

Evidence Table  
AORN Guideline for Prevention of Venous Thromboembolism

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
1	Venous thromboembolism (blood clots). Centers for Disease Control and Prevention. <a href="https://www.cdc.gov/ncbddd/dvt/index.html">https://www.cdc.gov/ncbddd/dvt/index.html</a> . Accessed August 24, 2017.	Expert Opinion	n/a	n/a	n/a	n/a	Public information and statistics on VTE in the US.	VA
2	Gould MK, Garcia DA, Wren SM, et al. Prevention of VTE in nonorthopedic surgical patients: Antithrombotic Therapy and Prevention of Thrombosis, 9th ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines. Chest. 2012;141(2 Suppl):e227S-e277S.	Guideline	n/a	n/a	n/a	n/a	Provides specific guidance for selection of VTE prophylaxis in nonorthopedic surgical patients, considering the risk of venous thromboembolism, risk of bleeding complications, and the values and preferences of individual patients.	IVA
3	Heit JA. Epidemiology of venous thromboembolism. Nat Rev Cardiol. 2015;12(8):464-474.	Literature Review	n/a	n/a	n/a	n/a	Although independent risk factors for VTE and predictors of VTE recurrence have been identified, and effective prophylaxis is available, the occurrence of VTE is generally constant or even increasing.	VB
4	Maynard G. Preventing Hospital-Associated Venous Thromboembolism: A Guide for Effective Quality Improvement. 2nd ed. [AHRQ Publication No. 16-0001-EF]. Rockville, MD: Agency for Healthcare Research and Quality; 2016. <a href="https://www.ahrq.gov/sites/default/files/publications/files/vteguide.pdf">https://www.ahrq.gov/sites/default/files/publications/files/vteguide.pdf</a> . Accessed August 24, 2017	Expert Opinion	n/a	n/a	n/a	n/a	There are many lost opportunities to optimize VTE prophylaxis in virtually every hospital. This guide targets these failure modes in the process of preventing VTE in the inpatient setting and provides improvement teams with field-tested strategies and tools to enhance their chances of success.	VA

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5	Vekeman F, LaMori JC, Laliberté F, et al. Risks and cost burden of venous thromboembolism and bleeding for patients undergoing total hip or knee replacement in a managed-care population. <i>J Med Econ.</i> 2011;14(3):324-334.	Nonexperimental	119,729 patients who underwent total knee or hip arthroplasty/ Ingenix IMPACT	n/a	n/a	Healthcare costs associated with VTE and bleeding events	The risk of VTE was 6.7 events per 100 patients. The mean cost associated with VTE up to 3 months postoperatively was \$2729. The total monthly cost for VTE over 3 months versus matched controls was \$12,333 vs \$9604.	IIIA
6	Baser O, Supina D, Sengupta N, Wang L, Kwong L. Clinical and cost outcomes of venous thromboembolism in Medicare patients undergoing total hip replacement or total knee replacement surgery. <i>Curr Med Res Opin.</i> 2011;27(2):423-429.	Nonexperimental	166,735 patients who underwent total knee or hip arthroplasty/ Medicare Provider	n/a	n/a	VTE-associated: Cost, mortality, rehospitalization, complications	VTE after total knee or hip arthroplasty was associated with higher mortality, rehospitalization, and bleeding within one year. Risk adjusted healthcare costs were significantly higher for patients who developed VTE (\$18,929 vs \$3763).	IIIA
7	Cohoon KP, Leibson CL, Ransom JE, et al. Direct medical costs attributable to venous thromboembolism among persons hospitalized for major operation: a population-based longitudinal study. <i>Surgery.</i> 2015;157(3):423-431.	Nonexperimental	355 patients diagnosed with VTE within 92 days of hospitalization for major operation and	n/a	n/a	Cost	Adjusted mean costs were 1.5 fold greater for cases than controls (\$55,956 vs \$32,718) up to 5 years after surgery.	IIIA
8	Adams A. Proactivity in VTE prevention: a concept analysis. <i>Br J Nurs.</i> 2015;24(1):20-25.	Literature Review	n/a	n/a	n/a	n/a	Nurses have a pivotal role in VTE prevention, and a proactive approach is central to this.	VA

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9	Findlay J, Keogh M, Cooper L. Venous thromboembolism prophylaxis: the role of the nurse. Br J Nurs. 2010;19(16):1028-1032.	Expert Opinion	n/a	n/a	n/a	n/a	The nursing profession must routinely ensure our patients are considered for VTE prophylaxis.	VB
10	Frostick S. Pharmacological thromboprophylaxis and total hip or knee replacement. Br J Nurs. 2016;25(1):45-53.	Expert Opinion	n/a	n/a	n/a	n/a	Nurses play a major role in VTE prevention by ensuring that optimal prophylactic measures are in place, and increasingly they may have to manage pharmacological treatment to complement conventional mechanical interventions.	VB
11	McNamara SA. Prevention of venous thromboembolism. AORN J. 2014;99(5):642-647.	Expert Opinion	n/a	n/a	n/a	n/a	The nurse's critical thinking skills and knowledge will facilitate leading efforts to prevent VTE to protect the patient and create a culture of safety.	VB
12	Collins R, MacLellan L, Gibbs H, MacLellan D, Fletcher J. Venous thromboembolism prophylaxis: the role of the nurse in changing practice and saving lives. Aust J Adv Nurs. 2010;27(3):83-89.	Organizational Experience	n/a	n/a	n/a	n/a	Nurses who are committed to VTE risk assessment and prophylaxis have the ability to contribute significantly to the reduction of VTE and its subsequent complications.	VA
13	Smith T, Daniell H, Hing C. Upper extremity deep vein thrombosis in orthopaedic and trauma surgery: a systematic review. Eur J Orthop Surg Traumatol. 2011;21(2):79-85.	Systematic Review	n/a	n/a	n/a	n/a	The incidence of upper extremity DVT and PE shows that it is a relatively uncommon complication. Although it should be considered as a complication after upper extremity surgery or trauma, and the incidence was greatest following shoulder	IIIB

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14	Desai K, Dinh TP, Chung S, Pierpont YN, Naidu DK, Payne WG. Upper extremity deep vein thrombosis with tourniquet use. <i>Int J Surg Case Rep.</i> 2015;6C:55-57.	Case Report	83 year old male who underwent evacuation of left arm hematoma	n/a	n/a	n/a	Upper extremity deep vein thrombosis is uncommon. Operative tourniquet use may be a risk factor.	VB
15	Durant TJS, Swanson BT, Cote MP, Allen DA, Arciero RA, Mazzocca AD. Upper extremity deep venous thromboembolism following arthroscopic labral repair of the shoulder and biceps tenodesis: a case report. <i>Int J Sports Phys Ther.</i> 2014;9(3):377-382.	Case Report	37 year old male who underwent arthroscopic shoulder surgery and	n/a	n/a	n/a	Upper extremity deep vein thrombosis is a rare complication after arthroscopic shoulder surgery.	VB
16	Garofalo R, Notarnicola A, Moretti L, Moretti B, Marini S, Castagna A. Deep vein thromboembolism after arthroscopy of the shoulder: two case reports and a review of the literature. <i>BMC Musculoskelet Disord.</i> 2010;11:65.	Case Report	21 year old student and 54 year old male who underwent arthroscopic	n/a	n/a	n/a	DVT after shoulder arthroscopy procedure is a very rare complication. However, in view of the growing number of patients undergoing this procedure, this figure is expected to rise.	VB
17	Oofuvong M, Oearsakul T, Chittithavorn V, Viboonjuntra P. Upper extremity deep vein thrombosis related to fatal massive pulmonary embolism after spinal surgery. <i>J Med Assoc Thai.</i> 2012;95(2):279-281.	Case Report	56 year old man with paraplegia undergoing spine surgery and developed	n/a	n/a	n/a	Report of fatal pulmonary embolism with upper extremity DVT of superior vena cava.	VB
18	Saleh H, Pennings A, Elmaraghy A. Venous thromboembolism after shoulder arthroplasty: a report of three cases. <i>Acta Orthop Traumatol Turc.</i> 2015;49(2):220-223.	Case Report	64 year old male, 68 year old female, and 61 year old male who underwent	n/a	n/a	n/a	VTE after shoulder arthroplasty is rare, but can be dangerous and life threatening.	VB

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19	Wood J, Halen JV, Samant S. Upper extremity deep vein thrombosis and pulmonary embolus after radial forearm free flap: a case report and literature review. J Reconstr Microsurg. 2014;30(4):275-278.	Case Report	57 year old male who underwent radial forearm free flap and developed	n/a	n/a	n/a	DVT is less common in upper extremities than lower extremities. Risk factors for upper DVT include presence of a central venous catheter, cancer, and immobility. Patients undergoing operative procedures of the upper extremity with a tourniquet	VB
20	Yamamoto T, Tamai K, Akutsu M, Tomizawa K, Sukegawa T, Nohara Y. Pulmonary embolism after arthroscopic rotator cuff repair: a case report. Case Rep Orthop. 2013;2013:801752.	Case Report	72 year old female who underwent shoulder arthroscopy and developed	n/a	n/a	n/a	Arthroscopic shoulder surgery can cause pulmonary embolism.	VB
21	Parvizi J, Parmar R, Raphael IJ, Restrepo C, Rothman RH. Proximal deep venous thrombosis and pulmonary embolus following total joint arthroplasty. J Arthroplasty. 2014;29(9):1846-1848.	Nonexperimental	4572 patients who underwent total joint arthroplasty/Thomas	n/a	n/a	DVT, PE	No statistically significant association was found between development of PE and DVT. Formation of DVT and PE may be independent events. Efficacy of thromboprophylaxis for DVT prevention may not reflect efficacy for prevention of PE	IIIA
22	Bikdeli B, Sharif-Kashani B, Shahabi P, et al. Comparison of three risk assessment methods for venous thromboembolism prophylaxis. Blood Coagul Fibrinolysis. 2013;24(2):157-163.	Nonexperimental	1091 (673 men, 418 women) hospitalized patients, Iran	n/a	n/a	Accuracy of the Goldhaber, Harinath, and St. John RAM for VTE prophylaxis	Goldhaber RAM had superior accuracy in medical oncology patients, whereas the Harinath and St. John method was superior among surgical patients.	IIIB
23	Hewes PD, Hachey KJ, Zhang XW, et al. Evaluation of the Caprini model for venothromboembolism in esophagectomy patients. Ann Thorac Surg. 2015;100(6):2072-2078.	Nonexperimental	70 patients who underwent esophagectomy for esophageal	n/a	n/a	Caprini risk score, VTE incidence	Caprini risk score correlated with VTE development in patients undergoing esophagectomy.	IIIB

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24	Lobastov K, Barinov V, Schastlivtsev I, Laberko L, Rodoman G, Boyarintsev V. Validation of the Caprini risk assessment model for venous thromboembolism in high-risk surgical patients in the background of standard prophylaxis. <i>J Vasc Surg.</i> 2016;4(2):153-160.	Nonexperimental	140 patients who underwent major surgery for general surgical or	n/a	n/a	Caprini risk score, DVT incidence	Caprini risk score correlated with DVT development in high risk surgical patients.	IIIB
25	Pannucci CJ, Bailey SH, Dreszer G, et al. Validation of the Caprini risk assessment model in plastic and reconstructive surgery patients. <i>J Am Coll Surg.</i> 2011;212(1):105-112.	Nonexperimental	1126 patients who underwent plastic or reconstructive surgery/ 5	n/a	n/a	Caprini risk score, VTE incidence	Caprini risk score correlated with VTE development in patients undergoing plastic and reconstructive surgery.	IIIB
26	Pannucci CJ, Barta RJ, Portschy PR, et al. Assessment of postoperative venous thromboembolism risk in plastic surgery patients using the 2005 and 2010 Caprini risk score. <i>Plast Reconstr Surg.</i> 2012;130(2):343-353.	Nonexperimental	3334 patients who underwent plastic surgery/ 4 tertiary care	n/a	n/a	Caprini risk score using 2005 model, Caprini score using 2010 model. VTE	The 2005 Caprini Risk Assessment Model provided superior risk stratifications in plastic surgery patients.	IIIB
27	Pannucci CJ, Basta MN, Fischer JP, Kovach SJ. Creation and validation of a condition-specific venous thromboembolism risk assessment tool for ventral hernia repair. <i>Surgery.</i> 2015;158(5):1304-1313.	Nonexperimental	113,873 hernia repair patients/ ACS-NSQIP database, United States	n/a	n/a	30-day VTE (DVT, PE), 30-day complications	A 14-factor, weighted risk assessment model was created and validated for ventral hernia repair patients, which also can be used to stratify risk for 30-day complications and mortality.	IIIA
28	Pannucci CJ, Laird S, Dimick JB, Campbell DA, Henke PK. A validated risk model to predict 90-day VTE events in postsurgical patients. <i>Chest.</i> 2014;145(3):567-573.	Nonexperimental	10,344 surgical patients/ Michigan Surgical Quality Collaborative	n/a	n/a	90-day VTE	A 7-factor VTE risk model was created and validated in surgical patients. The model identified an 18-fold variation in VTE risk for surgical patients.	IIIA

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29	Nam D, Nunley RM, Johnson SR, Keeney JA, Clohisy JC, Barrack RL. The effectiveness of a risk stratification protocol for thromboembolism prophylaxis after hip and knee arthroplasty. <i>J Arthroplasty</i> . 2016;31(6):1299-1306.	Nonexperimental	3143 patients who underwent total joint arthroplasty/ Single	n/a	n/a	VTE	A risk stratification protocol was validated in patients undergoing total joint arthroplasty. The protocol reduced aggressive anticoagulation while maintaining a low incidence of symptomatic VTE.	IIIA
30	Shaikh M, Jeong HS, Mastro A, Davis K, Lysikowski J, Kenkel JM. Analysis of the American Society of Anesthesiologists physical status classification system and Caprini risk assessment model in predicting venous thromboembolic outcomes in plastic surgery patients. <i>Aesthet Surg J</i> .	Nonexperimental	1801 patients who underwent contouring and reconstructive surgery/ 4	n/a	n/a	VTE, ASA scores, Caprini scores	Both the ASA scores and Caprini scores predicted VTE development.	IIIB
31	Iorio ML, Venturi ML, Davison SP. Practical guidelines for venous thromboembolism chemoprophylaxis in elective plastic surgery. <i>Plast Reconstr Surg</i> . 2015;135(2):413-423.	Consensus	n/a	n/a	n/a	n/a	Recommendations for VTE risk assessment and chemoprophylaxis for plastic surgery.	IVC
32	Cassidy MR, Rosenkranz P, McAneny D. Reducing postoperative venous thromboembolism complications with a standardized risk-stratified prophylaxis protocol and mobilization program. <i>J Am Coll Surg</i> . 2014;218(6):1095-1104.	Organizational Experience	Large academic, urban hospital/United States	n/a	n/a	n/a	A patient care program, emphasizing early postoperative mobilization along with mandatory VTE risk stratification and commensurate electronic prophylaxis recommendations, significantly reduced the likelihood of VTE complications at this	VA
33	Shah DR, Wang H, Bold RJ, et al. Nomograms to predict risk of in-hospital and post-discharge venous thromboembolism after abdominal and thoracic surgery: an American College of Surgeons National Surgical Quality Improvement Program analysis. <i>J Surg Res</i> . 2013;183(1):462-471	Nonexperimental	471,867 patients who underwent inpatient abdominal or thoracic	n/a	n/a	n/a	On multivariate analysis, age, body mass index, presence of preoperative infection, operation for cancer, procedure type (spleen highest), multivisceral resection, and non-bariatric laparoscopic surgery were significant predictors for VTE. Other	IIIA

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34	Stroud W, Whitworth JM, Miklic M, et al. Validation of a venous thromboembolism risk assessment model in gynecologic oncology. <i>Gynecol Oncol.</i> 2014;134(1):160-163.	Nonexperimental	1123 gynecologic oncology patients/ US	n/a	n/a	Caprini RAM, VTE	The use of the Caprini RAM accurately predicted patients at the highest risk of experiencing VTE.	IIIB
35	Goz V, McCarthy I, Weinreb JH, et al. Venous thromboembolic events after spinal fusion: which patients are at high risk? <i>J Bone Joint Surg Am.</i> 2014;96(11):936-942.	Nonexperimental	710,154 spinal fusion procedures from 2001 to 2010/ Nationwide	n/a	n/a	VTE, Risk Factors	Multiple independent risk factors for postoperative VTE were identified and used to create a VTE Risk Index.	IIIA
36	Cavazza S, Rainaldi MP, Adduci A, Palareti G. Thromboprophylaxis following cesarean delivery: one site prospective pilot study to evaluate the application of a risk score model. <i>Thromb Res.</i> 2012;129(1):28-31.	Quasi-experimental	501 women undergoing Cesarean delivery/ Italy	Risk assessment score model and pharmacologic prophylaxis based on risk level	n/a	VTE	The risk score model applied proved effective in avoiding pharmacological prophylaxis in almost half of women and safe.	IIB
37	Shuman AG, Hu HM, Pannucci CJ, Jackson CR, Bradford CR, Bahl V. Stratifying the risk of venous thromboembolism in otolaryngology. <i>Otolaryngol Head Neck Surg.</i> 2012;146(5):719-724.	Nonexperimental	2016 adult patients undergoing otolaryngologic surgery/ Single	n/a	n/a	Caprini RAM, VTE	The Caprini risk assessment model effectively risk-stratifies otolaryngology patients for 30-day VTE events and allows otolaryngologists to identify patient subgroups who have a higher risk of VTE in the absence of chemoprophylaxis.	IIIB
38	Janus E, Bassi A, Jackson D, Nandurkar H, Yates M. Thromboprophylaxis use in medical and surgical inpatients and the impact of an electronic risk assessment tool as part of a multi-factorial intervention. A report on behalf of the eVis study investigators. <i>J Thromb Thrombolysis</i>	Nonexperimental	2400 hospitalized patients/ Multicenter, Australia	n/a	n/a	VTE, Risk Factors	The electronic VTE risk assessment tool improved the use VTE prophylaxis to guidelines by 5.0% among all patients and by 10.7% among high risk patients.	IIIA



