REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
1	Fleisch MC, Bader W, Balzer K, et al. The prevention of positioning injuries during gynecologic surgery. Guideline of the DGGG, OEGGG and SGGG (S2k Level, AWMF Registry Number 015/077, October 2020). Geburtshilfe Frauenheilkd. 2021;81(4):447-468.	Guideline	n/a	n/a	n/a	n/a	This guideline aims to provide statements and recommendations for the prevention, diagnosis and management of positioning injuries in gynecology, based on an interdisciplinary consensus which was achieved after reviewing the current literature.	IVA
2	Sawyer RJ, Richmond MN, Hickey JD, Jarrratt JA. Peripheral nerve injuries associated with anaesthesia. Anaesthesia. 2000;55(10):980-991.	Expert Opinion	n/a	n/a	n/a	n/a	Prevention of peripheral nerve injuries involves awareness of potential problems associated with operative positions and careful positioning of the patient with optimal padding.	VB
3	Chitlik A. Safe positioning for robotic-assisted laparoscopic prostatectomy. AORN J. 2011;94(1):37-45.	Expert Opinion	n/a	n/a	n/a	n/a	The lithotomy with Trendelenburg position used for robotic procedures creates unique challenges. Using a beanbag positioning device designed for use with this position helps prevent complications.	VA
4	Ducic I, Zakaria HM, Felder JM 3rd, Arnspiger S. Abdominoplasty-related nerve injuries: systematic review and treatment options. Aesthet Surg J. 2014;34(2):284-297.	Systematic Review	23/Studies related to abdominoplasty-related nerve injuries	n/a	n/a	n/a	Results showed a low incidence of nerve injury after abdominoplasty, some injuries were caused by incorrect positioning techniques.	IA
5	Johnson RL, Warner ME, Staff NP, Warner MA. Neuropathies after surgery: anatomical considerations of pathologic mechanisms. Clin Anat. 2015;28(5):678-682.	Expert Opinion	n/a	n/a	n/a	n/a	Avoiding direct compression and stretch to soft tissues and nerves reduces the frequency of positioning-related problems.	VA
6	Prielipp RC, Weinkauf JL, Esser TM, Thomas BJ, Warner MA. Falls from the O.R. or procedure table. Anesth Analg. 2017;125(3):846-851.	Case Report	n/a	n/a	n/a	n/a	Several cases of falls from Trendelenburg position	VA
7	Lopes CM, Galvão CM. Surgical positioning: evidence for nursing care. Rev Lat Am Enfermagem. 2010;18(2):287-294.	Literature Review	N/A	N/A	N/A	N/A	Included studies focused on risk factors for complications due to surgical positioning, and nursing care related to surgical positioning.	VB
8	Bouyer-Ferullo S. Preventing perioperative peripheral nerve injuries. AORN J. 2013;97(1):110-124.	Literature Review	n/a	n/a	n/a	n/a	No standard exists to identify, document, or monitor peripheral nerve injuries; however, increasing awareness of the potential for injury and implementing safe positioning practices has the potential to decrease the incidence of peripheral nerve injury.	VA
9	MacDonald JJ, Washington SJ. Positioning the surgical patient. Anaesth Intensive Care Med. 2012;13(11):528-532.	Expert Opinion	n/a	n/a	n/a	n/a	Recommendations are provided for patient positioning and the physiological changes associated with different positions.	VB
10	Nilsson UG. Intraoperative positioning of patients under general anesthesia and the risk of postoperative pain and pressure ulcers. J Perianesth Nurs. 2013;28(3):137-143.	Nonexperimental	86 Patients undergoing elective surgery in the supine position who had normal BMI and were ASA class I or II	n/a	n/a	Risk factors associated with intraoperative positioning/ Development of postoperative pain or pressure injury	The risk for positioning pain seems to be greater in patients suffering from preoperative pain.	IIIB
11	Dybec RB. Keeping up-to-date on patient positioning. OR Nurse. 2013;7(2):16-17.	Expert Opinion	n/a	n/a	n/a	n/a	Safe positioning of surgical patients requires a combination of current and basic knowledge.	VC
12	Guideline for safe patient handling and movement. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2022:895-946.	Guideline	n/a	n/a	n/a	n/a	This document provides guidance to perioperative professionals for developing, implementing, and maintaining an effective safe patient handling and movement (SPHM) program to reduce the incidence and minimize the severity of injuries to patients and health care workers related to performance of high-risk tasks in the perioperative environment.	IVA
13	Lindgren M, Unosson M, Krantz AM, Ek AC. Pressure ulcer risk factors in patients undergoing surgery. J Adv Nurs. 2005;50(6):605-612.	Nonexperimental	286 Adult patients undergoing surgical treatment	n/a	n/a	Pressure injury development	Special attention to the risk of pressure injury development is warranted for patients undergoing surgery who are women, have low ASA classification, or low food intake.	IIIB
14	Abdalmageed OS, Bedaiwy MA, Falcone T. Nerve injuries in gynecologic laparoscopy. J Minim Invasive Gynecol. 2017;24(1):16-27.	Expert Opinion	n/a	n/a	n/a	n/a	Discussion of the anatomy of upper and lower limbs and anterior abdominal wall, strategies in positioning to prevent nerve injury-can apply to several positions	VA
15	Chui J, Murkin JM, Posner KL, Domino KB. Perioperative peripheral nerve injury after general anesthesia: a qualitative systematic review. Anesth Analg. 2018;127(1):134-143.	Systematic Review	n/a	n/a	n/a	n/a	The causes of perioperative PNI after general anesthesia are likely multifactorial, resulting in a “difficult to predict and prevent” phenomenon. Nearly half of the PNI closed claims did not have an obvious etiology, and most (91%) were associated with appropriate anesthetic care. Future studies should focus on the interaction between different mechanisms of insult, severity and duration of injury, and underlying neuronal reserves. Recent automated detection technology in neuromonitoring with somatosensory evoked potentials may increase the ability to identify at-risk patients and individualize patient management. (Anesth Analg 2018;127:134–43)	IIIA
16	Duffy BJ, Tubog TD. The prevention and recognition of ulnar nerve and brachial plexus injuries. J Perianesth Nurs. 2017;32(6):636-649.	Expert Opinion	n/a	n/a	n/a	n/a	Overview of the causes and prevention strategies of ulnar and brachial nerve injuries	VA
17	Practice Advisory for Perioperative Visual Loss Associated with Spine Surgery 2019: An Updated Report by the American Society of Anesthesiologists Task Force on Perioperative Visual Loss, the North American Neuro-Ophthalmology Society, and the Society for Neuroscience in Anesthesiology and Critical Care. Anesthesiology. 2019;130(1):12-30.	Guideline	n/a	n/a	n/a	n/a	The task force does not believe there are identifiable preoperative patient characteristics that predispose patients to perioperative ischemic optic neuropathy.	IVA
18	Bouyer-Ferullo S, Androwich IM, Dykes PC. Clinical decision support and perioperative peripheral nerve injury: a quality improvement project. Comput Inform Nurs. 2015;33(6):238-248.	Organizational Experience	48,651 surgeries	n/a	n/a	n/a	QI project focused on preventing a peripheral never injury from compression, hyperextension, flexion, or ischemia. Implemented an educational program, decision support within the OR record to support risk assessment of peripheral nerve injury and implementation of prevention strategies.	VA

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19	Penprase B, Johnson C. Optimizing the perioperative nursing role for the older adult surgical patient. OR Nurse. 2014;8(4):26-33.	Expert Opinion	n/a	n/a	n/a	n/a	Early identification and interventions for older adult surgical patients through preoperative assessments, careful positioning, maintaining normothermia, managing pain, and providing education is essential.	VB
20	Schultz A. Predicting and preventing pressure ulcers in surgical patients. AORN J. 2005;81(5):986-1006.	Systematic Review	31 published studies	n/a	n/a	Development of a new pressure ulcer within 72 hours after surgery	Contradictory findings with limited sample sizes and questionable internal validity provide only weak support for recommendations to predict and prevent pressure injury in surgical patients.	IIIB
21	Shaw LF, Chang PC, Lee JF, Kung HY, Tung TH. Incidence and predicted risk factors of pressure ulcers in surgical patients: experience at a medical center in Taipei, Taiwan. Biomed Res Int. 2014;2014:416896.	Nonexperimental	297 Patients admitted to a teaching hospital for a surgical procedure	n/a	n/a	Pressure injury development	Older age, type of anesthesia, surgical position, and type of surgery are associated with pressure injury development.	IIIB
22	Fletcher HC. Preventing skin injury in the OR. OR Nurse. 2014;8(3):28-34.	Expert Opinion	n/a	n/a	n/a	n/a	Preoperative assessment can prevent skin injury and reduce hospital length of stay. Prolonged surgery is a risk factor for pressure injury development in surgical patients.	VC
23	Armstrong D, Bortz P. An integrative review of pressure relief in surgical patients. AORN J. 2001;73(3):645-657.	Literature Review	n/a	n/a	n/a	n/a	All surgical patients should be considered at risk for pressure injury development. Effective perioperative nursing interventions should be implemented to prevent pressure injury.	VB
24	Lumbley JL, Ali SA, Tchokouani LS. Retrospective review of predisposing factors for intraoperative pressure ulcer development. J Clin Anesth. 2014;26(5):368-374.	Nonexperimental	222 Patients who underwent an operation of at least two hours duration	n/a	n/a	Pressure injury development	Risk factors for pressure injury development included surgical times of four hours or longer, comorbidities affecting tissue perfusion, supine position, and abdominal, noncardiac thoracic, and orthopedic positions. Regions of the body most at risk of injury included the sacral region, buttocks, genitalia, and heels.	IIIB
25	Walton-Geer PS. Prevention of pressure ulcers in the surgical patient. AORN J. 2009;89(3):538-548.	Expert Opinion	n/a	n/a	n/a	n/a	All surgical patients should be considered at risk of pressure injury; therefore, perioperative team members should develop and implement strategic plans to prevent pressure injury.	VB
26	Hayes RM, Spear ME, Lee SI, et al. Relationship between time in the operating room and incident pressure ulcers: a matched case-control study. Am J Med Qual. 2015;30(6):591-597.	Nonexperimental	931 patients with pressure injury following surgery	n/a	n/a	Time in the OR	OR time in the 24 hours prior to PU documentation was associated with PUs. Only 5% of HAPUs occurred within 24 hours of extended (>4 hours) surgery and 58% occurred after hospital day 5	IIIB
27	Practice Advisory for the Prevention of Perioperative Peripheral Neuropathies 2018: An Updated Report by the American Society of Anesthesiologists Task Force on Prevention of Perioperative Peripheral Neuropathies. Anesthesiology. 2018;128(1):11-26.	Systematic Review	n/a	n/a	n/a	n/a	Updates the "Practice Advisory for the Prevention of Perioperative Peripheral Neuropathies: An Updated Report by the American Society of Anesthesiologists Task Force on Prevention of Perioperative Peripheral Neuropathies," adopted by the ASA in 2010 and published in 2011. It focuses on perioperative positioning of the adult patient, use of protective padding, and avoidance of contact with hard surfaces or supports that may apply direct pressure on susceptible peripheral nerves.	IIIA
28	Aronovitch SA. Intraoperatively acquired pressure ulcers: are there common risk factors? Ostomy Wound Manage. 2007;53(2):57-69.	Nonexperimental	281/Members of the Wound, Ostomy, and Continence Nurses Society	n/a	n/a	Pressure injury development	The results of the study showed that 3.5% of patients developed a pressure injury within seven days of their operation. Factors that may increase patient risk for developing intraoperative pressure ulcers include positioning, use of positioning and thermoregulatory devices, length of surgery, type of anesthesia, and comorbidities. Current risk assessment tools to predict intraoperatively-acquired pressure injury are not adequate.	IIIB
29	Sukhu T, Krupski TL. Patient positioning and prevention of injuries in patients undergoing laparoscopic and robot-assisted urologic procedures. Curr Urol Rep. 2014;15(4):398.	Expert Opinion	n/a	n/a	n/a	n/a	Remaining cognizant of the operative time while in steep Trendelenburg, avoiding excessive intravenous fluid loading while maintaining perfusion, and careful positioning of extremities with avoidance of shoulder braces may help to reduce complications associated with surgical positioning.	VA
30	Colsa Gutiérrez P, Viadero Cervera R, Morales-Garcia D, Ingelmo Setién A. Intraoperative peripheral nerve injury in colorectal surgery. An update. Cir Esp. 2016;94(3):125-136.	Literature Review	n/a	n/a	n/a	n/a	A review of the literature that showed that in colorectal surgery neuropathy most often occurs during a laparoscopic approach and femoral neuropathy is generally attributed to the use of self-retracting separators and the lithotomy position.	VA
31	Guideline for electrosurgical safety. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2022:119-144.	Guideline	n/a	n/a	n/a	n/a	This document provides guidance to the perioperative team for the safe use of electrosurgical units (ESUs), electrocautery devices, and argon-enhanced coagulators.	IVA
32	Larkin BG. The ins and outs of body piercing. AORN J. 2004;79(2):333-342.	Expert Opinion	n/a	n/a	n/a	n/a	Jewelry should be removed from surgical patients to prevent pressure injuries.	VA
33	Smith FD. Caring for surgical patients with piercings. AORN J. 2016;103(6):583-596.	Expert Opinion	n/a	n/a	n/a	n/a	The presence of piercings and dermal implants places patients at risk for surgical site infection, electrical burns, trauma, and airway obstruction.	VB
34	Guideline for team communication. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2022:155-186.	Guideline	n/a	n/a	n/a	n/a	This document provides guidance for improving perioperative team communication through a culture of safety that incorporates team training, simulation training, standardized transfer of patient information (commonly referred to as hand overs or hand offs), briefings, time outs, surgical safety checklists, and debriefings.	IVA
35	Black J, Fawcett D, Scott S. Ten top tips: preventing pressure ulcers in the surgical patient. Wounds Int. 2014;5(4):14-18.	Expert Opinion	n/a	n/a	n/a	n/a	Top 10 tips on pressure injury prevention in the surgical patient, includes a risk assessment, skin assessment, additional protection, padding, equipment, safe patient handling, protecting the occiput and heels and postoperative communication.	VB
36	Soncrant CM, Warner LJ, Neily J, et al. Root cause analysis of reported patient falls in ORs in the Veterans Health Administration. AORN J. 2018;108(4):386-397.	Organizational Experience	22 OR patient falls	n/a	n/a	Patient falls	Procedures requiring extreme positioning performed without safety restraints, positioning devices, or positioning equipment specifically designed for preventing falls may put patients at great risk. Implementing approaches centered on structural changes, such as positioning posts and well- designed safety restraints and positioning devices designed for extreme positioning may improve patient safety.	VA

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37	Jacobs A, Rose S. Assessment is more than skin deep in older adults. OR Nurse. 2011;5(4):29.	Expert Opinion	n/a	n/a	N/A	n/a	Older adults are more susceptible to pressure injury due to decreased skin elasticity, reduced subcutaneous tissue, dry skin, chronic illness, malnutrition, incontinence, and decreased vascular sufficiency.	VC
38	Adedeji R, Oragui E, Khan W, Maruthainar N. The importance of correct patient positioning in theatres and implications of mal-positioning. Journal of Perioperative Practice. 2010;20(4):143-147.	Expert Opinion	n/a	n/a	n/a	n/a	Correct patient positioning in the OR is crucial to avoid the preventable complications of pressure injury, nerve compression, DVT, and compartment syndrome.	VB
39	Martin JT, Warner MA. Positioning in Anesthesia and Surgery. 3rd ed. Philadelphia, PA: Saunders; 1997.	Expert Opinion	n/a	n/a	n/a	n/a	Meticulous adherence to safe positioning practices will minimize patient injury	VC
40	Enchev Y. Checklists in neurosurgery to decrease preventable medical errors: a review. Balkan Med J. 2015;32(4):337-346.	Expert Opinion	n/a	n/a	N/A	n/a	Neurosurgical positioning checklists represent an efficient, reliable, cost-effective, and time-saving tool for increasing patient safety.	VA
41	Rowen L, Hunt D, Johnson KL. Managing obese patients in the OR. OR Nurse. 2012;6(2):26-35.	Expert Opinion	n/a	n/a	n/a	n/a	Perioperative patients who are obese require an evidence-based, integrated approach to their care.	VB
42	WHO Surgical Safety Checklist. https://www.who.int/teams/integrated-health-services/patient-safety/research/safe-surgery/tool-and-resources. Accessed March 4, 2022.	Expert Opinion	n/a	n/a	n/a	n/a	Using the safe surgery checklist helps to decrease errors and adverse events and increase teamwork and communication among perioperative team members.	VA
43	Guideline for medical device and product evaluation. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2022:781-790.	Guideline	n/a	n/a	n/a	n/a	This document provides guidance to perioperative team members for developing and implementing a process for evaluating US Food and Drug Administration–cleared medical devices and products for use in the perioperative setting.	IVA
44	Sorensen EE, Kusk KH, Gronkjaer M. Operating room nurses' positioning of anesthetized surgical patients. J Clin Nurs. 2016;25(5-6):690-698.	Qualitative	481 OR nurses at 4 public university hospitals	n/a	n/a	OR nurses experiences concerning the positioning of the anesthetized patient in the prone, supine, lateral, sitting and lithotomy positions	Positioning of the prone, lithotomy and lateral positions is particularly difficult, there is a general need for better positioning devices, a need to establish permanent surgical teams and for special positioning competencies.	IIIB
45	Sehulster LM, Chinn RYW, Arduino MJ, et al. Guidelines for environmental infection control in health-care facilities. Recommendations from CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC). Centers for Disease Control and Prevention. https://www.cdc.gov/infectioncontrol/guidelines/environmental/index.html. Published 2003. Updated July 2019. Accessed March 4, 2022.	Guideline	n/a	n/a	n/a	n/a	an environmental infection-control guideline that reviews and reaffirms strategies for the prevention of environmentally-mediated infections, particularly among health-care workers and immunocompromised patients.	IVA
46	Ahmed K, Khan N, Khan MS, Dasgupta P. Development and content validation of a surgical safety checklist for operating theatres that use robotic technology. BJU Int. 2013;111(7):1161-1174.	Organizational Experience	15 member interdisciplinary team in a UK teaching hospital	a FEMA risk assessment tool was used in a urology OR with innovative tools	n/a	Elimination and control of identified hazards	It is anticipated that the use of the checklist will encourage a culture of safety and awareness within the operating theater, but it is unlikely that a simple checklist can be the sole driver of significant culture change without support and cooperation from all members of the team.	VA
47	Guideline for environmental cleaning. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2022:181-212.	Guideline	n/a	n/a	n/a	n/a	This document provides guidance on the selection and use of cleaning products, cleaning procedures, personnel education and competency verification, and monitoring cleanliness through performance improvement processes.	IVA
48	Dauber MH, Roth S. Operating table failure: another hazard of spine surgery. Anesth Analg. 2009;108(3):904-905.	Case Report	Obese patient undergoing spinal fusion with instrumentation in the prone position	n/a	n/a	n/a	Familiarity with intricacies of specialized operating room equipment is necessary. Attention to safety measures may improve patient care.	VB
49	Pressure ulcer prevention in the operating room: recommendations and guidance. Minnesota Hospital Association. https://www.mnhospitals.org/Portals/0/Documents/patientsafety/Pressure%20Ulcers/MHA_perioperative_recommendations.pdf. Published March 2013. Accessed March 4, 2022.	Expert Opinion	n/a	n/a	n/a	n/a	The use of a traction table is not without risks and significant complications can occur, including injury to the perineum and soft tissues, neurologic impairment, and compartment syndrome of the well-leg.	VA
50	Bushard S. Trauma in patients who are morbidly obese. AORN J. 2002;76(4):585-589.	Expert Opinion	n/a	n/a	n/a	n/a	Negative outcomes such as peripheral neuropraxia, fracture malrotation, and soft tissue injuries can often be avoided with careful positioning.	VB
51	Waters T, Short M, Lloyd J, et al. AORN ergonomic tool 2: positioning and repositioning the supine patient on the OR bed. AORN J. 2011;93(4):445-449.	Expert Opinion	n/a	n/a	n/a	n/a	It is important to determine which tasks may be safe to perform manually and which tasks should be performed with using assistive technology.	VA
52	Waters T, Baptiste A, Short M, Plante-Mallon L, Nelson A. AORN ergonomic tool 1: lateral transfer of a patient from a stretcher to an OR bed. AORN J. 2011;93(3):334-339.	Expert Opinion	n/a	n/a	n/a	n/a	It is important to determine which tasks may be safe to perform manually and which tasks should be performed using assistive technology.	VA
53	Beyea SC. Preventing patient falls in perioperative settings. AORN J. 2005;81(2):393-395.	Expert Opinion	n/a	n/a	n/a	n/a	To prevent falls, perioperative RNs should collaborate to develop an evidence-based approach specific to the perioperative setting. This approach would help determine which patients are at greatest risk of falling.	VB
54	Mackey D. Support surfaces: beds, mattresses, overlays–oh my! Nurs Clin North Am. 2005;40(2):251-265.	Expert Opinion	n/a	n/a	n/a	n/a	The selection of a support surface is an important component of a pressure injury prevention program.	VB
55	Asiedu GB, Lowndes BR, Huddleston PM, Hallbeck S. "The Jackson Table is a pain in the...": a qualitative study of providers' perception toward a spinal surgery table. J Patient Saf. 2018;14(1):21-26.	Qualitative	11 Members of a spinal positioning team	Interviews, coding, and thematic analysis	n/a	Themes related to prone positioning	Best results for prone positioning can be achieved through standardized practices, educational tools, and equipment checklists.	IIB
56	Shon YJ, Bae SK, Park JW, Kim IN, Huh J. Partial displacement of epidural catheter after patient position change: a case report. J Clin Anesth. 2017;37:17-20.	Case Report	36-year-old woman undergoing ankle surgery under epidural anesthesia	n/a	n/a	n/a	The change in patient position was the reason for the displacement of the epidural catheter.	VB

