: bridging a patient safety gap. Bull Am Coll Surg. 2014; 99(9): 18–27.	Expert Opinion	n/a	n/a	n/a	n/a	Educational program using a bottom up approach. Standardized curriculum for surgeons & other health care professionals with a certification test that meets accreditation standards. Test results verifies surgeon has attained basic knowledge of energy based devices in the OR.	VB

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71	Holla R, Darshan B, Unnikrishnan B et al.. Fire safety measures: awareness and perception of health care professionals in coastal Karnataka. Indian J Public Health Res Dev. 2016; 7(3): 246–249.	Nonexperimental	n=105 (n=72 doctors) (n=39 paramedical personnel) in India	n/a	n/a	n/a	The results of the study indicate that all health care staff are trained in fire management, participate in mock fire drills on a regular basis. Although most of the participants were aware of activation of fire alarm and contacting the fire department, there was a lack of knowledge related to Class A & B fires.	IIIB
72	Cvach M, Rothwell KJ, Cullen AM, Nayden MG, Cvach N, Pham JC. Effect of altering alarm settings: a randomized controlled study. Biomed Instrum Technol. 2015; 49(3): 214–222.	RCT	22 patients in a Cardiac Care Unit (CCU) at the John Hopkins Hospital	Altered cardiac monitor alarm settings	Standardized cardiac alarm monitor settings	Differences in alarms, number of clinically significant events (CSEs) detected, event-triggered interventions (ETIs), frequency of alarms per monitored bed, and patient complications.	The researchers suggest the study protocol can be used for outcome data related to altering patient monitor alarm settings and to conduct of a larger multicenter trial to test the effect of an altered set of alarm parameters on CSE and ETI.	IB
73	Arefiev K, Warycha M, Whiting D, Alam M. Flammability of topical preparations and surgical dressings in cutaneous and laser surgery: a controlled simulation study. J Am Acad Dermatol. 2012; 67(4): 700–705.	Nonexperimental	n=126 materials were subjected to laser and electrosurgery to test for fire potential.	n/a	n/a	Flames or evidence of fire	The findings indicate that fire is a potential complication of dermatologic procedures when using electrosurgery and laser devices. The need to identify and correct flammability risks before ignition occurs. Appropriate use of electrosurgical units and laser devices and training is imperative.	IIIA
74	Chowdhury K. Fires in Indian hospitals: root cause analysis and recommendations for their prevention. J Clin Anesth. 2014; 26(5): 414–424.	Literature Review	n/a	n/a	n/a	n/a	Conducted a root cause analysis and offered suggestions to preventing fires in all developing countries of the world with warm climates.	VC

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75	Jones EL, Overbey DM, Chapman BC et al.. Operating room fires and surgical skin preparation. J Am Coll Surg. 2017; 225(1): 160–165.	Nonexperimental	Porcine epidermis and dermis were used, each experiment were repeated 20 times	n/a	n/a	Fire	Nonalcohol based skin preps caused no fires on immediate testing or 3 minute delayed testing. All alcohol based preps created fires. Pooling of nonalcoholic skin preparations did not lead to fire. Pooling of alcohol based skin preps created more fires on immediate and delayed testing. Even when O2 is missing, fires can still occur. Alcohol based skin preps and pooling of alcohol based skin preps fuel surgical fires. The results indicate surgeons can decrease the risk of an OR fire by avoiding pooling of skin prep or use nonalcohol based skin preps.	IIIB
76	Michaels JPS, MacDonald P. Ignition of eyelash extensions during routine minor eyelid surgery. Ophthal Plast Reconstr Surg. 2014; 30(3): e61–e62.	Case Report	64 year old female who underwent excision of bilateral lower eyelid cystic lesions	n/a	n/a	n/a	Low temperature cautery was used for hemostasis, which ignited the superior eyelashes. The fire was put out by the surgeon's exhalation and the area irrigated with normal saline. Patient sustained eyelash singeing and mild temporal first-degree burns to the left upper eyelid. It was determined that the eyelash glue was a cyanoacrylate. The hazards identification does not mention flammability of the glue or eyelashes. Eyelash extensions should be added to the prosthetics section of any ocular surgery preop questionnaire.	VB
77	Rapp C, Gaines R. Fire in the operating room: a previously unreported ignition source. Am J Orthop. 2012; 41(8): 378–379.	Case Report	16 year old male who underwent I&D for knee arthrotomy	n/a	n/a	n/a	Bandage scissors were used to cut the irrigation tubing and power cord attached to the pulse lavage. Wisp of smoke was noted from drapes covering the arm board. The source of the smoke came from the cut ends of the power cord that was attached to the pulse lavage. No injury to the patient.	VB
78	Rocos B, Donaldson LJ. Alcohol skin preparation causes surgical fires. Ann R Coll Surg Engl. 2012; 94(2): 87–89.	Nonexperimental	n=13 surgical fires in the NRLS database between 2004 and 2011	n/a	n/a	n/a	Alcohol is a flammable skin antiseptic agent. Recommend fire risk assessment in the pre-surgical checklist. Surgical fires are preventable, need to increase awareness for fire safety.	IIIB
79	Schroeder RT. Using best practices to respond to an OR fire. AORN J. 2013; 97(6): 605–606.	Case Report	OR fire	n/a	n/a	n/a	A communication system diagnostic monitor used in the OR malfunctioned and caused an electrical fire. Environmental guidelines need to be updated and basic safety practices should be reinforced.	VB

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80	Seifert PC, Peterson E, Graham K. Crisis management of fire in the OR. AORN J. 2015; 101(2): 250–263.	Expert Opinion	n/a	n/a	n/a	n/a	Fire prevention strategies for airway, nonairway, team roles, responding to fires, crisis considerations algorithms, RACE, PASS, fire safety education, and case scenarios. Team training, practice drills, and how to react & respond to fire emergencies.	VA
81	Stewart MW, Bartley GB. Fires in the operating room: prepare and prevent. Ophthalmology. 2015; 122(3): 445–447.	Expert Opinion	n/a	n/a	n/a	n/a	Suggestions for ophthalmic surgeons include surgeons should hold fire drills with the surgical team, fire risk assessment in the Time Out, use bipolar over monopolar electrocautery, attempt to extinguish fire with saline and soaked towels draped across surgeon's arms, fire extinguishers with CO2 or ammonium phosphate.	VB
82	Wolf O, Weissman O, Harats M et al.. Birth wind and fire: raising awareness to operating room fires during delivery. J Matern Fetal Neonatal Med. 2013; 26(13): 1303–1305.	Case Report	3 patients burned in obstetric OR	n/a	n/a	n/a	Similarities between all 3 cases include O2 rich open ventilation, alcohol-based skin antisepsis, and hastiness of cesarean delivery. Recommended algorithm for preventing surgical fires in the OB OR, including universal protocol, surgeon asks anesthesiologist if an open ventilation system could be used in surgery, circulating RN to time a 5 minute safety pause between prepping the surgical field and draping, in case of emergencies suggest using a nonalcohol skin antiseptic solution, and alert the team that diathermy will be restricted to 120W.	VC
83	Kaye AD, Kolinsky D, Urman RD. Management of a fire in the operating room. J Anesth. 2014; 28(2): 279–287.	Expert Opinion	n/a	n/a	n/a	n/a	Fires are preventable. Developed a Fire Prevention Algorithm. In the event of a fire, surgeons, anesthetists, nurses must act in an organized and coordinated fashion to extinguish the fire as soon as possible. Steps to Fire safety - Preparation - routine checks of the availability and status of fire safety equipment. Location of fire extinguishers, sterile saline, fire alarms, medical gas valves, replacement airway supplies, drapes, & Sponges. Walkways free from obstacles.	VA
84	Gibbs VC. Thinking in three' s: changing surgical patient safety practices in the complex modern operating room. World J Gastroenterol. 2012;18(46): 6712–6719.	Expert Opinion	n/a	n/a	n/a	n/a	Roles for prevention of surgical fires include anesthesiologists have control of O2, nurses have control over fuel sources, and surgeons have control over the ignition source. Preventing fires requires constant situational awareness. Recommend use of safety checklists.	VC

