REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
1	Paulikas CA. Prevention of unplanned perioperative hypothermia. AORN J. 2008;88(3):358-365.	Expert opinion	N/A	N/A	N/A	N/A	Overview of causes, effect and prevention of hypothermia.	VC
2	Beltramini AM, Salata RA, Ray AJ. Thermoregulation and risk of surgical site infection. Infect Control Hosp Epidemiol. 2011;32(6):603-610	Literature Review	N/A	N/A	N/A	N/A	The definitions of hypothermia vary in the literature	VB
3	Journeaux M. Peri-operative hypothermia: implications for practice. Nurs Stand. 2013;27(45):33-38.	Literature Review	N/A	N/A	N/A	N/A	Maintaining perioperative normothermia improves outcomes in surgical patients. Pre-warming should be performed and risk factors for hypothermia should be identified preoperatively.	VA
4	Mitchell JC, D'Angelo M. Implications of hypothermia in procedural areas. J Radiol Nurs. 2008;27(2):70-73.	Literature Review	N/A	N/A	N/A	N/A	Outlines care and effects of hypothermia	VC
5	Sessler DI. Perioperative thermoregulation and heat balance. Lancet. 2016;387(10038):2655-2664.	Literature Review	N/A	N/A	N/A	N/A	Explains the mechanism of anesthesia induced hypothermia and recommends keeping all perioperative patients normothermic.	VA
6	Lenhardt R. The effect of anesthesia on body temperature control. Front Biosci (Schol Ed). 2010;2:1145-1154.	Expert opinion	N/A	N/A	N/A	N/A	Overview of the relationship between anesthesia and thermoregulation	VA
7	Sessler DI. Perioperative heat balance. Anesthesiology. 2000;92(2):578-590.	Expert opinion	N/A	N/A	N/A	N/A	Obesity, use of tourniquets, type of anesthesia all cause hypothermia.	VA
8	Sessler DI. Thermoregulatory defense mechanisms. Crit Care Med. 2009;37(7 Suppl):S203-S210.	Expert opinion	N/A	N/A	N/A	N/A	Therapeutic hypothermia remains a subject of active investigation. The combination of buspirone and dexmedetomidine reduces the shivering threshold.	VA
9	Sessler DI. Temperature monitoring and perioperative thermoregulation. Anesthesiology. 2008;109(2):318-338.	Expert opinion	N/A	N/A	N/A	N/A	Temperature should be monitored in patients undergoing major surgery during regional anesthesia. Patients should be actively warmed to maintain normothermia.	VA
10	Matsukawa T, Sessler DI, Sessler AM, et al. Heat flow and distribution during induction of general anesthesia. Anesthesiology. 1995;82(3):662-673.	Nonexperimental	Six male volunteers	N/A	N/A	Amount of core hypothermia resulting from distribution.	Administration of anesthesia results in a drop in core temperature and during the first hour most is due to redistribution.	IIIA
11	Kuht J, Farmery AD. Body temperature and its regulation. Anaesth Intensive Care Med. 2014;15(6):273-278.	Expert Opinion	N/A	N/A	N/A	N/A	Administration of anesthesia results in a drop in core temperature.	VC

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12	Durel YP, Durel JB. A comprehensive review of thermoregulation and intraoperative hypothermia. Curr Rev Nurse Anesth. 2000;22(22):249.	Expert Opinion	N/A	N/A	N/A	N/A	Provides information on effects of anesthesia on thermoregulation and defines preferred sites for temperature measurement	VC
13	Carrero EJ, Fàbregas N. Thermoregulation and neuroanesthesia. Saudi J Anaesth. 2012;6(1):5-7.	Expert Opinion	N/A	N/A	N/A	N/A	Provides information on effects of anesthesia on thermoregulation and recommends temperature monitoring and active warming.	VC
14	Burns SM, Wojnakowski M, Piotrowski K, Caraffa G. Unintentional hypothermia: implications for perianesthesia nurses. J Perianesth Nurs. 2009;24(3):167-173.	Expert Opinion	N/A	N/A	N/A	N/A	Provides information on effects of anesthesia on thermoregulation and recommends temperature monitoring and active warming.	VB
15	Kurz A. Physiology of thermoregulation. Best Pract Res.Clin Anaesthesiol. 2008;22(4):627-644.	Expert Opinion	N/A	N/A	N/A	N/A	Describes the physiologic response to anesthesia related to hypothermia.	VA
16	Lantry J, Dezman Z, Hirshon JM. Pathophysiology, management and complications of hypothermia. Br J Hosp Med. 2012;73(1):31-37.	Literature review	N/A	N/A	N/A	N/A	Defines methods of heat loss and signs and symptoms of hypothermia.	VB
17	Kim EJ, Yoon H. Preoperative factors affecting the intraoperative core body temperature in abdominal surgery under general anesthesia: an observational cohort. Clin Nurse Spec. 2014;28(5):268-276.	Nonexperimental	147 patients having abdominal surgery	N/A	N/A	Patient temperature	The following factors were indicative of hypothermia: Low body temp preoperative, low weight, and age.	IIIB
18	Benson EE, McMillan DE, Ong B. The effects of active warming on patient temperature and pain after total knee arthroplasty. Am J Nurs. 2012;112(5):26-33.	RCT	30 patients (15 in each group) having total knee replacement	Forced air warming device used	No warming device used	Patient temperature	Use of patient-controlled, forced-air warming gowns elevates perioperative body temperature, improves patient satisfaction and may decrease opioid use postoperatively.	IC
19	Lista F, Doherty CD, Backstein RM, Ahmad J. The impact of perioperative warming in an outpatient aesthetic surgery setting. Aesthet Surg J. 2012;32(5):613-620.	Organizational Experience	N/A	N/A	N/A	N/A	Warmed patients experienced less time in the PACU.	VB
20	Vanamoorthy P, Pandia MP, Bithal PK, Valiaveedan SS. Refractory hypotension due to intraoperative hypothermia during spinal instrumentation. Indian J Anaesth. 2010;54(1):56-58.	Case report	N/A	N/A	N/A	N/A	Report of a case of hypothermia during a spinal instrumentation procedure	VA
21	Lau AW, Chen CC, Wu RS, Poon KS. Hypothermia as a cause of coagulopathy during hepatectomy. Acta Anaesthesiol Taiwan. 2010;48(2):103-106.	Case report	N/A	N/A	N/A	N/A	Case report describing the relationship between hypothermia and coagulopathy.	VA
22	Niday LM. Intraoperative hypothermia and delayed awakening. Int Student J Nurse Anesth. 2011;10(1):34-39.	Case Report	N/A	N/A	N/A	N/A	Hypothermia alters medication metabolism	VB
23	Kapetanopoulos A, Katsetos MC, Kluger J. Intraoperative hypothermia increased defibrillation energy requirements. J Cardiovasc Med. 2007;8(9):741-743.	Case Report	N/A	N/A	N/A	N/A	Hypothermia results in the need for higher defibrillation power.	VC

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24	John M, Ford J, Harper M. Peri-operative warming devices: performance and clinical application. Anaesthesia. 2014;69(6):623-638.	Literature Review	N/A	N/A	N/A	N/A	Literature review covering the various types of warming devices including pros and cons.	VC
25	Torossian A. Thermal management during anaesthesia and thermoregulation standards for the prevention of inadvertent perioperative hypothermia. Best Pract Res Clin Anaesthesiol. 2008;22(4):659-668.	Literature review	N/A	N/A	N/A	N/A	Oral, nasopharynx, esophagus and urinary bladder temperature may be used. Hypothermia is connected with negative outcomes. Prewarming and active warming should be applied when anesthesia time will be greater than 60 min. Forced-air warming, conductive warming, infusion fluid warming, increasing the operating room temperature, and warming of irrigation fluids are warming methods. Patient should be normothermic preop. Temperature should be monitored throughout the perioperative period.	VB
26	Reynolds L, Beckmann J, Kurz A. Perioperative complications of hypothermia. Best Pract Res Clin Anaesthesiol. 2008;22(4):645-657.	Expert Opinion	N/A	N/A	N/A	N/A	Hypothermia contributes to several surgical complications including SSI, blood loss. Delayed post anesthesia recovery.	VA
27	da Silva AB, Peniche Ade C. Perioperative hypothermia and incidence of surgical wound infection: a bibliographic study. Einstein (Sao Paulo). 2014;12(4):513-517.	Literature Review	N/A	N/A	N/A	N/A	Active warming should be used because hypothermia contributes to various complications.	VC
28	Putzu M, Casati A, Berti M, Pagliarini G, Fanelli G. Clinical complications, monitoring and management of perioperative mild hypothermia: anesthesiological features. Acta Biomed Ateneo Parmense. 2007;78(3):163-169.	Literature Review	N/A	N/A	N/A	N/A	Temperature should be monitored in patients having surgery lasting longer than 30 minutes and hypothermia is connected with complications and the monitoring site should be individualized.	VB
29	Kumar, S., Wo29.Kumar S, Wong PF, Melling AC, Leaper DJ. Effects of perioperative hypothermia and warming in surgical practice. Int Wound J. 2005;2(3):193-204. ng, P. F., Melling, A. C. and Leaper, D. J. Effects of perioperative hypothermia and warming in surgical practice 2005	Literature Review	N/A	N/A	N/A	N/A	Hypothermia is linked to various complications and temperature can be measured accurately at various sites, passive warming should be used in conjunction to other methods, active warming methods should be performed.	VA

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30	Esnaola NF, Cole DJ. Perioperative normothermia during major surgery: is it important? Adv Surg. 2011;45:249-263.	Literature Review	N/A	N/A	N/A	N/A	Describes the pathophysiology of hypothermia, describes different means of temperature monitoring and different measures to prevent hypothermia.	VB
31	Sohn VY, Steele SR. Temperature control and the role of supplemental oxygen. Clin Colon Rectal Surg. 2009;22(1):21-27.	Expert Opinion	N/A	N/A	N/A	N/A	Hypothermia contributes to various complications.	VC
32	Dickinson A, Qadan M, Polk HC Jr. Optimizing surgical care: a contemporary assessment of temperature, oxygen, and glucose. Am Surg. 2010;76(6):571-577.	Expert opinion	N/A	N/A	N/A	N/A	Summarizes effects of hypothermia.	VB
33	Diaz M, Becker DE. Thermoregulation: physiological and clinical considerations during sedation and general anesthesia. Anesth Prog. 2010;57(1):25-32.	Expert opinion	N/A	N/A	N/A	N/A	Summarizes effects of hypothermia.	VC
34	Kurz A. Thermal care in the perioperative period. Best Pract Res Clin Anaesthesiol. 2008;22(1):39-62.	Literature Review	N/A	N/A	N/A	N/A	Perioperative hypothermia is a common complication of anesthesia and surgery. Body temperature should be monitored in most surgical patients.	VA
35	Hernandez M, Cutter TW, Apfelbaum JL. Hypothermia and hyperthermia in the ambulatory surgical patient. Clin Plast Surg. 2013;40(3):429-438.	Expert Opinion	N/A	N/A	N/A	N/A	Defines the effects of anesthesia and temperature taking methods and recommends passive and active methods for maintaining temperature or preventing hypothermia and certain factors increase the risk for hypothermia.	VB
36	Hart SR, Bordes B, Hart J, Corsino D, Harmon D. Unintended perioperative hypothermia. Ochsner J. 2011;11(3):259-270.	Expert Opinion	N/A	N/A	N/A	N/A	Describes the physiology of temperature regulation, mechanisms of heat loss, relationship between thermoregulation and anesthesia, and summarized recommendations for maintaining normothermia	VA
37	Heier T, Caldwell JE. Impact of hypothermia on the response to neuromuscular blocking drugs. Anesthesiology. 2006;104(5):1070-1080.	Expert Opinion	N/A	N/A	N/A	N/A	Medications are effected by hypothermia	VC
38	Pearce B, Christensen R, Voepel-Lewis T. Perioperative hypothermia in the pediatric population: prevalence, risk factors and outcomes. J Anesth Clin Res. 2010;1:102.	Nonexperimental	530 children having surgery	N/A	N/A	Presence of hypothermia	Hypothermia occurs more frequently in older children and in those having long procedures. Hypothermia is associated with greater blood loss.	IIIC

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39	Jeyadoss J, Thiruvenkatarajan V, Watts RW, Sullivan T, van Wijk RM. Intraoperative hypothermia is associated with an increased intensive care unit length-of-stay in patients undergoing elective open abdominal aortic aneurysm surgery: a retrospective cohort study. Anaesth Intensive Care. 2013;41(6):759-764.	Retrospective, cohort	102 patients having surgery	N/A	N/A	Temperature	Hypothermia increases the length of stay in the ICU.	IIIC
40	Uzoigwe CE, Khan A, Smith RP, et al. Hypothermia and low body temperature are common and associated with high mortality in hip fracture patients. Hip Int. 2014;24(3):237-242.	Nonexperimental	781 hip fracture patients	N/A	N/A	30-day mortality rate	Patients admitted with hypothermia had a 2.8 fold increase in mortality at 30 days.	IIIC
41	Qadan M, Gardner SA, Vitale DS, Lominadze D, Joshua IG, Polk HC Jr. Hypothermia and surgery: immunologic mechanisms for current practice. Ann Surg. 2009;250(1):134-140.	Descriptive	Blood samples of healthy volunteers	N/A	N/A	Cellular activity	Hypothermia exerts multiple effects at the cellular level, leading to impaired innate immune function.	IIIC
42	Caldwell JE, Heier T, Wright PM, et al. Temperature-dependent pharmacokinetics and pharmacodynamics of vecuronium. Anesthesiology. 2000;92(1):84-93.	Nonexperimental	6 male and 6 female volunteers	N/A	N/A	Vecuronium levels	Hypothermia alters the pharmacokinetics and pharmacodynamics of vecuronium.	IIIC
43	Holtzclaw BJ. Managing inadvertent and accidental hypothermia. Online J Clin Innov. 2008;10(2):1-58.	Systematic Review	N/A	N/A	N/A	N/A	Several recommendation for the prevention of hypothermia and rewarming.	IIIA
44	Mahoney CB, Odom J. Maintaining intraoperative normothermia: a meta-analysis of outcomes with costs. AANA J. 1999;67(2):155-163.	Systematic Review w/ Meta-Analysis	N/A	N/A	N/A	Presence of complications	A temperature less than 35.5 degrees C results in adverse outcomes	IIIB
45	Fred C, Ford S, Wagner D, Vanbrackle L. Intraoperatively acquired pressure ulcers and perioperative normothermia: a look at relationships. AORN J. 2012;96(3):251-260.	Nonexperimental	84 patients having pressure ulcers; 78 patients without pressure ulcers	N/A	N/A	Presence of hypothermia and pressure ulcers.	Perioperative hypothermia may be related to pressure ulcer development.	IIIB
46	Hannan EL, Samadashvili Z, Wechsler A, et al. The relationship between perioperative temperature and adverse outcomes after off-pump coronary artery bypass graft surgery. J Thorac Cardiovasc Surg. 2010;139(6):1568-1575.	Nonexperimental	2294 patients have off-pump CABG	N/A	N/A	Mortality, respiratory failure, unplanned operations	Normothermia should be maintained in postsurgical cardiac patients to minimize or avoid death and complications.	IIIA
47	Quiroga E, Tran NT, Hatsukami T, Starnes BW. Hypothermia is associated with increased mortality in patients undergoing repair of ruptured abdominal aortic aneurysm. J Endovasc Ther. 2010;17(3):434-438.	Descriptive	40 patients with ruptured AAAs	N/A	N/A	30-day mortality rate	Hypothermia increases the risk of mortality in pats having surgery for AAA	IIIB
48	Morehouse D, Williams L, Lloyd C, et al. Perioperative hypothermia in NICU infants: its occurrence and impact on infant outcomes. Adv Neonatal Care. 2014;14(3):154-164.	Prospective, case-control	108 infants having operative procedure	N/A	Neonates having surgery in the PACU to neonates having surgery in the OR	Presence of hypothermia.	Hypothermic neonates had a higher rate of adverse events and required more support interventions than normothermic	IIIB
49	Yamasaki H, Tanaka K, Funai Y, et al. The impact of intraoperative hypothermia on early postoperative adverse events after radical esophagectomy for cancer: a retrospective cohort study. J Cardiothorac Vasc Anesth. 2014;28(4):955-959.	Retrospective cohort study	121 patients having esophagectomy	N/A	N/A	Presence of complications	Intraoperative hypothermia leads to a greater risk of complications in patients undergoing esophagectomy.	IIIA