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57	Washington SJ, Smurthwaite GJ. Positioning the surgical patient. Anaesth Intensive Care Med. 2009;10(10):476-479.	Expert Opinion	n/a	n/a	n/a	n/a	Recommendations are provided for patient positioning and the physiological changes associated with different positions.	VB
58	Bjøro B, Mykkeltveit I, Rustøen T, Candas Altinbas B, Røise O, Bentsen SB. Intraoperative peripheral nerve injury related to lithotomy positioning with steep Trendelenburg in patients undergoing robotic-assisted laparoscopic surgery – a systematic review. J Adv Nurs. 2020;76(2):490-503.	Systematic Review	n/a	n/a	n/a	n/a	Both lower and upper extremities can be injured, patient risk factors such as higher ASA score, comorbidities and higher BNI were identified. It is important to obtain information about patient function and quality of life.	IIIA
59	Laughlin RS, Johnson RL, Burkle CM, Staff NP. Postsurgical neuropathy: a descriptive review. Mayo Clin Proc. 2020;95(2):355-369.	Literature Review	N/A	N/A	N/A	N/A	Summarized the literature surrounding the frequency of new neurologic deficits after various types of surgery and potential causes and treatments	VA
60	Bonnaig N, Dailey S, Archdeacon M. Proper patient positioning and complication prevention in orthopaedic surgery. J Bone Joint Surg Am. 2014;96(13):1135-1140.	Literature Review	n/a	n/a	n/a	n/a	Postoperative neuropathy can cause significant morbidity and providers should work to lessen it's frequency and impact.	VB
61	Shveiky D, Aseff JN, Iglesia CB. Brachial plexus injury after laparoscopic and robotic surgery. J Minim Invasive Gynecol. 2010;17(4):414-420.	Literature Review	n/a	n/a	n/a	n/a	Review of the literature included anatomy, clinical presentation, mechanism of injury, predisposing factors, reports in surgery, diagnosis, treatment and prevention of BPI during robotic surgery while in the Trend position.	VA
62	Agostini J, Goasguen N, Mosnier H. Patient positioning in laparoscopic surgery: tricks and tips. J Visc Surg. 2010;147(4):e227-e232.	Expert Opinion	n/a	n/a	n/a	n/a	Strategies to prevent injuries associated with patient positioning including nerve injury due to stretching or compression, rhabdomyolysis, and compartment syndrome are provided.	VB
63	.Akhavan A, Gainsburg DM, Stock JA. Complications associated with patient positioning in urologic surgery. Urology. 2010;76(6):1309-1316.	Expert Opinion	n/a	n/a	n/a	n/a	Strategies to prevent injuries associated with patient positioning including nerve injury due to stretching or compression, rhabdomyolysis, and compartment syndrome are provided.	VB
64	Zhang J, Moore AE, Stringer MD. Iatrogenic upper limb nerve injuries: a systematic review. ANZ J Surg. 2011;81(4):227-236.	Literature Review	n/a	n/a	n/a	n/a	Most cases of upper limb nerve injuries are preventable by an adequate knowledge of surgical anatomy and an awareness of the procedures in which peripheral nerves are particularly vulnerable.	VB
65	Bale E, Berrecloth R. The obese patient. Anaesthetic issues: airway and positioning. J Perioper Pract. 2010;20(8):294-299.	Expert Opinion	N/A	N/A	N/A	N/A	The author reviewed the challenges, assessment and solutions available to the clinician faced with a high BMI patient with particular reference to the technique of ramping.	VB
66	Kam AW, Lam PH, Murrell GAC. Brachial plexus injuries during shoulder arthroplasty: what causes them and how to prevent them. Tech Shoulder Elbow Surg. 2014;15(4):109-114.	Expert Opinion	n/a	n/a	n/a	n/a	Abduction greater than 90° can stretch the brachial plexus. Rotation and lateral flexion of the neck to the contralateral side also augments brachial plexus strains.	VA
67	Shimizu S, Sato K, Mabuchi I, et al. Brachial plexopathy due to massive swelling of the neck associated with craniotomy in the park bench position. Surg Neurol. 2009;71(4):504-508.	Case Report	56-year-old woman undergoing craniotomy in the lateral position	n/a	n/a	n/a	Possible pathologic mechanisms for the patient's injury included kinking of the jugular vein due to extremely flexed neck position during surgery and subsequent swelling of the neck and brachial plexus.	VB
68	Silverstein JW, Madhok R, Frendo CD, DeWal H, Lee GR. Contemporaneous evaluation of intraoperative ulnar and median nerve somatosensory evoked potentials for patient positioning: a review of four cases. Neurodiagn J. 2016;56(2):67-82.	Literature Review	n/a	n/a	n/a	n/a	Brachial plexus injuries are a recognized complication following spinal surgery. Attention to patient positioning with the use of electrophysiological monitoring techniques could minimize injury.	VB
69	Lin SP, Sung CS, Chan KH. Compartment syndrome and rhabdomyolysis as a positioning complication following retrosigmoid craniotomy. Acta Anaesthesiol Taiwan. 2013;51(4):184-186.	Case Report	30-year-old man undergoing retrosigmoid craniotomy in the supine position	n/a	n/a	n/a	The patient's postoperative compartment syndrome of the head and neck was likely the result of extreme rotation of the neck during a prolonged surgical procedure.	VB
70	Ortega R, Suzuki S, Sekhar P, Stram JR, Rengasamy SK. Paraplegia after mastoidectomy under general anesthesia. Am J Otolaryngol. 2009;30(5):340-342.	Case Report	34-year-old woman undergoing mastoidectomy and tympanoplasty of the right ear	n/a	n/a	n/a	case of complete paraplegia after general anesthesia for a right tympanomastoidectomy without any apparent predisposing factors related to the surgical procedure or the anesthetic. The case raises the possibility that the combination of neck rotation and relative hypotension may precipitate paraplegia in patients with preexisting spinal chord pathology.	VB
71	Morrison CM, Dobryansky M, Warren RJ, Zins JE. The table tilt: preventing traction on the brachial plexus during facelift surgery. Aesthet Surg J. 2012;32(4):524.	Expert Opinion	n/a	n/a	n/a	n/a	Tilting the OR bed improves visibility and reduces the potential for brachial plexus injury during rhytidectomy procedures.	VC
72	Anghelescu DL, Burgoyne LL, Khan RB. Multiple mechanisms of perioperative brachial plexus injury. Anaesth Intensive Care. 2008;36(2):276-278.	Case Report	1/19-year-old male undergoing limb-sparing surgery for osteosarcoma	n/a	n/a	n/a	Some risk factors for perioperative brachial plexus injury can be modified. All efforts should be made to modify the factors that are amenable to change, especially in high-risk situations.	VB
73	Truong AT, Sturgis EM, Rozner MA, Truong DT. Recurrent episodes of asystole from carotid sinus hypersensitivity triggered by positioning for head and neck surgery. Head Neck. 2013;35(1):E28-E30.	Case Report	39-year-old man undergoing thyroid surgery in the supine position	n/a	n/a	n/a	The fact that asystole occurred twice on separate occasions under the same circumstances suggests that the asystolic episodes were triggered by compression or mechanical manipulation of the carotid sinus during positioning of the neck in hyperextension.	VB
74	Li CC, Yie JC, Lai CH, Hung MH. Quadriplegia after off-pump coronary artery bypass surgery: look before you place the neck in an extended position. J Cardiothorac Vasc Anesth. 2013;27(2):e16-e17.	Case Report	1/77-year-old man undergoing coronary artery bypass surgery in the supine position	N/A	N/A	N/A	Neck extension to facilitate surgical exposure appeared to be the main factor involved in the genesis of the spinal cord injury.	VB
75	Reddy MK, Arivazhagan A, Chandramouli BA. Intractable hypotension and bradycardia during surgical positioning in atlantoaxial dislocation. J Neurosurg Anesthesiol. 2008;20(1):71.	Case Report	25-year-old man undergoing posterior fusion	n/a	n/a	n/a	This report emphasizes the need for meticulous positioning of unstable cervical spines.	VC

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
76	Sadeghpour M, Au J, Ho J, Hyman J, Patton T. Patient positioning and skin sequelae: ischemic epidermal necrosis from tight padding during cardiac surgery. A A Case Rep. 2016;6(10):293-295.	Case Report	54 year old mad with a body mass index of 28.7kg/m^2 undergoing heart surgery	n/a	n/a	n/a	Careful positioning and padding of pressure points during surgery are recommended to prevent pressure ulcers, vascular injury, and nerve damage in an immobilized patient. However, overpad-ding may have unintended consequences. We report a case of ischemia-induced full-thickness epidermal necrosis secondary to tight foam padding during a cardiac surgery.	VA
77	Bradshaw AD, Advincula AP. Optimizing patient positioning and understanding radiofrequency energy in gynecologic surgery. Clin Obstet Gynecol. 2010;53(3):511-520.	Expert Opinion	n/a	n/a	n/a	n/a	Understanding neuroanatomical relationships can help the perioperative team optimally position patients and minimize the incidence of postoperative neuropathy while maintaining functional and unobstructed access to the patient and surgical field.	VB
78	Clayton JL. Special needs of older adults undergoing surgery. AORN J. 2008;87(3):557-570.	Expert Opinion	n/a	n/a	N/A	n/a	Successful surgical management of an older adult depends on the perioperative RN's understanding of age-related factors that may affect the outcome of the procedure.	VB
79	Kuponiyi O, Alleemudder DI, Latunde-Dada A, Eedarapalli P. Nerve injuries associated with gynaecological surgery. Obstet Gynaecol. 2014;16(1):29-36.	Expert Opinion	n/a	n/a	n/a	n/a	Poor patient positioning is a major contributor to intraoperative nerve injuries.	VA
80	Kirkland-Walsh H, Teleten O, Wilson M, Raingruber B. Pressure mapping comparison of four OR surfaces. AORN J. 2015;102(1):61.e1-e9.	Quasi-experimental	51 volunteers	air inflated static seat cushion over a standard surgical table surface, two layer OR surface consisting of a top layer of non-powered self-contouring copolymer gel and a bottom layer of high density foam, and a fluid immersion simulation surgical surface.	standard 3 layer viscoelastic memory foam surgical table surface	Full body interface pressure testing to evaluate pressure redistribution properties of OR surfaces	Although all surfaces had similar average interface pressures, the air-inflated static seat cushion had the best pressure redistribution properties in the sacral region compared with the other surfaces tested	IIA
81	Fritzlen T, Kremer M, Biddle C. The AANA Foundation Closed Malpractice Claims Study on nerve injuries during anesthesia care. AANA J. 2003;71(5):347-352.	Nonexperimental	44/Cases of nerve injury contained within the total AANA Closed Malpractice Claims Database (N = 223)	n/a	n/a	Mechanisms of neurologic injury	The most common injury was to the brachial plexus. Documentation was lacking or inadequate in a majority of the claims. Abnormal body habitus, comorbidities, anesthesia technique, lack of adequate padding, and tourniquet use were implicated as risk factors for positioning injuries.	IIIB
82	O'Connell MP. Positioning impact on the surgical patient. Nurs Clin North Am. 2006;41(2):173-192.	Expert Opinion	n/a	n/a	n/a	n/a	There are many challenges and physiologic risks associated with surgical positioning.	VB
83	Clark JM, Friedell ML, Gupta BR, Davenport WC, Amponsah K. Perioperative compartment syndrome of the hand. Am Surg. 2011;77(1):116-117.	Case Report	One 76-year-old woman who underwent surgery for rectal prolapse, and one 63-year-old woman who underwent left nephrectomy	n/a	N/A	n/a	Prevention of hand compartment syndrome begins with positioning the patient's hands at the side with draw sheets loosely tucked around the dorsum of the hand. An arm board should be used if the patient's hands cannot be comfortably positioned at the sides. If swelling and cyanosis of the hand is noted postoperatively compartment syndrome should be considered.	VA
84	Pulos BP, Johnson RL, Laughlin RS, et al. Perioperative Ulnar Neuropathy: A Contemporary Estimate of Incidence and Risk Factors. Anesthesia & Analgesia. 2021;132(5).	Nonexperimental	22 surgical patients	n/a	n/a	Persistent perioperative ulnar neuropathy of at least 2-month duration, diagnosed within 6 months of sur-gery	Several of the previously reported risk factors continue to be associated with the development of persistent perioperative ulnar neuropathy, providing ongoing targets for practice changes that might further decrease the incidence of this problem.	IIIB
85	St-Arnaud D, Paquin MJ. Safe positioning for neurosurgical patients. AORN J. 2008;87(6):1156-1168.	Expert Opinion	n/a	n/a	n/a	n/a	The neurosurgical perioperative team faces additional challenges related to patient positioning because of the potential for complications during prolonged and complex procedures.	VA
86	Moore C. Intraoperative median nerve injury. Int Student J Nurse Anesth. 2011;10(2):11-14.	Case Report	1/24-year-old male undergoing elective surgery	n/a	n/a	n/a	The blood pressure cuff cycling every three minutes for four hours could have caused the injury.	VB
87	Hida A, Arai T, Nakanishi K, Nagaro T. Bilateral brachial plexus injury after liver transplantation. J Anesth. 2008;22(3):308-311.	Case Report	35-year-old man with hepatitis C cirrhosis undergoing a liver transplantation	n/a	n/a	n/a	A 90° abduction of the arms may have resulted in excessive stretching of the brachial nerves.	VB
88	Akinbingol G, Borman H, Maral T. Bilateral brachial plexus palsy after a prolonged surgical procedure of reduction mammaplasty, abdominoplasty, and liposuction. Ann Plast Surg. 2002;49(2):219-220.	Case Report	Obese 56-year-old woman undergoing reduction mammoplasty, abdominoplasty, and liposuction	n/a	n/a	n/a	When operating on overweight patients, arm abduction should be reduced during positioning.	VC

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89	Sabiniewicz R, Ereciński J, Zipser M. Brachial plexus injury as an unusual complication after aortic stent implantation. Cardiol Young. 2011;21(2):227-228.	Case Report	1/15-year-old girl undergoing aortic stent implantation in the supine position with arms raised over her head	n/a	n/a	n/a	The patient's brachial plexus injury caused by compression against skeletal structures.	VB
90	Cristian DA, Grama FA, Burcos T, Poalelungi A. Brachial plexus injury after a left-side modified radical mastectomy associated with patient positioning in the operating room. Gineco.ro. 2013;9(33):136-137.	Case Report	1 65-year-old woman undergoing left-sided modified radical mastectomy	n/a	n/a	n/a	A number of factors including incorrect patient positioning can cause brachial plexus injury.	VB
91	Ghomi A. Robotics in practice: new angles on safer positioning. Contemp Ob Gyn. October 2012:26-28, 30, 32, 37.	Expert Opinion	n/a	n/a	n/a	n/a	Positioning injury can occur during robotic gynecological surgery. Robotic surgery without steep Trendelenburg appears to be feasible without compromising surgical outcomes.	VB
92	Kan KM, Brown SE, Gainsburg DM. Ocular complications in robotic-assisted prostatectomy: a review of pathophysiology and prevention. Minerva Anestesiol. 2015;81(5):557-566.	Expert Opinion	N/A	N/A	N/A	N/A	Ocular complications may be more likely to occur after procedures using steep Trendelenburg position.	VA
93	Segal KL, Fleischut PM, Kim C, et al. Evaluation and treatment of perioperative corneal abrasions. J Ophthalmol. 2014;2014:901901.	Quasi-experimental	86 surgery patients 86 in the corneal abrasion group and 89 in the control group	Diagnosis of a corneal abrasion	No corneal abrasion	Intraoperative risk factors	Risk factors that contributed to a corneal abrasion were general anesthesia, greater than average blood loss, eyes taped during surgery, prone position, Trendelenburg position, supplemental oxygen being used end route to and in the PACU.	IIB
94	Grixti A, Sadri M, Watts MT. Corneal protection during general anesthesia for nonocular surgery. Ocul Surf. 2013;11(2):109-118.	Literature Review	n/a	n/a	N/A	n/a	None of the available methods of corneal protection for patients undergoing anesthesia are completely effective, and they all have unwanted side effects. Lid taping is the single, best protective measure.	VB
95	Kocatürk Ö, Kocatürk T, Kaan N, Dayanir V. The comparison of four different methods of perioperative eye protection under general anesthesia in prone position. J Clin Anal Med. 2012;3(2):163-165.	Nonexperimental	368 patient eyes undergoing general anesthesia for < 90 minutes for spinal surgery in the prone position	Application of hypoallergenic adhesive tape, antibiotic ointment, artificial liquid tear gel, or ocular lubricant	No protection	Basal tear production/Corneal and conjunctival staining	All of the methods tested are suitable to reduce the incidence of corneal injuries.	IIB
96	Roth S. Perioperative visual loss: what do we know, what can we do? Br J Anaesth. 2009;103(Suppl 1):31-40.	Literature Review	n/a	n/a	n/a	n/a	There is no evidence to support any interventions for preventing ischemic optic neuropathy, in most instances it is preventable by correct head positioning and avoiding external compression on the eyes.	VA
97	Addas BM. An uncommon cause of brachial plexus injury. Neurosciences (Riyadh). 2012;17(1):64-65.	Case Report	35-year-old woman undergoing lumbar spine surgery in the prone position	n/a	n/a	n/a	The cause of the injury was believed to be a very tight endotracheal tube tie in combination with the patient's head being turned to one side.	VB
98	Owers CE, Abbas Y, Ackroyd R, Barron N, Khan M. Perioperative optimization of patients undergoing bariatric surgery. J Obes. 2012;2012:781546.	Expert Opinion	n/a	n/a	n/a	n/a	Optimal management of the obese patient undergoing bariatric surgery is complex.	VB
99	Teeples TJ, Rallis DJ, Rieck KL, Viozzi CF. Lower extremity compartment syndrome associated with hypotensive general anesthesia for orthognathic surgery: a case report and review of the disease. J Oral Maxillofac Surg. 2010;68(5):1166-1170.	Case Report	53-year-old obese man undergoing orthognathic surgery in the supine position	n/a	n/a	n/a	Preoperative identification of risk factors, taking careful intraoperative preventive measures, and rapid response to postoperative lower leg pain will minimize the risk of a complication with long-term morbidity or potential mortality.	VB
100	Judge A, Fecho K. Lateral antebrachial cutaneous neuropathy as a result of positioning while under general anesthesia. Anesth Analg. 2010;110(1):122-124.	Case Report	1/25-year-old man undergoing medial meniscal transplant	N/A	N/A	N/A	Correct positioning should include minimal shoulder abduction, extension, and external rotation, the head should remain midline, elbows should be slightly flexed with forearm supination, and the wrists should remain neutral. It may be beneficial to assess the patient's comfort preoperatively.	VB
101	Song J. Severe brachial plexus injury after retropubic radical prostatectomy: a case report. Korean J Anesthesiol. 2012;63(1):68-71.	Case Report	69-year-old man with prostate cancer who underwent surgery for 16 h	n/a	n/a	n/a	Approximately 6 h after surgery, the patient developed severe pain and motor weakness in his right arm. After neurologic examinations that included a nerve conduction study and electromyography, the patient was diagnosed with a brachial plexus injury. The causes of the brachial plexus injury were thought to be abduction of both arms, direct compression of the shoulder brace, and prolonged surgery	VA
102	Gardner BM. The beach chair position. South Afr Fam Pract. 2015;57(2):S6-S9.	Expert Opinion	n/a	n/a	n/a	n/a	The semi-sitting position is commonly used for shoulder surgery. Avoiding the potentially catastrophic complications of cerebrovascular events that may occur requires vigilance and meticulous attention to detail.	VA
103	Ng AKH, Page RS. Greater auricular nerve neuropraxia with beach chair positioning during shoulder surgery. Int J Shoulder Surg. 2010;4(2):48-50.	Case Report	2 Patients undergoing shoulder surgery in the semi-sitting position	n/a	n/a	n/a	The use of a horseshoe-shaped head positioner is not recommended.	VB
104	LaPrade CM, Foad A. Greater auricular nerve palsy after arthroscopic anterior-inferior and posterior-inferior labral tear repair using beach-chair positioning and a standard universal headrest. Am J Orthop (Belle Mead NJ). 2015;44(4):188-191.	Case Report	18-year-old man undergoing arthroscopic shoulder surgery in the semi-sitting position	n/a	n/a	n/a	The location of the headrest in relation to the great auricular nerve should be monitored, especially in cases where the operative time may be prolonged.	VB

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105	Rowell J, Lynn AM, Filardi TZ, Celix J, Ojemann JG. Acute unilateral enlargement of the parotid gland immediately post craniotomy in a pediatric patient: a case report. Childs Nerv Syst. 2010;26(9):1239-1242.	Case Report	5-year-old boy undergoing craniotomy in the lateral position	n/a	n/a	n/a	The injury was likely caused by trapping the salivary duct between the teeth on the right side of the mouth and the horseshoe headrest that the right cheek rested on.	VA
106	Kamel I, Barnette R. Positioning patients for spine surgery: avoiding uncommon position-related complications. World J Orthop. 2014;5(4):425-443.	Expert Opinion	n/a	n/a	n/a	n/a	The prevention of uncommon complications of spine surgery depends primarily on identifying high-risk patients, proper positioning and optimal intraoperative management of physiological parameters. Modification of risk factors extrinsic to the patient may help reduce the incidence of PPNI and POVL	VA
107	Drummond JC, Ciacci JD, Lee RR. Direct pressure on a pseudomeningocele resulting in intraoperative cerebral ischemia. Can J Anaesth. 2014;61(7):656-659.	Case Report	32-year-old man with spina bifida and a pseudo meningocele undergoing urologic surgery in the lithotomy position	n/a	n/a	n/a	Intraoperative pressure on lesions containing cerebrospinal fluid can result in increases in cerebrospinal fluid pressure and a reduction in cerebral perfusion sufficient to result in cerebral ischemia.	VB
108	Silverstein JW, Matthews E, Mermelstein LE, DeWal H. Causal factors for position-related SSEP changes in spinal surgery. Eur Spine J. 2016;25(10):3208-3213.	Nonexperimental	398 patient charts and intraoperative neurophysiological monitoring data from patients who underwent thoracolumbar and lumbosacral spine surgery were reviewed in a consecutive sequence from 2012 to 2013.	n/a	n/a	Adverse events (AE) with the upper extremity SSEP recordings were compared to the independent variables, sex, positioning, length of procedure, and body habitus.	Sex, patient positioning, length of procedure, and BMI are determinants for upper extremity neural compromise during thoracolumbar and lumbosacral spine surgeries.	IIIB
109	Anastasian ZH, Ramnath B, Komotar RJ, et al. Evoked potential monitoring identifies possible neurological injury during positioning for craniotomy. Anesth Analg. 2009;109(3):817-821.	Case Report	One 73-year-old woman, and one 62-year-old man undergoing craniotomy procedures in the supine position with head turned to the right	n/a	n/a	n/a	These cases illustrate the usefulness of SSEP monitoring and the ability to reposition the patient to prevent injury	VB
110	Jahangiri FR, Holmberg A, Vega-Bermudez F, Arlet V. Preventing position-related brachial plexus injury with intraoperative somatosensory evoked potentials and transcranial electrical motor evoked potentials during anterior cervical spine surgery. Am J Electroneurodiagnostic Technol. 2011;51(3):198-205.	Case Report	1/43-year-old man with a history of neck pain undergoing anterior cervical spine surgery in the supine position	N/A	N/A	N/A	Intraoperative neurological monitoring was useful in identifying and reversing the patient's impending nerve injury.	VB
111	Chung I, Glow JA, Dimopoulos V, et al. Upper-limb somatosensory evoked potential monitoring in lumbosacral spine surgery: a prognostic marker for position-related ulnar nerve injury. Spine J. 2009;9(4):287-295.	Quasi-experimental	230 Consecutive patients undergoing elective, posterior lumbosacral spinal procedures	Upper-limb and lower-limb SSEP monitoring	Baseline levels	A $\geq$ 50% decrease in SSEPs	Upper limb SSEP monitoring detected position-related ulnar neuropathy in 5.2% of patients undergoing lumbosacral spine surgery.	IIB
112	La Neve JE, Zitney GP. Use of somatosensory evoked potentials to detect and prevent impending brachial plexus injury during surgical positioning for the treatment of supratentorial pathologies. Neurodiagn J. 2014;54(3):260-273.	Case Report	3 Patients undergoing cranial surgery in the supine position	n/a	n/a	n/a	These cases highlight the importance of vigilant monitoring in the period after final positioning and demonstrate the usefulness of SSEP monitoring as a tool to aid in the detection and prevention of position-related nerve injuries.	VA
113	Davis SF, Khalek MA, Giles J, Fox C, Lirette L, Kandil E. Detection and prevention of impending brachial plexus injury secondary to arm positioning using ulnar nerve somatosensory evoked potentials during transaxillary approach for thyroid lobectomy. Am J Electroneurodiagn Technol. 2011;51(4):274-279.	Case Report	13-year-old female patient undergoing robotic-assisted transaxillary subtotal thyroidectomy	n/a	n/a	n/a	The use of ulnar nerve SSEPs to detect and prevent position-related injury should be routinely performed during robotic-assisted transaxillary subtotal thyroidectomy.	VB
114	Jellish WS, Sherazee G, Patel J, et al. Somatosensory evoked potentials help prevent positioning-related brachial plexus injury during skull base surgery. Otolaryngol Head Neck Surg. 2013;149(1):168-173.	Nonexperimental	65 Patients between the ages of 15 and 77 undergoing elective lateral skull base surgery positioned in supine with head rotated to contralateral side secured with a Mayfield headrest	SSEP monitoring	Baseline levels	Changes in measurements caused by positioning	Upper extremity nerve stress can be detected in real time using SSEP monitoring and may be of value in protecting patients from nerve injury	IIIA

