REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
1	Altin R, Yesil M, Ozcan O, Karaca C, Sen S, Firat F. An investigation into the cellular-level adverse effects of tourniquet use on the infrapatellar fat pad in primary total knee arthroplasty: a prospective randomized study. Acta Orthop Traumatol Turc. 2023;57(5):283-288.	RCT	80 knees, primary arthroplasty	Tourniquet	No tourniquet	IPFP cellular hypoxia, oxidative stress, and apoptosis; KOOS, KSS, Kujala scores	Tourniquet use significantly increased cellular apoptosis, limb hypoxia and oxidative stress. KSS, KOOS, Kujala scores significantly higher in both groups postop	IB
2	Xu X, Wang C, Song Q, Mou Z, Dong Y. Tourniquet use benefits to reduce intraoperative blood loss in patients receiving total knee arthroplasty for osteoarthritis: an updated meta-analysis with trial sequential analysis. J Orthop Surg (Hong Kong). 2023;31(2):10225536231191607.	Systematic Review w/ Meta-Analysis	n/a	n/a	n/a	n/a	1999-2021, 15 RCTs; 1202 pts; tourniquet use significantly decreased intraop blood loss; does not have effect on postop, calculated, total blood loss, op time, DVT, transfusion rate; unclear effect on pain, ROM, swelling	IA
3	Cai DF, Fan QH, Zhong HH, Peng S, Song H. The effects of tourniquet use on blood loss in primary total knee arthroplasty for patients with osteoarthritis: a meta-analysis. J Orthop Surg Res. 2019;14(1):348.	Systematic Review w/ Meta-Analysis	n/a	n/a	n/a	n/a	1999-2016, 11 RCTs; 541 pts; blood loss, DVT, transfusion rate, surgical time related to tourniquet (T) vs no tourniquet (NT) for TKA. Significant differences: intraop blood loss (T<NT), calculated blood loss (T<NT), surgical time (T<NT). Tourniquet does not decrease total blood loss, transfusion rate, or DVT	IA
4	Salari P, Balato G, Cavallo G, Strigelli V, Meccariello A, Baldini A. A staged use of tourniquet does not influence the fast-track recovery after total knee arthroplasty: a prospective randomized study. Arch Orthop Trauma Surg. 2024;144(11):4677-4684.	RCT	100 pts	optimized tourniquet (deflated during after bone cuts, and reinflated during cementation then deflated after cement set up)	no tourniquet	Blood loss, pain, ROM, op time	Tourniquet use minimizes perioperative blood loss and enhances field visibility. Also had no effects on functional outcomes.	IB
5	Goel R, Rondon AJ, Sydnor K, et al. Tourniquet use does not affect functional outcomes or pain after total knee arthroplasty: a prospective, double-blinded, randomized controlled trial. J Bone Joint Surg Am. 2019;101(20):1821-1828.	RCT	200 pts	Tourniquet	No tourniquet	pain (VAS) & functional recovery (Timed-Up & Go); stair climb test, blood loss, field visibility, ROM	Tourniquet use significantly decreased blood loss (calculated) and greater knee extension (possibly clinically irrelevant) at first postop follow-up visit; surgeon visibility was best with tourniquet inflation; pain and functional recovery scores were not significantly different at any time point	IA
6	Kasem SA, Bassiouny AAE, Rashwan DAE, Bahr MH. Minimal inflation tourniquet pressure using induced hypotension with limb occlusion pressure determination or arterial occlusion pressure estimation in upper limb surgery: a randomized double-blinded comparative study. Anesth Pain Med. 2020;10(2):e102124.	RCT	40 pts	AOP estimation	Determined LOP	AOP, LOP, tourniquet pressure; field visibility, complications (eg, pain, burning, numbness, coldness)	AOP estimation and LOP determination methods can provide effective minimal inflation pressure with satisfactory field visibility without complications in upper limb surgery under induced hypotensive anesthesia; no evidence of tourniquet induced pain; LOP determination took longer and required additional equipment and competency	IA
7	Hamawandi SA, Amin HI, Al-Humairi AK. Effects of the use of tourniquet in total knee arthroplasty on the clinical and functional outcomes with 5 years of follow-up: a randomized controlled trial. J Knee Surg. 2023;36(2):222-230.	RCT	101 pts	Tourniquet	No tourniquet	functional outcome (KSS, KOOS), pain (VAS), complications	Tourniquet use in TKA has negative effects on pain and functional outcomes in the short term (up to 6 weeks for pain and 3 months for KSS & KOOS postop), but not long term (5 years) differences in functional outcome; tourniquet use also demonstrated shorter operative times, better visualization during surgery, less intraop & calculated blood loss, more postop blood loss, longer LOS	IC
8	Hegde V, Bracey DN, Johnson RM, Dennis DA, Jennings JM. Tourniquet use improves cement penetration and reduces radiolucent line progression at 5 years after total knee arthroplasty. J Arthroplasty. 2021;36(7S):S209-S214.	Nonexperimental	122 pts	Tourniquet	No tourniquet	cement penetration (radiographic), radiolucent line (RLL) progression	Tourniquet use improves cement penetration during TKA, and subsequently may improve mid-term implant stability	IIIB

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9	Kunes JA, El-Othmani MM, LaVelle M, Santos WM, Geller JA, Shah RP. Tourniquet-free minimally invasive total knee arthroplasty is associated with early aseptic loosening. Knee. 2024;46:19-26.	Quasi-experimental	329 pts	No tourniquet	Tourniquet	aseptic loosening, radiolucent lines (RLL), quality of life score (WOMAC, SF-12, KSKFS), complications, estimated blood loss	In minimally invasive TKA (MIS-TKA), use of tourniquet was associated with lower rates of aseptic loosening and revision for aseptic loosening, and reduced risk of RLL, lower EBL; complications and quality of life scores were similar between groups	IIB
10	Sun C, Yang X, Zhang X, et al. The impact of tourniquet on tibial bone cement penetration in different zones in primary total knee arthroplasty: a meta-analysis. J Orthop Surg Res. 2021;16(1):198.	Systematic Review w/ Meta-Analysis	n/a	n/a	n/a	n/a	2016-2021, 8 RCT, 4 nonrandomized studies of interventions; 1231 pts; tourniquet use can increase tibial cement mantle penetration; did not influence duration of surgery, change in Hgb, transfusion rates or complications	IA
11	Agrawal A, Arora A, Srivastava AK, Gupta N. Use of tourniquet during knee arthroplasty in patients with radiographic arterial calcifications. J Arthroplasty. 2020;35(8):2050-2053.	Nonexperimental	2548	Tourniquet on patients with radiographic calcifications	Tourniquet on patients without radiographic calcifications	tourniquet failure, postop blood transfusions, delayed wound healing, distal limb ischemia	Increased risk of tourniquet failure (at 300 mmHg) for pts with arterial calcifications, no significant increase in blood transfusions, wound healing, or ischemic complications	IIIA
12	Albayrak M, Ugur F. With or without a tourniquet? a comparative study on total knee replacement surgery in patients without comorbidities. Medicina (Kaunas). 2023;59(7):1196.	Nonexperimental	106 pts	Tourniquet	No tourniquet	complications r/t tourniquet use in pts 65 and over w/out comorbidities	No complications for pts 65 years and older were related with tourniquet use; tourniquet group increased pain and analgesic use; total blood loss not significantly different between groups	IIIB
13	Gangadharan R, Roslee C, Kelsall N, Taylor H. Retrospective review of complications following long tourniquet time in foot and ankle surgery. J Clin Orthop Trauma. 2021;16:189-194.	Nonexperimental	20 pts	n/a	n/a	complication rate r/t tourniquet time > 180 min; opioid consumption	No major systemic complications (ie, PE or renal dysfunction); some minor wound healing and sensory noted, resolved over time; opioid consumption more closely correlated with type of procedure, not tourniquet duration; recommended continued adherence to 2-h tourniquet time as safe practice	IIIA
14	Gurel R, Elbaz E, Ashkenazi I, et al. Trans tibial amputation with or without a tourniquet in patients with diabetic foot infection and peripheral vascular disease: comparison of postoperative outcomes. J Orthop Surg (Hong Kong). 2022;30(2):10225536221102694.	Nonexperimental	69 pts	n/a	n/a	Hgb, transfusion rate, 60-day mortality, SSI, reoperation	transtibial amputation in pts w/ PVD or DM is safer with tourniquet use; reduces blood loss, operation time, LOS (by 6 days), transfusion rates	IIIA
15	Dragosloveanu S, Dragosloveanu C, Petre M, Gherghe ME, Cotor DC. The impact of tourniquet usage on TKA outcome: a single-center prospective trial. Medicina (Kaunas). 2023;59(5):870.	RCT	190 pts	Tourniquet	No tourniquet	WOMAC scores, pain, blood loss (intra & postop), postop Hgb, OR time	Significantly less blood loss and shorter OR times for TKA performed without tourniquet; knee function (WOMAC and pain) were comparable between the two groups except at 6-weeks postop, NT group demonstrated less pain; more research is needed	IC
16	Ahmed I, Chawla A, Underwood M, et al. Time to reconsider the routine use of tourniquets in total knee arthroplasty surgery. Bone Joint J. 2021;103-B(5):830-839.	Systematic Review w/ Meta-Analysis	n/a	n/a	n/a	n/a	1995-2020, 41 RCTs; 2819 participants, surgery w/ tourniquet vs. surgery w/out tourniquet inflated. Tourniquet use associated with increased postop pain, serious adverse effects(DVT, PE, infection, reoperation, mortality). Strongly consider prior to use.	IA
17	Zhao J, Dong X, Zhang Z, et al. Association of use of tourniquets during total knee arthroplasty in the elderly patients with post-operative pain and return to function. Front Public Health. 2022;10:825408.	Systematic Review w/ Meta-Analysis	n/a	n/a	n/a	n/a	1995-2021, 33 RCTs; 2393 pts; meta-analysis shows tourniquet use was associated with increased pain, slower functional recovery and more complications postop	IB

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18	Jawhar A, Skeirek D, Stetzelberger V, Obertacke U. Influence of the tourniquet on pain and function in total knee arthroplasty: a systematic review and meta-analysis . Z Orthop Unfall. 2020;158(6):630-640.	Systematic Review w/ Meta-Analysis	n/a	n/a	n/a	n/a	1995-2017, 16 RCTs; 1279 pts; Risk of DVT w/ tourniquet use during TKA is over 2 times higher than without tourniquet; risk for wound infection and PE were higher as well, but not statistically significant; pain in the immediate postop period significantly increased; knee flexion is also negatively influenced by tourniquet in immediate postop period; tourniquet use has no long term effects on function and complications	IA
19	Lai YH, Xu H, Su Q, Wan XF, Yuan MC, Zhou ZK. Effect of tourniquet use on blood loss, pain, functional recovery, and complications in robot-assisted total knee arthroplasty: a prospective, double-blinded, randomized controlled trial. J Orthop Surg Res. 2022;17(1):118.	RCT	28 pts	Tourniquet	No tourniquet	blood loss (total, hidden, intraop, drainage), pain (VAS), functional recovery (straight leg raise, ROM), complications, LOS	In robot-assisted TKA, tourniquet use does not change total blood loss, increased postop pain (up to 1 month after surgery), slower short term functional recovery (up to POD 3), and higher rate of skin complications (eg, tension blisters); authors do not recommend tourniquet for robot-assisted TKA	IA
20	Lu C, Song M, Chen J, et al. Does tourniquet use affect the periprosthetic bone cement penetration in total knee arthroplasty? A meta-analysis. J Orthop Surg Res. 2020;15(1):602.	Systematic Review w/ Meta-Analysis	n/a	n/a	n/a	n/a	2014-2019, 8 RCTs; 677 knees; tourniquet increases thickness of bone cement, and may increase stability/durability of implant for TKA; tourniquet use can increase postop pain	IC
21	Xie J, Yu H, Wang F, Jing J, Li J. A comparison of thrombosis in total knee arthroplasty with and without a tourniquet: a meta-analysis of randomized controlled trials. J Orthop Surg Res. 2021;16(1):408.	Systematic Review w/ Meta-Analysis	n/a	n/a	n/a	n/a	1995-2019, 13 RCTs; 1321 pts; Tourniquet use reported increased incidence of DVT postop; greater knee swelling and pain scores also, but no longer term differences (T vs NT)	IA
22	Mateu Vicent D, Sola Ruano L, Cabré Serrés JL, Haro Fernandez D, Luna Gutiérrez R, Torra Parra M. Lower tourniquet pressure does not affect pain nor knee-extension strength in patients after total knee arthroplasty: a randomized controlled trial. Knee Surg Sports Traumatol Arthrosc. 2022;30(3):1075-1081.	RCT	73 knees	Tourniquet	No tourniquet	pain (VAS), isometric muscle strength, Hgb, transfusion index, LOS, need for rescue drugs	Low pressure tourniquet use (SBP + 100mmHg) did not result in increased pain or decreased quadricep strength compared to no tourniquet (up to 3 months postop); tourniquet use was associated with statistically longer LOS	IA
23	Xu H, Yang J, Xie J, et al. Tourniquet use in routine primary total knee arthroplasty is associated with a higher transfusion rate and longer postoperative length of stay: a real-world study. BMC Musculoskelet Disord. 2020;21(1):620.	Nonexperimental	6325 pts	Tourniquet	No tourniquet	transfusion rate, LOS	Tourniquet use significantly correlated with higher transfusion rate and postop LOS	IIIB
24	Li S, Zhang X, Liu M, et al. Not using a tourniquet is superior to tourniquet use for high tibial osteotomy: a prospective, randomised controlled trial. Int Orthop. 2022;46(4):823-829.	RCT	90 pts	No tourniquet	Tourniquet	blood loss, operative time, complications, LOS, opioid consumption	Tourniquet use in HTO does not reduce postop blood loss, operative time, or complications; Not using tourniquet reduces LOS, opioid consumption and complications; authors suggest that tourniquets should not be routinely used during HTO	IA
25	Ellanti P, Hurson C. Tourniquet-associated povidone-iodine-induced chemical burns. BMJ Case Rep. 2015;2015:bcr2014208967.	Case Report	n/a	n/a	n/a	n/a	Older male patient found chemical burn related to patient antisepsis solution; pain resolved postop day 4 & blisters resolved in 6 weeks.	VC
26	Yang JH, Lim H, Yoon JR, Jeong HI. Tourniquet associated chemical burn. Indian J Orthop. 2012;46(3):356-359.	Case Report	n/a	n/a	n/a	n/a	Young male reported chemical burn; concluded to decrease friction by using caution to prevent the tourniquet moving during draping, using elastic stockinette padding, preventing cuff & leg-shape mismatch, & providing a physical barrier to fluid accumulation, which can prevent further issues.	VB