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50	Moslemi-Kebria M, El-Nashar SA, Aletti GD, Cliby WA. Intraoperative hypothermia during cytoreductive surgery for ovarian cancer and perioperative morbidity. Obstet Gynecol. 2012;119(3):590-596.	Descriptive	146 women having cytoreductive surgery for ovarian cancer	N/A	N/A	Presence of temp below 36 degrees C.	The patients with hypothermia had a increased chance of having complications and mortality.	IIIA
51	Coon D, Michaels J5, Gusenoff JA, Chong T, Purnell C, Rubin JP. Hypothermia and complications in postbariatric body contouring. Plast Reconstr Surg. 2012;130(2):443-448.	Nonexperimental	308 patients having post bariatric body contouring surgery 77 receiving prewarming.	N/A	N/A	Rate of hypothermia/ Seroma formation	Hypothermia leads to complications in body contouring patients.	IIIA
52	Poveda VB, Nascimento AS. The effect of intraoperative hypothermia upon blood transfusion needs and length of stay among gastrointestinal system cancer surgery. Eur J Cancer Care (Engl). 2017;26(6).	Nonexperimental	79 patients having elective, oncology surgery of the digestive tract.	N/A	N/A	Blood loss, PACU length of stay, patient temperature	Hypothermia was not related to blood loss, but was related to length of stay in PACU, need for more fluids, longer procedures, increased rate of admission to the ICU. Patients should be prewarmed and active warming should be performed during surgery.	IIIB
53	Billeter AT, Hohmann SF, Druen D, Cannon R, Polk HC Jr. Unintentional perioperative hypothermia is associated with severe complications and high mortality in elective operations. Surgery. 2014;156(5):1245-1252.	Descriptive	2138 patients having elective surgery	N/A	N/A	Duration of stay, death, complications,	707 of 2138 patients experienced hypothermia which is associated with at higher rate of morbidity and mortality.	IIIA
54	Sim R, Hall NJ, de Coppi P, Eaton S, Pierro A. Core temperature falls during laparotomy in infants with necrotizing enterocolitis. Eur J Pediatr Surg. 2012;22(1):45-49.	Nonexperimental	49 patients (52 total procedures) having surgery for necrotizing enterocolitis.	N/A	N/A	Frequency of transfusions	Blood transfusion requirement increased related to decrease in perioperative temperature.	IIIB
55	Konstantinidis A, Inaba K, Dubose J, et al. The impact of nontherapeutic hypothermia on outcomes after severe traumatic brain injury. J Trauma. 2011;71(6):1627-1631.	Nonexperimental	1281 SICU admissions for traumatic brain injury (140 hypothermic) (1141 normothermic)	N/A	N/A	Rate of mortality	The rate of mortality is increased in patient having hypothermia upon admission	IIIB
56	Seamon MJ, Wobb J, Gaughan JP, Kulp H, Kamel I, Dempsey DT. The effects of intraoperative hypothermia on surgical site infection: an analysis of 524 trauma laparotomies. Ann Surg. 2012;255(4):789-795.	Descriptive	524 patients having trauma laparotomies	N/A	N/A	Presence of SSI	Intraoperative hypothermia less than 35C adversely affects SSI rates after trauma laparotomy.	IIIB
57	Karalapillai D, Story DA, Calzavacca P, Licari E, Liu YL, Hart GK. Inadvertent hypothermia and mortality in postoperative intensive care patients: retrospective audit of 5050 patients. Anaesthesia. 2009;64(9):968-972.	Retrospective study	5050 postoperative patients admitted to the ICU	N/A	N/A	Death	Hypothermia is related to an increase risk of mortality	IIIA
58	Sumer BD, Myers LL, Leach J, Truelson JM. Correlation between intraoperative hypothermia and perioperative morbidity in patients with head and neck cancer. Arch Otolaryngol Head Neck Surg. 2009;135(7):682-686.	Descriptive	43 patients having ablative surgery for head and neck surgery	N/A	N/A	Complications post-op	In this group of patients there is a correlation between hypothermia and post-op complications.	IIIB

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59	Sun Z, Honar H, Sessler DI, et al. Intraoperative core temperature patterns, transfusion requirement, and hospital duration in patients warmed with forced air. Anesthesiology. 2015;122(2):276-285.	Descriptive	58,814 patients having surgery	N/A	N/A	Need for transfusion	Hypothermia increased the need for transfusion.	IIIA
60	Karalapillai D, Story D, Hart GK, et al. Postoperative hypothermia and patient outcomes after elective cardiac surgery. Anaesthesia. 2011;66(9):780-784.	Nonexperimental	43,158 patients of which 28,587 experienced hypothermia	N/A	N/A	Patient mortality	Persistent hypothermia was associated with a marked increase in the risk of death.	IIIA
61	Flaifel HA, Ayoub F. Esophageal temperature monitoring. Middle East J Anesthesiol. 2007;19(1):123-147.	Descriptive	53 patients having surgery	N/A	N/A	Patient temperature	Temperatures should be monitored and there was a large difference between skin temperature and esophageal temperature. Warming devices should be used. Hypothermia leads to hypoxemia.	IIIB
62	Romlin B, Petruson K, Nilsson K. Moderate superficial hypothermia prolongs bleeding time in humans. Acta Anaesthesiol Scand. 2007;51(2):198-201.	Observational study	15 volunteers	N/A	N/A	Bleeding time	Surgical site bleeding is increased by hypothermia	IIIB
63	Emmert A, Franke R, Brandes IF, et al. Comparison of conductive and convective warming in patients undergoing video-assisted thoracic surgery: a prospective randomized clinical trial. Thorac Cardiovasc Surg. 2017;65(5):362-366.	Nonexperimental	339 patients having lung resection procedures with intraoperative forced-air warming	N/A	N/A	Transfusion requirements, length of stay (LOS) in the intensive care unit (ICU), hospital LOS, and in hospital mortality	Hypothermic patients had a longer hospital length of stay.	IIIB
64	Yi J, Lei Y, Xu S, et al. Intraoperative hypothermia and its clinical outcomes in patients undergoing general anesthesia: national study in China. PLoS One. 2017;12(6):e0177221.	Nonexperimental	3132 patients having general anesthesia	N/A	N/A	Patient temperature, risk factors, complications.	Hypothermic patients had a higher rate of postoperative ICU admissions, longer PACU and hospital stay, but no difference in surgical site infection rates or 30-day mortality. Active warming, BMI greater than or equal to 25; higher baseline core temperature; and higher ambient temperature decreased the risk for developing hypothermia. Those patients with major-plus surgery and long anesthesia were at a greater risk of developing hypothermia.	IIIA
65	Kiekkas P, Theodorakopoulou G, Stefanopoulos N, Tsotas D, Baltopoulos GI. Postoperative hypothermia and mortality in critically ill adults: review and meta-analysis. Aust J Adv Nurs. 2011;28(4):60-67.	Systematic Review w/ Meta-Analysis	N/A	N/A	N/A	N/A	There is a positive association between postoperative hypothermia and hospital mortality in surgical ICU patients.	IIIB

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66	Frisch NB, Pepper AM, Jildeh TR, Shaw J, Guthrie T, Silverton C. Intraoperative hypothermia during surgical fixation of hip fractures. Orthopedics. 2016;39(6):e1170-e1177.	Nonexperimental	1541 patients who had operative fixation for a hip fracture	N/A	N/A	Postoperative complications, length of stay, 30-day readmission, risk factors	Hypothermia contributed to an increased risk of deep surgical-site infection and that lower BMI and increasing age are risk factors for intraoperative hypothermia.	IIIB
67	Scott EM, Buckland R. A systematic review of intraoperative warming to prevent postoperative complications. AORN J. 2006;83(5):1090-1113.	Systematic Review w/ Meta-Analysis	N/A	N/A	N/A	N/A	Hypothermia is linked to complications and temperature needs to be monitored.	IA
68	Rajagopalan S, Mascha E, Na J, Sessler DI. The effects of mild perioperative hypothermia on blood loss and transfusion requirement. Anesthesiology. 2008;108(1):71-77.	Systematic Review w/ Meta-Analysis	N/A	N/A	N/A	N/A	Hypothermia increases blood loss.	IA
69	Kurz A, Sessler DI, Lenhardt R. Perioperative normothermia to reduce the incidence of surgical-wound infection and shorten hospitalization. Study of Wound Infection and Temperature Group. N Engl J Med. 1996;334(19):1209-1215.	RCT	200 adults having colorectal surgery divided equally into the warmed and non-warmed group	Application of forced air warming and IV fluid warming	No warming devices	Presence of wound infection	Maintaining intraoperative hypothermia may decrease infectious complications and shorten hospitalizations in patients having colorectal surgery.	IA
70	Winkler M, Akca O, Birkenberg B, et al. Aggressive warming reduces blood loss during hip arthroplasty. Anesth Analg. 2000;91(4):978-984.	RCT	75 patients having primary, unilateral, cement-free total hip arthroplasty in the aggressively warmed group and 75 in the conventionally warmed group.	Aggressive warming to maintain core temperature near 36.5°C	Conventional warming to maintain core temperature near 36.0°C.	Blood loss	Maintaining the higher core temperature decreased the blood loss.	IB
71	Schmied H, Kurz A, Sessler DI, Kozek S, Reiter A. Mild hypothermia increases blood loss and transfusion requirements during total hip arthroplasty. Lancet. 1996;347(8997):289-292.	RCT	60 patients having total hip arthroplasty	Forced air warming device and warm IV fluids	No warming	Blood loss	Blood loss is increased in hypothermic patients.	IB
72	Frank SM, Fleisher LA, Breslow MJ, et al. Perioperative maintenance of normothermia reduces the incidence of morbid cardiac events. A randomized clinical trial. JAMA. 1997;277(14):1127-1134.	RCT	270 surgical patients who were scheduled for ICU admission post-op (143 control, 127 experimental)	FAW device applied	No warming device applied	Post cardiac complications	The warmed group had fewer cardiac complications.	IB
73	Baucom RB, Phillips SE, Ehrenfeld JM, et al. Defining intraoperative hypothermia in ventral hernia repair. J Surg Res. 2014;190(1):385-390.	Descriptive	553 adult patients having ventral hernia repair	N/A	N/A	Surgical site infections	There is no association between temperature and SSI in ventral hernia repairs and maintaining perioperative normothermia may only decrease SSIs in certain at-risk populations.	IIIA

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74	Young H, Bliss R, Carey JC, Price CS. Beyond core measures: identifying modifiable risk factors for prevention of surgical site infection after elective total abdominal hysterectomy. Surg Infect (Larchmt). 2011;12(6):491-496.	Retrospective cohort descriptive	192 patients having total abdominal hysterectomy	N/A	N/A	Presence of an SSI	Hypothermia is not associated with higher rate of SSI	IIIB
75	Constantine RS, Kenkel M, Hein RE, et al. The impact of perioperative hypothermia on plastic surgery outcomes: a multivariate logistic regression of 1062 cases. Aesthet Surg J. 2015;35(1):81-88.	Descriptive	1062 plastic surgical patients	N/A	N/A	Wound complications and warming status	The rates of surgical site infection, dehiscence, erythema, necrosis, seroma, hematoma, delayed wound healing, and composite wound problems were not affected by the presence of hypothermia in plastic surgery patients. Prewarming appears to have no significant effect on reducing the rate of hypothermia in plastic surgery, and prewarming does not significantly impact patient outcomes.	IIIB
76	Karalapillai D, Story D, Hart GK, et al. Postoperative hypothermia and patient outcomes after major elective non-cardiac surgery. Anaesthesia. 2013;68(6):605-611.	Retrospective observational	50689 non-cardiac post-op ICU patients	N/A	N/A	Death	Hypothermia is not associated with increased length of stay or mortality	IIIB
77	Fecho K, Lunney AT, Boysen PG, Rock P, Norfleet EA. Postoperative mortality after inpatient surgery: Incidence and risk factors. Ther Clin Risk Manag. 2008;4(4):681-688.	Retrospective cohort	12739 records from inpatient surgery patients	N/A	N/A	Deaths	Perioperative hypothermia did not effect the incidence of 48 hour and 30 day postoperative mortality after inpatient operations.	IIIA
78	Lehtinen SJ, Onicescu G, Kuhn KM, Cole DJ, Esnaola NF. Normothermia to prevent surgical site infections after gastrointestinal surgery: Holy grail or false idol? Ann Surg. 2010;252(4):696-704.	Descriptive	146 patients having GI surgery and 323 matched controls	N/A	N/A	Patient temperature	Pay-for-reporting measures focusing on perioperative normothermia may be of limited value in preventing SSI after GI surgery.	IIIA
79	Melton GB, Vogel JD, Swenson BR, Remzi FH, Rothenberger DA, Wick EC. Continuous intraoperative temperature measurement and surgical site infection risk: analysis of anesthesia information system data in 1008 colorectal procedures. Ann Surg. 2013;258(4):606-612; discussion 612-613.	Descriptive	1008 patients having colorectal surgery	N/A	N/A	SSI after 30 days	These is no correlation between hypothermia and surgical site infection.	IIIA
80	Baucom RB, Phillips SE, Ehrenfeld JM, et al. Association of perioperative hypothermia during colectomy with surgical site infection. JAMA Surg. 2015;150(6):570-575.	Nonexperimental	296 adult patients having elective segmental colectomy	N/A	N/A	30 day SSI	Intraoperative hypothermia is not associated with 30 day SSI rate.	IIIA
81	Brown MJ, Curry TB, Hyder JA, et al. Intraoperative hypothermia and surgical site infections in patients with class I/clean wounds: a case-control study. J Am Coll Surg. 2017;224(2):160-171.	Nonexperimental	1,079 SSI cases and 2,549 controls	N/A	N/A	Rate of SSI	There was no significant relationship between intraoperative hypothermia and SSI.	IIIA

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82	Geiger TM, Horst S, Muldoon R, et al. Perioperative core body temperatures effect on outcome after colorectal resections. Am Surg. 2012;78(5):607-612.	Nonexperimental	79 patients having elective segmental colectomy without a stoma.	N/A	N/A	Presence of length of stay (LOS), placement of a nasogastric tube, return to the operating room, placement of an interventional drain, diagnosed leak, and surgical site infection	The presence of hypothermia did not increase the rate of postoperative complications measured.	IIIB
83	Tedesco NS, Korpi FP, Pazdernik VK, Cochran JM. Relationship between hypothermia and blood loss in adult patients undergoing open lumbar spine surgery. J Am Osteopath Assoc. 2014;114(11):828-838.	Descriptive	168 procedures on 160 lumbar spine surgery patients	N/A	N/A	Amount of perioperative blood loss	No correlation exists between intraoperative blood loss and intraoperative core body temperature during spine surgery	IIIA
84	Long KC, Tanner EJ, Frey M, et al. Intraoperative hypothermia during primary surgical cytoreduction for advanced ovarian cancer: risk factors and associations with postoperative morbidity. Gynecol Oncol. 2013;131(3):525-530.	Nonexperimental	297 women having cytoreductive surgery for ovarian cancer.	N/A	N/A	Presence of complications	Intraoperative hypothermia was not associated with the development of postoperative complications.	IIIA
85	Linam WM, Margolis PA, Staat MA, et al. Risk factors associated with surgical site infection after pediatric posterior spinal fusion procedure. Infect Control Hosp Epidemiol. 2009;30(2):109-116.	Retrospective case-control study	Pediatric patients who underwent a spinal fusion. 44 infected compared to 132 non-infected	N/A	N/A	Presence of complications	Hypothermia during surgery appears to provide protection against SSI.	IIIA
86	Salazar F, Donate M, Boget T, et al. Intraoperative warming and post-operative cognitive dysfunction after total knee replacement. Acta Anaesthesiol Scand. 2011;55(2):216-222.	RCT	125 adults over 65 yrs. of age	Active warming	Standard care	Cognitive functioning	Maintaining an intraoperative tympanic temperature higher than 36 0 C increased the risk of postoperative cognitive dysfunction markedly and the concept of normothermia should be evaluated further.	IA
87	Smith CE, Sidhu RS, Lucas L, Mehta D, Pinchak AC. Should patients undergoing ambulatory surgery with general anesthesia be actively warmed? Internet J Anesthesiol. 2007;12(1).	RCT	336 ambulatory surgery patients with cases scheduled longer than 30 mins. (156 warming group, 180 control)	Active warming used	No warming used.	Presence of hypothermia, patient temperature	The combination of IV fluid warming and convective warming was more effective at maintaining normothermia than the application of warmed cotton blankets, but there was no significant reduction in PACU time.	IB

