

AORN Guideline for Team Communication
Evidence Table

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
1	Institute of Medicine. Kohn LT, Corrigan JM, Donaldson MS, eds. To Err Is Human: Building a Safer Health System. Washington, DC: National Academy Press; 2000.	Regulatory	n/a	n/a	n/a	n/a	This is a report that describes serious concern about medical errors in healthcare.	n/a
2	Makary MA, Daniel M. Medical error—the third leading cause of death in the US. BMJ. 2016;353:i2139.	Expert Opinion	n/a	n/a	n/a	n/a	The science of safety has matured to describe how communication breakdowns, diagnostic errors, poor judgment, and inadequate skill can directly result in patient harm and death. The authors analyzed the scientific literature on medical error to identify its contribution to US deaths in relation to causes listed by the CDC.	VB
3	Information Statement: Surgical Patient Safety. American Academy of Orthopaedic Surgeons. https://www.aaos.org/uploadedFiles/PreProduction/About/Opinion_Statements/advistmt/1049%20Surgical%20Patient%20Safety.pdf . Published 2016. Accessed September 28, 2017.	Expert Opinion	n/a	n/a	n/a	n/a	n/a	VA
4	Information Statement: Surgical Site and Procedure Confirmation. American Academy of Orthopaedic Surgeons. https://www.aaos.org/uploadedFiles/PreProduction/About/Opinion_Statements/advistmt/1043%20Surgical%20Site%20and%20Procedure%20Confirmation.pdf . Published March 2015. Accessed September 28, 2017.	Expert Opinion	n/a	n/a	n/a	n/a	n/a	VA
5	Information Statement: Consistency for Safety in Orthopaedic Surgery. American Academy of Orthopaedic Surgeons. https://www.aaos.org/uploadedFiles/PreProduction/About/Opinion_Statements/advistmt/1042%20Consistency%20for%20Safety%20in%20Orthopaedic%20Surgery.pdf . Published March 2015. Accessed September 28, 2017.	Expert Opinion	n/a	n/a	n/a	n/a	n/a	VA
6	Information Statement: Surgeon and Surgical Team Concentration. American Academy of Orthopaedic Surgeons. https://www.aaos.org/uploadedFiles/PreProduction/About/Opinion_Statements/advistmt/1041%20Surgeon%20and%20Surgical%20Team%20Concentration.pdf . Published December 2014. Accessed September 28, 2017	Expert Opinion	n/a	n/a	n/a	n/a	n/a	VA
7	American College of Surgeons (ACS) Committee on Perioperative Care. Revised statement on safe surgery checklists, and ensuring correct patient, correct site, and correct procedure surgery. Bull Am Coll Surg. 2016;101(10):52.	Expert Opinion	n/a	n/a	n/a	n/a	n/a	VA
8	American College of Surgeons (ACS) Committee on Perioperative Care. Statement on distractions in the operating room. Bull Am Coll Surg. 2016;101(10):42-44.	Expert Opinion	n/a	n/a	n/a	n/a	n/a	VA
9	American College of Surgeons (ACS); American Society of Anesthesiologists. Statement on physician-led team-based surgical care. Bull Am Coll Surg. 2016;101(8):50.	Expert Opinion	n/a	n/a	n/a	n/a	n/a	VA
10	Ajlan AM, Harsh GR 4th. The human factor and safety attitudes in neurosurgical operating rooms. World Neurosurg. 2015;83(1):46-48.	Expert Opinion	n/a	n/a	n/a	n/a	Faithful adherence to checklist and time out protocols will enhance the safety attitudes in neurosurgical ORs and reduce the harm caused by adverse events.	VA

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11	Arriaga AF, Elbardissi AW, Regenbogen SE, et al. A policy-based intervention for the reduction of communication breakdowns in inpatient surgical care: results from a Harvard surgical safety collaborative. <i>Ann Surg.</i> 2011;253(5):849-854.	Quasi-experimental	Surgical services departments of 4 academic medical centers	Formal development of a set of policies for resident and attending communication practices and policy implementation through meetings and distribution of pocket cards.	Before and after intervention	Communication of critical events	Researchers found a 33% decrease in the proportion of critical events not conveyed to the attending and eliminated gaps in the frequency of attending notification of patient status on the weekends.	IIA
12	Barzallo Salazar MJ, Minkoff H, Bayya J, et al. Influence of surgeon behavior on trainee willingness to speak up: a randomized controlled trial. <i>J Am Coll Surg.</i> 2014;219(5):1001-1007.	RCT	55 medical students	Students randomly assigned to an "encouraged" or "discouraged" group. The students in the "encouraged" group were encouraged to speak up when something untoward happened in the simulation scenario.	No encouragement to speak up.	Speaking up	The students in the encouraged group were significantly more likely to speak up. The senior surgeon plays an important role in improving intraoperative communication between junior and senior clinicians and can enhance patient safety.	IA
13	Braaf S, Manias E, Finch S, Riley R, Munro F. Healthcare service provider perceptions of organisational communication across the perioperative pathway: a questionnaire survey. <i>J Clin Nurs.</i> 2013;22(1-2):180-191.	Nonexperimental	125 healthcare professionals in surgery, anesthesia and nursing. 2 focus groups and 20 semi-structured interviews, 350 hours of observation	n/a	n/a	How nurses, surgeons, and anesthesiologists communicated through documents and documentation as well as their perceptions and problems with using documents and documentation.	Communication failure occurred owing to a reliance on documents and documentation to transfer information at patient transition points, poor quality documents and documentation and problematic access to information.	IIIA
14	Michinov E, Jamet E, Dodeler V, Haegelen C, Jannin P. Assessing neurosurgical non-technical skills: an exploratory study of a new behavioural marker system. <i>J Eval Clin Pract.</i> 2014;20(5):582-588.	Nonexperimental	5 videos of operations	n/a	n/a	Behavior markers of non-technical skills in verbal communication.	The behavior marker system provides a structured approach to assessing non-technical skills in the field of neurosurgery.	IIIB
15	Update: sentinel event statistics. <i>Jt Comm Perspect.</i> 2006;26(10):14-15.	Regulatory	n/a	n/a	n/a	n/a	n/a	n/a
16	Treadwell JR, Lucas S, Tsou AY. Surgical checklists: a systematic review of impacts and implementation. <i>BMJ Qual Saf.</i> 2014;23(4):299-318.	Systematic Review	n/a	n/a	n/a	n/a	Surgical checklists were associated with increased detection of potential safety hazards, decreased surgical complications and improved communication among operating staff. Strategies for successful checklist implementation included enlisting institutional leaders as local champions, incorporating staff feedback for checklist adaptation and avoiding redundancies with existing systems for collecting information.	IIIA

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17	Thomassen Ø, Storesund A, Sjøfteland E, Brattebø G. The effects of safety checklists in medicine: a systematic review. <i>Acta Anaesthesiol Scand.</i> 2014;58(1):5-18.	Systematic Review	n/a	n/a	n/a	n/a	A systematic review of the medical literature to show the effects of safety checklists with a number of outcomes. Narrowed search to outcome measures on mortality and morbidity (7 studies). Also included studies reporting 'softer' process related measure: adherence to guidelines, human factors and reduction of adverse events. Findings included improved communication reduced adverse events, better adherence to standard operating procedures, and reduced morbidity and mortality. None of the studies reported decreased patient safety or quality after introducing safety checklists.	IIIA
18	Russ S, Rout S, Sevdalis N, Moorthy K, Darzi A, Vincent C. Do safety checklists improve teamwork and communication in the operating room? A systematic review. <i>Ann Surg.</i> 2013;258(6):856-871.	Systematic Review	n/a	n/a	n/a	n/a	Safety checklists are beneficial for OR teamwork and communication and this may be one mechanism through which patient outcomes are improved. Future research should aim to further elucidate the relationship between how safety checklists are used and team skills in the OR using more consistent methodological approaches and utilizing validated measures of teamwork such that best practice guidelines can be established.	IIIA
19	Lyons VE, Popejoy LL. Meta-analysis of surgical safety checklist effects on teamwork, communication, morbidity, mortality, and safety. <i>West J Nurs Res.</i> 2014;36(2):245-261.	Systematic Review w/ Meta-Analysis	n/a	n/a	n/a	n/a	Surgical safety checklists improve teamwork and communication, reduce morbidity and mortality and improve compliance with safety measures.	IA
20	Arriaga AF, Bader AM, Wong JM, et al. Simulation-based trial of surgical-crisis checklists. <i>N Engl J Med.</i> 2013;368(3):246-253.	Quasi-experimental	Operating room teams from one academic medical center and two community hospitals, 17 OR teams in 106 simulation scenarios	Use of crisis checklist	No checklist, relied on memory	Failure to adhere to critical processes of care. Participants were also surveyed regarding their perceptions of the usefulness and relevance of the checklists.	Checklist use was associated with significant improvement in the management of operating room crises.	IIA
21	Barrington MJ, Uda Y, Pattullo SJ, Sites BD. Wrong-site regional anesthesia: review and recommendations for prevention? <i>Curr Opin Anaesthesiol.</i> 2015;28(6):670-684.	Literature Review	n/a	n/a	n/a	n/a	Wrong site anesthetic procedures occur and a time out should occur immediately before an invasive procedure. If more than one block is performed on one patient, it is recommended that the time out be repeated each time the patient position is changed or separated in time or performed by a different team. Anesthesia teams should implement guidelines and checklists to reduce the occurrence of wrong site regional anesthetic procedures.	VA
22	Bergs J, Lambrechts F, Simons P, et al. Barriers and facilitators related to the implementation of surgical safety checklists: a systematic review of the qualitative evidence. <i>BMJ Qual Saf.</i> 2015;24(12):776-786.	Systematic Review	n/a	n/a	n/a	n/a	In order to implement a surgical checklist, leaders must facilitate team learning to foster the mutual understanding of perspectives and motivations and the realignment of routines.	IB

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23	Berrisford RG, Wilson IH, Davidge M, Sanders D. Surgical time out checklist with debriefing and multidisciplinary feedback improves venous thromboembolism prophylaxis in thoracic surgery: a prospective audit. <i>Eur J Cardiothorac Surg.</i> 2012;41(6):1326-1329.	Nonexperimental	959 time outs	n/a	n/a	Time outs were audited for performance and errors in VTE prophylaxis, blood products, and imaging.	Use of checklists alongside appropriate human factors training, debriefing, and regular multidisciplinary communication can substantially improve VTE prophylaxis in patients undergoing surgery.	IIIB
24	Bliss LA, Ross-Richardson CB, Sanzari LJ, et al. Thirty-day outcomes support implementation of a surgical safety checklist. <i>J Am Coll Surg.</i> 2012;215(6):766-776.	Quasi-experimental	All OR personnel in a 600 bed tertiary care facility and major teaching hospital	3 session team based training program	Data from ACS NSQIP compared to 2,079 historical control cases, 246 without checklist use and 73 with checklist use	30 day morbidity	Statistically significant reduction in overall adverse event rates from 23.60% for historical controls cases and 15.9% in cases with only team training to 8.2% in cases with checklist use. Checklist use was correlated with a decrease in all measured areas of 30-day morbidity.	IIA
25	Bock M, Fanolla A, Segur-Cabanac I, et al. A comparative effectiveness analysis of the implementation of surgical safety checklists in a tertiary care hospital. <i>JAMA Surg.</i> 2016;151(7):639-646.	Quasi-experimental	10,741 surgical patients (5444 preintervention and 5297 post intervention)	Implementation of surgical safety checklists	Before and after intervention	Risk adjusted rates of 90 and 30 day mortality, readmission rates and length of stay	The implementation of SSCs was associated with a 27% reduction in the adjusted risk for all cause death within 90 days but not within 30 days. The adjusted length of stay was reduced.	IIA
26	Starling J 3rd, Coldiron BM. Outcome of 6 years of protocol use for preventing wrong site office surgery. <i>J Am Acad Dermatol.</i> 2011;65(4):807-810.	Organizational Experience	n/a	n/a	n/a	n/a	Retrospective chart review of dermatology clinic to identify the number of wrong site surgeries. The chart review did not find any incidence of wrong site surgery but did find 18 cases where there was failure to identify the primary lesion.	VB
27	Calland JF, Turrentine FE, Guerlain S, et al. The surgical safety checklist: lessons learned during implementation. <i>Am Surg.</i> 2011;77(9):1131-1137.	RCT	Surgeons in an academic tertiary care center randomized into 2 groups, standard care and team training and preprocedural checklists (10 in each group)	Team training and preprocedural checklist	Standard care	Safety critical behaviors	Cases performed by surgeons in the checklist group were significantly more likely to involve positive safety related team behaviors, such as case presentations, explicit discussions of roles and responsibilities, contingency planning, equipment checks and post case debriefings.	IB
28	Collins SJ, Newhouse R, Porter J, Talsma A. Effectiveness of the surgical safety checklist in correcting errors: a literature review applying Reason's Swiss Cheese Model. <i>AORN J.</i> 2014;100(1):65-79.	Literature Review	n/a	n/a	n/a	n/a	Successful implementation of a surgical checklist requires perioperative stakeholders to understand the nature of errors, recognize the complex dynamic between systems and individuals, and create a just culture that encourages a shared vision of patient safety.	VA
29	Conley DM, Singer SJ, Edmondson L, Berry WR, Gawande AA. Effective surgical safety checklist implementation. <i>J Am Coll Surg.</i> 2011;212(5):873-879.	Organizational Experience	5 hospitals implementation leaders	n/a	n/a	n/a	The impact of surgical safety checklists on patient outcomes is likely to vary with the effectiveness of each hospital's implementation process.	VB