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115	Schwartz DM, Sestokas AK, Hilibrand AS, et al. Neurophysiological identification of position-induced neurologic injury during anterior cervical spine surgery. J Clin Monit Comput. 2006;20(6):437-444.	Nonexperimental	69 of 3806 Patients showing intraoperative evidence of impending neurologic injury secondary to positioning	n/a	n/a	Detection of emerging potential neurologic injury	Transcranial electric motor evoked potential monitoring helps validate SSEP monitoring and provides additional coverage for emerging motor nerve injury that may escape identification by SSEP monitoring alone.	IIIB
116	Bhalodia VM, Sestokas AK, Tomak PR, Schwartz DM. Transcranial electric motor evoked potential detection of compressional peroneal nerve injury in the lateral decubitus position. J Clin Monit Comput. 2008;22(4):319-326.	Case Report	One 65-year-old man, and one 39-year-old man undergoing spine surgery in the lateral position	n/a	n/a	n/a	These cases illustrate the usefulness of TCeMEP monitoring to identify emerging peroneal nerve compression secondary to lateral positioning.	VB
117	Bennicoff G. Perioperative care of the morbidly obese patient in the lithotomy position. AORN J. 2010;92(3):297-309.	Expert Opinion	n/a	n/a	n/a	n/a	Caring for a patient who is morbidly obese and who requires surgery in the lithotomy position can be especially challenging, and the possibility of injury to the patient or team members exists.	VB
118	Song JB, Vemana G, Mobley JM, Bhayani SB. The second "time-out": a surgical safety checklist for lengthy robotic surgeries. Patient Saf Surg. 2013;7(1):19.	Organizational Experience	n/a	n/a	n/a	Reduced perioperative complications after robotic surgery	A standardized surgical checklist conducted three to four hours after the start of surgery, may enhance perioperative patient safety and quality of care.	VB
119	Prevention and Treatment of Pressure Ulcers/Injuries: Clinical Practice Guideline. The International Guideline. 3rd ed. European Pressure Ulcer Advisory Panel, National Pressure Injury Advisory Panel (NPIAP) and Pan Pacific Pressure Injury Alliance; 2019.	Guideline	n/a	n/a	n/a	n/a	Guideline for the prevention and management of pressure injuries, recommendations given,	IVA
120	Price TP, Ivashchenko A, Schurr MJ. Perioperative visual loss after excision and autografting of a thermal burn to the back. Burns. 2014;40(4):e31-e34.	Case Report	45-year-old man undergoing deep partial- and full-thickness autografting in the prone position	n/a	n/a	n/a	Intraoperative contributors for the postoperative vision loss in this patient included prone positioning, Wilson frame use, prolonged duration of operation, extensive blood loss, and anemia.	VB
121	Winfree CJ, Kline DG. Intraoperative positioning nerve injuries. Surg Neurol. 2005;63(1):5-18.	Expert Opinion	n/a	n/a	n/a	n/a	Intraoperative positioning nerve injuries are largely preventable, yet they continue to occur.	VB
122	Rosevear HM, Lightfoot AJ, Zahs M, Waxman SW, Winfield HN. Lessons learned from a case of calf compartment syndrome after robot-assisted laparoscopic prostatectomy. J Endourol. 2010;24(10):1597-1601.	Case Report	57-year-old man undergoing robotic-assisted prostatectomy in the supine with Trendelenburg split-leg position on a fracture table	n/a	n/a	n/a	The perioperative team should verify there are no pressure points between the robotic arms and the patient.	VA
123	Pandey R, Elakkumanan LB, Garg R, et al. Brachial plexus injury after robotic-assisted thoracoscopic thymectomy. J Cardiothorac Vasc Anesth. 2009;23(4):584-586.	Case Report	1 18-year-old man undergoing arthroscopic shoulder surgery in the lateral position	n/a	n/a	n/a	Somatosensory evoked potential monitoring may be used to prevent injury. Patient position should avoid hyperabduction and also provide space for robotic arm movement.	VB
124	Hobaika AB, Horiguchi CH. Radial nerve lesion after malposition and sedation by continuous target controlled infusion of propofol for extracorporeal shock wave lithotripsy. Middle East J Anesthesiol. 2013;22(2):235-236.	Case Report	36-year-old female undergoing left-sided ESWL	n/a	n/a	n/a	The injury to the patient's radial nerve may have been related to incorrect positioning of the limb or contact of the limb with the lithotripter machine.	VC
125	Huber D. Preventing deep tissue injury of the foot and ankle in the operating theatre. Wounds UK. 2013;9(2):34-38.	Expert Opinion	n/a	n/a	n/a	n/a	Preventing heel and ankle pressure injury requires offloading the heels, flexing the knees 5° to 10° while preventing popliteal compression, distributing the weight of the legs along the calf with minimal pressure on the Achilles tendon, and preventing pressure on the lateral malleolus.	VB
126	Huber D, Huber J, DeYoung E. The association between popliteal vein compression and deep venous thrombosis: results of a pilot study. Phlebology. 2013;28(6):305-307.	Nonexperimental	54 Patients undergoing ultrasonic scanning for DVT	Popliteal vein measurements in patients with popliteal vein compression	Popliteal vein measurements in patients without popliteal vein compression	Occurrence of DVT	There is an association between the presence of popliteal vein compression and an increased likelihood of developing a DVT.	IIIB
127	Kim GS, Yoon JS, Kee R, et al. Association between the use of gel pads under patients' knees and the incidence of peroneal neuropathy following liver transplantation. Singapore Med J. 2014;55(8):432-435.	Nonexperimental	261 Adult liver transplant patients retrospective chart review	167 patients had a gel pad placed under the knees	94 did not have a gel pad	incidence of peroneal neuropathy	nerve injury was higher in the gel pad group, As the use of gel pads may increase the incidence of PN, the researchers recommend against the use of gel pads under the knees of LT recipients.	IIIB
128	King CA, Bridges E. Comparison of pressure relief properties of operating room surfaces. Perioper Nurs Clin. 2006;1(3):261-265.	Quasi-experimental	11/Perioperative team members	Pressure measurements of occiput, sacrum, heels, and trochanter in supine and lateral positions	Standard OR bed mattress compared with OR bed mattress with foam overlay, and OR bed mattress with gel overlay	Differences in pressure measurements	The peak skin interface pressures exceeded the mean of 32 mm Hg for all participants, suggesting that the peak skin interface may be tolerated without ischemic injury upward of four to six hours by some patients.	IIB

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129	Albrecht P, Grosse J, Neukaeter W. Femoral neuropathy caused by hyperlordotic positioning. J Anesth. 2014;28(5):800.	Case Report	32-year-old man undergoing general anesthesia for prolonged dental surgery in a hyperlordotic position	n/a	n/a	n/a	The hyperlordotic position led to angulation and prolonged strain on the femoral nerve.	VC
130	Arvizo C, Mehta ST, Yunker A. Adverse events related to Trendelenburg position during laparoscopic surgery: recommendations and review of the literature. Curr Opin Obstet Gynecol. 2018;30(4):272-278.	Literature Review	n/a	n/a	n/a	n/a	Most studies in this lit review were in men undergoing prostatectomy and a small number related to gyn surg. The cardio and resp systems are the soonest and most significantly affected. Close monitoring is required. Postoperative vision changes after long surgeries in steep Tren, also related to a pneumoperitoneum. Most studies advocate for limiting the time in Tren and optimizing patient and overall health prior to surgery.	VA
131	Ghomi A, Kramer C, Askari R, Chavan NR, Einarsson JI. Trendelenburg position in gynecologic robotic-assisted surgery. J Minim Invasive Gynecol. 2012;19(4):485-489.	Nonexperimental	20 women undergoing robotic-assisted gyn surgery for benign indications	n/a	n/a	perioperative complication, estimated blood loss, LOS, degree of Trendelenburg position	Robotic assisted benign gyn surgery can be effectively performed without the use of steep Tren, successful surgery with no perioperative complications, no conversion to laparotomy.	IIIB
132	Cullen A, Ferguson A. Perioperative management of the severely obese patient: a selective pathophysiological review. Can J Anaesth. 2012;59(10):974-996.	Expert Opinion	n/a	n/a	n/a	n/a	The literature clearly highlights the complexity of severe obesity as a multisystem disease. There are important considerations for positioning of obese patients.	VA
133	Brodsky JB. Positioning the morbidly obese patient for anesthesia. Obes Surg. 2002;12(6):751-758.	Expert Opinion	n/a	n/a	N/A	n/a	Positioning the extremely obese patient is a challenge. A thorough understanding of the pathophysiology of obesity, and the different surgical positions is essential for safe patient management.	VB
134	Ideno S, Miyazawa N, Yamamoto S. Muscle injury following laparoscopic appendectomy. J Anesth. 2014;28(5):801.	Case Report	13-year-old boy undergoing laparoscopic appendectomy in Trendelenburg position	n/a	n/a	n/a	In pediatric cases, the pressure gradient could affect limb perfusion because normal blood pressure is lower in children than in adults. Additional intermittent measurement of blood pressure at the lower extremity could be effective for monitoring limb perfusion, or the team should consider intermittent reversal of the head-down position or limiting the duration of that position.	VB
135	Awad H, Santilli S, Ohr M, et al. The effects of steep Trendelenburg positioning on intraocular pressure during robotic radical prostatectomy. Anesth Analg. 2009;109(2):473-478.	Quasi-experimental	33 Patients undergoing elective robotic prostatectomy who were ASA class I or II	Intraocular pressure measurements in 25° Trendelenburg position	Intraocular pressure measurements in supine position	Differences in intraocular pressure measurements	Intraocular pressure reached peak levels at the end of steep Trendelenburg position, on average 13 mm Hg higher than the preanesthesia induction level.	IIB
136	Borahay MA, Patel PR, Walsh TM, et al. Intraocular pressure and steep Trendelenburg during minimally invasive gynecologic surgery: is there a risk? J Minim Invasive Gynecol. 2013;20(6):819-824.	Quasi-experimental	10 Female patients scheduled for elective robotic-assisted and laparoscopic hysterectomies	Measurement of intraocular pressure after general anesthesia and intubation, after one hour of steep Trendelenburg position, after two hours of steep Trendelenburg position, and after return to supine position	Intraocular pressure measurements before anesthesia	Differences in intraocular pressure measurements	Intraocular pressure increases significantly when patients are placed in steep Trendelenburg position. Given the aging population in whom the risk for glaucoma is significant, preoperative ocular health assessment should be considered in some cases.	IIB
137	Taketani Y, Mayama C, Suzuki N, et al. Transient but significant visual field defects after robot-assisted laparoscopic radical prostatectomy in deep Trendelenburg position. PLoS One. 2015;10(4):e0123361.	Nonexperimental	25 Men undergoing robotic-assisted radical prostatectomy in the Trendelenburg position	n/a	n/a	Differences in intraocular pressure measurements	Transient, but significant unilateral visual field defects were found in 28% of subjects examined. The probable cause is the increased intraocular pressure and altered perfusion during surgery. Ophthalmological examinations are therefore suggested before and after robotic-assisted radical prostatectomy.	IIIB
138	Astuto M, Minardi C, Uva MG, Gullo A. Intraocular pressure during laparoscopic surgery in paediatric patients. Br J Ophthalmol. 2011;95(2):294-295.	Quasi-experimental	Not stated/Children without ocular pathologies undergoing an abdominal procedure	Measurement of intraocular pressure in 5° and 10° Trendelenburg position	Measurement of intraocular pressure in supine position	Differences in intraocular pressure measurements	There was a significant increase in intraocular pressure in the Trendelenburg procedure after pneumoperitoneum introduction, which returned to baseline levels in the supine position after pneumoperitoneum evacuation.	IIC
139	Walick KS, Kragh JE Jr, Ward JA, Crawford JJ. Changes in intraocular pressure due to surgical positioning: studying potential risk for postoperative vision loss. Spine (Phila Pa 1976). 2007;32(23):2591-2595.	RCT	20 subjects randomized into 2 groups. Prone flan and prone Trend	IOPs were measured	N/A	IOP at different time points	IOP increased in the prone Trend position and when combined with other factors, these patients may be at increased risk for post-op vision loss	IB
140	Mondzelewski TJ, Schmitz JW, Christman MS, et al. Intraocular pressure during robotic-assisted laparoscopic procedures utilizing steep Trendelenburg positioning. J Glaucoma. 2015;24(6):399-404.	Nonexperimental	18 Patients undergoing robotic-assisted radical prostatectomy	n/a	n/a	Differences in intraocular pressure measurements	Significant elevations of intraocular pressure are experienced during robotic surgery in the Trendelenburg position.	IIIB
141	Molloy BL. Implications for postoperative visual loss: steep Trendelenburg position and effects on intraocular pressure. AANA J. 2011;79(2):115-121.	Nonexperimental	37 patients positioned in Steep Trendelenburg	n/a	n/a	Ocular perfusion pressure	A direct correlation between the duration of time spent in ST with an increased IOP resulting in a decrease of OPP. Increases the risk of POVL.	IIIB

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142	Rewari V, Ramachandran R. Prolonged steep Trendelenburg position: risk of postoperative upper airway obstruction. J Robot Surg. 2013;7(4):405-406.	Expert Opinion	n/a	n/a	n/a	n/a	Prolonged steep Trendelenburg positioning poses a risk for postoperative upper airway obstruction.	VB
143	Phong SVN, Koh LKD. Anaesthesia for robotic-assisted radical prostatectomy: considerations for laparoscopy in the Trendelenburg position. Anaesth Intensive Care. 2007;35(2):281-285.	Case Report	n/a	n/a	n/a	n/a	2 cases of negative patient outcomes following steep Tren, on case of post-extubation respiratory distress requiring re-intubation and ICU care and one case of mild brachial plexus neuropraxia from compression of shoulder braces.	VA
144	Kalmar AF, Dewaele F, Foubert L, et al. Cerebral haemodynamic physiology during steep Trendelenburg position and CO(2) pneumoperitoneum. Br J Anaesth. 2012;108(3):478-484.	Nonexperimental	21/Consecutive patients who underwent robotic radical prostatectomy	N/A	N/A	Differences in cerebral perfusion measurements	Prolonged steep Trendelenburg positioning and pneumoperitoneum does not compromise cerebral perfusion.	IIIB
145	Choi SH, Lee SJ, Rha KH, Shin SK, Oh YJ. The effect of pneumoperitoneum and Trendelenburg position on acute cerebral blood flow-carbon dioxide reactivity under sevoflurane anaesthesia. Anaesthesia. 2008;63(12):1314-1318	Quasi-experimental	25/Consecutive male patients undergoing robotic-assisted laparoscopic radical prostatectomy	Measurement of cerebral blood flow in the Trendelenburg position with pneumoperitoneum	Measurement of cerebral blood flow in the supine position without pneumoperitoneum	Differences in cerebral blood flow	Cerebral blood flow was unchanged in the Trendelenburg position.	IIA
146	Closhen D, Treiber AH, Berres M, et al. Robotic assisted prostatic surgery in the Trendelenburg position does not impair cerebral oxygenation measured using two different monitors: a clinical observational study. Eur J Anaesthesiol. 2014;31(2):104-109.	Quasi-experimental	29 patients scheduled for robotic assisted prostatic surgery in a steep Trendelenburg position.	Measurement of O2 saturation using a trend monitor using two infrared wavelengths	Measurement of O2 saturation using a monitor using four wavelengths of laser light	Changes in cerebral oxygenation of more than 5% during surgery in the Trendelenburg position	Both monitors showed a clinically irrelevantdecrease in cerebral oxygen saturation of less than 5%over 4h in a steep Trendelenburg position combined with CO2pneumoperitoneum in patients undergoing robotic assisted prostatic surgery.	IIA
147	Park EY, Koo BN, Min KT, Nam SH. The effect of pneumoperitoneum in the steep Trendelenburg position on cerebral oxygenation. Acta Anaesthesiol Scand. 2009;53(7):895-899.	Nonexperimental	32 Male patients, ASA class I and II undergoing robotic-assisted radical prostatectomy in the Trendelenburg position	Measurement of cerebral oxygenation using near-infrared spectroscopy five minutes after a 30° Trendelenburg position, five minutes after pneumoperitoneum in the supine position, 30, 60, and 120 minutes after pneumoperitoneum in the Trendelenburg position, and after desufflation in supine position	Measurement of cerebral oxygenation using near-infrared spectroscopy immediately after induction	Differences in cerebral oxygenation measurements	Cerebral oxygenation increased slightly, which suggests that the procedure did not induce cerebral ischemia.	IIIB
148	Lahaye L, Grasso M, Green J, Biddle CJ. Cerebral tissue O2 saturation during prolonged robotic surgery in the steep Trendelenburg position: an observational case series in a diverse surgical population. J Robot Surg. 2015;9(1):19-25.	Quasi-experimental	42 Patients undergoing robotic surgery in the Trendelenburg position	Measurement of oxygen saturation throughout the surgical procedure in Trendelenburg position with pneumoperitoneum	Measurement of oxygen saturation before induction of anesthesia in supine position without pneumoperitoneum	Cerebral desaturation events	Robotic surgery in the Trendelenburg position with pneumoperitoneum was associated with significant and prolonged cerebral desaturation in four patients, with 11 patients experiencing episodic events. The majority (64%) did not experience cerebral desaturation.	IIB
149	Matanes E, Weissman A, Rivlin A, et al. Effects of pneumoperitoneum and the steep Trendelenburg position on heart rate variability and cerebral oxygenation during robotic sacrocolpopexy. J Minim Invasive Gynecol. 2018;25(1):70-75.	Nonexperimental	18 women who underwent robotic sacrocolpopexy in steep Tren and pneumoperitoneum robotic surgery	n/a	n/a	Cerebral O2 saturation, systemic O2 saturation, hear tare, diastolic BP, systolic BP and end-tidal CO2	supports the safety of robotic sacrocolpopexy performed with steep Trendelenburg positioning with pneumoperitoneum. Only minor alterations were observed in cerebral oxygenation and autonomic perturbations, which did not cause clinically significant alterations in HR rate and HR variability	IIIB
150	Barr C, Madhuri TK, Prabhu P, Butler-Manuel S, Tailor A. Cerebral oedema following robotic surgery: a rare complication. Arch Gynecol Obstet. 2014;290(5):1041-1044.	Case Report	51-year-old obese woman diagnosed with adenocarcinoma of the cervix undergoing robotic surgery	n/a	n/a	n/a	This rare case of cerebral edema following robotic surgery was associated with prolonged surgery in the early learning curve of this modality, a steep Trendelenburg position, high intra-abdominal CO_2 pressure and fluid resuscitation.	VB
151	Chin JH, Seo H, Lee EH, et al. Sonographic optic nerve sheath diameter as a surrogate measure for intracranial pressure in anesthetized patients in the Trendelenburg position. BMC Anesthesiol. 2015;15.	Quasi-experimental	21 Patients scheduled for robotic-assisted radical prostatectomy	Sonographic optic nerve sheath diameter measurements 3 minutes after steep Trendelenburg, and 3 minutes after steep Trendelenburg combined with pneumoperitoneum	Sonographic optic nerve sheath diameter measurements in the supine position after induction of anesthesia	Differences in sonographic optic nerve sheath diameter measurements	Use of the isolated steep Trendelenburg position, for even a short duration, increased the sonographic optic nerve sheath diameter measurements.	IIB