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39	Novis SJ, Havelka GE, Ostrowski D, et al. Prevention of thromboembolic events in surgical patients through the creation and implementation of a computerized risk assessment program. <i>J Vasc Surg.</i> 2010;51(3):648-654.	Quasi-experimental	400 surgical patients at VA medical center/ US	Risk assessment score model (computerized) and prophylaxis based on risk level	n/a	VTE, compliance with VTE protocol	The creation and implementation of a standardized DVT risk assessment program in the electronic medical record significantly increased use of pharmacological and mechanical DVT prophylaxis before surgery in a Veterans Affairs Medical Center setting	IIA
40	Bahl V, Hu HM, Henke PK, Wakefield TW, Campbell DAJ, Caprini JA. A validation study of a retrospective venous thromboembolism risk scoring method. <i>Ann Surg.</i> 2010;251(2):344-350.	Nonexperimental	8216 inpatients/ ACS NSQIP database, US	n/a	n/a	VTE risk factors	The retrospective risk scoring method is valid and supports use of individual patient assessment of risk for VTE within 30 days after surgery.	IIIA
41	Connelly CR, Laird A, Barton JS, et al. A clinical tool for the prediction of venous thromboembolism in pediatric trauma patients. <i>JAMA Surg.</i> 2016;151(1):50-57.	Nonexperimental	536,423 pediatric patients undergoing trauma surgery from	n/a	n/a	VTE	Researchers developed a simple clinical tool to predict the risk of developing VTE in pediatric trauma patients that is based on a model created using a large national database and was internally validated.	IIIA
42	Atchison CM, Arlikar S, Amankwah E, et al. Development of a new risk score for hospital-associated venous thromboembolism in noncritically ill children: findings from a large single-institutional case-control study. <i>J Pediatr.</i> 2014;165(4):793-798.	Nonexperimental	50 children with hospital-associated VTE/ US	n/a	n/a	VTE risk factors	The presence of a central venous catheter, infection, and length of stay >4 days are significant risk factors for HA-VTE in noncritically ill children, forming the basis for a new risk score that could inform prophylaxis decision-making	IIIA
43	Prentiss AS. Early recognition of pediatric venous thromboembolism: a risk-assessment tool. <i>Am J Crit Care.</i> 2012;21(3):178-183.	Nonexperimental	35 pediatric patients/ US	n/a	n/a	Novel tool scores, VTE	Results validated a significant relationship between the risk score and the incidence of VTE. Findings suggest that use of the assessment tool could significantly reduce adverse outcomes associated with VTE in children	IIIC

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44	Caprini JA. Identification of patient venous thromboembolism risk across the continuum of care. Clin Appl Thromb Hemost. 2011;17(6):590-599.	Expert Opinion	n/a	n/a	n/a	n/a	Use of a validated VTE risk assessment tool provides patients with the best care. Risk should be assessed upon admission and when any risk elements change.	VA
45	Caprini JA. Mechanical methods for thrombosis prophylaxis. Clin Appl Thromb Hemost. 2010;16(6):668-673.	Expert Opinion	n/a	n/a	n/a	n/a	Review of mechanical prophylaxis methods. The risk for VTE formation begins with preoperative immobility and administration of anesthesia and continues throughout the postoperative phase of care until the patient regains mobility.	VA
46	Borab ZM, Lanni MA, Tecce MG, Pannucci CJ, Fischer JP. Use of computerized clinical decision support systems to prevent venous thromboembolism in surgical patients: a systematic review and meta-analysis. JAMA Surg. 2017;152(7):638-645.	Systematic Review w/ Meta-Analysis	11 nonexperimental studies	n/a	n/a	n/a	Computerized clinical decision support systems significantly increased compliance with recommended prophylaxis and significantly reduced the risk for VTE events.	IIIC
47	Kahn SR, Morrison DR, Cohen JM, et al. Interventions for implementation of thromboprophylaxis in hospitalized medical and surgical patients at risk for venous thromboembolism. Cochrane Database Syst Rev. 2013;(7):CD008201.	Systematic Review w/ Meta-Analysis	54 RCTs and quasi-experimental studies	n/a	n/a	n/a	Use of alerts significantly improved prescription of VTE prophylaxis, especially as part of a multifaceted intervention to improve compliance.	IIA
48	Venous thromboembolism: reducing the risk for patients in hospital. Clinical guideline. NICE: National Institute for Health and Care Excellence. <a href="http://www.nice.org.uk/guidance/cg92">http://www.nice.org.uk/guidance/cg92</a> . Published January 2010. Updated June 2015. Accessed August 24, 2017.	Guideline	n/a	n/a	n/a	n/a	Comprehensive recommendations for venous thromboembolism and DVT prevention in surgical patients, including recommendations for patient education, risk factors for DVT, risk factors for bleeding, and contraindications to use of compression.	IVA

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49	Farge D, Debourdeau P, Beckers M, et al. International clinical practice guidelines for the treatment and prophylaxis of venous thromboembolism in patients with cancer. <i>J Thromb Haemost.</i> 2013;11(1):56-70.	Guideline	n/a	n/a	n/a	n/a	Provides guidance for VTE prophylaxis in patients with cancer.	IVA
50	Lyman GH, Bohlke K, Khorana AA, et al. Venous thromboembolism prophylaxis and treatment in patients with cancer: American Society of Clinical Oncology clinical practice guideline update 2014. <i>J Clin Oncol.</i> 2015;33(6):654-656.	Guideline	n/a	n/a	n/a	n/a	Provides guidance for VTE prophylaxis in patients with cancer. All patients with malignant disease undergoing a major surgery should be considered for pharmacologic prophylaxis, unless contraindicated due to bleeding risk	IVA
51	American Society for Metabolic and Bariatric Surgery Clinical Issues Committee. ASMBS updated position statement on prophylactic measures to reduce the risk of venous thromboembolism in bariatric surgery patients. <i>Surg Obes Relat Dis.</i> 2013;9(4):493-497.	Position Statement	n/a	n/a	n/a	n/a	All bariatric surgery patients are moderate to high risk for VTE and prophylaxis should be used.	IVC
52	Hoefnagel D, Kwee LE, van Putten EHP, Kros JM, Dirven CMF, Dammers R. The incidence of postoperative thromboembolic complications following surgical resection of intracranial meningioma. A retrospective study of a large single center patient cohort. <i>Clin Neurol Neurosurg</i>	Nonexperimental	581 consecutive patients underwent craniotomy for intracranial	n/a	n/a	VTE, Bleeding	The major risk factors for postoperative VTE were patient weight and a bedridden status postoperatively.	IIIB
53	Agarwal R, Hecht TEH, Lazo MC, Umscheid CA. Venous thromboembolism prophylaxis for patients undergoing bariatric surgery: a systematic review. <i>Surg Obes Relat Dis.</i> 2010;6(2):213-220.	Systematic Review	30 studies	n/a	n/a	n/a	Although patients undergoing bariatric surgery are at a major risk of VTE, the various thromboprophylaxis agents have been poorly studied.	IIIB

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54	Pellino G, Sciaudone G, Candilio G, De Fatico GS, Canonico S, Selvaggi F. Predictors of venous thromboembolism after colorectal surgery in a single unit. <i>Acta Chir Belg.</i> 2015;115(4):288-292.	Nonexperimental	476 patients undergoing colorectal surgery/ Single center, Italy	n/a	n/a	VTE, Risk Factors	VTE risk factors included advanced age, smoking, inflammatory bowel diseases, advanced pelvic malignancies, obesity, prolonged pelvic manipulation, and steep Trendelenburg position.	IIIB
55	Finks JF, English WJ, Carlin AM, et al. Predicting risk for venous thromboembolism with bariatric surgery: results from the Michigan Bariatric Surgery Collaborative. <i>Ann Surg.</i> 2012;255(6):1100-1104.	Nonexperimental	27, 818 patients undergoing bariatric surgery between	n/a	n/a	VTE, Risk Factors	VTE risk factors included history of VTE, male gender, operative time >3 hours, higher BMI, advanced age, and procedure type (duodenal switch, open/lap gastric bypass, sleeve gastrectomy).	IIIA
56	Stein PD, Matta F. Pulmonary embolism and deep venous thrombosis following bariatric surgery. <i>Obes Surg.</i> 2013;23(5):663-668.	Nonexperimental	508, 230 bariatric surgical patients from 2007 to 2009/ Nationwide	n/a	n/a	VTE	The in-hospital prevalence of PE, DVT, and VTE following bariatric surgery were 0.9, 1.3, and 2.2 %, respectively. The number of patients undergoing bariatric surgery increased 2.3-fold from 2007 to 2009.	IIIA
57	Wang L, Pryor AD, Altieri MS, et al. Perioperative rates of deep vein thrombosis and pulmonary embolism in normal weight vs obese and morbidly obese surgical patients in the era post venous thromboembolism prophylaxis guidelines. <i>Am J Surg.</i> 2015;210(5):859-863	Nonexperimental	33,325 general surgery patients from 2005 to 2009/ ACS NSQIP database US	n/a	n/a	VTE, BMI	VTE rates in the obese patients are similar to that of the general population with the exception of PE in those undergoing abdominal wall hernia repair.	IIIA
58	Nwaogu I, Yan Y, Margenthaler JA, Myckatyn TM. Venous thromboembolism after breast reconstruction in patients undergoing breast surgery: an American College of Surgeons NSQIP analysis. <i>J Am Coll Surg.</i> 2015;220(5):886-893.	Nonexperimental	68, 285 breast surgery patients from 2007 to 2011/ ACS NSQIP database US	n/a	n/a	VTE, Risk Factors	Breast reconstruction, higher BMI, increased operative time, operation within 30 days preceding breast surgery, and nonsmoking status are independent risk factors for VTE.	IIIA

Evidence Table  
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REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
59	Parkin L, Sweetland S, Balkwill A, et al. Body mass index, surgery, and risk of venous thromboembolism in middle-aged women: a cohort study. <i>Circulation</i> . 2012;125(15):1897-1904.	Nonexperimental	1,170,495 women in NHS Breast Screening Programme in England and	n/a	n/a	VTE, Risk Factors	VTE risk increases with increasing BMI and the associated excess risk is much greater after surgery than without surgery.	IIIA
60	Jamal MH, Corcelles R, Shimizu H, et al. Thromboembolic events in bariatric surgery: a large multi-institutional referral center experience. <i>Surg Endosc</i> . 2015;29(2):376-380.	Nonexperimental	4293 bariatric surgery patients from 2005 to 2013/ Cleveland Clinic	n/a	n/a	VTE, Risk Factors	The risk of VTE among morbidly obese patients undergoing bariatric surgery is persistent despite use of laparoscopy and aggressive prophylaxis. Patients with advanced age, higher BMI and those undergoing open or revision surgery are at	IIIA
61	Winegar DA, Sherif B, Pate V, DeMaria EJ. Venous thromboembolism after bariatric surgery performed by bariatric surgery center of excellence participants: analysis of the bariatric outcomes longitudinal database. <i>Surg Obes Relat Dis</i> . 2011;7(2):181-188.	Nonexperimental	73,921 bariatric surgery patients before 2009/ Bariatric	n/a	n/a	VTE, Risk Factors	The overall risk of VTE within 90 days after surgery was .42%, and 73% of these events occurred after discharge, most within 30 days after surgery. VTE risk factors: open approach, older, had a greater BMI, and were more likely to have a history of VTE	IIIA
62	Becattini C, Agnelli G, Manina G, Noya G, Rondelli F. Venous thromboembolism after laparoscopic bariatric surgery for morbid obesity: clinical burden and prevention. <i>Surg Obes Relat Dis</i> . 2012;8(1):108-115.	Systematic Review w/ Meta-Analysis	19 studies	n/a	n/a	n/a	The incidence of postoperative VTE seems to be relatively low for laparoscopic bariatric surgery, and the benefit of pharmacologic prophylaxis remains controversial.	IIIA
63	Bartlett MA, Mauck KF, Daniels PR. Prevention of venous thromboembolism in patients undergoing bariatric surgery. <i>Vasc Health Risk Manag</i> . 2015;11:461-477.	Systematic Review	n/a	n/a	n/a	n/a	VTE continues to be an important source of postoperative morbidity and mortality among patients undergoing bariatric surgery, despite current VTE prevention methods.	IIIA

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REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
64	Schoenfeld AJ, Herzog JP, Dunn JC, Bader JO, Belmont PJ Jr. Patient-based and surgical characteristics associated with the acute development of deep venous thrombosis and pulmonary embolism after spine surgery. <i>Spine</i> . 2013;38(21):1892-1898.	Nonexperimental	27,730 spine surgery patients from 2005 to 2011/ ACS NSQIP database. US	n/a	n/a	VTE, Risk Factors	BMI >40, age >80 years, operative time >261 min, and ASA >3 were identified as significant independent predictors of DVT.	IIIA
65	Swenson CW, Berger MB, Kamdar NS, Campbell DAJ, Morgan DM. Risk factors for venous thromboembolism after hysterectomy. <i>Obstet Gynecol</i> . 2015;125(5):1139-1144.	Nonexperimental	20,496 patients undergoing hysterectomy from 2008 to 2014/	n/a	n/a	VTE, Risk Factors	Body mass index 35 or greater, abdominal hysterectomy, increasing surgical time, and cancer as the indication for surgery are risk factors for VTE after hysterectomy.	IIIA
66	Wes AM, Wink JD, Kovach SJ, Fischer JP. Venous thromboembolism in body contouring: an analysis of 17,774 patients from the National Surgical Quality Improvement databases. <i>Plast Reconstr Surg</i> . 2015;135(6):972e-980e.	Nonexperimental	17,774 patients undergoing body contouring surgery/ ACS	n/a	n/a	VTE, Risk Factors	Older age, increasing World Health Organization obesity classification, contouring in an inpatient setting, a nonclean wound, contouring of the trunk, and contouring of greater than two regions in one operation, the incidence of VTE	IIIA
67	Anderson JAM, Weitz JI. Hypercoagulable states. <i>Crit Care Clin</i> . 2011;27(4):933-952.	Expert Opinion	n/a	n/a	n/a	n/a	Hypercoagulable states (previous stroke/VTE, thrombophilia, estrogen therapy, pregnancy) are a risk factor for VTE.	VA
68	Allen D, Sale G. Lower limb joint replacement in patients with a history of venous thromboembolism. <i>Bone Joint J</i> . 2014;96-B(11):1515-1519.	Nonexperimental	5967 patients undergoing arthroplasty between 2009 to 2011/ UK	n/a	n/a	VTE recurrence	Despite using mechanical prophylaxis and anticoagulation, patients with a previous history of VTE had a 3.4% chance of having a recurrence within 90 days of their joint replacement.	IIIB

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69	Liem TK, Huynh TM, Moseley SE, et al. Symptomatic perioperative venous thromboembolism is a frequent complication in patients with a history of deep vein thrombosis. J Vasc Surg. 2010;52(3):651-657.	Nonexperimental	372 patients with DVT between 2002 and 2006/ Vascular database IIS	n/a	n/a	VTE recurrence	In patients with prior DVT, perioperative symptomatic recurrence is common and is associated with high-risk procedures. A longer time interval between a DVT episode and subsequent surgery may decrease the risk of recurrence, but further research is	IIIB
70	Pedersen AB, Sorensen HT, Mehnert F, Overgaard S, Johnsen SP. Risk factors for venous thromboembolism in patients undergoing total hip replacement and receiving routine thromboprophylaxis. J Bone Joint Surg Am. 2010;92(12):2156-2164.	Nonexperimental	67,469 total hip procedures in patients receiving pharmacologic al VTE	n/a	n/a	VTE, Risk Factors	VTE risk factors: primary osteoarthritis, high score on the Charlson comorbidity index, history of cardiovascular disease, and prior VTE.	IIIA
71	Qu H, Li Z, Zhai Z, et al. Predicting of venous thromboembolism for patients undergoing gynecological surgery. Medicine. 2015;94(39):e1653.	Nonexperimental	739 female patients undergoing gynecological surgery between 2008	n/a	n/a	VTE, Risk Factors	VTE risk factors: varicose vein, bed rest time >48 h, length of operation >3 h, laparotomy surgery, hypertension, and age >50 years.	IIIB
72	Testroote MJG, Wittens CHA. Prevention of venous thromboembolism in patients undergoing surgical treatment of varicose veins. Phlebology. 2013;28(Suppl 1):86-90.	Systematic Review	13 studies	n/a	n/a	n/a	The incidence of VTE after varicose vein surgery remains unclear. Most retrospective papers report DVT incidence of ~1% based on a clinical diagnosis. However, prospective studies have detected DVT by duplex ultrasound and showed that the true	IIIB
73	Sutton PA, El-Dhuwaib Y, El-Duhwaib Y, Dyer J, Guy AJ. The incidence of post operative venous thromboembolism in patients undergoing varicose vein surgery recorded in hospital episode statistics. Ann R Coll Surg Engl. 2012;94(7):481-483.	Nonexperimental	35,374 patients undergoing varicose vein treatment/ Hospital	n/a	n/a	VTE, Risk Factors	The overall incidence of VTE was 0.51% and appears to be highest in those undergoing bilateral redo or short saphenous system surgery as well as those undergoing a combination of endovenous laser therapy and phlebectomy	IIIB

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74	Chen K, Yu GF, Huang JY, et al. Incidence and risk factors of early deep venous thrombosis after varicose vein surgery with routine use of a tourniquet. <i>Thromb Res.</i> 2015;135(6):1052-1056.	Nonexperimental	1461 patients undergoing varicose vein surgery with a tourniquet/ Single center	n/a	n/a	DVT, Risk Factors	This study found a higher incidence of postoperative DVT (7.7%) with routine use of a tourniquet during varicose vein surgery than has been reported previously. Among the factors examined, gastrocnemius vein dilation had the highest predictive power for	IIIA
75	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. <i>J Anesth.</i> 2012;26(3):464-466.	Case Report	n/a	n/a	n/a	n/a	Patient developed a VTE after placement of a central line in the right internal jugular for a lumbar procedure performed in the prone position.	VB
76	Smith BR, Diniz S, Stamos M, Nguyen NT. Deep venous thrombosis after general surgical operations at a university hospital: two-year data from the ACS NSQIP. <i>Arch Surg.</i> 2011;146(12):1424-1427.	Nonexperimental	2189 general surgery patients/ University hospital data in ACS NSQIP	n/a	n/a	DVT, Risk Factors	Since more than half of the DVTs are catheter induced, efforts for DVT prevention should include more attention to the need for a central catheter, limiting the amount of time of a central catheter, and possibly the use of anticoagulation	IIIB
77	Wang TF, Wong CA, Milligan PE, Thoenke MS, Woeltje KF, Gage BF. Risk factors for inpatient venous thromboembolism despite thromboprophylaxis. <i>Thromb Res.</i> 2014;133(1):25-29.	Nonexperimental	94 patients with VTE diagnosed in-hospital and 272 controls without VTE/	n/a	n/a	VTE, Risk Factors	VTE risk factors: hospitalization for cranial surgery, intensive care unit admission, admission leukocyte count >13,000/mm <sup>3</sup> , presence of an indwelling central venous catheter, and admission from a long-term care facility	IIIB
78	Holley AB, Petteys S, Mitchell JD, et al. Venous thromboembolism prophylaxis for patients receiving regional anesthesia following injury in Iraq and Afghanistan. <i>J Trauma Acute Care Surg.</i> 2014;76(1):152-159.	Nonexperimental	1259 patients injured in combat/ Water Reed Army Medical Center	n/a	n/a	Regional anesthesia, VTE	Soldiers wounded in combat who receive regional anesthesia are not at increased risk for VTE.	IIIB