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88	Winslow EH, Cooper SK, Haws DM, et al. Unplanned perioperative hypothermia and agreement between oral, temporal artery, and bladder temperatures in adult major surgery patients. J Perianesth Nurs. 2012;27(3):165-180.	Prospective descriptive	64 Elective major surgery patients	N/A	Oral, temporal artery, and bladder temperatures	Temperatures	Temporal artery thermometers should not be used in perioperative areas and patients should be warmed using convective and conductive measures. Older age, BMI lower than 30, and OR ambient temperature, lower than 68 are factors that increase the risk of unplanned perioperative hypothermia.	IIIA
89	Rightmyer J, Singbartl K. Preventing perioperative hypothermia. Nursing. 2016;46(9):57-60.	Expert Opinion	N/A	N/A	N/A	N/A	Defines shivering and provides basic recommendations for controlling hypothermia.	VC
90	Nygren J, Thacker J, Carli F, et al. Guidelines for perioperative care in elective rectal/pelvic surgery: Enhanced Recovery After Surgery (ERAS®) society recommendations. Clin Nutr. 2012;31(6):801-816.	Guideline	N/A	N/A	N/A	N/A	Professional guidelines supporting monitoring of temperature during rectal surgery.	IVA
91	Temperature monitoring during surgical procedures. Malignant Hyperthermia Association of the United States. https://www.mhaus.org/mhau001/assets/File/Temperature%20Monitoring%20during%20Surgical%20Procedures.pdf. Developed 2012. Accessed March 23, 2019.	Guideline	N/A	N/A	N/A	N/A	Provides guidance for temperature monitoring	IVB
92	Torossian A, Brauer A, Hocker J, Bein B, Wulf H, Horn EP. Preventing inadvertent perioperative hypothermia. Dtsch Arztebl Int. 2015;112(10):166-172.	Guideline	N/A	N/A	N/A	N/A	Guideline for prevention of intraoperative hypothermia	IVA
93	Forbes SS, Eskicioglu C, Nathens AB, et al. Best Practice in General Surgery Committee, University of Toronto. Evidence-based guidelines for prevention of perioperative hypothermia. J Am Coll Surg. 2009;209(4):492-503..	Guideline	N/A	N/A	N/A	N/A	Recommends that hypothermia be prevented and supports the use of various monitoring and warming devices.	IVA
94	AST Standards of Practice for Maintenance of Normothermia in the Perioperative Patient. Littleton, CO: Association of Surgical Technologists; 2015.	Guideline	N/A	N/A	N/A	N/A	Provides guidance for maintaining normothermia, temperature monitoring	IVB
95	Gustafsson UO, Scott MJ, Schwenk W, et al. Guidelines for perioperative care in elective colonic surgery: Enhanced Recovery After Surgery (ERAS®) Society recommendations. Clin Nutr. 2012;31(6):783-800.	Guideline	N/A	N/A	N/A	N/A	Clinical practice guidelines for care of the patient having elective colonic surgery	IVA
96	Standards for Nurse Anesthesia Practice. Park Ridge, IL: American Association of Nurse Anesthetists; 2019.	Guideline	N/A	N/A	N/A	N/A	Provides guidance for care of the patient by the CRNA including temperature measurement and documentation..	IVB

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97	O'Grady NP, Barie PS, Bartlett JG, et al. Guidelines for evaluation of new fever in critically ill adult patients: 2008 update from the American College of Critical Care Medicine and the Infectious Diseases Society of America. Crit Care Med. 2008;36(4):1330-1349.	Guideline	N/A	N/A	N/A	N/A	Provides guidance for temperature monitoring of patients in the ICU.	IVC
98	National Collaborating Centre for Nursing and Supportive Care. The Management of Inadvertent Perioperative Hypothermia in Adults (NICE Clinical Guidelines, No. 65). London, UK: Royal College of Nursing; 2008. https://www.ncbi.nlm.nih.gov/books/NBK53797/. Accessed April 3, 2019.	Guideline	N/A	N/A	N/A	N/A	Provides recommendations for preventing hypothermia.	IVC
99	Neft M, Quraishi JA, Greenier E. A closer look at the standards for nurse anesthesia practice. AANA J. 2013;81(2):92-96.	Guideline	N/A	N/A	N/A	N/A	Provides recommendation regarding maintaining normothermia and temperature monitoring.	IVC
100	Standards for basic anesthetic monitoring. American Society of Anesthesiologists. https://www.asahq.org/standards-and-guidelines/standards-for-basic-anesthetic-monitoring. Amended 2015. Accessed April 3, 2019.	Consensus	N/A	N/A	N/A	N/A	Provides guidance for temperature monitoring	IVC
101	Sessler DI. Temperature monitoring: the consequences and prevention of mild perioperative hypothermia. South Afr J Anaesth Analg. 2014;20(1):25-31.	Expert opinion	N/A	N/A	N/A	N/A	Hypothermia is connected to various complications and the standard of care is to monitor temperature.	VB
102	Singh A. Strategies for the management and avoidance of hypothermia in the perioperative environment. J Perioper Pract. 2014;24(4):75-78.	Expert Opinion	N/A	N/A	N/A	N/A	Temperatures should be monitored. Rewarming techniques should be used. Hypothermic patients should be rewarmed before inducing anesthesia.	VB
103	Aksu C, Kuş A, Gürkan Y, Solak M, Toker K. Survey on postoperative hypothermia incidence in operating theatres of Kocaeli University. Turk Anesteziyoloji ve Reanimasyon Dernegi Dergisi. 2014;42(2):66-70.	Descriptive	564 surgical patients of all ages	N/A	N/A	Patient temperature	Temperatures and patient warming should be completed during administration of anesthesia.	IIIB
104	Eshraghi Y, Nasr V, Parra-Sanchez I, et al. An evaluation of a zero-heat-flux cutaneous thermometer in cardiac surgical patients. Anesth Analg. 2014;119(3):543-549.	Descriptive	105 patients having nonemergent cardiac surgery	N/A	N/A	Patient temperature	Zero-heat-flux temperature probes are an effective means for measuring core temperature	IIIB
105	Bair Hugger for Measuring Core Temperature During Perioperative Care. MedTech Innovation Briefing. London, England: National Institute for Health and Care Excellence.	Literature Review	N/A	N/A	N/A	N/A	The zero-heat-flux thermometer is an effective method of measuring core temperature.	VA
106	Brandes IF, Perl T, Bauer M, Brauer A. Evaluation of a novel noninvasive continuous core temperature measurement system with a zero heat flux sensor using a manikin of the human body. Biomed Tech (Berl). 2015;60(1):1-9.	Nonexperimental	Laboratory study	N/A	N/A	Manikin temperature	The zero heat flux sensor may be used to indicate core temperature	IIIC

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107	Schell-Chaple HM, Liu KD, Matthay MA, Puntillo KA. Rectal and bladder temperatures vs forehead core temperatures measured with SpotOn monitoring system. Am J Crit Care. 2018;27(1):43-50.	Nonexperimental	748 paired temperature measurements from 38 ICU patients	N/A	N/A	Patient temperature	Zero-heat-flux temperatures closely correlate to rectal and bladder temperatures	IIIB
108	Mäkinen M, Pesonen A, Jousela I, et al. Novel zero-heat-flux deep body temperature measurement in lower extremity vascular and cardiac surgery. J Cardiothorac Vasc Anesth. 2016;30(4):973-978.	Nonexperimental	15 patients having vascular and 15 patients having cardiac surgery	N/A	Zero-heat-flux thermometry skin temperature probe, pulmonary artery and nasopharynx in cardiac patients. Lower esophageal in vascular patients.	Patient temperatures	Zero-heat-flux thermometry	IIIC
109	Dahyot-Fizelier C, Lamarche S, Kerforne T, et al. Accuracy of zero-heat-flux cutaneous temperature in intensive care adults. Crit Care Med. 2017;45(7):e715-e717.	Nonexperimental	52 ICU patients		Esophageal temperature and arterial temperature to zero-heat-flux thermometry	Patient temperature variance	Zero-heat-flux thermometry is comparable to esophageal or iliac arterial temperature measurements.	IIIB
110	Iden T, Horn EP, Bein BF, Böhm RF, Beese JF, Höcker J. Intraoperative temperature monitoring with zero heat flux technology (3M SpotOn sensor) in comparison with sublingual and nasopharyngeal temperature: an observational study. Eur J Anaesthesiol. 2015;32(6):387-391.	Nonexperimental	83 sets of temperatures	N/A	Sublingual and nasopharyngeal temperatures to zero-heat-flux thermometry	Patient temperatures	Zero-heat-flux thermometry closely correlates to nasopharyngeal and sublingual and is adequate for clinical use.	IIIB
111	Kimberger O, Thell R, Schuh M, Koch J, Sessler DI, Kurz A. Accuracy and precision of a novel non-invasive core thermometer. Br J Anaesth. 2009;103(2):226-231.	Quasi-experimental	68 periop and ICU patients,	Double sensor thermometer	Distal esophageal thermometer	Patient temperature	The double sensor thermometer can be considered an alternative to distal esophageal core temperature.	IIB
112	Kimberger O, Saager L, Egan C, et al. The accuracy of a disposable noninvasive core thermometer. Can J Anaesth. 2013;60(12):1190-1196.	Quasi-experimental	36 patients having general and 20 having regional anesthesia	Bladder temperature	Esophageal or forehead temperature	Bladder, esophageal or forehead temperature	The temperatures obtained using a double sensor forehead thermometer is an accurate method for obtaining temperatures in patients undergoing regional and general anesthesia.	IIB
113	Hardcastle TC, Stander M, Kalafatis N, Hodgson RE, Gopalan D. External patient temperature control in emergency centres, trauma centres, intensive care units and operating theatres: a multi-society literature review. S Afr Med J. 2013;103(9):609-611.	Literature Review	N/A	N/A	N/A	N/A	Patients should be prewarmed if hypothermic before going to OR; active warming should be performed including warming anesthesia gases and IV fluids; temperatures should be measured especially core,	VA

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114	Lefrant JY, Muller L, de La Coussaye JE, et al. Temperature measurement in intensive care patients: comparison of urinary bladder, oesophageal, rectal, axillary, and inguinal methods versus pulmonary artery core method. Intensive Care Med. 2003;29(3):414-418.	Descriptive	42 ICU patients	N/A	N/A	Patient temperature	In ICU patients, urinary bladder and esophageal electronic thermometers reflect core temperature better than the electronic rectal thermometer which is better than inguinal and axillary gallium-in-glass thermometers.	IIIB
115	Erdling A, Johansson A. Core temperature—the intraoperative difference between esophageal versus nasopharyngeal temperatures and the impact of prewarming, age, and weight: a randomized clinical trial. AANA J. 2015;83(2):99-105.	RCT	52 patients having colorectal surgery (26 each group)	Pre and intraoperative warming	Intraoperative warming	Esophageal and nasopharyngeal temperatures	Prewarming decreases the risk of hypothermia	IB
116	Pawley MD, Martinsen P, Mitchell SJ, et al. Brachial arterial temperature as an indicator of core temperature: proof of concept and potential applications. J Extra Corpor. 2013;45(2):86-93.	Descriptive/ comparative	10 patients having coronary surgery with bypass	N/A	Brachial artery temperature, pulmonary artery, aortic arterial inflow, and nasopharynx temperatures	Patient temperature	The brachial artery is a good location to monitor temperature and is reflective of core temperature.	IIIB
117	Gobolos L, Philipp A, Ugocsai P, et al. Reliability of different body temperature measurement sites during aortic surgery. Perfusion. 2014;29(1):75-81.	Observational retrospective	22 patients having surgical repair of the thoracic aorta	N/A	N/A	Patient temperature	Tympanic temperature measurements should replace bladder and rectal temperature measurements in this group of patients.	IIIB
118	Langham GE, Maheshwari A, Contrera K, You J, Mascha E, Sessler DI. Noninvasive temperature monitoring in postanesthesia care units. Anesthesiology. 2009;111(1):90-96.	Quasi-experimental	50 patients having laparoscopic surgery	Bladder temperature	Compared oral, axillary, temporal artery, forehead skin-surface, forehead liquid- crystal display, infrared aural canal, deep forehead, and deep chest temperatures	Patient temperature	None of the eight methods tested were consistently within 0.50 C of the bladder temperature. Oral, deep forehead and temporal artery temperatures correlated reasonably well. Oral and if necessary axillary are good routes to use for post-operative temperature monitoring.	IIB
119	Calonder EM, Sendelbach S, Hodges JS, et al. Temperature measurement in patients undergoing colorectal surgery and gynecology surgery: a comparison of esophageal core, temporal artery, and oral methods. J Perianesth Nurs. 2010;25(2):71-78.	Quasi-experimental	23 patients undergoing colorectal or gynecology surgery	Oral and temporal artery temperatures	Esophageal temperature	Patient temperature	Oral and temporal artery temperatures are a clinically acceptable replacement core (esophageal) temperatures.	IIB
120	Hooper VD, Andrews JO. Accuracy of noninvasive core temperature measurement in acutely ill adults: the state of the science. Biol Res Nurs. 2006;8(1):24-34.	Systematic review	N/A	N/A	N/A	N/A	Temporal artery thermometry is inaccurate and evidence is lacking on use of tympanic thermometry	IIIA

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121	Hocker J, Bein B, Bohm R, Steinfath M, Scholz J, Horn EP. Correlation, accuracy, precision and practicability of perioperative measurement of sublingual temperature in comparison with tympanic membrane temperature in awake and anaesthetised patients. Eur J Anaesthesiol. 2012;29(2):70-74.	Quasi-experimental	171 surgical patients	Sublingual temperatures	Tympanic temperatures	Sublingual and tympanic temperatures	Sublingual temperatures maybe used in awake or anesthetized patients.	IIB
122	Sato H, Yamakage M, Okuyama K, et al. Urinary bladder and oesophageal temperatures correlate better in patients with high rather than low urinary flow rates during non-cardiac surgery. Eur J Anaesthesiol. 2008;25(10):805–809.	RCT	24 patients undergoing tympanoplasty	Urinary flow rate	Esophageal versus bladder temperature	Patient temperature	Urinary bladder temperature can be used as an indicator of core body temperature and is more accurate in patients having a high urinary flow rate.	IB
123	Moran JL, Peter JV, Solomon PJ, et al. Tympanic temperature measurements: are they reliable in the critically ill? A clinical study of measures of agreement. Crit Care Med. 2007;35(1):155-164.	Nonexperimental	110 adult patients	N/A	Tympanic, urinary, and axillary temperatures to pulmonary artery temperatures	Temperature	Bladder temperature reflects core temperature more so than tympanic methods.	IIIA
124	Sahin SH, Duran R, Sut N, Colak A, Acunas B, Aksu B. Comparison of temporal artery, nasopharyngeal, and axillary temperature measurement during anesthesia in children. J Clin Anesth. 2012;24(8):647-651.	Quasi-experimental	60 children	Axillary temperature	Temporal artery, nasopharynx	Temperatures	There was a correlation of temperatures taken at the temporal artery and nasopharynx locations. The correlation was less between the temporal artery, nasopharynx, and axillary temperatures. Therefore the temporal artery method may be used for temperature taking in children.	IIB
125	Smith J. Methods and devices of temperature measurement in the neonate: a narrative review and practice recommendations. Newborn Infant Nurs Rev. 2014;14(2):64-71.	Expert Opinion	N/A	N/A	N/A	N/A	Provides guidance as to how to select an appropriate method of taking the temperature in neonates	VA
126	Lawson L, Bridges EJ, Ballou I, et al. Accuracy and precision of noninvasive temperature measurement in adult intensive care patients. Am J Crit Care. 2007;16(5):485-496.	Observational	60 ICU patients	N/A	N/A	Patient temperature	Temperature measurements in order were oral and temporal artery, axillary, then ear measurements. Intubation effected the accuracy of oral temperatures and temporal artery temperatures were effected by diaphoresis and air flow across the face.	IIIB
127	Farnell S, Maxwell L, Tan S, Rhodes A, Philips B. Temperature measurement: comparison of non-invasive methods used in adult critical care. J Clin Nurs. 2005;14(5):632-639.	Nonexperimental	160 temperature sets from 25 adult intensive care patients	N/A	Pulmonary artery catheter temperature to chemical thermometer; tympanic thermometer	Patient temperature	The chemical thermometer was more reliable than the tympanic thermometer. However, compared with the pulmonary artery catheter.	IIIB