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152	Shah SB, Bhargava AK, Choudhury I. Noninvasive intracranial pressure monitoring via optic nerve sheath diameter for robotic surgery in steep Trendelenburg position. Saudi J Anaesth. 2015;9(3):239-246.	RCT	252 Patients undergoing robotic-assisted surgery in Trendelenburg position who are ASA class I and II	Measurement of optic nerve sheath diameter 10 minutes after induction and every hour thereafter, after return to supine position, and at one, three, and 24 hours postoperatively	Measurement of optic nerve sheath diameter at baseline	Differences in optic sheath diameter measurements	Trendelenburg position with pneumoperitoneum results in increasing venous congestion within and outside the cranium leading to cerebral edema and raised intracranial pressure.	IA
153	Kim MS, Bai SJ, Lee JR, Choi YD, Kim YJ, Choi SH. Increase in intracranial pressure during carbon dioxide pneumoperitoneum with steep Trendelenburg positioning proven by ultrasonographic measurement of optic nerve sheath diameter. J Endourol. 2014;28(7):801-806.	Nonexperimental	20/Patients undergoing robotic-assisted prostatectomy	n/a	n/a	Differences in optic sheath diameter measurements	In patients undergoing robotic-assisted prostatectomy, an increase of 12.5% in optic nerve sheath diameter during pneumoperitoneum with steep Trendelenburg was observed, thus, an increase in intracranial pressure could be predicted. In 15% of the enrolled patients, the optic nerve sheath diameter increased to values equivalent to an intracranial pressure above 20 mm Hg without deterioration of cerebral oxygen saturation or any neurologic complications.	IIIB
154	Kim SH, Kim HJ, Jung KT. Position does not affect the optic nerve sheath diameter during laparoscopy. Korean J Anesthesiol. 2015;68(4):358-363.	Nonexperimental	Female patients undergoing laparoscopic surgery.	n/a	n/a	After anesthesia induction, optic nerve sheath diameter was measured.	Optic nerve sheath diameter during laparoscopic surgery with pneumoperitoneum increased slightly until 15 minutes, but there were no significant differences according to the position. Increases in ICP during laparoscopic surgery with short period of pneumoperitoneum would be small in disregard of position in patients without intracranial pathology.	IIIC
155	Oztan MO, Aydin G, Cigsar EB, Sutas Bozkurt P, Koyluoglu G. Effects of carbon dioxide insufflation and Trendelenburg position on brain oxygenation during laparoscopy in children. Surg Laparosc Endosc Percutan Tech. 2019;29(2):90-94.	Nonexperimental	44 pediatric patients, observed 2 groups, one open appendectomy and laparoscopic appendectomy with 15 degrees of Tren	n/a	n/a	Heart rate, mean blood pressure, end tidal CO2, peripheral O2 sat, right and left regional cerebral O2 sat were recorded at baseline and at several time instances throughout the procedure.	Trendelenburg and left lateral position during pneumoperitoneum have no negative effects on cerebral oxygen saturation in children.	IIIB
156	de Leon A, Thörn SE, Ottosson J, Wattwil M. Body positions and esophageal sphincter pressures in obese patients during anesthesia. Acta Anaesthesiol Scand. 2010;54(4):458-463.	Quasi-experimental	17 Patients 27 to 63 years with a BMI $\geq$ 35 kg/m^2 undergoing laparoscopic bariatric surgery	Measurements of upper esophageal sphincter and lower esophageal sphincter pressures in the reverse Trendelenburg (20°), and Trendelenburg (20°) positions	Measurements of upper esophageal sphincter and lower esophageal sphincter pressures in the supine position	Differences in esophageal sphincter pressure measurements	Lower esophageal sphincter pressures increased during the Trendelenburg position before anesthesia.	IIA
157	Choi DK, Lee IG, Hwang JH. Arterial to end-tidal carbon dioxide pressure gradient increases with age in the steep Trendelenburg position with pneumoperitoneum. Korean J Anesthesiol. 2012;63(3):209-215.	Quasi-experimental	92 Consecutive patients undergoing robotic-assisted laparoscopic prostatectomy in the steep Trendelenburg position.	Measurement of heart rate, mean arterial pressure, peak inspiratory pressure, lung compliance, minute ventilation in patients older than 65 years.	Measurement of heart rate, mean arterial pressure, peak inspiratory pressure, lung compliance, minute ventilation in patients 45 to 65 years.	Differences in measurements	The magnitude of arterial to end-tidal carbon dioxide pressure gradient during pneumoperitoneum in the steep Trendelenburg position increased with age, which could be attributed to age-related respiratory physiological changes.	IIA
158	Kilic OF, Börgers A, Köhne W, Musch M, Kröpfl D, Groeben H. Effects of steep Trendelenburg position for robotic-assisted prostatectomies on intra- and extrathoracic airways in patients with or without chronic obstructive pulmonary disease. Br J Anaesth. 2015;114(1):70-76.	Quasi-experimental	75 Patients without (n = 55) and with (n = 20) COPD undergoing robotic-assisted prostatectomy	Measurement of lung function on the morning of surgery, and 40 and 120 minutes, and 24 hours after extubation in patients with COPD	Measurement of lung function on the morning of surgery, and 40 and 120 minutes, and 24 hours after extubation in patients without COPD	Differences in lung function measurements	Robotic-assisted prostatectomy in the steep Trendelenburg position led to an increase in upper airway resistance directly after surgery that normalized within 24 hours. In patients without COPD, vital capacity and forced expiratory volume were reduced after surgery and recovered within five days, while in patients with COPD, the alteration lasted beyond 5 days.	IIB
159	Takmaz O, Asoglu MR, Gungor M. Patient positioning for robot-assisted laparoscopic benign gynecologic surgery: a review. Eur J Obstet Gynecol Reprod Biol. 2018;223:8-13.	Expert Opinion	n/a	n/a	n/a	n/a	Perioperative considerations for Trendelenburg position	VA
160	Gould C, Cull T, Wu YX, Osmundsen B. Blinded measure of Trendelenburg angle in pelvic robotic surgery. J Minim Invasive Gynecol. 2012;19(4):465-468.	Quasi-experimental	86 Patients undergoing pelvic robotic surgery	Measurement of angle of Trendelenburg used during procedure	Historical angle of 40°	Degree of Trendelenburg required for adequate visualization	A mean Trendelenburg of 28° was adequate to complete most gynecological robotic procedures	IIB
161	Mangham M. Positioning of the anaesthetised patient during robotically assisted surgery: perioperative staff experiences. J Perioper Pract. 2016;26(3):50-52.	Expert Opinion	n/a	n/a	n/a	n/a	Perioperative team members should never stop questioning and evaluating current practices and continue to look for improved methods of caring for patients undergoing robotic procedures.	VC

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162	Schramm P, Treiber AH, Berres M, et al. Time course of cerebrovascular autoregulation during extreme Trendelenburg position for robotic-assisted prostatic surgery. Anaesthesia. 2014;69(1):58-63.	Nonexperimental	23 Male patients undergoing robotic-assisted prostatectomy in the Trendelenburg position	n/a	n/a	Differences in hemodynamic measurements	Cerebrovascular autoregulation deteriorated with longer duration of Trendelenburg position and pneumoperitoneum.	IIIB
163	Russo A, Marana E, Viviani D, et al. Diastolic function: the influence of pneumoperitoneum and Trendelenburg positioning during laparoscopic hysterectomy. Eur J Anaesthesiol. 2009;26(11):923-927.	Nonexperimental	20 Healthy women, ASA class I, undergoing laparoscopic hysterectomy in the Trendelenburg position (n = 10), and open hysterectomy in the supine position (n = 10)	n/a	n/a	Differences in cardiac function measurements	Pneumoperitoneum has an important effect on left ventricular end-diastolic volume; it also affects diastolic function with a delay in deceleration time and isovolumetric relaxation time without any effects on intracavitary pressures.	IIIB
164	Kadono Y, Yaegashi H, Machioka K, et al. Cardiovascular and respiratory effects of the degree of head-down angle during robot-assisted laparoscopic radical prostatectomy. Int J Med Robot. 2013;9(1):17-22.	RCT	47 ASA class I patients undergoing retropubic radical prostatectomy or robotic-assisted radical prostatectomy	Robotic-assisted procedure and use of 20°, 25°, or 30° Trendelenburg position	Open procedure in supine position	Effects of Trendelenburg on cardiovascular and respiratory homeostasis	The degree of Trendelenburg affected cardiovascular and respiratory parameters. Pneumoperitoneum with Trendelenburg influenced parameters to a greater degree, with stronger effects in steeper Trendelenburg.	IB
165	Addison AB, Inarra E, Watts S. Bilateral otorrhagia: a rare complication of laparoscopic abdominopelvic surgery. BMJ Case Rep. 2014;2014:bcr2014206118.	Case Report	n/a	n/a	n/a	n/a	A report of a case of otorrhagia from being in steep Trendelenburg for a long period of time, in addition the patient had a pneumoperitoneum. The risk of a head down position for a long period of time and the potential dangers with precautions being taken are discussed. IVF management, shorter times in the position and gradual change in position are recommended.	VA
166	Pandey R, Garg R, Darlong V, Punj J, Chandralekha, Kumar A. Unpredicted neurological complications after robotic laparoscopic radical cystectomy and ileal conduit formation in steep Trendelenburg position: two case reports. Acta Anaesthesiol Belg. 2010;61(3):163-166.	Case Report	One 60-year-old woman, and one 75-year-old man undergoing robotic-assisted urological procedures in Trendelenburg position	n/a	n/a	n/a	Brain edema is a potential complication of prolonged surgeries in the Trendelenburg position.	VB
167	Johansson VR, von Vogelsang AC. Patient-reported extremity symptoms after robot-assisted laparoscopic cystectomy. J Clin Nurs. 2019;28(9-10):1708-1718.	Nonexperimental	94 patients undergoing robotic assisted laparoscopic cystectomy in the steep Trendelenburg position	n/a	n/a	Extremity symptoms (pain, numbness, weakness)	46.8% of patients reported extremity symptoms 7-10 days post op. Stressed the importance of interventions to maintain patient safety to prevent postoperative extremity symptoms.	IIIA
168	Lachman E, Rosenberg P, Gino G, Levine S, Goldberg S, Borstein M. Axonal damage to the left musculocutaneous nerve of the left biceps muscle during laparoscopic surgery. J Am Assoc Gynecol Laparosc. 2001;8(3):453-455.	Case Report	n/a	n/a	n/a	n/a	A female patient in steep Trendelenburg with shoulder braces with the right arm on a standard arm board level with the table was placed in a foam cradle to prevent 10-15 degree deviation to the floor which created stretch on the arm. The patient had post-op weakness and pain in the left arm with progressive atrophy of the biceps muscle. The left arm was drawn towards the head increasing the angle to 120 degrees causing pressure and stretch of the brachial plexus nerve.	VA
169	Thomas J. Post-operative brachial plexus neuropraxia: a less recognised complication of combined plastic and laparoscopic surgeries. Indian J Plast Surg. 2014;47(3):460-464.	Case Report	n/a	n/a	n/a	n/a	A case of brachial plexus neuropraxia in a 26-year-old obese patient following a prolonged combined plastic surgery procedure was encountered.	VB
170	Eteuati J, Hiscock R, Hastie I, Hayes I, Jones I. Brachial plexopathy in laparoscopic-assisted rectal surgery: a case series. Tech Coloproctol. 2013;17(3):293-297.	Literature Review	n/a	n/a	n/a	n/a	Brachial plexus injury in steep Tren	VA
171	Codd RJ, Evans MD, Sagar PM, Williams GL. A systematic review of peripheral nerve injury following laparoscopic colorectal surgery. Colorectal Dis. 2013;15(3):278-282.	Systematic Review	8 Studies with a total of 10 cases of peripheral nerve injury following laparoscopic colorectal surgery	n/a	n/a	Postoperative nerve injury/ Duration of operation/ Position of patient/ Outcome of nerve injury	The surgeon and surgical team must be aware of the risk of peripheral nerve injury when positioning patients for laparoscopic colorectal procedures.	IIIB
172	Mattei A, Di Pierro GB, Rafeld V, Konrad C, Beutler J, Danuser H. Positioning injury, rhabdomyolysis, and serum creatine kinase-concentration course in patients undergoing robot-assisted radical prostatectomy and extended pelvic lymph node dissection. J Endourol. 2013;27(1):45-51.	Nonexperimental	60 Patients undergoing robotic-assisted radical prostatectomy and extended pelvic lymph node dissection	n/a	n/a	Positioning injury and rhabdomyolysis	Clinically relevant positioning injuries and rhabdomyolysis can occur in patients who are subjected to prolonged extreme Trendelenburg position during robotic-assisted radical prostatectomy and extended pelvic lymph node dissection.	IIIB

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173	Gollapalli L, Papapetrou P, Gupta D, Fuleihan SF. Post-operative alopecia after robotic surgery in steep Trendelenburg position: a restated observation of pressure alopecia. Middle East J Anesthesiol. 2013;22(3):343-345.	Case Report	n/a	n/a	n/a	n/a	Case of alopecia following robotic surgery in steep trend (5 hours).	VA
174	Freshcoln M, Diehl MR. Repositioning during robotic procedures to prevent postoperative visual loss. OR Nurse. 2014;8(4):36-41.	Expert Opinion	n/a	n/a	n/a	n/a	A review of the evidence supports performing a position change from Trendelenburg to supine for 5 to 7 minutes during lengthy procedures.	VC
175	Gkegkes ID, Karydis A, Tyritzis SI, Iavazzo C. Ocular complications in robotic surgery. Int J Med Robot. 2015;11(3):269-274.	Systematic Review	8 Articles representing 142 patients who sustained ocular complications following robotic surgery	n/a	n/a	Risk factors for ocular complications following robotic surgery	The most frequent complication was increased intraocular pressure. Corneal abrasion, ischemic optic neuropathy, and postoperative visual loss were also reported. Meticulous preoperative ophthalmological assessment, restriction of intravenous fluids, rest stops, eyelid taping, and ocular dressings are the major protective measures suggested by the literature.	IIIB
176	Grosso A, Scozzari G, Bert F, Mabilia MA, Siliquini R, Morino M. Intraocular pressure variation during colorectal laparoscopic surgery: standard pneumoperitoneum leads to reversible elevation in intraocular pressure. Surg Endosc. 2013;27(9):3370-3376.	Quasi-experimental	29 patients undergoing laparoscopic colorectal surgery	Placed in Trendelenburg position	without Trendelenburg position	Intraocular pressure	Standard pneumoperitoneum (≤14 mmHg) led to mild and reversible IOP increases. A trend was observed toward a greater IOP increase in patients with Trendelenburg positioning. Thus, the patient's position during surgery may represent a stronger risk factor for IOP increase than pneumoperitoneum-related intraabdominal pressure.	IIC
177	Steck-Bayat KP, Henderson S, Aguirre AG, et al. Prospective randomized controlled trial comparing cephalad migration in robotic gynecologic surgery using egg-crate foam versus the Pink Pad. J Robot Surg. 2020;14(2):343-347.	RCT	60 women undergoing robotic lap gyn surgery in Trend	Placed on the pink pad N=26	Place on egg crate foam N=24	Cephalad migration	The egg-crate foam resulted in less cephalad migration at all anatomic sites and significantly less migration at the buttocks compared to the Pink Pad®. This suggests that the less-costly egg-crate foam is noninferior to the Pink Pad® system and trends at superiority.	IA
178	Klauschie J, Wechter ME, Jacob K, et al. Use of anti-skid material and patient-positioning to prevent patient shifting during robotic-assisted gynecologic procedures. J Minim Invasive Gynecol. 2010;17(4):504-507.	Quasi-experimental	22 women undergoing robotic assisted gyn procedures and placed in the steep Trendelenburg position	egg-crate foam placed beneath the patients	None	Shift in position	Minimal patient shifting was observed with the use of the antiskid egg crate foam.	IIB
179	Wechter ME, Kho RM, Chen AH, Magrina JF, Pettit PD. Preventing slide in Trendelenburg position: randomized trial comparing foam and gel pads. J Robot Surg. 2013;7(3):267-271.	RCT	61 women undergoing gyn surgery lap or robotic in Trend	Placed on an egg crate foam mattress N=32	Placed on a gel pad N=29	Slide and adverse effects	Minor shoulder complaints that were transient, minimum slide, no difference between surfaces	IB
180	Sutton S, Link T, Makic MBF. A quality improvement project for safe and effective patient positioning during robot-assisted surgery. AORN J. 2013;97(4):448-456.	Organizational Experience	30 patients in the air-inflated positioning device group and 29 patients in the foam padding group.	n/a	n/a	n/a	No difference was found between the two methods. Patients with high BMIs slipped with the use of either positioning method-continual evaluation of the patient's position and assessment for movement is an essential nursing responsibility.	VA
181	Mangham M. Positioning of the anaesthetised patient during robotically assisted laparoscopic surgery: perioperative staff experiences. J Perioper Pract. 2016;26(3):50-52.	Expert Opinion	N/A	N/A	N/A	N/A	Perioperative team members should never stop questioning and evaluating current practices and continue to look for improved methods of caring for patients undergoing robotic procedures.	VC
182	Talab SS, Elmi A, Sarma J, Barrisford GW, Tabatabaei S. Safety and effectiveness of SAF-R, a novel patient positioning device for robot-assisted pelvic surgery in Trendelenburg position. J Endourol. 2016;30(3):286-292.	Quasi-experimental	16 patients undergoing surgery in Trend	Placed on a device that was made from plexi-glass with a gel covering that is placed under the patient and it curves over the shoulders. It is called SAF-R	N/A	Contact pressure over the shoulder, movement, complications	Pressure over the shoulders was in a safe range and there were no patient complications.	IIB
183	Nakayama JM, Gerling GJ, Horst KE, Fitz VW, Cantrell LA, Modesitt SC. A simulation study of the factors influencing the risk of intraoperative slipping. Clin Ovarian Other Gynecol Cancer. 2014;7(1-2):24-28.	Nonexperimental	2 Mannequins	n/a	n/a	Degree of mannequin slippage	The combination of operative position, patient weight, and bed surface influence slipping propensity. In lithotomy position, heavier patients were more prone to slip. The inverse was true in supine position. The convoluted foam, vacuum-packed positioning device, and sheet provided the most anti-slip surfaces.	IIIB
184	Hewer CL. The physiology and complications of the Trendelenburg position. Can Med Assoc J. 1956;74(4):285-288.Hewer CL. The physiology and complications of the Trendelenburg position. Can Med Assoc J. 1956;74(4):285-288.	Expert Opinion	n/a	n/a	n/a	n/a	Neck and lumbar bolsters may be helpful in preventing sliding in the Trendelenburg position.	VB
185	Badillo FL, Goldberg G, Pinkhasov G, Badillo C, Sultan RC. Secure patient positioning using Badillo/Trendelenburg restraint strap during robotic surgery. J Robot Surg. 2014;8(3):239-243.	Quasi-experimental	1200 patients undergoing robotic assisted radical prostatectomy in steep Trend	Placed in the Badillo/Trend strap	N/A	Shoulder or nerve injury and movement	No reports of shoulder or nerve injury, the most movement noted was 1 cm.	IIB
186	Nakayama J, Ashby K, Wherley S, et al. A prospective randomized trial of antislip surfaces during minimally invasive gynecologic surgery. J Gynecol Surg. Published online October 21, 2021. doi:10.1089/gyn.2021.0092.	RCT	Adult patient undergoing laparoscopic or vaginal surgery at a University Hospital	Placement on a pink pad or a bean bag 50patients in each arm	Placement on a gel pad-50 patients	Intraoperative displacement	Patients on the pink pad had significantly less displacement with Trendelenburg and faster positioning, compared to the gel pad. Obesity is a major predictor of movement. The pink pad was associated with less postoperative pain than the gel pad and less postoperative erythema than the beanbag.	IB

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187	Coppieters MW, Van de Velde M, Stappaerts KH. Positioning in anesthesiology: toward a better understanding of stretch-induced perioperative neuropathies. Anesthesiology. 2002;97(1):75-81.	Quasi-experimental	25 Male volunteers	Brachial plexus tension test in three different positions	Brachial plexus tension test in neutral position	Differences in range of motion/ Differences in pain intensity/ Type of elicited symptoms	Even during careful positioning of all upper limb joints, complete prevention of perioperative neuropathy may not be possible.	IIB
188	Suozzi BA, Brazell HD, O'Sullivan DM, Tulikangas PK. A comparison of shoulder pressure among different patient stabilization techniques. Am J Obstet Gynecol. 2013;209(5):478.e1-e5.	Quasi-experimental	25 volunteers	Placed in the dorsal lithotomy position, shoulders padded with gel pads and were tilted at 5, 10, 15, 20, 25 and 30 degrees. S shoulder braces were tested. 2 padded shoulder braces and one bean bag,	NA	Shoulder pressure was measured	Shoulder pressure increases as tilt angle increases, of the 3 support systems, the bean bag exerted less pressure to the shoulders at a 30 degree Trend than the shoulder supports.	IIB
189	Farag S, Rosen L, Ascher-Walsh C. Comparison of the memory foam pad versus the bean bag with shoulder braces in preventing patient displacement during gynecologic laparoscopic surgery. J Minim Invasive Gynecol. 2018;25(1):153-157.	RCT	Women greater that 18 years of age undergoing laparoscopic or robotic gyn surgery, 22 in the memory foam pad group and 21 in the bean bag with shoulder braces group	Positioning on a memory foam pad	Positioning with a bean bag with shoulder braces.	Movement	Positioning patients on the bean bag with shoulder braces resulted in significantly less displacement during gyn laparoscopic surgery compared to the memory foam pad. Postop extremity numbness, weakness and pain were temporary and resolved completely in this cohort of patients.	IB
190	Treszezamsky AD, Fenske S, Moshier EL, Ascher-Walsh CJ. Neurologic injury and patient displacement in gynecologic laparoscopic surgery using a beanbag and shoulder supports. Int J Gynaecol Obstet. 2018;140(1):26-30.	Nonexperimental	967 patients undergoing gyn lap surgery in trend	n/a	n/a	Shoulder injuries and displacement	Using shoulder braces with foam, and beanbags and arm board egg crate foam, there were no shoulder injuries and minimal displacement	IIIA
191	Edgcombe H, Carter K, Yarrow S. Anaesthesia in the prone position. Br J Anaesth. 2008;100(2):165-183.	Literature Review	n/a	n/a	n/a	n/a	The prone position is associated with a variety of complications, some of which can be prevented.	VA
192	Kwee MM, Ho YH, Rozen WM. The prone position during surgery and its complications: a systematic review and evidence-based guidelines. Int Surg. 2015;100(2):292-303.	Guideline	n/a	n/a	n/a	n/a	Postoperative vision loss and cardiovascular complications, including hypovolemia and cardiac arrest, had the most studies and the highest level of evidence.	IVA
193	Koh JC, Lee JS, Han DW, Choi S, Chang CH. Increase in airway pressure resulting from prone position patient placing may predict intraoperative surgical blood loss. Spine (Phila Pa 1976). 2013;38(11):E678-E682.	Nonexperimental	33/Patients, class ASA I or II undergoing posterior lumbar interbody fusion surgery	n/a	n/a	Correlation of blood loss with measurements of airway pressure	Increase in airway pressures resulting from placement into a prone position may predict intraoperative surgical blood loss.	IIIB
194	DePasse JM, Palumbo MA, Haque M, Eberson CP, Daniels AH. Complications associated with prone positioning in elective spinal surgery. World J Orthop. 2015;6(3):351-359.	Literature Review	n/a	n/a	n/a	n/a	Complications of prone position	VA
195	Postoperative Visual Loss Study Group. Risk factors associated with ischemic optic neuropathy after spinal fusion surgery. Anesthesiology. 2012;116(1):15-24.	Nonexperimental	395 Patients who did (n = 80) and did not (n = 315) develop postoperative vision loss following spinal surgery in the prone position	n/a	n/a	Risk-factors associated with postoperative vision loss	Obesity, male sex, Wilson frame use, longer anesthetic times, greater estimated blood loss, and decreased colloid administration were significantly and independently associated with ischemic optic neuropathy after spinal surgery.	IIIA
196	Akinci IO, Tunali U, Kyzy AA, et al. Effects of prone and jackknife positioning on lumbar disc herniation surgery. J Neurosurg Anesthesiol. 2011;23(4):318-322.	RCT	40Patients between 18 and 70 years, ASA class I or II, undergoing elective lumbar discectomy	Measurement of lung mechanics, intra-abdominal pressure, and blood loss at the surgical site during prone position	Measurement of lung mechanics, intra-abdominal pressure, and blood loss at the surgical site during jack-knife position	Differences in measurements	The Jackknife position causes less intra-abdominal pressure elevation and less surgical site bleeding compared with the prone position	IC
197	Chalhoub V, Tohmé J, Richa F, Dagher C, Yazbeck P. Inferior vena cava filter migration during the prone position for spinal surgery: a case report. Can J Anesth. 2015;62(10):1114-1118.	Case Report	54-year-old man with multiple unstable fractures following trauma undergoing spine surgery in the prone position	n/a	n/a	n/a	The prone position during surgery can induce anatomic and hemodynamic changes in the inferior vena cava. This may contribute to the migration of inferior vena cava filters.	VB
198	Aisu Y, Hori T, Kato S, et al. Brachial plexus paralysis after thoracoscopic esophagectomy for esophageal cancer in the prone position: a thought-provoking case report of an unexpected complication. Int J Surg Case Rep. 2019;55:11-14.	Case Report	n/a	n/a	n/a	n/a	Brachial plexus paralysis in the prone position	VA