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85	Poore SO, Sillah NM, Mahajan AY, Gutowski KA. Patient safety in the operating room: II. intraoperative and postoperative. Plast Reconstr Surg. 2012; 130(5): 1048–1058.	Expert Opinion	n/a	n/a	n/a	n/a	The authors reviewed intraoperative risks facing patients during inpatient plastic surgery includes DVT prophylaxis, hypothermia, MH, electrosurgery safety, RSIs, patient jewelry, tourniquet use, post op communication, and handoffs. The need for clear communication.	VB
86	Porteous J. Evacuating an OR is a complex process: who does what? ORNAC J. 2013; 31(1): 15, 17–19, 30–32 passim.	Organizational Experience	Large tertiary hospital in Canada	n/a	n/a	n/a	Conducted an evacuation simulation exercise for educational opportunities. Pre-evacuation education, participation, practice drills to be conducted routinely. Clear communication is critical.	VC
87	Joint Commission on Accreditation of Healthcare. Maintaining fire equipment and building features. A deep dive into EC.02.03.05. Jt Comm Perspect. 2013; 33(12): 12–15.	Accreditation	n/a	n/a	n/a	n/a	The Joint Commission standards for maintaining fire equipment and building features.	n/a
88	Spratt D, Cowles CE, Berguer R et al.. Workplace safety equals patient safety. AORN J. 2012; 96(3): 235–244.	Expert Opinion	n/a	n/a	n/a	n/a	The key to prevention of fires is education of all team members about what contributes to the risk of fires.	VB
89	Bongiovanni I, Leo E, Ritrovato M, Santoro A, Derrico P. Implementation of best practices for emergency response and recovery at a large hospital: a fire emergency case study. Saf Sci. 2017;96:121–131.	Case Report	Fire in the ICU at a pediatric hospital in Italy	n/a	n/a	n/a	No lives were lost. Recommend constant training, safety track records, situation awareness, and well-managed emergency plan are needed.	VB

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90	Silva JF, Almeida JE, Rossetti RJF, Coelho AL. A serious game for EVAcuation training. In: Book of Proceedings. IEEE 2nd International Conference on Serious Games and Applications for Health (SeGAH 2013). Vilamoura Algarve, Portugal: IEEE; 2013.	Nonexperimental	n=20	n/a	n/a	n/a	Game environments can be a fun way to train and learn as a learning asset to improve traditional fire drills. Expected to use this tool as a decision support tool, for evacuation plans, layouts, and other design criteria to enhance building design.	IIIC
91	Prosper D. Boosting fire drill participation in hospital settings. J Healthc Prot Manage. 2015; 31(1): 23–30.	Organizational Experience	Health care organization with 100 sites	n/a	n/a	n/a	Successful implementation of participation in standardizing fire drills, training, and exercises. Developed a fire drill schedule, designating a fire warden for each shift, dropping by unannounced simulate a code red, leadership must support and be engaged, face to face meetings.	VB
92	Fire alarm led to center evacuation. Same Day Surg. 2012: 83–84.	Organizational Experience	Allegiance Health Surgery Center in Jackson, MI	n/a	n/a	n/a	When a fire alarm went off, staff had to evacuate patients from the building. Because staff participate in quarterly fire drills, the evacuation went smoothly as staff knew what to do.	VC
93	NFPA 101: Life Safety Code. Quincy, MA: National Fire Protection Association; 2018	Consensus	n/a	n/a	n/a	n/a	NFPA life safety code.	IVB
94	Guideline for team communication. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2018: 745–772.	Guideline	n/a	n/a	n/a	n/a	Provides guidance for team communication.	IVA
95	Culp WC, Kimbrough BA, Luna S, Maguddayao AJ. Mitigating operating room fires: development of a carbon dioxide fire prevention device. Anesth Analg. 2014; 118(4): 772–775.	Nonexperimental	Five trials were performed with the fire prevention device CO2 flow at 8 L/min, and five trials with the CO2 flow off	n/a	n/a	Fire ignition	Fires were ignited in every control group trial. The fire prevention device prevented or suppressed all fires for the 30-second duration of ESU use. An operating room fire prevention device can prevent ignition by an ESU pencil in simulation.	IIIB

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96	Van Cleave AM, Jones JE, McGlothlin JD, Saxen MA, Sanders BJ, Vinson LA. The effect of intraoral suction on oxygen-enriched surgical environments: a mechanism for reducing the risk of surgical fires. Anesth Prog. 2014; 61(4): 155–161.	Nonexperimental	n=41 trials	n/a	n/a	n/a	The use of a high volume intraoral suction may suppress the onset of combustion in dental pediatric settings. Suction may reduce the severity of surgical like fires.	IIIB
97	Guideline for safe use of energy-generating devices. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2018: 129–156.	Guideline	n/a	n/a	n/a	n/a	Provides guidance for safe use of energy-generating devices.	IVA
98	Feldman LS, Fuchshuber PR, Jones DB. The SAGES Manual on the Fundamental Use of Surgical Energy (FUSE). New York, NY: Springer; 2012.	Consensus	n/a	n/a	n/a	n/a	Recommendations for preventing surgical fires for patients being sedated to breathe room air or to limit O2 to 30% as long as hypoxemia does not result. O2 should be used at the lowest concentration.	IVC
99	ECRI Institute. New clinical guide to surgical fire prevention. Patients can catch fire— here's how to keep them safer. Health Devices. 2009;38(10): 314–332.	Expert Opinion	n/a	n/a	n/a	n/a	Recommendations for surgical fire prevention from ECRI Institute	VA
100	Bielen RP, Lathrop JK; National Fire Protection Association. NFPA 99: Health Care Facilities Code Handbook. Quincy, MA: National Fire Protection Association; 2018.	Consensus	n/a	n/a	n/a	n/a	NFPA health care facilities code.	IVB
101	NFPA 30: Flammable and Combustible Liquids Code. Quincy, MA: National Fire Protection Association; 2018.	Consensus	n/a	n/a	n/a	n/a	Standard for handling flammable and combustible liquids.	IVB

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102	Kim JB, Jung HJ, Im KS. Operating room fire using an alcohol-based skin preparation but without electrocautery. Can J Anesth. 2013; 60(4): 413–414.	Case Report	46 year old female patient who underwent adhesiolysis of flexion in right 3rd finger	n/a	n/a	n/a	Occurrence of an OR fire while using an alcohol skin antiseptic without the use of ESU. Pooling of the skin antiseptic agent led to alcohol vapor that was ignited by a static spark. As a result of this case, authors suggest to prevent pooling of alcohol skin antiseptic agents, minimize excess application of alcohol skin antiseptic agent, and solution soaked drapes in the operative field should be immediately removed.	VC
103	Chapp K, Lange L. Warming blanket head drapes and trapped anesthetic gases: understanding the fire risk. AORN J. 2011; 93(6): 749–760.	Organizational Experience	Bench study	Head drape tucked with blower on or off.	Head drape loosely tucked with blower on or off.	Oxygen saturation	An oxygen enriched environment is created when a blanket warmer head drape is tucked in around head especially when warmer is turned off.	VA
104	NFPA 10: Standard for Portable Fire Extinguishers. Quincy, MA: National Fire Protection Association; 2018.	Consensus	n/a	n/a	n/a	n/a	Standard for fire extinguishers.	IVB
105	Executive brief: top 10 health technology hazards for 2017. ECRI Institute. https://www.ecri.org/Resources/Whitepapers_and_reports/Haz17.pdf. Accessed August 21, 2018.	Expert Opinion	n/a	n/a	n/a	n/a	Reported that one of the top 10 health technology hazards for 2017 was equipment device failures caused by use of improper cleaning products and practices.	VC
106	Cappell MS. Accidental occupational injuries to endoscopy personnel in a high-volume endoscopy suite during the last decade: mechanisms, workplace hazards, and proposed remediation. Dig Dis Sci. 2011; 56(2): 479–487.	Organizational Experience	Retrospective review of 14 previously unreported injuries among 120 endoscopy suite personnel in a high-volume endoscopy suite during 2000-2010	n/a	n/a	n/a	Potentially correctable design flaws may frequently contribute to accidents in endoscopy suites, including: bulky overhead video monitors, too narrow doors for extra-wide stretchers, absence of slip-resistant flooring, and wires exposed above the floor.	VB