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79	Dahl OE, Harenberg J, Wexels F, Preissner KT. Arterial and venous thrombosis following trauma and major orthopedic surgery: molecular mechanisms and strategies for intervention. <i>Semin Thromb Hemost.</i> 2015;41(2):141-145.	Expert Opinion	n/a	n/a	n/a	n/a	Trauma is a risk factor for VTE.	VA
80	Allen CJ, Murray CR, Meizoso JP, et al. Risk factors for venous thromboembolism after pediatric trauma. <i>J Pediatr Surg.</i> 2016;51(1):168-171.	Nonexperimental	1934 pediatric trauma patients/ Single center, US	n/a	n/a	VTE, Risk Factors	Significant VTE risk factors were age $\geq 13$ years, indwelling central venous catheter, orthopedic surgery, and motor vehicle injury.	IIIA
81	Matsumoto S, Suda K, Imoto S, et al. Prospective study of deep vein thrombosis in patients with spinal cord injury not receiving anticoagulant therapy. <i>Spinal Cord.</i> 2015;53(4):306-309.	Nonexperimental	29 patients with spinal cord injury/ Single center, Japan	n/a	n/a	DVT (ultrasound, D-Dimer)	These results suggest that DVT can develop at the very-acute stage of spinal cord injury and the incidence increases with a more severe paralysis.	IIIB
82	Giorgi Pierfranceschi M, Donadini MP, Dentali F, et al. The short- and long-term risk of venous thromboembolism in patients with acute spinal cord injury: a prospective cohort study. <i>Thromb Haemost.</i> 2013;109(1):34-38.	Quasi-experimental	94 patients with spinal cord injury/ Italy	LMWH + GCS	n/a	VTE (ultrasound)	The risk of VTE in patients suffering from spinal cord injury is high despite the use of thromboprophylaxis, in particular in some patients categories. However, this risk appears to be limited to the first 3 months after the index event	IIB
83	Hunt BJ. Venous thromboembolism and thrombophilia testing. <i>Medicine (United Kingdom).</i> 2013;41(4):234-237.	Expert Opinion	n/a	n/a	n/a	n/a	Thrombophilia is a risk factor for VTE.	VB

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84	Banks-Gonzales V, Ruppert SD. Thrombophilia and hypercoagulation: risk assessment and screening. <i>J Nurse Pract.</i> 2012;8(8):649-655.	Case Report	n/a	n/a	n/a	n/a	Patient with hypercoagulable condition developed DVT and PE after lap cholecystectomy.	VA
85	Committee on Practice Bulletins—Gynecology, American College of Obstetricians and Gynecologists. ACOG Practice Bulletin No. 84: Prevention of deep vein thrombosis and pulmonary embolism. <i>Obstet Gynecol.</i> 2007;110(2 Pt 1):429-440.	Guideline	n/a	n/a	n/a	n/a	Provides guidance for VTE prophylaxis in gynecology patients.	IVC
86	Amar S, Van Boven M, Rooijackers H, Momeni M. Massive postoperative pulmonary embolism in a young woman using oral contraceptives: the value of a preoperative anesthetic consult. <i>Acta Anaesthesiol Belg.</i> 2014;65(2):73-75.	Case Report	n/a	n/a	n/a	n/a	Patient on oral contraceptives developed PE after lumbar fusion surgery and died as a result of complications from the PE.	VA
87	Barsoum MK, Heit JA, Ashrani AA, Leibson CL, Petterson TM, Bailey KR. Is progestin an independent risk factor for incident venous thromboembolism? A population-based case-control study. <i>Thromb Res.</i> 2010;126(5):373-378.	Nonexperimental	726 women with VTE, 830 cases without VTE/ Olmsted County, MN	n/a	n/a	VTE, Risk Factors	Oral contraceptives, estrogen alone, estrogen plus progestin, and progestin with or without estrogen are independent VTE risk factors.	IIIA
88	Paresi RJ Jr, Myers RS, Matarasso A. Contraceptive vaginal rings: do they pose an increased risk of venous thromboembolism in aesthetic surgery? <i>Aesthet Surg J.</i> 2015;35(6):721-727.	Case Report	n/a	n/a	n/a	n/a	Two patients using contraceptive vaginal ring developed VTE after plastic surgery procedure.	VB

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89	Alaia MJ, Zuskov A, Davidovitch RI. Contralateral deep venous thrombosis after hip arthroscopy. Orthopedics. 2011;34(10):e674-e677.	Case Report	n/a	n/a	n/a	n/a	Patient on oral contraceptives developed DVT after hip arthroscopy surgery.	VB
90	Zeng Y, Shen B, Yang J, Zhou Z, Kang P, Pei F. Preoperative comorbidities as potential risk factors for venous thromboembolism after joint arthroplasty: a systematic review and meta-analysis of cohort and case-control studies. J Arthroplasty. 2014;29(12):2430-2438.	Systematic Review w/ Meta-Analysis	16 studies	n/a	n/a	n/a	The results showed that patients with cardiovascular disease, previous VTE history, neurologic disease and high ASA rating had significantly higher VTE risk after joint arthroplasty.	IIIA
91	Markovic-Denic L, Zivkovic K, Lesic A, Bumbasirevic V, Dubljanin-Raspopovic E, Bumbasirevic M. Risk factors and distribution of symptomatic venous thromboembolism in total hip and knee replacements: prospective study. Int Orthop. 2012;36(6):1299-1305.	Nonexperimental	499 patients undergoing total hip and knee arthroplasty/ Single center	n/a	n/a	VTE, Risk Factors	VTE is common following hip and knee arthroplasty surgery. Orthopaedic patients with a family history of VTE, heart failure and coronary heart disease are at a considerable risk of thromboembolic complications in the postoperative period.	IIIB
92	Singh JA, Jensen MR, Harmsen WS, Gabriel SE, Lewallen DG. Cardiac and thromboembolic complications and mortality in patients undergoing total hip and total knee arthroplasty. Ann Rheum Dis. 2011;70(12):2082-2088.	Nonexperimental	1604 total knee and 1195 total hip patients between 1994 and	n/a	n/a	VTE, Risk Factors	Older age, higher comorbidity, higher ASA class and prior history of cardiac/ thromboembolic disease was associated with an increased risk of 90-day cardiac and thromboembolic complications.	IIIB
93	Haskins IN, Amdur R, Sarani B, Vaziri K. Congestive heart failure is a risk factor for venous thromboembolism in bariatric surgery. Surg Obes Relat Dis. 2015;11(5):1140-1145.	Nonexperimental	102,869 bariatric surgery patients between 2005 and 2012/ ACS	n/a	n/a	VTE, Risk Factors	DVT risk factors in laparoscopic bariatric surgery: male gender, higher BMI, congestive heart failure, and hypertension. PE risk factors: male gender, age >60, higher BMI, African American race, chronic obstructive pulmonary disease and CHF	IIIA

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94	Kapoor A, Labonte AJ, Winter MR, et al. Risk of venous thromboembolism after total hip and knee replacement in older adults with comorbidity and co-occurring comorbidities in the Nationwide Inpatient Sample (2003-2006). <i>BMC Geriatrics</i> . 2010;10:63.	Nonexperimental	93,071 total hip and 223,600 total knee arthroplasty patients	n/a	n/a	VTE, Risk Factors	Older adults with CHF undergoing THR or TKR and with COPD undergoing TKR are at increased risk of VTE.	IIIB
95	Masoomi H, Buchberg B, Reavis KM, Mills SD, Stamos M, Nguyen NT. Factors predictive of venous thromboembolism in bariatric surgery. <i>Am Surg</i> . 2011;77(10):1403-1406.	Nonexperimental	304,515 bariatric surgery patients from 2006 to 2008/ Nationwide	n/a	n/a	VTE, Risk Factors	VTE risk factors: alcohol abuse, open operation, gastric bypass procedures, renal failure, congestive heart failure, male gender, and chronic lung disease.	IIIB
96	Gephart MGH, Zygourakis CC, Arrigo RT, Kalanithi PSA, Lad SP, Boakye M. Venous thromboembolism after thoracic/thoracolumbar spinal fusion. <i>World Neurosurg</i> . 2012;78(5):545-552.	Nonexperimental	430,081 patients undergoing spinal fusion between 2002 and 2008/	n/a	n/a	VTE, Risk Factors	VTE risk factors: age, insurance status, hospital type, combined anterior/ posterior surgical approach, and the presence of congestive heart failure or weight loss.	IIIA
97	Huang L, Li J, Jiang Y. Association between hypertension and deep vein thrombosis after orthopedic surgery: a meta-analysis. <i>Eur J Med Res</i> . 2016;21(1):13.	Systematic Review w/ Meta-Analysis	16 studies	n/a	n/a	n/a	Hypertension is a risk factor for DVT after orthopedic surgery.	IIIC
98	Delos D, Rodeo SA. Venous thrombosis after arthroscopic shoulder surgery: pacemaker leads as a possible cause: pacemaker leads as a possible cause. <i>HSS J</i> . 2011;7(3):282-285.	Case Report	n/a	n/a	n/a	n/a	Patient with cardiac pacemaker developed upper arm DVT after shoulder arthroscopy surgery.	VB

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99	Barbot M, Daidone V, Zilio M, et al. Perioperative thromboprophylaxis in Cushing's disease: what we did and what we are doing? Pituitary. 2015;18(4):487-493.	Nonexperimental	78 patients undergoing pituitary transsphenoidal surgery/ Single center	n/a	n/a	VTE, prophylaxis compliance, risk factors	Cushing's disease is associated with an increased risk of thrombotic events, particularly after surgery. The prophylactic regimen proposed in this paper afforded an efficacy prophylaxis against postoperative VTE in patients with CD	IIIA
100	Manetti L, Bogazzi F, Giovannetti C, et al. Changes in coagulation indexes and occurrence of venous thromboembolism in patients with Cushing's syndrome: results from a prospective study before and after surgery. Eur J Endocrinol. 2010;163(5):783-791	Nonexperimental	40 patients with Cushing's syndrome and 70 controls/ Single center, Italy	n/a	n/a	VTE, coagulation and fibrinolysis indexes	Patients with Cushing's have a procoagulative phenotype due to cortisol-associated changes in hemostatic and fibrinolytic markers, leading to increased incidence of VTE.	IIIB
101	Masoomi H, Paydar KZ, Wirth GA, Aly A, Kobayashi MR, Evans GRD. Predictive risk factors of venous thromboembolism in autologous breast reconstruction surgery. Ann Plast Surg. 2014;72(1):30-33.	Nonexperimental	35,883 breast reconstruction patients between 2009 and 2010/ Nationwide	n/a	n/a	VTE, Risk Factors	In patients undergoing autologous breast reconstruction surgery, immediate reconstruction, older than 65 years, obesity, history of chemotherapy, and chronic lung disease are all independent predictors of higher VTE	IIIA
102	Monn MF, Hui X, Lau BD, et al. Infection and venous thromboembolism in patients undergoing colorectal surgery: what is the relationship? Dis Colon Rectum. 2014;57(4):497-505.	Nonexperimental	39,831 colorectal surgery patients in 2010/ ACS NSQIP	n/a	n/a	VTE, Risk Factors	Following colorectal surgery, the development of a urinary tract infection, pneumonia, organ space surgical site infection, or deep surgical site infection was associated with a significantly increased risk for VTE	IIIA
103	Baker D, Sherrod B, McGwin GJ, Ponce B, Gilbert S. Complications and 30-day outcomes associated with venous thromboembolism in the pediatric orthopaedic surgical population. J Am Acad Orthop Surg. 2016;24(3):196-206.	Nonexperimental	14,776 orthopedic surgery patients between 2012 and 2013/ ACS	n/a	n/a	VTE, Risk Factors	VTE risk factors: hyponatremia, abnormal partial thromboplastin time, elevated aspartate transaminase level, and gastrointestinal, renal, and hematologic disorders.	IIIA

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104	Barmparas G, Fierro N, Lamb AW, et al. Clostridium difficile increases the risk for venous thromboembolism. Am J Surg. 2014;208(5):703-709.	Nonexperimental	1728 patients admitted to surgical ICU between 2011 and 2013/ Single center	n/a	n/a	Clostridium difficile infection, VTE	C. difficile infection increases the risk for VTE in surgical patients admitted to the ICU.	IIIA
105	Donze JD, Ridker PM, Finlayson SRG, Bates DW. Impact of sepsis on risk of postoperative arterial and venous thromboses: large prospective cohort study. BMJ. 2014;349:g5334.	Nonexperimental	2,305,380 surgical patients/ ACS NSQIP database, US	n/a	n/a	Sepsis, arterial thromboses, VTE	Preoperative sepsis represents an important independent risk factor for both arterial and venous thromboses. The risk of thrombosis increases with the severity of the inflammatory response and is higher in both <del>emergent and elective surgical procedures</del>	IIIA
106	Hatch Q, Nelson D, Martin M, et al. Can sepsis predict deep venous thrombosis in colorectal surgery? Am J Surg. 2016;211(1):53-58.	Nonexperimental	26,554 colorectal surgery patients/ ACS NSQIP database, US	n/a	n/a	DVT, sepsis	Perioperative sepsis is a significant risk factor for postoperative DVT in the colorectal surgery population.	IIIA
107	Albayati MA, Grover SP, Saha P, Lwaleed BA, Modarai B, Smith A. Postsurgical inflammation as a causative mechanism of venous thromboembolism. Semin Thromb Hemostas. 2015;41(6):615-620.	Expert Opinion	n/a	n/a	n/a	n/a	Postoperative inflammation is a risk factor for VTE.	VA
108	Wilson MZ, Connelly TM, Tinsley A, Hollenbeak CS, Koltun WA, Messaris E. Ulcerative colitis is associated with an increased risk of venous thromboembolism in the postoperative period: the results of a matched cohort analysis. Ann Surg. 2015;261(6):1160-1166	Nonexperimental	96,999 patients undergoing colonic resection between 2005	n/a	n/a	VTE, Risk Factors	This study affirms that inpatient Ulcerative Colitis patients undergoing colonic resection are at high risk for VTE and suggests that this risk persists into the post discharge period.	IIIA

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109	Kaplan GG, Lim A, Seow CH, et al. Colectomy is a risk factor for venous thromboembolism in ulcerative colitis. <i>World J Gastroenterol.</i> 2015;21(4):1251-1260.	Nonexperimental	1020 ulcerative colitis patients between 1997 and 2009/ Data	n/a	n/a	VTE, Risk Factors	VTE was associated with colectomy, particularly, among Ulcerative Colitis patients who failed medical management. VTE prophylaxis may not be sufficient to prevent VTE in patients undergoing colectomy.	IIIB
110	Merrill A, Millham F. Increased risk of postoperative deep vein thrombosis and pulmonary embolism in patients with inflammatory bowel disease: a study of National Surgical Quality Improvement Program patients. <i>Arch Surg.</i> 2012;147(2):120-124.	Nonexperimental	271,368 patients in 2008 ACS NSQIP database (2249 patients)	n/a	n/a	VTE, myocardial infarction, stroke	Patients with IBD are at increased risk for developing postoperative DVT or PE. Risk of DVT or PE appears to be even higher for patients with IBD who are having nonintestinal surgery. Cardiac and stroke risks do not appear to be increased by IBD.	IIIA
111	Moghadamyeghaneh Z, Hanna MH, Carmichael JC, Nguyen NT, Stamos MJ. A nationwide analysis of postoperative deep vein thrombosis and pulmonary embolism in colon and rectal surgery. <i>J Gastrointest Surg.</i> 2014;18(12):2169-2177.	Nonexperimental	116,029 colorectal resection patients between 2005 and 2011/ ACS	n/a	n/a	VTE, Risk Factors	DVT risk factors: ASA score >2, hypoalbuminemia, Ulcerative colitis, stage 4 cancer, open procedures, emergent admission. PE risk factors: DVT, disseminated cancer.	IIIA
112	Colorectal Writing Group for Surgical Care and Outcomes Assessment Program-Comparative Effectiveness Research Translation Network (SCOAP-CERTAIN) Collaborative; Nelson DW, Simianu VV, et al. Thromboembolic complications and prophylaxis patterns in colorectal surgery. <i>JAMA Surg.</i>	Nonexperimental	16,120 colorectal surgery patients between 2006 and 2011/ ACS	n/a	n/a	VTE, Risk Factors	VTE risk factors: male, older, higher Charlson Comorbidity Index and ASA class, history of VTE, and nonelective, open abdominal surgery.	IIIA
113	Mameli A, Marongiu F. Thromboembolic disease in patients with rheumatoid arthritis undergoing joint arthroplasty: update on prophylaxes. <i>World J Orthop.</i> 2014;5(5):645-652.	Systematic Review w/ Meta-Analysis	8 studies	n/a	n/a	n/a	Rheumatoid arthritis patients may be at increased risk of VTE due to active inflammatory disease, specific joint problems and the surgical procedures themselves.	IIIB