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27	Supradeeptha C, Shandilya SM, Naresh A, Satyaprasad J. Aqueous based povidone-iodine related chemical burn under the tourniquet (a case report) and literature review. J Orthop. 2013;10(3):152-154.	Case Report	n/a	n/a	n/a	n/a	Chemical burn related to friction with elastic under cotton roll; recommend applying tourniquet with uniform thickness & decrease movement during draping, protect cuff from fluids.	VB
28	Chiang YC, Lin TS, Yeh M. Povidone-iodine-related burn under the tourniquet of a child: a case report and literature review. J Plast Reconstr Aesthet Surg. 2011;64(3):412-415.	Case Report	n/a	n/a	n/a	n/a	Chemical burn related to pressure from PT, body, & solution on cuff that creates maceration, long operative time; pediatrics are more sensitive or history of skin disorders. Researchers recommend never abrading skin, don't allow solution to pool or trap under cuff, keep cuff dry, decrease operative & pneumatic tourniquet inflation time, & protect under the cuff by taping the distal end or using spray prep.	VC
29	Kindle BJ, Murthy N, Stolp K. Compartment syndrome with mononeuropathies following anterior cruciate ligament reconstruction. Am J Phys Med Rehabil. 2015;94(5):e37-e41.	Case Report	n/a	n/a	n/a	n/a	Multiple case reports concluded that tourniquet pressure >350 increases compressive neuropraxia & potential compartment syndrome risk.	VC
30	Mingo-Robinet J, Castañeda-Cabrero C, Alvarez V, Léon Alonso-Cortés JM, Monge-Casares E. Tourniquet-related iatrogenic femoral nerve palsy after knee surgery: case report and review of the literature. Case Rep Orthop. 2013;2013:368290.	Case Report	n/a	n/a	n/a	n/a	3 times the complications for every 30 minutes of inflation; however, others reported <2 hour or <300 mmHg still had complications.	VC
31	Muhammad H, Hardiyanti L, Anwar S, Hanif F, Ditta AAM, Harahap ISK. Tourniquet-related nerve injury following reconstructive surgery for Wassel type IV preaxial polydactyly of 13-year-old boy: a case report. Am J Case Rep. 2023;24:e940977.	Case Report	n/a	n/a	n/a	n/a	13 year old pt underwent reconstruction for polydactyly; tourniquet applied to upper limb, 200mmHg for 90 minutes; resulted in total weakness, numbness, tingling, burning sensation from upper arm to fingertips; pharmacologic and physical rehab restored normal function and sensation after 6 months	VA
32	Santhosh MC, Pai RB, Rao RP. Acute pulmonary edema following inflation of arterial tourniquet. Rev Esp Anestesiol Reanim. 2014;61(8):451-453.	Case Report	n/a	n/a	n/a	n/a	Inflation of the tourniquet lead to pulmonary edema in a young patient.	VA
33	Houng WR, Lee CL, Chiou HM, Wei YS. Cardiac arrest after tourniquet deflation in tibial plateau fracture surgery in a healthy man. Formosan Journal of Musculoskeletal Disorders. 2012;3(1):34-38.	Case Report	n/a	n/a	n/a	n/a	Cardiac arrest after 5 minutes of inflation in healthy male patient, recommend readjustment after 2 hours of pneumatic tourniquet inflation is >15 min, potential harm after >2 hour according to previous AORN guideline.	VB
34	Zarrouki Y, Abouelhassan T, Samkaoui MA. Cardiac arrest after tourniquet deflation in upper limb. Trauma Case Rep. 2017;7:1-2.	Case Report	n/a	n/a	n/a	n/a	Pneumatic tourniquet inflation lead to ischemia with metabolic changes including decreased oxygen, acid-base balance of lactic acid, carbon dioxide, potassium, & toxic metabolites; tourniquet deflation released toxins into circulation, which lead to myocardial stunning; researchers recommended duration & pressure parameters for safe PT use be followed.	VC
35	Liao X, Guo M, Wen J, Huang W, Ye H, Li B. Pulmonary embolism caused by tourniquets in the lower extremities treated with ECMO - a case report. Heart Surg Forum. 2022;25(3):E449-E451.	Case Report	n/a	n/a	n/a	n/a	Pts undergoing fracture surgery are at risk for VTE (DVT, PE) with use of tourniquet.	VA

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36	Cao Z, Guo J, Li Q, Wu J, Li Y. Comparison of efficacy and safety of different tourniquet applications in total knee arthroplasty: a network meta-analysis of randomized controlled trials. Ann Med. 2021;53(1):1816-1826.	Systematic Review w/ Meta-Analysis	n/a	n/a	n/a	periop blood loss, operation time, postop pain, function, complications	1990-2020, 38 RCTs; 3007 pts; compared different tourniquet applications vs NT; shorter duration of tourniquet time (ie, before osteotomy until wound closure in TKA) may lead to the lowest blood loss, risk of complications, and surgical time	IA
37	Guideline for care of the patient receiving local-only anesthesia. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2025:469-486.	Guideline	n/a	n/a	n/a	n/a	Guidance on patient care receiving local anesthesia.	IVA
38	Guideline for team communication. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2025:1143-1178.	Guideline	n/a	n/a	n/a	n/a	Guidance on team communication as it relates to patient safety.	IVA
39	Imran R, Jose RM. Rumple-Leede phenomenon after tourniquet application in acute hand surgery: a case report. J Hand Surg Eur Vol. 2020;45(10):1095-1096.	Case Report	n/a	n/a	n/a	n/a	Tourniquet use in older adult patient resulted in Rumple-Leede phenomenon; patient developed asymptomatic non-blanching petechial rash distal to site of tourniquet. Duration of tourniquet is not a factor (d/t proximal compressive force). Patients can develop RLP without secondary causes (eg, DM, steroid use), but may resolve without intervention	VA
40	Kumar K, Railton C, Tawfic Q. Tourniquet application during anesthesia: "What we need to know?" J Anaesthesiol Clin Pharmacol. 2016;32(4):424-430.	Literature Review	n/a	n/a	n/a	n/a	Concludes there are no absolute contraindications for tourniquet use, but use caution in patients diagnosed with peripheral vascular disease, sickle cell disorder, diabetic neuropathy, or DVT, or with crushing injuries.	VA
41	Ducic I, Chang S, Dellon AL. Use of the tourniquet in reconstructive surgery in patients with previous ipsilateral lower extremity revascularization: is it safe? A survey. J Reconstr Microsurg. 2006;22(3):183-189.	Qualitative	28 vascular surgeons	n/a	n/a	Pneumatic tourniquet use in previously revascularized lower extremity - possible complication graft failure	93% reported it was inappropriate to use pneumatic tourniquet on previous revascularized extremity, 71% reported the same for an angioplasty, however there is a lack of RCT to study complications; concluded to avoid pneumatic tourniquet use.	IIIC
42	McMillan TE, Johnstone AJ. Tourniquet uses and precautions. Surgery (Oxf). 2017;35(4):201-203.	Literature Review	n/a	n/a	n/a	n/a	Concludes contraindication decision is patient & case-specific & to limit inflation time.	VB
43	Drolet BC, Okhah Z, Phillips BZ, et al. Evidence for safe tourniquet use in 500 consecutive upper extremity procedures. Hand (N Y). 2014;9(4):494-498.	Nonexperimental	505 pt	n/a	n/a	demographic, comorbidities, complications, pneumatic tourniquet parameters - application, pressure, time	No injuries reported, concluded that SBP+100 mmHg (<250 mmHg) pressure for 2 hour is safe.	IIIB
44	Bailey AN, Hocker AD, Vermillion BR, et al. MAFbx, MuRF1, and the stress-activated protein kinases are upregulated in muscle cells during total knee arthroplasty. Am J Physiol Regul Integr Comp Physiol. 2012;303(4):R376-R386.	Nonexperimental	12 TKA	n/a	n/a	measure Forkhead box O3 , stress-activated protein kinases during TKA	Down regulation of serine/threonine protein kinase B leads to dephosphorylation of Forkhead box O3 increased atrophy; oxidative stress may stimulate upregulation of Stress-activated protein kinases (SAPK)/Jun amino-terminal kinases (JNK)/Forkhead box O3.	IIIC
45	Lu K, Xu M, Li W, Wang K, Wang D. A study on dynamic monitoring, components, and risk factors of embolism during total knee arthroplasty. Medicine (Baltimore). 2017;96(51):e9303.	Nonexperimental	40 TKA	n/a	n/a	transesophageal echocardiography (TEE) to diagnose embolism after tourniquet deflation, pulmonary arterial pressure (PAP), medullary cavity biopsies	Pulmonary arterial pressure peaks at 30 seconds after pneumatic tourniquet deflation, embolism had bone marrow particulates, quantity of embolus found correlated with increased age, Body mass index, & the fat content of bone marrow, which were also risk factors for pulmonary hypertension.	IIIB