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107	Cappell MS. Injury to endoscopic personnel from tripping over exposed cords, wires, and tubing in the endoscopy suite: a preventable cause of potentially severe workplace injury. Dig Dis Sci. 2010; 55(4): 947–951.	Organizational Experience	Retrospective review of 110,000 endoscopic procedures performed during the last 5 years at an academic, teaching hospital with a high-volume endoscopy unit	n/a	n/a	n/a	Tripping, slipping, and falling over exposed wires can cause significant injury to endoscopic personnel. This previously undescribed hazard should be preventable by simple remediation, and all endoscopic personnel, hospital architects, hospital administrators, and governmental regulators should be alerted to this potential hazard.	VB
108	Hargrove M, Aherne T. Possible fire hazard caused by mismatching electrical chargers with the incorrect device within the operating room. J Extra Corpor Technol. 2007; 39(3): 199–200.	Organizational Experience	n/a	n/a	n/a	n/a	Numerous devices that need charging adaptors during cardiopulmonary bypass (CPB) have similar charging sockets but different voltage requirements. One of their devices overheated and completely shut down when connected to an incorrect higher-voltage charger.	VC
109	ECRI Institute. Warming cabinets. Operating Room Risk Management; 2017.	Expert Opinion	n/a	n/a	n/a	n/a	Recommendations from ECRI Institute on warming cabinets.	VC
110	Huang S, Gateley D, Moss AL. Accidental burn injury during knee arthroscopy. Arthroscopy. 2007; 23(12): 1363.e1–1363.e3.	Case Report	46 year old male who underwent knee arthroscopy	n/a	n/a	n/a	The patient experienced full-thickness skin burns and joint damage from irrigation solutions that were warmed in a cabinet in which the temperature ranged from 100.4° F (38° C) on the top shelf to 118.4° F (48° C) on the bottom shelf.	VC
111	Bujdoso PJ. Blanket warming: comfort and safety. AORN J. 2009; 89(4): 717–722.	Organizational Experience	270-bed hospital in Columbus, Ohio	n/a	n/a	n/a	Audits revealed that blankets were being warmed in autoclaves and microwaves to satisfy patient complaints.	VB
112	Guideline for prevention of unplanned patient hypothermia. In: Guidelines for Perioperative Practice. Denver, CO: AORN; Inc; 2018: 549–572.	Guideline	n/a	n/a	n/a	n/a	Provides guidance for prevention of unplanned patient hypothermia.	IVA

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113	ECRI institute continues to recommend maximum temperature setting of 130 degrees Fahrenheit for blanket warming cabinets. ECRI Institute. https://www.ecri.org/components/PSOCore/Pages/PSMU040114_ecri.aspx. Published April 1 , 2014. Accessed August 21, 2018.	Expert Opinion	n/a	n/a	n/a	n/a	ECRI recommendations for setting blanket warmers at 130 degrees.	VC
114	Sutton LT, Baker FS, Faile NJ, Tavakoli A. A quasi-experimental study examining the safety profile and comfort provided by two different blanket temperatures. J Perianesth Nurs. 2012; 27(3): 181–192.	Quasi-experimental	156 patients at a 384-bed metropolitan medical center	n=76 patients who received 155 degree blankets	n=110 patients who received 110 degree blankets	Infrared thermometer was used to measure skin and blanket temperatures and a numeric scale was used to measure thermal comfort.	Results support the hypothesis that it is safe to cover patients with 155 degree blankets, and patients experienced a higher thermal comfort level. The limitations of this study are that participants were awake postoperative patients and that the study did not address the risk for potential thermal injuries ranging from minor skin irritation to partial- or full-thickness burns from the increased temperature setting when blankets are folded or rolled against the skin of semiconscious patients.	IIB
115	Kelly PA, Cooper SK, Krogh ML et al.. Thermal comfort and safety of cotton blankets warmed at 130°F and 200°F. J Perianesth Nurs. 2013; 28(6): 337–346.	RCT	20 healthy volunteers at a large urban hospital	Blankets warmed in 130°F (54°C) cabinets	Blankets warmed in 200°F (93°C) cabinets	Skin temperature, skin damage	The researchers found no skin temperature approached levels that cause epidermal damage. They recommended warming cotton blankets in cabinets set at 200° F (93° C) or less to improve thermal comfort without compromising patient safety.	IC
116	Kelly PA, Morse EC, Swanfeldt JV et al.. Safety of rolled and folded cotton blankets warmed in 130°F and 200°F cabinets. J Perianesth Nurs. 2017; 32(6): 600–608.	RCT	20 healthy volunteers at a large urban hospital	Rolled and folded dry cotton blankets warmed in 130°F (54°C) cabinets	Rolled and folded dry cotton blankets warmed in 200°F (93°C) cabinets	Skin temperature, skin damage	The folded blanket was applied to the volunteer's back and the rolled blanket was applied to the neck. Skin temperatures from blankets warmed to 200° F (93° C) were greater than those from blankets warmed to 130° F (54° C). There was no evidence of skin temperature elevated high enough or long enough to cause dermal injury.	IC
117	Limiting temperature settings on blanket and solution warming cabinets can prevent patient burns. Health Devices. 2005; 34(5): 168–171.	Expert Opinion	n/a	n/a	n/a	n/a	ECRI hazard report on warming cabinets	VC

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118	US Department of Health and Human Services, Food and Drug Administration, Center for Drug Evaluation and Research. Guidance for Hospitals, Nursing Homes, and Other Health Care Facilities. https://www.fda.gov/downloads/drugs/guidancecomplianceregulatory-information/guidances/ucm070285.pdf. Published 2001. Accessed August 21, 2018.	Regulatory	n/a	n/a	n/a	n/a	Public health advisory for connection errors in medical gas systems.	n/a
119	US Department of Health and Human Services, Food and Drug Administration. Medical gas containers and closures; current good manufacturing practice requirements. Fed Regist. 2006; 71(68): 18039–18053.	Regulatory	n/a	n/a	n/a	n/a	Requirements for medical gas containers.	n/a
120	Compressed medical gases guideline. US Food and Drug Administration. https://www.fda.gov/drugs/guidance-complianceregulatoryinformation/guidances/ucm124716.htm. Revised 1989. Accessed August 21, 2018.	Regulatory	n/a	n/a	n/a	n/a	Requirements for medical gas containers.	n/a
121	ISO 407:2004. Small medical gas cylinders—pin-index yoke-type valve connections. International Organization for Standardization. http://www.iso.org/iso/catalogue_detail.htm?csnumber=40148. Accessed August 21, 2018.	Consensus	n/a	n/a	n/a	n/a	Recommendations for marking of gas cylinders.	IVB