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199	Borodiciene J, Gudaityte J, Macas A. Lithotomy versus jack-knife position on haemodynamic parameters assessed by impedance cardiography during anorectal surgery under low dose spinal anaesthesia: a randomized controlled trial. BMC Anesthesiol. 2015;15:74.	RCT	104 ASA class I or II patients undergoing elective minor anorectal surgery	Measurement of cardiac output, cardiac index, systemic vascular resistance, and stroke index at arrival to the OR, positioning, start and end of surgery, and return to bed in lithotomy position	Measurement of cardiac output, cardiac index, systemic vascular resistance, and stroke index at arrival to the OR, positioning, start and end of surgery, and return to bed in jack-knife position	Differences in measurements	Use of the jack-knife position after low-dose spinal anesthesia produces transitory, but statistically significant reduction of cardiac output and cardiac index with increase of systemic vascular resistance, compared to lithotomy position.	IA
200	Chui J, Craen RA. An update on the prone position: continuing professional development. Can J Anaesth. 2016;63(6):737-767.	Literature Review	n/a	n/a	n/a	n/a	Increased age, elevated BMI, the presence of comorbidities, and long duration of surgery appear to be the most important risk factors for complications associated with prone positioning.	VA
201	Li A, Swinney C, Veeravagu A, Bhatti I, Ratliff J. Postoperative visual loss following lumbar spine surgery: a review of risk factors by diagnosis. World Neurosurg. 2015;84(6):2010-2021.	Literature Review	n/a	n/a	n/a	n/a	Ischemic optic neuropathy risks may be influenced by a longer operative time in the prone position with anemia, hypotension, and blood transfusion. The risk for central retinal artery occlusion is usually due to incorrect positioning. Prone positioning and obesity were found to be most commonly associated with cortical blindness.	VA
202	Nuzzi R, Tridico F. Ocular complications in laparoscopic surgery: review of existing literature and possible prevention and treatment. Semin Ophthalmol. 2016;31(6):584-592.	Literature Review	n/a	n/a	n/a	n/a	A collaborative approach is recommended to prevent and manage ocular complications related to laparoscopic surgery.	VB
203	Lee LA, Newman NJ, Wagner TA, Dettori JR, Dettori NJ. Postoperative ischemic optic neuropathy. Spine (Phila Pa 1976). 2010;35(9 Suppl):S105-S116.	Literature Review	n/a	n/a	n/a	n/a	Ischemic optic neuropathy may be associated with prone position of more than five hours surgical duration and blood loss of more than 1000 mL.	VA
204	Akhaddar A, Boucetta M. Subconjunctival hemorrhage as a complication of intraoperative positioning for lumbar spinal surgery. Spine J. 2012;12(3):274.	Case Report	42-year-old woman undergoing lumbar spine surgery in the prone position	n/a	n/a	n/a	Subconjunctival hemorrhage as seen in this patient is a rare complication of patient positioning for posterior spinal surgery.	VA
205	Russell DJ, Dutton JJ. Bilateral spontaneous subperiosteal orbital hemorrhages following endoscopic retrograde cholangiopancreatography. Ophthalmic Plast Reconstr Surg. 2011;27(3):e49-e50	Case Report	42-year-old man undergoing endoscopic surgery in the prone position	n/a	n/a	n/a	Increased venous pressure from Valsalva, prone positioning, and mild coagulopathy may have contributed to the hemorrhages in this patient.	VC
206	Guillaume JE, Gowreesunker P. Horner's syndrome in the prone position—a case report. Acta Anaesthesiol Belg. 2013;64(3):119-121.	Case Report	42-year-old woman undergoing a circular abdominoplasty and liposuction procedure	n/a	n/a	n/a	Horner syndrome can occur after non-cervical surgery in the prone position.	VC
207	Shifa J, Abebe W, Bekele N, Habte D. A case of bilateral visual loss after spinal cord surgery. Pan Afr Med J. 2016;23:119.	Case Report	17-year-old male undergoing laminectomy in prone position under general anesthesia	n/a	n/a	n/a	Preoperative identification of patients with risk factors, close intraoperative monitoring, and correct positioning is advised.	VA
208	Stang-Veldhouse KN, Yeu E, Rothenberg DM, Mizen TR. Unusual presentation of perioperative ischemic optic neuropathy following major spine surgery. J Clin Anesth. 2010;22(1):52-55.	Case Report	44-year-old man undergoing lumbar spinal surgery in the prone position	n/a	n/a	n/a	Patients should be screened preoperatively for risk factors such as diabetes, hypertension, and small cup-to-disc ratio on fundoscopic examination should be considered.	VB
209	Quraishi NA, Wolinsky JP, Gokaslan ZL. Transient bilateral post-operative visual loss in spinal surgery. Eur Spine J. 2012;21(Suppl 4):S495-S498.	Case Report	44-year-old man undergoing lumbar spinal surgery in the prone position	n/a	n/a	n/a	Even when all recommendations for correct positioning are met, devastating injuries can still occur.	VB
210	Goni V, Tripathy SK, Goyal T, Tamuk T, Panda BB, Bk S. Cortical blindness following spinal surgery: very rare cause of perioperative vision loss. Asian Spine J. 2012;6(4):287-290.	Case Report	1/38-year-old man undergoing spinal surgery following a motor vehicle accident	n/a	n/a	n/a	The specific pathogenesis of postoperative vision loss remains elusive. Important causes include ischemic optic neuropathy, retinal vascular occlusion, and cortical blindness.	VB
211	Reddy A, Foroozan R, Edmond JC, Hinckley LK. Dilated superior ophthalmic veins and posterior ischemic optic neuropathy after prolonged spine surgery. J Neuroophthalmol. 2008;28(4):327-328.	Case Report	55-year-old man undergoing lumbar spine surgery in the prone position	n/a	n/a	n/a	This case suggests an association between increased orbital venous pressure during surgery and the development of postoperative posterior ischemic optic neuropathy.	VB
212	Dahab R, Barrett C, Pillay R, De Matas M. Anterior thigh compartment syndrome after prone positioning for lumbosacral fixation. Eur Spine J. 2012;21(Suppl 4):S554-S556.	Case Report	47-year-old woman undergoing spinal surgery in the prone position	n/a	n/a	n/a	The patient's compartment syndrome was caused by ischemia of the lower limb that reversed when the patient was returned to the supine position at the end of the procedure.	VB
213	Gupta R, Batra S, Chandra R, Sharma VK. Compartment syndrome with acute renal failure: a rare complication of spinal surgery in knee-chest position. Spine (Phila Pa 1976). 2008;33(8):E272-E273.	Case Report	35-year-old man reporting to the ED after spinal surgery in the knee-chest position	n/a	n/a	n/a	The knee-chest position can lead to a disturbance of arterial microcirculation and the capillary network, with subsequent edema causing a decrease in muscle perfusion.	VB

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214	Amukoa P, Reed A, Thomas JM. Use of the sitting position for pineal tumour surgery in a five-year-old child. S Afr J Anaesth Analg. 2011;17(6):388-392.	Expert Opinion	n/a	n/a	n/a	n/a	The sitting position still has a role in modern neurosurgical practice, but should only be used following consideration of its potential complications.	VB
215	Minami K, Iida M, Iida H. Case report: central venous catheterization via internal jugular vein with associated formation of perioperative venous thrombosis during surgery in the prone position. J Anesth. 2012;26(3):464-466.	Case Report	76-year-old woman undergoing spinal surgery	n/a	n/a	n/a	The prone patient's slightly flexed neck may have kinked the internal jugular vein causing engorgement with venous blood and subsequent venous thrombosis.	VB
216	Harman F, Yayci F, Deren S, et al. Acute cerebellar ischemia after lumbar spinal surgery: a rare clinical entity. J Anesth. 2012;26(6):947-948.	Case Report	69-year-old man, ASA class II, undergoing spinal surgery	n/a	n/a	n/a	Neutral alignment of the neck is necessary to prevent ischemia-related complications following spinal surgery.	VC
217	Højlund J, Sandmand M, Sonne M, et al. Effect of head rotation on cerebral blood velocity in the prone position. Anesthesiol Res Pract. 2012;2012:647258.	Quasi-experimental	22/Healthy volunteers	Measurements of cerebral blood velocity with the patient's head rotated to the side	Measurements of cerebral blood velocity with the patient's head in neutral position	Differences in cerebral blood velocity measurements	Prone position with the head rotated to the side affects both cerebral blood flow and cerebrovenous drainage, indicating that optimal brain perfusion requires head centering.	IIB
218	Ooi EI, Ahem A, Zahidin AZ, Bastion ML. Unilateral visual loss after spine surgery in the prone position for extradural haematoma in a healthy young man. BMJ Case Rep. 2013;2013:bcr2013200632.	Case Report	1 22-year-old man undergoing spine surgery post-traumatic tracheostomy	n/a	n/a	n/a	The patient's head was incorrectly positioned during prone surgery resulting in excessive pressure of the headrest onto the right eye causing postoperative vision loss.	VC
219	Pin-On P, Boonsri S. Postoperative visual loss in orthopedic spine surgery in the prone position: a case report. J Med Assoc Thai. 2015;98(3):320-324.	Case Report	64-year-old man undergoing lumbar spine surgery in the prone position	n/a	n/a	n/a	The most probable cause of the injury was obstruction of venous return from the left orbit, which led to increased intraocular pressure and postoperative vision loss.	VB
220	Yu YH, Chen WJ, Chen LH, Chen WC. Ischemic orbital compartment syndrome after posterior spinal surgery. Spine (Phila Pa 1976). 2008;33(16):E569-E572.	Case Report	68-year-old man undergoing spinal surgery in the prone position	n/a	n/a	n/a	The patient was in the prone and head-down position and there was direct orbital compression by the headrest leading to postoperative vision loss.	VB
221	Peruto CM, Ciccotti MG, Cohen SB. Shoulder arthroscopy positioning: lateral decubitus versus beach chair. Arthroscopy. 2009;25(8):891-896.	Expert Opinion	n/a	n/a	n/a	n/a	The lateral position puts neurovascular structures at greater risk than the semi-sitting position. The risk of cardiovascular complications is greater for patients in the semi-sitting position than the lateral position, with hypertension and obesity further increasing those risks.	VA
222	Rains DD, Rooke GA, Wahl CJ. Pathomechanisms and complications related to patient positioning and anesthesia during shoulder arthroscopy. Arthroscopy. 2011;27(4):532-541.	Literature Review	n/a	n/a	n/a	n/a	The lateral position has been associated with peripheral neuropraxia, brachial plexopathy, direct nerve injury and airway compromise. The semi-sitting position has been associated with cervical neuropraxia, pneumothorax, and the potential for end-organ hypoperfusion injuries.	VB
223	Andersen JDH, Baake G, Wiis JT, Olsen KS. Effect of head rotation during surgery in the prone position on regional cerebral oxygen saturation: a prospective controlled study. Eur J Anaesthesiol. 2014;31(2):98-103.	Quasi-experimental	48 Patients (34 women; 14 men), 18 to 80 years undergoing spinal surgery estimated to last longer than two hours in prone position	Near-infrared spectroscopy measurements conducted during anesthesia with the head rotated left, rotated right, and returned to neutral position	Near-infrared spectroscopy measurements conducted during anesthesia with the head in neutral position	Differences in regional cerebral oxygen saturation measurements	A neutral head position should be used.	IIB
224	Deniz MN, Erakgün A, Sertöz N, Yılmaz SG, Ateş H, Erhan E. The effect of head rotation on intraocular pressure in prone position: a randomized trial. Braz J Anesthesiol. 2013;63(2):209-212.	RCT	45/Patients undergoing percutaneous nephrolithotomy	Measurement of intraocular pressures in patients in prone position with the head rotated 45° to the right	Measurement of intraocular pressure in patients in prone position with head in neutral position	Differences in intraocular pressure measurements	Prone positioning increases intraocular pressure. In patients positioned in prone position with a head rotation 45° laterally, intraocular pressure in the upper positioned eye was significantly lower.	IB
225	Uribe AA, Baig MN, Puente EG, Viloria A, Mendel E, Bergese SD. Current intraoperative devices to reduce visual loss after spine surgery. Neurosurg Focus. 2012;33(2):E14.	Expert Opinion	n/a	n/a	n/a	n/a	eliminating the potential for eye compression with face positioning devices could potentially prevent postoperative vision loss.	VB
226	Grover V, Jangra K. Perioperative vision loss: a complication to watch out. J Anaesthesiol Clin Pharmacol. 2012;28(1):11-16.	Literature Review	n/a	n/a	N/A	n/a	Perioperative vision loss is a serious complication with medicolegal implications. Perioperative professionals assisting with or performing spinal procedures in the prone position should take adequate precautions during positioning.	VA
227	Grisell M, Place HM. Face tissue pressure in prone positioning: a comparison of three face pillows while in the prone position for spinal surgery. Spine (Phila Pa 1976). 2008;33(26):2938-2941.	Quasi-experimental	66 Consecutive elective thoracic or lumbar surgery patients from 18- to 65-years	Measurement of facial interface pressures at the forehead and chin at times 0, 5, 15, and 60 minutes of positioning with the ROHO and OSI face positioners	Measurement of facial interface pressures at the forehead and chin at times 0, 5, 15, and 60 minutes of positioning with the ProneView Protective Helmet	Differences in facial interface pressure measurements	The Prone View Protective Helmet was superior to both the OSI and ROHO face positioners in decreasing forehead and chin interface pressures during prone position surgery.	IIB
228	McMichael JC, Place HM. Face tissue pressures in prone positioning: a comparison of 3 pillows. J Spinal Disord Tech. 2008;21(7):508-513.	Nonexperimental	15 Volunteer participants	n/a	n/a	Differences in forehead and chin interface pressure measurements	At all time points, the head positioner made of disposable foam with face plate and mirror and the neoprene pillow demonstrated significantly lower face-pillow interface pressures than the polyurethane pillow.	IIIC

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229	Nazerali RS, Song KR, Wong MS. Facial pressure ulcer following prone positioning. J Plast Reconstr Aesthet Surg. 2010;63(4):e413-e414.	Case Report	31-year-old man undergoing surgery in the prone position	n/a	n/a	n/a	The use of appropriate padding and minimizing the length of time in prone position are two variables that can reduce facial pressure injury development.	VB
230	Ameri E, Behtash H, Omidi-Kashani F. Isolated long thoracic nerve paralysis – a rare complication of anterior spinal surgery: a case report. J Med Case Rep. 2009;3:7366.	Case Report	23-year-old woman	n/a	n/a	n/a	During positioning of patients into the lateral position, the course of the long thoracic nerve must be protected from any external pressure.	VB
231	Epstein NE. Perioperative visual loss following prone spinal surgery: a review. Surg Neurol Int. 2016;7(Suppl 13):S347-S360.	Literature Review	n/a	n/a	n/a	n/a	The best way to avoid POVL is to recognize its multiple etiologies and limit the various risk factors that contribute to this devastating complication of prone spinal surgery. Furthermore, routinely utilizing a 3-pin head holder will completely avoid ophthalmic compression, while maintaining the neck in a neutral posture, largely avoiding the risk of jugular vein and/or carotid artery compromise and thus avoiding increasing IOP.	VA
232	Kitthaweesin K, Moontawee K, Thanathanee O. Sudden visual loss and total ophthalmoplegia after brain surgery. Neuroophthalmology. 2009;33(1-2):59-61.	Case Report	1 19-year-old woman undergoing craniotomy in prone position	n/a	n/a	n/a	Adequate intraoperative eye protection is mandatory to reduce the risk of ophthalmic complications.	VB
233	Takahashi Y, Kakizaki H, Selva D, Leibovitch I. Bilateral orbital compartment syndrome and blindness after cerebral aneurysm repair surgery. Ophthalmic Plast Reconstr Surg. 2010;26(4):299-301	Case Report	56-year-old man undergoing cranial surgery in the jack-knife position	n/a	n/a	n/a	Attention to factors such as direct compression from skin flaps, congestion from head positioning, and adequate intraoperative eye protection can reduce the risk of orbital compartment syndrome or allow faster management when diagnosed.	VC
234	Nickels TJ, Manlapaz MR, Farag E. Perioperative visual loss after spine surgery. World J Orthop. 2014;5(2):100-106.	Expert Opinion	n/a	n/a	n/a	n/a	There are no effective treatment options for postoperative vision loss and the diagnosis is often irreversible, so efforts must focus on prevention and modification of risk factors.	VA
235	Woodruff C, English M, Zaouter C, Hemmerling TM. Postoperative visual loss after plastic surgery: case report and a novel continuous real-time video monitoring system for the eyes during prone surgery. Br J Anaesth. 2011;106(1):149-151.	Case Report	62-year-old male undergoing plastic surgery in the prone position	n/a	n/a	n/a	The eyes must be continuously monitored when patients are in the prone position.	VC
236	Lee JA, Jeon YS, Jung HS, Kim HG, Kim YS. Acute compartment syndrome of the forearm and hand in a patient of spine surgery: a case report. Korean J Anesthesiol. 2010;59(1):53-55.	Case Report	38-year-old woman undergoing spine surgery in the prone position	n/a	n/a	n/a	Incorrect placement of chest supports can cause compartment syndrome.	VB
237	Cho KT, Lee HJ. Prone position-related meralgia paresthetica after lumbar spinal surgery: a case report and review of the literature. J Korean Neurosurg Soc. 2008;44(6):392-395.	Case Report	51-year-old woman undergoing posterior lumbar interbody fusion	n/a	n/a	n/a	To decrease the incidence of prone position-related melagia paresthetica, the patient should be positioned symmetrically and every effort should be made to reduce the length of surgery, minimize intraoperative blood loss, and avoid hypotension during surgery.	VA
238	Chikhani M, Evans DL, Blatcher AW, et al. The effect of prone positioning with surgical bolsters on liver blood flow in healthy volunteers. Anaesthesia. 2016;71(5):550-555.	Nonexperimental	10 Volunteers	n/a	n/a	Differences in cardiac output and plasma disappearance rate	There is an acute and reversible change in hepatocellular function and cardiac output associated with the supine position.	IIIB
239	Debbarma S, Garg S, Kumar K, Anuradha S, Dewan R. Obesity and respiratory complications. J Int Med Sci Acad. 2008;21(3):151-153.	Expert Opinion	n/a	n/a	n/a	n/a	Respiratory alterations and complications in obese patients can be broadly classified into three main categories: 1) alteration in respiratory system mechanics, 2) sleep-related respiratory complications, and, 3) respiratory complications during critical illness.	VB
240	Ghai A, Saini S, Kiran s, Kamal K, Kad N, Bhawna. Influence of lithotomy position on the haemodynamic changes in patients with coronary artery disease. J Anaesthesiol Clin Pharmacol. 2008;24(3):359-360.	Case Report	78-year-old male patient, ASA class II, undergoing a cystoscopy	n/a	n/a	n/a	During lithotomy position, the elevation of the patient's legs autotransfuses as much as 1500 mL of blood from the periphery to the central circulation. Patients with severe pre-existing depressed cardiac function may not tolerate such acute variations of myocardial preload.	VB
241	Roeder RA, Geddes LA, Corson N, Pell C, Otlewski M, Kemeny A. Heel and calf capillary-support pressure in lithotomy positions. AORN J. 2005;81(4):821-830.	Nonexperimental	46 Adult participants	n/a	n/a	Differences in ankle blood pressure measurements	Support pressure for the heel is greater than capillary perfusion pressure when patients are lying flat, and the support pressure increases as the elevation of the lithotomy position increases.	IIIB
242	Wilde S. Compartment syndrome. The silent danger related to patient positioning and surgery. Br J Perioper Nurs. 2004;14(12):546-554.	Expert Opinion	n/a	n/a	n/a	n/a	Perioperative team members involved in prolonged surgical procedures should ensure that the patient is not positioned in unnatural positions for longer than is absolutely necessary.	VC
243	Bauer ECA, Koch N, Janni W, Bender HG, Fleisch MC. Compartment syndrome after gynecologic operations: evidence from case reports and reviews. Eur J Obstet Gynecol Reprod Biol. 2014;173:7-12.	Literature Review	n/a	n/a	n/a	n/a	Diagnosis of compartment syndrome is often delayed due to a lack of knowledge of the condition and its signs and symptoms.	VA
244	Bauer ECA, Koch N, Janni W, Bender HG, Fleisch MC. Compartment syndrome after gynecologic operations: evidence from case reports and reviews. Eur J Obstet Gynecol Reprod Biol. 2014;173:7-12.	Nonexperimental	59 of 168/Gynecological departments in Germany	n/a	n/a	Cases of compartment syndrome	Compartment syndrome is clearly associated with long lasting gynecological operations in lithotomy position.	IIIB
245	Karmaniolou I, Staikou C. Compartment syndrome as a complication of the lithotomy position. West Indian Med J. 2010;59(6):698-701.	Expert Opinion	n/a	n/a	n/a	n/a	Measures for preventing compartment syndrome include careful placement of the patient's legs and limited degrees of leg elevation.	VA
246	Raza A, Byrne D, Townell N. Lower limb (well leg) compartment syndrome after urological pelvic surgery. J Urol. 2004;171(1):5-11.	Literature Review	n/a	n/a	n/a	n/a	Perioperative team members should remain vigilant during the procedure to prevent patient injury.	VB
247	Rao MM, Jayne D. Lower limb compartment syndrome following laparoscopic colorectal surgery: a review. Colorectal Dis. 2011;13(5):494-499.	Literature Review	n/a	n/a	n/a	n/a	Preventive measures are identified that may help reduce the incidence of acute lower limb compartment syndrome.	VB