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46	Li Z, Liu D, Long G, et al. Association of tourniquet utilization with blood loss, rehabilitation, and complications in Chinese obese patients undergoing total knee arthroplasty: a retrospective study. Medicine (Baltimore). 2017;96(49):e9030.	Quasi-experimental	130 pt	PT	no PT	total EBL, intraoperative blood loss, hidden blood loss, transfusion volume, drain volume, difference between Hemoglobin preop & 5th postop day for thigh swelling rate, VAS, Knee Society Scale	Pneumatic tourniquet not related to decreased blood loss or increased postop complications in patients with higher body mass index.	IIC
47	Lozano LM, Tio M, Rios J, et al. Severe and morbid obesity (BMI ≥ 35 kg/m(2)) does not increase surgical time and length of hospital stay in total knee arthroplasty surgery. Knee Surg Sports Traumatol Arthrosc. 2015;23(6):1713-1719.	Nonexperimental	922 TKA	n/a	n/a	age, sex, weight, height, body mass index, ASA score, preop Hemoglobin at 2 months prior to surgery, hemostasis drug prescription, transfusions, length of hospital stay	Factors affecting length of stay including ASA score 3-4, preop Hemoglobin <13, preop diagnosis of anemia; not the patient's body mass index.	IIIB
48	Roth KE, Mandryka B, Maier GS, et al. In-vivo analysis of epicutaneous pressure distribution beneath a femoral tourniquet – an observational study. BMC Musculoskelet Disord. 2015;16(1):1.	Nonexperimental	25 consecutive pt	n/a	n/a	transfer of pressure to thigh skin, homogeneous distribution, variations over time, effect of limb circumference & body mass index on pressure distribution	Body mass index & associated higher circumference could affect deeper pressure points, surgical procedure may affect results; concluded that significant loss of pressure not related to patients' body mass index or circumference & to make overlap as narrow as possible.	IIIB
49	Wu EJ, Lai CH, Muraoka K, Segovia N, Kleimeyer JP, Yao J. Prospective analysis of simulated pneumatic tourniquet use and oedema following axillary lymph node dissection. J Hand Surg Asian Pac Vol. 2024;29(1):29-35.	Nonexperimental	12 pts	Tourniquet use on ipsilateral limb post-ax lymph node dissection (ALND)	contralateral limb w/out ax lymph node dissection	change limb volume after tourniquet use	Tourniquet use during elective hand surgery in pts with history of ALND may cause non-clinically significant swelling; measured swelling was temporary and self-resolving	IIIB
50	Paton M, Kovar A, Iorio ML. An evaluation of safety and patient outcomes for hand surgery following prior breast cancer treatment: establishing new recommendations in lymphedema. Plast Reconstr Surg. 2020;145(2):459-467.	Systematic Review w/ Meta-Analysis	n/a	n/a	n/a	n/a	1995-2017; 4 studies (case studies, retrospective, expert opinion); 167 pts; tourniquet use on pts (hx of breast cancer & lymph node dissection) with or without preexisting ipsilateral lymphedema for minor hand surgery; results suggest preexisting lymphedema may increase risk of postop infection or worsening lymphedema; however, tourniquet use not associated with increased risk of complications, can be used safely in pts with preexisting lymphedema or breast surgery	IIIC
51	Fulford D, Dalal S, Winstanley J, Hayton MJ. Hand surgery after axillary lymph node clearance for breast cancer: contra-indication to surgery? Ann R Coll Surg Engl. 2010;92(7):573-576.	Qualitative	339 surgeon responses	n/a	n/a	current opinion of hand surgeons, breast surgeons, breast-care nurses whether hand surgery should be undertaken	79% of hand surgeons, 57% breast surgeons would use tourniquet for patients after axillary lymph node dissection if it was considered standard practice; 68% of RN advised against it.	IIIB
52	Habbu R, Adams JE. Role of elective hand surgery and tourniquet use in patients with prior breast cancer treatment. J Hand Surg Am. 2011;36(9):1537-1540.	Literature Review	n/a	n/a	n/a	n/a	Patients with preexisting lymphedema may experience increased symptoms after minor hand surgery; however, upper arm tourniquet may be used safely in some populations. Patients should be educated of potential for complications.	VB

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
53	Asdourian MS, Skolny MN, Brunelle C, Seward CE, Salama L, Taghian AG. Precautions for breast cancer-related lymphoedema: risk from air travel, ipsilateral arm blood pressure measurements, skin puncture, extreme temperatures, and cellulitis. Lancet Oncol. 2016;17(9):e392-e405.	Literature Review	n/a	n/a	n/a	n/a	Few studies show the relationship between complications and tourniquet use in limbs with or at risk for lymphedema. Low-quality studies have been done and showed no new or worsening lymphedema with tourniquet use. Surveys of surgeons (breast, hand) show a willingness to use a tourniquet on the affected limb if recommended.	VA
54	Jiao X, Li Z, An S, Huang J, Feng M, Cao G. Does diabetes mellitus increase the incidence of early thrombosis in deep vein following unicompartmental knee arthroplasty: a retrospective cohort study. BMC Geriatr. 2022;22(1):448.	Nonexperimental	224 pts	n/a	n/a	DVT	Diabetes significantly increases risk of DVT after UKA; diabetic pts developed DVT on surgical limb w/ tourniquet more than non-diabetic pts	IIIB
55	Tan Y, Guo S, Wang H, et al. The effects of tourniquet use on blood loss and perioperative complications in total knee arthroplasty. BMC Musculoskelet Disord. 2023;24(1):847.	RCT	50 pts	Tourniquet	No tourniquet	change in Hgb, blood loss, operation time, D-dimer, postop complications (thrombotic & nonthrombotic)	Tourniquet use does not reduce operative time or blood loss, and increases incidence of local complications (thigh bruising, blisters, pain, fat liquefication, superficial infections) in TKA	IB
56	Stronach BM, Jones RE, Meneghini RM. Tourniquetless total knee arthroplasty: history, controversies, and technique. J Am Acad Orthop Surg. 2021;29(1):17-23.	Literature Review	n/a	n/a	n/a	n/a	Use of tourniquets increases risk for thromboembolic events by interfering with all three components of Virchow's triad; Preoperative anemia is a relative contraindication for TKA (w/ tourniquet use) and identification of patients with low preop hemoglobin is recommended	VA
57	Boutsiadis A, Reynolds RJ, Saffarini M, Panisset JC. Factors that influence blood loss and need for transfusion following total knee arthroplasty. Ann Transl Med. 2017;5(21):418.	Nonexperimental	150 TKA	n/a	n/a	anticoagulation medication administration, type of anesthesia, TXA administration, presence of pneumatic tourniquet or drain, Hemoglobin preop & postop levels, blood transfusion requirement	preop Hemoglobin was associated with how much Hemoglobin decreased & whether TXA was used & both correlated with blood transfusion requirement.	IIIB
58	Yasin S, Sood C, Dubey CR, Manzoor N, kompani A. Blood loss and tourniquet in total knee replacement surgery: a randomised control study. J Arthrosc Jt Surg. 2020;7(3):122.	RCT	103 pts	Tourniquet	No tourniquet	Hgb, packed cell volume (PCV), intraop blood loss, postop blood loss	Tourniquet use during TKA does not decrease total blood loss compared to no tourniquet use; tourniquet use decreases intraop blood loss, but can lead to increased postop blood loss	IB
59	Davey MS, Davey MG, Hurley ET, Kearns SR. Tourniquet use during open reduction and internal fixation of ankle fractures – a systematic review and meta-analysis. J Foot Ankle Surg. 2022;61(5):1103-1108.	Systematic Review w/ Meta-Analysis	n/a	n/a	n/a	n/a	1993-2019, 4 RCTs; 350pts; T vs NT in ORIF Ankle fractures; Tourniquet significantly reduces operative time, but significantly increased postop pain and reduced ROM	IA
60	Farhan-Alanie MM, Trompeter AJ, Wall PDH, Costa ML. Tourniquet use in lower limb trauma and fracture surgery. Bone Joint J. 2021;103-B(5):809-812.	Literature Review	n/a	n/a	n/a	n/a	Tourniquets associated with increased pain, potentially higher risk of complications, no statistically significant difference in blood loss; more high quality research is needed for tourniquet use with lower limb fracture surgery	VB

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61	Lodin J, Humhej I, Táborská J, Sameš M. Gas gangrene following posterior tibial tendon transfer of a 34-year-old patient – a case report. Acta Chir Plast. 2021;63(1):18-22.	Case Report	n/a	n/a	n/a	n/a	Authors recommend using caution using tourniquets in patients with a history of open contaminated wounds; tissue hypoxia may potentially activate sporulent bacteria; 34 year pt attacked by wild boar, complete nerve disruption and partial biceps femoris tear. Had immediate surgery to repair, 15 months later had reconstructive surgery with tourniquet, discharged home POD1. Presented to hospital same day, gas gangrene identified in surgical wound, eventual BKA amputation required	VB
62	Derner R, Buckholz J. Surgical hemostasis by pneumatic ankle tourniquet during 3027 podiatric operations. J Foot Ankle Surg. 1995;34(3):236-246.	Nonexperimental	3027 podiatry cases	n/a	n/a	complication, pressure, time	3/5 complications were post-pneumatic tourniquet syndrome (7 total); conclude contraindications - poor circulation or vasculitis, hx DVT/pulmonary edema, sickle cell anemia, little ischemia as possible based on procedure.	IIIA
63	Farhan-Alanie MM, Dhaif F, Trompeter A, et al. The risks associated with tourniquet use in lower limb trauma surgery: a systematic review and meta-analysis. Eur J Orthop Surg Traumatol. 2021;31(5):967-979.	Systematic Review w/ Meta-Analysis	n/a	n/a	n/a	n/a	1991-2019, 6 RCTs; 552 pts; Researchers concluded tourniquet application in lower limb fracture surgery reduced duration of surgery, but no statistically significant difference in postop pain (at 24 h), blood loss, function, LOS, and complications.	IA
64	Liu PL, Li DQ, Zhang YK, et al. Effects of unilateral tourniquet used in patients undergoing simultaneous bilateral total knee arthroplasty. Orthop Surg. 2017;9(2):180-185.	RCT	52 pt	PT	no PT	op time, pain, ROM, first straight leg, swell, wound healing, DVT, KSS	Pneumatic tourniquet associated with decreased operative time; no pneumatic tourniquet associated with less pain, time to straight-leg raise, swelling, & complications; no difference in range of motion, DVT, or Knee Society Score.	IB
65	Mori N, Kimura S, Onodera T, Iwasaki N, Nakagawa I, Masuda T. Use of a pneumatic tourniquet in total knee arthroplasty increases the risk of distal deep vein thrombosis: a prospective, randomized study. Knee. 2016;23(5):887-889.	RCT	103 pt	pneumatic tourniquet at 250 mmHg deflated after skin closure	pneumatic tourniquet - only during cementation	comorbidities. Operative time, total blood loss, & - distal, proximal, & total DVT	Distal & total DVT significantly higher with late release PT.	IA
66	Zan P, Mol MO, Yao JJ, et al. Release of the tourniquet immediately after the implantation of the components reduces the incidence of deep vein thrombosis after primary total knee arthroplasty. Bone Joint Res. 2017;6(9):535-541.	Quasi-experimental	200 pt; 200 pt retrospective cohort	early release	prior cohort, tourniquet release after dressing	Transfusion at Hemoglobin <8 or symptomatic & <10, postop day 5-7 DVT by ultrasound (US), Gross formula to calculate total blood loss (TBL)	Found sign less DVT in early release, recommend early release practice.	IIB
67	Liu Y, Si H, Zeng Y, Li M, Xie H, Shen B. More pain and slower functional recovery when a tourniquet is used during total knee arthroplasty. Knee Surg Sports Traumatol Arthrosc. 2020;28(6):1842-1860.	Systematic Review w/ Meta-Analysis	n/a	n/a	n/a	n/a	1994-2019, 46 RCTs; 1598 pts (NT/Whole Duration), 627 (Short Duration/Whole Duration), 845 (Most Duration/Whole Duration); Not using a tourniquet or only during cementation (short duration) provides faster functional recovery, lower rate of DVTs and complications compared with tourniquet throughout TKA (incision to close)	IB
68	Tuncalı B, Boya H, Kayhan Z, Araç S. Obese patients require higher, but not high pneumatic tourniquet inflation pressures using a novel technique during total knee arthroplasty. Eklem Hastalik Cerrahisi. 2018;29(1):40-45.	Nonexperimental	208 TKA	n/a	n/a	intraoperative & postop systolic blood pressure, AOP, pressure, effectiveness, field visibility, circulation	The initial & maximum systolic blood pressure, arterial occlusion pressure (AOP), initial & maximum pressures were all higher in patients with high body mass index, but all good field visualization without complications.	IIIB