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128	Frommelt T, Ott C, Hays V. Accuracy of different devices to measure temperature. MEDSURG Nursing. 2008;17(3):171-174.	Quasi-experimental	84 postoperative patients	Temporal artery thermometer, oral disposable thermometer, tympanic infrared sensor	Oral electronic thermometer	Difference in temperature	All three methods showed statistically significant differences from the oral electronic thermometer with e tympanic device having the greatest difference.	IIA
129	Kiya T, Yamakage M, Hayase T, Satoh J, Namiki A. The usefulness of an earphone-type infrared tympanic thermometer for intraoperative core temperature monitoring. Anesth Analg. 2007;105(6):1688-1692.	Comparative	Adult patients having surgery under general anesthesia and cardia surgery (18 non-cardiac, 8 cardiac)	N/A	Esophageal temperature to earphone type infrared tympanic thermometer	Patient temperature	Earphone type infrared tympanic thermometer may be used for intraoperative temperature monitoring.	IIIB
130	Masamune T, Yamauchi M, Wada K, et al. The usefulness of an earphone-type infrared tympanic thermometer during cardiac surgery with cardiopulmonary bypass: clinical report. J Anesth. 2011;25(4):576-579.	Quasi-experimental	12 patients having coronary surgery with bypass	Ear phone thermometer	Rectal and nasopharyngeal thermometers	Correlation between different sites of temperature monitoring	There was correlation between the temperatures from the three different types of thermometers.	IIB
131	Apa H, Gözmen S, Bayram N, et al. Clinical accuracy of tympanic thermometer and noncontact infrared skin thermometer in pediatric practice: an alternative for axillary digital thermometer. Pediatr Emerg Care. 2013;29(9):992-997.	Descriptive	1639 readings for each method, 50 pediatric patients	N/A	Infrared tympanic and forehead noncontact thermometers to axillary digital thermometer	Difference between temperature readings	The infrared tympanic thermometer can be used to measure temperature in the pediatric population as can the noncontact infrared thermometer.	IIIB
132	Drake-Brockman TFE, Hegarty M, Chambers NA, Von Ungernsternberg BS. Monitoring temperature in children undergoing anaesthesia: a comparison of methods. Anaesth Intensive Care. 2014;42(3):315-320.	Comparative	200 children having elective non-cardiac surgery	N/A	Temperature recorded at tympanic membrane, temporal artery, axilla, skin on the chest, nasopharyngeal	Patient temperature	Temperatures varied between sites.	IIIA
133	Minzola DJ, Keele R. Relationship of tympanic and temporal temperature modalities to core temperature in pediatric surgical patients. AANA J. 2018;86(1):19-26.	Nonexperimental	106 pediatric surgical	N/A	N/A	Patient rectal, tympanic and temporal temperatures	Tympanic temperature correlates closer to rectal than temporal.	IIIB
134	Eyelade OR, Orimadegun AE, Akinyemi OA, Tongo OO, Akinyinka OO. Esophageal, tympanic, rectal, and skin temperatures in children undergoing surgery with general anesthesia. J Perianesth Nurs. 2011;26(3):151-159.	Nonexperimental	36 children having short duration surgeries	N/A	N/A	Patient temperature via esophageal, tympanic, skin and rectal	Tympanic temperature measurement with a probe is a good method of temperature monitoring if rectal or esophageal are not available. Skin temperature is effected by room temperature and other factors	IIIB

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135	Barringer LB, Evans CW, Ingram LL, Tisdale PP, Watson SP, Janken JK. Agreement between temporal artery, oral, and axillary temperature measurements in the perioperative period. J Perianesth Nurs. 2011;26(3):143-150.	Nonexperimental	86 adult surgical patients	N/A	Oral, temporal artery and axillary temperatures	Oral, temporal artery and axillary temperatures	Temporal artery monitoring may be used as method for obtaining noninvasive perioperative temperatures.	IIIA
136	Furlong D, Carroll DL, Finn C, Gay D, Gryglik C, Donahue V. Comparison of temporal to pulmonary artery temperature in febrile patients. Dimens Crit Care Nurs. 2015;34(1):47-52.	Nonexperimental	60 ICU patients	N/A	N/A	Difference between pulmonary and temporal temperature readings	Temporal artery is accurate within 0.5 degrees when compared to pulmonary artery temperature in febrile patients.	IIIB
137	McConnell E, Senseney D, George SS, Whipple D. Reliability of temporal artery thermometers. Medsurg Nurs. 2013;22(6):387-392.	Nonexperimental	34 adult surgical inpatients	N/A	Oral temperatures to temporal artery temperatures	Patient temperature	Temporal artery temperature is a reliable method to measure patient temperature.	IIIA
138	Kimberger O, Cohen D, Illievich U, Lenhardt R. Temporal artery versus bladder thermometry during perioperative and intensive care unit monitoring. Anesth Analg. 2007;105(4):1042-1047.	Comparative	35 neurosurgery patients in OR and ICU; 280 sets of measurements	N/A	N/A	Temperature	Temporal artery thermometry should not be used in the OR and it is not a substitute for bladder thermometry	IIIB
139	Stelfox HT, Straus SE, Ghali WA, Conly J, Laupland K, Lewin A. Temporal artery versus bladder thermometry during adult medical-surgical intensive care monitoring: an observational study. BMC Anesthesiol. 2010;10:13.	Prospective Observational	14 adult ICU patients, 736 pairs of temperatures	N/A	Bladder temperatures to temporal artery temperatures	Patient temperature via bladder or temporal artery sites.	Temporal artery not recommended when need accuracy for hyper or hypothermia.	IIIA
140	Hooper VD, Chard R, Clifford T, et al. ASPAN's evidence-based clinical practice guideline for the promotion of perioperative normothermia: second edition. J Perianesth Nurs. 2010;25(6):346-365.	Guideline	N/A	N/A	N/A	N/A	Summarizes measures to take to prevent hypothermia throughout the entire perioperative time frame.	IVA
141	Asher C, Northington LK. SPN Position Statement: Temperature Measurement. Chicago, IL: Society of Pediatric Nurses; 2016. http://www.pedsnurses.org/p/cm/ld/fid=220&tid=28&sid=1574 . Accessed April 3, 2019.	Guideline	N/A	N/A	N/A	N/A	Guideline for taking temperatures in infants and neonates	IVC
142	Counts D, Acosta M, Holbrook H, et al. Evaluation of temporal artery and disposable digital oral thermometers in acutely ill patients. Medsurg Nurs. 2014;23(4):239-250.	Nonexperimental	48 acutely ill patients	N/A	N/A	Oral, temporal artery and axillary temperatures	The digital disposable oral and temporal artery thermometers had precision values of ≤ 0.5˚C but should not replace electronic oral nondisposable thermometers.	IIIA
143	Fetzer SJ, Lawrence A. Tympanic membrane versus temporal artery temperatures of adult perianesthesia patients. J Perianesth Nurs. 2008;23(4):230-236.	Descriptive correlational	222 adult surgical patients	N/A	Temporal artery to tympanic membrane	Patient temperature	Tympanic membrane thermometers or temporal artery thermometers can be used but should not compare the results.	IIIB

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144	Washington GT, Matney JL. Comparison of temperature measurement devices in post anesthesia patients. J Perianesth Nurs. 2008;23(1):36-48.	Descriptive correlational	727 surgical patients	N/A	Chemical clinical thermometer to electronic thermometer	Temperature	Either the electronic thermometer or the chemical clinical thermometers may be used but should use only one type of measure on each person.	IIIA
145	Collins JB, Verheyden CN, Mahabir RC. Core measures: implications for plastic surgery. Plast Reconstr Surg. 2013;131(6):1266-1271.	Expert opinion	N/A	N/A	N/A	N/A	Temperatures should be monitored in all plastic surgery patients having a procedure lasting longer than 60 minutes	VB
146	Arshad M, Qureshi WA, Ali A, Haider SZ. Frequency of hypothermia during general anaesthesia. Pak J Med Health Sci. 2011;5(3):549-552.	Descriptive longitudinal	300 patients 15-60 yrs. having general anesthesia for > 1 hour.	N/A	N/A	Patient Temperature	Hypothermia occurred in 25 % of the patients therefore the patient's temperature should be monitored.	IIIC
147	Horosz B, Malec-Milewska M. Methods to prevent intraoperative hypothermia. Anaesthesiol Intensive Ther. 2014;46(2):96-100.	Literature Review	N/A	N/A	N/A	N/A	Active warming methods should be used for procedures over 30 minutes, and they should be applied pre-induction and in long procedures and in high-risk patients multiple methods should be used.	VA
148	Guideline for health care information management. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2019:371-400.	Guideline	N/A	N/A	N/A	N/A	Recommendations for documenting patient care information	IVB
149	Guideline for team communication. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2019:1093-1120.	Guideline	N/A	N/A	N/A	N/A	Recommendations for sharing of patient care information	IVA
150	Yokoe DS, Anderson DJ, Berenholtz SM, et al. A compendium of strategies to prevent healthcare-associated infections in acute care hospitals: 2014 updates. Infect Control Hosp Epidemiol. 2014;35(8):967-977.	Guideline	N/A	N/A	N/A	N/A	Guideline describing steps to take to prevent SSI.	IVB
151	Fleisher LA, Fleischmann KE, Auerbach AD, et al. 2014 ACC/AHA guideline on perioperative cardiovascular evaluation and management of patients undergoing noncardiac surgery: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. Circulation. 2014;130(24):2215-2245.	Guideline	N/A	N/A	N/A	N/A	Maintaining perioperative normothermia may decrease cardiac events inpatients having non-cardiac surgery.	IVA
152	Berrios-Torres SI, Umscheid CA, Bratzler DW, et al. Centers for Disease Control and Prevention guideline for the prevention of surgical site infection, 2017. JAMA Surg. 2017;152(8):784-791.	Guideline	N/A	N/A	N/A	N/A	Guidelines for maintaining normothermia	IVA

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153	Chon JY, Lee JY. The effects of surgery type and duration of tourniquet inflation on body temperature. J Int Med Res. 2012;40(1):358-365.	Observational study	60 patients having knee surgery with a tourniquet	N/A	N/A	Core temperature	In knee surgery with a tourniquet, the drop in core body temperature after tourniquet deflation correlates is greater with increased tourniquet time and in arthroscopic procedures compared to open procedures	IIIA
154	Khan SA, Aurangzeb M, Zarin M, Khurshid M. Temperature monitoring and perioperative heat loss. J Postgrad Med Inst. 2010;24(2):85-90.	Observational	32 patients undergoing major lower limb vascular surgery	N/A	N/A	Patient temperature	The amount of heat lost is related to the amount of time spent in the perioperative environment and on the measures used to prevent heat loss.	IIIC
155	Leijtens B, Koeter M, Kremers K, Koeter S. High incidence of postoperative hypothermia in total knee and total hip arthroplasty: a prospective observational study. J Arthroplasty. 2013;28(6):895-898.	Prospective, observational study	262 TKA 426 THA	N/A	N/A	Temperature after peri- prosthetic closure	Incidence of hypothermia was 26.3% for Total hip and 28% for TKA. Study done in the Netherlands.	IIIB
156	Parodi D, Tobar C, Valderrama J, et al. Hip arthroscopy and hypothermia. Arthroscopy. 2012;28(7):924-928.	Observational	73 patients having hip arthroscopic surgery	N/A	N/A	Patient temperature	Factors contributing to development of hypothermia included prolonged surgery time, low body mass index, low blood pressure, low temp of irrigation fluid (with significance on surgery time and fluid temp).	IIIB
157	Hoda MR, Popken G. Maintaining perioperative normothermia during laparoscopic and open urologic surgery. J Endourol. 2008;22(5):931-938.	Quasi-experimental	300 patients having urological procedures (53 open, 247 laparoscopic)	Temperatures of patients having laparoscopic surgery	Temperatures of patients having open surgery	End of surgery core temperature	A combination of an upper and lower body forced-air warmer and a single warming blanket is effective at maintaining normothermia in laparoscopic and open urologic procedures.	IIB
158	Mehta OH, Barclay KL. Perioperative hypothermia in patients undergoing major colorectal surgery. ANZ J Surg. 2014;84(7-8):550-555.	Nonexperimental	255 patients having colorectal surgery	N/A	N/A	Patient temperature	Temperature monitoring and prewarming should be performed.	IIIB
159	de Brito Poveda V, Galvão C, Santos CB. Factors associated to the development of hypothermia in the intraoperative period. Rev Lat Am Enfermagem. 2009;17(2):228-233.	Prospective, descriptive, correlational study	70 patients having elective surgery lasting at least one hour.	N/A	N/A	Patient temperature	The type and duration of anesthesia, body mass index, and operating room temperature were directly associated with a drop in the mean body temperature.	IIIB
160	Guideline for care of patients undergoing pneumatic tourniquet-assisted procedures. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2019:607-636.	Guideline	N/A	N/A	N/A	N/A	Provides guidance for care of the patient experiencing pneumatic tourniquet-assisted procedures.	IVB
161	Guideline for prevention of venous thromboembolism. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2019:1123-1152.	Guideline	N/A	N/A	N/A	N/A	Provides guidance for preventing venous thromboembolism.	IVB

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162	Standards of perioperative nursing. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2015:693-708. https://www.aorn.org/guidelines/clinical-resources/aorn-standards. Accessed April 3, 2019.	Guideline	N/A	N/A	N/A	N/A	Provides guidance for care of the patient by the RN.	IVB
163	Huh J, Cho YB, Yang MK, Yoo YK, Kim DK. What influence does intermittent pneumatic compression of the lower limbs intraoperatively have on core hypothermia? Surg Endosc. 2013;27(6):2087-2093.	RCT	47 patients having laparoscopic resection for colorectal cancer (23 without SCDs, 24 with SCDs)	Intermittent pneumatic compression devices on	Intermittent pneumatic compression devices off	Core temperature	Use of intermittent compressions devices caused a decrease in temperature therefore temperature should be monitored.	IA
164	Han SB, Gwak MS, Choi SJ, et al. Risk factors for inadvertent hypothermia during adult living-donor liver transplantation. Transplant Proc. 2014;46(3):705-708.	Retrospective	134 patients having living donor liver transplants	N/A	N/A	Patient temperature	Low body surface area, emergency of end- stage-liver disease (acute or acute-on-chronic vs chronic) are risk factors for hypothermia.	IIIB
165	Araz C, Pirat A, Unlukaplan A, et al. Incidence and risk factors of intraoperative adverse events during donor lobectomy for living-donor liver transplantation: a retrospective analysis. Exp Clin Transplant. 2012;10(2):125-131.	Retrospective descriptive	182 patients undergoing donor lobectomy for living-donor liver transplantation	N/A	N/A	Temperature	Increased age was a predictor of hypothermia and IV fluids should be used.	IIIA
166	Talley HC, Talley CH. AANA Journal course update for nurse anesthetists—part 5: evaluation of older adults. AANA J. 2009;77(6):451-460.	Expert opinion	N/A	N/A	N/A	N/A	The elderly are more prone to hypothermia therefore methods to maintain normothermia should be instituted.	VB
167	Yang R, Wolfson M, Lewis MC. Unique aspects of the elderly surgical population: an anesthesiologist's perspective. Geriatr Orthop Surg Rehabil. 2011;2(2):56-64.	Expert opinion	N/A	N/A	N/A	N/A	Describes the steps to take to decrease the risk for hypothermia in the elderly.	VA
168	Maintaining perioperative normothermia. J Perioper Pract. 2017;27(1):4-9.	Expert Opinion	N/A	N/A	N/A	N/A	Provides a summary of risk factors for hypothermia and recommendations for care to prevent hypothermia.	VB
169	Guedes Lopes I, Sousa Magalhães AM, Abreu dS, Batista dA. Preventing perioperative hypothermia: an integrative literature review. Revista de Enfermagem Referência. 2015;8(1):147-155.	Systematic Review	N/A	N/A	N/A	N/A	Active warming is more effective than passive. Circulating water garments and forced air system were most effective. A combination of methods is better than just a single method.	IIIC
170	Eich C, Zink W, Schwarz SKW, Radke O, Bräuer A. A combination of convective and conductive warming ensures pre- and post-bypass normothermia in paediatric cardiac anaesthesia. Appl Cardiopulm Pathophysiol. 2009;13(1):3-10.	Nonexperimental	26 children having cardiac surgery	N/A	N/A	Patient temperature	A combination of convective and conductive warming resulted in normothermia before and after CPB	IIIC