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248	Pridgeon S, Bishop CV, Adshead J. Lower limb compartment syndrome as a complication of robot-assisted radical prostatectomy: the UK experience. BJU Int. 2013;112(4):485-488.	Nonexperimental	17 of 22/Urology units from the United Kingdom	n/a	n/a	Incidence of lower limb compartment syndrome events/ Identification of risk factors for compartment syndrome	Long operating times, surgical inexperience, poor patient positioning, obesity, and vascular disease appear to be risk factors for compartment syndrome.	IIIB
249	Chin KY, Hemington-Gorse SJ, Darcy CM. Bilateral well leg compartment syndrome associated with lithotomy (Lloyd Davies) position during gastrointestinal surgery: a case report and review of literature. Eplasty. 2009;9:e48.	Case Report	44-year-old woman with ulcerative colitis undergoing proctectomy, pouch formation, and ileostomy	n/a	n/a	n/a	Clinicians should be aware of the risk factors for developing well-leg compartment syndrome and assess patients for these risks.	VB
250	Galyon SW, Richards KA, Pettus JA, Bodin SG. Three-limb compartment syndrome and rhabdomyolysis after robotic cystoprostatectomy. J Clin Anesth. 2011;23(1):75-78.	Case Report	53-year-old man, ASA class III, undergoing laparoscopic-assisted cystoprostatectomy	n/a	n/a	n/a	The risk of well-limb compartment syndrome may be reduced by selective patient choice, limiting lithotomy-Trendelenburg and overall operating time, careful maintenance of limb perfusion, and avoidance of compression stockings.	VB
251	Awab A, El Mansoury D, Benkabbou A, et al. Acute compartment syndrome following laparoscopic colorectal surgery. Colorectal Dis. 2012;14(2):e76.	Case Report	2/One 55-year-old woman, and one 74-year-old man undergoing laparoscopic colorectal surgery	N/A	N/A	N/A	The extended duration of the procedure, the position, and the quality of the OR bed appear to be the determinants for compartment syndrome.	VC
252	Keene R, Froelich JM, Milbrandt JC, Idusuyi OB. Bilateral gluteal compartment syndrome following robotic-assisted prostatectomy. Orthopedics. 2010;33(11):852.	Case Report	1/61-year-old man who underwent prolonged urological surgery in the lithotomy position	N/A	N/A	N/A	Prevention of gluteal compartment syndrome should focus on padding, intraoperative repositioning, and restricting the length of the procedure.	VB
253	Raman SR, Jamil Z. Well leg compartment syndrome after robotic prostatectomy: a word of caution. J Robot Surg. 2009;3(2):105-107	Case Report	45-year-old male undergoing robotic prostatectomy in the lithotomy position under general anesthesia	n/a	n/a	n/a	Patients should be placed in the lithotomy position with minimal elevation of the ankles above the level of the heart. The duration of Trendelenburg position with lithotomy should be minimized.	VB
254	Enomoto T, Ohara Y, Yamamoto M, Oda T, Ohkohchi N. Well leg compartment syndrome after surgery for ulcerative colitis in the lithotomy position: a case report. Int J Surg Case Rep. 2016;23:25-28.	Case Report	28-year-old man undergoing surgery for ulcerative colitis in the lithotomy position	n/a	n/a	n/a	A risk factor for development of compartment syndrome is prolonged time in the high lithotomy position. Consideration should be given to lowering the patient's legs during the operation.	VA
255	Oman SA, Schwarz D, Muntz HG. Lower limb compartment syndrome as a complication of radical hysterectomy. Gynecol Oncol Rep. 2016;16:39-41.	Case Report	39-year-old woman undergoing robotic-assisted laparoscopic radical hysterectomy	n/a	n/a	n/a	Risk reduction strategies for preventing compartment syndrome should be incorporated into the positioning plan.	VA
256	Stornelli N, Wydra FB, Mitchell JJ, Stahel PF, Fabbri S. The dangers of lithotomy positioning in the operating room: case report of bilateral lower extremity compartment syndrome after a 90-minutes surgical procedure. Patient Saf Surg. 2016;10:18.	Case Report	n/a	n/a	n/a	n/a	Technical diligence in applying a lithotomy position is paramount for preventing postoperative lower extremity compartment syndrome. A high level of suspicion for this severe complication in conjunction with early recognition and immediate surgical management can mitigate long-term adverse sequelae and improve postoperative outcomes.	VA
257	Anusionwu IM, Wright EJ. Compartment syndrome after positioning in lithotomy: what a urologist needs to know. BJU Int. 2011;108(4):477-478.	Expert Opinion	n/a	n/a	n/a	n/a	Compartment syndrome of the well leg can complicate prolonged procedures in lithotomy.	VB
258	Koç G, Tazeh NN, Joudi FN, Winfield HN, Tracy CR, Brown JA. Lower extremity neuropathies after robot-assisted laparoscopic prostatectomy on a split-leg table. J Endourol. 2012;26(8):1026-1029.	Nonexperimental	377 patients undergoing robotic assisted laparoscopic prostatectomy using a split-leg table	n/a	n/a	Lower extremity neuropathies.	Intraoperative time is a significant risk factor for development of post-operative neuropathy. Split-leg positioning appears to put the femoral nerve at risk for injury.	IIIA
259	Chikazawa K, Netsu S, Akashi K, Suzuki Y, Konno R, Motomatsu S. Delayed diagnosis of single compartment muscle contusion after radical hysterectomy in the lithotomy position: a case report. Int J Surg Case Rep. 2016;26:199-201.	Case Report	N/A	N/A	N/A	The duration of compression of the lower legs was sufficient through the use of serial compression stockings and intermittent pneumatic compression devices to cause a muscle contusion.	A 50-year-old woman underwent radical hysterectomy. She complained of edema and tenderness in the lower left leg on postoperative day 6. T2-weighted magnetic resonance imaging revealed swelling of the muscle in the deep posterior compartment of the lower left leg, edematous fascia, and subcutaneous adipose tissue. She recovered naturally without other complications	VB
260	Lawrenz B, Kraemer B, Wallwiener D, Witte M, Fehm T, Becker S. Lower extremity compartment syndrome after laparoscopic radical hysterectomy: brief report of an unusual complication of laparoscopic positioning requirements. J Minim Invasive Gynecol. 2011;18(4):531-533.	Case Report	30-year-old woman undergoing laparoscopic hysterectomy	n/a	n/a	n/a	All perioperative team members must be aware of the potential for compartment syndrome to occur postoperatively and take measures to prevent it.	VB

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261	Boesgaard-Kjer DH, Boesgaard-Kjer D, Kjer JJ. Well-leg compartment syndrome after gynecological laparoscopic surgery. Acta Obstet Gynecol Scand. 2013;92(5):598-600.	Case Report	45-year-old woman with a BMI of 47 kg/m^2, and one 32-year old woman with a BMI of 41 kg/m^2 undergoing laparoscopic gynecologic surgery	n/a	n/a	n/a	Several circumstances predispose to this condition as a consequence of increased intra-compartmental pressure, including positioning of the legs, a prolonged operation, and external compression and vascular insults.	VB
262	Ulrich D, Bader AA, Zotter M, Koch H, Pristauz G, Tamussino K. Well-leg compartment syndrome after surgery for gynecologic cancer. J Gynecol Surg. 2010;26(4):261-262.	Case Report	38-year-old woman undergoing gynecologic surgery in the lithotomy position	n/a	n/a	n/a	The cause of the compartment syndrome in this patient was likely multifactorial. Injury of the right iliac artery may have contributed to ischemia in combination with the prolonged surgery time in lithotomy and Trendelenburg position.	VC
263	Nakamura K, Aoki H, Hirakawa T, Murata T, Kanuma T, Minegishi T. Compartment syndrome with thrombosis of common iliac artery after gynecologic surgery. Obstet Gynecol. 2008;112(2 Pt 2):486-488.	Case Report	34-year-old woman undergoing radical hysterectomy with pelvic and para-aortic lymph node resection in the lithotomy position	n/a	n/a	n/a	The lithotomy position may cause insufficient arterial circulation in both the pelvis and the legs.	VB
264	Dos Reis JMC, Queiroz LJM, Mello PF, Teixeira RKC, Gonçalves FA. Bilateral compartment syndrome of the lower limbs after urological surgery in the lithotomy position: a clinical case. J Vasc Bras. 2019;18:e20180117.	Case Report	n/a	n/a	n/a	n/a	We report the case of a 67-year-old male who underwent laparoscopic prostatectomy surgery to treat cancer, spending 180 minutes in surgery. Postoperatively, the patient developed acute compartment syndrome of both legs, needing emergency bilateral four-compartment fasciotomies, with repeated returns to the operating room for second-look procedures	VA
265	Yang RH, Chu YK, Huang CW. Compartment syndrome following robotic-assisted prostatectomy: rhabdomyolysis in bone scintigraphy. Clin Nucl Med. 2013;38(5):365-366.	Case Report	56-year-old man undergoing robotic assisted prostatectomy in the lithotomy position	n/a	n/a	n/a	Prolonged or exaggerated lithotomy position is likely to expose patients to the risk of rhabdomyolysis and acute renal failure. Prolonged surgery is the most important risk factor for such complications.	VC
266	Sadeghian H, Arasteh H, Motiei-Langroudi R. Bilateral femoral neuropathy after transurethral lithotomy in the lithotomy position: report of a case. J Clin Neuromuscul Dis. 2016;17(4):225-226.	Case Report	1/20-year-old man undergoing transurethral lithotomy in the lithotomy position	n/a	n/a	n/a	Even in short procedures special care should be used for positioning.	VB
267	Guella A, Al Oraifi I. Rhabdomyolysis and acute renal failure following prolonged surgery in the lithotomy position. Saudi J Kidney Dis Transpl. 2013;24(2):330-332.	Case Report	80-year-old man undergoing cystoscopy and cystolitholapaxy	n/a	n/a	n/a	Rhabdomyolysis and acute renal failure can develop and prolonged surgery is the most important risk factor for such complications.	VB
268	Mizuno J, Takahashi T. Male sex, height, weight, and body mass index can increase external pressure to calf region using knee-crutch-type leg holder system in lithotomy position. Ther Clin Risk Manag. 2016;12:305-312.	Nonexperimental	21 Healthy volunteers	n/a	n/a	Differences in external pressure measurements	External pressure applied to the calf region is higher in males than in females when supported by a knee crutch leg holder. External pressure increases with increase in height, weight, and BMI.	IIIB
269	Hsu KL, Chang CW, Lin CJ, Chang CH, Su WR, Chen SM. The dangers of hemilithotomy positioning on traction tables: case report of a well-leg drop foot after contralateral femoral nailing. Patient Saf Surg. 2015;9:18.	Case Report	28-year-old woman undergoing femoral nailing in hemi-lithotomy position	n/a	n/a	n/a	This case highlights the need to monitor patient positioning even during the most common orthopedic procedures. The authors recommend repositioning the patient's extremities at regular intervals during prolonged procedures.	VB
270	Bradshaw AD, Advincula AP. Postoperative neuropathy in gynecologic surgery. Obstet Gynecol Clin North Am. 2010;37(3):451-459.	Expert Opinion	N/A	N/A	N/A	N/A	Perioperative team members should be familiar with the location of the nerves that are at greatest risk of injury during gynecologic surgery.	VB
271	Mizuno J, Takahashi T. Factors that increase external pressure to the fibular head region, but not medial region, during use of a knee-crutch/leg-holder system in the lithotomy position. Ther Clin Risk Manag. 2015;11:255-261.	Nonexperimental	21 Healthy volunteers	n/a	n/a	Differences in external pressure measurements	The external pressure to the fibular head increases with increasing weight, BMI, and fibular head circumference.	IIIB
272	Wilson M, Ramage L, Yoong W, Swinhoe J. Femoral neuropathy after vaginal surgery: a complication of the lithotomy position. J Obstet Gynaecol. 2011;31(1):90-91.	Case Report	One 41-year-old woman, and one 65-year-old woman undergoing gynecological procedures in the lithotomy position	n/a	n/a	n/a	Lithotomy position should be maintained with moderate flexion and minimal abduction and external rotation at the hip. Moreover, assistants should not lean against the inner thigh of the patient during the procedure, as this can cause external hip rotation.	VB
273	Navarro-Vicente F, García-Granero A, Frasson M, et al. Prospective evaluation of intraoperative peripheral nerve injury in colorectal surgery. Colorectal Dis. 2012;14(3):382-385.	Nonexperimental	8 Patients who experienced intraoperative nerve injury	n/a	n/a	Common elements related to nerve injury	Adequate positioning and safe use of positioning devices may prevent intraoperative peripheral nerve injury during laparoscopic procedures.	IIIB
274	Yamada Y, Fujimura T, Fukuhara H, et al. Measuring contact pressure of lower extremities in patients undergoing robot-assisted radical prostatectomy. Urol Int. 2016;96(3):268-273.	Nonexperimental	138 Patients undergoing robotic-assisted radical prostatectomy in the lithotomy position	n/a	n/a	Differences in contact pressure measurements of lower extremities	The contact pressure of the lower extremities increased after robotic-assisted radical prostatectomy and the increase was correlated with BMI.	IIIB

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275	Sze EHM. An alternate approach to using candy cane stirrups in vaginal surgery. Obstet Gynecol. 2019;133(4):666-668.	Case Report	n/a	n/a	n/a	n/a	simple modification to the candy cane stirrups allows placement of patients in dorsal lithotomy with their legs in an anatomically and neuro-logically neutral position.	VA
276	Vijay MK, Vijay P, Kundu AK. Rhabdomyolysis and myogloginuric acute renal failure in the lithotomy/exaggerated lithotomy position of urogenital surgeries. Urol Ann. 2011;3(3):147-150.	Case Report	4 Patients undergoing urethroplasty in the lithotomy position	n/a	n/a	n/a	The duration of surgery is the most important factor affecting development of rhabdomyolysis and acute renal failure.	VC
277	Tondare AS, Nadkarni AV, Sathe CH, Dave VB. Femoral neuropathy: a complication of lithotomy position under spinal anesthesia. Report of three cases. Can Anaesth Soc J. 1983;30(1):84-86.	Case Report	3 Patients undergoing vaginal hysterectomy in the lithotomy position	n/a	n/a	n/a	Extreme abduction or external rotation of the hip can lead to ischemia of the femoral nerve as it is kinked beneath the inguinal ligament.	VB
278	Sajid MS, Shakir AJ, Khatri K, Baig MK. Lithotomy-related neurovascular complications in the lower limbs after colorectal surgery. Colorectal Dis. 2011;13(11):1203-1213.	Literature Review	n/a	n/a	n/a	n.	Measures should be taken to reduce the risk of compartment syndrome in patients undergoing prolonged colorectal surgery in the lithotomy position.	VB
279	Chung JH, Ahn KR, Park JH, et al. Lower leg compartment syndrome following prolonged orthopedic surgery in the lithotomy position: a case report. Korean J Anesthesiol. 2010;59(Suppl):S49-S52.	Case Report	1/20-year-old male patient undergoing arthroscopic surgery of the right knee	N/A	N/A	N/A	To avoid compartment syndrome in an operation performed in the lithotomy position, the intraoperative blood pressure should not be significantly reduced, external pressure should be avoided by use of padding, the leg position should be kept at the level of the atrium, the duration of the procedure should be reduced as much as possible, and the patient should be continuously monitored.	VA
280	Meyer RS, White KK, Smith JM, Groppo ER, Mubarak SJ, Hargens AR. Intramuscular and blood pressures in legs positioned in the hemilithotomy position: clarification of risk factors for well-leg acute compartment syndrome. J Bone Joint Surg Am. 2002;84(10):1829-1835.	Nonexperimental	8 Volunteers positioned on a fracture table	n/a	n/a	Differences in intramuscular pressures	The hemi-lithotomy position creates a risk of compartment syndrome.	IIIB
281	Tan V, Pepe MD, Glaser DL, Seldes RM, Heppenstall RB, Esterhai JL Jr. Well-leg compartment pressures during hemilithotomy position for fracture fixation. J Orthop Trauma. 2000;14(3):157-161.	Nonexperimental	10 Patients undergoing intramedullary nailing of a fractured femur in the hemi-lithotomy position	n/a	n/a	Differences in calf compartment pressure measurements	The use of the well leg holder to maintain hemi-lithotomy position increases the calf compartment pressures significantly. This position should be avoided.	IIIB
282	Li X, Eichinger JK, Hartshorn T, Zhou H, Matzkin EG, Warner JP. A comparison of the lateral decubitus and beach-chair positions for shoulder surgery: advantages and complications. J Am Acad Orthop Surg. 2015;23(1):18-28.	Expert Opinion	n/a	n/a	n/a	n/a	Complications associated with the semi-sitting position include cervical hypoperfusion, cervical traction neuropraxia, blindness, and cardiac and embolic events. Complications associated with the lateral position include traction injuries, thromboembolic events, difficulty with airway management, and the need to convert to an open procedure.	VA
283	Lindroos AC, Niiya T, Randell T, Romani R, Hernesniemi J, Niemi T. Sitting position for removal of pineal region lesions: the Helsinki experience. World Neurosurg. 2010;74(4-5):505-513.	Nonexperimental	72 Anesthesiology reports of pineal region tumor surgery using the supracerebellar approach in the sitting position	n/a	n/a	Incidence of VAE and hemodynamic stability	There is a risk of hypotension and VAE in the sitting position.	IIIB
284	Cogan A, Boyer P, Soubeyrand M, Hamida FB, Vannier JL, Massin P. Cranial nerves neuropraxia after shoulder arthroscopy in beach chair position. Orthop Traumatol Surg Res. 2011;97(3):345-348.	Case Report	66-year-old man undergoing arthroscopic rotator cuff repair in the semi-sitting position	n/a	n/a	n/a	There are neurological risks associated with the semi-sitting position and precautions should be implemented to prevent complications.	VB
285	Basaldella L, Ortolani V, Corbanese U, Sorbara C, Longatti P. Massive venous air embolism in the semi-sitting position during surgery for a cervical spinal cord tumor: anatomic and surgical pitfalls. J Clin Neurosci. 2009;16(7):972-975.	Case Report	52-year-old man placed in the semi-sitting position for removal of a spinal cord tumor	n/a	n/a	n/a	The procedure was interrupted by a massive VAE that was effectively managed by the surgical team.	VC
286	Dilmen OK, Akcil EF, Tureci E, et al. Neurosurgery in the sitting position: retrospective analysis of 692 adult and pediatric cases. Turk Neurosurg. 2011;21(4):634-640.	Nonexperimental	692 Adults (n = 601) and pediatric patients (n = 91) undergoing neurosurgery in the sitting position	n/a	n/a	Incidence of VAE	Results suggest that if the sitting position is a neurosurgical necessity it can be used with vigilant attention to detect any occurrence of VAE using end tidal carbon dioxide monitoring.	IIIB
287	Friedman DJ, Parnes NZ, Zimmer Z, Higgins LD, Warner JJP. Prevalence of cerebrovascular events during shoulder surgery and association with patient position. Orthopedics. 2009;32(4).	Nonexperimental	93 Members of the American Shoulder and Elbow Surgeons Society	n/a	n/a	Cerebrovascular events in the semi-sitting and lateral positions	No significant differences were observed in the number of cerebrovascular events between positions.	IIIC
288	Meex I, Genbrugge C, De Deyne C, Jans F. Cerebral tissue oxygen saturation during arthroscopic shoulder surgery in the beach chair and lateral decubitus position. Acta Anaesthesiol Belg. 2015;66(1):11-17.	Expert Opinion	n/a	n/a	n/a	n/a	Near infrared spectroscopy may be useful to provide early warning signs of cerebral hypoperfusion.	VA
289	Pant S, Bokor DJ, Low AK. Cerebral oxygenation using near-infrared spectroscopy in the beach-chair position during shoulder arthroscopy under general anesthesia. Arthroscopy. 2014;30(11):1520-1527.	Systematic Review	9 Articles	n/a	n/a	Correlation between cerebral desaturation events and the semi-sitting position	There was a strong correlation between cerebral desaturation events and degree of elevation in the semi-sitting position as measured by near-infrared spectroscopy.	IIIB

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290	Mazzon D, Danelli G, Poole D, Marchini C, Bianchin C. Beach chair position, general anesthesia and deliberated hypotension during shoulder surgery: a dangerous combination! Minerva Anestesiol. 2009;75(5):281-282.	Expert Opinion	n/a	n/a	n/a	n/a	It is advisable to limit the semi-sitting position during general anesthesia to 45° while avoiding deliberate hypotension and maintaining normal blood pressure.	VB
291	Moerman AT, De Hert SG, Jacobs TF, De Wilde LF, Wouters PF. Cerebral oxygen desaturation during beach chair position. Eur J Anaesthesiol. 2012;29(2):82-87.	Nonexperimental	20 Consecutive adult patients undergoing elective shoulder surgery under general anesthesia	n/a	n/a	Differences in oxygen saturation measurements	The prevalence for significant cerebral oxygen desaturation during shoulder surgery in the semi-sitting position underlines the need for close monitoring.	IIB
292	Triplet JJ, Lonetta CM, Levy JC, Everding NG, Moor MA. Cerebral desaturation events in the beach chair position: correlation of noninvasive blood pressure and estimated temporal mean arterial pressure. J Shoulder Elbow Surg. 2015;24(1):133-137.	Nonexperimental	57 Patients undergoing arthroscopic shoulder surgery in the semi-sitting position	n/a	n/a	Correlations between blood pressure and arterial pressure measurements with cerebral desaturation events	Brachial noninvasive blood pressure and estimated temporal mean arterial pressure are unreliable methods for identifying cerebral desaturation events in the semi-sitting position.	IIIB
293	Murphy GS, Szokol JW, Marymont JH, et al. Cerebral oxygen desaturation events assessed by near-infrared spectroscopy during shoulder arthroscopy in the beach chair and lateral decubitus positions. Anesth Analg. 2010;111(2):496-505.	Nonexperimental	124/Patients undergoing elective shoulder surgery in the semi-sitting (n = 61) and lateral (n = 63) position	n/a	n/a	Number of cerebral desaturation events	Shoulder surgery in the semi-sitting position is associated with significant reductions in cerebral oxygenation compared with the lateral position.	IIIB
294	Meex I, Vundelinckx J, Buyse K, et al. Cerebral tissue oxygen saturation values in volunteers and patients in the lateral decubitus and beach chair positions: a prospective observational study. Can J Anaesth. 2016;63(5):537-543.	Expert Opinion	n/a	n/a	n/a	n/a	Near infrared spectroscopy may be useful to provide early warning signs of cerebral hypoperfusion.	VA
295	Salazar D, Hazel A, Tauchen AJ, Sears BW, Marra G. Neurocognitive deficits and cerebral desaturation during shoulder arthroscopy with patient in beach-chair position: a review of the current literature. Am J Orthop (Belle Mead NJ). 2016;45(3):E63-E68.	Systematic Review	10 studies	n/a	n/a	Cerebral desaturation events/ Neurocognitive deficits	Incidence of reported intraoperative cerebral desaturation events varied significantly. There was only one case of a postoperative neurocognitive deficit.	IIIB
296	Dippmann C, Winge S, Nielsen HB. Severe cerebral desaturation during shoulder arthroscopy in the beach-chair position. Arthroscopy. 2010;26(9 Suppl):S148-S150.	Case Report	One 46-year-old man, and one 58-year-old man undergoing arthroscopic shoulder surgery	n/a	n/a	n/a	During surgery in the semi-sitting position, hypotension must be avoided, and cerebral oxygenation should be monitored in all patients.	VB
297	Laflam A, Joshi B, Brady K, et al. Shoulder surgery in the beach chair position is associated with diminished cerebral autoregulation but no differences in postoperative cognition or brain injury biomarker levels compared with supine positioning: The Anesthesia Patient Safety Foundation Beach Chair Study. Anesth Analg. 2015;120(1):176-185.	Quasi-experimental	109 patients undergoing shoulder surgery in each group	30-40 degree head up position (beach chair)	Lateral decubitus without head elevation.	Mean arterial blood pressure, Bispectral index and cerebral oximetry index	Patients undergoing surgery in beach chair were more likely to have higher cerebral oximetry index indicating diminished cerebral autoregulation and lower regional cerebral oxygen saturation than those in the lateral decubitus position.	IIB
298	Hanouz JL, Fiant AL, Gérard JL. Middle cerebral artery blood flow velocity during beach chair position for shoulder surgery under general anesthesia. J Clin Anesth. 2016;33:31-36.	Nonexperimental	Fifty-three consecutive patients scheduled for shoulder surgery in beach chair position	Transcranial Doppler performed after induction of general anesthesia (baseline), after beach chair positioning (BC1), during surgery 20 minutes (BC2), and after back to supine position before stopping anesthesia (supine).	N/A	Mean arterial pressure (MAP), end-tidal CO2, and volatile anesthetic concentration andVMCAwere recorded at baseline, BC1, BC2, and supine. Postoperative complications.	Beach chair position resulted in transient decrease in MAP requiring fluid challenge and vasopressors and a moderate decrease in VMCA	IIIB
299	Buget MI, Atalar AC, Edipoglu IS, et al. Patient state index and cerebral blood flow changes during shoulder arthroscopy in beach chair position. Braz J Anesthesiol. 2016;66(5):470-474.	Nonexperimental	35 patients undergoing arthroscopic shoulder surgery	n/a	n/a	Doppler ultrasound of the patients' internal carotid artery and vertebral arteries were evaluated	Beach chair position was associated with a decrease in cerebral blood flow and patient state index values. Patient state index was affected by the gravitational change of the cerebral blood flow; however, both factors were not directly correlated to each other. Moreover, the decrease in patient state index value was transient and returned to normal values within 20 min	IIIB
300	McCulloch TJ, Liyanagama K, Petchell J. Relative hypotension in the beach-chair position: effects on middle cerebral artery blood velocity. Anaesth Intensive Care. 2010;38(3):486-491.	Nonexperimental	19/Patients undergoing arthroscopic shoulder surgery in the semi-sitting position	N/A	N/A	Differences in cerebral hemodynamics measurements	Cerebral arterial pressure was frequently below the lower limit of autoregulation; however, the changes were not so great as to indicate cerebral ischemia.	IIIB
301	Yadeau JT, Liu SS, Bang H, et al. Cerebral oximetry desaturation during shoulder surgery performed in a sitting position under regional anesthesia. Can J Anaesth. 2011;58(11):986-992.	Nonexperimental	99/Patients undergoing shoulder surgery in the semi-sitting position in an ambulatory surgery center	N/A	N/A	Number of blood pressure and cerebral desaturation events	Despite frequent hypotension in the semi-sitting position, cerebral desaturation events were uncommon.	IIIB