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30	Cullati S, Le Du S, Rae AC, et al. Is the surgical safety checklist successfully conducted? An observational study of social interactions in the operating rooms of a tertiary hospital. <i>BMJ Qual Saf.</i> 2013;22(8):639-646.	Nonexperimental	80 time outs and 81 sign outs across Geneva University Hospitals Sweden	n/a	n/a	That time out and sign out checklists were confirmed by at least one member of the team and validated by at least one other member of the team. A secondary outcome was the number of validated items during the time out and the sign out.	Items were mostly confirmed during the time out but less often during the sign out. 13% of time outs and 3% of sign outs were validated. Training should be provided on the proper completion of the checklists.	IIIB
31	Cullati S, Licker M, Francis P, et al. Implementation of the surgical safety checklist in Switzerland and perceptions of its benefits: cross-sectional survey. <i>PLoS One.</i> 2014;9(7):e101915.	Nonexperimental	152 surgeons and anesthesiologists working in Swiss hospitals and clinics	n/a	n/a	Checklist use and value	The SSC has largely been implemented and is being used. It has been perceived to be a valuable tool in improving intraoperative patient safety and communication with a lesser importance in facilitating teamwork and eliminating hierarchical categories.	IIIB
32	Fargen KM, Velat GJ, Lawson MF, Firment CS, Mocco J, Hoh BL. Enhanced staff communication and reduced near-miss errors with a neurointerventional procedural checklist. <i>J Neurointerv Surg.</i> 2013;5(5):497-500.	Organizational Experience	71 procedures pre intervention and 60 post intervention in one neurointerventional unit in one facility	n/a	n/a	n/a	A new checklist was developed specific to the needs of the unit. Use of the checklist resulted in statistically significant improvements in team communication and a significant reduction in total adverse events.	VB
33	Gordon BM, Lam TS, Bahjri K, Hashmi A, Kuhn MA. Utility of preprocedure checklists in the congenital cardiac catheterization laboratory. <i>Congenit Heart Dis.</i> 2014;9(2):131-137.	Quasi-experimental	371 procedures prechecklist and 370 post checklist	Preprocedure checklist	Before and after intervention	Complication rates, anesthesia and cardiac catheterization lab staff attitude toward safety, team climate and the impact of errors	The checklist was easy to perform, complication rates were equal pre and post but there was a greater proportion of interventional cases and higher median complication level in the post checklist group. Staff reported improved awareness of being briefed with the checklist. Anesthesia differed from the staff in perception of communication as well as team and safety climate.	IIB
34	Graling PR. Designing an applied model of perioperative patient safety. <i>Clin Scholars Rev.</i> 2011;4(2):104-114	Organizational Experience	283 surgical team members in one institution	n/a	n/a	n/a	This applied model for perioperative safety which incorporates cultural assessment, team training and use of checklists to guide critical communication has been designed to create an infrastructure that will allow an institution to sustain excellence in patient safety and quality.	VA
35	Hawranek M, Gasior PM, Buchta P, et al. Periprocedural checklist in the catheterisation laboratory is associated with decreased rate of treatment complications. <i>Kardiol Pol.</i> 2015;73(7):511-519.	Quasi-experimental	1011 patients before checklist and 1053 after	Preprocedure checklist	Before and after intervention	Adverse events	The checklist was associated with a significant reduction of adverse events among patients undergoing invasive procedures. Team communication, organization and quality of treatment was also perceived to have a positive influence.	IIB

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36	Helmiö P, Blomgren K, Takala A, Pauniahio SL, Takala RS, Ikonen TS. Towards better patient safety: WHO Surgical Safety Checklist in otorhinolaryngology. Clin Otolaryngol. 2011;36(3):242-247.	Quasi-experimental	Otolaryngologists, anesthesiologists, circulating nurses, 304 before and 443 operations before and after checklist implementation	Checklist implementation	Before and after intervention	Fit of checklist into the surgical working process and awareness of safety related issues.	The checklist fits well into the surgical working process and improved the sharing of patient related medical information between team members.	IIB
37	Hullfish KL, Miller T, Pastore LM, et al. A checklist for timeout on labor and delivery: a pilot study to improve communication and safety. J Reprod Med. 2014;59(11-12):579-584.	Organizational Experience	70 patients in labor and delivery in one hospital	n/a	n/a	n/a	Implementation of a formalized obstetric time out improved the subjective perception of communication among obstetric staff. This tool has the potential to improve patient safety in labor and delivery.	VA
38	Jones S. Your life in WHO's hands: The World Health Organization Surgical Safety Checklist: a critical review of the literature. J Perioper Pract. 2011;21(8):271-274.	Literature Review	n/a	n/a	n/a	n/a	Supports the use of the WHO SSC.	VA
39	Mainthia R, Lockney T, Zotov A, et al. Novel use of electronic whiteboard in the operating room increases surgical team compliance with pre-incision safety practices. Surgery. 2012;151(5):660-666.	Quasi-experimental	80 cases during each time interval	Pre and post survey	80 case prior to implementation of iECS and then 1mos and 9mos after implementation	Compliance score of the core elements of the time out procedure.	The interactive Electronic Checklist System improved the compliance with preprocedural time outs in the OR, an important and necessary step in improving patient outcomes and reducing preventable complications and deaths.	IIA
40	Nissan J, Campos V, Delgado H, Matadial C, Spector S. The automated operating room: a team approach to patient safety and communication. JAMA Surg. 2014;149(11):1209-1210.	Qualitative	46 surgical team members	An automated workflow system (AWS; OR-Dashboard [LiveData]) was implemented at the Miami VA Healthcare System to provide a common display of perioperative data elements, viewable to every member of the surgical team.	n/a	Completion of surgical checklist	The AWS provides a consistent, reliable, and user-friendly method for completing the surgical safety checklist and for improving operative team engagement in the process.	IIIC
41	Norton EK, Singer SJ, Sparks W, Ozonoff AI, Baxter J, Rangel S. Operating room clinicians' attitudes and perceptions of a pediatric surgical safety checklist at 1 institution. J Patient Saf. 2016;12(1):44-50.	Qualitative	Surgical staff at pediatric facility, 196/396 (49%)	n/a	n/a	Staff perceptions in completing surgical safety checklist and the impact it had on efficiency, teamwork and prevention of medical errors.	Studying surgical staff perceptions about the checklist is an important way to identify opportunities, to address compliance issues, and to improve the content of the checklist. The results suggest that surgical staff members generally feel that the checklist is benefiting safety in the operating room and support its use. Most of the staff members responded that the checklist improved patient safety and prevented errors. One-third of all respondents reported observing a situation in which the checklist actually prevented an error or complication.	IIIA

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42	Nugent E, Hseino H, Ryan K, Traynor O, Neary P, Keane FBV. The surgical safety checklist survey: a national perspective on patient safety. <i>Ir J Med Sci.</i> 2013;182(2):171-176.	Qualitative	61 hospitals in Ireland. 67% response rate	n/a	n/a	Determine (i) whether SSC is being implemented, (ii) whether it promotes a safer surgical environment and (iii) identify problems associated with its introduction and on-going implementation.	The SSC has not been implemented throughout all operating departments in Ireland. Where it has been introduced there has been a perceived positive change in safety culture. However, overall greater education, endorsement, teamwork, and communication will be required to optimize the potential benefits associated with this safety instrument. In order to properly determine the benefit of the SSC following its implementation, a formal audit of morbidity and mortality is required.	IIIA
43	Oak SN, Dave NM, Garasia MB, Parelkar SV. Surgical checklist application and its impact on patient safety in pediatric surgery. <i>J Postgrad Med.</i> 2015;61(2):92-94.	Quasi-experimental	3000 patients	Checklist implementation	Standard care	Assess the acceptance of the SSC in pediatric surgery practice	In 54 patients, children had the same names and identical surgical procedure posted on the same operation list. The patient identification tag was missing in four patients. Mention of the side of procedures was missing in 108 cases. In 78 patients, the consent form was not signed by parents/guardians or the side of the procedure was not quoted. Antibiotic orders were missing in five patients. In 12 cases, immobilization of the patients was suboptimal, which led to displacement of diathermy grounding pad. In 54 patients, the checklist was not used at all. In 76 patients the checklist was found to be incompletely filled.	IIC
44	Papaconstantinou HT, Jo CH, Reznik SI, Smythe WR, Wehbe-Janek H. Implementation of a surgical safety checklist: impact on surgical team perspectives. <i>Ochsner J.</i> 2013;13(3):299-309.	Quasi-experimental	437 care providers (45%) response rare baseline, (64%) responded at follow-up	Checklist implementation	Pre and post intervention	Perspective on use of SSC implementation on surgical patients' safety	Implementation of a surgical safety checklist improves perceptions of surgical safety. Barriers to implementation exist, but staff feedback may be used to enhance the sustainability and success of patient safety initiatives.	IIA
45	Porter AJ, Narimasu JY, Mulroy MF, Koehler RP. Sustainable, effective implementation of a surgical preprocedural checklist: an "attestation" format for all operating team members. <i>Jt Comm J Qual Patient Saf.</i> 2014;40(1):3-9.	Nonexperimental	31	n/a	n/a	Measured participation in PreProcedural pause (PPP)	A preprocedural checklist format in which each member of the operating team provides a personal attestation can improve pause compliance and may contribute to improvements in the culture of teamwork within an OR. Successful online implementation of a PPP, which includes participation by all operating team members, requires little or no additional expense and only minimal formal coaching outside working situations.	IIIC
46	Pucher PH, Johnston MJ, Aggarwal R, Arora S, Darzi A. Effectiveness of interventions to improve patient handover in surgery: a systematic review. <i>Surgery.</i> 2015;158(1):85-95.	Systematic Review	n/a	n/a	n/a	n/a	Nineteen studies included in this literature search. Improvements in information transfer may be achieved through checklist- or performance-based interventions in surgical handover. Although initial data appear promising, future research must be backed by robust study design, relevant outcomes, and clinical implementation strategies to identify the most effective means to improve information transfer and optimize patient outcomes.	IIIA

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47	Raman J, Leveson N, Samost AL, et al. When a checklist is not enough: how to improve them and what else is needed. <i>J Thorac Cardiovasc Surg.</i> 2016;152(2):585-592.	Organizational Experience	380 cardiac patients	n/a	n/a	n/a	30 adverse events were identified. The adverse events were classified as anything that resulted in an operative delay, no availability of equipment, failure of drug administration or unexpected adverse clinical outcome. The time-out and checklist can prevent some types of adverse events but they need to be carefully designed. Customization of checklists for specialized surgical procedures may reduce adverse events.	VA
48	Silva Araújo MP, de Oliveira AC. "Safe surgery saves lives" program contributions in surgical patient care: integrative review. <i>Rev Enferm UFPE.</i> 2015;9(4):7448-7457.	Literature Review	n/a	n/a	n/a	n/a	The benefits associated with the adoption of the program have been well established, even challenges related to its implementation. However, it is necessary that professionals really intend to use it, understanding the importance, necessity of using, adapting it to their reality and, above all incorporating it to daily practice in order to mitigate damage to surgical patients.	VA
49	Takala RS, Pauniahio SL, Kotkansalo A, et al. A pilot study of the implementation of WHO surgical checklist in Finland: improvements in activities and communication. <i>Acta Anaesthesiol Scand.</i> 2011;55(10):1206-1214.	Qualitative	4 hospitals in Finland	WHO checklist	n/a	Pre and post intervention of checklist	The checklist increased OR teams' awareness of patient-related issues, the procedure and expected risks. It also enhanced team communication and prevented communication failures. Support the use of WHO checklist in various surgical fields.	IIIB
50	Wahr JA, Prager RL, Abernathy JH, et al. Patient safety in the cardiac operating room: human factors and teamwork: a scientific statement from the American Heart Association. <i>Circulation.</i> 2013;128(10):1139-1169.	Guideline	n/a	n/a	n/a	n/a	Guideline for cardiac teams with recommendations to improve teamwork from literature review.	IVA
51	Walker IA, Reshamwalla S, Wilson IH. Surgical safety checklists: do they improve outcomes? <i>Br J Anaesth.</i> 2012;109(1):47-54.	Expert Opinion	n/a	n/a	n/a	n/a	The concept of using a checklist in surgical and anesthetic practice was energized by publication of the WHO Surgical Safety Checklist in 2008. It was believed that by routinely checking common safety issues, and by better team communication and dynamics, perioperative morbidity and mortality could be improved. However, introducing surgical checklists is not as straightforward as it seems, and requires leadership, flexibility, and teamwork in a different way to that which is currently practiced. Future work should be aimed at ensuring effective implementation.	VB
52	Zeeni C, Carabini L, Gould RW, et al. The implementation and efficacy of the Northwestern High Risk Spine Protocol. <i>World Neurosurg.</i> 2014;82(6):e815-e823.	Organizational Experience	n/a	n/a	n/a	n/a	Implementation of a high risk spine (HRS) protocol based on two Do-Confirm checklists that focused on communication between the surgical team and oxygen delivery and hemostasis.	VA
53	Safe Surgery Checklist Implementation Guide. Boston MA: Ariadne Labs; 2015. <i>Safe Surgery 2015.</i> http://www.safesurgery2015.org/uploads/1/0/9/0/1090835/safe_surgery_implementation_guide__092515.012216_.pdf . Accessed September 28, 2017.	Expert Opinion	n/a	n/a	n/a	n/a	This is a guide on implementing the surgical checklist, includes training and coaching and many other techniques, also include briefs and debriefs.	VA
54	Berlinger N, Dietz E. Time-out: the professional and organizational ethics of speaking up in the OR. <i>AMA J Ethics.</i> 2016;18(9):925-932.	Expert Opinion	n/a	n/a	n/a	n/a	Emphasizes the importance of checklist creating and not just adoption, getting the team involved in creating a checklist that meets their needs. Speaking up and interprofessional communication is addressed.	VB

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55	Dagey D. Using simulation to implement an OR cardiac arrest crisis checklist. AORN J. 2017;105(1):67-72.	Organizational Experience	11 perioperative team members	n/a	n/a	n/a	Simulation training to implement crisis checklists. Assists teams to work more effectively during critical events in the OR. Simulation training helped staff members to feel more comfortable caring for patients during a cardiac arrest.	VA
56	de Vries EN, Prins HA, Crolla RM, et al. Effect of a comprehensive surgical safety system on patient outcomes. N Engl J Med. 2010;363(20):1928-1937.	Quasi-experimental	3760 patients before checklist implementation and 3820 post checklist implementation	Implementation of the SURPASS Checklist in 6 teaching and academic hospitals	Pre and post checklist implementation	Surgical complications	After implementation of the checklist, the total number of complications decreased from 27.3 per 100 patients to 16.7 per 100 patients corresponding to an absolute reduction of 10.6 complications. In hospital mortality decreased from 1.5% to 0.8%.	IIA
57	Haynes AB, Weiser TG, Berry WR, et al. Changes in safety attitude and relationship to decreased postoperative morbidity and mortality following implementation of a checklist-based surgical safety intervention. BMJ Qual Saf. 2011;20(1):102-107.	Quasi-experimental	8 hospitals, 281 clinicians in the preintervention group and 257 in the post intervention group	A survey modified from the Safety Attitudes Questionnaire was administered pre and post checklist intervention	Pre and post checklist implementation	Safety attitude score, post operative outcomes	Improvements in postoperative outcomes were associated with improve perception of teamwork and safety climate suggesting that changes in these may be partially responsible for the effect of the checklist.	IIA
58	Safe surgery saves lives: surgical safety checklist. In: The ORNAC Standards for Perioperative Registered Nursing Practice. 12th ed. Kingston, Ontario: Operating Room Nurses Association of Canada (ORNAC); 2015:34-35.	Position Statement	n/a	n/a	n/a	n/a	n/a	IVB
59	Russ S, Rout S, Caris J, et al. Measuring variation in use of the WHO Surgical Safety Checklist in the operating room: a multicenter prospective cross-sectional study. J Am Coll Surg. 2015;220(1):1-11.e4.	Nonexperimental	5 hospitals in UK NHS, 565 time-outs, 309 sign outs	n/a	n/a	CUT checklist used to evaluate the completeness of time out and sign out	Found large variation in WHO checklist use in a representative sample of English OR's. Measures to observe the practice quality like CUT will help identify areas for improvement in implementation and enable feedback to the OR team.	IIIA
60	Position statement: surgical safety. In: 2014-2015 ACORN Standards for Perioperative Nursing. Adelaide, South Australia: The Australian College of Operating Room Nurses; 2014:154-156.	Position Statement	n/a	n/a	n/a	n/a	ACORN position statement on patient safety program with recommendations for implementation of the SSC.	IVB
61	Michael R, Della P, Zhou H. The effectiveness of the Surgical Safety Checklist as a means of communication in the operating room. ACORN. 2013;26(2):48-52.	Systematic Review	n/a	n/a	n/a	n/a	An integrative research review that came up with two main themes in studying the Surgical Safety Checklist: administration of checklist (which deals with compliance rate and completion rate) and the outcomes of implementation.	IIIA
62	Pugel AE, Simianu VV, Flum DR, Dellinger EP. Use of the surgical safety checklist to improve communication and reduce complications. J Infect Public Health. 2015;8(3):219-225.	Expert Opinion	n/a	n/a	n/a	n/a	A growing body of literature points out that while the physical act of "checking the box" may not necessarily prevent all adverse events, the checklist is a scaffold on which attitudes toward teamwork and communication can be encouraged and improved. Recent evidence reinforces the fact the compliance with the checklist is critical for the effects on patient safety to be realized.	VB
63	Gillespie BM, Withers TK, Lavin J, Gardiner T, Marshall AP. Factors that drive team participation in surgical safety checks: a prospective study. Patient Saf Surg. 2016;10(1):3.	Nonexperimental	10 surgical teams, 33 interviews with 70 participants from nursing, surgery, anesthesia and the community	n/a	n/a	Factors that drive team participation in safety checks in surgery	Team participation depends on a convergence on intertwined factors, namely team attributes, communication strategies and checking processes.	IIIA