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122	Standard Color Marking of Compressed Gas Cylinders Intended for Medical Use. 4th ed. Chantilly, VA: Compressed Gas Association; 2004.	Consensus	n/a	n/a	n/a	n/a	Recommendations for marking of gas cylinders.	IVB
123	ECRI. Compressed gases. Healthcare Risk Control. 2007;3(Environmental Issues 17.1).	Expert Opinion	n/a	n/a	n/a	n/a	ECRI recommendations for compressed gases	VB
124	Anesthetics, volatile. IARC monographs on the evaluation of carcinogenic risks to humans. Overall evaluations of carcinogenicity: An updating of IARC Monographs volumes 1 to 42. Supplement 7 (1987). International Agency for Research on Cancer. https://monographs.iarc.fr/iarc-monographs-on-the-evaluation-of-carcinogenic-risks-to-humans-80/. Accessed August 21, 2018.	Expert Opinion	n/a	n/a	n/a	n/a	The International Agency for Research on Cancer classifies volatile anesthetics as group 3, which is defined as not classifiable as to its carcinogenicity to humans.	VA
125	Oliveira CR. Occupational exposure to anesthetic gases residue. Rev Bras Anestesiol. 2009; 59(1): 110–124.	Literature Review	n/a	n/a	n/a	n/a	The effects of waste anesthesia gases are disputed and the acceptable occupational levels vary by country.	VC

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
126	Waste anesthetic gases: occupational hazards in hospitals. DHHS (NIOSH) Publication No 2007-151. National Institute for Occupational Safety and Health. https://www.cdc.gov/niosh/docs/2007-151/default.html. Published September 2007. Accessed August 21, 2018.	Expert Opinion	n/a	n/a	n/a	n/a	NIOSH report shows inconsistencies in the literature regarding the effects of waste anesthesia gases, confirms the means of exposure, and provides guidance for reducing exposures.	VA
127	Anesthetic gases: guidelines for workplace exposures. Occupational Safety and Health Administration. https://www.osha.gov/dts/osta/anestheticgases/index.html. Published 1999. Revised 2000. Accessed August 21, 2018.	Consensus	n/a	n/a	n/a	n/a	Recommendations for occupational exposure to waste anesthetic gases.	IVB
128	Teschke K, Abanto Z, Arbour L et al.. Exposure to anesthetic gases and congenital anomalies in offspring of female registered nurses. Am J Ind Med. 2011; 54(2): 118–127.	Nonexperimental	15,317 live births between 1990 and 2000 to 9,433 mothers who were exposed to waste anesthesia gases	n/a	n/a	Congenital anomalies	Mothers who were exposed to waste anesthesia gases consisting of halothane, isoflurane, sevoflurane, and nitrous oxide have a potential exposure-response relationship between gas exposure and the development of congenital anomalies in the children, although the study did not establish a causal link. Results suggest the anomalies may correlate with the type of waste anesthesia gas to which the mother was exposed.	IIIB
129	Dreyfus E, Tramoni E, Lehucher-Michel MP. Persistent cognitive functioning deficits in operating rooms: two cases. Int Arch Occup Environ Health. 2008; 82(1): 125–130.	Case Report	2 cases of nitrous oxide exposure	n/a	n/a	n/a	Suggests a potential relationship between personnel exposure to high nitrous oxide concentrations and persistent cognitive deficits.	VC

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130	Wronska-Nofer T, Palus J, Krajewski W et al.. DNA damage induced by nitrous oxide: study in medical personnel of operating rooms. Mutat Res. 2009; 666(1-2): 39–43.	Nonexperimental	55 female nurses and 29 male anesthesiologists in Poland	n/a	n/a	DNA damage	Researchers found a link between waste nitrous oxide and DNA damage. If the concentration of nitrous oxide exceeded the occupational exposure level of 180 mg/m3, the genetic injury was aggravated. In contrast, the researchers found no significant correlation between the DNA damage score and exposure to sevoflurane and isoflurane.	IIIB
131	Krajewski W, Kucharska M, Pilacik B et al.. Impaired vitamin B12 metabolic status in healthcare workers occupationally exposed to nitrous oxide. Br J Anaesth. 2007; 99(6): 812–818.	Nonexperimental	95 OR nurses who had exposure to nitrous oxide in Poland	n/a	n/a	Vitamin B12 levels	Researchers found a link between lower vitamin B12 metabolism and levels of nitrous oxide greater than the recommended occupational exposure level, but no link existed if the level was less than the occupational exposure level.	IIIB
132	Baysal Z, Cengiz M, Ozgonul A, Cakir M, Celik H, Kocyigit A. Oxidative status and DNA damage in operating room personnel. Clin Biochem. 2009; 42(3): 189–193.	Nonexperimental	30 OR personnel and 30 non-OR personnel in Turkey	n/a	n/a	DNA damage	The OR personnel had been exposed to a complex mixture of halothane, isoflurane, sevoflurane, nitrous oxide, and desflurane. The researchers found a correlation between levels of waste anesthesia gases and DNA damage. They also found a correlation between DNA damage and an increased oxidative stress index and total oxidative status.	IIIB
133	Rozgaj R, Kasuba V, Brozovic G, Jazbec A. Genotoxic effects of anaesthetics in operating theatre personnel evaluated by the comet assay and micronucleus test. Int J Hyg Environ Health. 2009; 212(1): 11–17.	Nonexperimental	50 OR personnel (ie, anesthesiologists, technicians, and nurses) and 50 non-OR personnel in Croatia	n/a	n/a	DNA damage	A gas scavenging system was in use at the facility. The researchers found the presence of DNA damage in all participants who had been exposed to sevoflurane, isoflurane and nitrous oxide. A limitation of this study is the type of anesthesia gas is not mentioned.	IIIB
134	Chandrasekhar M, Rekhadevi PV, Sailaja N et al.. Evaluation of genetic damage in operating room personnel exposed to anaesthetic gases. Mutagenesis. 2006; 21(4): 249–254.	Nonexperimental	45 OR personnel who had been exposed to waste anesthesia gases and 45 non-exposed health care workers in India	n/a	n/a	DNA damage	Exposure to waste anaesthetic gases has the potential to cause changes in the human genome. The OR personnel had been exposed to a mixture of halothane, isoflurane, sevoflurane, sodium pentothal, nitrous oxide, desflurane, and enflurane.	IIIB

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
135	Eroglu A, Celep F, Erciyes N. A comparison of sister chromatid exchanges in lymphocytes of anesthesiologists to nonanesthesiologists in the same hospital. Anesth Analg. 2006; 102(5): 1573–1577.	Nonexperimental	25 anesthesiologists who had been exposed to waste anesthesia gases and 25 nonexposed internists in Turkey	n/a	n/a	DNA damage	A group of anesthesiologists who were exposed to higher than the NIOSH acceptable levels of waste anesthesia gases (ie, sevoflurane and nitrous oxide) experienced higher levels of sister chromatid exchanges (ie, DNA mutation) compared to internists who did not work in the OR, and the levels dropped after a 2-month absence from the OR. These ORs did not have scavenging systems or low-leakage anesthesia machines, and no preventative maintenance had been performed.	IIIB
136	Criteria for a recommended standard: occupational exposure to waste anesthetic gases and vapors. NIOSH Publication Number 77-140. National Institute for Occupational Safety and Health. https://www.cdc.gov/niosh/docs/77-140/default.html. Published March 1977. Accessed August 21, 2018.	Consensus	n/a	n/a	n/a	n/a	Recommendations for occupational exposure to waste anesthetic gases.	IVB
137	Sartini M, Ottria G, Dallera M, Spagnolo AM, Cristina ML. Nitrous oxide pollution in operating theatres in relation to the type of leakage and the number of efficacious air exchanges per hour. J Prev Med Hyg. 2006; 47(4): 155–159.	Nonexperimental	ORs at hospital in Liguria	n/a	n/a	Nitrous oxide concentration via gas chromatography	Various types of leaks were present during anesthesia administration.	IIIB
138	Irwin MG, Trinh T, Yao CL. Occupational exposure to anaesthetic gases: a role for TIVA. Expert Opin Drug Saf. 2009; 8(4): 473–483.	Literature Review	n/a	n/a	n/a	n/a	Higher levels of waste anesthesia gases were related to the use of uncuffed endotracheal tubes and during induction with a mask.	VA