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REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
114	Ahlehoff O, Gislason GH, Lindhardsen J, et al. Psoriasis carries an increased risk of venous thromboembolism: a Danish nationwide cohort study. <i>PLoS One</i> . 2011;6(3):e18125.	Nonexperimental	35,138 patients with mild psoriasis, 3526 patients with severe psoriasis	n/a	n/a	VTE	This nationwide cohort study indicates that patients with psoriasis are at increased risk of VTE. The risk was highest in young patients with severe psoriasis.	IIIA
115	James A; Committee on Practice Bulletins—Obstetrics. Practice Bulletin No. 123: Thromboembolism in pregnancy. <i>Obstet Gynecol</i> . 2011;118(3):718-729.	Guideline	n/a	n/a	n/a	n/a	Provides guidance for VTE prophylaxis in pregnant patients.	IVB
116	D’Alton ME, Friedman AM, Smiley RM, et al. National partnership for maternal safety: consensus bundle on venous thromboembolism. <i>Obstet Gynecol</i> . 2016;128(4):688-698.	Consensus	n/a	n/a	n/a	n/a	Recommendations for VTE prophylaxis for obstetrics.	IVB
117	Tepper NK, Boulet SL, Whiteman MK, et al. Postpartum venous thromboembolism: incidence and risk factors. <i>Obstet Gynecol</i> . 2014;123(5):987-996.	Nonexperimental	2,456 women with postpartum VTE between 2005 and 2011/ Truven	n/a	n/a	VTE	Risk for postpartum VTE is highest during the first 3 weeks after delivery. Women with obstetric complications are at highest risk for postpartum VTE, and this risk remains elevated throughout the first 12 weeks after delivery	IIIA
118	Musallam KM, Rosendaal FR, Zaatari G, et al. Smoking and the risk of mortality and vascular and respiratory events in patients undergoing major surgery. <i>JAMA Surg</i> . 2013;148(8):755-762.	Nonexperimental	607,558 patients undergoing major surgery between 2008 and 2009/ Non-	n/a	n/a	Postoperative mortality, arterial events, venous events, and respiratory events	Smoking cessation at least 1 year before major surgery abolishes the increased risk of postoperative mortality and decreases the risk of arterial and respiratory events evident in current smokers.	IIIA



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119	Sweetland S, Parkin L, Balkwill A, et al. Smoking, surgery, and venous thromboembolism risk in women: United Kingdom cohort study. <i>Circulation</i> . 2013;127(12):1276-1282.	Nonexperimental	1,162,718 women in United Kingdom Cohort Study	n/a	n/a	VTE	VTE incidence was increased in current smokers, both in the absence of surgery and in the 12 weeks after surgery.	IIIA
120	Deflandre E, Degey S, Opsomer N, Brichant J, Joris J. Obstructive sleep apnea and smoking as a risk factor for venous thromboembolism events: review of the literature on the common pathophysiological mechanisms. <i>Obes Surg</i> . 2016;26(3):640-648.	Literature Review	n/a	n/a	n/a	n/a	Smoking and obstructive sleep apnea are risk factors for VTE.	VB
121	Kantar RS, Haddad AG, Tamim H, Jamali F, Taher AT. Venous thromboembolism and preoperative steroid use: analysis of the NSQIP database to evaluate risk in surgical patients. <i>Eur J Intern Med</i> . 2015;26(7):528-533.	Nonexperimental	58,667 patients taking glucocorticoids for at least 30 days preoperatively	n/a	n/a	VTE, Risk Factors	Our results suggest that surgical patients with prolonged preoperative glucocorticoid intake are at a higher risk of developing postoperative VTE as well as other secondary outcomes including: all-cause mortality, urinary tract occurrences, sepsis	IIIA
122	Greaves SW, Holubar SD. Preoperative hospitalization is independently associated with increased risk for venous thromboembolism in patients undergoing colorectal surgery: a National Surgical Quality Improvement Program database study. <i>Dis Colon Rectum</i> . 2015;58(8):782-791	Nonexperimental	242,670 colorectal surgery patients between 2005 and 2011/ ACS	n/a	n/a	VTE	Preoperative hospitalization is an independent risk factor for VTE and its associated increase in mortality after colorectal surgery, whereas laparoscopy is a strong protective variable.	IIIA
123	Lieber BA, Han J, Appelboom G, et al. Association of steroid use with deep venous thrombosis and pulmonary embolism in neurosurgical patients: a national database analysis. <i>World Neurosurg</i> . 2016;89:126-132.	Nonexperimental	94,620 neurosurgical patients between 2006 and 2013/ ACS NSQIP	n/a	n/a	VTE	In the neurosurgical population, prolonged courses of corticosteroids are associated with an increased risk of developing postoperative DVT and PE.	IIIA

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REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
124	Rolston JD, Han SJ, Bloch O, Parsa AT. What clinical factors predict the incidence of deep venous thrombosis and pulmonary embolism in neurosurgical patients? J Neurosurg. 2014;121(4):908-918.	Nonexperimental	38,058 neurosurgical patients between 2006 and 2011/ ACS NSQIP	n/a	n/a	VTE	VTE is a common complication in neurosurgical patients. VTE risk factors: ventilator dependence, immobility, malignancy, chronic steroid use, and sepsis. VTE appear significantly more likely to occur in patients undergoing cranial procedures.	IIIA
125	Mueller MG, Pilecki MA, Catanzarite T, Jain U, Kim JYS, Kenton K. Venous thromboembolism in reconstructive pelvic surgery. Am J Obstet Gynecol. 2014;211(5):552.e1-552.e6.	Nonexperimental	20,687 women undergoing reconstructive pelvic surgery between 2006 and 2010/ ACS	n/a	n/a	VTE, Risk Factors	The incidence of VTE following RPS is very low, but it is increased in women undergoing concomitant surgeries. Patients undergoing inpatient surgery with higher ASA Physical Status classifications and requiring emergency intervention were at highest risk.	IIIA
126	Miller TJ, Jeong HS, Davis K, et al. Evaluation of the American Society of Anesthesiologists physical status classification system in risk assessment for plastic and reconstructive surgery patients. Aesthet Surg J. 2014;34(3):448-456.	Nonexperimental	1794 patients undergoing complex plastic and reconstructive surgery	n/a	n/a	ASA physical status, VTE, complications	After high-risk (n = 398) and low-risk (n = 1396) groups were identified, infection, delayed wound healing, deep vein thrombosis, and overall complications had significantly increased incidence in the high risk group.	IIIB
127	Ghazi L, Schwann TA, Engoren MC, Habib RH. Role of blood transfusion product type and amount in deep vein thrombosis after cardiac surgery. Thromb Res. 2015;136(6):1204-1210.	Nonexperimental	1219 cardiac surgery patients/ Single center, US	n/a	n/a	VTE, Risk Factors	RBC transfusion is associated with increased risk of DVT after cardiac surgery in a dose-dependent fashion that is exacerbated when accompanied with FFP.	IIIB
128	Tollefson MK, Karnes RJ, Rangel L, Carlson R, Boorjian SA. Blood type, lymphadenectomy and blood transfusion predict venous thromboembolic events following radical prostatectomy with pelvic lymphadenectomy. J Urol. 2014;191(3):646-651.	Nonexperimental	18,472 patients undergoing radical prostatectomy for cancer	n/a	n/a	VTE, Risk Factors	Blood type, pelvic lymphadenectomy extent and blood transfusion are significant risk factors for symptomatic VTE event before radical prostatectomy plus pelvic lymph node dissection.	IIIA

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129	Xenos ES, Vargas HD, Davenport DL. Association of blood transfusion and venous thromboembolism after colorectal cancer resection. <i>Thromb Res.</i> 2012;129(5):568-572.	Nonexperimental	21,943 colorectal surgery cancer patients between 2005 and 2009/ ACS	n/a	n/a	VTE, Risk Factors	Blood transfusion is associated with increased risk of VTE. Malignancy and surgery are known prothrombotic stimuli, the subset of patients receiving intraoperative RBC transfusion are even more at risk for VTE.	IIIA
130	Yang S, Ding W, Yang D, et al. Prevalence and risk factors of deep vein thrombosis in patients undergoing lumbar interbody fusion surgery: a single-center cross-sectional study. <i>Medicine.</i> 2015;94(48):e2205.	Nonexperimental	995 patients undergoing lumbar fusion between 2014 and 2015/ Single hospital	n/a	n/a	DVT, Risk Factors	Advanced age, high postoperative Visual Analog Scale scores, and blood transfusion were risk factors for postoperative lower limb DVT.	IIIB
131	Turley RS, Reddy SK, Shortell CK, Clary BM, Scarborough JE. Venous thromboembolism after hepatic resection: analysis of 5,706 patients. <i>J Gastrointest Surg.</i> 2012;16(9):1705-1714.	Nonexperimental	5706 patients undergoing hepatic resection between 2005 and 2009/ ACS	n/a	n/a	VTE	The overall incidence of VTE after hepatic resection was 2.9 %. Significant predictors of VTE after hepatic resection included preoperative mechanical ventilation, male gender, operative time>3 h, age≥70 years, intraoperative transfusion, and extended	IIIA
132	Wang JK, Boorjian SA, Frank I, et al. Non-O blood type is associated with an increased risk of venous thromboembolism after radical cystectomy. <i>Urology.</i> 2014;83(1):140-145.	Nonexperimental	2076 patients undergoing radical cystectomy between 1980 and 2005/	n/a	n/a	Blood type, VTE	Non-O blood type was independently associated with an increased risk of VTE after radical cystectomy.	IIIB
133	Ha LP, Arrendondo M. Fatal venous thromboembolism after splenectomy: pathogenesis and management. <i>J Am Osteopath Assoc.</i> 2012;112(5):291-300.	Case Report	n/a	n/a	n/a	n/a	Patient died from VTE after splenectomy for idiopathic thrombocytopenia purpura.	VB

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REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
134	Abel EJ, Wong K, Sado M, et al. Surgical operative time increases the risk of deep venous thrombosis and pulmonary embolism in robotic prostatectomy. <i>JSLs</i> . 2014;18(2):282-287.	Nonexperimental	549 patients undergoing robot-assisted radical prostatectomy between 2007	n/a	n/a	VTE, Risk Factors	A prolonged operative time increases the risk of symptomatic VTEs after robot-assisted radical prostatectomy.	IIIA
135	Kim JYS, Khavanin N, Rambachan A, et al. Surgical duration and risk of venous thromboembolism. <i>JAMA Surg</i> . 2015;150(2):110-117.	Nonexperimental	1,432,855 patients undergoing surgery under general anesthesia	n/a	n/a	VTE, surgical duration	Among patients undergoing surgery, an increase in surgical duration was directly associated with an increase in the risk for VTE.	IIIA
136	Kimmell KT, Walter KA. Risk factors for venous thromboembolism in patients undergoing craniotomy for neoplastic disease. <i>J Neurooncol</i> . 2014;120(3):567-573.	Nonexperimental	3782 patients undergoing craniotomy between 2006 and 2010/ ACS NSQIP	n/a	n/a	VTE, Risk Factors	Patients undergoing craniotomy for neoplasm are at increased risk of VTE. VTE risk factors: Age >60, OR time >4 h, UTI, and septic shock.	IIIA
137	Kim BD, Hsu WK, De Oliveira GSJ, Saha S, Kim JYS. Operative duration as an independent risk factor for postoperative complications in single-level lumbar fusion: an analysis of 4588 surgical cases. <i>Spine</i> . 2014;39(6):510-520.	Nonexperimental	4588 patients undergoing lumbar fusion between 2006 and 2011/ ACS NSQIP	n/a	n/a	30-day morbidity and mortality, operative duration	Operative duration of 5 hours or more was also associated with increased risk of reoperation, organ/space surgical site infection, sepsis/septic shock, wound dehiscence, and deep vein thrombosis.	IIIA
138	Chan MM, Hamza N, Ammori BJ. Duration of surgery independently influences risk of venous thromboembolism after laparoscopic bariatric surgery. <i>Surg Obes Relat Dis</i> . 2013;9(1):88-93.	Nonexperimental	50 bariatric surgery patients between 2007 and 2010/ Single center	n/a	n/a	VTE, Operative Time	Increasing obesity was associated with a longer operative time, which consequently increased the risk of VTE.	IIIA

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139	Montoya TI, Leclaire EL, Oakley SH, et al. Venous thromboembolism in women undergoing pelvic reconstructive surgery with mechanical prophylaxis alone. <i>Int Urogynecol J.</i> 2014;25(7):921-926.	Nonexperimental	10,627 women undergoing urogynecological surgery/ Multiple centers, US	n/a	n/a	VTE	Laparotomy, age ≥70 years, and surgery duration ≥5 h were associated with VTE occurrence.	IIIA
140	Leung ASM, Fok MWM, Fung BKK. Fatal bilateral lower-limb deep vein thrombosis and pulmonary embolism following single digit replantation. <i>Hong Kong Med J.</i> 2015;21(3):283-285.	Case Report	n/a	n/a	n/a	n/a	Patient died from VTE after prolonged surgery for microsurgical finger replantation.	VB
141	Guideline for positioning the patient. In: <i>Guidelines for Perioperative Practice.</i> Denver, CO: AORN, Inc; 2017: e1-e72.	Guideline	n/a	n/a	n/a	n/a	Provides guidance for positioning the patient.	IVA
142	Guideline for care of patients undergoing pneumatic tourniquet-assisted procedures. In: <i>Guidelines for Perioperative Practice.</i> Denver, CO: AORN, Inc; 2017:157-182.	Guideline	n/a	n/a	n/a	n/a	Provides guidance for use of pneumatic tourniquets.	IVA
143	Falck-Ytter Y, Francis CW, Johanson NA, et al. Prevention of VTE in orthopedic surgery patients: antithrombotic therapy and prevention of thrombosis, 9th ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines. <i>Chest.</i> 2012;141(2 Suppl):e278S-e325S	Guideline	n/a	n/a	n/a	n/a	Provides specific guidance for selection of VTE prophylaxis in orthopedic surgical patients, considering the risk of venous thromboembolism, risk of bleeding complications, and the values and preferences of individual patients	IVA

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144	Mont MA, Jacobs JJ, Boggio LN, et al. Preventing venous thromboembolic disease in patients undergoing elective hip and knee arthroplasty. J Am Acad Orthop Surg. 2011;19(12):768-776.	Guideline	n/a	n/a	n/a	n/a	Provides guidance for selection of VTE prophylaxis in patients undergoing arthroplasty. Elective total hip or knee arthroplasty places the patient at high risk for DVT.	IVA
145	Januel J, Chen G, Ruffieux C, et al. Symptomatic in-hospital deep vein thrombosis and pulmonary embolism following hip and knee arthroplasty among patients receiving recommended prophylaxis: a systematic review. JAMA. 2012;307(3):294-303.	Systematic Review w/ Meta-Analysis	47 studies	n/a	n/a	n/a	Using current VTE prophylaxis, approximately 1 in 100 patients undergoing total knee arthroplasty and approximately 1 in 200 patients undergoing total hip arthroplasty develops symptomatic VTE prior to hospital discharge	IIIA
146	Zhang J, Chen Z, Zheng J, Breusch SJ, Tian J. Risk factors for venous thromboembolism after total hip and total knee arthroplasty: a meta-analysis. Arch Orthop Trauma Surg. 2015;135(6):759-772.	Systematic Review w/ Meta-Analysis	14 studies	n/a	n/a	n/a	Among ten VTE risk factors investigated after total hip and knee arthroplasty, 3 were significantly associated with VTE: history of VTE, varicose vein, and congestive cardiac failure. There was also an increased risk for female gender, age > 80, hypertension	IIIA
147	Lewis CG, Inneh IA, Schutzer SF, Grady-Benson J. Evaluation of the first-generation AAOS clinical guidelines on the prophylaxis of venous thromboembolic events in patients undergoing total joint arthroplasty: experience with 3289 patients from a single institution. J Bone Joint Surg Am	Quasi-experimental	3289 patients undergoing total hip or knee arthroplasty/ JIS	VTE protocol based on AAOS guidelines	n/a	VTE	The prospective use of the first-generation American Academy of Orthopaedic Surgeons guidelines resulted in a low incidence of clinically important thromboembolic events in total hip and total knee arthroplasty patients	IIB
148	Steele KE, Schweitzer MA, Prokopowicz G, et al. The long-term risk of venous thromboembolism following bariatric surgery. Obes Surg. 2011;21(9):1371-1376.	Nonexperimental	17,434 bariatric surgery patients/ private insurance	n/a	n/a	VTE	The period of increased risk for VTE following bariatric surgery extends well beyond the initial hospital discharge and 30 days after surgery. The high frequency of VTE up to 6 months following bariatric surgery suggests that more aggressively	IIIA

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149	Di Nisio M, Peinemann F, Porreca E, Rutjes AWS. Primary prophylaxis for venous thromboembolism in patients undergoing cardiac or thoracic surgery. Cochrane Database Syst Rev. 2015;(6):CD009658.	Systematic Review w/ Meta-Analysis	13 RCTs	n/a	n/a	n/a	The evidence regarding the efficacy and safety of thromboprophylaxis in cardiac and thoracic surgery is limited. Data for important outcomes such as pulmonary embolism or major bleeding were often lacking. Given the uncertainties around the	IB
150	Ho KM, Bham E, Pavey W. Incidence of venous thromboembolism and benefits and risks of thromboprophylaxis after cardiac surgery: a systematic review and meta-analysis. J Am Heart Assoc. 2015;4(10):e002652.	Systematic Review w/ Meta-Analysis	68 studies	n/a	n/a	n/a	Unless proven otherwise by adequately powered RCTs, initiating pharmacological VTE prophylaxis as soon as possible after cardiac surgery for patients who have no active bleeding is highly recommended.	IIIA
151	Aziz F, Patel M, Ortenzi G, Reed AB. Incidence of postoperative deep venous thrombosis is higher among cardiac and vascular surgery patients as compared with general surgery patients. Ann Vasc Surg. 2015;29(4):661-669.	Nonexperimental	18,670 patients with DVT after surgery between 2005 and 2010/ ACS	n/a	n/a	DVT, Risk Factors	The incidence of DVT is higher among vascular and cardiac surgery patients as compared with that of general surgery patients.	IIIA
152	Ramanan B, Gupta PK, Sundaram A, et al. In-hospital and postdischarge venous thromboembolism after vascular surgery. J Vasc Surg. 2013;57(6):1589-1596.	Nonexperimental	45,548 vascular surgery patients between 2007 and 2009/ ACS	n/a	n/a	VTE	Postoperative VTE is associated with the type of vascular procedure and is highest after operations in the chest and abdomen/pelvis. About 40% of VTE events in elective vascular surgery patients were diagnosed after discharge and the presence	IIIA
153	Scarborough JE, Cox MW, Mureebe L, Pappas TN, Shortell CK. A novel scoring system for predicting postoperative venous thromboembolic complications in patients after open aortic surgery. J Am Coll Surg. 2012;214(4):620-626.	Nonexperimental	6035 patients undergoing open aortic surgery between 2005 and 2009/ ACS	n/a	n/a	VTE, Risk Factors	Independent predictors of postoperative VTE included ruptured aneurysmal disease, prolonged operative time, obesity, preoperative dyspnea, and chronic steroid usage.	IIIA