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REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
64	Salzwedel C, Bartz HJ, Kühnelt I, et al. The effect of a checklist on the quality of post-anaesthesia patient handover: a randomized controlled trial. <i>Int J Qual Health Care</i> . 2013;25(2):176-81.	RCT	120 PACU handovers. 40 preintervention, 80 after implementation	Checklist implementation	Handover with and without checklist	Specific items handed over and duration of handover.	The study suggests the use of a checklist for PACU handover might improve the quality of patient handover by increasing the information handed over.	IA
65	Sexton JB, Schwartz SP, Chadwick WA, et al. The associations between work-life balance behaviours, teamwork climate and safety climate: cross-sectional survey introducing the work-life climate scale, psychometric properties, benchmarking data and future directions. <i>BMJ Qual Saf</i> . 2017;26(8):632-640.	Nonexperimental	7,923 healthcare workers across 325 work settings within 16 hospitals	n/a	n/a	Safety attitude questionnaire	The work-life climate scale exhibits strong psychometric properties, elicits results that vary widely by work setting, discriminates between positive and negative workplace norms, and aligns well with other culture constructs that have been found to correlate with clinical outcomes.	IIIA
66	Mohorek M, Webb TP. Establishing a conceptual framework for handoffs using communication theory. <i>J Surg Educ</i> . 2015;72(3):402-409.	Expert Opinion	n/a	n/a	n/a	n/a	A significant consequence of the 2003 Accreditation Council for Graduate Medical Education duty hour restrictions has been the dramatic increase in patient care handoffs. Ineffective hand offs have been identified as the third most common cause of medical error. However, research into health care handoffs lacks a unifying foundational structure. The Shannon-Weaver Linear Model of Communication was identified as the most appropriate conceptual framework for healthcare handoffs.	VB
67	Hull L, Arora S, Kassab E, Kneebone R, Sevdalis N. Observational teamwork assessment for surgery: content validation and tool refinement. <i>J Am Coll Surg</i> . 2011;212(2):234-243.e1-e5.	Nonexperimental	30 OR procedures	n/a	n/a	This was an evaluation of OTAS, exemplar behaviors were measured	The exemplars of OTAS demonstrated very good content validity. Taken together with recent evidence on the construct validity of the tool, these findings demonstrate that OTAS is psychometrically robust for capturing teamwork in the OR.	IIIB
68	Sharma B, Mishra A, Aggarwal R, Grantcharov TP. Non-technical skills assessment in surgery. <i>Surg Oncol</i> . 2011;20(3):169-177.	Systematic Review	n/a	n/a	n/a	n/a	Several non-technical skills evaluation tools have been developed for use in surgery, without adequate comparison and consensus on which should be standard for training. Eleven articles describing the use of three non-technical evaluation tools related to surgery: NOTSS (Non Technical Skills for Surgeons), NOTECHS (Non Technical Skills) and OTAS (Observational Teamwork Assessment for Surgery) were analyzed with respect to scale formulation, validity, reliability and feasibility.	IIIB
69	Mitchell L, Mitchell J. "Pass the buzzy thing, please." Recognising and understanding information: an essential non-technical skill element for the efficient scrub practitioner. <i>J Perioper Pract</i> . 2011;21(6):203-205.	Quasi-experimental	25 interviews with experienced scrub nurses	SPLINTS tool	Compared the scores of reviewers of the scenarios and tested inter-rater reliability	The behaviors that are used by Scrub nurses to deal with difficult situations.	Generic non-technical skills such as communication, teamwork, leadership, situation awareness and decision making have been found to be critical for safety in most 'high risk' occupations. Systems for rating non-technical skills have already been developed for anesthetists (Anesthetists' Non-Technical Skills - ANTS) and surgeons (Non-Technical Skills for Surgeons - NOTSS). In 2007, NHS Education for Scotland funded development of the Scrub Practitioners' List of Intraoperative Non-Technical Skills (SPLINTS) system.	IIC

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70	Spanager L, Beier-Holgerson R, Dieckmann P, Konge L, Rosenberg J, Oestergaard D. Reliable assessment of general surgeons' non-technical skills based on video-recordings of patient simulated scenarios. <i>Am J Surg.</i> 2013;206(5):810-817.	Quasi-experimental	15 general surgeons	Non-Technical Skills for Surgeons dk (NOTSSdk)	Pre and post intervention	Inter rater reliability of observations	The high pretraining interrater reliability indicates that videos were easy to rate and NOTSSdk easy to use. This observation tool could be an important tool in surgical training, potentially improving safety and quality for surgical patients.	IIB
71	Geraghty AM, McIlhenny C. Human factor skills in the surgical environment. <i>Br J Hosp Med (Lond).</i> 2016;77(1):14-16.	Expert Opinion	n/a	n/a	n/a	n/a	Stresses the importance of non technical skills.	VC
72	Dedy NJ, Fecso AB, Szasz P, Bonrath EM, Grantcharov TP. Implementation of an effective strategy for teaching nontechnical skills in the operating room: a single-blinded nonrandomized trial. <i>Ann Surg.</i> 2016;263(5):937-941.	Quasi-experimental	11 senior surgical residents	Training intervention	Before and after intervention	Nontechnical performance using the Non-Technical Skills for Surgeons rating system	Scores on nontechnical skills improved significantly post training. Participants felt the intervention was useful and the majority thought that debriefing and feedback on nontechnical skills should be incorporated in surgical training.	IIA
73	Han SJ, Rolston JD, Lau CY, Berger MS. Improving patient safety in neurologic surgery. <i>Neurosurg Clin North Am.</i> 2015;26(2):143-147.	Expert Opinion	n/a	n/a	n/a	n/a	Clinicians must incorporate systems thinking in which the responsibility of patient safety is placed on all parts of the health care team and infrastructure from hospital administrators and bedside nurses. Effective communication is essential but difficult due to hierarchies, many strategies should be pursued to establish centers of excellence.	VB
74	Hemingway MW, O'Malley C, Silvestri S. Safety culture and care: a program to prevent surgical errors. <i>AORN J.</i> 2015;101(4):404-415.	Expert Opinion	n/a	n/a	n/a	n/a	The role of quality and safety measures in the care of the patient should continue to expand and perioperative nursing should include preventing surgical near misses and adverse events.	VA
75	El Bardissi AW, Sundt TM. Human factors and operating room safety. <i>Surg Clin North Am.</i> 2012;92(1):21-35.	Expert Opinion	n/a	n/a	n/a	n/a	Recognizes human factors in surgical error, article highlights work system failures and interventions that can be developed in operating rooms.	VA
76	Leading a Culture of Safety: A Blueprint for Success. Boston, MA: National Patient Safety Foundation; 2017.	Regulatory	n/a	n/a	n/a	n/a	n/a	n/a
77	Espin S, Lingard L, Baker GR, Regehr G. Persistence of unsafe practice in everyday work: an exploration of organizational and psychological factors constraining safety in the operating room. <i>Qual Saf Health Care.</i> 2006;15(3):165-170.	Nonexperimental	Interviews of 9 surgeons, 9 nurses and 10 anesthesiologists	n/a	n/a	Definition of error, role of scope of practice in nursing reporting preferences, and factors underlying the migration of practice across the safety boundary.	This study looked at organization and psychological factors around safety to help understand why breaches in safety occur but does not give guidance on what to do.	IIIB
78	AORN Position Statement on a Healthy Perioperative Practice Environment. AORN, Inc. https://www.aorn.org/guidelines/clinical-resources/position-statements . Updated 2015. Accessed September 29, 2017.	Position Statement	n/a	n/a	n/a	n/a	A healthy perioperative practice environment can be defined as a practice setting that is safe, healing, humane, and respectful of the rights, responsibilities, needs, and contributions of all members of the perioperative team. Members of a highly functioning perioperative team communicate, collaborate, and respect each other's roles and skill sets. A positive practice environment encourages safe patient care practices, promotes optimal patient outcomes, and fosters a desirable workplace.	IVB
79	Lipira LE, Gallagher TH. Disclosure of adverse events and errors in surgical care: challenges and strategies for improvement. <i>World J Surg.</i> 2014;38(7):1614-1621.	Expert Opinion	n/a	n/a	n/a	n/a	Multiple strategies are included to address the barriers to full disclosure of adverse events and errors in surgical care.	VB

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80	Merry AF, Weller J, Mitchell SJ. Improving the quality and safety of patient care in cardiac anesthesia. <i>J Cardiothorac Vasc Anesth.</i> 2014;28(5):1341-1351.	Expert Opinion	n/a	n/a	n/a	n/a	People in a group working together may have different mental models whereas a fundamental requirement for successful teamwork is that people who are working together have a shared mental model. The use of checklists and briefings promotes a shared mental model.	VA
81	Tsao K, Browne M. Culture of safety: a foundation for patient care. <i>Semin Pediatr Surg.</i> 2015;24(6):283-287.	Expert Opinion	n/a	n/a	n/a	n/a	The ability to achieve high levels of patient safety relies in the struggle to maintain the three pillars of safety culture (trust, report and improve). Leaders need to champion non-intimidating behaviors while encouraging and rewarding the reporting of errors and unsafe conditions.	VA
82	Kolbe M, Burtscher MJ, Wacker J, et al. Speaking up is related to better team performance in simulated anesthesia inductions: an observational study. <i>Anesth Analg.</i> 2012;115(5):1099-1108.	Nonexperimental	31 nurses and 31 residents	n/a	n/a	Speaking up, clarification of procedure, initiating procedural change or evaluating information	This study provides empirical evidence and shows mechanisms for the positive relationship between speaking up behavior and technical team performance.	IIIB
83	Maxfield D, Grenny J, Lavandero R, Groah L. The Silent Treatment: Why Safety Tools and Checklists Aren't Enough to Save Lives. Provo, UT: VitalSmarts; 2011.	Nonexperimental	Story Collector- 2,383 RN and 169 Managers. Traditional survey 4,235 RN and 832 were managers	n/a	n/a	Speaking up in patient adverse event	The Silent Treatment is a survey conducted in conjunction with AORN and AACN to study the ability of health professionals to discuss emotionally and politically risky topics in healthcare. It shows how nurses' failure to speak up when risks are known undermines the effectiveness of current safety tools. Three specific concerns that result in a decision to not speak up: dangerous shortcuts, incompetence and disrespect. Communication breakdown was divided into two categories: honest mistakes and undiscussables. Recommendations to resolve undiscussables are discussed.	IIIA
84	Hu YY, Arriaga AF, Roth EM, et al. Protecting patients from an unsafe system: the etiology and recovery of intraoperative deviations in care. <i>Ann Surg.</i> 2012;256(2):203-210.	Organizational Experience	10 high acuity surgical operations	n/a	n/a	n/a	Unanticipated events are common in the OR. Deviations result from poor organizational/environmental design and suboptimal team dynamics with caregivers compensating to avoid patient harm. Human resilience has major implications for the design of safety interventions.	VA
85	Hickson GB, Pichert JW, Webb LE, Gabbe SG. A complementary approach to promoting professionalism: identifying, measuring, and addressing unprofessional behaviors. <i>Acad Med.</i> 2007;82(11):1040-1048.	Expert Opinion	n/a	n/a	n/a	n/a	Vanderbilt's policy is described here but is not sufficient to address unprofessional behavior. Recommends that every institution create their own policy on professional conduct. They recommend surveillance tools for detecting unprofessional behavior, conducting interventions and intervention skills training.	VA
86	Reiter CE, Pichert JW, Hickson GB. Addressing behavior and performance issues that threaten quality and patient safety: what your attorneys want you to know. <i>Prog Pediatr Cardiol.</i> 2012;33(1):37-45.	Organizational Experience	n/a	n/a	n/a	n/a	The five steps of the WHO checklist is still far from routine for every surgical patient and standardization of the SSC has been a challenge for Up hospitals. The NPSA has captured and analyzed data relating to surgical harm.	VA