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139	Barberio JC, Bolt JD, Austin PN, Craig WJ. Pollution of ambient air by volatile anesthetics: a comparison of 4 anesthetic management techniques. AANA J. 2006; 74(2): 121–125.	Quasi-experimental	Laboratory setting	4 combinations of 3 volatile anesthetic gases	n/a	Waste anesthetic gases measured using a MIRAN Ambient Air Analyzer placed at a level approximating the anesthetist's head.	Variance in the level of waste anesthesia gases was related to the administration technique.	IIB
140	Smith FD. Management of exposure to waste anesthetic gases. AORN J. 2010; 91(4): 482–494.	Organizational Experience	n/a	n/a	n/a	n/a	Testing of anesthesia machines revealed differing high- and low-level leaks at the time of testing. One group of machines had leaks primarily at the absorbent canister bases. The remainder of the machines had leaks in other locations.	VA
141	Mertes PM, Lambert M, Gueant-Rodriguez RM et al.. Perioperative anaphylaxis. Immunol Allergy Clin North Am. 2009; 29(3): 429–451.	Literature Review	n/a	n/a	n/a	n/a	The incidence of immune-mediated anaphylaxis during anesthesia ranges from 1 in 10,000 to 1 in 20,000. Neuromuscular blocking agents represent the most frequently involved substances, followed by latex and antibiotics, but every drug or substance used may be involved. Diagnosis relies on tryptase measurements at the time of the reaction and skin tests and specific IgE or basophil activation assays.	VB
142	Heitz JW, Bader SO. An evidence-based approach to medication preparation for the surgical patient at risk for latex allergy: is it time to stop being stopper poppers? Clin Anesth. 2010; 22(6): 477–483.	Expert Opinion	n/a	n/a	n/a	n/a	The practice of removing the rubber stopper in medication vials is a risk for latex allergy patients.	VC
143	Pollart SM, Warniment C, Mori T. Latex allergy. Am Fam Physician. 2009; 80(12): 1413–1418.	Literature Review	n/a	n/a	n/a	n/a	The prevalence of latex allergy in the general population is low; however, the risk of developing latex allergy is higher in persons with increased latex exposure. Children with spina bifida and others who undergo multiple surgeries or procedures, particularly within the first year of life, are also at greater risk of latex allergy.	VB

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144	Latex allergy management guidelines. 2014. American Association of Nurse Anesthetists. https://www.aana.com/docs/default-source/practice-aana-com-web-documents-(all)/latex-allergy-management.pdf?sfvrsn=9c0049b1_2. Accessed August 21, 2018.	Guideline	n/a	n/a	n/a	n/a	Management of latex allergy includes identifying the problem and actions to protect patients and healthcare workers by the American Association of Nurse Anesthetists.	IVB
145	Boonchai W, Sirikudta W, Iamtharachai P, Kasemsarn P. Latex glove-related symptoms among health care workers: a self-report questionnaire-based survey. Dermatitis. 2014; 25(3): 135–139.	Nonexperimental	n=4529 health care workers in Taiwan	n/a	n/a	Latex glove related symptoms	The prevalence of glove-related symptoms among HCWs is 13.3%. Hospital housekeepers showed the highest prevalence rate. Irritation and allergic reactions. Encourage to use more powder free latex gloves.	IIIB
146	Larese Filon F, Bochdanovits L, Capuzzo C, Cerchi R, Rui F. Ten years incidence of natural rubber latex sensitization and symptoms in a prospective cohort of health care workers using non-powdered latex gloves 2000-2009. Int Arch Occup Environ Health. 2014; 87(5): 463–469.	Nonexperimental	n= 1040 health care workers	n/a	n/a	n/a	The results of this study demonstrated the introduction of non powdered latex gloves for all workers and non-latex gloves for symptomatic can determine a significant reduction in incidence cases of gloves-related symptoms.	IIIA
147	Liu Q, He X, Liang K et al.. Prevalence and risk factors for latex glove allergy among female clinical nurses: a multicenter questionnaire study in China. Int J Occup Environ Health. 2013; 19(1): 29–34.	Nonexperimental	n=8823 female nurses in China	n/a	n/a	n/a	Clinical female nurse are at high risk for latex allergy in China. Suggest using powder free NRL gloves or latex free gloves along with other preventative measures in nursing activities.	IIIB

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
148	Phaswana SM, Naidoo S. The prevalence of latex sensitization and allergy and associated risk factors among healthcare workers using hypoallergenic latex gloves at King Edward VIII Hospital, KwaZulu-Natal South Africa: a cross-sectional study. BMJ Open. 2013;3(12):e002900.	Nonexperimental	n=600 health care workers	n/a	n/a	n/a	Even in the presence of powder free hypoallergenic glove use, there is latex sensitization and latex allergy. LS and LA remain an occupational hazard for HCWs. Suggest to develop a policy with implementation plans, education, & training programs to address LS & LA. Alternate latex-free gloves must be made available for them.	IIIB
149	Supapvanich C, Povey AC, Vocht FD. Latex sensitization and risk factors in female nurses in Thai governmental hospitals. Int J Occup Med Environ Health. 2014; 27(1): 93–103.	Nonexperimental	n=363 nurses	n/a	n/a	Latex sensitization	Respiratory exposure is a factor to dermal exposure and latex sensitization. Suggest latex gloves replaced by non-latex gloves, or replacement gloves with a lower protein content should be considered.	IIIB
150	Wang ML, Kelly KJ, Klancnik M, Petsonk EL. Self-reported hand symptoms: a role in monitoring health care workers for latex sensitization? Ann Allergy Asthma Immunol. 2012; 109(5): 314–318.	Nonexperimental	n = 805 health care workers	n/a	n/a	Latex sensitization	Results confirm reported hand symptoms attributed to latex gloves are associated with latex sensitization. Hand symptoms associated with job exposure to latex gloves.	IIIB
151	Köse S, Mandiracioglu A, Tatar B, Gül S, Erdem M. Prevalence of latex allergy among healthcare workers in Izmir (Turkey). Cent Eur J Public Health. 2014; 22(4): 262–265.	Nonexperimental	n=1115 health care workers	n/a	n/a	Natural rubber latex (NRL) allergy	Latex allergy significantly higher rate of latex allergy among nurses. Medical treatment may reduce allergic symptoms but the most effective is termination of exposure. Non-powdered gloves reduced amount of protein instead of latex products.	IIIA