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302	Tange K, Kinoshita H, Minonishi T, et al. Cerebral oxygenation in the beach chair position before and during general anesthesia. Minerva Anestesiol. 2010;76(7):485-490.	Nonexperimental	30/Patients undergoing arthroscopic shoulder surgery	N/A	N/A	Differences in cerebral oxygenation measurements	The semi-sitting position does not alter cerebral oxygenation in patients with normal brain tissue oxygen index.	IIIB
303	Pin-on P, Schroeder D, Munis J. The hemodynamic management of 5177 neurosurgical and orthopedic patients who underwent surgery in the sitting or "beach chair" position without incidence of adverse neurologic events. Anesth Analg. 2013;116(6):1317-1324.	Nonexperimental	5177/Patients who underwent orthopedic shoulder surgery or neurological surgery in the sitting position	N/A	N/A	Differences in intraoperative blood pressure measurements	The average reduction in blood pressure ranged from 12% to 19% depending on the type of surgery and the method of measurement; however the average reduction was not clinically significant.	IIIA
304	Lee SW, Choi SE, Han JH, Park SW, Kang WJ, Choi YK. Effect of beach chair position on bispectral index values during arthroscopic shoulder surgery. Korean J Anesthesiol. 2014;67(4):235-239.	Nonexperimental	30/Patients undergoing arthroscopic shoulder surgery	N/A	N/A	Differences in Bispectral index measurements associated with position change	Bispectral index measurements are significantly decreased in the semi-sitting position compared with the supine position, and this might affect interpretation of the depth of anesthesia.	IIIB
305	Vermeersch G, Menovsky T, De Ridder D, De Bodt M, Saldien V, Van de Heyning P. Life-threatening macroglossia after posterior fossa surgery: a surgical positioning problem? B-ENT. 2014;10(4):309-313.	Case Report	1/55-year-old woman undergoing cranial surgery in the lateral position	N/A	N/A	N/A	The macroglossia in this case resulted from lymphatic drainage blockage caused by a combination of head positioning, extreme neck flexion, and the pressure of the endotracheal tube on the tongue and floor of the mouth.	VB
306	Wang JC, Wong TT, Chen HH, Chang PY, Yang TF. Bilateral sciatic neuropathy as a complication of craniotomy performed in the sitting position: localization of nerve injury by using magnetic resonance imaging. Childs Nerv Syst. 2012;28(1):159-163.	Case Report	12-year-old boy undergoing cranial surgery in the sitting position	n/a	n/a	n/a	The patient's thin body habitus and the prolonged duration of the procedure were predisposing factors for the patient's sciatic compressive palsy.	VB
307	Kiermeir D, Banic A, Rösler K, Erni D. Sciatic neuropathy after body contouring surgery in massive weight loss patients. J Plast Reconstr Aesthet Surg. 2010;63(5):e454-e457.	Case Report	28-year-old woman undergoing abdominoplasty and mastopexy in sitting position	n/a	n/a	n/a	The patient's sciatic neuropathy may have been related to nerve compression associated with the semi recumbent position combined with hip flexion and abduction necessary for simultaneous abdominal closure and access to the inner thighs.	VB
308	Rawlani V, Lee MJ, Dumanian GA. Bilateral sciatic neurapraxia following combined abdominoplasty and mastopexy. Plast Reconstr Surg. 2010;125(1):31e-32e.	Case Report	1/28-year-old woman undergoing abdominoplasty and mastopexy in sitting position	N/A	N/A	N/A	Time in the sitting position should be minimized and the OR bed well padded. If the hips must be flexed, the knees should also be flexed.	VC
309	Kwak HJ, Lee JS, Lee DC, Kim HS, Kim JY. The effect of a sequential compression device on hemodynamics in arthroscopic shoulder surgery using beach-chair position. Arthroscopy. 2010;26(6):729-733.	RCT	50/Patients undergoing elective shoulder arthroscopy under general anesthesia in the semi-sitting position	Sequential compression devices activated before anesthesia	Sequential compression devices not activated	Changes in hemodynamic measurements	The use of sequential compression devices reduced the incidence of hypotension associated with the semi-sitting position from 64% to 28%.	IA
310	Woo KY, Kim EJ, Lee JH, Lee SG, Ban JS. Recurrent paroxysmal supraventricular tachycardia in the beach chair position for shoulder surgery under general anesthesia. Korean J Anesthesiol. 2013;65(6 Suppl):S75-S76.	Case Report	81-year-old woman undergoing shoulder surgery in the semi-sitting position	n/a	n/a	n/a	Blood pooling in the lower extremities during the semi-sitting position and decreased intravascular volume due to bleeding may have been the main factors in the occurrence of the patient's recurrent paroxysmal supraventricular tachycardia.	VB
311	Guideline for prevention of venous thromboembolism. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2022:1217-1246.	Guideline	n/a	n/a	n/a	n/a	This document provides guidance to perioperative team members for developing and implementing a protocol for prevention of venous thromboembolism (VTE), including prevention of deep vein thrombosis (DVT) by mechanical and pharmacologic prophylaxis and prevention of pulmonary embolism (PE) as a complication of DVT.	IVA
312	Woernle CM, Sarnthein J, Foit NA, Krayenbuhl N. Enhanced serum creatine kinase after neurosurgery in lateral position and intraoperative neurophysiological monitoring. Clin Neurol Neurosurg. 2013;115(3):266-269.	Quasi-experimental	150 Patients operated on in the supine (n = 50), prone (n = 50), and lateral (n = 50) positions	Preoperative and postoperative creatine kinase levels with the patient in supine and prone positions	Preoperative and postoperative creatine kinase levels with the patient in lateral position	Differences in serum creatine kinase levels	There is a strong association between elevated serum creatine kinase levels and the lateral position that may be related to the elevated body pressure on the OR bed.	IIB
313	Achar SK, Paul C, Varghese E. Unilateral pulmonary edema after laparoscopic nephrectomy. J Anaesthesiol Clin Pharmacol. 2011;27(4):556-558.	Case Report	61-year-old man diagnosed with right renal cell carcinoma	n/a	n/a	n/a	Prolonged lateral position, pneumoperitoneum, ventilation-perfusion mismatch, and Starling's forces led to the patient's dependent lung edema in the postoperative period.	VB
314	Danish SF, Wilden JA, Schuster J. Iatrogenic paraplegia in 2 morbidly obese patients with ankylosing spondylitis undergoing total hip arthroplasty. J Neurosurg Spine. 2008;8(1):80-83.	Case Report	One extremely obese 59-year-old man, and one extremely obese 60-year-old man undergoing hip arthroplasty procedures in the supine position with a modified lateral approach	n/a	n/a	n/a	Morbidly obese patients with ankylosing spondylosis and a fragile kyphotic spine may be susceptible to symptomatic vertebral fracture during positioning.	VB

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
315	Kim TK, Yoon JR, Lee MH. Rhabdomyolysis after laparoscopic radical nephrectomy: a case report. Korean J Anesthesiol. 2010;59(Suppl):S41-S44.	Case Report	51-year-old man undergoing laparoscopic radical nephrectomy	n/a	n/a	n/a	Body parts under pressure should be padded. The kidney rest may need to be lowered during the procedure.	VB
316	De Tommasi C, Cusimano MD. Rhabdomyolysis after neurosurgery: a review and a framework for prevention. Neurosurg Rev. 2013;36(2):195-202.	Case Report	One 54-year-old hypertensive woman with a BMI of 44 kg/m^2 undergoing a craniotomy, one 57-year-old woman with diabetes, hypertension, and a BMI of 37.4 kg/m^2 undergoing excision of a petroclival tumor, and one 66-year-old hypertensive woman with a BMI of 30.7 kg/m^2 undergoing decompression of cranial nerves V and IX	n/a	n/a	n/a	Obese patients undergoing long neurosurgical procedures, particularly in the lateral position, should be evaluated for rhabdomyolysis.	VA
317	Dakwar E, Rifkin SI, Volcan IJ, Goodrich JA, Uribe JS. Rhabdomyolysis and acute renal failure following minimally invasive spine surgery: report of 5 cases. J Neurosurg Spine. 2011;14(6):785-788.	Case Report	5 Patients developing rhabdomyolysis and acute renal failure after minimally invasive spine surgery	n/a	n/a	n/a	There is a possibility of postoperative rhabdomyolysis and acute renal failure after minimally invasive spine surgery, particularly if the patient is morbidly obese and the procedure is prolonged.	VB
318	Deane LA, Lee HJ, Box GN, et al. Third place: Flank position is associated with higher skin-to-surface interface pressures in men versus women: implications for laparoscopic renal surgery and the risk of rhabdomyolysis. J Endourol. 2008;22(6):1147-1151.	Quasi-experimental	20 Volunteers with BMI ≤ 25 (n = 10 [5 men; 5 women]) and with BMI > 25 (n = 10 [5 men; 5 women])	Measurement of interface pressures when placed in lateral position with the OR bed half-flexed, fully-flexed, half-flexed with elevated kidney rest, and fully-flexed with elevated kidney rest	Measurement of interface pressures when placed in lateral position with the OR bed flat	Differences in interface pressure measurements	Women have significantly lower interface pressures when compared with men. Having a BMI > 25 also increases interface pressures. The use of the kidney rest is associated with markedly increased pressure. Use of a half-flexed position is preferable to a full-flexed position.	IIB
319	Schwarzman G, Schwarzman L, MacGillis K, Chmell S. A case report of a radial nerve palsy following uncomplicated total hip arthroplasty. J Orthop Case Rep. 2018;8(2):107-109.	Case Report	n/a	n/a	n/a	n/a	case report demonstrates a rare nerve palsy complication that can be associated with positioning in THA surgeries. Knowledge of this complication can be used to avoid pressure points in future THA surgeries in the lateral decubitus position.	VA
320	Jain V, Davies M. Axillary artery compression in park bench position during a microvascular decompression. J Neurosurg Anesthesiol. 2011;23(3):264.	Case Report	1/Adult man undergoing microvascular decompression surgery in the lateral position with his neck flexed and his head rotated toward the floor	n/a	n/a	n/a	When the patient is in the park bench position, especially if the patient is obese, it is prudent to monitor the circulation in both hands by pulse oximeter or palpation of peripheral pulses	VC
321	Newton G, White E. Femoral artery occlusion in obese patients in the lateral position. Anaesthesia. 2010;65(8):863.	Case Report	2 Obese, elderly patients undergoing surgery in the lateral position	n/a	n/a	n/a	Perioperative team members should remain vigilant during the procedure to prevent patient injury.	VC
322	Shriver MF, Zeer V, Alentado VJ, Mroz TE, Benzel EC, Steinmetz MP. Lumbar spine surgery positioning complications: a systematic review. Neurosurg Focus. 2015;39(4):E16.	Systematic Review	34 Published case reports, randomized controlled trials, prospective and retrospective cohort studies	n/a	n/a	Identification of complications associated with positioning during lumbar spine surgery	Vision loss was the most commonly reported complication. Other complications included conjunctival swelling, ischemic orbital compartment syndrome, nerve palsies, thromboembolic complications, pressure injury, lower extremity compartment syndrome, and shoulder dislocation.	IIIB
323	Mendel E, Stoicea N, Rao R, et al. Revisiting postoperative vision loss following non-ocular surgery: a short review of etiology and legal considerations. Front Surg. 2017;4:34.	Literature Review	n/a	n/a	n/a	n/a	This literature review was conducted in order to identify legal issues as a major barrier to studying POVL and address how this affects current knowledge.	VB

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324	Van Wicklin SA. Systematic review and meta-analysis of prone position on intraocular pressure in adults undergoing surgery. Int J Spine Surg. 2020;14(2):195-208.	Systematic Review w/ Meta-Analysis	n/a	n/a	n/a	n/a	Meta-analysis showed that intraocular pressure increased significantly between induction of anesthesia and up to 10 minutes of prone position and continued to increase significantly until the end of prone position.	IA
325	Van Wicklin SA. Systematic review and meta-analysis of Trendelenburg position on intraocular pressure in adults undergoing surgery. Ann Laparosc Endosc Surg. 2019;4(September):88.	Systematic Review w/ Meta-Analysis	n/a	n/a	n/a	n/a	Using a random effects model, meta-analysis showed that IOP increased significantly after abdominal insufflation (T2: d=1.89, P<0.001) and during Trendelenburg position (T3: d=1.34, P<0.001; T4: d=0.91, P<0.001; T6: d=0.30, P<0.001; T8: d=0.38, P<0.001). In total, IOP increases significantly by 13.6 mmHg. Based on the upper limits of the prediction intervals, in 95% of all populations IOP could increase by as much as 28.1 mmHg.	IA
326	Goel N, Chowdhury I, Dubey J, Mittal A, Pathak S. Quantitative rise in intraocular pressure in patients undergoing robotic surgery in steep Trendelenburg position: a prospective observational study. J Anaesthesiol Clin Pharmacol. 2020;36(4):546-551.	Quasi-experimental	95 patients in steep trend robotic surgery	IOPs were measured	None	IOP at different time points	Steep Trendelenburg position for prolong duration leads to significant rise in intraocular pressure.	IIB
327	Ackerman RS, Cohen JB, Getting REG, Patel SY. Are you seeing this: the impact of steep Trendelenburg position during robot-assisted laparoscopic radical prostatectomy on intraocular pressure: a brief review of the literature. J Robot Surg. 2019;13(1):35-40.	Literature Review	n/a	n/a	n/a	n/a	All eight studies found in the literature review showed that ST position led to a statistically significant increase in IOP after 1 h	VA
328	Yoo YC, Kim NY, Shin S, et al. The intraocular pressure under deep versus moderate neuromuscular blockade during low-pressure robot assisted laparoscopic radical prostatectomy in a randomized trial. PLoS One. 2015;10(8):e0135412.	RCT	patients undergoing low pressure robotic assisted laparoscopic radical prostatectomy in steep trend	34 patients receiving a deep neuromuscular blockade	33 patients receiving a moderate neuromuscular blockade	Maximum Intraocular pressure	Continuous deep neuromuscular blockade may facilitate this surgery under low intraabdominal pressure and decrease in IOP	IA
329	Dereine T, van Pesch V, Van Boven M, Hantson P. Transient perioperative visual loss after an elective neurosurgical procedure. Acta Anaesthesiol Belg. 2013;64(3):109-113.	Case Report	63-year-old woman undergoing an elective neurosurgical procedure	n/a	n/a	n/a	This case illustrates the individual risk for visual injury after prone positioning during neurosurgical interventions.	VB
330	Grant GP, Szirth BC, Bennett HL, et al. Effects of prone and reverse Trendelenburg positioning on ocular parameters. Anesthesiology. 2010;112(1):57-65.	Quasi-experimental	10 Healthy volunteers	Measurement of intraocular pressure, choroidal thickness, and optic nerve diameter at initial prone positioning and hourly thereafter over 5 hours	Measurement of intraocular pressure, choroidal thickness, and optic nerve diameter at initial supine position	Changes in intraocular pressure measurements	Prolonged prone positioning increases intraocular pressure, choroid layer thickness, and optic nerve diameter.	IIB
331	Carey TW, Shaw KA, Weber ML, DeVine JG. Effect of the degree of reverse Trendelenburg position on intraocular pressure during prone spine surgery: a randomized controlled trial. Spine J. 2014;14(9):2118-2126.	RCT	19 Patients with no history of eye pathology undergoing prone spine surgery at a military medical center	Measurements of intraocular pressure, mean arterial pressure, estimated blood loss, fluid resuscitation, and ophthalmologic complications during surgery, beginning at 30 minutes, 60 minutes, and 60 minute increments thereafter in reverse Trendelenburg position	Measurements of intraocular pressure, mean arterial pressure, estimated blood loss, fluid resuscitation, and ophthalmologic complications during surgery, beginning at 30 minutes, 60 minutes, and 60 minute increments thereafter in prone position	Differences in intraocular pressure measurements	Reverse Trendelenburg positioning elicits decreased intraocular pressures compared with prone positioning for surgery times less than 120 minutes. No significant complications were associated with reverse Trendelenburg positioning.	IC
332	Emery SE, Daffner SD, France JC, et al. Effect of head position on intraocular pressure during lumbar spine fusion: a randomized, prospective study. J Bone Joint Surg Am. 2015;97(22):1817-1823.	RCT	52 Patients undergoing lumbar spine surgery in the prone position	Neck was extended so that the face had a 10 degree angle of inclination in relation to the table	Head in neutral and the face parallel to the level operating table	Changes in intraocular pressure measurements	Head elevation for adult lumbar spine fusion performed with the patient prone resulted in significantly lower intraocular pressure measurements than those seen when the patient's head was in neutral position.	IB

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333	Molloy B. A preventive intervention for rising intraocular pressure: development of the Molloy/Bridgeport Anesthesia Associates Observation Scale. AANA J. 2012;80(3):213-222.	Nonexperimental	A review of 17 patients who experienced POVL follow-ing spine procedures showed findings of eyelid edema, corneal/conjunctival edema, exophthalmia, periorbital ecchymosis, periorbital numbness, and facial edema	n/a	n/a	the need for the measurement of IOP under anesthesia in the ST position	this observation scale can be used to assess the need and timing for IOP-normalizing interventions and possibly to prevent POVL.	IIIB
334	Kendrick H. Post-operative vision loss (POVL) following surgical procedures. J Anesthe Clin Res. 2012;3(1). doi:10.4172/2155-6148.1000184.	Literature Review	n/a	n/a	n/a	n/a	There is an increased risk of postoperative vision loss when both preoperative and intraoperative risk factors are present.	VB
335	Agah M, Ghasemi M, Roodneshin F, Radpay B, Moradian S. Prone position in percutaneous nephrolithotomy and postoperative visual loss. Urol J. 2011;8(3):191-196	Nonexperimental	20 patients undergoing percutaneous nephrolithotomy in the prone position.	n/a	n/a	Intraocular pressure	Intraocular pressure dropped significantly after anesthesia and increased in prone position. There was a linear relationship between IOP rise and the prone position duration, doubled within two hours.	IIIB
336	Szmuk P, Steiner JW, Pop RB, et al. Intraocular pressure in pediatric patients during prone surgery. Anesth Analg. 2013;116(6):1309-1313.	Nonexperimental	30/Pediatric patients undergoing surgery in the prone position	n/a	n/a	n/a	Differences in intraocular pressure measurements	IIIB
337	Yoshimura K, Hayashi H, Tanaka Y, Nomura Y, Kawaguchi M. Evaluation of predictive factors associated with increased intraocular pressure during prone position spine surgery. J Anesth. 2015;29(2):170-174.	Nonexperimental	56 Patients undergoing spinal surgery in the prone position	n/a	n/a	Differences in intraocular pressure measurements	Intraocular pressures > 23 mm Hg were found to be a significant predictor for increased intraocular pressure > 30 mm Hg. These intraocular pressure values may be used as a predictor of high intraocular pressure in anesthetized patients.	IIIB
338	Eddama M. Re: Raised intraocular pressure and perioperative visual loss in laparoscopic colorectal surgery: a catastrophe waiting to happen? A systematic review of evidence from other surgical specialties. Tech Coloproctol. 2013;17(2):247.	Expert Opinion	n/a	n/a	n/a	n/a	Positioning patients in a way that causes an increase in intraocular pressure for a prolonged period of time could lead to postoperative visual loss.	VA
339	Pinkney TD, King AJ, Walter C, Wilson TR, Maxwell-Armstrong C, Acheson AG. Raised intraocular pressure (IOP) and perioperative visual loss in laparoscopic colorectal surgery: a catastrophe waiting to happen? A systematic review of evidence from other surgical specialities. Tech Coloproctol. 2012;16(5):331-335.	Systematic Review	8 Studies providing data on the actual values of intraocular pressure measurements and a clear indication of patient positioning	n/a	n/a	Increases in intraocular pressure associated with patient position	Patients undergoing laparoscopic colorectal surgery in a prolonged head-down position are likely to experience increased intraocular pressure and are thus at risk of perioperative vision loss. Patients having a laparoscopic abdominoperineal excision with prone positioning for the perineal component are likely those at greatest risk.	IIIB
340	Raz O, Boesel TW, Arianayagam M, et al. The effect of the modified Z Trendelenburg position on intraocular pressure during robotic assisted laparoscopic radical prostatectomy: a randomized, controlled study. J Urol. 2015;193(4):1213-1219.	RCT	50 Patients undergoing robotic-assisted radical prostatectomy under general anesthesia	Measurement of intraocular pressure, blood pressure, and endotracheal carbon dioxide in the modified Trendelenburg position at 18 time points	Measurement of intraocular pressure, blood pressure, and endotracheal carbon dioxide in the Trendelenburg position at 18 time points	Differences in measurements	Modifying the Trendelenburg position has a significant positive effect on patient neuro-ocular safety by lowering intraocular pressure and accelerating recovery to normal levels.	IB
341	Hoshikawa Y, Tsutsumi N, Ohkoshi K, et al. The effect of steep Trendelenburg positioning on intraocular pressure and visual function during robotic-assisted radical prostatectomy. Br J Ophthalmol. 2014;98(3):305-308.	Quasi-experimental	31 Patients undergoing robotic-assisted radical prostatectomy	Measurements of intraocular pressure after induction while supine, every hour after steep Trendelenburg position, before arousal in supine position, and 30 minutes after arousal in supine position	Measurements of intraocular pressure before induction in supine position	Differences in intraocular pressure measurements	While intraocular pressure increased in a time-dependent fashion, visual function showed no significant change postoperatively and no complications were seen.	IIB