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87	Lane-Fall MB, Brooks AK, Wilkins SA, Davis JJ, Riesenber LA. Addressing the mandate for hand-off education: a focused review and recommendations for anesthesia resident curriculum development and evaluation. <i>Anesthesiology</i> . 2014;120(1):218-229.	Expert Opinion	n/a	n/a	n/a	n/a	Provides recommendations for anesthesia resident hand-off curriculum development and evaluation.	VA
88	Prati G, Pietrantonio L. Attitudes to teamwork and safety among Italian surgeons and operating room nurses. <i>Work</i> . 2014;49(4):669-677.	Qualitative	55 surgeons, 28 operating room nurses	n/a	n/a	Operating Room Management Attitudes Questionnaire (ORMAQ)	The results are only partially aligned with previous ORMAQ surveys of surgical teams in other countries. This study shows discrepancies on many aspects in attitudes to teamwork and safety between surgeons and operating room nurses. The findings support implementation and use of team interventions and human factor training. Finally, attitude surveys provide a method for assessing safety culture in surgery, for evaluating the effectiveness of training initiatives, and for collecting data for a hospital's quality assurance programme.	IIIA
89	Vannucci A, Kras JF. Decision making, situation awareness, and communication skills in the operating room. <i>Int Anesthesiol Clin</i> . 2013;51(1):105-127.	Expert Opinion	n/a	n/a	n/a	n/a	n/a	VA
90	Brennan PA, Mitchell DA, Holmes S, Plint S, Parry D. Good people who try their best can have problems: recognition of human factors and how to minimise error. <i>Br J Oral Maxillofac Surg</i> . 2016;54(1):3-7.	Expert Opinion	n/a	n/a	n/a	n/a	How human factors can lead to error and how they can be minimized in day to day practice, moving to high reliability.	VA
91	Kirschbaum KA, Rask JP, Brennan M, Phelan S, Fortner SA. Improved climate, culture, and communication through multidisciplinary training and instruction. <i>Am J Obstet Gynecol</i> . 2012;207(3):200.e1-200.e7.	Organizational Experience	teams of ob/gyn and anesthesia residents N=44	n/a	n/a	n/a	The multidisciplinary team training program resulted in increased teamwork among ob/gyns and anesthesiologists.	VB
92	Singer SJ, Rivard PE, Hayes JE, Shokeen P, Gaba D, Rosen A. Improving patient care through leadership engagement with frontline staff: a Department of Veterans Affairs case study. <i>Jt Comm J Qual Patient Saf</i> . 2013;39(8):349-360.	Organizational Experience	n/a	n/a	n/a	n/a	Leveraging Frontline Expertise (LFLE) is a patient safety intervention for engaging senior managers with the work-systems challenges faced by frontline workers and ensuring follow-up and accountability for systemic change.	VA
93	Bearman M, O'Brien R, Anthony A, et al. Learning surgical communication, leadership and teamwork through simulation. <i>J Surg Educ</i> . 2012;69(2):201-207.	Nonexperimental	12 surgical residents	n/a	n/a	Evaluation of a simulation course	Simulation scenarios contributed to learning of competencies in communication, teamwork, leadership and professionalism.	IIIB
94	The Joint Commission. The essential role of leadership in developing a safety culture. Sentinel Event Alert. 2017;57. https://www.jointcommission.org/assets/1/18/SEA_57_Safety_Culture_Leadership_0317.pdf . Accessed September 29, 2017.	Expert Opinion	n/a	n/a	n/a	n/a	Joint Commission sentinel event alert provides resources for leadership in creating and sustaining a culture of patient safety. List of tools for assessing culture of safety program.	VA
95	Huang LC, Conley D, Lipsitz S, et al. The surgical safety checklist and teamwork coaching tools: a study of inter-rater reliability. <i>BMJ Qual Saf</i> . 2014;23(8):639-650.	Nonexperimental	50 surgical cases independently rated surgical teas using 2 tools	n/a	n/a	Inter rater reliability of two novel observation tools for measuring surgical safety checklist performance and teamwork	Both tools demonstrated substantial IRR and required limited training to use. These instruments may be used to observe checklist performance and teamwork in the operating room. However, further refinement and calibration of observer expectations, particularly in rating teamwork could improve the utility of the tools.	IIIA
96	Henrickson Parker S, Yule S, Flin R, McKinley A. Towards a model of surgeons' leadership in the operating room. <i>BMJ Qual Saf</i> . 2011;20(7):570-579.	Literature Review	n/a	n/a	n/a	n/a	This review looked at surgeon leadership skills. Leadership theories come into two categories, task focus and team focus. Further research is required to determine effective intraoperative leadership behaviors for safe surgical practice.	VA
97	Taylor AM, Chuo J, Figueroa-Altman A, Di Taranto S, Shaw KN. Using four-phased unit-based patient safety walkrounds to uncover correctable system flaws. <i>Jt Comm J Qual Patient Saf</i> . 2013;39(9):396-403.	Organizational Experience	n/a	n/a	n/a	n/a	A facility's experience with patient safety walkarounds (PSWR)	VA

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98	Free from Harm: Accelerating Patient Safety Improvement Fifteen Years After To Err is Human. Boston, MA: National Patient Safety Foundation; 2015. http://c.ymcdn.com/sites/www.npsf.org/resource/resmgr/PDF/Free_from_Harm.pdf . Accessed September 29, 2017.	Expert Opinion	n/a	n/a	n/a	n/a	National Patient Safety Foundation advisory board update on the state of health care in addressing the reduction of errors after the IOM 1999 report to Err is Human.	VA
99	Figueroa MI, Sepanski R, Goldberg SP, Shah S. Improving teamwork, confidence, and collaboration among members of a pediatric cardiovascular intensive care unit multidisciplinary team using simulation-based team training. <i>Pediatr Cardiol</i> . 2013;34(3):612-619.	Organizational Experience	37 team members in pediatric cardiac intensive care unit in one facility	n/a	n/a	n/a	Confidence and skill in the roles of team leader, advanced airway management and cardioversion/defibrillation were increased significantly post training and 3 months later. Simulation training proved to be effective in improving communication and increasing confidence among the team members during a crisis scenario.	VB
100	Gillespie BM, Gwinner K, Chaboyer W, Fairweather N. Team communications in surgery—creating a culture of safety. <i>J Interprof Care</i> . 2013;27(5):387-393.	Nonexperimental	19 interviews, 16 individual and 3 group, observations of 63 nurses, 26 anesthetists, 39 surgeons and 15 ancillary staff, in a tertiary care facility in Australia	n/a	n/a	Team communication in surgery and ways in which it fostered or threatened safety culture.	In creating a safety culture in a healthcare organization, a team's optimal performance relies on the open discussion of teamwork and team expectation and significantly depends on how the organization culture promotes such discussions.	IIIA
101	Rosenstein A. Managing disruptive behaviors in the health care setting: focus on obstetrics services. <i>Am J Obstet Gynecol</i> . 2011;204(3):187-182.	Organizational Experience	Survey on disruptive behaviors, administered in 100 acute care facilities	n/a	n/a	Stress, frustration, loss of concentration, collaboration, communication, clinical outcomes	Disruptive behavior has an adverse impact on staff relationships, communication flow, and patient care.	VB
102	Walrath JM, Dang D, Nyberg D. An organizational assessment of disruptive clinician behavior: findings and implications. <i>J Nurs Care Qual</i> . 2013;28(2):110-121.	Case Report	n/a	n/a	n/a	n/a	Using the Disruptive Clinician Behavior Survey for Hospital Settings, it was found that RNs experienced a significantly higher frequency of disruptive behaviors and triggers than MDs; MDs (45% of 295) and RNs (37% of 689) reported that their peer's disruptive behavior affected them most negatively. The most frequently occurring trigger was pressure from high census, volume, and patient flow; 189 incidences of harm to patients as a result of disruptive behavior were reported.	VA
103	Swiggart WH, Dewey CM, Hickson GB, Finlayson AJ, Spickard WA Jr. A plan for identification, treatment, and remediation of disruptive behaviors in physicians. <i>Front Health Serv Manage</i> . 2009;25(4):3-11	Organizational Experience	n/a	n/a	n/a	n/a	Physicians exhibiting a pattern of disruptive conduct can increase workplace stress; contribute to poor workplace environments; contribute to dysfunctional teams; reduce quality of care for patients and families; and increase risk of litigation for hospitals and institutions. Internal and external factors play a role in a physician's behavior and ability to cope with workplace stresses. The vast majority of healthcare team members conduct themselves professionally and without complaint.	VA

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104	Hu YY, Arriaga AF, Peyre SE, Corso KA, Roth EM, Greenberg CC. Deconstructing intraoperative communication failures. J Surg Res. 2012;177(1):37-42.	Organizational Experience	6 complex operations	n/a	n/a	n/a	During complex operations, communication failures occur frequently and lead to inefficiency. Prevention may be achieved by improving communication. The rate of failure during discussions about/mandated by policy highlights the need for carefully designed standardized interventions. System-level support for asynchronous perioperative communication may streamline operating room coordination and preparation efforts.	VB
105	Nembhard IM, Labao I, Savage S. Breaking the silence: determinants of voice for quality improvement in hospitals. Health Care Manage Rev. 2015;40(3):225-236.	Qualitative	99 interviews with staff at 12 hospitals	n/a	n/a	Factors that influence health professionals' voice.	Factors such as tenure, work configuration, culture, benchmarking and external environment influenced health professionals' voice. These factors shaped their sense of safety, efficacy, opportunity or legitimacy all of which affected their belief about the risk and benefit of voice and willingness to voice. They voice for three purposes: to learn for themselves, inform others, and protect patients. Leaders can influence or elicit voice by attending to these multiple factors.	IIIA
106	Reid J, Bromiley M. Clinical human factors: the need to speak up to improve patient safety. Nurs Stand. 2012;26(35):35-40.	Case Report	n/a	n/a	n/a	n/a	This article examines the role of human factors in health care by focusing on a case of poor management of an emergency situation in an operating department, involving Martin Bromiley's late wife, Elaine Bromiley. It explores the conclusions of the subsequent independent inquiry and considers the need for education and training in non-technical skills to remove barriers in communication and enhance teamwork to improve patient safety. The need for everyone in the healthcare team to be able to speak up if they have concerns about patient care is emphasized.	VA
107	Raemer DB, Kolbe M, Minehart RD, Rudolph JW, Pian-Smith MC. Improving anesthesiologists' ability to speak up in the operating room: a randomized controlled experiment of a simulation-based intervention and a qualitative analysis of hurdles and enablers. Acad Med. 2016;91(4):530-539.	RCT	71 workshops	Workshop on speaking up	The control group did not have workshop prior to the simulation scenario	Would the simulation based education improve speaking up behavior? Would it be different if it was speaking up to a nurse, surgeon or colleague? What were the hurdles to speaking up?	An educational intervention alone was ineffective in improving the speaking up behaviors of practicing nontrainee anesthesiologists. Other measures to change speaking-up behaviors could be implemented and might improve patient safety.	IA
108	Meginniss A, Damian F, Falvo F. Time out for patient safety. J Emerg Nurs. 2012;38(1):51-53.	Case Report	n/a	n/a	n/a	n/a	Facility experience with use of a specific language to stop the line when a patient safety concern is recognized. The team utilizes the phrase "time out for patient safety" and clearly describes the concern. The team then can stop what they are doing to correct the clinical situation.	VB

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109	Sexton JB, Thomas EJ, Helmreich RL. Error, stress, and teamwork in medicine and aviation: cross sectional surveys. <i>BMJ</i> . 2000;320(7237):745-749.	Nonexperimental	1033 doctors, nurses, fellows, and residents working in operating theatres and intensive care units and over 30 000 cockpit crew members (captains, first officers, and second officers).	n/a	n/a	Perceptions of error, stress, and teamwork	Medical staff reported that error is important but difficult to discuss and not handled well in their hospital. Barriers to discussing error are more important since medical staff seem to deny the effect of stress and fatigue on performance.	IIIA
110	Stein JE, Heiss K. The Swiss Cheese Model of adverse event occurrence—closing the holes. <i>Semin Pediatr Surg</i> . 2015;24(6):278-282.	Expert Opinion	n/a	n/a	n/a	n/a	Just culture is an environment where workers feel safe enough and accountable enough to engage in the prevention of errors. High reliability organizations move to close the holes in the Swiss cheese by using 5 key factors.	VA
111	Reason J. <i>Human Error</i> . New York, NY: Cambridge University Press; 1990:302.	Expert Opinion	n/a	n/a	n/a	n/a	n/a	VA
112	Herzer KR, Mirrer M, Xie Y, et al. Patient safety reporting systems: sustained quality improvement using a multidisciplinary team and “good catch” awards. <i>Jt Comm J Qual Patient Saf</i> . 2012;38(8):399-347.	Organizational Experience	One surgical suite in one hospital	n/a	n/a	n/a	A multidisciplinary team’s analysis and mitigation of hazards identified in a patient safety reporting process entailed positive recognition with a Good Catch award, education of practitioners, and long-term follow-up.	VA
113	Pape TM. The role of distractions and interruptions in operating room safety. <i>Perioper Nurs Clin</i> . 2011;6(2):101-111.	Expert Opinion	n/a	n/a	n/a	n/a	Safety within the operating room begins with strong leadership and management principles. Employees will follow the attitude and policies emulated by those in administrative roles. Innovative strategies to reduce interruptions and prevent errors in the operative environment can prevent errors. These include posting of signs and checklist protocols to reduce distractions and interruptions within the operating room department. Redesigning operating room work processes assists people avoid errors and their consequences.	VA
114	Kleiner C, Link T, Maynard MT, Halverson Carpenter K. Coaching to improve the quality of communication during briefings and debriefings. <i>AORN J</i> . 2014;100(4):358-368.	Organizational Experience	320 observations (160 before and 160 after a coaching intervention) in the surgical department of one academic med center	n/a	n/a	n/a	The quality of both briefings and debriefings significantly improved after the coaching intervention. Coaching should be considered as an intervention to improve communication during surgical procedures, especially during briefings and debriefings.	VA
115	McCulloch P, Mishra A, Handa A, Dale T, Hirst G, Catchpole K. The effects of aviation-style non-technical skills training on technical performance and outcome in the operating theatre. <i>Qual Saf Health Care</i> . 2009;18(2):109-115.	Organizational Experience	n/a	n/a	n/a	n/a	Non-technical skills training improved technical performance in theatre, but the effects varied between teams. Considerable cultural resistance to adoption was encountered, particularly among medical staff. Debriefing and challenging authority seemed more difficult to introduce than other parts of the training. Further studies are needed to define the optimal training package, explain variable responses and confirm clinical benefit.	VB
116	Boyd M, Cumin D, Lombard B, Torrie J, Civil N, Weller J. Read-back improves information transfer in simulated clinical crises. <i>BMJ Qual Saf</i> . 2014;23(12):989-993.	Nonexperimental	83 simulation scenarios with post anesthesia nurses and anesthetic assistants	n/a	n/a	Effect of read back on the transfer of information	Training healthcare teams to use the read-back techniques could increase information transfer between team members with the potential to improve patient safety.	IIIB