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171	Pagnocca ML, Tai EJ, Dwan JL. Temperature control in conventional abdominal surgery: Comparison between conductive and the association of conductive and convective warming. Rev Bras Anestesiol. 2009;59(1):56-66.	RCT	43 patients undergoing exploratory laparotomy (24 mattress only , 19 combination	Circulating water mattress plus forced air warming	Circulating water mattress	Patient temperature	The combined warming method was more effective at maintaining normothermia than the circulating water mattress alone.	IB
172	Okeke LI. Effect of warm intravenous and irrigating fluids on body temperature during transurethral resection of the prostate gland. BMC Urol. 2007;7:15.	RCT	120 patient having TURP which were divided into three equal groups	Warmed IV fluids; warmed IV fluids plus warmed irrigation fluids	Room temperature IV and irrigation fluids.	Patient temperature	Warming of IV plus irrigation fluids decreases the rate of hypothermia compared to just warming of IV fluids or having both solutions at room temperature.	IB
173	Cho YJ, Lee SY, Kim TK, Hong DM, Jeon Y, eds. Effect of prewarming during induction of anesthesia on microvascular reactivity in patients undergoing off-pump coronary artery bypass surgery: a randomized clinical trial. Plos One. 2016;11(7):e0159772.	RCT	40 patients having OPCAB	Prewarming	No prewarming	Patient temperature	Prewarming with a forced air system results in a smaller decrease in intraoperative temperature.	IC
174	Minchin I. Management of temperature & major abdominal surgery. Dissector. 2009;37(3):13-15.	Quasi-experimental	10 patients having elective abdominal surgery	Use of pre-warming	No pre-warming	Temperature	Pre-warming should be performed	IIC
175	Koc BB, Schotanus MGM, Kollenburg JAPAC, Janssen MJA, Tijssen F, Jansen EJP. Effectiveness of early warming with self-warming blankets on postoperative hypothermia in total hip and knee arthroplasty. Orthop Nurs. 2017;36(5):356-360.	RCT	105 patients having TKA or THA (48 in intervention group) (57 in control group)	86 minute prewarming using a self warming blanket	Forced air warming applied after prepping	Patient temperature	Early warming with self-warming blankets is more effective at reducing the incidence of hypothermia than forced air warming devices applied after skin prep.	IC
176	Munday J, Hines S, Wallace K, Chang AM, Gibbons K, Yates P. A systematic review of the effectiveness of warming interventions for women undergoing cesarean section. Worldviews Evid Based Nurs. 2014;11(6):383-393.	Systematic Review	N/A	N/A	N/A	N/A	IV fluid warming, forced air warming and under- body carbon polymer mattresses were effective at preventing intraoperative hypothermia	IA
177	Gorges M, Ansermino JM, Whyte SD. A retrospective audit to examine the effectiveness of preoperative warming on hypothermia in spine deformity surgery patients. Paediatr Anaesth. 2013;23(11):1054-1061.	Retrospective	55 no warming, 105 warming. pediatric patients having spinal surgery	N/A	No warming to preoperative warming	Patient temperature	Preoperative warming reduces the amount of time the patient is hypothermic	IIIB
178	Gorges M, West NC, Cheung W, Zhou G, Miyanji F, Whyte SD. Preoperative warming and undesired surgical and anesthesia outcomes in pediatric spinal surgery—a retrospective cohort study. Paediatr Anaesth. 2016;26(9):866-875.	Nonexperimental	334 patients having spinal surgery	N/A	N/A	Patient temperature and rates of transfusion.	Prewarming reduced interoperative hypothermia and was associated with a reduction in allogenic blood transfusion	IIIB

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179	Moola S, Lockwood C. Effectiveness of strategies for the management and/or prevention of hypothermia within the adult perioperative environment. Int J Evid Based Healthc. 2011;9(4):337-345.	Systematic Review	N/A	N/A	N/A	N/A	Use active warming strategies (forced air warming); discontinue passive warming in vulnerable groups; commence warming preoperatively; in extended surgeries or aged patients use multiple active warming strategies; warm fluids designated for intraoperative administration; water garment warmer was significantly more effective than forced air warming.	IA
180	Perl T, Peichl LH, Reyntjens K, Deblaere I, Zaballos JM, Bräuer A. Efficacy of a novel prewarming system in the prevention of perioperative hypothermia. A prospective, randomized, multicenter study. Minerva Anestesiol. 2014;80(4):436-443.	RCT	90 patients having surgery lasting 30-120 minutes. (30 in each group)	Active preoperative prewarming with a forced-air warmer connected to a prewarming suit	Standard preoperative insulation, passive preoperative insulation with a commercial prewarming suit	Patient temperature	Active prewarming with a forced-air warmer and an insulating prewarming suit achieves significantly higher core temperatures during anesthesia and at the end of surgery when compared to commercial or conventional insulation.	IA
181	de Brito Poveda V, Clark AM, Galvão CM. A systematic review on the effectiveness of prewarming to prevent perioperative hypothermia. J Clin Nurs. 2013;22(7-8):906-918.	Systematic Review	N/A	N/A	N/A	N/A	Forced air warming is effective as a method for prewarming.	IA
182	Rosenkilde C, Vamosi M, Lauridsen J, Hasfeldt D. Efficacy of prewarming with a self-warming blanket for the prevention of unintended perioperative hypothermia in patients undergoing hip or knee arthroplasty. J Perianesth Nurs. 2017;32(5):419-428.	Quasi-experimental	30 patients having elective primary hip or knee arthroplasty (15 in each group.	Prewarming using self-warming blanket	No prewarming	Patient temperature	Prewarming with a self-warming blanket reduces unintentional perioperative hypothermia.	IIB
183	Llewellyn L. Effect of pre-warming on reducing the incidence of inadvertent peri-operative hypothermia for patients undergoing general anaesthesia: a mini-review. British Journal of Anaesthetic & Recovery Nursing. 2013;14(1-2):3-10.	Systematic Review	N/A	N/A	N/A	N/A	Prewarming should be performed preoperatively.	IA
184	Roberson MC, Dieckmann LS, Rodriguez RE, Austin PN. A review of the evidence for active preoperative warming of adults undergoing general anesthesia. AANA J. 2013;81(5):351-356.	Systematic review	N/A	N/A	N/A	N/A	Prewarming is effective	IIB
185	Cassey JG, King RA, Armstrong P. Is there thermal benefit from preoperative warming in children? Paediatr Anaesth. 2010;20(1):63-71.	RCT	60 children having surgery (30 in each group)	Ambient temperature at 26 degrees C.	Ambient temperature at 21 degrees C.	Patient temperature	Prewarming by increasing the ambient temperature increased the core temperature of the participants.	IB

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186	Jo YY, Chang YJ, Kim YB, Lee S, Kwak HJ, eds. Effect of preoperative forced-air warming on hypothermia in elderly patients undergoing transurethral resection of the prostate. Urol J. 2015;12(5):2366-2370.	RCT	50 patients having TURP (25 each group)	Prewarming	No prewarming	patient temperature	Prewarming reduced the incidence of moderate and profound hypothermia but did not eliminate hypothermia completely.	IB
187	Melling AC, Ali B, Scott EM, Leaper DJ. Effects of preoperative warming on the incidence of wound infection after clean surgery: a randomised controlled trial. Lancet. 2001;358(9285):876-880.	RCT	421 patients having breast, varicose vein, or hernia surgery.	Prewarming	No prewarming	Surgical site infection	Prewarming before surgery reduced infection rates in clean surgery.	IA
188	Shin KM, Ahn JH, Kim IS, et al. The efficacy of pre-warming on reducing intraprocedural hypothermia in endovascular coiling of cerebral aneurysms. BMC Anesthesiol. 2015;15:8.	RCT	72 patients having endovascular treatment of cerebral aneurysms. (36 in each group)	Prewarming	No prewarming	Patient temperature	Pre-warming significantly reduced the rate of intraoperative hypothermia	IA
189	Wong PF, Kumar S, Bohra A, Whetter D, Leaper DJ. Randomized clinical trial of perioperative systemic warming in major elective abdominal surgery. Br J Surg. 2007;94(4):421-426.	RCT	103 patients having major elective abdominal surgery; (56 control group, 47 warming group).	Prewarming 2 hours before surgery	No prewarming	Blood loss and complication rates.	Prewarming helped decrease blood loss and complication rates.	IB
190	Horn EP, Bein B, Broch O, et al. Warming before and after epidural block before general anaesthesia for major abdominal surgery prevents perioperative hypothermia: a randomised controlled trial. Eur J Anaesthesiol. 2016;33(5):334-340.	RCT	99 patients having major abdominal surgery and combined epidural and general anesthesia divided into three groups (32 no warming, 33 warming after epidural, 34 warming before and after epidural)	15 minutes prewarming after epidural insertion, 15 minutes prewarming before and after epidural insertion.	Warm blankets	Patient temperature	Pre warming both before or before and after the administration of epidural anesthesia assists with preventing hypothermia.	IB
191	Wasfie TJ, Barber KR. Value of extended warming in patients undergoing elective surgery. Int Surg. 2015;100(1):105-108.	RCT	94 (46 warming group, 48 control group)	Portable warming gown applied preoperatively	Standard warming procedures	Patient temperature	The incidence of hypothermia is decreased when patients are prewarmed.	IB
192	D'Angelo Vanni SM, Castiglia YM, Ganem EM, et al. Preoperative warming combined with intraoperative skin-surface warming does not avoid hypothermia caused by spinal anesthesia in patients with midazolam premedication. Sao Paulo Med J. 2007;125(3):144-149.	RCT	30 patients undergoing lower abdominal surgery	Prewarming for 45 minutes plus intraoperative warming, intraoperative warming only	No warming.	Patient temperature	45 minutes of prewarming combined with intraoperative warming minimized hypothermia, but did not eliminate it.	IB
193	Connelly L, Cramer E, DeMott Q, et al. The optimal time and method for surgical prewarming: a comprehensive review of the literature. J Perianesth Nurs. 2017;32(3):199-209.	Systematic Review	N/A	N/A	N/A	N/A	Patients should be prewarmed for 30 minutes ideally but at least a minimum of 10 minutes. Forced air warming was the best method for prewarming.	IIIA

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194	Nicholson M. A comparison of warming interventions on the temperatures of inpatients undergoing colorectal surgery. AORN J. 2013;97(3):310-322.	RCT	66 patients having colon surgery (32 control, 34 experimental)	Prewarming	No prewarming	Presence of hypothermia	Prewarming did not reduce the number of patients experiencing hypothermia.	IC
195	Rowley B, Kerr M, Van Poperin J, Everett C, Stommel M, Lehto RH. Perioperative warming in surgical patients: a comparison of interventions. Clin Nurs Res. 2015;24(4):432-441.	Quasi-experimental	55 surgical patients in each group	Prewarming, increase ambient temperature, prewarming plus increase ambient temperature.	Warming started after induction	Patient temperature	Prewarming or increase ambient temperature or prewarming plus increase ambient temperature had no greater impact on patient temperature when compared to just warming after induction.	IIC
196	Adriani MB, Moriber N. Preoperative forced-air warming combined with intraoperative warming versus intraoperative warming alone in the prevention of hypothermia during gynecologic surgery. AANA J. 2013;81(6):446-451.	Quasi-experimental	30 Patients having gynecologic surgery	Prewarming for 30 minutes plus intraoperative warming	Intraoperative warming only	Patient temperature	Preoperative warming with a forced air warming gown offers no benefit over conventional therapy in maintaining normothermia in the perioperative period.	IIA
197	Shukry M, Matthews L, de Armendi AJ, et al. Does the covering of children during induction of anesthesia have an effect on body temperature at the end of surgery? J Clin Anesth. 2012;24(2):116-120.	RCT	49 children having minor surgery	Application of a cotton blanket and forced air warming device pre-anesthesia induction	No covers	Patient temperature	Application of cotton blankets and a forced air warming device after the patient entered the OR but before induction did not result in a higher core temperature when compared to no cotton blankets or a forced air warming device being applied.	IA
198	Akhtar Z, Hesler BD, Fiffick AN, et al. A randomized trial of prewarming on patient satisfaction and thermal comfort in outpatient surgery. J Clin Anesth. 2016;33:376-385.	RCT	51 who received no prewarming and 51 who received 60 minutes of prewarming.	Prewarming	No prewarming	Patient temperature, EVAN-G satisfaction score, thermal comfort	The researchers found forced-air prewarming increased the sensation of warmth preoperatively and postoperatively but did not significantly reduce redistribution hypothermia; and the mean postoperative core temperatures were not significantly different between groups.	IA
199	Munday J, Osborne S, Yates P, Sturgess D, Jones L, Gosden E. Preoperative warming versus no preoperative warming for maintenance of normothermia in women receiving intrathecal morphine for cesarean delivery: a single-blinded, randomized controlled trial. Anesth Analg. 2018;126(1):183-189.	RCT	50 C-section patients. (25 each group)	Prewarming	No prewarming	Patient temperature	20 minutes of prewarming is not effective at preventing intraoperative temperature drop in women having intrathecal morphine	IB
200	Lassen K, Soop M, Nygren J, et al. Consensus review of optimal perioperative care in colorectal surgery: Enhanced Recovery After Surgery (ERAS) group recommendations. Arch Surg. 2009;144(10):961-969.	Consensus	N/A	N/A	N/A	N/A	Upper-body forced air heating cover should be used in addition to warming to 2 hours before and after surgery	IVC

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201	Lassen K, Coolsen M, Slim K, et al. Guidelines for perioperative care for pancreaticoduodenectomy: Enhanced Recovery After Surgery (ERAS®) Society recommendations. Clin Nutr. 2012;31(6):817-830.	Guideline	N/A	N/A	N/A	N/A	Recommend using circulating- water garment systems or forced air warming devices	IVA
202	Horn EP, Schroeder F, Gottschalk A, et al. Active warming during cesarean delivery. Anesth Analg. 2002;94(2):409-414.	RCT	30 patients having elective C-section (15 in each group).	Active warming including prewarming	Blankets	Patient temperature	15 minutes of prewarming in addition to intraoperative warming prevents hypothermia	IA
203	Chung SH, Lee BS, Yang HJ, et al. Effect of preoperative warming during cesarean section under spinal anesthesia. Korean J Anesthesiol. 2012;62(5):454-460.	RCT	45 patients undergoing elective cesarean delivery with spinal anesthesia. (15 in each group)	Prewarming by either warm IV fluids or forced air warming	No prewarming applied	Patient temperature	Prewarming by forced air- warming devices and warmed fluid prevents hypothermia in patients undergoing elective cesarean delivery with spinal anesthesia.	IB
204	Andrzejowski J, Hoyle J, Eapen G, Turnbull D. Effect of prewarming on post-induction core temperature and the incidence of inadvertent perioperative hypothermia in patients undergoing general anaesthesia. Br J Anaesth. 2008;101(5):627-631.	RCT	31 prewarmed. 37 control group. Patients undergoing spinal surgery under general anesthesia	Prewarming	No prewarming	Patient temperature	Prewarming with a forced air system results in a smaller decrease in intraoperative temperature.	IB
205	Warttig S, Alderson P, Campbell G, Smith AF. Interventions for treating inadvertent postoperative hypothermia. Cochrane Database of Syst Rev. 2014;11:CD009892.	Systematic Review w/ Meta-Analysis	N/A	N/A	N/A	N/A	Mean time taken to achieve normothermia was less when forced air warming was applied compared to warm or room temperature blankets, and circulating hot water devices. No statistically significant difference in rewarming time between thermal insulation and cotton blankets	IA
206	Alderson P, Campbell G, Smith AF, Warttig S, Nicholson A, Lewis SR. Thermal insulation for preventing inadvertent perioperative hypothermia. Cochrane Database Syst Rev. 2014:6:CD009908.	Systematic Review w/ Meta-Analysis	N/A	N/A	N/A	N/A	Forced air warming is more effective at maintaining normothermia than reflective blankets or clothing and no clear evidence indicating that reflective blankets or clothing increases a person's temperature.	IA
207	Tjoakarfa C, David V, Ko A, Hau R. Reflective blankets are as effective as forced air warmers in maintaining patient normothermia during hip and knee arthroplasty surgery. J Arthroplasty. 2017;32(2):624-627.	RCT	50 patients undergoing hip or knee arthroplasty who were warmed preoperatively(25 in each group).	Reflective blankets	Forced air warming	Patient temperature	After a period of prewarming, reflective blankets are as effective as forced air warming devices for maintaining normothermia in patients having hip or knee arthroplasty.	IC