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69	Baltzer HL, Harvey J, Fox PM, Moran SL. De novo upper extremity lymphedema after elective hand surgery in breast cancer survivors. Ann Plast Surg. 2017;79(1):24-27.	Nonexperimental	103 pts	n/a	n/a	development of lymphedema postelective hand surgery	Tourniquet use was not associated with lymphedema and tourniquet time was significantly longer among those who did not develop lymphedema	IIIB
70	Memtsoudis SG, Stundner O, Yoo D, et al. Does limb preconditioning reduce pain after total knee arthroplasty? A randomized, double-blind study. Clin Orthop Relat Res. 2014;472(5):1467-1474.	RCT	60 unilateral TKA	5 minute inflation & 5 minute reperfusion period	pneumatic tourniquet inflated only once	pain at rest & exercise, pain meds, systemic prothrombotic local inflammatory markers, LOS, pneumatic tourniquet milestones	Found significantly less pain at rest; no difference in medications, muscle oxidation, Interleukin 6, Tumor necrosis factor, prothrombolysis, length of stay, pneumatic tourniquet milestones; recommend more studies for mechanism, safety, & cost of pneumatic tourniquet use.	IA
71	Volkmar AJ, Day MA, Fleury IG, Lawler EA, Seering M, Caldwell LS. Safety and efficacy of forearm tourniquet compared to upper arm tourniquet for local intravenous regional anesthesia in hand surgery: a randomized clinical trial. Iowa Orthop J. 2021;41(1):177-181.	RCT	66 pts	Upper arm tourniquet	Lower arm tourniquet	efficacy, cost effectiveness, complications, duration, pt satisfaction of IVRA in upper and forearm	Pts experience comparable tourniquet pain in upper arm and forearm tourniquet for IVRA; lower arm tourniquets does not increase complications, and reduces dose of local anesthetic needed for IVRA. Less cost associated with forearm tourniquet	IB
72	Mittal R, Ko V, Adie S, et al. Tourniquet application only during cement fixation in total knee arthroplasty: a double-blind, randomized controlled trial. ANZ J Surg. 2012;82(6):428-433.	RCT	65 pt at 300 mmHg	pneumatic tourniquet during cement fixation	pneumatic tourniquet at incision to fixation	baseline Oxford Knee Score (OKS), range of motion, leg lag test, DVT screening within 2-6 weeks preop	Planned to randomize 230 patients but discontinued study after 65 patients due to high transfusion rate in participants.	IA
73	Stimpson J, Gill DF, Memarzadeh A, et al. Reducing the hypertensive effects of the prolonged surgical tourniquet using a dual-cuff strategy: a prospective randomized controlled trial. J Foot Ankle Surg. 2019;58(6):1177-1186.	RCT	20 pts	Dual cuff (thigh & calf)	Single cuff (thigh)	MAP, HR, SBP, pain (VAS), function (Functional Recovery Index)	Prolonged lower limb tourniquet was associated with increased MAP and HR; inflating second tourniquet distally to lower leg (calf) attenuated this hypertensive response; dual tourniquet technique (thigh tourniquet inflated for 60 min, calf tourniquet inflated & and thigh deflated for remainder of procedure)	IA
74	Walls RJ, O'Malley J, O'Flanagan SJ, Kenny PJ, Leahy AL, Keogh P. Total knee replacement under tourniquet control: a prospective study of the peripheral arterial vasculature using colour-assisted duplex ultrasonography. Surgeon. 2015;13(6):303-307.	Nonexperimental	40 pt	n/a	n/a	prevalence & risk factors for PVD - smoking history, hypertension, diabetes, ischemic heart disease (IHD), hyper cholesterol, lower extremity (LE) claudication & rest pain, bilateral assessment of hair, skin, & nails, x-ray to see calcification	There was no significant change in blood flow; concluded that TKA with pneumatic tourniquet does not potentiate arterial injury with normal vasculature or mild PVD.	IIIB
75	Woelfle-Roos JV, Dautel L, Mayer B, Bieger R, Woelfle KD, Reichel H. Vascular calcifications on the preoperative radiograph: harbinger of tourniquet failure in patients undergoing total knee arthroplasty? Skeletal Radiol. 2017;46(9):1219-1224.	Quasi-experimental	765 pt screened, retrospectively compared groups	medial arterial calcification	no calcification	pneumatic tourniquet failure, intraoperative by cell-saving device, calcifications via x-ray	Found that vascular calcifications were not associated with pneumatic tourniquet failure, but recommended to be aware that minimizing cuff pressures may not be suitable with patients diagnosed with calcifications.	IIA
76	Koehler SM, Fields A, Noori N, Weiser M, Moucha CS, Bronson MJ. Safety of tourniquet use in total knee arthroplasty in patients with radiographic evidence of vascular calcifications. Am J Orthop (Belle Mead NJ). 2015;44(9):E308-E316.	Nonexperimental	373 TKA	n/a	n/a	calcifications versus none; predisposing factors	Male patients or patients with diagnosis of diabetes, hypertension, prior VTE, or coronary heart disease associated with increase complication separately; recommend taking a history & exam of risk factors diabetes, VTE, hypertension, coronary heart disease to look for PVD, vascular claudication or peripheral artery disease.	IIIB

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77	Guideline for prevention of perioperative pressure injury. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2025:773-796.	Guideline	n/a	n/a	n/a	n/a	Guideline on strategies to prevent perioperative pressure injuries.	IVA
78	Guideline for prevention of venous thromboembolism. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2025:1207-1232.	Guideline	n/a	n/a	n/a	n/a	Guidance on additional ways to prevent VTEs.	IVA
79	Guideline for the implementation of enhanced recovery after surgery. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2025:339-374.	Guideline	n/a	n/a	n/a	n/a	Guidelines for implementation of ERAS programs in health care organizations	IVA
80	Younger AS, McEwen JA, Inkpen K. Wide contoured thigh cuffs and automated limb occlusion measurement allow lower tourniquet pressures. Clin Orthop Relat Res. 2004;(428):286-293.	RCT	40 pt	wide cuff	standard cuff	SBP & field visibility	Wide cuff significantly decrease limb occlusion pressure (LOP) & final cuff pressure, LOP technique has 80% accuracy; LOP & systolic blood pressure (SBP) weak linear correlation, so SBP should not be used to assume LOP.	IB
81	Pedowitz RA, Gershuni DH, Botte MJ, Kuiper S, Rydevik BL, Hargens AR. The use of lower tourniquet inflation pressures in extremity surgery facilitated by curved and wide tourniquets and an integrated cuff inflation system. Clin Orthop Relat Res. 1993;(287):237-244.	RCT	26 volunteers, 60 patients	curved, wide cuff with LOP machine measurement; patients - observed LOP+50 mmHg safety margin	cylindrical, narrow cuff with LOP Doppler pressure measurement	pressure & field visibility	LOP had significantly lower pressure; 5/10 had fair/poor field visibility associated with an increase in SBP; concluded that curved & wider cuffs minimize pressure & decrease the risk of neuromuscular injury.	IB
82	de Roo SF, Teunissen JS, Rutten MJCM , van der Heijden BEPA. Tourniquet does not affect long-term outcomes in minor hand surgery: a randomized controlled trial. Plast Reconstr Surg Glob Open. 2022;10(8):e4495.	RCT	142 pts	Tourniquet	No tourniquet	Pt reported physical function, scar tissue formation, complication rate	Long-term physical function, scar tissue formation, and complication rates were similar between the groups (T vs NT); tourniquets can be used safely without increasing complication rates and should be based on shared decision between surgeon and patient	IA
83	Dimnjaković D, Hrabač P, Bojanić I. Ankle arthroscopy without tourniquet: a mid-term follow-up. J Foot Ankle Surg. 2023;62(6):963-966.	RCT	39 pts	n/a	n/a	5-year functional outcomes (AOFAS, FADI, Tegner activity, MAQ), patient satisfaction	60-month follow-up from previous study (T vs NT, ankle arthroscopy); functional scores 60 months after surgery were similar to 6 months postop; high pt satisfaction in both groups;	IB
84	Wang S, Wang MS. Intraoperative pneumatic tourniquet use may improve the clinical outcomes of arteriovenous fistula creations. J Vasc Access. 2019;20(6):706-715.	Nonexperimental	575 pts	n/a	n/a	AV fistula patency, failure rate	Pneumatic tourniquet use may significantly improve outcomes of AVF creation; demonstrated reduced juxta-anastomosis stenosis and subsequent primary failure and interventions to promote fistula maturation compared to vascular clamp use during creation	IIIA
85	Jensen J, Hicks RW, Labovitz J. Understanding and optimizing tourniquet use during extremity surgery. AORN J. 2019;109(2):171-182.	Literature Review	n/a	n/a	n/a	n/a	Concludes to use waterproof drapes to prevent fluid accumulation under cuff & use lower inflation pressures when possible.	VA
86	Latex Allergy Management Guidelines. Rosemont, IL: American Association of Nurse Anesthesiology; 2018.	Guideline	n/a	n/a	n/a	n/a	Guidance to remove latex tourniquets if there is a latex allergy.	IVB
87	Guideline for a safe environment of care. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2025:165-196.	Guideline	n/a	n/a	n/a	n/a	Guidance for safe equipment use in the perioperative environment.	IVA
88	Thompson SM, Middleton M, Farook M, Cameron-Smith A, Bone S, Hassan A. The effect of sterile versus non-sterile tourniquets on microbiological colonisation in lower limb surgery. Ann R Coll Surg Engl. 2011;93(8):589-590.	Nonexperimental	70 reusable & single-use tourniquets	n/a	n/a	bacterial type & colony count	Methicillin-resistant Staphylococcus aureus (MRSA) was not isolated, but Staphylococcus found on 11/25 PT; sterile pneumatic tourniquet remained sterile.	IIIC
89	Haghighi M, Mardani-Kivi M, Mirbolook A, et al. A comparison between single and double tourniquet technique in distal upper limb orthopedic surgeries with intravenous regional anesthesia. Arch Bone Jt Surg. 2018;6(1):63-70.	RCT	80 pt UE IVRA lidocaine	single wide PT	double narrow PT	Visual analog scale, onset & maximum pain, fentanyl consumption	Wide pneumatic tourniquet cuff associated with less pain but similar fentanyl consumption under 40 minutes; conclude that single pneumatic tourniquet cuff has less potential toxicity related to switching pneumatic tourniquet cuffs & releasing medication.	IA

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90	Kokki H, Väätäinen U, Penttilä I. Metabolic effects of a low-pressure tourniquet system compared with a high-pressure tourniquet system in arthroscopic anterior crucial ligament reconstruction. Acta Anaesthesiol Scand. 1998;42(4):418-424.	RCT	26 pt	low pressure, wide curved cuff with microprocessor	standard narrow straight with higher pressure	injury & metabolism	Pneumatic tourniquet deflation significantly released lactate, myoglobin, potassium, & increased carbon dioxide; more metabolic changes with longer pneumatic tourniquet time, no difference at 60 minutes after deflation.	IC
91	Din R, Geddes T. Skin protection beneath the tourniquet. A prospective randomized trial. ANZ J Surg. 2004;74(9):721-722.	RCT	150 pt	skin protection, soffban or drape	no protection	skin blisters	Found significantly less skin blisters with protection under the pneumatic tourniquet cuff.	IC
92	Olivecrona C, Tidermark J, Hamberg P, Ponzer S, Cederfjäll C. Skin protection underneath the pneumatic tourniquet during total knee arthroplasty: a randomized controlled trial of 92 patients. Acta Orthop. 2006;77(3):519-523.	RCT	92 pt	stockinette versus cast padding	no padding	blister incidence	Stockinette padding significantly better than no padding but not significant, but stockinette was better than cast padding, & cast padding was not significantly better than none; recommend using conical pneumatic tourniquet only pressure when following manufacturer's instruction for use (MIFU); concluded a lack of knowledge in safe pneumatic tourniquet application techniques & longer pneumatic tourniquet inflation time increase risk overall.	IB
93	Aydin A, Kanan N. Effect of protective padding in pneumatic tourniquet applications on the prevention of skin complications. Orthop Nurs. 2022;41(4):260-268.	RCT	60 pts	Tourniquet w/ padding (2 different types)	Tourniquet w/out padding	skin complications r/t tourniquet use	Skin complications in the unpadded group were higher than both padded groups (cast padding, protection sleeve); skin protection under a tourniquet cuff should be used to prevent skin complications	IC
94	Kvederas G, Porvaneckas N, Andrijauskas A, et al. A randomized double-blind clinical trial of tourniquet application strategies for total knee arthroplasty. Knee Surg Sports Traumatol Arthrosc. 2013;21(12):2790-2799.	RCT	36 pt	pneumatic tourniquet - incision to harden versus cement to harden	pneumatic tourniquet - incision to skin	Hemoglobin & Hematocrit to calculate blood loss - classic, Gross, Shander's x Nadler's to calculate, body surface area, plus red blood cell volume for each method to calculate EBL, Timed Up & Go postop day 2, fit to discharge = pain with NSAID, Timed Up & Go <20 s, wound healing, body temperature <37.7	Pneumatic tourniquet inflation from incision to cement hardening & cement-only increased EBL; functional Timed Up & Go recovery was better in incision to cement group, time to be fit to discharge shorter with shorter pneumatic tourniquet inflation time.	IB
95	Zhang Y, Li D, Liu P, Wang X, Li M. Effects of different methods of using pneumatic tourniquet in patients undergoing total knee arthroplasty: a randomized control trial. Ir J Med Sci. 2017;186(4):953-959.	RCT	150 pt	pneumatic tourniquet - entire incision to dressing versus beginning incision to joint replacement before skin closure	pneumatic tourniquet - osteotomy to dressing	intraoperative blood loss (IBL), postop blood loss (PBL), hidden blood loss (HBL), total blood loss (TBL), operative time, pneumatic tourniquet time, complications, Hospital for Special Surgery score	Less pneumatic tourniquet inflation time associated with less complications; more pneumatic tourniquet time increases redness, swelling, DVT, convenience, accuracy, & EBL; recommend limiting the role of PT, exercise caution with use.	IA
96	Olivecrona C, Ponzer S, Hamberg P, Blomfeldt R. Lower tourniquet cuff pressure reduces postoperative wound complications after total knee arthroplasty: a randomized controlled study of 164 patients. J Bone Joint Surg Am. 2012;94(24):2216-2221.	RCT	164 pt	LOP	surgeon decides pressure	pain, field visibility, range of motion, complications at discharge & 2 month	LOP lowers pressure but no difference pain, visual analog scale & field visualization, complications, or range of motion, but associated with less stiffness; both pressure parameters have good postop outcomes.	IA