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117	Patel B, Johnston M, Cookson N, King D, Arora S, Darzi A. Interprofessional communication of clinicians using a mobile phone app: a randomized crossover trial using simulated patients. <i>J Med Internet Res.</i> 2016;18(4):e79.	RCT	22	Hand off using phone based app	Hand off using pager	The quality of information transfer, time taken to respond to messages, and users' satisfaction with each device.	Use of a phone based app for hand off improved the quality of transfer of information about simulated patients and was rated by users as more effective and efficient, and less distracting than pagers. Using this device did not result in delay in patient care.	IB
118	Saxton R. Communication skills training to address disruptive physician behavior. <i>AORN J.</i> 2012;95(5):602-611.	Quasi-experimental	17 perioperative nurses	Crucial conversation course	Pre and post intervention	Self-efficacy score	Participants reported the ability to address disruptive physician behavior 71% of the time after course.	IIA
119	Simmons A. "Territorial games" aim to help curb disruptive behavior in the OR. <i>OR Manager.</i> 2014;30(1):24-26.	Expert Opinion	n/a	n/a	n/a	n/a	In power struggles, root cause analysis stops being a useful tool and becomes a destructive spiral of fixing the blame instead of fixing the problem. Lists 10 Territorial games that people use to protect territory.	VC
120	Implementation Manual WHO Surgical Safety Checklist 2009: Safe Surgery Saves Lives. Geneva, Switzerland: World Health Organization; 2009. http://apps.who.int/iris/bitstream/10665/44186/1/9789241598590_eng.pdf . Accessed September 29, 2017.	Guideline	n/a	n/a	n/a	n/a	Guideline for using WHO safe surgical checklist	IVA
121	Plonien C, Williams M. Stepping up teamwork via TeamSTEPS. <i>AORN J.</i> 2015;101(4):465-470.	Organizational Experience	n/a	n/a	n/a	n/a	Evidence shows that implementation of TeamSTEPS in surgical settings has resulted in achieving organizational success factors, thus reducing error and patient harm.	VB
122	Sentinel events (SE). In: <i>Comprehensive Accreditation Manual. E-dition.</i> Oakbrook Terrace, IL: The Joint Commission; 2017:SE-1–SE-20.	Regulatory	n/a	n/a	n/a	n/a	n/a	n/a
123	Klipfel JM, Carolan BJ, Brytowski N, Mitchell CA, Gettman MT, Jacobson TM. Patient safety improvement through in situ simulation interdisciplinary team training. <i>Urol Nurs.</i> 2014;34(1):39-46.	Organizational Experience	n/a	n/a	n/a	n/a	Simulation training was effective in building interdisciplinary teamwork and nursing staff confidence in managing surgical emergencies.	VA
124	Al-Hakim LG, Xiao Y. On the day of surgery: how long does preventable disruption prolong the patient journey? <i>Int J Health Care Qual Assur.</i> 2012;25(4):322-342	Nonexperimental	31 events that disturb OR time were recorded over 5 months	n/a	n/a	Disruption events	Preventable disruption caused an increase in surgical time of approximately 25% of cases, including poor information flow, lack of communication and lack of coordination.	IIIB
125	Steeple LR, Hingorani M, Flanagan D, Kelly SP. Wrong intraocular lens events—what lessons have we learned? A review of incidents reported to the national reporting and learning system: 2010-2014 versus 2003-2010. <i>Eye.</i> 2016;30(8):1049-1055.	Nonexperimental	178 wrong site IOL	n/a	n/a	Contributory factors	The selection and implantation of the correct IOL is a complex process which is not adequately addressed by existing checklists procedures. Human factors are implicated in these errors and need to be addressed by novel approaches.	IIIA
126	Campbell G, Arfanis K, Smith AF. Distraction and interruption in anaesthetic practice. <i>Br J Anaesth.</i> 2012;109(5):707-715.	Nonexperimental	30 anesthetists in a variety of surgical settings	n/a	n/a	Distracting events	Distractions were common, with 424 distracting events during induction, transfer, maintenance and emergence. 22% had a negative effect and 3.3% had a positive effect.	IIIA
127	Stewart DE, Tlusty SM, Taylor KH, et al. Trends and patterns in reporting of patient safety situations in transplantation. <i>Am J Transplant.</i> 2015;15(12):3123-3133.	Nonexperimental	n/a	n/a	n/a	Safety events in transplant related to human caused errors, process failures, errors of commission and errors of omission.	Studying the errors reported in Organ procurement and transplantation network is aimed at better understanding the nature of safety situations with the hope of designing systems and interventions to prevent future errors.	IIIA

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128	Wheelock A, Suliman A, Wharton R, et al. The impact of operating room distractions on stress, workload, and teamwork. <i>Ann Surg.</i> 2015;261(6):1079-1084.	Nonexperimental	90 general surgery cases	n/a	n/a	Differences in teamwork, workload and stress level among team members	Although some distractions may be inevitable in the OR, they can also be detrimental to the team. A deeper understanding of the effect of distractions on teams and their outcomes can lead to targeted quality improvement.	IIIA
129	Keller S, Tschan F, Beldi G, Kurmann A, Candinas D, Semmer NK. Noise peaks influence communication in the operating room. an observational study. <i>Ergonomics.</i> 2016;59(12):1541-1552.	Nonexperimental	119 surgical procedures in one university hospital	n/a	n/a	Noise peak, communication, case-relevant communication, loud noises	Results showed that high noise peaks reduced the frequency of patient-related communication but did not reduce patient irrelevant communication. Noise may negatively affect team coordination in surgeries.	IIIB
130	Way TJ, Long A, Weijing J, et al. Effect of noise on auditory processing in the operating room. <i>J Am Coll Surg.</i> 2013;216(5):933-938.	Quasi-experimental	15 surgeons	Speech in Noise test	Auditory performance in all four scenarios	Quiet, filtered noise, background noise with and without music	Operating room noise can cause a decrease in auditory processing function, particularly in the presence of music. This becomes even more difficult when the communication involves conversations that carry critical information that is unpredictable. To avoid possible miscommunication in the OR, attempts should be made to reduce ambient noise levels.	IIA
131	Jothiraj H, Howland-Harris J, Evley R, Moppett IK. Distractions and the anaesthetist: a qualitative study of context and direction of distraction. <i>Br J Anaesth.</i> 2013;111(3):477-482.	Nonexperimental	Observational study of 32 surgical operations in one facility	n/a	n/a	Observed effect of distractions	Distraction events involving the anesthetist were seen, 2/3 had no externally visible effect. Another anesthetist was the most common distracting event. Anesthetists need to address themselves as causes of distractions and the potential impact on patient safety.	IIIB
132	Weigl M, Antoniadis S, Chiapponi C, Bruns C, Sevdalis N. The impact of intraoperative interruptions on surgeons' perceived workload: an observational study in elective general and orthopedic surgery. <i>Surg Endosc.</i> 2015;29(1):145-153.	Nonexperimental	56 elective cases	n/a	n/a	Intraoperative interruptions and self-rated workload.	Whereas case-irrelevant communications may be beneficial for mental fatigue and stress in routine cases, procedural interruptions and case-irrelevant communication may contribute to surgeons' mental focus deteriorating. Well designed OR environments, surgical leadership, and awareness can help to control unnecessary interruptions for effective and safe surgical care.	IIIB
133	Chen JG, Wright MC, Smith PB, Jagers J, Mistry KP. Adaptation of a postoperative handoff communication process for children with heart disease: a quantitative study. <i>Am J Med Qual.</i> 2011;26(5):380-386.	Organizational Experience	Members of healthcare teams of cardiothoracic surgery, cardiac anesthesia and intensive care staff, nursing, resp. therapy in on facility's PICU	n/a	n/a	n/a	Three years after implementing a handover process, demonstrated high and consistent reliability in attendance, variable reliability in required content reporting and numerous nonessential distractions.	VB
134	AORN Position Statement on Managing Distractions and Noise During Perioperative Patient Care. https://www.aorn.org/guidelines/clinical-resources/position-statements . Updated 2014. Accessed September 29, 2017.	Position Statement	n/a	n/a	n/a	n/a	Strategies to eliminate or minimize noise and distractions.	IVB
135	Wright MI. Implementing no interruption zones in the perioperative environment. <i>AORN J.</i> 2016;104(6):536-540.	Organizational Experience	n/a	n/a	n/a	n/a	The implementation of No Interruption Zones (NIZ) during critical times in a surgical procedure decreased unnecessary noise and distractions. The simplicity of NIZ makes them applicable to every clinical arena. Introducing NIZs is an effective strategy to improve processes and reduce the risk of errors.	VA

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136	Saleem AM, Paulus JK, Vassiliou MC, Parsons SK. Initial assessment of patient handoff in accredited general surgery residency programs in the United States and Canada: a cross-sectional survey. <i>Can J Surg.</i> 2015;58(4):269-277.	Nonexperimental	244 American residents, 17 Canadian	n/a	n/a	Training, adequacy of hand off, existing handoffs support to patient care and harm from inadequate handoff.	The survey results indicate that the current patient handoff system contributes to patient harm. More efforts are needed to establish standardized forms of verbal and written handoff to ensure patient safety and continuity of care.	IIIA
137	Nagpal K, Abboudi M, Manchanda C, et al. Improving postoperative handover: a prospective observational study. <i>Am J Surg.</i> 2013;206(4):494-501.	Quasi-experimental	90 handovers observed, 50 before and 40 after	Training on new handover protocol	Observations were recorded by observer using an assessment tool	Information omission, tasks errors, teamwork, nurse satisfaction and duration	Standardization of postoperative handover improved communication and teamwork and reduced information omissions and task errors.	IIA
138	Nagpal K, Arora S, Vats A, et al. Failures in communication and information transfer across the surgical care pathway: interview study. <i>BMJ Qual Saf.</i> 2012;21(10):843-849.	Nonexperimental	18 healthcare professional interviews	n/a	n/a	Preoperative assessment and optimization, preprocedure teamwork, postoperative handover, and daily ward care phases for ITC failures.	This study suggests that 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
139	Manser T, Foster S. Effective handover communication: an overview of research and improvement efforts. <i>Best Pract Res Clin Anaesthesiol.</i> 2011;25(2):181-191.	Literature Review	n/a	n/a	n/a	n/a	Despite the growing evidence at the descriptive level, future research will have to take a more systematic approach to establish valid measures of handover quality and safety, establish the causal effects of handover characteristics on safe care and identify best practices in safe handover and effective interventions within and across health-care settings.	VA
140	Grover A, Duggan E. Chinese whispers in the post anaesthesia care unit (PACU). <i>Ir Med J.</i> 2013;106(8):241-243	Organizational Experience	100 handovers before and 100 after an educational session	n/a	n/a	n/a	Introducing a formal structure to handovers, simulation based training and daily use of SBAR based handovers helps to ensure adequate transfer of information and continuity of care.	VB
141	Evanina EY, Monceaux NL. Anesthesia handoff: a root cause analysis based on a near-miss scenario. <i>Clin Scholars Rev.</i> 2012;5(2):132-136.	Case Report	n/a	n/a	n/a	n/a	A near miss case was reviewed and a root cause analysis conducted that determined that communication was the issue and how a standardized anesthesia handoff tool can facilitate patient safety.	VB
142	Chard R, Makary MA. Transfer-of-care communication: nursing best practices. <i>AORN J.</i> 2015;102(4):329-342.	Expert Opinion	n/a	n/a	n/a	n/a	Review article of best practices in transfer of care communication to enable perioperative RNs to take an active, leading role in the hand over process.	VA

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143	Petrovic MA, Aboumatar H, Scholl AT, et al. The perioperative handoff protocol: evaluating impacts on handoff defects and provider satisfaction in adult perianesthesia care units. <i>J Clin Anesth.</i> 2015;27(2):111-119.	Quasi-experimental	103 hand offs	Hand off tool	53 preintervention, 50 postintervention	Type of information shared, type and duration of procedure, total duration of handoff, number and type of providers at the bedside, number of report interruptions, environmental distractions, and any other disruptive events.	The perioperative handoff protocol implementation was associated with improved information sharing and reduced handoff defects.	IIA
144	Agarwal HS, Saville BR, Slayton JM, et al. Standardized postoperative handover process improves outcomes in the intensive care unit: a model for operational sustainability and improved team performance. <i>Crit Care Med.</i> 2012;40(7):2109-2115.	Organizational Experience	185 members of a pediatric coronary intensive care unit of one academic medical center	n/a	n/a	n/a	Using a standardized handover tool is associated with a decrease in the loss of patient information, an improvement in the quality of communication during post op transfer, a decrease in post op complications and an improvement in 24 hour patient outcomes.	VA
145	Breuer RK, Taicher B, Turner DA, Cheifetz IM, Rehder KJ. Standardizing postoperative PICU handovers improves handover metrics and patient outcomes. <i>Pediatr Crit Care Med.</i> 2015;16(3):256-263.	Quasi-experimental	Multidisciplinary PICU in a university hospital	Standardized hand over protocol	Before and after intervention	Communication, metrics and patient outcomes	Postoperative communication and patient outcomes can be improved and sustained over time with implementation of a standardized handover protocol.	IIA
146	Siddiqui N, Arzola C, Iqbal M, et al. Deficits in information transfer between anaesthesiologist and postanesthesia care unit staff: an analysis of patient handover. <i>Eur J Anaesthesiol.</i> 2012;29(9):438-445.	Qualitative	526 transfers	n/a	n/a	Handover data omissions, and which data items the clinicians thought were a necessary part of the transfer process and whether this information was communicated at the time of handover.	This study demonstrates that the handover process is inconsistent and in some cases information defined as important by the physicians and the nurses is not transferred. Further studies need to investigate whether a handover protocol leads to a minimization of omissions in information transfer.	IIIB
147	Craig R, Moxey L, Young D, Spenceley NS, Davidson MG. Strengthening handover communication in pediatric cardiac intensive care. <i>Paediatr Anaesth.</i> 2012;22(4):393-399.	Quasi-experimental	21 pre intervention and 22 post intervention handovers	Implementation of a structured hand over process	Pre and post intervention	Prepatient readiness, prehandover readiness, and information conveyed.	All three phases of the handover were significantly improved with the handover intervention. The perception of staff were also improved, there was no significant increase in the duration of the handover.	IIA
148	Joy BF, Elliott E, Hardy C, Sullivan C, Backer CL, Kane JM. Standardized multidisciplinary protocol improves handover of cardiac surgery patients to the intensive care unit. <i>Pediatr Crit Care Med.</i> 2011;12(3):304-308.	Quasi-experimental	79 patient hand overs in patients going from the OR to the pediatric ICU	Handover process and protocol	Before and after intervention	Technical errors, critical verbal handoff information omissions, duration, caregiver perception of improvement	A formal, structured handover process for pediatric patients transitioning to the ICU after cardiac surgery can reduce medical errors that occur during the admission process and improve teamwork among caregivers.	IIIB