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154	Aloia TA, Geerts WH, Clary BM, et al. Venous thromboembolism prophylaxis in liver surgery. J Gastrointest Surg. 2016;20(1):221-229.	Guideline	n/a	n/a	n/a	n/a	Provides guidance for selection of VTE prophylaxis in patients undergoing liver surgery.	IVC
155	Ejaz A, Spolverato G, Kim Y, et al. Defining incidence and risk factors of venous thromboembolism after hepatectomy. J Gastrointest Surg. 2014;18(6):1116-1124.	Nonexperimental	599 patients undergoing hepatic resection between 2006 and 2012/	n/a	n/a	VTE within 90 days	VTE within 90 days of hepatic resection is common, occurring in nearly one in 20 patients. Most VTE events occurred among patients who received current best practice prophylaxis for VTE. More aggressive strategies to identify and reduce the risk of	IIIA
156	Newhook TE, Lapar DJ, Walters DM, et al. Impact of postoperative venous thromboembolism on postoperative morbidity, mortality, and resource utilization after hepatectomy. Am Surg. 2015;81(12):1216-1223.	Nonexperimental	3973 patients undergoing hepatectomy between 2005 and 2008/ ACS NSQIP	n/a	n/a	VTE	Risk factors for postoperative VTE included older age, male gender, compromised functional status, degree of intraoperative blood transfusion, preoperative albumin level, and extent of hepatectomy. Major postoperative complications including acute	IIIB
157	Bouras G, Burns EM, Howell A, Bottle A, Athanasiou T, Darzi A. Risk of post-discharge venous thromboembolism and associated mortality in general surgery: a population-based cohort study using linked hospital and primary care data in england. PLoS One. 2015;10(12):e0145759	Nonexperimental	981 general surgery patients with VTE between 1997 and 2012/ national	n/a	n/a	VTE, Mortality	VTE risk factors: emergency surgery, age, BMI, length of stay, advanced cancer stages, major organ resections.	IIIA
158	Humes DJ, Walker AJ, Hunt BJ, Sultan AA, Ludvigsson JF, West J. Risk of symptomatic venous thromboembolism following emergency appendectomy in adults. Br J Surg. 2016;103(4):443-450.	Nonexperimental	13,441 emergency appendectomy patients between 2001 and 2011/	n/a	n/a	VTE	The risk of symptomatic VTE following appendectomy is relatively high during the in-hospital admission and remains increased after discharge.	IIIA



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REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
159	Violette PD, Cartwright R, Briel M, Tikkinen KAO, Guyatt GH. Guideline of guidelines: thromboprophylaxis for urological surgery. <i>BJU Int.</i> 2016;118(3):351-358.	Literature Review	n/a	n/a	n/a	n/a	Recommendations for VTE prophylaxis for urological surgery.	VA
160	Tikkinen KAO, Agarwal A, Craigie S, et al. Systematic reviews of observational studies of risk of thrombosis and bleeding in urological surgery (ROTBUS): introduction and methodology. <i>Syst Rev.</i> 2014;3:150.	Systematic Review w/ Meta-Analysis	n/a	n/a	n/a	n/a	This series of systematic reviews fills the gap in knowledge by addressing the risks of VTE and bleeding requiring reoperation in patients undergoing urological surgery.	IIIB
161	Tyson MD, Castle EP, Humphreys MR, Andrews PE. Venous thromboembolism after urological surgery. <i>J Urol.</i> 2014;192(3):793-797.	Nonexperimental	82,808 urological surgery patients between 2005 and 2011 / ACS	n/a	n/a	VTE, Risk Factors	VTE risk factors: age greater than 60 years, functional status, history of disseminated cancer, congestive heart failure, anesthesia time greater than 120 minutes, chronic steroid use, cystectomy/urinary diversion, partial cystectomy, open radical	IIIA
162	Salmaggi A, Simonetti G, Trevisan E, et al. Perioperative thromboprophylaxis in patients with craniotomy for brain tumours: a systematic review. <i>J Neurooncol.</i> 2013;113(2):293-303.	Systematic Review w/ Meta-Analysis	13 RCTs	n/a	n/a	n/a	Overall data show a trend of reduction of VTE in patients undergoing craniotomy for brain tumors who were treated with mechanical methods (IPC or GCS).	IB
163	Harris DA, Lam S. Venous thromboembolism in the setting of pediatric traumatic brain injury. <i>J Neurosurg Pediatr.</i> 2014;13(4):448-455.	Nonexperimental	58,529 children with traumatic brain injury in 2009/ Healthcare	n/a	n/a	VTE, Risk Factors	VTE risk factors: older age, venous catheterization, nonaccidental trauma, increased length of hospital stay, orthopedic surgery, and cranial surgery.	IIIA

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164	Algattas H, Kimmell KT, Vates GE, Jahromi BS. Analysis of venous thromboembolism risk in patients undergoing craniotomy. <i>World Neurosurg.</i> 2015;84(5):1372-1379.	Nonexperimental	10,477 craniotomy patients between 2011 and 2012/ ACS NSQIP	n/a	n/a	VTE, Risk Factors	VTE risk factors: steroid use, ventilator use, time from admission to surgery >4 days, nonelective cases, BMI >30, age >60, African-American race, inpatient status, impaired sensorium, ASA class of 4 or greater, cumulative postoperative	IIIA
165	Kimmell KT, Jahromi BS. Clinical factors associated with venous thromboembolism risk in patients undergoing craniotomy. <i>J Neurosurg.</i> 2015;122(5):1004-1011.	Nonexperimental	4844 craniotomy patients/ ACS NSQIP database, US	n/a	n/a	VTE	Patients undergoing craniotomy are at low risk of developing VTE, but this risk is increased by preoperative medical comorbidities and postoperative complications. The presence of more of these clinical factors is associated with	IIIA
166	Sansone JM, del Rio AM, Anderson PA. The prevalence of and specific risk factors for venous thromboembolic disease following elective spine surgery. <i>J Bone Joint Surg Am.</i> 2010;92(2):304-313.	Systematic Review w/ Meta-Analysis	14 studies	n/a	n/a	n/a	The risk of deep venous thrombosis and pulmonary embolism is relatively low following elective spine surgery, particularly for patients who receive pharmacologic prophylaxis. Unfortunately, pharmacologic prophylaxis exposes patients to a greater	IIIA
167	Oglesby M, Fineberg SJ, Patel AA, Pelton MA, Singh K. The incidence and mortality of thromboembolic events in cervical spine surgery. <i>Spine.</i> 2013;38(9):E521-E527.	Nonexperimental	273,396 patients undergoing cervical procedures between 2002	n/a	n/a	VTE, Risk Factors	Thromboembolic events are potential complications of cervical spine surgery. The highest rates of VTE were identified in those patients undergoing posterior cervical fusion.	IIIA
168	Fineberg SJ, Oglesby M, Patel AA, Pelton MA, Singh K. The incidence and mortality of thromboembolic events in lumbar spine surgery. <i>Spine.</i> 2013;38(13):1154-1159.	Nonexperimental	578,457 lumbar surgery patients between 2002 and 2009/ Nationwide	n/a	n/a	VTE, Mortality	Patients undergoing lumbar decompression or fusion are at inherent risk of thromboembolic events. VTE are more common after lumbar fusion procedures.	IIIA

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REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
169	Schairer WW, Pedtke AC, Hu SS. Venous thromboembolism after spine surgery. Spine. 2014;39(11):911-918.	Nonexperimental	357,926 spine surgery patients/ state databases, US	n/a	n/a	VTE	Posterior cervical fusion had a higher rate of VTE than anterior cervical fusion, whereas anterior thoracolumbar and lumbosacral fusions had higher rates than the respective posterior approaches. Additional risk factors included patients receiving long spine	IIIA
170	Hohl JB, Lee JY, Rayappa SP, et al. Prevalence of venous thromboembolic events after elective major thoracolumbar degenerative spine surgery. J Spinal Disord Tech. 2015;28(5):E310-E315.	Nonexperimental	5766 thoracolumbar degenerative spine surgeries between 2000 and 2009/	n/a	n/a	VTE, Risk Factors	Patients with increasingly extensive surgery had a higher risk of PE, specifically those undergoing fusion of >5 segments.	IIIA
171	Cox JB, Weaver KJ, Neal DW, Jacob RP, Hoh DJ. Decreased incidence of venous thromboembolism after spine surgery with early multimodal prophylaxis: clinical article. J Neurosurg Spine. 2014;21(4):677-684.	Nonexperimental	1933 spine surgery patients/ Single center, US	n/a	n/a	VTE	Spinal disorders increase the risk for developing VTE because of multiple factors originating from both the underlying disease and associated comorbidities. Impaired mobility due to preexisting disability, pain, or neurological weakness leads to increased	IIIA
172	Jain A, Karas DJ, Skolasky RL, Sponseller PD. Thromboembolic complications in children after spinal fusion surgery. Spine. 2014;39(16):1325-1329.	Nonexperimental	21,955 children undergoing spinal fusion surgery between 2001	n/a	n/a	VTE	The incidence of thromboembolic complications in children was approximately 21 events per 10,000 spinal fusions. A higher incidence of VTE in children was associated with older age and certain diagnoses (congenital scoliosis, syndromic scoliosis/	IIIA
173	Barber EL, Neubauer NL, Gossett DR. Risk of venous thromboembolism in abdominal versus minimally invasive hysterectomy for benign conditions. Am J Obstet Gynecol. 2015;212(5):609.e1-609.e7.	Nonexperimental	44,167 hysterectomy patients between 2010 and 2012/ ACS NSQIP	n/a	n/a	VTE	A minimally invasive approach to hysterectomy was independently associated with a decreased incidence of VTE when compared with open hysterectomy.	IIIA

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REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
174	Buchberg B, Masoomi H, Lusby K, et al. Incidence and risk factors of venous thromboembolism in colorectal surgery: does laparoscopy impart an advantage? Arch Surg. 2011;146(6):739-743.	Nonexperimental	149,304 colorectal surgery patients between 2002 and 2006/	n/a	n/a	VTE	The incidence of VTE is lower after laparoscopic colorectal surgery than after open colorectal surgery.	IIIA
175	Shapiro R, Vogel JD, Kiran RP. Risk of postoperative venous thromboembolism after laparoscopic and open colorectal surgery: an additional benefit of the minimally invasive approach? Dis Colon Rectum. 2011;54(12):1496-1502.	Nonexperimental	31,109 colorectal surgery patients between 2005 and 2008/ ACS	n/a	n/a	VTE	The laparoscopic approach is associated with a lower venous thromboembolism rate in comparison with open surgery, despite controlling for other variables.	IIIA
176	Cui G, Wang X, Yao W, Li H. Incidence of postoperative venous thromboembolism after laparoscopic versus open colorectal cancer surgery: a meta-analysis. Surg Laparosc Endosc Percutan Tech. 2013;23(2):128-134.	Systematic Review w/ Meta-Analysis	11 RCTs	n/a	n/a	n/a	The combined results of the individual trials showed no statistically significant difference in the odds ratio for overall VTE, as well as in subgroups of deep vein thrombosis and anticoagulant prophylaxis between laparoscopic and open approaches	IA
177	Xie YZ, Fang K, Ma WL, Shi ZH, Ren XQ. Risk of postoperative deep venous thrombosis in patients with colorectal cancer treated with open or laparoscopic colorectal surgery: a meta-analysis. Indian J Cancer. 2015;51(Suppl 2):e42-e44.	Systematic Review w/ Meta-Analysis	9 RCTs	n/a	n/a	n/a	The operation time in laparoscopic colorectal cancer surgery was statistical longer than in the open colorectal cancer surgery, but the DVT risk of the two surgery approach was not different according to this meta-analysis	IB
178	Autorino R, Zargar H, Butler S, Laydner H, Kaouk JH. Incidence and risk factors for 30-day readmission in patients undergoing nephrectomy procedures: a contemporary analysis of 5276 cases from the national surgical quality improvement program database. Urology. 2015;85(4):843-849.	Nonexperimental	5276 nephrectomy patients between 2011 and 2012/ ACS NSQIP	n/a	n/a	Readmissions	VTE or thrombophlebitis was one of the predictors of 30-day readmission after nephrectomy.	IIIA

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179	Saad AN, Parina R, Chang D, Gosman AA. Risk of adverse outcomes when plastic surgery procedures are combined. <i>Plast Reconstr Surg.</i> 2014;134(6):1415-1422.	Nonexperimental	477,741 abdominoplasty patients between 2005 and 2010/ California	n/a	n/a	VTE	Some combinations of elective outpatient procedures conferred an additive, and sometimes more than additive, venous thromboembolism risk.	IIIA
180	Fischer JP, Wes AM, Tuggle CT, Wu LC. Venous thromboembolism risk in mastectomy and immediate breast reconstruction: analysis of the 2005 to 2011 American College of Surgeons National Surgical Quality Improvement Program data sets. <i>Plast Reconstr Surg.</i> 2014;133(3):263e-273e	Nonexperimental	48,634 mastectomy patients between 2005 and 2011/ ACS NSQIP	n/a	n/a	VTE	Immediate breast reconstruction is associated with an added risk of venous thromboembolism relative to mastectomy, but this risk is procedure and body mass index dependent.	IIIA
181	Tran BH, Nguyen TJ, Hwang BH, et al. Risk factors associated with venous thromboembolism in 49,028 mastectomy patients. <i>Breast.</i> 2013;22(4):444-448.	Nonexperimental	49,028 mastectomy patients between 2005 and 2009/ ACS NSQIP	n/a	n/a	VTE	VTE risk factors: obesity, inpatient status, venous catheterization, prolonged operative time >3 h, immediate reconstruction.	IIIA
182	Elboudwarej O, Patel JK, Liou F, et al. Risk of deep vein thrombosis and pulmonary embolism after heart transplantation: clinical outcomes comparing upper extremity deep vein thrombosis and lower extremity deep vein thrombosis. <i>Clin Transplant.</i> 2015;29(7):629-635	Nonexperimental	1258 heart transplant patients between 1994 and 2011/ Single center	n/a	n/a	VTE	Heart transplant patients have a high incidence of VTE despite current best practice, indicating a need for a more aggressive approach to thromboprophylaxis.	IIIA
183	Annamalai A, Kim I, Sundaram V, Klein A. Incidence and risk factors of deep vein thrombosis after liver transplantation. <i>Transplant Proc.</i> 2014;46(10):3564-3569.	Nonexperimental	314 liver transplant patients between 2005 and 2012/ Single center	n/a	n/a	VTE	The risk of developing a DVT after liver transplant was 9% even with mechanical DVT prophylaxis. Patients with mobility difficulty and use of factor VII were at higher risk.	IIIA

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184	Cherian TP, Chiu K, Gunson B, et al. Pulmonary thromboembolism in liver transplantation: a retrospective review of the first 25 years. <i>Transplant Int.</i> 2010;23(11):1113-1119.	Nonexperimental	3000 liver transplant patients between 1982 and 2007/ Single center	n/a	n/a	PE	Acute PE in the setting of open liver transplant has an incidence rate (0.37%) in our series that appears to be lower than one would expect after a 'major complex' category operation.	IIIA
185	Emuakhagbon V, Philips P, Agopian V, Kaldas FM, Jones CM. Incidence and risk factors for deep venous thrombosis and pulmonary embolus after liver transplantation. <i>Am J Surg.</i> 2016;211(4):768-771.	Nonexperimental	867 liver transplant patients between 2006 and 2013/ Single center	n/a	n/a	VTE, Risk Factors	Patients were more likely to develop VTE if they received increased amounts of intraoperative cryoprecipitate/ fresh frozen plasma or had an elevated postoperative INR. Furthermore, patients with a complicated postoperative course have the	IIIA
186	Alvarez-Alvarez RJ, Barge-Caballero E, Chavez-Leal SA, et al. Venous thromboembolism in heart transplant recipients: incidence, recurrence and predisposing factors. <i>J Heart Lung Transplant.</i> 2015;34(2):167-174.	Nonexperimental	635 heart transplant patients between 1991 and 2013/ Single center	n/a	n/a	VTE	VTE is a frequent complication after heart transplant, mainly during the first post-operative year. In view of a high recurrence rate, long-term anti-coagulation should be considered in HT recipients who experience a first VTE episode	IIIA
187	Abualhassan N, Aljiffry M, Thalib L, Coussa R, Metrakos P, Hassanain M. Post-transplant venous thromboembolic events and their effect on graft survival. <i>Saudi J Kidney Dis Transpl.</i> 2015;26(1):1-5.	Nonexperimental	1596 kidney transplant patients between 1985 and 2010/ Saudi Arabia	n/a	n/a	VTE, graft survival	VTEs in kidney transplant recipients was 1.6%. Although it did not reach statistical significance, it increased the risk of graft failure by 30%.	IIIB
188	Salami A, Qureshi W, Kuriakose P, Moonka D, Yoshida A, Abouljoud M. Frequency and predictors of venous thromboembolism in orthotopic liver transplant recipients: a single-center retrospective review. <i>Transplant Proc.</i> 2013;45(1):315-319.	Nonexperimental	917 liver transplant patients between 1995 and 2010/ Single center	n/a	n/a	VTE	The 4.58% incidence of VTE is comparable with the reported incidence after major abdominal procedures (5%–10%).	IIIB