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342	Shirono Y, Takizawa I, Kasahara T, et al. Intraoperative intraocular pressure changes during robot-assisted radical prostatectomy: associations with perioperative and clinicopathological factors. BMC Urol. 2020;20(1):26.	Nonexperimental	59 men undergoing robot-assisted radical prostectomy	n/a	n/a	IOP at different time points	Less than 4 hours time in Trend is important to prevent extreme elevation of IOP.	IIIB
343	Archer TL, Suresh P, Shapiro AE. Cardiac output measurement, by means of electrical velocimetry, may be able to determine optimum maternal position during gestation, labour and caesarean delivery, by preventing vena caval compression and maximising cardiac output and placental perfusion pressure. Anaesth Intensive Care. 2011;39(2):308-311.	Expert Opinion	n/a	n/a	n/a	n/a	Measurement of cardiac output during labor by means of electrical velocimetry may represent a method for determining sufficient uterine displacement.	VB
344	Saravanakumar K, Hendrie M, Smith F, Danielian P. Influence of reverse Trendelenburg position on aortocaval compression in obese pregnant women. Int J Obstet Anesth. 2016;26:15-18.	Nonexperimental	6 Obese, pregnant women	n/a	n/a	Differences in measurements of inferior vena cava or aorta diameter	A no statistically significant improvement of aortocaval compression was noted with the addition of 15° reverse Trendelenburg tilt to the supine position with pelvic tilt in obese pregnant women.	IIIC
345	Lee SW, Khaw KS, Ngan Kee WD, Leung TY, Critchley LA. Haemodynamic effects from aortocaval compression at different angles of lateral tilt in non-labouring term pregnant women. Br J Anaesth. 2012;109(6):950-956.	Nonexperimental	157 Non-laboring pregnant patients scheduled for elective cesarean section	n/a	n/a	Differences in hemodynamic measurements	Aortocaval compression can be minimized by a left lateral tilt of 15° or more.	IIIB
346	Baird EJ, Arkoosh VA. Hemodynamic effects of aortocaval compression and uterine contractions in a parturient with left ventricular outflow tract obstruction. Anesthesiology. 2012;117(4):879-879.	Case Report	21-year-old pregnant woman at 37 weeks gestation	n/a	n/a	n/a	At term gestation, there is nearly complete obstruction of the inferior vena cava in the supine position. Left uterine displacement resolved the aortal compression.	VC
347	Zhou ZQ, Shao Q, Zeng Q, Song J, Yang JJ. Lumbar wedge versus pelvic wedge in preventing hypotension following combined spinal epidural anaesthesia for caesarean delivery. Anaesth Intensive Care. 2008;36(6):835-839.	RCT	60 Pregnant women undergoing cesarean section	Use of a pelvic wedge	Use of a lumbar wedge	Incidence of hypotension	A lumbar wedge was more effective than a pelvic wedge in preventing hypotension.	IB
348	Perioperative Care of the Pregnant Woman. Evidence-Based Clinical Practice Guideline. 2nd ed. Washington, DC: Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN); 2019.	Guideline	n/a	n/a	n/a	n/a	Assessments and interventions that are appropriate for pregnant women undergoing nonobstetric surgical procedures should be initiated.	IVA
349	Higuchi H, Takagi S, Zhang K, Furui I, Ozaki M. Effect of lateral tilt angle on the volume of the abdominal aorta and inferior vena cava in pregnant and nonpregnant women determined by magnetic resonance imaging. Anesthesiology. 2015;122(2):286-293.	Nonexperimental	20 Pregnant (n = 10), and nonpregnant (n = 10) volunteers	n/a	n/a	Degree of aortocaval compression	Aortic volume in pregnant women did not differ from nonpregnant women in supine position with 15° left lateral tilt, but was significantly increased at 30° and 45° left lateral tilt.	IIIA
350	Harvey NL, Hodgson RL, Kinsella SM. Does body mass index influence the degree of pelvic tilt produced by a Crawford wedge? Int J Obstet Anesth. 2013;22(2):129-132.	Nonexperimental	60 Pregnant women undergoing cesarean section (20 with a BMI $\leq$ 25 kg/m^2; 20 with a BMI of 25.1 to 35 kg/m^2; 20 with a BMI > 35 kg/m^2)	n/a	n/a	Differences in pelvic tilt measurements	Variability of pelvic tilt increased with BMI and was greatest in pregnant women with a BMI > 35 kg/m^2.	IIIB
351	Cluver C, Novikova N, Hofmeyr GJ, Hall DR. Maternal position during caesarean section for preventing maternal and neonatal complications. Cochrane Database Syst Rev. 2013;(3):CD007623.	Systematic Review w/ Meta-Analysis	11 Studies with a total of 857 women undergoing cesarean section	n/a	n/a	Incidence of air embolism, maternal hypotension, and maternal hypertension	There is limited evidence to support or clearly disprove the value of the use of tilting or flexing the OR bed, the use of wedges and cushions or the use of mechanical displacers. A left lateral tilt may be better than a right lateral tilt and manual displacers may be better than a left lateral tilt.	IA
352	Defining adult overweight & obesity. Centers for Disease Control and Prevention. https://www.cdc.gov/obesity/adult/defining.html. Accessed March 4, 2022.	Expert Opinion	n/a	n/a	n/a	n/a	Web page gives the definition of overweight and obesity as defined by the US Centers for Disease Control and Prevention	VA
353	Donohoe CL, Feeney C, Carey MF, Reynolds JV. Perioperative evaluation of the obese patient. J Clin Anesth. 2011;23(7):575-586.	Expert Opinion	n/a	n/a	n/a	n/a	Obesity is a condition of chronic systemic inflammation and is associated with an increased burden of comorbidities.	VA
354	Han IH, Son DW, Nam KH, Choi BK, Song GS. The effect of body mass index on intra-abdominal pressure and blood loss in lumbar spine surgery. J Korean Neurosurg Soc. 2012;51(2):81-85.	Quasi-experimental	30 Patients undergoing spinal surgery (10 normal weight, BMI 18.5 kg/m^2 to 22.9 kg/m^2; 10 overweight, BMI 23 kg/m^2 to 24.9 kg/m^2; 10 obese, BMI 25 kg/m^2 to 29.9 kg/m^2)	Measurements of intra-abdominal pressure and intraoperative blood loss in the prone position	Measurements of intra-abdominal pressure and blood loss in the supine position	Differences in intra-abdominal pressures/ Differences in intraoperative blood loss	Body mass index affects intra-abdominal pressure in the in the prone position more than in the supine position during lumbar surgery. Intraoperative blood loss was found to increase with intra-abdominal pressure and with BMI.	IIB
355	Cheema UY, Vogler CN, Thompson J, Sattovia SL, Vallurupalli S. Protracted hypocalcemia following post-thyroidectomy lumbar rhabdomyolysis secondary to evolving hypoparathyroidism. Ear Nose Throat J. 2015;94(3):113-116.	Case Report	Extremely obese, 51-year-old woman undergoing thyroidectomy	n/a	n/a	n/a	The patient's extreme obesity, the supine position, and the prolonged surgery contributed to the development of rhabdomyolysis.	VB
356	Carron M, Safaee Fakhr B, Iepparielloo G, Foletto M. Perioperative care of the obese patient. Br J Surg. 2020;107(2):e39-e55.	Literature Review	n/a	n/a	n/a	n/a	A review of the literature that gives guidance for the care of the obese patient in surgery, guidance for positioning is included.	VA
357	Wysham WZ, Kim KH, Roberts JM, et al. Obesity and perioperative pulmonary complications in robotic gynecologic surgery. Am J Obstet Gynecol. 2015;213(1):33.e1-33.e7.	Nonexperimental	146 of 1032 Obese patients from two academic institutions who developed postoperative complications	n/a	n/a	Pulmonary complications/ Any type of complication	Only age was significantly associated with a higher risk of pulmonary complications. Older age, higher estimates of blood loss, and longer case length were associated with a higher rate of any type of complication.	IIIB

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358	Vaughan RW, Wise L. Intraoperative arterial oxygenation in obese patients. Ann Surg. 1976;184(1):35-42.	Quasi-experimental	64 Extremely obese patients undergoing jejunoileal bypass in the supine and 15° Trendelenburg position	Measurement of arterial oxygenation in the 15° Trendelenburg position	Measurement of arterial oxygenation in the supine position	Differences in arterial oxygenation measurements	The Trendelenburg position should not be used with obese patients.	IIB
359	Chacon MM, Cheruku SR, Neuburger PJ, Lester L, Shillcutt SK. Perioperative care of the obese cardiac surgical patient. J Cardiothorac Vasc Anesth. 2018;32(4):1911-1921.	Expert Opinion	n/a	n/a	n/a	n/a	Overview of physiologic abnormalities and clinical implications of obese patients in cardiac surgery.	VA
360	Booth RT, McAllister RK, Bittenbinder TM. Table tipping and a near-miss fall after unlocking a surgical table holding a morbidly obese patient. Proc (Bayl Univ Med Cent). 2016;29(2):145-146.	Case Report	n/a	n/a	n/a	n/a	This case report describes a morbidly obese patient who experienced a near-miss fall in the OR when the bed was unlocked and moved which caused the table to tip.	VA
361	Dybec RB. Intraoperative positioning and care of the obese patient. Plast Surg Nurs. 2004;24(3):118-122.	Expert Opinion	n/a	n/a	n/a	n/a	Positioning obese patients presents significant challenges.	VB
362	Rao SL, Kunselman AR, Schuler HG, DesHarnais S. Laryngoscopy and tracheal intubation in the head-elevated position in obese patients: a randomized, controlled, equivalence trial. Anesth Analg. 2008;107(6):1912-1918.	RCT	85 Adults with BMI > 30 kg/m^2 undergoing elective surgery	Head-elevated position using blankets or elevating the head of the OR bed	Supine position	Ease of mask ventilation/ Ease of intubation	The two methods are equivalent.	IA
363	Cattano D, Melnikov V, Khalil Y, Sridhar S, Hagberg CA. An evaluation of the rapid airway management positioner in obese patients undergoing gastric bypass or laparoscopic gastric banding surgery. Obes Surg. 2010;20(10):1436-1441.	Quasi-experimental	51 Adult surgical patients undergoing gastric bypass or laparoscopic gastric banding surgery	Supine position augmented with an inflatable wedge-shaped positioning device	Supine position	Ease of mask ventilation/ Ease of intubation	Ease of ventilation and laryngeal view were both improved with the inflatable wedge-shaped positioning device.	IIB
364	Satin AM, DePalma AA, Cuellar J, Gruson KI. Lateral femoral cutaneous nerve palsy following shoulder surgery in the beach chair position: a report of 4 cases. Am J Orthop (Belle Mead NJ). 2014;43(9):E206-E209.	Case Report	One 62-year-old obese female, one 34-year-old obese female, one 35-year-old obese male, and one 58-year-old obese male undergoing arthroscopic shoulder surgery in the semi-sitting position	n/a	n/a	n/a	The neuropraxia resulted from external compression on the lateral femoral cutaneous nerve by the patients' abdominal pannus.	VA
365	Levy BJ, Tauberg BM, Holtzman AJ, Gruson KI. Reducing lateral femoral cutaneous nerve palsy in obese patients in the beach chair position: effect of a standardized positioning and padding protocol. J Am Acad Orthop Surg. 2019;27(12):437-443.	Nonexperimental	Retrospective review of 400 patients with a BMI of ≥30 kg/m² who underwent open or arthroscopic shoulder surgery in the beach chair position by a single surgeon	Patients in standard beach chair position with foam padding placed over their thighs underneath a wide safety strap and underneath the abdominal pannus.	Patients in standard beach chair position with no extra padding	Symptoms of lateral femoral cutaneous nerve palsy (LFCN)	Five cases (3.6%) of LFCN palsy occurred with conventional beach chair positioning, and a single case (0.4%) occurred with the standardized positioning and padding technique	IIIA
366	Doerflinger DMC. Older adult surgical patients: presentation and challenges. AORN J. 2009;90(2):223-240.	Expert Opinion	n/a	n/a	n/a	n/a	The older surgical patient presents a greater challenge for prevention of positioning injury because of risk factors, loss of physiologic reserves, and comorbid diseases.	VA
367	Sewchuk D, Padula C, Osborne E. Prevention and early detection of pressure ulcers in patients undergoing cardiac surgery. AORN J. 2006;84(1):75-96.	Nonexperimental	150 Patients undergoing cardiac surgery	n/a	n/a	Development of a new pressure injury within 72 hours after surgery	The number of pressure injuries decreased when the fluid, pressure-redistributing mattress was used in conjunction with a comprehensive RN education program.	IIIB
368	Banicek J, McGarvey D. The effect of patient positioning during lengthy surgery on postoperative health. Nurs Times. 2010;106(3):15.	Case Report	53-year-old man undergoing colon resection in the lithotomy position	n/a	n/a	n/a	Assess patients who have received epidural anesthesia for sensory and motor block pain and unusual symptoms such as pins and needles, or numbness in the legs.	VC
369	Engels D, Austin M, McNichol L, Fencl J, Gupta S, Kazi H. Pressure ulcers: factors contributing to their development in the OR. AORN J. 2016;103(3):271-281.	Nonexperimental	retrospective chart review oft 4 community hospitals-identified any patient who experience a HAPU within one week of undergoing an OR procedure. 45 patients who did not develop a pressure ulcer served as controls.	n/a	n/a	postoperative pressure injury within one week of a perioperative stay	15 patients were identified who underwent surgical procedures and developed a pressure injury within one week of a perioperative stay. Compared to the 45 control patients-total of 60 patients. The authors concluded that gel pad overlays or thermo-active foam pads significantly reduce the incidence of pressure injury compared to standard OR mattresses but they did not find a correlation in this study. Duration of surgery is a significant contributor to the risk of tissue damage. Hypothermia is significantly correlated with development of pressure injury. Implemented a sacral dressing protocol.	IIIA
370	2021-2022 Perianesthesia Nursing Standards, Practice Recommendations and Interpretive Statements. Cherry Hill, NJ: American Society of PeriAnesthesia Nurses; 2020.	Guideline	n/a	n/a	n/a	n/a	These standards provide a framework for care of a diverse patient population in all perianesthesia settings.	IVB

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371	Menezes S, Rodrigues R, Tranquada R, Müller S, Gama K, Manso T. Injuries resulting from positioning for surgery: incidence and risk factors. Acta Med Port. 2013;26(1):12-16.	Nonexperimental	172 Patients undergoing elective surgery	n/a	n/a	Positioning injury	Postoperative evaluation of surgical patients allows early detection, documentation, and treatment of injury	IIIC
372	Kalin A, Hariharan V, Tudor F. Unicompartment compartment syndrome following laparascopic colonic resection. BMJ Case Rep. 2013;2013:bcr2013009894.	Case Report	43-year-old man who underwent laparoscopic colorectal surgery in the lithotomy position	n/a	n/a	n/a	Any patient with increasing and abnormal or unexpected pain following laparoscopic surgery and higher use of analgesia than anticipated should trigger an assessment for compartment syndrome.	VB
373	Hoff JM, Varhaug P, Midelfart A, Lund-Johansen M. Acute visual loss after spinal surgery. Acta Opthalmologica. 2010;88(4):490-492.	Case Report	1/56 year-old man undergoing cervical spinal surgery	n/a	n/a	n/a	Ischemic optic neuropathy is the most common cause of visual loss after spine surgery and safe practices should be established and implemented for protecting the patient's eyes.	VB
374	Yilmaz M, Kalemci O. Visual loss after lumbar discectomy due to cortical infarction: case report. J Neurol Sci. 2013;30(2):422-426.	Case Report	53-year-old woman undergoing spinal surgery in the prone position	n/a	n/a	n/a	The patient's risk factors for anemia and hypotension may help to explain the postoperative vision loss.	VC
375	Guideline for patient information management. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2022:387-416.	Guideline	n/a	n/a	n/a	n/a	This document provides guidance to assist perioperative nurses in documenting and managing patient care information within the perioperative practice setting.	IVA
376	Medical records. In: Regular Standards and Checklists for Accreditation of Ambulatory Surgery Facilities. Version 14.5. Gurnee, IL: American Association for Accreditation of Ambulatory Surgery Facilities, Inc (AAAASF); 2017:57-63.	Accreditation	n/a	n/a	n/a	n/a	n/a	n/a
377	Medical records. In: Procedural Standards and Checklists for Accreditation of Ambulatory Surgery Facilities. Version 4.3. Gurnee, IL: American Association for Accreditation of Ambulatory Surgery Facilities (AAAASF); 2019:63-65.	Accreditation	n/a	n/a	n/a	n/a	n/a	n/a
378	42 CFR 482. Conditions of participation for hospitals. Code of Federal Regulations. https://www.ecfr.gov/current/title-42/chapter-IV/subchapter-G/part-482. Accessed March 9, 2022.	Regulatory	n/a	n/a	n/a	n/a	n/a	n/a
379	42 CFR 416. Ambulatory surgical services. Code of Federal Regulations. https://www.ecfr.gov/current/title-42/chapter-IV/subchapter-B/part-416. Accessed March 9, 2022.	Regulatory	n/a	n/a	n/a	n/a	n/a	n/a
380	Program: Hospital. Chapter: Record of Care, Treatment, and Services. RC.01.01.01: The hospital maintains complete and accurate medical records for each individual patient. In: The Joint Commission Comprehensive Accreditation and Certification Manual. E-dition. Oakbrook Terrace, IL: The Joint Commission; 2022.	Accreditation	n/a	n/a	n/a	n/a	n/a	n/a
381	Medical Staff (MS). In: NIAHO Accreditation Requirements, Interpretive Guidelines & Surveyor Guidance for Hospitals. Revision 20-1. Katy, TX: DNV Healthcare; 2020:26-40.	Accreditation	n/a	n/a	n/a	n/a	n/a	n/a
382	Program: Ambulatory. Chapter: Record of Care, Treatment, and Services. RC.01.01.01: The organization maintains complete and accurate clinical records. In: The Joint Commission Comprehensive Accreditation and Certification Manual. E-dition. Oakbrook Terrace, IL: The Joint Commission; 2022.	Accreditation	n/a	n/a	n/a	n/a	n/a	n/a
383	Clinical records and health information. In: Accreditation Handbook for Ambulatory Health Care. v41. Skokie, IL: Accreditation Association for Ambulatory Health Care, Inc; 2020:53-57.	Accreditation	n/a	n/a	n/a	n/a	n/a	n/a
384	Jordan C, Thomas MB, Evans ML, Green A. Public policy on competency: how will nursing address this complex issue? J Contin Educ Nurs. 2008;39(2):86-91.	Expert Opinion	n/a	n/a	n/a	n/a	The primary responsibility for maintaining ongoing competency remains with the individual.	VB
385	State Operations Manual Appendix A. Survey Protocol, Regulations and Interpretive Guidelines for Hospitals. Rev 200. 02-21-20. Centers for Medicare & Medicaid Services. https://www.cms.gov/Regulations-and-Guidance/Guidance/Manuals/downloads/som107ap_a_hospitals.pdf. Accessed March 9, 2022.	Regulatory	n/a	n/a	n/a	n/a	n/a	n/a
386	State Operations Manual Appendix L. Guidance for Surveyors: Ambulatory Surgical Centers. Rev 200. 02-21-20. Centers for Medicare & Medicaid Services. https://www.cms.gov/Regulations-and-Guidance/Guidance/Manuals/downloads/som107ap_l_ambulatory.pdf. Accessed March 9, 2022.	Regulatory	n/a	n/a	n/a	n/a	n/a	n/a
387	Program: Hospital. Chapter: Human Resources. HR.01.05.03: Staff participate in ongoing education and training. In: The Joint Commission Comprehensive Accreditation and Certification Manual. E-dition. Oakbrook Terrace, IL: The Joint Commission; 2022.	Accreditation	n/a	n/a	n/a	n/a	n/a	n/a
388	MS.10: Continuing education. In: NIAHO Accreditation Requirements, Interpretive Guidelines & Surveyor Guidance for Hospitals. Revision 20-1. Katy, TX: DNV Healthcare; 2020:32.	Accreditation	n/a	n/a	n/a	n/a	n/a	n/a
389	Governance. In: Accreditation Handbook for Ambulatory Health Care. v41. Skokie, IL: Accreditation Association for Ambulatory Health Care, Inc; 2020:25-38.	Regulatory	n/a	n/a	n/a	n/a	n/a	n/a
390	Personnel records. In: Procedural Standards and Checklists for Accreditation of Ambulatory Surgery Facilities. Version 4.3. Gurnee, IL: American Association for Accreditation of Ambulatory Surgery Facilities (AAAASF); 2019:75-77.	Accreditation	n/a	n/a	n/a	n/a	n/a	n/a

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391	Program: Ambulatory. Chapter: Human Resources. HR.01.05.03: Staff participate in ongoing education and training. In: The Joint Commission Comprehensive Accreditation and Certification Manual. E-dition. Oakbrook Terrace, IL: The Joint Commission; 2022.	Accreditation	n/a	n/a	n/a	n/a	n/a	n/a
392	Stansby G, Avital L, Jones K, Marsden G; Guideline Development Group. Prevention and management of pressure ulcers in primary and secondary care: summary of NICE guidance. BMJ. 2014;348:g2592.	Guideline	n/a	n/a	n/a	n/a	Guidance includes five detailed algorithms on identifying who is at risk; prevention of pressure injury in adults at risk and high risk; prevention of pressure ulcers in neonates, infants, children, and young people; management of pressure injury in adults; and management of pressure injury in neonates, infants, children, and young people.	IVA
393	Lupe L, Zambrana D, Cooper L. Prevention of hospital-acquired pressure ulcers in the operating room and beyond: a successful monitoring and intervention strategy program. Int Anesthesiol Clin. 2013;51(1):128-146.	Organizational Experience	n/a	n/a	n/a	Pressure injury development	Multidisciplinary programs designed to monitor, educate, and evaluate the incidence of pressure ulcers are effective in reducing pressure injury.	VB
394	Mirski MA, Lele AV, Fitzsimmons L, Toung TJ. Diagnosis and treatment of vascular air embolism. Anesthesiology. 2007;106(1):164-177.	Expert Opinion	n/a	n/a	n/a	n/a	Vascular air embolism is a potentially life-threatening event that is increasingly more common in situations other than surgery performed in the sitting position. Clinicians must be competent to manage this silent, but deadly complication.	VB
395	Natal BL, Doty CI. Venous air embolism treatment & management. Medscape. http://emedicine.medscape.com/article/761367-treatment. Updated December 30, 2017. Accessed March 8, 2022.	Expert Opinion	n/a	n/a	n/a	n/a	Management of VAE, once suspected, includes identification of the source of air, prevention of further air entry, a reduction in the amount of air entrained, and hemodynamic support.	IIIB
396	Operating Room Crisis Checklists. Beth Israel Deaconess Medical Center. https://anesthesia.bidmc.harvard.edu/AnesPortal/Documents/EmergencyManual-PRINT.pdf. Updated December 22, 2020. Accessed March 8, 2022.	Expert Opinion	n/a	n/a	n/a	n/a	Crisis checklist addressing VAE	n/a
397	Pandey V, Varghese E, Rao M, et al. Nonfatal air embolism during shoulder arthroscopy. Am J Orthop (Belle Mead NJ). 2013;42(6):272-274.	Case Report	1/23-year-old man undergoing shoulder surgery in the semi-sitting position	N/A	N/A	N/A	This case emphasizes the importance of the perioperative team being prepared to manage VAE events.	VB
398	Salkind EM. A novel approach to improving the safety of patients undergoing lumbar laminectomy. AANA J. 2013;81(5):389-393.	Organizational Experience	prone patients undergoing spinal laminectomy.	Used a positioning checklist to address specific positioning needs	N/A	Decreased morbidity and mortality associated with positioning	The checklist itself was easy to use in its intended environment and accomplished the goal of including the many facets of correct positioning necessary to prevent morbidity and mortality.	VC
399	MedWatch: The FDA Safety Information and Adverse Event Reporting Program. US Food & Drug Administration. https://www.fda.gov/safety/medwatch-fda-safety-information-and-adverse-event-reporting-program. Accessed March 8, 2022.	Regulatory	n/a	n/a	n/a	n/a	The FDA's medical product safety reporting program for health professionals, patients and consumers	n/a
400	MAUDE: Manufacturer and User Facility Device Experience. US Food & Drug Administration. https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfMAUDE/search.CFM. Accessed March 8, 2022.	Regulatory	n/a	n/a	n/a	n/a	The MAUDE database houses medical device reports submitted to the FDA my mandatory reporters and voluntary reporters such as health care professionals, patients and consumers	n/a