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149	Raiten JM, Lane-Fall M, Gutsche JT, et al. Transition of care in the cardiothoracic intensive care unit: a review of handoffs in perioperative cardiothoracic and vascular practice. <i>J Cardiothorac Vasc Anesth.</i> 2015;29(4):1089-1095.	Literature Review	n/a	n/a	n/a	n/a	Multiple studies have shown the importance of effective and accurate handoffs to ensure quality and continuity of care. The literature review looks at verbal principles and practices, standardization and financial considerations. The author discusses the needs for future research.	VB
150	Johner AM, Merchant S, Aslani N, et al. Acute general surgery in Canada: a survey of current handover practices. <i>Can J Surg.</i> 2013;56(3):E24-E28.	Qualitative	ACS residents in 6 Canadian general surgery programs (39)	n/a	n/a	Current handover practices	Resident handovers occur frequently but not under ideal circumstances. Most residents spent less than 5 min preparing handovers. Overall quality was perceived as poor. Handover skills must be standardized and taught in a systematic fashion.	IIIB
151	Møller TP, Madsen MD, Fuhrmann L, Østergaard D. Postoperative handover: characteristics and considerations on improvement: a systematic review. <i>Eur J Anaesthesiol.</i> 2013;30(5):229-242.	Systematic Review w/ Meta-Analysis	n/a	n/a	n/a	n/a	Postoperative handovers are described as a complex work process challenged by interruptions, time pressure and a lack of supporting framework. Interventional studies introduced standardized handover tools in combination with environmental changes, resulting in better flow of information, better teamwork, and less technical errors.	IIIA
152	Segall N, Bonifacio AS, Schroeder RA, et al; Durham VA Patient Safety Center of Inquiry. Can we make postoperative patient handovers safer? A systematic review of the literature. <i>Anesth Analg.</i> 2012;115(1):102-115.	Systematic Review	n/a	n/a	n/a	n/a	All relevant team members should be present during the handover, and each should have an opportunity to speak or ask questions. Surgical patient transfers are characterized by poor teamwork and communication, patients arriving in a compromised state, unclear procedures, technical errors, unstructured processes, interruptions and distractions, lack of central information repositories, and nurse inattention because of multitasking.	IIIA
153	McElroy LM, Daud A, Lapin B, et al. Detection of medical errors in kidney transplantation: a pilot study comparing proactive clinician debriefings to a hospital-wide incident reporting system. <i>Surgery.</i> 2014;156(5):1106-1115.	Nonexperimental	270 briefings reported 334 patient safety issues and 57 incident reports reported 92 patient safety issues.	n/a	n/a	Number of incident reports	The use of a proactive, web-based debriefing to augment an incident reporting system in assessing safety risks in kidney transplantation demonstrated increased information, provided more perspectives of a single safety issue, and increased breadth of participants.	IIIA
154	McElroy LM, Macapagal KR, Collins KM et al. Clinician perceptions of operating room to intensive care unit handoffs and implications for patient safety: a qualitative study. <i>Am J Surg.</i> 2015;210(4):629-635.	Qualitative	38 interviews	n/a	n/a	Studied the relationship between handoff process failures and patient harm. Qualitative analysis was used to identify key themes.	Ambiguous roles and conflicting expectations of team members during the OR to ICU handoff can increase risk of patient harm.	IIIB
155	Agarwala AV, Firth PG, Albrecht MA, Warren L, Musch G. An electronic checklist improves transfer and retention of critical information at intraoperative handoff of care. <i>Anesth Analg.</i> 2015;120(1):96-104.	Organizational Experience	69 handoffs between anesthesia providers were observed (39 with a checklist and 30 without a checklist)	n/a	n/a	n/a	An electronic checklist improved relay and retention of critical patient information (administration of vasopressors and antiemetics, estimated blood loss and urine output) communication about potential areas of concern, postop planning and introduction of the relieving anesthesiologist to the OR team.	VA
156	Schuster KM, Jenq GY, Thung SF, et al. Electronic handoff instruments: a truly multidisciplinary tool? <i>J Am Med Inform Assoc.</i> 2014;21(e2):e352-e357.	Organizational Experience	n/a	n/a	n/a	n/a	An electronic handoff tool was used for physician handoff. Non-physicians used the tool as well.	VB
157	Eberhardt S. Improve handoff communication with SBAR. <i>Nursing.</i> 2014;44(11):17-20.	Expert Opinion	n/a	n/a	n/a	n/a	Supports the use of the SBAR tool.	VC

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158	Johnson F, Logsdon P, Fournier K, Fisher S. SWITCH for safety: perioperative hand-off tools. <i>AORN J.</i> 2013;98(5):494-507.	Organizational Experience	One facility implemented standardized hand off for intraoperative environment	n/a	n/a	n/a	The standardized hand over method enabled health care providers to address communication barriers and to maintain their focus on the patient during critical moments (shift changes) thereby improving patient safety.	VA
159	Morris AM, Hoke N. Communication is key in the continuum of care. <i>OR Nurse.</i> 2015;9(5):14-19	Organizational Experience	n/a	n/a	n/a	n/a	Electronic medical records (EMRs) allow patient information to be assimilated and interfaced through the entire continuum of care, allowing HCPs to continuously assess patient-care needs when creating an individualized plan of care. An excellent opportunity exists to design information technology systems that support handoffs and transitions in care, including EMRs, continuity of care records, and various integrated summary-of-care documents.	VC
160	Randmaa M, Mårtensson G, Swenne CL, Engström M. SBAR improves communication and safety climate and decreases incident reports due to communication errors in an anaesthetic clinic: a prospective intervention study. <i>BMJ Open.</i> 2014;4(1):e004268.	Quasi-experimental	168 observations	Implementation of SBAR handoff tool	Comparison group, no structured communication system was used	Staff members perceptions of communication between different professions, safety attitudes, psychological empowerment, and change in the proportion of incident reports caused by communication errors.	The SBAR tool improved staff perception of communication between professionals and their perception of the safety climate as well as with a decreased proportion of incident reports related to communication errors.	IIA
161	Ryan S, O'Riordan JM, Tierney S, Conlon KC, Ridgway PF. Impact of a new electronic handover system in surgery. <i>Int J Surg.</i> 2011;9(3):217-220.	Qualitative	88, 47 paper, 41 electronic	Electronic sign-out system	n/a	Length of stay	Prospectively audit for the introduction of new electronic handover tool. The introduction of electronic sign-out post-call was associated with a significant reduction in patient length of stay and provided better continuity of care than the previously used paper-based handover.	IIIB
162	Weiss MJ, Bhanji F, Fontela PS, Razack SI. A preliminary study of the impact of a handover cognitive aid on clinical reasoning and information transfer. <i>Med Educ.</i> 2013;47(8):832-41.	Organizational Experience	n/a	n/a	n/a	n/a	Using a novel scoring system, the handover cognitive aid was shown to improve information transfer and resident expression of clinical reasoning without prolonging the handover.	VA
163	Pukenas EW, Dodson G, Deal ER, Gratz I, Allen E, Burden AR. Simulation-based education with deliberate practice may improve intraoperative handoff skills: a pilot study. <i>J Clin Anesth.</i> 2014;26(7):530-538.	Qualitative	10 residents	n/a	n/a	Communication failure rate	Simulation-based education using deliberate practice may result in improved intraoperative handoff communication and retention of skills at one year.	IIIA
164	Petrovic MA, Martinez EA, Aboumatar H. Implementing a perioperative handoff tool to improve postprocedural patient transfers. <i>Jt Comm J Qual Patient Saf.</i> 2012;38(3):135-142.	Expert Opinion	n/a	n/a	n/a	n/a	The success of the Perioperative Handoff Tool in the various settings is attributed to the comprehensive development phase. Although the plan was to pilot test in the CSICU, all types of providers from all perioperative settings were included in the focus groups and surveys that identified key defects in the routine (standard) approach and suggested elements for the new tool.	VA

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165	Department of Defense Patient Safety Program. Healthcare Communications Toolkit to Improve Transitions in Care. Falls Church, VA: TRICARE Management Activity; 2005. https://www.oumedicine.com/docs/ad-obgyn-workfiles/handofftoolkit.pdf?sfvrsn=2 . Accessed September 29, 2017.	Guideline	n/a	n/a	n/a	n/a	n/a	IVA
166	Zahiri HR, Stromberg J, Skupsky H, et al. Prevention of 3 "never events" in the operating room: fires, gossypiboma, and wrong-site surgery. <i>Surg Innov.</i> 2011;18(1):55-60.	Literature Review	n/a	n/a	n/a	n/a	Recommendations to prevent never events - fire, gossypiboma, and wrong-site surgery.	VA
167	Wu RL, Aufses A Jr. Characteristics and costs of surgical scheduling errors. <i>Am J Surg.</i> 2012;204(4):468-473.	Nonexperimental	151/17,606 (0.86%) booking errors	n/a	n/a	Errors in scheduling surgical cases	Although infrequent, scheduling errors disrupt operating room team dynamics, causing delays and bearing substantial costs. Further research is necessary to develop tools for more accurate scheduling.	IIIA
168	McElroy LM, Collins KM, Koller FL, et al. Operating room to intensive care unit handoffs and the risks of patient harm. <i>Surgery.</i> 2015;158(3):588-594.	Quasi-experimental	16 individual and small group session with transplant surgeons, anesthesiologists, OR and ICU nurses.	Failure mode effects and criticality analysis (HMECA)	Risk Priority number was assigned to each step of the handover process after review of the process.	Used Failure modes effect and criticality analysis (FMECA) of the OR to ICU handoff looking for frequency of occurrence, causes, potential effects and safeguards of errors.	Based on the analysis, recommendations were made to reduce potential for patient harm during OR to ICU handoffs. The FMECA revealed steps in the OR to ICU handoff that are high risk for patient harm and are currently being targeted for process improvement.	IIB
169	Fabila TS, Hee HI, Sultana R, Assam PN, Kiew A, Chan YH. Improving postoperative handover from anaesthetists to non-anaesthetists in a children's intensive care unit: the receiver's perception. <i>Singapore Med J.</i> 2016;57(5):242-253.	Organizational Experience	Cardiac ICU at a women's and children's hospital in Singapore, 52 CICU personnel	n/a	n/a	n/a	The current handover process was evaluated, a new handover process was created and implemented and an evaluation of the new handover process was done. Staff members indicated that the new handover tool provided more useful information and improved information sufficiency, clarity, reduction of omission error and fewer inconsistencies in patient descriptions.	VA
170	Lingard L, Regehr G, Cartmill C, et al. Evaluation of a preoperative team briefing: a new communication routine results in improved clinical practice. <i>BMJ Qual Saf.</i> 2011;20(6):475-482.	Quasi-experimental	340 pre intervention and 340 post intervention perioperative team briefings across 3 institutions in Canada	Checklist-guided preoperative team briefing	Pre and post intervention	Prophylactic antibiotic administration timing	Use of the team checklist briefing was associated with improved physician compliance with antibiotic administration guidelines.	IIB
171	Johnston FM, Tergas AI, Bennett JL, et al. Measuring briefing and checklist compliance in surgery: a tool for quality improvement. <i>Am J Med Qual.</i> 2014;29(6):491-498.	Organizational Experience	One OR in one academic facility	n/a	n/a	n/a	A briefing audit tool was developed across surgical services, 63 briefings were observed. There was a wide variation in discussion of critical goals of the procedure among services. Contributions were variable across all roles and compliance was variable. The tool is a practical method for studying debriefing. The need for service specific customization in a briefing tool was identified.	VA
172	Thanapongsathorn W, Jitsopa J, Wongviriyakorn O. Interprofessional preoperative briefing enhances surgical teamwork satisfaction and decrease operative time: a comparative study in abdominal operation. <i>J Med Assoc Thai.</i> 2012;95(Suppl 12):S8-S14.	Organizational Experience	35	n/a	n/a	n/a	Interprofessional preop briefing increased satisfaction level of the surgical team and decreased operative time due to preventable causes.	VA

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REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
173	Jain AL, Jones KC, Simon J, Patterson MD. The impact of a daily pre-operative surgical huddle on interruptions, delays, and surgeon satisfaction in an orthopedic operating room: a prospective study. <i>Patient Saf Surg.</i> 2015;9(1):8.	Organizational Experience	19 baseline observations and 19 pre-op huddle observations in an ortho OR in one hospital	n/a	n/a	n/a	A daily pre-op huddle improved the flow of a surgeon's day and satisfaction and indirectly provided indications of safety benefits by decreasing the number of interruptions and delays.	VA
174	Bethune R, Sasirekha G, Sahu A, Cawthorn S, Pullyblank A. Use of briefings and debriefings as a tool in improving team work, efficiency, and communication in the operating theatre. <i>Postgrad Med J.</i> 2011;87(1027):331-334.	Organizational Experience	Operating rooms at one general hospital	n/a	n/a	n/a	Briefings and debriefings were conducted for 6 months, a questionnaire was used to assess staff attitude and concluded that there was a positive impact on teamwork and communication.	VA
175	Hicks CW, Rosen M, Hobson DB, Ko C, Wick EC. Improving safety and quality of care with enhanced teamwork through operating room briefings. <i>JAMA Surg.</i> 2014;149(8):863-868.	Organizational Experience	n/a	n/a	n/a	n/a	Briefings and debriefings are a good method for improving teamwork and communication in the OR. Effective implementation may be associated with improve patient outcomes. Commitment by the participating providers is essential for effective briefings which includes discussion of relevant information pertaining to the procedure.	VA
176	Bandari J, Schumacher K, Simon M, et al. Surfacing safety hazards using standardized operating room briefings and debriefings at a large regional medical center. <i>Jt Comm J Qual Patient Saf.</i> 2012;38(4):154-160.	Organizational Experience	OR teams in one regional medical center	n/a	n/a	n/a	A briefing and debriefing tool was used by surgical teams in one facility to identify clinical and operational defects. 46% were identified during briefings and 54% during debriefings. Equipment was 48%, communication defects was 31%. Overall briefings and debriefings were a practical and effective strategy to surface potential defects in operating rooms.	VA
177	Symons NRA, Wong HWL, Manser T, Sevdalis N, Vincent CA, Moorthy K. An observational study of teamwork skills in shift handover. <i>Int J Surg.</i> 2012;10(7):355-359.	Organizational Experience	n/a	n/a	n/a	n/a	Teamwork skills vary widely between handovers and can be consistently scored using both rating scales. It is feasible to use adapted teamwork skill rating scales in shift handover and they appear to measure different constructs to traditional handover measures such as interruptions and communication checklist completion. The assessment of teamwork skills is a necessary complement to the assessment of completeness of information transfer when evaluating the overall quality of handover.	VA
178	Einav Y, Gopher D, Kara I, et al. Preoperative briefing in the operating room: shared cognition, teamwork, and patient safety. <i>Chest.</i> 2010;137(2):443-449.	Quasi-experimental	130 surgeries observed without a briefing (92 gynecologic and 38 orthopedic) and 102 with a briefing (76 gynecologic and 26 orthopedic) in one facility	Briefing process	No briefing process	Number of near misses, nonroutine events and team perspective on the briefing process	There was a 25% reduction in the number of nonroutine events when briefing was conducted and a significant increase in the number of surgeries in which no nonroutine event was observed. Team members evaluated the briefing as most valuable for their own work, the teamwork, and patient safety.	I/A
179	Van Herzele I, Sevdalis N, Lachat M, Desender L, Rudarakanchana N, Rancic Z. Team training in ruptured EVAR. <i>J Cardiovasc Surg.</i> 2014;55(2):193-206.	Organizational Experience	n/a	n/a	n/a	n/a	This article described why team training is important in the management of rAAA, who should be involved, what should be trained and how it should be realized. EVEReST has organized innovative team training rEVAR course including technical and human factor skills exercises with the explicit aim of improving treatment of rAAA and patient outcomes.	VA