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189	Verhave JC, Tagalakis V, Suissa S, Madore F, Hebert M, Cardinal H. The risk of thromboembolic events in kidney transplant patients. <i>Kidney Int.</i> 2014;85(6):1454-1460.	Nonexperimental	913 kidney transplant patients/ Single center, Canada	n/a	n/a	VTE	VTE risk in kidney transplant recipients was eightfold higher than in the general population but not fully explained by the increased risk associated with hospitalization.	IIIB
190	Ooi CY, Brandao LR, Zolpys L, et al. Thrombotic events after pediatric liver transplantation. <i>Pediatr Transplant.</i> 2010;14(4):476-482.	Nonexperimental	88 children with liver transplants between 2002 and 2007/ Canada	n/a	n/a	VTE	The incidence of early thrombotic events post-pediatric liver transplant was 16%, including DVT in 8%.	IIIB
191	Saez-Gimenez B, Berastegui C, Loor K, et al. Deep vein thrombosis and pulmonary embolism after solid organ transplantation: an unresolved problem. <i>Transplant Rev.</i> 2015;29(2):85-92.	Literature Review	n/a	n/a	n/a	n/a	Patients undergoing organ transplant surgery are at risk for VTE.	VB
192	Arshad F, Lisman T, Porte RJ. Hypercoagulability as a contributor to thrombotic complications in the liver transplant recipient. <i>Liver Int.</i> 2013;33(6):820-827.	Expert Opinion	n/a	n/a	n/a	n/a	Liver transplant patients are hypercoagulable and at risk for VTE.	VB
193	Fleischer AE, Abicht BP, Baker JR, Boffeli TJ, Jupiter DC, Schade VL. American College of Foot and Ankle Surgeons' clinical consensus statement: risk, prevention, and diagnosis of venous thromboembolism disease in foot and ankle surgery and injuries requiring immobilization. <i>J Foot Ankle</i>	Consensus	n/a	n/a	n/a	n/a	Guidance for VTE prevention after foot and ankle surgery. Routine chemical prophylaxis is not warranted. Patients should be treated according to individual risk level, considering addressing modifiable risk factors, use of mechanical prophylaxis, early mobilization	IVB

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REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
194	Calder JDF, Freeman R, Domeij-Arverud E, van Dijk CN, Ackermann PW. Meta-analysis and suggested guidelines for prevention of venous thromboembolism (VTE) in foot and ankle surgery. <i>Knee Surg Sports Traumatol Arthrosc.</i> 2016;24(4):1409-1420.	Systematic Review w/ Meta-Analysis	22 studies	n/a	n/a	n/a	Isolated foot and ankle surgery has a lower incidence of clinically apparent VTE when compared to general lower limb procedures. The incidence of VTE following Achilles tendon rupture is high whether treated surgically or conservatively.	IIIA
195	Mangwani J, Sheikh N, Cichero M, Williamson D. What is the evidence for chemical thromboprophylaxis in foot and ankle surgery? Systematic review of the English literature. <i>Foot.</i> 2015;25(3):173-178.	Systematic Review	25 studies	n/a	n/a	n/a	The overall incidence of symptomatic VTE in foot and ankle surgery is low. There is increased incidence in foot and ankle trauma patients with the highest incidence reported in tendo-achilles surgery.	IIIB
196	Barg A, Henninger HB, Hintermann B. Risk factors for symptomatic deep-vein thrombosis in patients after total ankle replacement who received routine chemical thromboprophylaxis. <i>J Bone Joint Surg Br.</i> 2011;93(7):921-927.	Nonexperimental	665 patients undergoing total ankle replacement/ Switzerland	n/a	n/a	DVT	The incidence of symptomatic DVT after total ankle replacement and use of low molecular-weight heparin is comparable with that in patients undergoing total knee or hip replacement.	IIIA
197	Basques BA, Miller CP, Golinvaux NS, Bohl DD, Grauer JN. Risk factors for thromboembolic events after surgery for ankle fractures. <i>Am J Orthop (Belle Mead NJ).</i> 2015;44(7):E220-E224.	Nonexperimental	4412 ankle fracture patients between 2005 and 2012/ ACS NSQIP	n/a	n/a	VTE	BMI of 30 to 35, BMI of 35 kg/m <sup>2</sup> or higher, heart disease, and dependent functional status were independently associated with occurrence of VTE after ankle fracture ORIF.	IIIA
198	Altintas F, Ozler T, Guven M, Ozkut AT, Ulucay C. Deep venous thrombosis and pulmonary embolism as rare complications after hallux valgus surgery: case report and literature review. <i>J Am Podiatr Med Assoc.</i> 2013;103(2):145-148.	Case Report	n/a	n/a	n/a	n/a	Patient developed VTE after hallux valgus surgery despite mechanical prophylaxis and early mobilization.	VB



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199	Kadous A, Abdelgawad AA, Kanlic E. Deep venous thrombosis and pulmonary embolism after surgical treatment of ankle fractures: a case report and review of literature. <i>J Foot Ankle Surg.</i> 2012;51(4):457-463.	Case Report	n/a	n/a	n/a	n/a	Patient developed VTE after ankle fracture surgery.	VB
200	Makhdom AM, Garceau S, Dimentberg R. Fatal pulmonary embolism following Achilles tendon repair: a case report and a review of the literature. <i>Case Rep Orthop.</i> 2013;2013:401968.	Case Report	n/a	n/a	n/a	n/a	Patient died from VTE after ruptured Achilles tendon repair.	VB
201	Roberts DC, Warwick DJ. Venous thromboembolism following elbow, wrist and hand surgery: a review of the literature and prophylaxis guidelines. <i>J Hand Surg Br.</i> 2014;39(3):306-312.	Literature Review	n/a	n/a	n/a	n/a	Recommendations for VTE prophylaxis for elbow, hand, and wrist surgery.	VA
202	Mathur M, Shafi I, Alkhouli M, Bashir R. Surgical hardware-related iatrogenic venous compression syndrome. <i>Vasc Med.</i> 2015;20(2):162-167.	Case Report	n/a	n/a	n/a	n/a	Two patients developed VTE as a result of iatrogenic venous compression syndrome from hardware implanted in spine.	VA
203	Pannucci CJ, MacDonald JK, Ariyan S, et al. Benefits and risks of prophylaxis for deep venous thrombosis and pulmonary embolus in plastic surgery: a systematic review and meta-analysis of controlled trials and consensus conference. <i>Plast Reconstr Surg.</i> 2016;137(2):709-730	Systematic Review w/ Meta-Analysis	27 studies	n/a	n/a	n/a	The consensus panel recommended that all plastic and reconstructive surgery patients should be risk-stratified for perioperative venous thromboembolism risk using a 2005 Caprini score.	IIIA

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204	Zareba P, Wu C, Agzarian J, Rodriguez D, Kearon C. Meta-analysis of randomized trials comparing combined compression and anticoagulation with either modality alone for prevention of venous thromboembolism after surgery. <i>Br J Surg.</i> 2014;101(9):1053-1062.	Systematic Review w/ Meta-Analysis	25 studies	n/a	n/a	n/a	Combined compression and anticoagulation is more effective at preventing postoperative DVT than either modality alone.	IA
205	Gustafsson UO, Scott MJ, Schwenk W, et al. Guidelines for perioperative care in elective colonic surgery: Enhanced Recovery After Surgery (ERAS®) Society recommendations. <i>Clin Nutr.</i> 2012;31(6):783-800 18p.	Guideline	n/a	n/a	n/a	n/a	Provides guidance based on ERAS protocols, including VTE prophylaxis, for patients undergoing elective colon surgery.	IVA
206	Nelson G, Altman AD, Nick A, et al. Guidelines for postoperative care in gynecologic/oncology surgery: Enhanced Recovery After Surgery (ERAS®) Society recommendations—part II. <i>Gynecol Oncol.</i> 2016;140(2):323-332.	Guideline	n/a	n/a	n/a	n/a	Provides guidance based on ERAS protocols, including VTE prophylaxis, for patients undergoing gynecologic/oncology surgery.	IVA
207	Nygren J, Thacker J, Carli F, et al. Guidelines for perioperative care in elective rectal/pelvic surgery: Enhanced Recovery After Surgery (ERAS®) Society recommendations. <i>Clin Nutr.</i> 2012;31(6):801-816.	Guideline	n/a	n/a	n/a	n/a	Provides guidance based on ERAS protocols, including VTE prophylaxis, for patients undergoing elective rectal/pelvic surgery.	IVA
208	Skillman J, Thomas S. An audit of pressure sores caused by intermittent compression devices used to prevent venous thromboembolism. <i>J Perioper Pract.</i> 2011;21(12):418-420.	Organizational Experience	n/a	n/a	n/a	n/a	Use of intermittent pneumatic compression devices can lead to the patient developing pressure injuries. Care should be taken to avoid injury, especially with prolonged use near bony prominences.	VB

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209	Huh J, Cho YB, Yang MK, Yoo YK, Kim DK. What influence does intermittent pneumatic compression of the lower limbs intraoperatively have on core hypothermia? Surg Endosc. 2013;27(6):2087-2093.	RCT	56 patients/Korea	Calf length IPC	No IPC	Esophageal temperature	Temperatures dropped significantly for patients wearing calf- or thigh-length sequential compression devices compared to patients not wearing the devices. The researchers recommended temperature monitoring and active warming methods.	IC
210	Boelig MM, Streiff MB, Hobson DB, Kraus PS, Pronovost PJ, Haut ER. Are sequential compression devices commonly associated with in-hospital falls? A myth-busters review using the patient safety net database. J Patient Saf. 2011;7(2):77-79.	Nonexperimental	3562 patient falls between 2004 and 2009/ Single center, US	n/a	n/a	SCD use	Sequential compression device use is rarely associated with in-hospital patient falls, and SCD-related falls are not more harmful than other types of falls.	IIIA
211	Eppsteiner RW, Shin JJ, Johnson J, van Dam RM. Mechanical compression versus subcutaneous heparin therapy in postoperative and posttrauma patients: a systematic review and meta-analysis. World J Surg. 2010;34(1):10-19.	Systematic Review w/ Meta-Analysis	16 studies	n/a	n/a	n/a	These results suggest that the overall bleeding risk profile favors the use of compression over heparin, with the benefits in term of venous thromboembolic disease prophylaxis being similar between groups.	IA
212	Pavon JM, Adam SS, Razouki ZA, et al. Effectiveness of intermittent pneumatic compression devices for venous thromboembolism prophylaxis in high-risk surgical patients: a systematic review. J Arthroplasty. 2016;31(2):524-532.	Systematic Review w/ Meta-Analysis	17 studies	n/a	n/a	n/a	Intermittent pneumatic compression devices are appropriate for VTE thromboprophylaxis when used in accordance with current clinical guidelines. The current evidence base to guide selection of a specific device or type of device is limited.	IIIA
213	Arverud E, Azevedo J, Labruto F, Ackermann PW. Adjuvant compression therapy in orthopaedic surgery-an evidence-based review. Eur Orthop Traumatol. 2013;4(1):49-57.	Literature Review	n/a	n/a	n/a	n/a	Review of mechanical VTE prophylaxis use for orthopedic surgery and mechanism of action for intermittent pneumatic compression devices.	VB

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214	Feng JP, Xiong YT, Fan ZQ, Yan LJ, Wang JY, Gu ZJ. Efficacy of intermittent pneumatic compression for venous thromboembolism prophylaxis in patients undergoing gynecologic surgery: a systematic review and meta-analysis. <i>Oncotarget</i> . 2017;8(12):20371-20379.	Systematic Review w/ Meta-Analysis	7 studies	n/a	n/a	n/a	IPC is effective in reducing DVT complications in gynecologic surgery. IPC is neither superior nor inferior to pharmacological thromboprophylaxis. However, whether combination of IPC and chemoprophylaxis is more effective than IPC	IIIB
215	O'Connell S, Bashar K, Broderick BJ, et al. The use of intermittent pneumatic compression in orthopedic and neurosurgical postoperative patients. A systematic review and meta-analysis. <i>Ann Surg</i> . 2016;263(5):888-899.	Systematic Review w/ Meta-Analysis	9 studies	n/a	n/a	n/a	In the absence of large randomized multicenter trials comparing the use of intermittent pneumatic compression or chemoprophylaxis alone to a combination of both treatments, the current evidence supports the use of a combined approach in	IIIA
216	Sadaghianloo N, Dardik A. The efficacy of intermittent pneumatic compression in the prevention of lower extremity deep venous thrombosis. <i>J Vasc Surg</i> . 2016;4(2):248-256.	Systematic Review	61 articles	n/a	n/a	n/a	In high-risk patients, IPC is recommended as a synergistic tool in combination with pharmacologic agents. No specific compression modality proved its superiority, although newer portable battery-powered devices seem to allow better patient	IIIB
217	Kakkos SK, Warwick D, Nicolaidis AN, Stansby GP, Tsolakis IA. Combined (mechanical and pharmacological) modalities for the prevention of venous thromboembolism in joint replacement surgery. <i>J Bone Joint Surg Br</i> . 2012;94(6):729-734.	Systematic Review w/ Meta-Analysis	6 studies	n/a	n/a	n/a	Addition of intermittent mechanical leg compression augments the efficacy of anticoagulation in preventing DVT in patients undergoing both knee and hip replacement.	IIB
218	Sobieraj DM, Coleman CI, Tongbram V, et al. Comparative effectiveness of combined pharmacologic and mechanical thromboprophylaxis versus either method alone in major orthopedic surgery: a systematic review and meta-analysis. <i>Pharmacotherapy</i> . 2013;33(3):275-283.	Systematic Review w/ Meta-Analysis	6 studies	n/a	n/a	n/a	The risk of DVT was reduced with the use of combination prophylaxis rather than pharmacologic prophylaxis alone in patients undergoing total hip or knee replacement.	IIB

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REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
219	Parry K, Sadeghi A, van der Horst S, Westerink J, Ruurda JP, van Hillegersberg R. Intermittent pneumatic compression in combination with low-molecular weight heparin in the prevention of venous thromboembolic events in esophageal cancer surgery. <i>J Surg Oncol</i> . 2017;115(2):181-185.	Nonexperimental	332 esophagectomy cancer patients between 2006 and 2014/	n/a	n/a	IPC use, length of stay, VTE	The addition of IPC in patients undergoing esophagectomy for cancer was associated with a reduction in symptomatic VTE's.	IIIB
220	Delos Reyes AP, Partsch H, Mosti G, Obi A, Lurie F. Report from the 2013 meeting of the international compression club on advances and challenges of compression therapy. <i>J Vasc Surg Venous Lymphat Disord</i> . 2014;2(4):469-476.	Expert Opinion	n/a	n/a	n/a	n/a	Recommendations for compression therapy, including mechanical VTE prophylaxis. Elastic bandages should not be used for compression therapy due to inability to control compression pressures.	VA
221	Larkin BG, Mitchell KM, Petrie K. Translating evidence to practice for mechanical venous thromboembolism prophylaxis. <i>AORN J</i> . 2012;96(5):513-527.	Literature Review	n/a	n/a	n/a	n/a	Review of VTE formation and mechanical prophylaxis, includes an organizational implementation experience.	VB
222	Committee opinion no 610: chronic antithrombotic therapy and gynecologic surgery. <i>Obstet Gynecol</i> . 2014;124(4):856-862.	Guideline	n/a	n/a	n/a	n/a	Provides guidance on care of gynecologic patients on chronic antithrombotic therapy.	IVC
223	Rahn DD, Mamik MM, Sanses TVD, et al. Venous thromboembolism prophylaxis in gynecologic surgery: a systematic review. <i>Obstet Gynecol</i> . 2011;118(5):1111-1125.	Systematic Review	23 studies	n/a	n/a	n/a	Intermittent pneumatic compression provides sufficient prophylaxis for the majority of gynecology patients undergoing benign surgery. Additional risk factors warrant the use of combined mechanical and pharmacologic prophylaxis.	IIIA

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REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
224	Gao J, Zhang Z, Li Z, et al. Two mechanical methods for thromboembolism prophylaxis after gynaecological pelvic surgery: a prospective, randomised study. <i>Chin Med J (Engl)</i> . 2012;125(23):4259-4263.	RCT	108 high-risk patients undergoing gynecological pelvic surgery/ China	IPC + GCS	GCS	VTE	The combination of intermittent pneumatic compression and graduated compression stockings significantly reduced VTE rates compared with use of graduated compression stockings alone.	IB
225	Morris RJ, Woodcock JP. Intermittent pneumatic compression or graduated compression stockings for deep vein thrombosis prophylaxis? A systematic review of direct clinical comparisons. <i>Ann Surg</i> . 2010;251(3):393-396.	Systematic Review	10 studies	n/a	n/a	n/a	There is only weak evidence to show a difference in performance between IPC and GCS, however, given the many influential factors, caution should be taken in assuming equivalence.	IIIB
226	Zhao JM, He ML, Xiao ZM, Li TS, Wu H, Jiang H. Different types of intermittent pneumatic compression devices for preventing venous thromboembolism in patients after total hip replacement. <i>Cochrane Database Syst Rev</i> . 2012;11:CD009543	Systematic Review w/ Meta-Analysis	1 study	n/a	n/a	n/a	Only one study in the systematic review compared various lengths of pneumatic compression devices; this study found that calf-length pneumatic compression was more effective than plantar compression for reduction of thigh swelling, although no	IIC
227	Pour AE, Keshavarzi NR, Purtill JJ, Sharkey PF, Parvizi J. Is venous foot pump effective in prevention of thromboembolic disease after joint arthroplasty: a meta-analysis. <i>J Arthroplasty</i> . 2013;28(3):410-417.	Systematic Review w/ Meta-Analysis	13 studies	n/a	n/a	n/a	The use of mechanical devices like venous calf or foot pump, either alone or in combination with less potent chemical prophylaxis, on the other hand can reduce the rate of venous thromboembolism and complications of potent chemoprophylaxis	IIA
228	Dohm M, Williams KM, Novotny T. Micro-mobile foot compression device compared with pneumatic compression device. <i>Clin Orthop Relat Res</i> . 2011;469(6):1692-1700.	RCT	60 healthy subjects/ US	Novel foot pump	Established foot pump system	Venous velocity	The established foot pump tended to be associated with greater peak velocities; the novel device produced more consistent mean peak venous velocities and may be more acceptable to patients and caregivers.	IB