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152	Risenga SM, Shivambu GP, Rakgole MP et al.. Latex allergy and its clinical features among healthcare workers at Mankweng Hospital, Limpopo Province, South Africa. S Afr Med J. 2013; 103(6): 390–394.	Nonexperimental	n=158 health care workers	n/a	n/a	Latex allergy	Recommend latex free protocol in high risk areas such as the OR.	IIIC
153	Supapvanich C, Povey AC, de Vocht F. Respiratory and dermal symptoms in Thai nurses using latex products. Occup Med (Lond). 2013; 63(6): 425–428.	Nonexperimental	n=899 nurses in 3 hospitals in Thailand	n/a	n/a	Dermal and respiratory symptoms associated with latex glove use	Reducing the use of latex gloves and/or replace with non-latex gloves focusing on OB & OR departments. Replace CHG detergents with alternatives may reduce new cases of dermal symptoms is recommended. Highest prevalence of dermal symptoms in ER, OB, & OR. Respiratory symptoms in OB.	IIIA
154	Worth A, Sheikh A. Prevention of anaphylaxis in healthcare settings. Expert Rev Clin Immunol. 2013; 9(9): 855–869.	Literature Review	n/a	n/a	n/a	n/a	All patients are at risk for developing allergic responses to latex. Identify patient risk factors & minimize risk of reactions and improving outcomes should a reaction occur. Identification of patients at risk is crucial to prevention.	VA
155	Al-Niaimi F, Chiang YZ, Chiang YN, Williams J. Latex allergy: assessment of knowledge, appropriate use of gloves and prevention practice among hospital health-care workers. Clin Exp Dermatol. 2013; 38(1): 77–80.	Nonexperimental	n=156 health care workers (HCW) in a large teaching hospital in the UK.	n/a	n/a	n/a	Results from the survey provides knowledge of latex allergy and prevention practice of HCWs and highlights a lack of knowledge in this area. Potential safety issues to patients and the need for further training.	IIIB
156	Kelly KJ, Wang ML, Klancnik M, Petsonk EL. Prevention of IgE sensitization to latex in health care workers after reduction of antigen exposures. J Occup Environ Med. 2011; 53(8): 934–940.	Nonexperimental	n=805 health care workers	n/a	n/a	Latex antigen concentrations in work area air ducts, latex sensitivity symptoms	Health care providers are exposed to latex antigens from airborne sources, and the use of powder-free latex gloves reduces the risk of sensitization.	IIIC
157	Liberatore K. Latex: a lingering and lurking safety risk. Penn Patient Saf Advis. 2018;15(1).	Case Report	Review of latex allergy reports in PA-PSRS database between 2014-2016	n/a	n/a	n/a	Latex allergy poses a significant risk for patient harm, especially in the perioperative areas. Authors make several recommendations for practice.	VB

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
158	Latex in the hospital environment. Spina Bifida Association. https://spinabifidaassociation.org/wp-content/uploads/2015/07/latex-in-the-hospital-environment-eng.pdf. Updated 2015. Accessed August 21, 2018.	Expert Opinion	n/a	n/a	n/a	n/a	Listing of products that contain latex and alternatives that do not contain latex.	VC
159	Medical products. American Latex Allergy Association. http://latexallergyresources.org/medical-products. Accessed August 21, 2018.	Expert Opinion	n/a	n/a	n/a	n/a	Listing of products that contain latex and alternatives that do not contain latex.	VC
160	Bigat Z, Kayacan N, Ertugrul F, Karsli B. Latex allergy on anaesthesiologist and anaesthesia managements: are the health workers high risk patients? J Pak Med Assoc. 2014; 64(4): 453–456.	Case Report	39 year old female (also an anesthestist) who underwent two myomectomy procedures 5 years apart	n/a	n/a	n/a	Patient had latex hypersensitivity. Suggested strategies for caring for latex-sensitive patients which include using non-latex gloves, warning signs, pharmacologic prophylaxis, and H2 blocking agents and steroids. A latex free environment should be provided to prevent anaphylaxis.	VB
161	Gentili A, Lima M, Ricci G et al.. Perioperative treatment of latex-allergic children. J Patient Saf. 2007; 3(3): 166–172.	Nonexperimental	n=26 children with latex allergy out of 7507 patients who underwent surgery between 1998 and 2004	n/a	n/a	n/a	Most patients have many risk factors simultaneously for the development of a latex allergy, which increases the severity of the allergy. Latex-safe perioperative management improves safety against latex allergy phenomena.	IIIB
162	Nagpal K, Arora S, Vats A et al.. Failures in communication and information transfer across the surgical care pathway: interview study. BMJ Qual Saf. 2012; 21(10): 843–849.	Nonexperimental	n=18 members of the multidisciplinary team (seven surgeons, five anaesthetists and six nurses) in an acute National Health Service trust	n/a	n/a	n/a	Communication failures occur across the entire continuum of care and the participants opined that it could have a potentially serious impact on patient safety. This data can be used to plan interventions targeted at the entire surgical pathway so as to improve the quality of care at all stages of the patient's journey.	IIIB

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163	29 CFR § 1910.1200. Hazard communication: toxic and hazardous substances. US Government Publishing Office. https://www.gpo.gov/fdsys/pkg/CFR-2014-title29-vol6/pdf/CFR-2014-title29-vol6-sec1910-1200.pdf. Accessed August 21, 2018.	Regulatory	n/a	n/a	n/a	n/a	Requirements for handling toxic and hazardous substances.	n/a
164	29 CFR § 1910.1048: Formaldehyde. US Government Publishing Office. https://www.gpo.gov/fdsys/granule/CFR-2016-title29-vol6/CFR-2016-title29-vol6-sec1910-1048/content-detail.html. Accessed August 21, 2018.	Regulatory	n/a	n/a	n/a	n/a	Requirements for handling formaldehyde.	n/a
165	29 CFR § 1910.1047: Ethylene oxide. US Government Publishing Office. https://www.gpo.gov/fdsys/granule/CFR-2010-title29-vol6/CFR-2010-title29-vol6-sec1910-1047. Accessed August 21, 2018.	Regulatory	n/a	n/a	n/a	n/a	Requirements for handling ethylene oxide.	n/a
166	Berton F, Di Novi C. Occupational hazards of hospital personnel: assessment of a safe alternative to formaldehyde. J Occup Health. 2012; 54(1): 74–78.	Nonexperimental	n=171 interviews & n= 156 observations	n/a	n/a	Respiratory symptoms with exposure to formaldehyde	An alternative to using formaldehyde is known as the vacuum sealer. Using the suggested alternative under-vacuum sealer would improve the health of personnel.	IIIB

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167	Davies T. Health problems have come in wake of contact with chemicals. Nurs Stand. 2016; 30(39): 30–31.	Case Report	1 perioperative nurse	n/a	n/a	n/a	This is a personal letter written to Nursing Standard from Royal College of Nursing in Great Britain. Theatre nurse describes health problems from exposure to glutaraldehyde. Caused occupational lung disease, tachycardia, burns & swelling of eyes, difficulty swallowing, staining of the skin, rash over body and face, and carcinogenic activity.	VC
168	Karnwal A, Lippmann M, Kakazu C. Bone cement implantation syndrome affecting operating room personnel. Br J Anaesth. 2015;115(3):478.	Expert Opinion	n/a	n/a	n/a	n/a	Bone cement is hazardous to patients and the periop team. Bone cement can lead to negative health effects that include; teary eyes, sore throat, coughing, & nose irritation. Direct contact with skin can cause itching, burning, redness, swelling, & cracking of skin, dermatitis. MMA can penetrate clothing and surgical gloves, affect the brain such as headache, drowsiness, nausea, weakness, fatigue, irritability, dizziness, loss of appetite, and insomnia. May cause birth defects - staff or patients should avoid overexposure to MMA.	VB
169	Ponce V, Muñoz-Bellido F, González A, Gracia M, Moreno A, Macías E. Occupational contact dermatitis to methacrylates in an orthopaedic operating room nurse. J Investig Allergol Clin Immunol. 2013;23(4):286.	Case Report	40 year old male (OR nurse) who had contact dermatitis	n/a	n/a	n/a	Exposure to methyl methacrylate led to erythema, edema, blistering, and cracking on fingertips, & sides of 2nd, 3rd, 4th fingers. Suggested to change workplace, but he decided to stay in the orthopedic OR but avoid handling bone cements.	VC
170	Walters GI, Moore VC, McGrath EE, Burge PS, Henneberger PK. Agents and trends in health care workers' occupational asthma. Occup Med (Lond). 2013;63(7): 513–516.	Nonexperimental	n=182 occupational asthma notifications from the Midland Thoracic Society's Surveillance Scheme of Occupational Asthma (SHIELD) database	n/a	n/a	n/a	Most frequent agents were glutaraldehyde (n=69) latex (n=47), & cleaning products (n=27). Cases of occupational asthma related to exposure to glutaraldehyde, latex, & cleaning products.	IIIB