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97	Na YG, Bamne AB, Won HH, Kim TK. After early release of tourniquet in total knee arthroplasty, should it be reinflated or kept deflated? A randomized trial. Knee Surg Sports Traumatol Arthrosc. 2017;25(9):2769-2777.	RCT	210 TKA	early release	reinflation of PT after early release	field visibility, operative time, drainage, Hemoglobin postop day 2 & 5, transfusion, knee & thigh pain visual analog scale, wound complications, pneumatic tourniquet site complications, major complications	No difference in operative time, postop blood loss, Hemoglobin, transfusion, pain, or complications; concluded that reinflation after early release may be safe alternative for better field visibility.	IA
98	Yalçinkaya M, Sökücü S, Erdoğan S, Kabukçuoğlu YS. Tourniquet use in orthopedic surgery: a descriptive survey study among Turkish orthopedic surgeons and residents in Istanbul. Acta Orthop Traumatol Turc. 2014;48(5):483-490.	Qualitative	211 orthopedic surgeons	n/a	n/a	12 Questionnaire researcher-derived, face to face survey	Association between more years in practice & higher pressures used; conclude surgeons should review EBP of pneumatic tourniquet use.	IIIB
99	Mendes E, Cesur M, Sen E, Gocergil H. Intravenous regional anesthesia (IVRA) with forearm tourniquet for short-term hand surgery: a case report. J Surg Med. 2021;5(12):1227-1229.	Case Report	n/a	n/a	n/a	n/a	Forearm tourniquet in IVRA may be preferred in short-term hand surgeries; easy to apply, lower risk of toxicity, early block recovery	VB
100	Masri BA, Eisen A, Duncan CP, McEwen JA. Tourniquet-induced nerve compression injuries are caused by high pressure levels and gradients – a review of the evidence to guide safe surgical, pre-hospital and blood flow restriction usage. BMC Biomed Eng. 2020;2:7.	Literature Review	n/a	n/a	n/a	n/a	Nerve injuries r/t tourniquet use are more commonly reported in upper extremities with radial nerve being most vulnerable (placement of tourniquet cuff is crucial to reducing nerve compression); muscle tissue is susceptible to damage with 30-60 minutes of inflation, can result in post-tourniquet syndrome; minimizing inflation pressure and personalizing to patient can reduce patient injuries related to pressure gradient	VA
101	Akinyoola AL, Adegbehingbe OO, Odunsi A. Timing of antibiotic prophylaxis in tourniquet surgery. J Foot Ankle Surg. 2011;50(4):374-376.	RCT	106 pt all ages	antibiotics 5 minutes before exsanguination & inflation	antibiotics 1 minute after inflation	rate of infection, healing time, surgeon satisfaction with healing	Administering antibiotics after inflation had significantly less infections & healing time & increase surgeon satisfaction with healing.	IB
102	Soriano A, Bori G, García-Ramiro S, et al. Timing of antibiotic prophylaxis for primary total knee arthroplasty performed during ischemia. Clin Infect Dis. 2008;46(7):1009-1014.	RCT	908 pt	antibiotics 10-30 minutes before incision	10 before deflation	3,12 month of surgical site infection (SSI)	There were no significant difference, but require more studies to prove one is better, however administering antibiotics before pneumatic tourniquet deflation is not inferior to before incision.	IB
103	Prats L, Valls J, Ros J, Jover A, Pérez-Villar F, Fernández-Martínez JJ. Influence of the ischaemic tourniquet in antibiotic prophylaxis in total knee replacement. Rev Esp Cir Ortop Traumatol. 2015;59(4):275-280.	Nonexperimental	32 pt	n/a	n/a	observed antibiotic concentration before & after pneumatic tourniquet use	Antibiotic concentration gradually decreases during operation, but remained over minimum inhibitory concentration level.	IIIB
104	Dounis E, Tsourvakas S, Kalivas L, Giamaçellou H. Effect of time interval on tissue concentrations of cephalosporins after tourniquet inflation. Highest levels achieved by administration 20 minutes before inflation. Acta Orthop Scand. 1995;66(2):158-160.	Quasi-experimental	62 pt	ceftazidime	ceftriaxone or ceforanide	tissue from skin, fat, muscle, bone at 20 minutes, 2 hour & 4 hour	Maximum antibiotic tissue concentration in soft tissue & bone at 20 minutes.	IIB
105	Papaioannou N, Kalivas L, Kalavritinos J, Tsourvakas S. Tissue concentrations of third-generation cephalosporins (ceftazidime and ceftriaxone) in lower extremity tissues using a tourniquet. Arch Orthop Trauma Surg. 1994;113(3):167-169.	Nonexperimental	47 pt	n/a	n/a	tissue & bone concentration of ceftazidime & ceftriaxone antibiotics at 10 minutes, 20 minutes, 2 hour, 4 hour before inflation	Highest concentration at 20 minutes, 4 hour lowest concentration for both, ceftriaxone highest at 10 minutes; administering antibiotics the night before no longer recommended.	IIIB

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106	Montreuil J, Tanzer M, Zhang YL, Rajda E, Avizonis D, Hart A. Tourniquet use and local tissue concentrations of cefazolin during total knee arthroplasty: a randomized clinical trial. JAMA Netw Open. 2024;7(8):e2429702.	RCT	59 pts	Tourniquet	No tourniquet	local tissue concentration of antibiotic	Tourniquet use significantly decreases the concentration of cefazolin in fat, synovium, and bone on the operative limb compared to patients that did not have a tourniquet used. Concentrations may be inadequate to provide necessary concentration for entirety of procedure to prevent surgical site infection	IA
107	Calderwood MS, Anderson DJ, Bratzler DW, et al. Strategies to prevent surgical site infections in acute-care hospitals: 2022 update. Infect Control Hosp Epidemiol. 2023;44(5):695-720.	Guideline	n/a	n/a	n/a	n/a	Guidelines for antibiotic administration when using a pneumatic tourniquet	IVB
108	Mu J, Liu D, Ji D, et al. Determination of Pneumatic Tourniquet pressure of lower limb by ultrasonic Doppler. Ann Plast Surg. 2018;80(3):290-292.	RCT	96 pt	Doppler for maximum systolic velocity	pneumatic tourniquet by surgeon preference	pneumatic tourniquet pressure, hemostatic effect, incidence of adverse reaction	Doppler method found significantly lower pressure, with no difference in pneumatic tourniquet inflation time or field visibility with significantly less complications.	IA
109	Kim TK, Bamne AB, Sim JA, Park JH, Na YG. Is lower tourniquet pressure during total knee arthroplasty effective? A prospective randomized controlled trial. BMC Musculoskelet Disord. 2019;20(1):275.	RCT	160 knees; 124 pts	lower inflation pressure	standard inflation pressure	field visibility, blood loss, Hgb, postop pain, skin changes, VTE, postop function	Lower tourniquet pressure (SBP+120mmHg) was effective in patients during TKA; blood loss, field visibility comparable, no difference in Hgb drop, pain, postop function	IC
110	Kanchanathepsak T, Pukrittayakamee NC, Woratanarat P, Tawonsawatruk T, Angsanuntsukh C. Limb occlusion pressure versus standard tourniquet inflation pressure in minor hand surgery: a randomized controlled trial. J Orthop Surg Res. 2023;18(1):539.	RCT	112 pts	LOP + safety margin	250 mmHg (aka standard pressure)	pain (VAS), discomfort, surgeon satisfaction, field visibility, complications, differences in pressure between groups	LOP + safety margin significantly reduced tourniquet pressure, related pain and discomfort for minor hand surgeries, better motionless field and comparable field visibility to standard tourniquet pressure; RTP (LOP + safety margin) is optimal for minor hand surgeries	IA
111	Sun C, Yang X, Zhang X, et al. Personalized tourniquet pressure may be a better choice than uniform tourniquet pressure during total knee arthroplasty: A PRISMA-compliant systematic review and meta-analysis of randomized-controlled trials. Medicine (Baltimore). 2022;101(8):e28981.	Systematic Review w/ Meta-Analysis	n/a	n/a	n/a	n/a	2005-2021, 13 RCTs; 1201 pts; tourniquet pressures based on SBP or LOP demonstrate lower tourniquet pressures, similar blood loss & field visibility, less pain, thigh circumference, rate of thigh ecchymosis, better initial knee flexion after TKA than standardized pressures; authors recommend personalized tourniquet inflation pressure	IB
112	Ding L, Ding CY, Wang YL, et al. Application effect of pneumatic tourniquet with individualized pressure setting in orthopedic surgery of extremities: a meta-analysis. J Adv Nurs. 2019;75(12):3424-3433.	Systematic Review w/ Meta-Analysis	n/a	n/a	n/a	n/a	2003- 2016 9 Chinese RCTs included with 1200 patients; lower pressure improves hemostatic effect & reduces complications, no difference in operative time.	IB
113	Wu J, Fu Q, Li H, et al. An alternative method for personalized tourniquet pressure in total knee arthroplasty: a prospective randomized and controlled study. Sci Rep. 2022;12(1):9652.	RCT	138 pts	AOP	SBP + 100mmHg; standard value (300 mmHg)	Tourniquet pressure, pain, field visibility, complications	AOP estimation formula provided the lowest tourniquet inflation pressures with no difference in hemostatic effect; lower postoperative pain scores; easy and rapid method to determine initial inflation pressure	IB
114	Pinsornsak P, Pinitchanon P, Boontanapibul K. Effect of different tourniquet pressure on postoperative pain and complications after total knee arthroplasty: a prospective, randomized controlled trial. J Arthroplasty. 2021;36(5):1638-1644.	RCT	150 pts	Tourniquet pressure SBP + 75mmHg, or SBP + 100mmHg	Tourniquet pressure SBP + 150mmHg (up to 300mmHg)	pain (tourniquet site, surgical site; VAS), limb circumference (thigh, knee, lower leg), Hgb, transfusion rate, wound complications (oozing, infection), skin complications (hematoma, bleb, blister), CPK, KSS, ROM	Higher tourniquet pressures (SBP + 150mmHg) provided better field visibility; lower tourniquet pressures (SBP + 75-100mmHg) demonstrated lower tourniquet and surgical site pain, muscle damage (lower CPK levels), and wound complications; pressure did not influence blood loss, operative time, ROM, KSS, transfusions	IB

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
115	Lim E, Shukla L, Barker A, Trotter DJ. Randomized blinded control trial into tourniquet tolerance in awake volunteers. ANZ J Surg. 2015;85(9):636-638.	RCT	40 healthy volunteers	200 mmHg	250 mmHg	Vital signs & pain, grip strength until return to normal	Found less pain with lower pressure; 200 mmHg better tolerated during procedures not under general anesthesia, but still need to assess upper limit.	IB
116	Sáenz-Jalón M, Ballesteros-Sanz MA, Sarabia-Cobo CM, et al. Assessment of the pneumatic ischemia technique using the limb occlusion pressure during upper limb surgery. J Perianesth Nurs. 2018;33(5):699-707.	RCT	160 pt	LOP	standard 300 mmHg	field visibility on a 4 Likert scale, & team opinion of quality on a 0-9, hyperemia 1-5 after & postop (body cleaning metabolic waste anoxia), pain 1-10 postop & 24 hour postop	LOP required less general anesthetic conversions due to unbearable pain; conclude that LOP safe parameter that decreased pain & hyperemia in the control group.	IB
117	Hughes L, McEwen J. Investigation of clinically acceptable agreement between two methods of automatic measurement of limb occlusion pressure: a randomised trial. BMC Biomed Eng. 2021;3(1):8.	RCT	81 pts	LOP embedded	LOP distal	LOP	Measuring the patient LOP was clinically agreeable and support the use of embedded LOP method for automatic sensing system measurement with a dual-purpose cuff	IB
118	Besir A, Tugcugil E. Does tourniquet time or pressure contribute to intracranial pressure increase following tourniquet application? Med Princ Pract. 2019;28(1):16-22.	RCT	60 pts	Tourniquet pressure = SBP + 100mmHg	Tourniquet pressure = AOP estimation formula	intracranial pressure r/t tourniquet time & tourniquet pressure	Tourniquet time is correlated with ICP after deflation; pressure (SBP or AOP) had no differing effect on ICP. ICP increase noted after 67.5 min mark; initial and max tourniquet pressures in SBP + margin group significantly higher than AOP group; comparable field visibility	IB
119	Liu HY, Guo JY, Zhang ZB, Li KY, Wang WD. Development of adaptive pneumatic tourniquet systems based on minimal inflation pressure for upper limb surgeries. Biomed Eng Online. 2013;12:92.	Nonexperimental	70 healthy soldiers	n/a	n/a	BMI, Blood Flow velocity & Blood Pressure (BP), occlusion diagnosed by plethysmograph, proposed AOP formula & machine-measured limb occlusion pressure compared	There was no difference in field visibility or complications between groups, but pressure was significantly different at each time point; conclude to continue modifying AOP formula.	IIIB
120	Sato J, Ishii Y, Noguchi H, Takeda M. Safety and efficacy of a new tourniquet system. BMC Surg. 2012;12:17.	Nonexperimental	120 consecutive upper extremity procedures	n/a	n/a	field visibility & complications	Pressure by vital information monitor machine system synchronized with SBP but did not significantly lower pressures; conclude recommend PT pressure for SBP+100 for upper extremity (UE) procedures.	IIIB
121	Lieberman JR, Staheli LT, Dales MC. Tourniquet pressures on pediatric patients: a clinical study. Orthopedics. 1997;20(12):1143-1147.	Nonexperimental	29 pediatrics	n/a	n/a	pneumatic tourniquet time, high & low operative BP, inadequate field, increase pressure needed, failure & SBP at that time	Lower extremity occlusion was 95% adequate for field visibility 100 mmHg above LOP, upper extremity was 100% adequate at 75 mmHg above LOP; lower pressures generally acceptable; 34% of procedures required a pressure higher than twice the patient's SBP.	IIIB