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229	Pitto RP, Koh CK. Flowtron foot-pumps for prevention of venous thromboembolism in total hip and knee replacement. <i>J Orthop.</i> 2015;12(1):35-38.	Nonexperimental	424 total hip and knee arthroplasty patients using Flowtron foot pump/ Single	n/a	n/a	VTE	Thromboembolism prophylaxis after total hip and knee replacement using Flowtron® foot-pumps as main prevention tool of an individualized protocol appears effective and safe.	IIIA
230	Sakai T, Izumi M, Kumagai K, et al. Effects of a foot pump on the incidence of deep vein thrombosis after total knee arthroplasty in patients given edoxaban: a randomized controlled study. <i>Medicine.</i> 2016;95(1):e2247.	RCT	120 patients undergoing total knee arthroplasty and edoxaban therapy/ Japan	Foot pump	No foot pump	DVT (ultrasound), PE	The A-V Impulse system foot pump did not affect the incidence of DVT under edoxaban thromboprophylaxis in patients undergoing TKA.	IB
231	Wickham N, Gallus AS, Walters BNJ, Wilson A; NHMRC VTE Prevention Guideline Adaptation Committee. Prevention of venous thromboembolism in patients admitted to Australian hospitals: summary of National Health and Medical Research Council clinical practice guideline. <i>Intern Med J</i>	Guideline	n/a	n/a	n/a	n/a	Australian guidelines for VTE prophylaxis in patients admitted to the hospital.	IVA
232	Hou H, Yao Y, Zheng K, et al. Does intermittent pneumatic compression increase the risk of pulmonary embolism in deep venous thrombosis after joint surgery? <i>Blood Coagul Fibrinolysis.</i> 2016;27(3):246-251.	Nonexperimental	144 patients with DVT undergoing joint surgery/ China	n/a	n/a	DVT	Early postoperative application of intermittent pneumatic compression was safe in these patients.	IIIB
233	Guideline for prevention of unplanned patient hypothermia. In: <i>Guidelines for Perioperative Practice.</i> Denver, CO: AORN, Inc; 2017:567-590.	Guideline	n/a	n/a	n/a	n/a	Provides guidance for prevention of unplanned patient hypothermia.	IVA

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234	Guideline for sterile technique. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2017:75-104.	Guideline	n/a	n/a	n/a	n/a	Provides guidance for sterile technique.	IVA
235	Levy YD, Hardwick ME, Copp SN, Rosen AS, Colwell CWJ. Thrombosis incidence in unilateral vs simultaneous bilateral total knee arthroplasty with compression device prophylaxis. J Arthroplasty. 2013;28(3):474-478.	Nonexperimental	55 patients undergoing bilateral total knee arthroplasty and 287	n/a	n/a	VTE	Patients undergoing simultaneous bilateral TKA yielded more than twice the rate of VTE compared with patients undergoing unilateral TKA using a mobile compression device as sole thromboprophylaxis modality.	IIIB
236	Morris JK, Fincham BM. Intermittent pneumatic compression for venous thromboembolism prophylaxis in total knee arthroplasty. Orthopedics. 2012;35(12):e1716-e1721.	Quasi-experimental	157 patients undergoing total knee arthroplasty/ US	VTE protocol, including bilateral intra- and postoperative intermittent pneumatic	n/a	VTE	The results of this study support the use of a multimodal approach to VTE prophylaxis in TKA without the use of major anticoagulation. High compliance of IPC use intra and postoperatively is necessary.	IIB
237	Guideline for minimally invasive surgery. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2017:629-658.	Guideline	n/a	n/a	n/a	n/a	Provides guidance for care of the patient undergoing minimally invasive surgery.	IVA
238	Frisius J, Ebeling M, Karst M, et al. Prevention of venous thromboembolic complications with and without intermittent pneumatic compression in neurosurgical cranial procedures using intraoperative magnetic resonance imaging. A retrospective analysis. Clin Neurol Neurosurg	Nonexperimental	207 neurosurgical patients using intraoperative MRI/ Germany	n/a	n/a	DVT	The development of deep venous thrombosis was reduced from 9.9% to 3.5% in our patients with the additional use of intraoperative and postoperative pneumatic compression.	IIIB



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239	Maybody M, Taslakian B, Durack JC, et al. Feasibility of intermittent pneumatic compression for venous thromboembolism prophylaxis during magnetic resonance imaging-guided interventions. <i>Eur J Radiol.</i> 2015;84(4):668-670.	Nonexperimental	38 patients undergoing MR-guided ablations/ Single center, US	n/a	n/a	SCD device function	The sleeves and tubing of an intermittent compression device were MRI safe, although the control unit was not MRI safe. To comply with MRI safety requirements, the control unit was placed in the MRI control room and connected to the sleeves using extended	IIIB
240	Ritsema DF, Watson JM, Stiteler AP, Nguyen MM. Sequential compression devices in postoperative urologic patients: an observational trial and survey study on the influence of patient and hospital factors on compliance. <i>BMC Urol.</i> 2013;13:20.	Nonexperimental	100 urologic surgery inpatients/ Single center, US	n/a	n/a	SCD compliance	Patient self-reported bother with SCD devices was low. Hospital factors, including SCD machine availability and timely restarting of devices by nursing staff when a patient returns to bed, played a greater role in SCD non-compliance than patient factors	IIIB
241	Obi AT, Alvarez R, Reames BN, et al. A prospective evaluation of standard versus battery-powered sequential compression devices in postsurgical patients. <i>Am J Surg.</i> 2015;209(4):675-681.	RCT	67 general and orthopedic surgery patients/ US	Battery-powered ICS	Stationary ICS that must be plugged into electrical outlet	Patient compliance	Use of portable, battery-operated intermittent pneumatic compression devices significantly increased patient compliance compared to use of stationary devices.	IB
242	Sobieraj-Teague M, Hirsh J, Yip G, et al. Randomized controlled trial of a new portable calf compression device (Venowave) for prevention of venous thrombosis in high-risk neurosurgical patients. <i>J Thromb Haemost.</i> 2012;10(2):229-235.	RCT	75 patients undergoing neurosurgery/ Canada	New portable calf compression device	No device	VTE	Venowave devices are effective in preventing VTE in high-risk neurosurgical patients.	IB
243	Colwell CWJ, Froimson MI, Anseth SD, et al. A mobile compression device for thrombosis prevention in hip and knee arthroplasty. <i>J Bone Joint Surg Am.</i> 2014;96(3):177-183.	Quasi-experimental	3060 patients undergoing total hip or knee arthroplasty/ US	Mobile compression device	Use of device with or without aspirin	VTE	Use of the mobile compression device with or without aspirin for patients undergoing arthroplasty of a lower-extremity joint provides a noninferior risk for the development of venous thromboembolism compared with current pharmacological	IIA

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244	Haynes J, Barrack RL, Nam D. Mobile pump deep vein thrombosis prophylaxis: just say no to drugs. <i>Bone Joint J.</i> 2017;99-B(1 Suppl A):8-13.	Nonexperimental	Phase 1: 1502 patients, Phase 2: 1641 patients undergoing total hip or	n/a	n/a	VTE, complications, bleeding	Mobile compression devices were effective in reducing the incidence of symptomatic VTE and had high patient compliance.	IIIB
245	Nam D, Nunley RM, Johnson SR, Keeney JA, Barrack RL. Mobile compression devices and aspirin for VTE prophylaxis following simultaneous bilateral total knee arthroplasty. <i>J Arthroplasty.</i> 2015;30(3):447-450.	Nonexperimental	96 total knee arthroplasty patients/ Single center, US	n/a	n/a	VTE	In appropriately selected patients, mobile compression devices with aspirin shows promise in VTE prevention following simultaneous bilateral total knee arthroplasty.	IIIB
246	Hardwick ME, Pulido PA, Colwell CWJ. A mobile compression device compared with low-molecular-weight heparin for prevention of venous thromboembolism in total hip arthroplasty. <i>Orthop Nurs.</i> 2011;30(5):312-316.	RCT	219 patients undergoing abdominal- pelvic surgeries/ Turkey	(1) low-pressure (ie, 15 mmHg to 18 mmHg), knee-length stockings	(2) low-pressure, thigh-length stockings  (3) moderate-pressure (20	DVT (duplex ultrasonography)	Patients who wore low-pressure (ie, 15 mmHg to 18 mmHg), knee-length stockings were more satisfied and had fewer problems than those in comparison groups. No patients in the study had experienced DVT.	IA
247	Craigie S, Tsui JF, Agarwal A, Sandset PM, Guyatt GH, Tikkinen KAO. Adherence to mechanical thromboprophylaxis after surgery: a systematic review and meta-analysis. <i>Thromb Res.</i> 2015;136(4):723-726.	Systematic Review w/ Meta-Analysis	8 studies	n/a	n/a	n/a	As many as 25% of hospitalized surgical patients were not compliant with wearing mechanical prophylaxis.	IIIA
248	Kim JH, Kim WI, Kim JY, Choe WJ. Peroneal nerve palsy after compression stockings application. <i>Saudi J Anaesth.</i> 2016;10(4):462-464.	Case Report	n/a	n/a	n/a	n/a	Cardiac surgery patient wearing knee high stocking developed foot drop and peroneal nerve palsy 24 hours postoperatively.	VB

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249	Guzelkucuk U, Skempes D, Kumnerdee W. Common peroneal nerve palsy caused by compression stockings after surgery. Am J Phys Med Rehabil. 2014;93(7):609-611.	Case Report	n/a	n/a	n/a	n/a	Patient who underwent surgery to remove post auricular skin cancer developed foot drop and peroneal nerve palsy on the third postoperative day after thigh-length stockings rolled down.	VB
250	Hinderland MD, Ng A, Paden MH, Stone PA. Lateral leg compartment syndrome caused by ill-fitting compression stocking placed for deep vein thrombosis prophylaxis during surgery: a case report. J Foot Ankle Surg. 2011;50(5):616-619.	Case Report	n/a	n/a	n/a	n/a	Patient developed lateral leg compartment syndrome after ankle surgery in a patient's nonoperative extremity. The authors attributed the compartment syndrome to a graduated compression stocking that was a size too small. The patient complained of	VB
251	Thompson A, Walter S, Brunton LR, et al. Anti-embolism stockings and proximal indentation. Br J Nurs. 2011;20(22):1426-1430.	Nonexperimental	57 total hip and knee arthroplasty patients/ Single center, UK	n/a	n/a	Proximal indentation, stocking sizes and patient compliance	The standardized protocol significantly improved correct sizing of stockings, reduced the proportion of patients with proximal indentation from stockings, reduced the number of patients with reverse gradients, and improved patient compliance	IIIB
252	Bowling K, Ratcliffe C, Townsend J, Kirkpatrick U. Clinical thromboembolic deterrent stockings application: Are thromboembolic deterrent stockings in practice matching manufacturers application guidelines. Phlebology. 2015;30(3):200-203	Nonexperimental	100 legs/ Single center, UK	n/a	n/a	Compliance with manufacturer's instructions for stockings and NICE	About 20% of stockings were worn incorrectly by patients. Stocking remeasurement was not taking place according to recommendations from NICE. Only 14% of stockings worn by patients had gradation in accordance with the	IIIB
253	Sachdeva A, Dalton M, Amaragiri SV, Lees T. Graduated compression stockings for prevention of deep vein thrombosis. Cochrane Database Syst Rev. 2014;(12):CD001484.	Systematic Review w/ Meta-Analysis	19 RCTs	n/a	n/a	n/a	Graduated compression stockings were effective in reducing the risk for VTE in hospitalized surgical patients, although the included research was conducted primarily with patients undergoing general and orthopedic surgery	IA

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254	Mandavia R, Shalhoub J, Head K, Davies AH. The additional benefit of graduated compression stockings to pharmacologic thromboprophylaxis in the prevention of venous thromboembolism in surgical inpatients. <i>J Vasc Surg Venous Lymphat Disord.</i> 2015;3(4):447-455. e1.	Systematic Review w/ Meta-Analysis	27 RCTs	n/a	n/a	n/a	No clear benefit of graduated compression stockings in addition to pharmaceutical prophylaxis in surgical inpatients when compared to patients receiving only pharmaceutical prophylaxis.	IB
255	Sajid MS, Desai M, Morris RW, Hamilton G. Knee length versus thigh length graduated compression stockings for prevention of deep vein thrombosis in postoperative surgical patients. <i>Cochrane Database Syst Rev.</i> 2012;(5):CD007162.	Systematic Review w/ Meta-Analysis	3 RCTs	n/a	n/a	n/a	This review found that there is insufficient high quality evidence to determine whether or not knee length and thigh length GCS differ in their effectiveness in terms of reducing the incidence of DVT in hospitalized patients.	IB
256	Wade R, Paton F, Rice S, et al. Thigh length versus knee length antiembolism stockings for the prevention of deep vein thrombosis in postoperative surgical patients; a systematic review and network meta-analysis. <i>BMJ Open.</i> 2016;6(2):e009456.	Systematic Review w/ Meta-Analysis	23 RCTs	n/a	n/a	n/a	Thigh length stockings may be more effective than knee length stockings, but results did not reach statistical significance and the evidence base is weak. While thigh length stockings appear to have superior efficacy, practical issues such as patient	IA
257	Wade R, Sideris E, Paton F, et al. Graduated compression stockings for the prevention of deep-vein thrombosis in postoperative surgical patients: a systematic review and economic model with a value of information analysis. <i>Health Technol Assess.</i> 2015;19(98):1-220.	Systematic Review w/ Meta-Analysis	23 RCTs	n/a	n/a	n/a	The evidence base for knee-length versus thigh-length GCSs when used in combination with pharmacological prophylaxis (heparin) is weak and subject to considerable heterogeneity. Studies of patient adherence and preference found that the results favor	IA
258	Loomba RS, Arora RR, Chandrasekar S, Shah PH. Thigh-length versus knee-length compression stockings for deep vein thrombosis prophylaxis in the inpatient setting. <i>Blood Coagul Fibrinolysis.</i> 2012;23(2):168-171.	Systematic Review w/ Meta-Analysis	5 studies	n/a	n/a	n/a	Current data does not favor either thigh-length or knee-length compression stockings when it comes to prophylaxis of deep vein thrombosis.	IIB

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259	Feist WR, Andrade D, Nass L. Problems with measuring compression device performance in preventing deep vein thrombosis. <i>Thromb Res.</i> 2011;128(3):207-209.	Literature Review	n/a	n/a	n/a	n/a	Patient compliance with graduated compression stockings is poor, and compliance with mechanical VTE prophylaxis could be a confounding variable in research studies of these devices and stockings.	VB
260	Ayhan H, Iyigun E, Ince S, Can MF, Hatipoglu S, Saglam M. A randomised clinical trial comparing the patient comfort and efficacy of three different graduated compression stockings in the prevention of postoperative deep vein thrombosis. <i>J Clin Nurs.</i> 2015;24(15-16):2247-2257.	RCT	219 patients undergoing abdominal-pelvic surgeries/ Turkey	(1) low-pressure, knee-length stockings	(2) low-pressure, thigh-length stockings  (3) moderate-pressure knee-	DVT (duplex ultrasonography)	The low-pressure, knee-length GCS are as effective as the other graduated compression stockings of different pressures and sizes in the postoperative deep vein thrombosis prophylaxis, and the patients have fewer problems while using these	IB
261	Lattimer CR, Azzam M, Kalodiki E, Makris GC, Geroulakos G. Compression stockings significantly improve hemodynamic performance in post-thrombotic syndrome irrespective of class or length. <i>J Vasc Surg.</i> 2013;58(1):158-165.	Quasi-experimental	34 patients/ UK	n/a	4 different GCS	Hemodynamic performance tests	GCS significantly improved all hemodynamic performance tests, including venous filling index, venous volume, and time to fill 90% of venous volume, regardless of length or compression class. The majority of patients preferred knee-length graduated	IIB
262	Bell BR, Bastien PE, Douketis JD; Thrombosis Canada. Prevention of venous thromboembolism in the Enhanced Recovery After Surgery (ERAS) setting: an evidence-based review. <i>Can J Anaesth.</i> 2015;62(2):194-202.	Literature Review	n/a	n/a	n/a	n/a	VTE prophylaxis as part of ERAS protocols should balance VTE and bleeding risk. VTE is preventable and we should aim to eradicate this condition.	VB
263	Glassou EN, Pedersen AB, Hansen TB. Risk of re-admission, reoperation, and mortality within 90 days of total hip and knee arthroplasty in fast-track departments in Denmark from 2005 to 2011. <i>Acta Orthop.</i> 2014;85(5):493-500.	Nonexperimental	79,098 arthroplasty patients/ Danish hip and knee arthroplasty	n/a	n/a	Readmission, reoperation, and mortality	Relative risk of re-admission due to a thromboembolic event was lower in the fast-track cohort in 2010–2011 than in the national cohort in the same time period.	IIIA

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264	Husted H, Otte KS, Kristensen BB, Orsnes T, Wong C, Kehlet H. Low risk of thromboembolic complications after fast-track hip and knee arthroplasty. <i>Acta Orthop.</i> 2010;81(5):599-605.	Nonexperimental	1977 fast-track total hip and knee arthroplasty patients/ Denmark	n/a	n/a	VTE	The risk of clinical DVT, and of fatal and nonfatal PE after THA and TKA following a fast-track set-up with early mobilization, short hospitalization, and short duration of DVT prophylaxis compares favorably with published regimens with extended	IIIB
265	Jorgensen CC, Jacobsen MK, Soeballe K, et al. Thromboprophylaxis only during hospitalisation in fast-track hip and knee arthroplasty, a prospective cohort study. <i>BMJ Open.</i> 2013;3(12):e003965.	Nonexperimental	4924 fast track total hip and knee arthroplasty patients/ Denmark	n/a	n/a	VTE	The low incidence of VTE suggests that in-hospital prophylaxis only, is safe in fast track THA and TKA patients with LOS of ≤5 days. Guidelines on thromboprophylaxis may need reconsideration in fast-track elective surgery	IIIA
266	Jorgensen CC, Kehlet H; Lundbeck Foundation Centre for Fast-track Hip and Knee Replacement Collaborative Group. Early thromboembolic events. <i>Thromb Res.</i> 2016;138:37-42.	Nonexperimental	13,775 fast track total hip and knee arthroplasty patients/ Denmark	VTE	n/a	n/a	Incidence of “early” thromboembolism after fast-track THA and TKA is low, but myocardial infarctions may be further reduced by improving perioperative treatment of anemia.	IIIB
267	Khan SK, Malviya A, Muller SD, et al. Reduced short-term complications and mortality following enhanced recovery primary hip and knee arthroplasty: results from 6,000 consecutive procedures. <i>Acta Orthop.</i> 2014;85(1):26-31.	Nonexperimental	6,000 enhanced recovery total hip and knee arthroplasty patients/ UK	n/a	n/a	Length of stay, return to theater, readmission, mortality, and complications	There were fewer DVT with the enhanced recovery protocol, although the difference was not statistically significant.	IIIB
268	Wang Z, Chen Q, Ye M, Shi G, Zhang B. Active ankle movement may prevent deep vein thrombosis in patients undergoing lower limb surgery. <i>Ann Vasc Surg.</i> 2016;32:65-72.	RCT	174 patients undergoing lower limb surgery (ie, hip surgery, including	Active ankle movement for 1-7 days postoperatively (30 times per minute, 20 times per day). Movements included	Routine nursing care (n = 78)	DVT occurrence up to 6 months postoperatively. Postoperative days 1-7: thigh and calf	Postoperative active ankle movements after lower extremity surgery significantly reduced the occurrence of thrombus and DVT 1-7 days after surgery; significantly reduced limb circumference on days 5-7; and significantly improved the maximum	IB