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171	Downes J, Rauk PN, Vanheest AE. Occupational hazards for pregnant or lactating women in the orthopaedic operating room. J Am Acad Orthop Surg. 2014; 22(5): 326–332.	Literature Review	n/a	n/a	n/a	n/a	Studies suggest with the use of a vacuum mixer and personal hood protectant system, the risk of occupational exposure to MMA is low.	VA
172	Olsen F, Kotyra M, Houltz E, Ricksten SE. Bone cement implantation syndrome in cemented hemiarthroplasty for femoral neck fracture: incidence, risk factors, and effect on outcome. Br J Anaesth. 2014; 113(5): 800–806.	Nonexperimental	n=1016 patients underwent cemented hemiarthroplasty	n/a	n/a	n/a	Bone cement implantation syndrome (BCIS) symptoms include hypoxia, hypotension, & loss of consciousness occurring around the time of bone cementation. BCIS is a common phenomena in cemented hemiarthroplasty. The researchers identified preoperative risk factors for the development of severe BCIS.	IIIB
173	Ethylene Oxide (EtO): Evidence of Carcinogenicity. Atlanta, GA: US Department of Health & Human Services: Centers for Disease Control and Prevention, The National Institute for Occupational Safety and Health (NIOSH); 2014.	Expert Opinion	n/a	n/a	n/a	n/a	Ethylene Oxide carcinogenicity	VA
174	Casey ML, Hawley B, Edwards N, Cox-Ganser J, Cummings KJ. Health problems and disinfectant product exposure among staff at a large multispecialty hospital. Am J Infect Control. 2017; 45(10): 1133–1138.	Nonexperimental	n=163 health care workers	n/a	n/a	n/a	Disinfectant product was associated with mucous membrane and respiratory health effects. Risks of mucous membrane irritation and asthma in health care workers should be considered in development of disinfection protocols to protect patients from hospital-acquired infections. Identifying disinfection protocols to protect patients from hospital-acquired infections while maintaining safety is needed.	IIIB

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175	Reducing ethylene oxide use. US Environmental Protection Agency. http://www.glrppr.org/docs/r5-eto-factsheet-revised-feb2018.pdf. Accessed August 21, 2018.	Regulatory	n/a	n/a	n/a	n/a	Requirements for handling ethylene oxide.	n/a
176	Lawson CC, Rocheleau CM, Whelan EA et al.. Occupational exposures among nurses and risk of spontaneous abortion. Am J Obstet Gynecol. 2012; 206(4): 327.e1–327.e8.	Nonexperimental	n=8461 nurses	n/a	n/a	Spontaneous abortion	Increased risks for spontaneous abortion with reported exposures to antineoplastic drugs, sterilizing agents, and X-rays. Nurses who are pregnant or wish to become pregnant to work with employers to reduce exposures during pregnancy & lactation.	IIIB
177	29 CFR § 1910.120. Hazardous waste operations and emergency response. US Government Publishing Office. https://www.gpo.gov/fdsys/pkg/CFR-2009-title29-vol5/pdf/CFR-2009-title29-vol5-sec1910-120.pdf. Accessed August 21, 2018.	Regulatory	n/a	n/a	n/a	n/a	Requirements for handling hazardous waste.	n/a
178	Healthcare wide hazards: hazardous chemicals. Occupational Safety and Health Administration. https://www.osha.gov/SLTC/etools/hospital/hazards/hazchem/haz.html. Accessed August 21, 2018.	Expert Opinion	n/a	n/a	n/a	n/a	OSHA resources for hazardous chemicals in the workplace	VC
179	29 CFR § 1910.132. General requirements. US Government Publishing Office. https://www.gpo.gov/fdsys/pkg/CFR-2009-title29-vol5/pdf/CFR-2009-title29-vol5-sec1910-120.pdf. Accessed August 21, 2018.	Regulatory	n/a	n/a	n/a	n/a	Requirements for handling hazardous waste.	n/a

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180	Guideline for high-level disinfection. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2018: 883–906	Guideline	n/a	n/a	n/a	n/a	Provides guidance on performing high-level disinfection.	IVA
181	Guideline for sterilization. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; [in press].	Guideline	n/a	n/a	n/a	n/a	Provides guidance on sterilization.	IVA
182	Guideline for preoperative patient skin antisepsis. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2018: 51–74.	Guideline	n/a	n/a	n/a	n/a	Provides guidance on perioperative skin antisepsis.	IVA
183	Guideline for hand hygiene. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2018:29–50.	Guideline	n/a	n/a	n/a	n/a	Provides guidance on hand hygiene.	IVA
184	Guideline for surgical attire. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2018: 105–128.	Guideline	n/a	n/a	n/a	n/a	Provides guidance on surgical attire.	IVA
185	29 CFR § 1910.134. Respiratory protection. US Government Publishing Office. https://www.govinfo.gov/app/details/CFR-2018-title29-vol5/CFR-2018-title29-vol5-sec1910-134/context. Accessed August 21, 2018.	Regulatory	n/a	n/a	n/a	n/a	Provides requirements for PPE.	n/a
186	American National Standard for Emergency Eyewash and Shower Equipment. Arlington, VA: International Safety Equipment Association (ISEA); 2014:22.	Guideline	n/a	n/a	n/a	n/a	Provides the minimum requirements for installation, performance, maintenance, test procedures, and use for training of emergency eyewash and shower equipment.	IVC

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187	International chemical safety cards: methyl methacrylate. Centers for Disease Control and Prevention. http://www.cdc.gov/niosh/ipcsneng/neng0300.html. Updated July 1, 2014. Accessed August 21, 2018.	Expert Opinion	n/a	n/a	n/a	n/a	NIOSH chemical safety card for methyl methacrylate	VA
188	Methyl methacrylate. Occupational Safety and Health Administration. https://www.osha.gov/chemical-data/chemResult.html?RecNo=712. Accessed 9/20, 2017.2017.	Regulatory	n/a	n/a	n/a	n/a	Requirements for handling methyl methacrylate.	n/a
189	Methyl methacrylate. In: IARC Monographs on the Evaluation of Carcinogenic Risks to Humans. Vol 60. Lyon, France: World Health Organization: International Agency for Research on Cancer; 1994.	Expert Opinion	n/a	n/a	n/a	n/a	Methyl methacrylate carcinogenicity	VA
190	Medical devices; reclassification of polymethyl-methacrylate (PMMA) bone cement. Final rule. Fed Regist. 2002; 67(137): 46852–46855.	Regulatory	n/a	n/a	n/a	n/a	Requirements for handling polymethyl-methacrylate.	n/a
191	Jelecevic J, Maidanjuk S, Leithner A, Loewe K, Kuehn KD. Methyl methacrylate levels in orthopedic surgery: comparison of two conventional vacuum mixing systems. Ann Occup Hyg. 2014; 58(4): 493–500.	Nonexperimental	Laboratory, OR environment	n/a	Two commonly used vacuum mixing systems for methyl methacrylate bone cement	MMA vapor concentrations	Significant differences in MMA mean vapor concentrations, with the highest mean concentrations observed in a laboratory and the lowest average concentrations in an operating theatre with laminar flow ventilation and 22 air changes per hour. No significant differences in overall MMA concentrations were found between the two vacuum mixing systems in either location. Concentrations do not reach the short-term exposure limit of 100 ppm.	IIIB