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122	Elbadrawy RE, Aboelela MA. Gradual versus intermittent release of tourniquet in total knee arthroplasty surgery, effects on hemodynamics and acid base parameters: a prospective randomized controlled study. Egyptian Journal of Anaesthesia. 2021;37(1):234-240.	RCT	60 pts	Gradual cuff deflation	Intermittent cuff deflation	Mean arterial pressure (MAP), HR, RR, pH, serum lactate, HCO3 & K	Intermittent deflation of the tourniquet resulted in more stable hemodynamics, less tachycardia, less hyperlactemia, less hyperkalemia than gradual deflation. Intermittent deflation involved 10 sec deflation, then 50 sec reinflation performed 3 times over 3 minutes; gradual deflation involved decrease 50mmHg/30 sec until complete release within 3 min; more research is needed	IA
123	Kamath K, Kamath SU, Tejaswi P. Incidence and factors influencing tourniquet pain. Chin J Traumatol. 2021;24(5):291-294.	Nonexperimental	132 pts	n/a	n/a	tourniquet duration & pressure, anesthesia type, interval release and reapplication, upper vs lower limb, pain (VAS & verbal rating), blood loss	Tourniquet pain incidence and intensity noted to be directly proportional with tourniquet duration; recommends limiting duration of tourniquet inflation	IIIB
124	Pavão DM, Pires eAlbuquerque RS, de Faria JLR, Sampaio YD, de Sousa EB, Fogagnolo F. Optimized tourniquet use in primary total knee arthroplasty: a comparative, prospective, and randomized study. J Arthroplasty. 2023;38(4):685-690.	RCT	127 pts	Optimized tourniquet (inflate before incision, deflate after cementing; pressure = SBP + 100 mmHg)	No tourniquet	blood loss, transfusions, pain (VAS), swelling, ROM, functional score (KSS, SLR), complications	Optimized tourniquet protocol & no tourniquet resulted in similar results (blood loss, functional recovery, complication rate); authors recommend tourniquet use at low pressures for short duration w/ release before wound closure in TKA	IA
125	Pavão DM, de Sousa EB, Fogagnolo F, et al. The optimized tourniquet versus no tourniquet in total knee arthroplasty. Analysis of muscle injury, functional recovery, and knee strength. J Orthop. 2023;48:72-76.	RCT	60 pts	Optimized tourniquet (inflate before incision, deflate after cementing; pressure = SBP + 100 mmHg)	No tourniquet	creatine phosphokinase, KSS, knee isokinetic strength	Optimized tourniquet protocol did not cause additional muscle damage, functional or muscle strength compared to no tourniquet use;	IA
126	Zhao HY, Yeersheng R, Kang XW, Xia YY, Kang PD, Wang WJ. The effect of tourniquet uses on total blood loss, early function, and pain after primary total knee arthroplasty a prospective, randomized controlled trial. Bone Joint Res. 2020;9(6):322-332.	RCT	180 pts	Tourniquet; tourniquet during cementation	No tourniquet	blood loss, CK, CRP, IL-6, pain (VAS), limb swelling, ROM, KSS, quadricep strength, straight leg raise (SLR), complications	Absence of tourniquet use demonstrated decreased total blood loss, less postop inflammation and pain, and better early knee function; no significant differences in 3 groups at 3 month follow-up, only noted in short term (within 3 weeks postop)	IA
127	Azad A, Sager B, Gupta S, Ayalon O, Paksima N. Reducing tourniquet pressures in hand surgery: are lower pressures as effective? J Wrist Surg. 2022;12(3):205-210.	Quasi-experimental	107 pts	Tourniquet pressure determined by SBP	n/a	tourniquet inflation pressure based on SBP; need to adjust or reinflate tourniquet; field visibility	Excellent field visibility; personalized tourniquet pressure r/t SBP may provide bloodless surgical field; SBP + 60mmHg (SBP<130), SBP + 80mmHg (SBP = 131-190), SBP + 100mmHg (SBP >191)	IIB
128	Cheng W, Wang M, Liu P, Zhao S, Liu X, Wang X. Protective effects of dexmedetomidine and oxycodone in patients undergoing limb ischemia-reperfusion. Med Sci Monit. 2019;25:9073-9084.	RCT	60 pts	Tourniquet, no pharmacologic	Tourniquet + Dexmedetomidine or Oxycodone	hemodynamic changes r/t tourniquet, oxidative stress	Tourniquet use significantly increased systolic arterial pressure, mean arterial pressure, diastolic arterial pressure; evidence of oxidative stress r/t tourniquet	IB
129	Masri BA, Day B, Younger ASE, Jeyasurya J. Technique for measuring limb occlusion pressure that facilitates personalized tourniquet systems: a randomized trial. J Med Biol Eng. 2016;36(5):644-650.	RCT	143 pt, 252 total measurements	automatic LOP	doppler LOP	pressure measurement	There was no difference in pressure with new machine or Doppler; safe to use proposed method with machine.	IB
130	McEwen JA, Kelly DL, Jardanowski T, Inkpen K. Tourniquet safety in lower leg applications. Orthop Nurs. 2002;21(5):55-62.	RCT	16 volunteers; 53 reviewed cases	automatic LOP	doppler LOP	pressure difference between Doppler & automatic machine LOP	There was a significant difference between Doppler & auto pressures, significantly lower mean pressure for wide, contoured cuff, though automatic pressures might not be as precise.	IC

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
131	Tuncalı B, Boya H, Kayhan Z, Araç Ş, Çamurdan MA. Clinical utilization of arterial occlusion pressure estimation method in lower limb surgery: effectiveness of tourniquet pressures. Acta Orthop Traumatol Turc. 2016;50(2):171-177.	Nonexperimental	198 operations, 224 Lower Extremities, 193 pt	n/a	n/a	pressure & effectiveness of Arterial Occlusion Pressure formula, field visibility & complications, time to set pressure	Time to measure AOP was 19 seconds, average AOP was 148.7 (initial pressure 168.4 maximum pressure 173.3); concluded AOP estimation formula is practical & efficient.	IIIB
132	Tuncalı B, Boya H, Kayhan Z, Araç Ş. Tourniquet pressure settings based on limb occlusion pressure determination or arterial occlusion pressure estimation in total knee arthroplasty? A prospective, randomized, double blind trial. Acta Orthop Traumatol Turc. 2018;52(4):256-260.	RCT	93 pt	LOP	arterial occlusion pressure estimation	initial & maximum SBP, LOP/AOP levels, time to estimate & set pressure, initial & maximum pneumatic tourniquet pressure, pneumatic tourniquet time, effectiveness	AOP estimate comparable to LOP measurement, but found lower pressure & took less time to measure.	IB
133	Kasem SA, Al Menesy T, Badawy AA, Abd Elmawgoud A, Adel G, Badawy YA. Comparison between two mathematical methods to estimate arterial occlusion pressure and tourniquet effectiveness in lower limb surgery: a prospective, randomized, double blind, comparative study. J Clin Monit Comput. 2020;34(4):675-681.	RCT	80 pts	Inflated to 20mmHg above Liu AOP formula	Inflated to 20 mmHg above Tuncali AOP formula	initial SBP, max SBP, initial Tourn pressure, max Tourn pressure; field visibility, complications	Tuncali AOP formula estimated lowest effective tourniquet pressure with equivalent field visibility in lower limb surgery; no complications reported; Initial and max tourniquet pressure significantly higher w/ Liu AOP formula; Do not recommend Liu AOP formula for lower limb surgery, further research is needed	IA
134	Tuncalı B, Kokten G, Boya H, Altinel F, Kayhan Z. Efficacy of arterial occlusion pressure estimation-based tourniquet pressure settings in upper limb surgery. J Orthop Sci. 2022;27(5):1051-1055.	Nonexperimental	115 pts	AOP estimation + 20mmHg **{[(SBP+10)/Ktp]+20** [plus 10 per 10-mmHg SBP increase]**}**	n/a	tourniquet pressure, effectiveness, time to set pressure, complications, field visibility	AOP + 20mmHg is recommended; tourniquet pressure should be increased 10mmHg for every 10mmHg increment of SBP during tourniquet inflation; allows for lower tourniquet pressures and may decrease complications	IIIB
135	Perez BA, Smith BA, Gugala Z, Lindsey RW. The reduced cuff inflation protocol does not improve the tissue oxygen recovery after tourniquet ischemia. J Anesth Clin Res. 2014;5(11):474.	Quasi-experimental	18 pt	LOP	MD decides pressure based on SBP	electroneurography ENeG & quantitative sensory testing QST of thermal thresholds on postop day 3 & 2 months with electromyography EMG - follow up at 18 month for symptomatic nerve injury	2% incident rate of complications, concluded that 240 mm Hg for 80 minutes was safe regarding the risk for nerve injury.	IIB
136	Hughes L, Jeffries O, Waldron M, et al. Influence and reliability of lower-limb arterial occlusion pressure at different body positions. PeerJ. 2018;6:e4697.	Quasi-experimental	50 people	LOP measurement standing, sitting, laying	n/a	AOP measurement	LOP measurement is body position dependent; should be measured in position intended for application	IIB
137	Angadi DS, Blanco J, Garde A, West SC. Lower limb elevation: useful and effective technique of exsanguination prior to knee arthroscopy. Knee Surg Sports Traumatol Arthrosc. 2010;18(11):1559-1561.	Nonexperimental	50 pt	n/a	n/a	pneumatic tourniquet time, time to incision, complications	No difference in pneumatic tourniquet time or complications, risk associated with Rhys-Davies exsanguination technique; recommend only elevate to exsanguinate extremity.	IIIC
138	Cunningham L, McCarthy T, O'Byrne J. A survey of upper and lower limb tourniquet use among Irish orthopaedic surgeons. Ir J Med Sci. 2013;182(3):325-330.	Qualitative	92 orthopedic surgeons	n/a	n/a	15 question survey, author-derived	Lack of consensus needs further research, stated pressures used may be higher than necessary.	IIIB