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269	Shimizu Y, Kamada H, Sakane M, et al. A novel apparatus for active leg exercise improves venous flow in the lower extremity. <i>J Sports Med Phys Fitness</i> . 2016;56(12):1592-1597.	Quasi-experimental	8 healthy volunteers without DVT (confirmed by ultrasound), history of DVT	1-minute exercise on a novel leg apparatus (LEX) with arch support that compresses the venous pump in the	Intermittent pneumatic compression (IPC) (45 mmHg for 11 seconds with 20 - 60	Femoral venous flow volume, maximum and mean blood flow velocities as measured by	Blood flow measures in the femoral vein were significantly improved after 1 minute of exercise using a novel leg apparatus (LEX) as compared to intermittent pneumatic compression (IPC) use for 10 minutes.	IIC
270	DailyMed. US National Library of Medicine. <a href="https://dailymed.nlm.nih.gov/dailymed/">https://dailymed.nlm.nih.gov/dailymed/</a> . Accessed August 28, 2017.	Regulatory	n/a	n/a	n/a	n/a	Database of medication package inserts submitted to FDA. Reviewed package inserts for low molecular weight heparin, low-dose unfractionated heparin, warfarin, factor Xa inhibitors (ie, fondaparinux, rivaroxaban, apixaban), dabigatran, vitamin K antagonists	n/a
271	Mahan CE, Spyropoulos AC. ASHP therapeutic position statement on the role of pharmacotherapy in preventing venous thromboembolism in hospitalized patients. <i>Am J Health Syst Pharm</i> . 2012;69(24):2174-2190.	Position Statement	n/a	n/a	n/a	n/a	Position statement on use of pharmacologic VTE prophylaxis.	IVB
272	Horlocker TT, Wedel DJ, Rowlingson JC, et al. Regional anesthesia in the patient receiving antithrombotic or thrombolytic therapy: American Society of Regional Anesthesia and Pain Medicine Evidence-Based Guidelines (Third Edition). <i>Reg Anesth Pain Med</i> . 2010;35(1):64-101	Consensus	n/a	n/a	n/a	n/a	Recommendations for regional anesthesia for patients on thromboprophylaxis.	IVA
273	Karupiah SV, Johnstone AJ. Skin necrosis associated with thromboprophylaxis after total knee replacement. <i>Case Rep Orthop</i> . 2014;2014:139218.	Case Report	n/a	n/a	n/a	n/a	Patient developed skin necrosis at LMWH injection site for VTE prophylaxis after total knee arthroplasty.	VB

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	Short, Scott S., Nasser, Yosef, Gangi, Alexandra, Berel, Dror and Fleshner, Phillip. Deep vein thrombosis prophylaxis increases perioperative surgical site infection in a prospective cohort of patients undergoing colorectal surgery. 2011	Non-experimental		n/a				IIIB
	Kulshrestha, Vikas, Kumar, Santhosh. DVT prophylaxis after TKA: routine anticoagulation vs risk screening approach - a randomized study. 2013	RCT						IA
	Asensio, Angel, Antolin, Francisco J., Sanchez-Garcia, Joseph M., et al. Timing of DVT prophylaxis and risk of postoperative knee prosthesis infection. 2010	Non-experimental		n/a				IIIA
	Milanchi, Siamak, Nasser, Yosef, Westhout, Franklin, Murrell, Zuri A. and Fleshner, Phillip R. Does prophylactic subcutaneous heparin increase the risk of wound infection after colorectal surgery?. 2010	Non-experimental		n/a				IIIB
	Berrios-Torres SI, Umscheid CA, Bratzler DW, et al. Centers for disease control and prevention guideline for the prevention of surgical site infection, 2017. <i>JAMA Surg</i> .	Guideline	n/a	n/a	n/a	n/a		IVA



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274	Sadideen H, O'Callaghan JM, Navidi M, Sayegh M. Educating surgical patients to reduce the risk of venous thromboembolism: an audit of an effective strategy. <i>JRSM Short Rep.</i> 2011;2(12):97.	Quasi-experimental	121 patients undergoing major general surgery/ UK	Targeted VTE education	Did not receive targeted VTE education	Patient awareness (VTE, risk factors, prevention measures)	Introducing patient education at pre-assessment clinic and as part of discharge planning for major elective surgery is an effective system in improving patient understanding of VTE, its risk factors and the importance of prophylaxis.	IIB
275	Haymes A. Venous thromboembolism: patient awareness and education in the pre-operative assessment clinic. <i>J Thromb Thrombolysis.</i> 2016;41(3):459-463.	Nonexperimental	68 patient questionnaires after preoperative consultation/ UK	n/a	n/a	n/a	Many patients already possess an awareness of VTE, however, specific knowledge regarding its risk factors and methods of prevention is lacking. Provision of targeted written and verbal educational information during the preoperative assessment is an	IIIB
276	Keiter JE, Johns D, Rockwell WB. Importance of postoperative hydration and lower extremity elevation in preventing deep venous thrombosis in full abdominoplasty: a report on 450 consecutive cases over a 37-year period. <i>Aesthet Surg J.</i> 2015;35(7):839-841.	Nonexperimental	450 abdominoplasty patients between 1976 and 2013/ Single center	n/a	n/a	Hydration, lower extremity elevation, DVT	Hydration and lower extremity elevation are innocuous and risk-free adjuncts that improve venous return from the legs and lessen the chance of postoperative DVT.	IIIB
277	Guyatt GH, Akl EA, Crowther M, Gutterman DD, Schünemann HJ. Executive summary: Antithrombotic Therapy and Prevention of Thrombosis, 9th ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines. <i>Chest.</i> 2012;141(2 Suppl):7S-47S.	Guideline	n/a	n/a	n/a	n/a	Provides specific guidance for selection of VTE prophylaxis.	IVA
278	Alzoubi KH, Khassawneh BY, Obeidat B, Asfoor SS, Al-azzam SI. Awareness of patients who undergo cesarean section about venous thromboembolism prophylaxis. <i>J Vasc Nurs.</i> 2013;31(1):15-20.	Nonexperimental	230 patients undergoing Cesarean delivery/ Jordan	n/a	n/a	Patient awareness (VTE, risk factors, prevention measures)	The study showed that most patients who underwent CS were not aware of VTE as a complication of CS and the factors that may increase its risk, which could reflect inadequate patient counseling/ education on the part of healthcare professionals	IIIA

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REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
279	He ML, Xiao ZM, Lei M, Li TS, Wu H, Liao J. Continuous passive motion for preventing venous thromboembolism after total knee arthroplasty. Cochrane Database Syst Rev. 2012;1:CD008207.	Systematic Review w/ Meta-Analysis	11 RCTs of continuous passive motion therapy after total knee arthroplasty	n/a	n/a	Venous thromboembolism	There is insufficient evidence to determine whether continuous passive motion therapy after total knee arthroplasty reduces venous thrombolism events.	IA
280	Lobastov K, Barinov V, Laberko L, Obolensky V, Boyarintsev V, Rodoman G. Electrical calf muscle stimulation with Veinoplus device in postoperative venous thromboembolism prevention. Int Angiol. 2014;33(1):42-49.	Quasi-experimental	80 patients over 40 years of age undergoing major surgery, Russia	Electrical calf muscle stimulation with Veinoplus device, in addition to control group DVT prophylaxis (n = 40)	Graduated middle stretch compression bandage (20-40 mmHg) and low dose	DVT, Pulmonary Embolism	Electrical calf muscle stimulation with Veinoplus device for >100 minutes/day (5 sessions), significantly reduced the incidence of DVT. Using the device in patients with calf DVT did not increase the rate of pulmonary embolism. RCT is needed to confirm study.	IIB
281	Guideline for Medication Safety. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2017:295-333.	Guideline	n/a	n/a	n/a	n/a	Provides guidance for medication safety.	IVB
282	Eisenstein DH. Anticoagulation management in the ambulatory surgical setting. AORN J. 2012;95(4):510-521.	Expert Opinion	n/a	n/a	n/a	n/a	Recommendations for patient education on safe use of pharmacologic VTE prophylaxis.	VB
283	Standards of perioperative nursing. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2015:693-732. <a href="https://www.aorn.org/aorn-org/guidelines/clinical-resources/aorn-standards">https://www.aorn.org/aorn-org/guidelines/clinical-resources/aorn-standards</a> . Accessed August 24, 2017.	Consensus	n/a	n/a	n/a	n/a	Standards of perioperative nursing practice.	IVC

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REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
284	State Operations Manual Appendix A—Survey Protocol, Regulations and Interpretive Guidelines for Hospitals. Rev 151; 2015 Centers for Medicare & Medicaid Services. <a href="https://www.cms.gov/Regulations-and-Guidance/Guidance/Manuals/downloads/som107an">https://www.cms.gov/Regulations-and-Guidance/Guidance/Manuals/downloads/som107an</a>	Regulatory	n/a	n/a	n/a	n/a	CMS Conditions of Participation	n/a
285	State Operations Manual Appendix L—Guidance for Surveyors: Ambulatory Surgical Centers. Rev. 137; 2015. Centers for Medicare & Medicaid Services. <a href="https://www.cms.gov/Regulations-and-Guidance/Guidance/Manuals/downloads/som107ap_l_ambulatory.pdf">https://www.cms.gov/Regulations-and-Guidance/Guidance/Manuals/downloads/som107ap_l_ambulatory.pdf</a> . Accessed August 24, 2017.	Regulatory	n/a	n/a	n/a	n/a	CMS Conditions for Coverage	n/a
286	42 CFR 482. Conditions of participation for hospitals. 2011. Government Publishing Office. <a href="https://www.gpo.gov/fdsys/granule/CFR-2011-title42-vol5/CFR-2011-title42-vol5-part482">https://www.gpo.gov/fdsys/granule/CFR-2011-title42-vol5/CFR-2011-title42-vol5-part482</a> . Accessed August 24, 2017.	Regulatory	n/a	n/a	n/a	n/a	CMS Conditions of Participation	n/a
287	42 CFR 416. Ambulatory surgical services. 2011. Government Publishing Office. <a href="https://www.gpo.gov/fdsys/granule/CFR-2011-title42-vol3/CFR-2011-title42-vol3-part416">https://www.gpo.gov/fdsys/granule/CFR-2011-title42-vol3/CFR-2011-title42-vol3-part416</a> . Accessed August 24, 2017.	Regulatory	n/a	n/a	n/a	n/a	CMS Conditions for Coverage	n/a
288	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; 2016.	Accreditation	n/a	n/a	n/a	n/a	The Joint Commission standard for medical records.	n/a

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REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
289	MS.16: Medical record maintenance. In: National Integrated Accreditation for Healthcare Organizations (NIAHO): Interpretive Guidelines and Surveyor Guidance. Version 11. Milford, OH: DNV-GL Healthcare; 2014:37. <a href="http://cms.inressroom.com/s3.amazonaws.com/107/">http://cms.inressroom.com/s3.amazonaws.com/107/</a>	Accreditation	n/a	n/a	n/a	n/a	DNV standard for medical records.	n/a
290	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; 2016.	Accreditation	n/a	n/a	n/a	n/a	The Joint Commission standard for medical records.	n/a
291	Clinical records and health information. In: Accreditation Handbook for Ambulatory Health Care. Skokie, IL: Accreditation Association for Ambulatory Health Care, Inc; 2016:51-53. <a href="https://www.aaahc.org/Global/Handbooks/2016/HB16_ENI-interactive_v2.pdf">https://www.aaahc.org/Global/Handbooks/2016/HB16_ENI-interactive_v2.pdf</a> Accessed August 24	Accreditation	n/a	n/a	n/a	n/a	AAAHC standard for medical records.	n/a
292	Medical records: operating room records. In: Regular Standards and Checklist for Accreditation of Ambulatory Surgery Facilities. Version 14.4. Gurnee, IL: American Association for Accreditation of Ambulatory Surgery Facilities, Inc; 2016:60-63.	Accreditation	n/a	n/a	n/a	n/a	AAAASF standard for medical records.	n/a
293	Medical records: procedure room records. In: Regular Standards and Checklist for Accreditation of Ambulatory Surgery Facilities. 3rd ed. Gurnee, IL: American Association for Accreditation of Ambulatory Surgery Facilities, Inc; 2011:64-66. <a href="https://www.aaaasf.org/docs/default-">https://www.aaaasf.org/docs/default-</a>	Accreditation	n/a	n/a	n/a	n/a	AAAASF standard for medical records.	n/a

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REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
294	Miller JA. Use and wear of anti-embolism stockings: a clinical audit of surgical patients. <i>Int Wound J.</i> 2011;8(1):74-83.	Nonexperimental	80 surgical patients/ Australia	n/a	n/a	Fitting and wearing of antiembolism stockings	The findings of this study showed that anti-embolism stockings were not fitted and worn according to evidence-based guidelines. The author recommends a new recording tool be developed to ensure consistency of assessment and	IIIB
295	Jordan C, Thomas MB, Evans ML, Green A. Public policy on competency: how will nursing address this complex issue? <i>J Contin Educ Nurs.</i> 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 nurse.	VB
296	HR.01.05.03: Staff participate in ongoing education and training. In: <i>The Joint Commission Comprehensive Accreditation and Certification Manual. E-dition. Oakbrook Terrace, IL: The Joint Commission; 2016.</i>	Accreditation	n/a	n/a	n/a	n/a	The Joint Commission standard for staff education.	n/a
297	MS.10: Continuing education. In: <i>National Integrated Accreditation for Healthcare Organizations (NIAHO): Interpretive Guidelines and Surveyor Guidance. Version 11. Milford, OH: DNV-GL Healthcare; 2014:30.</i> <a href="http://cms.inpressroom.com/s3.amazonaws.com/107/">http://cms.inpressroom.com/s3.amazonaws.com/107/</a>	Accreditation	n/a	n/a	n/a	n/a	DNV standard for staff education.	n/a
298	HR.01.05.03: Staff participate in ongoing education and training. In: <i>The Joint Commission Comprehensive Accreditation and Certification Manual. E-dition. Oakbrook Terrace, IL: The Joint Commission; 2016.</i>	Accreditation	n/a	n/a	n/a	n/a	The Joint Commission standard for staff education.	n/a

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REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
299	Governance. In: Accreditation Handbook for Ambulatory Health Care. Skokie, IL: Accreditation Association for Ambulatory Health Care, Inc; 2016:33-40. <a href="https://www.aaahc.org/Global/Handbooks/2016/HB16_ENI-interactive_v2.pdf">https://www.aaahc.org/Global/Handbooks/2016/HB16_ENI-interactive_v2.pdf</a> Accessed August 24, 2016.	Accreditation	n/a	n/a	n/a	n/a	AAAHC standard for governance.	n/a
300	Personnel: Personnel records; individual personnel files. In: Regular Standards and Checklist for Accreditation of Ambulatory Surgery Facilities. Version 14.4. Gurnee, IL: American Association for Accreditation of Ambulatory Surgery Facilities, Inc; 2016:74-75.	Accreditation	n/a	n/a	n/a	n/a	AAAASF standard for personnel records.	n/a
301	PI.03.01.01: The hospital improves performance on an ongoing basis. In: The Joint Commission Comprehensive Accreditation and Certification Manual. E-dition. Oakbrook Terrace, IL: The Joint Commission; 2016.	Accreditation	n/a	n/a	n/a	n/a	The Joint Commission standard for performance improvement.	n/a
302	QM.1: Quality management system. In: National Integrated Accreditation for Healthcare Organizations (NIAHO): Interpretive Guidelines and Surveyor Guidance. Version 11. Milford, OH: DNV-GL Healthcare; 2014:10-17. <a href="http://cms.inressroom.com/s3.amazonaws.com/107/">http://cms.inressroom.com/s3.amazonaws.com/107/</a>	Accreditation	n/a	n/a	n/a	n/a	DNV standard for quality management.	n/a
303	PI.03.01.01: The organization improves performance. In: The Joint Commission Comprehensive Accreditation and Certification Manual. E-dition. Oakbrook Terrace, IL: The Joint Commission; 2016.	Accreditation	n/a	n/a	n/a	n/a	The Joint Commission standard for performance improvement.	n/a

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REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
304	Quality management and improvement. In: Accreditation Handbook for Ambulatory Health Care. Skokie, IL: Accreditation Association for Ambulatory Health Care, Inc; 2016:46-50. <a href="https://www.aaahc.org/Global/Handbooks/2016/HB16_ENI-interactive_v2.pdf">https://www.aaahc.org/Global/Handbooks/2016/HB16_ENI-interactive_v2.pdf</a> Accessed August 24, 2016.	Accreditation	n/a	n/a	n/a	n/a	AAAHC standard for quality management,	n/a
305	Quality assessment/quality improvement: Quality improvement. In: Regular Standards and Checklist for Accreditation of Ambulatory Surgery Facilities. Version 14.4. Gurnee, IL: American Association for Accreditation of Ambulatory Surgery Facilities, Inc; 2016:64.	Accreditation	n/a	n/a	n/a	n/a	AAAASF standard for quality improvement.	n/a
306	Quality assessment/quality improvement: unanticipated operative sequelae In: Regular Standards and Checklist for Accreditation of Ambulatory Surgery Facilities. Version 14.4. Gurnee, IL: American Association for Accreditation of Ambulatory Surgery Facilities, Inc; 2016:66-69.	Accreditation	n/a	n/a	n/a	n/a	AAAASF standard for quality improvement.	n/a
307	PSI 90: Patient Safety for Selected Indicators. Technical Specifications. Rockville, MD: Agency for Healthcare Research and Quality; 2015.	Regulatory	n/a	n/a	n/a	n/a	Specifications for reporting quality patient safety indicator (PSI) perioperative pulmonary embolism or deep vein thrombosis rate.	n/a
308	Venous thromboembolism national hospital inpatient quality measures. In: Specifications Manual for National Hospital Inpatient Quality Measures. Version 5.2a. Oakbrook Terrace, IL: The Joint Commission; 2016:VTE-1. <a href="https://www.jointcommission.org/assets/1/6/HIOR">https://www.jointcommission.org/assets/1/6/HIOR</a>	Accreditation	n/a	n/a	n/a	n/a	The Joint Commission quality measure for VTE.	n/a