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208	Koëter M, Leijtens B, Koëter S. Effect of thermal reflective blanket placement on hypothermia in primary unilateral total hip or knee arthroplasty. J Perianesth Nurs. 2013;28(6):347-352.	RCT	58 patients having hip or knee arthroplasty divided equally into 2 groups	Reflective blanket	Two cotton blankets	Patient temperature	Use of a reflective thermal blanket is not effective in decreasing the incidence of hypothermia when compared with the use of two cotton blankets.	IC
209	Koenen M, Passey M, Rolfe M. "Keeping them warm"—a randomized controlled trial of two passive perioperative warming methods. J Perianesth Nurs. 2017;32(3):188-198.	RCT	Patients having surgery of one hour or less. (179 in reflective blanket group, 141 in cotton blanket group)	Reflective blanket	Cotton blanket	Temporal artery and foot temperature.	Reflective blankets are more effective than cotton blankets for perioperative temperature management.	IB
210	Kurnat-Thoma E, Roberts MM, Corcoran EB. Perioperative heat loss Prevention—a feasibility trial. AORN J. 2016;104(4):307-319.	Quasi-experimental	110 surgical patient warmed with reflective blanket; 114 patients warmed with cotton blankets	Reflective blankets	Cotton blankets	Patient temperature	Use of reflective blankets did not create a cost saving or decreased rate of hypothermia when compared to use of cotton blankets.	IIB
211	Lee HY, Kim G, Shin Y. Effects of perioperative warm socks-wearing in maintaining core body temperature of patients undergoing spinal surgery. J Clin Nurs. 2018;27(7):1399-1407.	Quasi-experimental	72 patients having spinal surgery (36 in each group).	Warm socks	No socks	Patient temperature	Wearing warm socks helped decrease the rate of hypothermia	IIC
212	Cobb B, Cho Y, Hilton G, Ting V, Carvalho B. Active warming utilizing combined IV fluid and forced-air warming decreases hypothermia and improves maternal comfort during cesarean delivery: a randomized control trial. Anesth Analg. 2016;122(5):1490-1497.	RCT	46 C-section patients; (23 in each group)	Forced air warming and IV	Blankets	Patient temperature	Active warming with forced air blanket and warmed IV fluids did not prevent hypothermia but the temperatures were higher in those warmed when entering the PACU.	IC
213	Madrid E, Urrútia G, Roqué i Figuls M, et al. Active body surface warming systems for preventing complications caused by inadvertent perioperative hypothermia in adults. Cochrane Database Syst Rev. 2016;4: CD009016.	Systematic Review	N/A	N/A	N/A	N/A	Active warming is beneficial to patients and reduces the risk of heart and circulatory complications. Prewarming is beneficial in abdominal surgery.	IA
214	Shaw CA, Steelman VM, DeBerg J, Schweizer ML. Effectiveness of active and passive warming for the prevention of inadvertent hypothermia in patients receiving neuraxial anesthesia: a systematic review and meta-analysis of randomized controlled trials. J Clin Anesth. 2017;38:93-104.	Systematic Review w/ Meta-Analysis	N/A	N/A	N/A	N/A	Active is more effective than passive warming in patients receiving neuraxial anesthesia. Additional research comparing the effectiveness of different active warming methods is needed	IA
215	Sultan P, Habib AS, Cho Y, Carvalho B. The effect of patient warming during caesarean delivery on maternal and neonatal outcomes: a meta-analysis. Br J Anaesth. 2015;115(4):500-510.	Systematic Review w/ Meta-Analysis	N/A	N/A	N/A	N/A	Active warming by warming IV fluids or forced air warming or a combination of these two methods reduced patient temperature change and improved thermal comfort.	IA

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216	Allen GS. Intraoperative temperature control using the Thermogard system during off-pump coronary artery bypass grafting. Ann Thorac Surg. 2009;87(1):284-288.	RCT	38 OPCAD patients equally divided into	The triple-lumen temperature control catheter	conventional warming (elevated room temperature, warmed intravenous fluids, warming blanket)	Patient temperature	Use of a triple-lumen temperature control catheter is safe, simple to use and compares favorable to the conventional methods.	IB
217	Pikus E, Hooper VD. Postoperative rewarming: are there alternatives to warm hospital blankets. J Perianesth Nurs. 2010;25(1):11-23.	Systematic Review	N/A	N/A	N/A	N/A	Active warming should be applied in the PACU	IIIB
218	Yang HL, Lee HF, Chu TL, Su YY, Ho LH, Fan JY. The comparison of two recovery room warming methods for hypothermia patients who had undergone spinal surgery. J Nurs Scholarsh. 2012;44(1):2-10.	Quasi-experimental	65 post-operative spinal surgery patients with hypothermia	Radiant warming device	Warm cotton blankets	Patient temperature	Radiant warming devices effectively rewarmed patients faster than warm cotton blankets.	IIB
219	Yoo HS, Park SW, Yi JW, Kwon MI, Rhee YG. The effect of forced-air warming during arthroscopic shoulder surgery with general anesthesia. Arthroscopy. 2009;25(5):510-514.	RCT	44 patients having elective shoulder arthroplasty (22 in each group)	Forced air warming	Cotton blanket	Patient temperature	Forced-air warming is more efficient than a cotton blanket alone at maintaining perioperative normothermia	IB
220	Torossian A, Van Gerven E, Geertsen K, Horn B, Van de Velde M, Raeder J. Active perioperative patient warming using a self-warming blanket (BARRIER EasyWarm) is superior to passive thermal insulation: a multinational, multicenter, randomized trial. J Clin Anesth. 2016;34:547-554.	RCT	277 patients having elective orthopedic; gynecologic; or ear, nose, and throat surgery with a scheduled time of 30 to 120 minutes. (122 in the warmed group and 124 in the control group)	Warmed using a conductive self warming blanket	Warmed using a cotton blanket	Patient temperature; patients' thermal comfort	Use of the self-warming blanket reduced the rate of perioperative hypothermia, and improved patients' thermal comfort.	IA
221	Chakladar A, Dixon MJ, Crook D, Harper CM. The effects of a resistive warming mattress during caesarean section: a randomised, controlled trial. Int J Obstet Anesth. 2014;23(4):309-316.	RCT	116 patients having cesarean birth	Use of resistive warming mattress	No warming mattress	Presence of inadvertent perioperative hypothermia	Use of a resistive warming mattress decreased the rate of perioperative hypothermia in patients having cesarean birth	IA
222	Sharma M, Dixon M, Eljelani F, Crook D, Harper M. A randomised controlled trial to determine the influence of carbon-polymer warming blankets on the incidence of perioperative hypothermia during and after short, day-case operations. J One Day Surg. 2014;24(4):92-99.	RCT	70 surgical patients	Standard care plus an electric warming blanket	Standard care	Patient temperature	Use of an electric blanket during short surgeries may reduce the incidence of hypothermia.	IB
223	Allen PB, Salyer SW, Dubick MA, Holcomb JB, Blackbourne LH. Preventing hypothermia: comparison of current devices used by the US army in an in vitro warmed fluid model. J Trauma. 2010;69(Suppl 1):S154-61.	Quasi-experimental	Laboratory study	Active warming devices	Passive warming devices	Temperature loss	Active warming devices were more effective maintaining a normal temperature than passive devices.	IIB
224	Horn EP, Bein B, Steinfath M, Ramaker K, Buchloh B, Hocker J. The incidence and prevention of hypothermia in newborn bonding after cesarean delivery: a randomized controlled trial. Anesth Analg. 2014;118(5):997-1002.	RCT	40 patients have C-sections, (21 in warming group, 19 in passive warming only group).	Warming with a forced air device	Passive warming	Mother and neonate temperature, maternal shivering and comfort.	Use of a forced air warming device for both mother and infant during bonding reduces the incidence of hypothermia, decreases maternal shivering and increases maternal comfort.	IB

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225	Borms SF, Engelen SL, Himpe DG, Suy MR, Theunissen WJ. Bair Hugger forced-air warming maintains normothermia more effectively than Thermo-lite insulation. J Clin Anesth. 1994;6(4):303-307.	RCT	20 patients having total hip arthroplasty	Forced air warming applied	Reflective insulating blanket	Patient temperature	The reflective blanket was inferior to the farced air warming blanket at preventing hypothermia.	IB
226	Sato H, Yamakage M, Okuyama K, et al. Forced-air warming effectively prevents midazolam-induced core hypothermia in volunteers. Eur J Anaesthesiol. 2009;26(7):566-571.	Quasi-experimental	6 volunteers	Forced air warming device activated	Forced air warming device inactivated	Volunteer temperature	FAW after midazolam administration can prevent sedation-induced redistribution hypothermia.	IIC
227	Zeba S, Surbatovic M, Marjanovic M, et al. Efficacy of external warming in attenuation of hypothermia in surgical patients. Vojnosanit pregl. 2016;73(6):566-571.	RCT	30 patients having extensive abdominal surgery with a duration of 2 hours and longer. 15 in each group	Forced air warming mattress	No additional warming devices were used.	Patient temperature	The use of a warm air mattress resulted in a decrease in the rate of hypothermia.	IC
228	Panossian C, Simoes CM, Milani WR, Baranauskas MB, Margarido CB. The intraoperative use of warming blankets in patients undergoing radical prostatectomy is related with a reduction in post-anesthetic recovery time. Rev Bras Anestesiol. 2008;58(3):220-226.	Retrospective comparison	244 men having radical prostatectomy	N/A	No warming/Forced air warming	Length of stay in PACU	Use of forced air warming device reduces the length of stay in the PACU.	IIIC
229	Witt L, Dennhardt N, Eich C, et al. Prevention of intraoperative hypothermia in neonates and infants: results of a prospective multicenter observational study with a new forced-air warming system with increased warm air flow. Paediatr Anaesth. 2013;23(6):469-474.	Descriptive	119 neonates and infants having surgery	N/A	N/A	Patient temperature	The forced air warming system providing warm air from the back is effective in preventing hypothermia in neonates and infants	IIIB
230	Shorrab AA, El-Sawy ME, Othman MM, Hammouda GE. Prevention of hypothermia in children under combined epidural and general anesthesia: a comparison between upper- and lower-body warming. Paediatr Anaesth. 2007;17(1):38-43.	Quasi-experimental	80 children having urology surgery	Upper body FAW	Lower body FAW	Patient temperature	In this population upper and lower body warming was equally effective.	IIB
231	Steelman VM. Conductive skin warming and hypothermia: an observational study. AANA J. 2017;85(6):461-468.	Nonexperimental	948 surgical patients	N/A	N/A	Patient temperature	A combination of products results in high rate of compliance.	IIIB
232	de Bernardis RC, Siaulys MM, Vieira JE, Mathias LA, eds. Perioperative warming with a thermal gown prevents maternal temperature loss during elective cesarean section. A randomized clinical trial. Braz J Anesthesiol. 2016;66(5):451-455.	RCT	40 patients having C-section (20 in each group).	Warmed with forced air warming gown and blanket	No active warming	Patient temperature	Thirty minutes of active warming before spinal anesthesia and intraoperatively prevented hypothermia.	IB
233	Nieh HS, Shu-Fen. Forced-air warming for rewarming and comfort following laparoscopy: a randomized controlled trail. Clin Nurs Res. 2018;27(5):540-559.	RCT	127 patients having laparoscopic thoracic or abdominal surgery (64 intervention group) (63 control)	Forced air warming device	Passive insulation	Patient temperature	Forced air warming reduces the rate hypothermia and is effective for rewarming and improved comfort levels.	IA

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234	Pu Y, Cen G, Sun J, et al. Warming with an underbody warming system reduces intraoperative hypothermia in patients undergoing laparoscopic gastrointestinal surgery: a randomized controlled study. Int J Nurs Stud. 2014;51(2):181-189.	RCT	110 patients undergoing laparoscopic surgery for GI cancer; (55 in each group)	No warming device	Underbody warming device	Patient temperature	Use of an underbody warming system decreases intraoperative hypothermia during laparoscopic gastrointestinal surgery.	IA
235	Kim YS, Jeon YS, Lee JA, et al. Intra-operative warming with a forced-air warmer in preventing hypothermia after tourniquet deflation in elderly patients. J Int Med Res. 2009;37(5):1457-1464.	RCT	24 females over 65 years old undergoing unilateral TKA. (2 groups of 12)	Either FAW device with upper body blanket	No warming	Final core body temperature after tourniquet deflation	Intraop warming with FAW prevented hypothermia caused by general anesthesia and tourniquet deflation in elderly patients undergoing TKA; although a drop in core body temperature after tourniquet deflation could not be prevented, intraoperative active warming increased core body temperature before tourniquet deflation preventing subsequent hypothermia	IA
236	Leung KK, Lai A, Wu A. A randomised controlled trial of the electric heating pad vs forced-air warming for preventing hypothermia during laparotomy. Anaesthesia. 2007;62(6):605-608.	RCT	60 patients undergoing laparotomy, 30 in each group	Forced air warming device and warm IV fluids	Electric heating pad	Patient temperature	Forced air warming device is more effective than electric heating pad in patients having a laparotomy	IB
237	Ihn CH, Joo JD, Chung HS, et al. Comparison of three warming devices for the prevention of core hypothermia and post-anaesthesia shivering. J Int Med Res. 2008;36(5):923-931.	RCT	90 females having total abdominal hysterectomy (30 in each group	FAW device surgical access blanket,	FAW Upper body blanket; Circulating water mattress.	Patient temperature	The surgical access blanket prevented the core temperature from decreasing more effectively than the upper body blanket or the circulating water mattress.	IB
238	Rajan S, Halemani KR, Puthenveettil N, Baalachandran R, Gotluru P, Paul J. Are active warming measures required during paediatric cleft surgeries? Indian J Anaesth. 2013;57(4):377-380.	RCT	60 patients (30 in each group)	Forced air warming device	No forced air warming device.	Patient temperatures	Apply active warming during the first 30 minutes for procedures expected to last for <2 hours, and no active warming is required for procedures >2 hours.	IB
239	Su S, Nieh H. Efficacy of forced-air warming for preventing perioperative hypothermia and related complications in patients undergoing laparoscopic surgery: A randomized controlled trial. Int J Nurs Pract.	RCT	127 patients having laparoscopic thoracic or abdominal surgery (64 intervention group, 63 control)	Forced air warming device	Passive insulation	Patient temperature	Forced air warming reduces complications associated with hypothermia.	IA
240	Fleisher LA, Metzger SE, Lam J, Harris A. Perioperative cost-finding analysis of the routine use of intraoperative forced-air warming during general anesthesia. Anesthesiology. 1998;88(5):1357-1364.	RCT	100 patients having surgery (50 each group)	Application of a FAW device	No warming	Cost of procedure	There is a cost savings realized with the use of FAW.	IB
241	Moysés AM, dos Santos Trettene A, Navarro LH, Ayres JA. Hypothermia prevention during surgery: Comparison between thermal mattress and thermal blanket. Rev Esc Enfermagem USP. 2014;48(2):226-252.	RCT	38 patients having Open GI tract surgery (19 in each group)	Thermal blanket	Thermal mattress	Patient temperature	The thermal mattress was more effective in preventing hypothermia during surgery than a forced air warming blanket.	IB