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180	Gillespie BM, Gwinner K, Fairweather N, Chaboyer W. Building shared situational awareness in surgery through distributed dialog. <i>J Multidiscip Healthc.</i> 2013;6:109-118.	Nonexperimental	19 semi structured interviews with 24 participants from anesthesia, surgery and nursing in a large metropolitan hospital in Australia	n/a	n/a	Dialogue around clinical decisions made by team members in the OR and the impact on situational awareness.	Strategies include the use of self talk, closed loop communications and overhearing conversations that occurred at the operating table. Behaviors that compromised a team's shared situational awareness included tunneling and fixating on one aspect of the situation.	IIIA
181	Birnbach DJ, Rosen LF, Fitzpatrick M, Paige JT, Arheart KL. Introductions during time-outs: do surgical team members know one another's names? <i>Jt Comm J Qual Patient Saf.</i> 2017;43(6):284-288.	Nonexperimental	Operating rooms in 3 teaching hospitals, 150 OR personnel	n/a	n/a	Knowing names of other team members and the importance of knowing the names of everyone on the team.	Members of the team were not able to state the name of others much of the time. Personnel may consider introductions to be a bureaucratic hurdle instead of the safety check it was designed to be. Authors concluded that simply ticking off items on a checklist reduces complications but a strong belief in the importance of the acts the checklist demands.	IIIB
182	Guideline for a safe environment of care, part 1. In: <i>Guidelines for Perioperative Practice.</i> Denver, CO: AORN, Inc; 2017:243-268.	Guideline	n/a	n/a	n/a	n/a	n/a	IVA
183	Clarke JR, Waddell L, Wolff DD Jr. Quarterly update on wrong-site surgery: how to do an effective time-out in the dark. <i>Penn Patient Saf Advis.</i> 2014;11(2):88-92.	Expert Opinion	n/a	n/a	n/a	n/a	This is a report on wrong site surgery of the eye during laser surgery and addresses how to do a time out in the dark.	VA
184	Weiser TG, Berry WR. Review article: perioperative checklist methodologies. <i>Can J Anesth.</i> 2013;60(2):136-142.	Literature Review	n/a	n/a	n/a	n/a	Checklists can aid clinicians involved in complex processes and multidisciplinary team interactions to improve the quality and safety of care by prompting dialogue and exchange of information.	VB
185	Revised guidance related to new & revised regulations for hospitals, ambulatory surgical centers (ASCs), rural health clinics (RHCs) and federally qualified health centers (FQHCs). 2015. Centers for Medicare & Medicaid Services. https://www.cms.gov/Medicare/Provider-Enrollment-and-Certification/SurveyCertificationGenInfo/Downloads/Survey-and-Cert-Letter-15-22.pdf . Accessed September 29, 2017.	Regulatory	n/a	n/a	n/a	n/a	CMS revised guidance on the time-out process.	n/a
186	UP.01.02.01: Mark the procedure site. In: <i>Comprehensive Accreditation Manual.</i> E-dition. Oakbrook Terrace, IL: The Joint Commission; 2017.	Regulatory	n/a	n/a	n/a	n/a	n/a	n/a
187	Mayer JE, Dang RP, Duarte Prieto GF, Cho SK, Qureshi SA, Hecht AC. Analysis of the techniques for thoracic- and lumbar-level localization during posterior spine surgery and the occurrence of wrong-level surgery: results from a national survey. <i>Spine J.</i> 2014;14(5):741-748.	Qualitative	173/2,338 survey sent response rate of 7.4%	n/a	n/a	Self-reported localization methods (anatomic landmarks, imaging techniques), the prevalence of wrong-level surgery, and any correlations between localization method and wrong-level surgery.	Sixty-eight percent of surgeons admitted to wrong-level localization, some of which were rectified intraoperatively, during their careers. Fifty-six percent of these surgeons reported using plain radiographs and 44% used fluoroscopy when the errors occurred. Common sources of preoperative errors included failure to visualize known reference points, recognize unconventional spinal anatomy, and adequately visualize the level because of large body habitus. Common sources of intraoperative errors included poor communication, failure to relocalize after exposure, and poor counting methods.	IIIB
188	Yoon RS, Alaia MJ, Hutzler LH, Bosco JA 3rd. Using "near misses" analysis to prevent wrong-site surgery. <i>J Healthc Qual.</i> 2015;37(2):126-132.	Organizational Experience	n/a	n/a	n/a	n/a	n/a	VA
189	A time-out is performed before the procedure. In: <i>Comprehensive Accreditation Manual.</i> E-dition. Oakbrook Terrace, IL: The Joint Commission; 2017.	Regulatory	n/a	n/a	n/a	n/a	n/a	n/a

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190	Song JB, Vemana G, Mobley JM, Bhayani SB. The second "time-out": a surgical safety checklist for lengthy robotic surgeries. <i>Patient Saf Surg.</i> 2013;7(1):19.	Organizational Experience	One service line in one facility	n/a	n/a	n/a	The second time out was easy to implement and did not add to the surgical time.	VA
191	Urbach DR, Govindarajan A, Saskin R, Wilton AS, Baxter NN. Introduction of surgical safety checklists in Ontario, Canada. <i>N Engl J Med.</i> 2014;370(11):1029-1038.	Nonexperimental	Surgical patients before and after adoption of a safe surgery checklist at 101 hospitals in Canada	n/a	n/a	Operative mortality, rates of surgical complications, lengths of hospital stay, rates of hospital readmission, emergency department visits within 30 days after discharge	The safe surgery checklist may be beneficial in improving teamwork and communication, although the researchers found no significant reduction in operative mortality after checklist implementation.	IIIA
192	Sewell M, Adebibe M, Jayakumar P, et al. Use of the WHO Surgical Safety Checklist in trauma and orthopaedic patients. <i>Int Orthop.</i> 2011;35(6):897-901.	Organizational Experience	n/a	n/a	n/a	n/a	This study has shown that education and infrastructure changes can significantly increase accurate use and improve staff perceptions of the WHO SSC; however, this was not associated with a significant reduction in early major complications or mortality in orthopaedic patients.	VA
193	Fourcade A, Blache JL, Grenier C, Bourgain JL, Minvielle E. Barriers to staff adoption of a surgical safety checklist. <i>BMJ Qual Saf.</i> 2012;21(3):191-197.	Quasi-experimental	1440 surgical procedures in 18 cancer centers in France	Implementation of a SSC	n/a	Barriers to effective implementation of a SSC	The mean compliance rate was 90.2%, the mean completion rate was 61%. The barriers identified were duplication of items within existing checklists, poor communication between surgeon and anesthetist, time spent completing the checklist for no perceived benefit, and lack of understanding and timing of item checks, ambiguity, unaccounted risks and time honored hierarchy.	IIB
194	Lyons VE, Popejoy LL. Time-out and checklists: a survey of rural and urban operating room personnel. <i>J Nurs Care Qual.</i> 2017;32(1):E3-E10.	Nonexperimental	Survey of 77 rural and 47 urban facilities	n/a	n/a	Time out and checklist process	Process was the barrier to checklist use and their use was inconsistent. Emphasizes opportunities to modify the checklist getting team members involved and education of staff members. Encouragement of interdisciplinary collaboration.	IIIB
195	Cima R, Dankbar E, Lovely J, et al. Colorectal surgery surgical site infection reduction program: a National Surgical Quality Improvement Program-driven multidisciplinary single-institution experience. <i>J Am Coll Surg.</i> 2013;216(1):23-33.	Expert Opinion	n/a	n/a	n/a	n/a	Surgeons play an important role in facilitating the development of and empowering the teams they work through their active participation and effective leadership within the operating room team.	VB
196	Maniar RL, Sytnik P, Wirtzfeld DA, et al. Synoptic operative reports enhance documentation of best practices for rectal cancer. <i>J Surg Oncol.</i> 2015;112(5):555-560.	Nonexperimental	97 SR (synoptic reports) 97 NR (narration report) were compared the completeness of the documentation of the RCC in the patient record.	n/a	n/a	Completion of the elements cited in the Renal Cancer Checklist (RCC) in the postop report.	SR were associated with reliable and more complete and reliable documentation of items on the RCC. Use of an SR system standardizes operative reporting, providing the opportunity to enhance checklist compliance, and enable timely feedback to improve surgical outcomes for rectal cancer patients.	IIIA
197	State Operations Manual Appendix A—Survey Protocol, Regulations and Interpretive Guidelines for Hospitals. Rev 151; 2015. Centers for Medicare & Medicaid Services. https://www.cms.gov/Regulations-and-Guidance/Guidance/Manuals/downloads/som107ap_a_hospitals.pdf . Accessed September 29, 2017.	Regulatory	n/a	n/a	n/a	n/a	n/a	n/a

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198	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 September 29, 2017.	Regulatory	n/a	n/a	n/a	n/a	n/a	n/a
199	42 CFR 482. Conditions of participation for hospitals. 2011. Government Publishing Office. https://www.gpo.gov/fdsys/granule/CFR-2011-title42-vol5/CFR-2011-title42-vol5-part482 . Accessed September 29, 2017.	Regulatory	n/a	n/a	n/a	n/a	n/a	n/a
200	42 CFR 416. Ambulatory surgical services. 2011. Government Publishing Office. https://www.gpo.gov/fdsys/granule/CFR-2011-title42-vol3/CFR-2011-title42-vol3-part416 . Accessed September 29, 2017.	Regulatory	n/a	n/a	n/a	n/a	n/a	n/a
201	Patient safety systems for hospitals. In: Comprehensive Accreditation Manual for Hospitals. Oakbrook Terrace, IL: The Joint Commission; 2017:PS-1–PS-50. https://www.jointcommission.org/assets/1/18/CAMH_04a_PS.pdf . Accessed September 29, 2017.	Expert Opinion	n/a	n/a	n/a	n/a	Joint Commission publication about safety systems that addresses many aspects of designing, improving, educating and evaluating patient safety systems.	VA
202	NIAHO: National Integrated Accreditation for Healthcare Organizations. Surgical services (SS). In: Interpretive Guidelines and Surveyor Guidance. Version 11. Milford, OH: DNV GL Healthcare USA, Inc; 2014:80-91.	Regulatory	n/a	n/a	n/a	n/a	n/a	n/a
203	Quality assessment/quality improvement: quality improvement. In: Regular Standards and Checklist for Accreditation of Ambulatory Surgery Facilities. Version 14.5. Gurnee, IL: American Association for Accreditation of Ambulatory Surgery Facilities, Inc; 2017:64.	Regulatory	n/a	n/a	n/a	n/a	n/a	n/a
204	Quality assessment/quality improvement: unanticipated operative sequelae. In: Regular Standards and Checklist for Accreditation of Ambulatory Surgery Facilities. Version 14.5. American Association for Accreditation of Ambulatory Surgery Facilities, Inc; 2017:66-69.	Regulatory	n/a	n/a	n/a	n/a	n/a	n/a
205	Cassin BR, Barach PR. Making sense of root cause analysis investigations of surgery-related adverse events. <i>Surg Clin North Am.</i> 2012;92(1):101-115.	Expert Opinion	n/a	n/a	n/a	n/a	Promotes using an RCA team.	VA
206	Scoville R, Little K, Rakover J, Luther K, Mate K. Sustaining Improvement. IHI White Paper. Cambridge, MA: Institute for Healthcare Improvement; 2016. http://www.ihl.org/resources/Pages/IHIWhitePapers/Sustaining-Improvement.aspx . Accessed September 29, 2017.	Expert Opinion	n/a	n/a	n/a	n/a	This white paper presents a framework that health care organizations can use to sustain improvements in the safety, effectiveness, and efficiency of patient care. The key to sustaining improvement is to focus on the daily work of frontline managers, supported by a high-performance management system that prescribes standard tasks and responsibilities for managers at all levels of the organization. To inform this work, we reviewed selected literature and interviewed leading organizations.	VA
207	Blackmore CC, Bishop R, Luker S, Williams BL. Applying lean methods to improve quality and safety in surgical sterile instrument processing. <i>Jt Comm J Qual Patient Saf.</i> 2013;39(3):99-105.	Organizational Experience	Instrument processing department in one facility	n/a	n/a	n/a	Surgical instrument processing errors are a barrier to the highest quality and safety in surgical care but are amenable to substantial improvement using Lean techniques.	VB

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208	Wakeam E, Hyder JA, Ashley SW, Weissman JS. Barriers and strategies for effective patient rescue: a qualitative study of outliers. <i>Jt Comm J Qual Patient Saf.</i> 2014;40(11):503-513.	Nonexperimental	7 outlier hospitals with statistically better or worse FTR performance	n/a	n/a	Failure to rescue (FTR) or death after postop complications	FTR is a complex process that is viewed, defined and acted on differently across and within organizations. Early recognition of patients deviating from normal recovery was enhanced in high-performing hospitals through the use of standardized postop recovery pathways and automated escalation protocols.	IIIB
209	Johnson M, Sanchez P, Suominen H, et al. Comparing nursing handover and documentation: forming one set of patient information. <i>Int Nurs Rev.</i> 2014;61(1):73-81.	Nonexperimental	Transcripts from 162 digitally recorded handovers and written nursing notes in general medical-surgical wards from two metropolitan hospitals in Sydney Australia.	n/a	n/a	Content of nursing hand overs	Can use one set of patient information (within some limitations) for two purposes with system design, practice change and education.	IIIB
210	Pronovost PJ, Armstrong CM, Demski R, et al. Creating a high-reliability health care system: improving performance on core processes of care at Johns Hopkins Medicine. <i>Acad Med.</i> 2015;90(2):165-172.	Organizational Experience	n/a	n/a	n/a	n/a	A quality improvement project established an infrastructure to manage quality and safety concerns and improved performance on core measures. Robust leadership from the board and a fractal infrastructure created a model that fostered interdependence and independence among the participating staff and hospitals.	VA
211	Chassin MR, Loeb JM. High-reliability health care: getting there from here. <i>Milbank Q.</i> 2013;91(3):459-490.	Expert Opinion	n/a	n/a	n/a	n/a	n/a	VA
212	Lin M, Heisler S, Fahey L, McGinnis J, Whiffen TL. Nurse knowledge exchange plus: human-centered implementation for spread and sustainability. <i>Jt Comm J Qual Patient Saf.</i> 2015;41(7):303-312.	Organizational Experience	125 nursing units in 14 hospitals	n/a	n/a	n/a	Human-centered implementation appeared to help spread a new model of nursing handoffs and change the culture of professional nursing practice related to shift change.	VA
213	Rogers SO Jr, Gawande AA, Kwaan M, et al. Analysis of surgical errors in closed malpractice claims at 4 liability insurers. <i>Surgery.</i> 2006;140(1):25-33.	Nonexperimental	Retrospective review of 444 closed malpractice claims, from 4 malpractice liability insurers, in which patients alleged a surgical error.	n/a	n/a	Surgical errors resulting in patient injury, and causative factors	Systems factors play a critical role in most surgical errors, including technical errors. Closed claims analysis can help to identify priority areas for intervening to reduce errors.	IIIA
214	Glymph DC, Olenick M, Barbera S, Brown EL, Prestianni L, Miller C. Healthcare utilizing deliberate discussion linking events (HUDDLE): a systematic review. <i>AANA J.</i> 2015;83(3):183-188.	Literature Review	n/a	n/a	n/a	n/a	Huddles should be taught and implemented into anesthesia. Leadership plays a vital role in creating new initiatives. The huddle creates a shared mental model among team members by bringing them together before a case to discuss its critical aspects.	VA
215	Krenzschek DA, Xie Y, Petrovic M, et al. The perioperative handoff protocol: application of a multidisciplinary model to promote teamwork and reduce perioperative miscommunication. <i>J Perianesth Nurs.</i> 2011;26(3):188-189.	Expert Opinion	n/a	n/a	n/a	n/a	Supports a standardized approach to hand overs.	VC