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192	Ungers LJ, Vendrely TG, Barnes CL. Control of methyl methacrylate during the preparation of orthopedic bone cements. J Occup Environ Hyg. 2007; 4(4): 272–280.	Nonexperimental	Laboratory	n/a	Various methods of MMA preparation	MMA vapor concentrations	Preparation of bone cement releases MMA vapors into the breathing zone of the preparer. One preparation technique (Stryker Bowl) controlled emissions during mixing and curing and affected a 73% reduction in measured MMA concentrations. In addition to mixing and curing, the second technique (UltraMix System) also controlled the MMA during pouring of the monomer and affected a 90% reduction in MMA concentrations.	IIIB
193	Burston B, Yates P, Bannister G. Cement burn of the skin during hip replacement. Ann R Coll Surg Engl. 2007; 89(2): 151–152.	Case Report	63 year old female who underwent total hip arthroplasty	n/a	n/a	n/a	First reported case of a partial thickness burn to the skin from discarded bone cement during a routine total hip replacement. The patient required plastic surgical attention for 5 months before the skin was healed.	VC
194	40 CFR § 260: Hazardous waste system: general. US Government Publishing Office. https://www.gpo.gov/fdsys/pkg/CFR-2017-title40-vol28/xml/CFR-2017-title40-vol28-part260.xml. Accessed August 21, 2018.	Regulatory	n/a	n/a	n/a	n/a	Requirements for handling waste.	n/a
195	Glutaraldehyde. OSHA Occupational Chemical Database. https://www.osha.gov/chemicaldata/chemResult.html?recNo=123. Updated 2018. Accessed August 21, 2018.	Regulatory	n/a	n/a	n/a	n/a	Requirements for handling glutaraldehyde.	n/a
196	Glutaraldehyde: TLV Chemical Substances. 7th ed. Cincinnati, OH: American Conference of Governmental Industrial Hygienists (ACGIH); 2015.	Expert Opinion	n/a	n/a	n/a	n/a	Provides guidance for handling glutaraldehyde	VA

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197	Smith DR, Wang R. Glutaraldehyde exposure and its occupational impact in the health care environment. Environ Health Prev Med. 2005; 11(1): 3–10.	Expert Opinion	n/a	n/a	n/a	n/a	Personnel exposure to glutaraldehyde result in throat and lung irritation, asthma and difficulty breathing, dermatitis, nasal irritation, sneezing, wheezing, burning eyes, and conjunctivitis.	VB
198	Best Practices for the Safe Use of Glutaraldehyde in Health Care. Washington, DC: Occupational Safety and Health Administration; 2006.	Expert Opinion	n/a	n/a	n/a	n/a	OSHA recommendations for safe use of glutaraldehyde.	VB
199	Sampling strategy and analytical methods for formaldehyde. Occupational Safety and Health Administration. https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=standards&p_id=10077. Accessed August 21, 2018.	Regulatory	n/a	n/a	n/a	n/a	Requirements for sampling for formaldehyde.	n/a
200	Hazardous waste. US Environmental Protection Agency. https://www.epa.gov/hw. Accessed August 21, 2018.	Regulatory	n/a	n/a	n/a	n/a	Requirements for handling wastes.	n/a
201	40 CFR § 266: Standards for the management of specific hazardous wastes and specific types of hazardous waste management facilities. US Government Publishing Office. https://www.gpo.gov/fdsys/granule/CFR-2012-title40-vol28/CFR-2012-title40-vol28-part266. Accessed August 21, 2018.	Regulatory	n/a	n/a	n/a	n/a	Requirements for handling hazardous wastes.	n/a

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202	29 CFR Appendix D to § 1910.1200: definition of "trade secret" (mandatory). http://www.osha.gov/pls/oshaweb/owa-dispshow_document?p_table=STANDARDS&p_id=10103. Accessed August 21, 2018.	Regulatory	n/a	n/a	n/a	n/a	Regulatory definition of a trade secret.	n/a
203	Safe Medical Devices Act of 1990 and the Medical Device Amendments of 1992. Washington, DC: US Department of Health and Human Services, Public Health Service/Food and Drug Administration, Center for Devices and Radiological Health; 1993.	Regulatory	n/a	n/a	n/a	n/a	Regulations for handling broken medical devices.	n/a
204	Phillips J. Clinical alarms: complexity and common sense. Crit Care Nurs Clin North Am. 2006; 18(2): 145–156.	Expert Opinion	n/a	n/a	n/a	n/a	Reviews the components of an alarm safety program.	VB
205	Randall SB, Pories WJ, Pearson A, Drake DJ. Expanded Occupational Safety and Health Administration 300 log as metric for bariatric patient-handling staff injuries. Surg Obes Relat Dis. 2009; 5(4): 463–468.	Nonexperimental	761-bed, level 1 trauma center affiliated with a U.S. medical school	n/a	n/a	n/a	The E-OSHA 300 log provides a method to identify the frequency, severity, and nature of caregiver injury during mobilization of the obese. Understanding the heightened risk of injury associated with manual bariatric patient handling should help healthcare institutions identify deficiencies in their current injury prevention program and focus resources more precisely for safer, systems-based bariatric patient-handling solutions.	IIIA

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206	42 CFR § 482: Conditions of participation for hospitals. US Government Publishing Office. https://www.gpo.gov/fdsys/granule/CFR-2011-title42-vol5/CFR-2011-title42-vol5-part482. Accessed August 21, 2018.	Regulatory	n/a	n/a	n/a	n/a	CMS conditions of participation for hospitals.	n/a
207	42 CFR § 416: Ambulatory surgical services. US Government Publishing Office. https://www.gpo.gov/fdsys/granule/CFR-2011-title42-vol3/CFR-2011-title42-vol3-part416. Accessed August 21, 2018.	Regulatory	n/a	n/a	n/a	n/a	CMS conditions of coverage for ambulatory centers.	n/a
208	State Operations Manual Appendix A—Survey Protocol, Regulations and Interpretive Guidelines for Hospitals. Rev 137; 2105. Centers for Medicare & Medicaid Services. https://www.cms.gov/Regulations-and-Guidance/Guidance/Manuals/downloads/som107ap_a_hospitals.pdf. Accessed August 21, 2018.	Regulatory	n/a	n/a	n/a	n/a	CMS conditions of participation for hospitals.	n/a
209	State Operations Manual Appendix L—Guidance for Surveyors: Ambulatory Surgical Centers. Rev 137; 2015. Centers for Medicare & Medicaid Services. https://www.cms.gov/Regulations-and-Guidance/Guidance/Manuals/Downloads/som107ap_l_ambulatory.pdf. Accessed August 21, 2018.	Regulatory	n/a	n/a	n/a	n/a	CMS conditions of coverage for ambulatory centers.	n/a

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210	Quality management and improvement. In: Accreditation Handbook for Ambulatory Health Care. Skokie, IL: Accreditation Association for Ambulatory Health Care, Inc; 2016:46–50.	Accreditation	n/a	n/a	n/a	n/a	AAAHC quality management and improvement standards.	n/a
211	MedWatch: The FDA Safety Information and Adverse Event Reporting Program. http://www.fda.gov/Safety/MedWatch/default.htm. Accessed August 21, 2018.	Regulatory	n/a	n/a	n/a	n/a	FDA MedWatch adverse event reporting program.	n/a
212	MAUDE—Manufacturer and User Facility Device Experience. https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfMAUDE/search.CFM. Updated July 31, 2018. Accessed August 21, 2018.	Regulatory	n/a	n/a	n/a	n/a	FDA MAUDE database.	n/a