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242	Nieh HC, Su FS. Meta-analysis: effectiveness of forced-air warming for prevention of perioperative hypothermia in surgical patients. J Adv Nurs. 2016;72(10):2294-2314.	Systematic Review w/ Meta-Analysis	N/A	N/A	N/A	N/A	Forced air warming is more effective at reducing perioperative hypothermia than passive insulation and circulating water mattresses, but is equally effective as circulating water garments, resistive heating blankets and radiant warming systems.	IA
243	de Brito Poveda V, Martinez EZ, Galvão CM. Active cutaneous warming systems to prevent intraoperative hypothermia: a systematic review. Rev Lat Am. 2012;20(1):183-191.	Systematic Review	N/A	N/A	N/A	N/A	Forced air warming and the carbon-fiber system were comparable but the circulating water garment was superior to the other two.	IC
244	Fanelli A, Danelli G, Ghisi D, Ortu A, Moschini E, Fanelli G. The efficacy of a resistive heating under-patient blanket versus a forced-air warming system: a randomized controlled trial. Anesth Analg. 2009;108(1):199-201.	RCT	56 patients having hip replacement	Resistive heating under-patient blanket	Forced-air warming system	Patient temperature	No significant difference between resistive heating- blanket or FAW system.	IC
245	Sandoval MF, Mongan PD, Dayton MR, Hogan CA. Safety and efficacy of resistive polymer versus forced air warming in total joint surgery. Patient Saf Surg. 2017;11:11.	Organizational Experience	120 total hip or knee with 60 in forced air warming group, 60 in resistive polymer device	N/A	N/A	Patient temperature	Both devices warm the patient similarly.	VA
246	Kimberger O, Held C, Stadelmann K, et al. Resistive polymer versus forced-air warming: comparable heat transfer and core rewarming rates in volunteers. Anesth Analg. 2008;107(5):1621-1626.	Quasi-experimental	8 healthy volunteers, warmed with one system one day and the other system the second study day.	Forced air warming device	Polymer resistive warming device	Patient temperature	No significant difference between resistive warming device and FAW system.	IIB
247	Tanaka N, Ohno Y, Hori M, Utada M, Ito K, Suzuki T. A randomised controlled trial of the resistive heating blanket versus the convective warming system for preventing hypothermia during major abdominal surgery. J Perioper Pract. 2013;23(4):82-86.	RCT	70 patients undergoing major abdominal surgery (33 resistive, 31 convective)	Resistive heating device	Forced air warming device	Patient temperature	Forced air warming is just as effective as resistive heating at maintaining normothermia.	IB
248	Egan C, Bernstein E, Reddy D, et al. A randomized comparison of intraoperative PerfecTemp and forced-air warming during open abdominal surgery. Anesth Analg. 2011;113(5):1076-1081.	RCT	Patients undergoing major open abdominal surgery (36 underbody, 34 upper body)	Underbody resistive warming system	Upper-body forced- air warming system	Patient temperature	Resistive heating blanket vs air- forced system. No statistically significant difference between the two groups.	IB
249	Kadam VR, Moyes D, Moran JL. Relative efficiency of two warming devices during laparoscopic cholecystectomy. Anaesth Intensive Care. 2009;37(3):464-468.	RCT	29 patients having elective laparoscopic cholecystectomy (15 FAW group, 14 radiant group)	Radiant warming device	Forced air warming device	Patient temperature	No difference in the efficacy of either system	IB

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250	Ruetzler K, Kovaci B, Guloglu E, et al. Forced-air and a novel patient-warming system (vitalHEAT vH2) comparably maintain normothermia during open abdominal surgery. Anesth Analg. 2011;112(3):608-614.	Quasi-experimental	71 Patients having elective major open abdominal surgery. (37 sleeve, 34 FAW)	Circulating-water sleeve	Forced air warming device	Patient temperature	Upper body FAW and the water sleeve device were equally effective in maintaining normothermia.	IIB
251	Ng V, Lai A, Ho V. Comparison of forced-air warming and electric heating pad for maintenance of body temperature during total knee replacement. Anaesthesia. 2006;61(11):1100-1104.	RCT	60 patients undergoing total knee replacement.	Forced air warming device	Electric heating pad	Patient temperature	Intraoperative body temperature was maintained equally well in both groups.	IA
252	Galvão CM, Marck PB, Sawada NO, Clark AM. A systematic review of the effectiveness of cutaneous warming systems to prevent hypothermia. J Clin Nurs. 2009;18(5):627-636.	Systematic Review	N/A	N/A	N/A	N/A	Carbon-fiber blankets and forced-air warming systems are effective at preventing hypothermia but circulating- water garments may be more effective	IA
253	Wadhwa A, Komatsu R, Orhan-Sungur M, et al. New circulating-water devices warm more quickly than forced-air in volunteers. Anesth Analg. 2007;105(6):1681-1687.	RCT	7 healthy adult volunteers	Energy transfer pad,	Circulating-water garment, to forced air warming devices.	Rate of rewarming.	The rate of rewarming was 25% faster with the energy transfer pad than circulating-water garment, and twice as fast as the forced air warming devices.	IC
254	Rein EB, Filtvedt M, Walloe L, Raeder JC. Hypothermia during laparotomy can be prevented by locally applied warm water and pulsating negative pressure. Br J Anaesth. 2007;98(3):331-336.	RCT	20 patients having laparotomy for major abdominal surgery. (10 in each group)	Application of locally applied warm water and pulsating negative pressure warming device	Forced air warming device	Patient temperature	A device using warm water and pulsating negative pressure was better at preventing and reversing hypothermia during laparotomy compared to a forced-air warming device.	IC
255	Kjellman BM, Fredrikson M, Glad-Mattsson G, Sjöberg F, Huss FR. Comparing ambient, air-convection, and fluid-convection heating techniques in treating hypothermic burn patients, a clinical RCT. Ann Surg Innov Res. 2011;5(1):4.	RCT	10 patients with burns.	Circulating water warming device and warmed Iv fluids or forced air warming mattress and warmed IV fluids	Conventional (forced air warming blanket plus radiator ceiling plus bed warmer and warmed IV fluids)	Increase in patient's temperatures	The circulating water warming device and warmed IV fluids were more effective than the other two methods at controlling patient's temperatures.	IC
256	Butwick AJ, Lipman SS, Carvalho B. Intraoperative forced air-warming during cesarean delivery under spinal anesthesia does not prevent maternal hypothermia. Anesth Analg. 2007;105(5):1413-1419.	RCT	30 women having C-sections	FAW unit applied to lower body	No warming device used	Patient temperature/ presence of hypothermia	Intraop lower body FAW does not prevent intraop hypothermia in women having cesarean delivery.	IC
257	Hasegawa K, Nakagawa F, Negishi C, Ozaki M. Core temperatures during major abdominal surgery in patients warmed with new circulating-water garment, forced-air warming, or carbon-fiber resistive-heating system. J Anesth. 2012;26(2):168-173.	Quasi-experimental	36 patients undergoing open abdominal surgery	Circulating water garment	Forced air warming device or carbon- fiber resistive heating system	Patient temperature	The circulating water garment was more effective than forced air warming device or carbon- fiber resistive heating system.	IIA
258	Calcaterra D, Ricci M, Lombardi P, Katariya K, Panos A, Salerno TA. Reduction of postoperative hypothermia with a new warming device: a prospective randomized study in off-pump coronary artery surgery. J Cardiovasc Surg. 2009;50(6):813-817.	RCT	50 patients having off pump coronary artery bypass	Circulating water device	Forced air warming device	Blood loss, length of stay	Use of the circulating water device decreased the blood loss and length of stay compared to use of forced air warming devices.	IA

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259	De Witte JL, Demeyer C, Vandemaele E. Resistive-heating or forced-air warming for the prevention of redistribution hypothermia. Anesth Analg. 2010;110(3):829-833.	RCT	27 patients undergoing laparoscopic colorectal surgery, divided into three groups	Pre warming with either a resistive - heating or forced air warming device	No prewarming	Patient temperature	Resistive heating blanket vs air- forced system vs control no warming. Resistive heating group temperature was significantly higher than the control group.	IA
260	Hofer CK, Worn M, Tavakoli R, et al. Influence of body core temperature on blood loss and transfusion requirements during off-pump coronary artery bypass grafting: a comparison of 3 warming systems. J Thorac Cardiovasc Surg. 2005;129(4):838-843.	RCT	90 patients having elective multiple off-pump coronary artery bypass grafting	Circulating water warming device	Forced air warming device and electric heating blanket	Core temperature	The circulating water device had the highest final core body temperature at 36.5°C.	IC
261	Sugai H, Koizumi T, Sumita S, Yamakage M. Relative clinical heat transfer effectiveness: forcedair warming vs. conductive fabric electric warming, A randomized controlled trial. J Anesth Surg. 2018;5(2):123-126.	RCT	41 patients having open GI procedures	Conductive fabric warming	forced air warming	Rewarming rate	The rewarming rate of the conductive warming device was greater than the rate for forced air warming. (0.35°C/hr. vs. 0.01°C/hr.)	IC
262	Janicki PK, Higgins MS, Janssen J, Johnson RF, Beattie C. Comparison of two different temperature maintenance strategies during open abdominal surgery: upper body forced-air warming versus whole body water garment. Anesthesiology. 2001;95(4):868-874.	RCT	53 patients having open abdominal surgery	Water garment warming system	a single (upper body) forced-air warming system	rectal and esophageal temperatures at incision, 1 h after incision, at skin closure, and immediately postoperatively	The temperatures were all significantly higher in the water garment group	IB
263	Haeberle HS, Navarro SM, Samuel LT, et al. No evidence of increased infection risk with forced-air warming devices: a systematic review. Surg Technol Int. 2017;31:295-301.	Systematic Review	N/A	N/A	N/A	N/A	Forced air warming devices should be used for orthopedic surgery.	IIIC
264	Dasari KB, Albrecht M, Harper M. Effect of forced-air warming on the performance of operating theatre laminar flow ventilation. Anaesthesia. 2012;67(3):244-249.	Quasi-experimental	Simulation	Forced-air warming blanket, over-body conductive blanket,	Under-body resistive mattress	Air-temperature at surgical site	FAW release significantly higher levels of excess heat.	IIB
265	Reed M, Kimberger O, McGovern PD, Albrecht MC. Forced-air warming design: evaluation of intake filtration, internal microbial buildup, and airborne-contamination emissions. AANA J. 2013;81(4):275-280.	Observational study	23 FAW device blowers	N/A	N/A	Microorganism from areas swabbed;	FAW devices emit significant levels of airborne particles which may or may not end up on the surgical site.	IIIB
266	Albrecht M, Gauthier RL, Belani K, Litchy M, Leaper D. Forced-air warming blowers: an evaluation of filtration adequacy and airborne contamination emissions in the operating room. Am J Infect Control. 2011;39(4):321-328.	Descriptive	52 blowers	N/A	N/A	Microbial counts emitted and organisms on internal air pathways	FAW Blowers emit air borne contaminants. Alternative technologies to prevent inadvertent hypothermia should be considered.	IIIB
267	Albrecht M, Gauthier R, Leaper D. Forced-air warming: a source of airborne contamination in the operating room? Orthop Rev (Pavia). 2009;1(2):e28.	Descriptive	25 blowers	N/A	N/A	Microbial counts emitted from FAW	FAW blowers emit air borne contaminants. Alternative technologies to prevent inadvertent hypothermia should be considered.	IIIB

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268	He X, Karra S, Pakseresht P, Apte SV, Elghobashi S. Effect of heated-air blanket on the dispersion of squames in an operating room. Int J Numer Method Biomed Eng. 2018;34(5):e2960.	Nonexperimental	Simulation	N/A	Blower off to blower on	Skin squame cell counts	When the forced air warmer was turned on there were more skin squames in the four locations than with it turned off.	IIIB
269	Zink RS, Iaizzo PA. Convective warming therapy does not increase the risk of wound contamination in the operating room. Anesth Analg. 1993;76(1):50-53.	Quasi-experimental	8 volunteers	Forced air warming device activated	Forced air warming device not activated	Bacterial counts	Use of a FAW unit does not increase the bacterial counts at the surgical sites	IIC
270	Huang JK, Shah EF, Vinodkumar N, Hegarty MA, Greatorex RA. The Bair Hugger patient warming system in prolonged vascular surgery: an infection risk? Crit Care. 2003;7(3):R13-R16.	Descriptive	16 adults having prolonged abdominal vascular surgery	N/A	N/A	Bacterial counts	Use of a FAW unit does not increase the bacterial counts at the surgical sites	IIIB
271	Kellam MD, Dieckmann LS, Austin PN. Forced-air warming devices and the risk of surgical site infections. AORN J. 2013;98(4):354-366.	Systematic Review	15 articles	N/A	N/A	N/A	The evidence did not clearly identify that FAW as increased the risk of SSI.	IIIB
272	Sessler DI, Olmsted RN, Kuelpmann R. Forced-air warming does not worsen air quality in laminar flow operating rooms. Anesth Analg. 2011;113(6):1416-1421.	Quasi-experimental	Volunteer and manikins	FAW unit on	FAW unit off	Tracer background particle counts	FAW does not negatively effect laminar airflow.	IIB
273	Augustine SD. Forced-air warming discontinued: periprosthetic joint infection rates drop. Orthop Rev (Pavia). 2017;9(2):6998.	Nonexperimental	1089 Conductive fabric; 945 Forced air warming	N/A	N/A	Periprosthetic joint infection	Periprosthetic joint infection rates were less after changing from forced air warming to conductive fabric warming.	IIIC
274	Sikka RS, Prielipp RC. Forced air warming devices in orthopaedics: a focused review of the literature. J Bone Joint Surg Am. 2014;96(24):e200.	Literature Review	N/A	N/A	N/A	N/A	Warming devices should be cleaned and maintained according to manufacturer's instructions for use.	VB
275	Chung K, Lee S, Oh SC, Choi J, Cho HS. Thermal burn injury associated with a forced-air warming device. Korean J Anesthesiol. 2012;62(4):391-392.	Case report	N/A	N/A	N/A	N/A	FAW should always be used with a blanket and according to manufacturer DFU.	VC
276	Wu X. The safe and efficient use of forced-air warming systems. AORN J. 2013;97(3):302-308.	Literature Review	N/A	N/A	N/A	N/A	Recommendations for choosing a FAW device	VB
277	Brauer A, Quintel M. Forced-air warming: technology, physical background and practical aspects. Curr Opin Anaesthesiol. 2009;22(6):769-774.	Literature Review	N/A	N/A	N/A	N/A	Blankets should be attached to the hose prior to use.	VA
278	Chapp K, Lange L. Warming blanket head drapes and trapped anesthetic gases: understanding the fire risk. AORN J. 2011;93(6):749-760.	Organizational Experience	N/A	N/A	N/A	N/A	The forced air warming blanket head drape should be tented and the blower should be on whenever the drape is in place.	VB
279	Wagner K, Smith CE, Quan KJ. Prevention of hypothermia during interventional cardiology procedures in adults. Internet J Anesthesiol. 2010;23(2).	RCT	95 adults undergoing elective electrophysiology (48 intervention group, 47 control group)	Gel pad warming	No warming	Patient temperature	Full body gel pad warming resulted in higher procedural temps and lower incidence of hypothermia compared to controls	IB
280	Kiridume K, Hifumi T, Kawakita K, et al. Clinical experience with an active intravascular rewarming technique for near-severe hypothermia associated with traumatic injury. J Intensive Care. 2014;2(1):11.	Case Report	N/A	N/A	N/A	N/A	Active rewarming may be accomplished using an intravascular warming device.	VB