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139	Desai S, Prashantha PG, Torgal SV, Rao R. Fatal pulmonary embolism subsequent to the use of Esmarch bandage and tourniquet: a case report and review of literature. Saudi J Anaesth. 2013;7(3):331-335.	Case Report	n/a	n/a	n/a	n/a	Mechanical stress of pneumatic tourniquet & Esmarch lead to pulmonary embolism; immediate diagnosis may lead to successful resuscitation, preop anticoagulation & diagnosis workup to prevent adverse event, estimate the risk of using an Esmarch & pneumatic tourniquet to avoid in high risk patients.	VB
140	Barron SL, McGrory BJ. Total knee arthroplasty in a patient with ipsilateral calcific myonecrosis. Arthroplast Today. 2018;4(4):421-425.	Case Report	n/a	n/a	n/a	n/a	Limiting tourniquet use to cement-only time & not exsanguinating allowed for tourniquet use by not rupturing calcific myonecrosis mass.	VA
141	Tanpowpong T, Kitidumrongsook P, Patradul A. The deleterious effects of exsanguination with a tight bandage on tourniquet tolerance in the upper arm. J Hand Surg Eur Vol. 2012;37(9):839-841.	Quasi-experimental	23 healthy	elevation	elastic b&	age, sex, height, weight, BP, arm length, arm circumference, visual analog scale 1-10	Found that elevation exsanguination promotes pain tolerance; recommend elevating if not using general anesthesia.	IIC
142	Goodwin TM, Davies JP, Jackson JB 3rd, Millikin M, Walsh JJ 4th. Evaluating tourniquet efficacy comparing exsanguination techniques for the upper extremity. Orthop Nurs. 2021;40(2):89-93.	Quasi-experimental	30 volunteers; 60 arms tested	Gravity exsanguination	Esmarch exsanguination	water displacement	For upper extremity, elastic wrap exsanguination was most effective, while gravity exsanguination was more effective than no exsanguination at all; age also had significant effect on exsanguination method efficacy; elastic wrap exsanguination can cause more pain and risk for skin complications than elevation	IIA
143	Zhang M, Liu G, Zhao Z, Wu P, Liu W. Comparison of lower limb lifting and squeeze exsanguination before tourniquet inflation during total knee arthroplasty. BMC Musculoskelet Disord. 2019;20(1):35.	RCT	236 pt	hand over hand squeezing with elastic rubber squeeze	lifting method	primary visual analog scale, complications, secondary pneumatic tourniquet time, operative time, intraoperative blood loss (suction & gauze), drain, calculated by Gross formula, knee function (measured by average of 3 goniometer measurements), Hospital for Special Surgery & visual analog scale of pain	No difference in pneumatic tourniquet inflation time, operative time, intraoperative blood loss, drain, or calculated blood loss; hand-over-hand had significantly higher pain postop day 1 & 7 significant difference, blisters & total complications; concluded - lifting for exsanguination is safe to decrease risk of skin blisters & pain.	IB
144	Tie K, Hu D, Qi Y, Wang H, Chen L. Effects of tourniquet release on total knee arthroplasty. Orthopedics. 2016;39(4):e642-e650.	Systematic Review w/ Meta-Analysis	n/a	n/a	n/a	n/a	1966-2015, 16 RCTs included, 1073 patients; researchers found similar results but early release of PT had less complications (eg, calculated blood loss, Hemoglobin/Hematocrit drop, postop blood loss, total blood loss, transfusion rate, operative time, DVT incidence).	IB
145	Zan PF, Yang Y, Fu D, Yu X, Li GD. Releasing of tourniquet before wound closure or not in total knee arthroplasty: a meta-analysis of randomized controlled trials. J Arthroplasty. 2015;30(1):31-37.	Systematic Review w/ Meta-Analysis	n/a	n/a	n/a	n/a	1979 - 2014 16 RCTs included; researchers concluded that minor complications (eg, erythema, marginal necrosis, cellulitis, superficial infection, oozing, significant swelling, DVT) were more common in the pneumatic tourniquet group; need consistent reporting in more RCT.	IA

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146	Wang C, Zhou C, Qu H, Yan S, Pan Z. Comparison of tourniquet application only during cementation and long-duration tourniquet application in total knee arthroplasty: a meta-analysis. J Orthop Surg Res. 2018;13(1):216.	Systematic Review w/ Meta-Analysis	n/a	n/a	n/a	n/a	1997-2016 7 RCTs included, 440 TKAs; early release of PT allows hemostasis, increased bleeding related to fibrinolytic activity; relevant EBL considering preop Hemoglobin & body mass index; variability in transfusion requirements lead to nonsignificant result; pneumatic tourniquet during cementation does not affect postop rehabilitation, limb swelling, quadricep strength; 1 compartment syndrome with pneumatic tourniquet use, wound complications related to the oxygen supply to soft tissues, inflammation, muscle damage; researchers concluded that the results were insufficient, varied, & too short & required follow up to make recommendations.	IB
147	Huang Z, Ma J, Zhu Y, et al. Timing of tourniquet release in total knee arthroplasty. Orthopedics. 2015;38(7):445-451.	Systematic Review w/ Meta-Analysis	n/a	n/a	n/a	n/a	1979-2012 14 RCTs included, TKAs; pneumatic tourniquet significantly decreased measured blood loss, but there's no difference for DVT, infection, or minor & major complications; studies had limited randomization, missing data, heterogeneity of populations; researchers concluded with proper control of pressure & inflation time, late release does not increase complications.	IA
148	Zhang W, Liu A, Hu D, Tan Y, Al-Aidaros M, Pan Z. Effects of the timing of tourniquet release in cemented total knee arthroplasty: a systematic review and meta-analysis of randomized controlled trials. J Orthop Surg Res. 2014;9:125.	Systematic Review w/ Meta-Analysis	n/a	n/a	n/a	n/a	1979- 2013 11 RCTs included; 651 patients. Decreased pneumatic tourniquet time could reduce complications, but concluded not enough evidence.	IA
149	Rathod P, Deshmukh A, Robinson J, Greiz M, Ranawat A, Rodriguez J. Does tourniquet time in primary total knee arthroplasty influence clinical recovery? J Knee Surg. 2015;28(4):335-342.	Quasi-experimental	73 pt	pneumatic tourniquet cementation-only	pneumatic tourniquet - incision to arthrotomy closure	Knee Society Scale, ROM, flexion contracture, extensor lag, quadricep strength, visual analog scale, circumference of knee at 6 week, 3 month, & 1 year, Short Form 36 regarding physical & mental component scores, operative & pneumatic tourniquet time, Hemoglobin & Hematocrit postop day 1,2,3; visual analog scale for pain on postop 4, 24,48,72 hour; postop passive & active straight leg raise (SLR) 24,48,72 hour; length of stay at 72 hour, narcotic use at hours 24, 48,72 & average dose; Xray at 6 week postop	Pneumatic tourniquet inflated only during cementation had no negative effects on cement efficacy.	IIC

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150	Yakumpor T, Panichkul P, Kanitnate S, Tammachote N. Blood loss in TKA with tourniquet release before and after wound closure. J Med Assoc Thai. 2018;101(10):1443-1449.	RCT	64 TKA	pneumatic tourniquet - released before polyethylene implant inserted	pneumatic tourniquet - released after wound closure	measured EBL, blood drainage, 24 hour drop Hematocrit, change in Hematocrit, transfusion rate, wound complications, DVT, knee flexion; 3 month follow up	Total blood loss was no different because higher intraoperative blood loss associated with less postop drainage; early release had lower transfusion rate & no difference in complications or postop knee flexion.	IA
151	Vertullo CJ, Nagarajan M. Is cement penetration in TKR reduced by not using a tourniquet during cementation? A single blinded, randomized trial. J Orthop Surg (Hong Kong). 2017;25(1):2309499016684323.	RCT	40 pt	pneumatic tourniquet - during cement only	no PT	mean 3 column penetration values of plateau & central penetration, tibial baseplate size, thickness, & stem diameter	Procedural methods to clear field are as effective as using pneumatic tourniquet during cementation.	IA
152	Vaishya R, Agarwal AK, Vijay V, Tiwari MK. Short term outcomes of long duration versus short duration tourniquet in primary total knee arthroplasty: a randomized controlled trial. J Clin Orthop Trauma. 2018;9(1):46-50.	RCT	80 knees	pneumatic tourniquet - inflation to cement	pneumatic tourniquet - incision to cement	intraop blood loss by suction canisters & laps, postop blood loss by drain volume, postop day 1 Hemoglobin x-ray, transfusion at <8, drain removed postop day 2 with physical therapy, Knee Society Scale, range of motion & visual analog scale by follow up every 1, 2, 6 weeks	No DVT in either group, 11 late release knees presented with swelling & redness; need to validate that shorter operative time with pneumatic tourniquet use is worth a potential increase complications, reactionary increase in EBL after pneumatic tourniquet release may not be as beneficial.	IA
153	Wang K, Ni S, Li Z, et al. The effects of tourniquet use in total knee arthroplasty: a randomized, controlled trial. Knee Surg Sports Traumatol Arthrosc. 2017;25(9):2849-2857.	RCT	50 pt	pneumatic tourniquet - incision to harden cement	pneumatic tourniquet - cement to harden cement	Hgb/Hct at preop, & postop day 1,2,5; calculated, intraop, postop, & hidden blood loss, Gross formula for postop blood loss; visual analog scale for thigh & knee pain, circum thigh, knee, calf; pulmonary embolism or DVT incidence; operative time, transfusion, clinical outcome Western Ontario & McMaster Universities Arthritis Index (WOMAC), straight leg raising, ROM	Longer pneumatic tourniquet inflation time decreased total & intraoperative blood loss; shorter pneumatic tourniquet inflation time decreased postop & hidden blood loss, no increase in transfusion rate, faster recovery, & less pain with early stages of rehabilitation with shorter PT time.	IA
154	Cao Q, He Z, Fan Y, et al. Effects of tourniquet application on enhanced recovery after surgery (ERAS) and ischemia-reperfusion post-total knee arthroplasty: full- versus second half-course application. J Orthop Surg (Hong Kong). 2020;28(1):2309499019896026.	RCT	102 pts	Second-half course tourniquet application (SHC)	full-course application (FC)	postop pain, swelling, early postop function	Tourniquet duration affects postop pain and swelling (FC > SHC); shorter duration = decreased swelling, less pain, less inflammatory factors. Total blood loss not affected by duration	IC

REFERENCE #	CITATION	EVIDENCE TYPE	SAMPLE SIZE/ POPULATION	INTERVENTION(S)	CONTROL/ COMPARISON	OUTCOME MEASURE(S)	CONCLUSION(S)	CONSENSUS SCORE
155	Diri D, Alasaad H, Abou Ali Mhana S, Muhammed H, Ibrahim J. Blood loss in primary unilateral total knee arthroplasty with limited tourniquet application: a randomized controlled trial. JB JS Open Access. 2023;8(4):e23.00020.	RCT	62 pts	limited tourniquet application	full-course application (long duration)	blood loss: intraop, postop, total, hidden; surgical visibility, operative duration, complications	Increased intraop blood loss in limited tourniquet group & lower surgical field visibility; total blood loss, and postop complications not significantly different. Limited tourniquet application can be safe for use in primary unilateral TKA	IA
156	Chang CW, Lan SM, Tai TW, Lai K, Yang CY. An effective method to reduce ischemia time during total knee arthroplasty. J Formos Med Assoc. 2012;111(1):19-23.	Quasi-experimental	72 pt	pneumatic tourniquet - release after tight arthrotomy closure	released before skin closure	operative time, pneumatic tourniquet time, Hemoglobin decrease, transfusion, range of motion, Oxford Knee Score (OKS)	Early release had better range of motion at 6 week, no difference otherwise; continue discussion on intraoperative pneumatic tourniquet inflation time.	IIB
157	Huang ZY, Pei FX, Ma J, et al. Comparison of three different tourniquet application strategies for minimally invasive total knee arthroplasty: a prospective non-randomized clinical trial. Arch Orthop Trauma Surg. 2014;134(4):561-570.	Quasi-experimental	90 pt	pneumatic tourniquet time - before incision & after cement, before prosthesis & after cement	pneumatic tourniquet - entire time (incision to closure)	ROM, straight leg, preop hospital for special surgery (HSS) knee score, girth/swelling by circumference, operative time, pneumatic tourniquet time, EBL, length of stay, drain volume, transfusion requirement, Hgb & Hct preop, postop, postop day (POD) 1,2,3; EBL by Gross formula; CRP & interleukin-6 for inflammation & surgical insult; creatine kinase & myoglobin (muscle damage) at same points	Found more soft tissue injury, but muscle damage markers did not reflect injury; no difference swelling, pain, length of stay; increase of pneumatic tourniquet time associated with increased inflammation & decreased EBL; concluded that pneumatic tourniquet <225 mm Hg & <120 minutes might not reflect significant negative impact in functional assessments.	IIB
158	Abbas K, Raza H, Umer M, Hafeez K. Effect of early release of tourniquet in total knee arthroplasty. J Coll Physicians Surg Pak. 2013;23(8):562-565.	Quasi-experimental	130 pt	early release	release after dressing	EBL, transfusion, operative time	Early release had no effect on blood conservation, but increased operative time, transfusion rate, & length of stay; late release associated with higher complication incidence (potentially related to comorbidities) but effective.	IIC
159	Wakai A, Wang JH, Winter DC, Street JT, O'Sullivan RG, Redmond HP. Tourniquet-induced systemic inflammatory response in extremity surgery. J Trauma. 2001;51(5):922-926.	RCT	26 patients	tourniquet-assisted procedures	no tourniquet	systemic proinflammatory response before, after 15 minutes, 4 hours, 24 hours of reperfusion after deflation	After 15 minutes, polymorphonuclear neutrophil CD11b significantly increased, monocyte CD14 significantly increased, cytokine significantly increased; concluded to limit use of PT.	IB
160	Lynn AM, Fischer T, Brandford HG, Pendergrass TW. Systemic responses to tourniquet release in children. Anesth Analg. 1986;65(8):865-872.	Nonexperimental	15 pediatric pt	n/a	n/a	lactate acid, SBP, Vital signs	Increase lactic acid persisted 10 minutes after deflation; recommend <75 min of inflation & releasing second pneumatic tourniquet within 60 minutes.	IIIC