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216	Morrison D, Sanders C. Huddling for optimal care outcomes. <i>Nursing</i> . 2011;41(12):22-24.	Organizational Experience	n/a	n/a	n/a	n/a	Huddles are a communication method that enables teams to conduct frequent but short briefings so that everyone can stay informed, review work, make plans, and move ahead rapidly. The ultimate goal of the huddle is to deliver patient-centered care efficiently. This process requires open communication in which participants ask each other to use critical thinking to find solutions to current problems or see patients a different way.	VB	
217	Park KW, Smaltz D, McFadden D, Souba W. The operating room dashboard. <i>J Surg Res</i> . 2010;164(2):294-300.	Expert Opinion	n/a	n/a	n/a	n/a	Supports determination of appropriate staffing to support the OR functions, management of supplies, equipment and technology, oversight of scheduling mode and time management, capacity planning for space, fostering of surgeon-staff teamwork and accountability, and assurance of patient safety and high quality of care, as well as judicious use of resources and maintenance of financial viability.	VB	
218	Johnson JK, Arora VM, Bacha EA, Barach PR. Improving communication and reliability of patient handovers in pediatric cardiac care. <i>Prog Pediatr Cardiol</i> . 2011;32(2):135-139.	Expert Opinion	n/a	n/a	n/a	n/a	Supports the use of handovers and engaging patients and families.	VB	
219	HR.01.05.03: Staff participate in ongoing education and training. In: <i>Comprehensive Accreditation and Certification Manual</i> . E-dition. Oakbrook Terrace, IL: The Joint Commission; 2016.	Regulatory	n/a	n/a	n/a	n/a	n/a	n/a	
220	Committee on Development of High Performance Teamwork; American College of Surgeons. Statement on high-performance teams. <i>Bull Am Coll Surg</i> . 2010;95(2):23-24.	Position Statement	n/a	n/a	n/a	n/a	The American College of Surgeons recognizes that safe patient care requires contributions from many providers and disciplines practicing together. Team science has shown that teamwork leads to better performance outcomes. Teamwork before, during, and after operations is essential to achieving the best patient outcomes.	IVC	
221	Larsson J, Holmström IK. How excellent anaesthetists perform in the operating theatre: a qualitative study on non-technical skills. <i>Br J Anaesth</i> . 2013;110(1):115-121.	Nonexperimental	18 anesthesia nurses in Swedish hospitals	n/a	n/a	n/a	Non technical skills	Nurses gave descriptions of how excellent anesthetists behave and perform.	IIIB
222	McClelland G. Assessing scrub practitioner non-technical skills: a literature review. <i>J Perioper Pract</i> . 2015;25(1-2):12-18.	Literature Review	7 papers were reviewed	n/a	n/a	n/a	n/a	This literature review identifies strategies that facilitate assessment of non-technical skills during surgery. Recommendations are made that will assist scrub practitioners in using a validated scrub practitioner non-technical skills assessment framework reliably.	VA
223	Paige JT, Garbee DD, Brown KM, Rojas JD. Using simulation in interprofessional education. <i>Surg Clin North Am</i> . 2015;95(4):751-766.	Expert Opinion	n/a	n/a	n/a	n/a	n/a	IPE involves bringing together 2 or more health profession students to learn with, from, and about each other. Core interprofessional competencies have been described and fall into 4 major domains.	VA
224	Rudarakanchana N, Van Herzele I, Desender L, Cheshire NJW. Virtual reality simulation for the optimization of endovascular procedures: current perspectives. <i>Vasc Health Risk Manag</i> . 2015;11:195-202.	Organizational Experience	n/a	n/a	n/a	n/a	n/a	Endovascular virtual reality (VR) simulation has evolved from simple benchtop devices to full physic simulators with advanced haptics and dynamic imaging and physiological controls. Simulation training that allows deliberate practice without danger to patients may be key to bridging the gap between new endovascular technology and improved patient outcomes.	VB

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225	Willems A, Waxman B, Bacon AK, Smith J, Peller J, Kitto S. Interprofessional non-technical skills for surgeons in disaster response: a qualitative study of the Australian perspective. <i>J Interprof Care</i> . 2013;27(2):177-183.	Nonexperimental	20 health professionals	n/a	n/a	Survival skills, psychological self-care, physical, flexibility, adaptability, innovation and improvisation, cognitive strategies and interprofessional skills.	The aims of this study were to identify interprofessional non-technical skills for surgeons in disaster response and training for disaster response.	IIIA
226	Rydenfalt C, Johansson G, Odenrick P, Akerman K, Larsson PA. Compliance with the WHO Surgical Safety Checklist: deviations and possible improvements. <i>Int J Qual Health Care</i> . 2013;25(2):182-187.	Organizational Experience	Twenty-four surgical procedures were video recorded.	n/a	n/a	Time out compliance	The components that facilitate communication are often neglected. The time-out does not appear to be conducted as a team effort. It is plausible that the personnel's conception of risk and the perceived importance of different checklist items are factors that influence checklist usage. To improve compliance and involve the whole team, the concept of risk and the perceived relevance of checklist items for all team members should be addressed.	VB
227	Nurok M, Sundt TM 3rd, Frankel A. Teamwork and communication in the operating room: relationship to discrete outcomes and research challenges. <i>Anesthesiol Clin</i> . 2011;29(1):1-11.	Systematic Review	n/a	n/a	n/a	Morbidity, mortality, technical errors, operating time and delays, and communication failures.	There is a small but growing body of literature demonstrating a relationship between teamwork and communication in the perioperative environment and discrete, measurable, clinically relevant outcomes. Future work in this field should seek to identify which elements of teamwork and communication are most important to improving and/or sustaining good outcomes and preventing the poor ones.	IIIB
228	Marshall MB, Emerson D. Patient safety in the surgical setting. <i>Thorac Surg Clin</i> . 2012;22(4):545-550.	Expert Opinion	n/a	n/a	n/a	n/a	Surgeons need to embrace the cultural change necessary to study errors prospectively, learn from their occurrence, and continually implement change to prevent future occurrences. Surgeons need to be strong advocates for this continual change within the system to help the surgical team trap errors before they reach the patients. Only through a conscious, robust team approach to error identification and management can surgeons slowly move toward safer health care for all.	VA
229	Bohmer AB, Kindermann P, Schwanke U, et al. Long-term effects of a perioperative safety checklist from the viewpoint of personnel. <i>Acta Anaesthesiol Scand</i> . 2013;57(2):150-157.	Nonexperimental	99 staff members in anesthesiology and traumatology	n/a	n/a	Perceptions of perioperative safety standards and quality of interprofessional cooperation	Verification of written consent for surgery, clear marking of the surgical site and time management were rated more positively over time by the anesthesiologists and nurses. Items involving communication were rated less positively. Orthopedic surgeons rated being better informed about the patients, the planned procedure and the assignment of tasks during surgery progressively more positively over time.	IIIA

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REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
230	Braaf S, Manias E, Riley R. The "time-out" procedure: an institutional ethnography of how it is conducted in actual clinical practice. <i>BMJ Qual Saf.</i> 2013;22(8):647-655.	Nonexperimental	125 healthcare professionals in surgery, anesthesia and nursing. 2 focus groups and 20 semi-structured interviews	n/a	n/a	Involvement in time out procedures, when overlapping conversations occurred, multitasking, types of communication channels used and the causes, outcomes and consequences of communication failure.	The time out procedure was adapted to who was involved, partially completed, conducted after surgery had commenced and involved only a few members of the team. Communication was restricted by asynchronous workflows, time restrictions, a hierarchical culture and disinclination by surgeons and anesthetists to volunteer information and openly communicate.	IIIB
231	Weiser TG, Porter MP, Maier RV. Safety in the operating theatre—a transition to systems-based care. <i>Nat Rev Urol.</i> 2013;10(3):161-173.	Literature Review	n/a	n/a	n/a	n/a	The coordination of surgical care requires the complex orchestration of multiple disciplines, from nurses to anesthetists to surgeons. Ensuring adherence to all appropriate steps of care, while avoiding errors of omission and commission, is just the beginning. Communication between providers is increasingly important in the ever-changing health-care environment.	VA
232	McCulloch P, Morgan L, New S, et al. Combining systems and teamwork approaches to enhance the effectiveness of safety improvement interventions in surgery: the safer delivery of surgical services (S3) program. <i>Ann Surg.</i> 2017;265(1):90-96.	Quasi-experimental	453 operations	4 month safety improvement program	Compared five groups with different training method-Standard operating procedure SOP, Lean, Team training (TT), SOP + TT, Lean + TT	Looked at before and after intervention of completion of WHO checklist compliance	Safety interventions combining teamwork training and systems rationalization are more effective than those adopting either approach alone.	IIA
233	Tibbs SM, Moss J. Promoting teamwork and surgical optimization: combining TeamSTEPPS with a specialty team protocol. <i>AORN J.</i> 2014;100(5):477-488.	Organizational Experience	n/a	n/a	n/a	n/a	Quality improvement project that utilized TeamSTEPPS to improve compliance with timeouts and huddle. The implementation of team training protocols can enhance surgical optimization, communication and work relationships.	VA
234	Li Y. Evidence summary. TeamSTEPPS. The Joanna Briggs Institute EBP Database, JBI@Ovid . 2017;JBI5271.	Position Statement	n/a	n/a	n/a	n/a	JBI Evidence summary on TeamSTEPPS	IVA
235	Young-Xu Y, Neily J, Mills PD, et al. Association between implementation of a medical team training program and surgical morbidity. <i>Arch Surg.</i> 2011;146(12):1368-1373.	Quasi-experimental	119,383 procedures	Medical Team Training program (MTT)	Veterans Health Administration Medical Team Training (MTT) program and surgical morbidity.	morbidity rate	The MTT program is associated with decreased surgical morbidity.	IIA
236	Nurok M, Evans LA, Lipsitz S, Satwicz P, Kelly A, Frankel A. The relationship of the emotional climate of work and threat to patient outcome in a high-volume thoracic surgery operating room team. <i>BMJ Qual Saf.</i> 2011;20(3):237-242.	Quasi-experimental	A total of 305 data sheets (91 pre-intervention, 165 post-intervention, 49 sustaining) were collected, representing 105 surgical cases and approximately 50 h of observation.	Two 90 min training sessions on safety culture highlighting positive and problematic team skills, communication and leadership	Pre and post intervention	Relationship of functional or less functional emotional climates of work to patient outcomes.	The emotional climate of work in the sterile surgical environment appeared to be related to threat to patient outcome prior to, but not after, a team-training intervention. Further study of the relationship between the emotional climate of work and threat to patient outcome using reproducible methods is required.	IIB

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237	Brown LL, Overly FL. Simulation-based interprofessional team training. Clin Pediatr Emerg Med. 2016;17(3):179-184.	Expert Opinion	n/a	n/a	n/a	n/a	n/a	VB
238	Burke C, Grobman W, Miller D. Interdisciplinary collaboration to maintain a culture of safety in a labor and delivery setting. J Perinat Neonatal Nurs. 2013;27(2):113-123.	Nonexperimental	370 professionals took part in an educational program designed by a multidisciplinary team using discussion and simulation in labor and delivery.	n/a	n/a	Team communication and performance	Increase in accurate and timely communication, flexible and adaptive protocol utilization and cohesive and reliable team cooperation.	IIIB
239	Cumin D, Boyd MJ, Webster CS, Weller JM. A systematic review of simulation for multidisciplinary team training in operating rooms. Simul Healthc. 2013;8(3):171-179.	Systematic Review	n/a	n/a	n/a	n/a	Simulation training was generally perceived as realistic and beneficial by participants. Challenges to conducting simulations include recruitment, model realism and financial cost.	IIIA
240	Gardner AK, Scott DJ. Concepts for developing expert surgical teams using simulation. Surg Clin North Am. 2015;95(4):717-728.	Expert Opinion	n/a	n/a	n/a	n/a	Supports incorporating simulation into training programs, the need for a firm foundation in the science of team performance and effectiveness and applying characteristics of expert teams to surgical teams.	VB
241	Andrew B, Plachta S, Salud L, Pugh CM. Development and evaluation of a decision-based simulation for assessment of team skills. Surgery. 2012;152(2):152-157.	Nonexperimental	15 surgical residents and 6 observers	n/a	n/a	Work quality, communication, team effectiveness	Team survey had good reliability and correlated with simulated task performance. There was strong evidence that nontechnical and team related skills can be assessed without simulating a crisis situation.	IIIB
242	Arain NA, Hogg DC, Gala RB, et al. Construct and face validity of the American College of Surgeons/Association of Program Directors in Surgery laparoscopic troubleshooting team training exercise. Am J Surg. 2012;203(1):54-62.	Nonexperimental	14 novice surgery residents and 10 experts	n/a	n/a	Time-out, scenario decision making, communication, teamwork and workload	The team training exercise showed construct validity and excellent face validity and participant feedback.	IIIA
243	Bilotta FF, Werner SM, Bergese SD, Rosa G. Impact and implementation of simulation-based training for safety. Sci World J. 2013;2013:652956.	Literature Review	n/a	n/a	n/a	n/a	Simulation based training should be used in residency training and continuing medical education to increase periop safety by improving communication skills, checklist use and procedural emergency management.	VA
244	Pena G, Altree M, Field J, et al. Nontechnical skills training for the operating room: a prospective study using simulation and didactic workshop. Surgery. 2015;158(1):300-309.	Qualitative	40	n/a	n/a	Non technical skills	Formal training in non technical skills is feasible and can impact positively participants' nontechnical performance in a simulated environment.	IIIB
245	Nicksa GA, Anderson C, Fidler R, Stewart L. Innovative approach using interprofessional simulation to educate surgical residents in technical and nontechnical skills in high-risk clinical scenarios. JAMA Surg. 2015;150(3):201-207.	Qualitative	37 surgical residents responded to survey	SimMan 3GS was used to simulate high-risk clinical scenarios.	n/a	Evaluation of resident skills: communication, leadership, teamwork, problem solving, situation awareness, and confidence in performing emergency procedures (eg, cricothyroidotomy).	89% of the residents responding found the sessions useful. Additionally, 85% reported improved confidence doing procedures and 78% reported knowing when the procedure should be applied. The PGY 2 residents improved their skills, but the PGY 1 residents did not. Participants found interprofessional simulations to be realistic and a valuable educational tool. Interprofessional simulation provides a valuable means of educating surgical residents and evaluating their skills in real-life clinical scenarios.	IIIB

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246	Weinger MB, Slagle JM, Kuntz AH, et al. A multimodal intervention improves postanesthesia care unit handovers. <i>Anesth Analg</i> . 2015;121(4):957-971.	Organizational Experience	452 clinicians	n/a	n/a	n/a	A multimodal intervention substantially improved interprofessional PACU handovers, including those by clinicians who had not undergone formal simulation training. An effect appeared to be present >3 years later.	VA