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281	Perez-Protto S, Sessler DI, Reynolds LF, et al. Circulating-water garment or the combination of a circulating-water mattress and forced-air cover to maintain core temperature during major upper-abdominal surgery. Br J Anaesth. 2010;105(4):466-470.	RCT	36 patients having abdominal surgery (16 garment, 20 mattress and FAW)	Circulating water mattress plus forced air warming	Circulating water garment	Patient temperature	Circulating water mattress plus forced air warming is non- inferior to just circulating water garment.	IC
282	Trentman TL, Weinmeister KP, Hentz JG, Laney MB, Simula DV. Randomized non-inferiority trial of the vitalHEAT temperature management system vs the Bair Hugger warmer during total knee arthroplasty. Can J Anaesth. 2009;56(12):914-920.	RCT	55 patients having unilateral total knee arthroplasty, (30 in water group 25 in FAW group)	Circulating warm water device with vacuum	Forced air warming device	Patient temperature	The Conductive warming system using circulating warm water with a vacuum applied to a single extremity underperforms when compared to a forced air warming device.	IB
283	Dostálová V, Schreiberova J, Bartoš M, et al. Thermal management in patients undergoing elective spinal surgery in prone position—a prospective randomized trial. Cesk Slov Neurol N. 2017;80/113(5):553-560.	RCT	100 patients having spinal surgery. (50 in each group)	Application of a self-warming blanket plus standard care.	Standard care	Patient temperature	The use of an activated self-warming blanket provided satisfactory body temperature control.	IC
284	Engelen S, Berghmans J, Borms S, Suy-Verburg M, Himpe D. Resistive heating during off-pump coronary bypass surgery. Acta Anaesthesiol Belg. 2007;58(1):27-31.	Quasi-experimental	Patients having OPCAB surgery, 10 with standard conventional warming and 10 with conventional plus resistive heating mattress.	Standard care plus resistive warming mattress	Standard of forced air warming device on top, warmed gases and warmed IV fluids,	Patient temperature	The use of the resistive device plus the standard care leads to higher core temperatures during OPCAB surgery.	IIC
285	Perl T, Rhenius A, Eich CB, Quintel M, Heise D, Bräuer A. Conductive warming and insulation reduces perioperative hypothermia. Cent Eur J Med. 2012;7(3):284-289.	RCT	30 patients having head and neck surgery.(15 in each group)	Insulation plus conductive warming mattress	Insulation only	Patient temperature	A conductive warming mattress system plus insulation is more effective than insulation alone.	IA
286	Paris LG, Seitz M, McElroy KG, Regan M. A randomized controlled trial to improve outcomes utilizing various warming techniques during cesarean birth. J Obstet Gynecol Neonatal Nurs. 2014;43(6):719-728.	RCT	226 women having cesarean birth divided into three groups; routine Care (n = 76), warmed IV Fluids (n = 73), warmed Under Body Pad (n = 77)	Application of warmed under body pad or warmed IV fluids.	Routine care	Patient temperature	Those receiving warmed fluids had a higher intraoperative temperature and those warmed with the underbody pad had a higher temperature in the PACU.	IA
287	Chebbout R, Newton RS, Walters M, Wrench IJ, Woolnough M. Does the addition of active body warming to in-line intravenous fluid warming prevent maternal hypothermia during elective caesarean section? A randomised controlled trial. Int J Obstet Anesth. 2017;31:37-44.	RCT	132 patients have C-Section equally divided into three groups	Warmed IV fluids plus forced air warming: Warmed IV fluids plus conductive device	Warmed IV fluids	Temperature of mother in PACU, temperature of neonate.	There is no benefit to using forced air warming or conductive warming devices in addition to warmed IV fluids during elective caesarean section under spinal anesthesia.	IC
288	Brandt S, Oguz R, Hüttner H, et al. Resistive-polymer versus forced-air warming: comparable efficacy in orthopedic patients. Anesth Analg. 2010;110(3):834-838.	RCT	80 patients having orthopedic surgery (40 in each group)	Forced air warming	Resistive-polymer system	Patient temperature	There is no significant difference FAW vs resistive warming	IA

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289	Jo YY, Kim HS, Chang YJ, Yun SY, Kwak HJ. The effect of warmed inspired gases on body temperature during arthroscopic shoulder surgery under general anesthesia. Korean J Anesthesiol. 2013;65(1):14-18.	RCT	40 patients having shoulder arthroscopic surgery	Use of heated humidifier	No warming	Patient temperature	Active warming and humidification of anesthesia gases decreases the degree of hypothermia during shoulder arthroscopy surgery.	IA
290	Anaegbu N, Olatosi O, Tobi K. Effectiveness of heat moisture exchangers (hmes) in preventing perioperative hypothermia among adult patients undergoing abdominal surgery under general endotracheal anaesthesia. J West Afr Coll Surg. 2013;3(3):16-32.	RCT	49 surgical patients in heated group; 50 in control group	Heated moisturized anesthesia gases	No warming	Patient temperature	Warmed anesthesia gases did not prevent hypothermia but the patient had a higher core temperature and warming anesthesia gases should be included in a multimodal approach to perioperative hypothermia prevention.	IB
291	Lee Y, Kim H. The effects of heated humidified gases on body temperature and shivering in patients under general anesthesia. Int J Biosci Biotechnol. 2013;5(4):61-72.	Quasi-experimental	71 patients having musculoskeletal surgery	Warmed gases	Room temperature gases	Patient temperature	Anesthesia gases should be heated and humidified.	IIB
292	Lee HK, Jang YH, Choi KW, Lee JH. The effect of electrically heated humidifier on the body temperature and blood loss in spinal surgery under general anesthesia. Korean J Anesthesiol. 2011;61(2):112-116.	RCT	80 patients having spinal surgery (40 in each group)	Use of heated humidifier	No warming	Patient temperature	Warming and humidification of anesthesia gases decreases the degree of hypothermia during spinal surgery but does not prevent it.	IB
293	Han SB, Gwak MS, Choi SJ, et al. Effect of active airway warming on body core temperature during adult liver transplantation. Transplant Proc. 2013;45(1):251-254.	RCT	34 patients having liver transplants (17 each group)	Use of heated humidifier	Use of heat and moisture exchanger	Patient temperature	Active warming and humidification of anesthesia gases decreases the rate and duration of hypothermia during liver transplants.	IB
294	Ma H, Lai B, Dong S, et al, eds. Warming infusion improves perioperative outcomes of elderly patients who underwent bilateral hip replacement. Medicine (Baltimore). 2017;96(13):e6490.	RCT	64 bilateral hip replacement patients with 32 in each group	Warmed IV fluids	Room temperature IV fluids	Recovery time, length of hospital stay, visual analogue scale (VAS) score, and postoperative complications rate of patients	Prewarmed IV fluids may reduce the incidence of perioperative hypothermia and improve outcomes in patients having bilateral hip replacement	IC
295	Kim G, Kim MH, Lee SM, Choi SJ, Shin YH, Jeong HJ. Effect of pre-warmed intravenous fluids on perioperative hypothermia and shivering after ambulatory surgery under monitored anesthesia care. J Anesth. 2014.	RCT	Females having minor surgery. 27 participants, 26 control	Pre-warmed IV fluids	Room temperature IV fluids	Patient temperature	Use of pre-warmed IV fluids decreased intraoperative hypothermia.	IA
296	Andrzejowski JC, Turnbull D, Nandakumar A, Gowthaman S, Eapen G. A randomised single blinded study of the administration of pre-warmed fluid vs active fluid warming on the incidence of peri-operative hypothermia in short surgical procedures. Anaesthesia. 2010;65(9):942-945.	RCT	76 day surgery procedures lasting <30 mins.	Warmed fluids using an inline warmer or a warming cabinet.	Room temperature fluids	Patient temperature	Administration of warm IV fluids is effective at decreasing the rate of hypothermia.	IA

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297	Hong-xia X, Zhi-jian Y, Hong Z, Zhiqing L. Prevention of hypothermia by infusion of warm fluid during abdominal surgery. J Perianesth Nurs. 2010;25(6):366-370.	RCT	30 patients having abdominal surgery. (15 in each group)	Warmed IV fluids	No warming of IV fluids	Patient temperature	Use of warmed IV fluids decrease the rate of hypothermia	IB
298	Campbell G, Alderson P, Smith AF, et al. Warming of intravenous and irrigation fluids for preventing inadvertent perioperative hypothermia. Cochrane Database Syst Rev. 2015;(4):CD009891.	Systematic Review w/ Meta-Analysis	N/A	N/A	N/A	N/A	Warm intravenous fluids appears to keep patients warmer during surgery when compared to room temperature fluids. They were unable to determine if the actual differences in temperature are clinically meaningful, if there are other benefits or harms associated with the use of warmed IV fluids and if using fluid warming in addition to other warming methods increases the benefits because a ceiling effect may occur with the use of multiple methods of warming.	IIA
299	JW, Kim DK, Lee SW, Park JB, Lee GH. Efficacy of intravenous fluid warming during goal-directed fluid therapy in patients undergoing laparoscopic colorectal surgery: a randomized controlled trial. J Int Med Res. 2016;44(3):605-612.	RCT	52 patients having laparoscopic colorectal surgery	Warmed IV fluids	Room temperature IV fluids	Core temperature	Routine use of IV fluid warming cannot be justified for an ERAS program involving laparoscopic colorectal surgery.	IA
300	Parodi D, Valderrama J, Tobar C, et al. Effect of warmed irrigation solution on core body temperature during hip arthroscopy for femoroacetabular impingement. Arthroscopy. 2014;30(1):36-41.	Quasi-experimental	166 patients having hip arthroscopic surgery for femoroacetabular impingement (83 patients in each group.)	Warmed irrigation solutions	Room temperature solutions	Patient temperature	Warming of irrigation solutions decreases the drop in temperature.	IIA
301	Pan X, Ye L, Liu Z, Wen H, Hu Y, Xu X. Effect of irrigation fluid temperature on core body temperature and inflammatory response during arthroscopic shoulder surgery. Arch Orthop Trauma Surg. 2015;135(8):1131-1139.	RCT	66 patients having knee arthroscopy	Warmed irrigation solution	Room temperature irrigation solutions	Patient temperature	The incidence of hypothermia is higher when using room-temperature irrigation fluid compared with warm irrigation fluid.	IB
302	Tekgul ZT, Pektas S, Yildirim U, et al. A prospective randomized double-blind study on the effects of the temperature of irrigation solutions on thermoregulation and postoperative complications in percutaneous nephrolithotomy. J Anesth. 2015;29(2):165-169.	RCT	60 patients having percutaneous nephrolithotomy (30 in each group)	Warmed irrigation fluids	Room temperature irrigation fluids	Patient temperature	Using room temperature irrigation fluids leads to an increased rate of hypothermia and other associated complications.	IA
303	Jin Y, Tian J, Sun M, Yang K. A systematic review of randomised controlled trials of the effects of warmed irrigation fluid on core body temperature during endoscopic surgeries. J Clin Nurs. 2011;20(3-4):305-316.	Systematic Review w/ Meta-Analysis	686 patients having endoscopic surgery; 13 RCTs	Warmed irrigation solution	Room temperature irrigation solutions	Patient temperature	Irrigation solution should be warmed for endoscopic surgeries	IB

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304	Board TN, Srinivasan MS. The effect of irrigation fluid temperature on core body temperature in arthroscopic shoulder surgery. Arch Orthop Trauma Surg. 2008;128(5):531-533.	Quasi-experimental	24 patients having arthroscopy surgery (12 in each group)	Warm irrigation fluid	Room temperature irrigation fluids	Patient temperature	Irrigation should be warmed to 36 degrees C for shoulder arthroscopy patients.	IIC
305	Mirza S, Panesar S, AuYong KJ, French J, Jones D, Akmal S. The effects of irrigation fluid on core temperature in endoscopic urological surgery. J Perioper Pract. 2007;17(10):494-503.	Nonexperimental	100 patients having urological surgery (67 in warmed group, 43 in room temperature group)	N/A	N/A	Patient temperature	Temperature drop was less in patients having warmed irrigation solutions.	IIIC
306	Oh JH, Kim JY, Chung SW, et al. Warmed irrigation fluid does not decrease perioperative hypothermia during arthroscopic shoulder surgery. Arthroscopy. 2014;30(2):159-164.	RCT	72 patients having arthroscopic shoulder surgery (36 in each group)	Warmed irrigation fluids	Room temperature irrigation fluids	Patient temperature	Warmed irrigation fluid was not superior to room-temperature irrigation fluid in reducing the occurrence of perioperative hypothermia during arthroscopic shoulder surgery.	IA
307	Roth JV, Sea S. An assessment by calorimetric calculations of the potential thermal benefit of warming and humidification of insufflated carbon dioxide. Surg Laparosc Endosc Percutan Tech. 2014;24(3):e106-e109.	Nonexperimental	Mathematical calculations	N/A	N/A	Amount of increase in core temperature	Use of warm and humidified insufflation gases would result in very little effect on the core temperature.	IIIB
308	Birch DW, Dang JT, Switzer NJ, et al. Heated insufflation with or without humidification for laparoscopic abdominal surgery. Cochrane Database Syst Rev. 2016;10:CD007821.	Systematic Review w/ Meta-Analysis	N/A	N/A	N/A	N/A	A small decrease in core body temperature was found with the use of heated, humidified insufflation gas but it did not account for an improvement in patient outcomes.	IA
309	Sajid MS, Mallick AS, Rimpel J, Bokari SA, Cheek E, Baig MK. Effect of heated and humidified carbon dioxide on patients after laparoscopic procedures: a meta-analysis. Surg Laparosc Endosc Percutan Tech. 2008;18(6):539-546.	Systematic Review w/ Meta-Analysis	N/A	N/A	N/A	N/A	The use of warmed/humidified insufflation gases resulted in lower risk of hypothermia and analgesic requirements.	IB
310	HumiGard for Preventing Inadvertent Perioperative Hypothermia (Medical Technologies Guidance [MTG31]). London, UK: National Institute for Health and Care Excellence; 2017.	Consensus	N/A	N/A	N/A	N/A	Provides guidance for moistening and warming anesthesia gases.	IVC
311	Inaba K, Berg R, Barmparas G, et al. Prospective evaluation of ambient operating room temperature on the core temperature of injured patients undergoing emergent surgery. J Trauma Acute Care Surg. 2012;73(6):1478-1483.	Nonexperimental	118 patients having emergent surgery	N/A	N/A	Change in patient temperature	Increasing ambient OR temperature is not correlated to an increase in patient core temperature.	IIIB
312	Cheng KW, Wang CH, Chen CL, et al. Decreased fresh gas flow cannot compensate for an increased operating room temperature in maintaining body temperature during donor hepatectomy for living liver donor hepatectomy. Transplant Proc. 2010;42(3):703-704.	Descriptive	167 patients having surgery	N/A	N/A	Patient temperature	Increasing the ambient room temperature increased the post-operative temperatures	IIIB

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313	Deren ME, Machan JT, DiGiovanni CW, Ehrlich MG, Gillerman RG. Prewarming operating rooms for prevention of intraoperative hypothermia during total knee and hip arthroplasties. J Arthroplasty. 2011;26(8):1380-1386.	RCT	66 patients undergoing elective knee or minimally invasive hip arthroplasty.	Prewarming the OR	OR was not prewarmed	Patient temperature	Raising the ambient temperature of the OR preoperatively has a minimal effect on preventing intraoperative hypothermia.	IA
314	Ozer AB, Tosun F, Demirel I, Unlu S, Bayar MK, Erhan OL. The effects of anesthetic technique and ambient temperature on thermoregulation in lower extremity surgery. J Anesth. 2013;27(4):528-534.	Quasi-experimental	90 adult males having lower extremity surgery	Room temperature of 20–22 degrees C	Room temperature of 23–25 degrees C.	Mean skin temperature and mean body temperature	In patients having lower extremity surgery the room temperature affected the mean skin temperature. Room temp affected thermoregulation in Group A (gen anesthesia)	IIB
315	Kent AL, Williams J. Increasing ambient operating theatre temperature and wrapping in polyethylene improves admission temperature in premature infants. J Paediatr Child Health. 2008;44(6):325-331.	Quasi-experimental	156 premature infants	OR ambient temperature at 20^0 C	OR ambient temperature at 24^0 - 26^0 C	NICU admission temperature	NICU admission temperature increased after increasing the ambient OR temperature	IIB