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161	Robertson C, Wilson V, Meek RMD, Carter R. Extended tourniquet times and the impact on wound healing in foot surgery. Clin Med Res. 2022;20(3):141-146.	Nonexperimental	96 pts	n/a	n/a	wound complications, LOS, complication rate	Tourniquet times up to 3 hours and 300mmHg not associated with differences in wound healing in foot surgery; no significant difference in wound healing between tourniquet inflation times, neither group demonstrated complications (major blood loss, DVT, compartment syndrome)	IIIB
162	Lee NK, Lee SI, Chang CB. The limited use of a tourniquet during total knee arthroplasty under a contemporary enhanced recovery protocol has no meaningful benefit: a prospective randomized controlled trial. Knee Surg Sports Traumatol Arthrosc. 2023;31(3):1089-1097.	RCT	100 pts	Limited tourniquet duration	Conventional tourniquet duration	operative time, blood loss, transfusion rate, pain, early functional recovery	In conjunction with an ERAS protocol limited tourniquet duration demonstrated no major disadvantages but did not reduce pain or improve early functional recovery; nearly 10% of LT group pts had tourniquet reinflated d/t intraop bleeding	IA
163	Migliorini F, Maffulli N, Eschweiler J, Knobe M, Tingart M, Betsch M. Tourniquet use during knee arthroplasty: A Bayesian network meta-analysis on pain, function, and thromboembolism. Surgeon. 2022;20(4):241-251.	Systematic Review w/ Meta-Analysis	n/a	n/a	n/a	n/a	1995-2020; 37 RCT, 7 prospective, 10 retrospective; 5497 procedures; use of tourniquet during TKA increases pain and DVT risk, decreases ROM and knee scores at every follow-up point (up to 12 months); even shorter duration tourniquet showed lower rate of DVT than full course use	IIIA
164	McCarthy Deering E, Hu SY, Abdulkarim A. Does tourniquet use in tka increase postoperative pain? A systematic review and meta-analysis. Clin Orthop Relat Res. 2019;477(3):547-558.	Systematic Review w/ Meta-Analysis	n/a	n/a	n/a	n/a	1995-2015, 14 RCTs; 939 knees; authors found no clinically important difference in pain and ROM between tourniquet and no tourniquet for TKA, and no difference in LOS; no clinically important difference between full course tourniquet and shorter duration tourniquet use (half-course) in pain	IA
165	Smith AF, Usmani RH, Wilson KD, Smith LS, Malkani AL. Effect of tourniquet use on patient outcomes after cementless total knee arthroplasty: a randomized controlled trial. J Arthroplasty. 2021;36(7):2331-2334.	RCT	95 pts	Short tourniquet time (10 min)	Long tourniquet time (duration of surgery)	opioid consumption, pain (VAS), KSS, LOS, Hgb, surgical time, creatine kinase	Shorter tourniquet duration did not significantly impact opioid consumption, pain scores, KSS, LOS, Hgb levels or surgical time	IB
166	Vojdani S, Ruberto RA, Gazgalis A, et al. The temporal effects of variable tourniquet use on pain after total knee arthroplasty. Knee. 2023;43:184-191.	Nonexperimental	911 pts	Tourniquet	No tourniquet	effect of tourniquet duration on postop pain	Tourniquet duration >60 min associated with increased opioid consumption per day(measured in morphine milligram equivalents, MME); no tourniquet use estimated blood loss was significantly higher than tourniquet use >60 min	IIIB
167	Berns J, Rogers C, Christie B. An evidence-based review of optimal perioperative practices in minor hand surgery. J Plast Reconstr Aesthet Surg. 2023;84:203-213.	Literature Review	n/a	n/a	n/a	n/a	Inflation pressures less than 250mmHg, no longer than 2 hours, 10-15 min reperfusion/hour of inflation.	VA
168	Horlocker TT, Hebl JR, Gali B, et al. Anesthetic, patient, and surgical risk factors for neurologic complications after prolonged total tourniquet time during total knee arthroplasty. Anesth Analg. 2006;102(3):950-955.	Nonexperimental	1001 pneumatic tourniquet>120 min PT	n/a	n/a	nerve injuries	Duration of uninterrupted tourniquet inflation increases the likelihood of neural dysfunction. Reperfusion intervals only modestly decreased risk of nerve ischemia, with most effective interval being ≥30 min.	IIIA
169	Pedowitz RA, Gershuni DH, Fridén J, Garfin SR, Rydevik BL, Hargens AR. Effects of reperfusion intervals on skeletal muscle injury beneath and distal to a pneumatic tourniquet. J Hand Surg Am. 1992;17(2):245-55.	RCT	58 rabbits	4-hour or 2-hour tourniquet compression; 10 minutes reperfusion interval	compression without reperfusion interval	muscle injury 2 days post tourniquet use (pyrophosphate incorporation, blue dye extravasation)	10-minute reperfusion after each hour of inflation may decrease compression-induced muscle injury.	IA

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170	Stompro BE, Stevenson TR, Wineinger MA, Sharman RB, Carlsen RC. A reperfusion interval reduces the contractile deficit in skeletal muscle following tourniquet ischemia. Plast Reconstr Surg. 1994;94(7):1003-1011.	Quasi-experimental	49 rats	3 hours tourniquet inflation w/ reperfusion interval at 2 hours for 15 minutes	3 hours continuous tourniquet inflation	muscle injury and contractility	Tourniquet-induced ischemia results in muscular injury; reperfusion during inflation can reduce the severity of injury for short term recovery (3 days); 15 minutes after first 2 hours of inflation	IIB
171	Mohler LR, Pedowitz RA, Myers RR, Ohara WM, Lopez MA, Gershuni DH. Intermittent reperfusion fails to prevent posttourniquet neurapraxia. J Hand Surg Am. 1999;24(4):687-693.	RCT	52 rabbits	4 hours tourniquet inflation; 2 hours inflation w/ 10 minute reperfusion; hour reperfusion	no tourniquet inflation	nerve conduction, neurologic response (foot drop, toe spread)	Animal study; Intermittent reperfusion failed to alleviate the compressive neuropathy resulting from tourniquet compression. Injury was localized to the tissue region under the tourniquet cuff. Using the lowest effective tourniquet pressure is recommended to minimize tourniquet-induced nerve injury.	IB
172	Huwae TECJ, Santoso ARB, Kesuma W, et al. Reperfusion interval as a prevention of lung injury due to limb ischemia-reperfusion after application of tourniquet in murine experimental study. Indian J Orthop. 2020;54(5):704-710.	Nonexperimental	48 rats	Tourniquet w/ reperfusion intervals (5, 10, & 15 minute)	Tourniquet no reperfusion interval	Lung Injury Score (LIS), MDA levels	Animal study; Reperfusion intervals can decrease level of remote organ damage due to ischemia reperfusion injury after tourniquet use; 15 minutes provided greater protection than 5 or 10 minutes	IIIB
173	Fitzgibbons PG, DiGiovanni C, Hares S, Akelman E. Safe tourniquet use: a review of the evidence. J Am Acad Orthop Surg. 2012;20(5):310-319.	Literature Review	n/a	n/a	n/a	n/a	Three factors that should be considered for every patient: duration of tourniquet, inflation pressure, tourniquet design; longer duration has higher incidence of short term complications but long term outcomes are equivalent; reperfusion interval recommendations differ, but studies support the use	VB
174	Bloch EC, Ginsberg B, Binner RA Jr, Sessler DI. Limb tourniquets and central temperature in anesthetized children. Anesth Analg. 1992;74(4):486-489.	Quasi-experimental	47 pediatric pt	tourniquet-assisted procedures	unassisted extremity surgical procedures	temperature	Tourniquet procedures significantly increase temperature; recommend not aggressively warming pediatric patients in PT-assisted procedures.	IIB
175	Bloch EC. Hyperthermia resulting from tourniquet application in children. Ann R Coll Surg Engl. 1986;68(4):193-194.	Nonexperimental	56 pediatric pt	n/a	n/a	temperature	After 120 minutes, only tourniquet-assisted procedures have significant increased temperatures.	IIIC
176	Estebe JP, Le Naoures A, Malledant Y, Ecoffey C. Use of a pneumatic tourniquet induces changes in central temperature. Br J Anaesth. 1996;77(6):786-788.	RCT	26 male pt	forced air warming	passive insulation v no tourniquet	temperature, esophageal versus rectal	Patient temperature decreased before inflation, significantly increased with pneumatic tourniquet inflation, significantly higher with forced air active warming at 30 minutes; temperatures significantly correlated with pneumatic tourniquet inflation time, SBP increased significantly, then decreased significantly after deflation, significant end tidal carbon dioxide & peak returned to baseline at 20 minutes post deflation; recommend further studies to confirm.	IC
177	Guideline for patient temperature management. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2025:677-706.	Guideline	n/a	n/a	n/a	n/a	Guideline for the prevention of hypothermia and maintaining normothermia.	IVA
178	Saleh E, Saleh J, Govshievich A, Ferland-Caron G, Lin JC, Tremblay DM. Comparing minor hand procedures performed with or without the use of a tourniquet: a randomized controlled trial. Plast Reconstr Surg Glob Open. 2021;9(4):e3513.	RCT	67 pts	Tourniquet	No tourniquet	pain, anxiety, pt satisfaction, operative time, control of bleeding, complications	Tourniquet use demonstrated significantly higher pain scores, and greater control of bleeding; operative time, complications, pt satisfaction were comparable	IB

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179	Albayrak M, Uğur F. Use of tourniquet under sedation anesthesia or the WALANT techniques in bilateral carpal tunnel surgery: a comparative analysis. Med Records. 2023;5(Suppl 1):69-76.	Nonexperimental	57 pts	n/a	n/a	Tourniquet (w/ sedation) vs WALANT technique provides greater pt comfort? Surgical duration and complications also measured	No significant difference was found for pt comfort, surgical duration, or complications r/t tourniquet vs no tourniquet use.	IIIA
180	Monteiro de Almeida MF. Branco de Sousa E, de Castro RRT. Escalonated tourniquet deflation strategy reduces the incidence of hypotension after total knee replacement surgery: a randomized double-blinded controlled trial. ARC J Orthop. 2019;4(1):14-18.	RCT	46 pts	Gradual cuff deflation	Sudden cuff deflation	blood pressure, heart rate	Gradual tourniquet deflation showed less variation from baseline on pt heart rate and blood pressure than sudden deflation; deflation = decrease of 87.5mmHg/minute over 4 minute period	IB
181	Rao M, Mudakanagoudar M, Devaraj DB. Effects of cyclic vs. non-cyclic deflation of pneumatic arterial tourniquet on haemodynamic and arterial blood gases in lower limb surgery: a prospective randomized study. J Krishna Inst Med Sci Univ. 2023;12(4):131-143.	RCT	60 pts	cyclic deflation (3 sequential deflations with increasing period of deflation [0 sec, 10 sec, & 30 sec] and reinflation)	non-cyclic deflation (single deflation over 2 minutes)	MAP, HR, arterial blood gas values	Cyclic deflation demonstrated better hemodynamic stability (SBP, MAP) and lower levels of serum lactate. No difference in heart rate between the groups after deflation. 10 minutes after deflation, hemodynamic parameters were comparable between groups.	IA
182	van der Velde J, Serfontein L, Iohom G. Reducing the potential for tourniquet-associated reperfusion injury. Eur J Emerg Med. 2013;20(6):391-396.	RCT	16 pts	staggered tourniquet deflation	standard deflation	MAP, HR, serum CA, NA, K, lactate	Staggered deflation technique (deflated for 30 seconds, reinflated. Repeat this process two more times 3 minutes apart) can decrease the hemodynamic effects of tourniquet deflation. Pts experienced less hypotension and bradycardia than those with standard deflation (sudden).	IC
183	Hung SH, Chiu FY, Cheng MF. A comparative study of the hemodynamic and clinical effects of using or not tourniquet in total knee arthroplasty. J Chin Med Assoc. 2023;86(5):529-533.	RCT	110 pts	Tourniquet	No tourniquet	quadricep muscle function (straight leg raise to 60 deg); blood loss (intraop, estimated, hidden); blood transfusion rate; LOS; DVT	Tourniquet (limited use) use showed extended quadricep muscle recovery (45.92 hours vs 23.84 hours for NT) and increased need for blood transfusion. All other variables (blood loss, LOS, DVT) similar between groups; tourniquet use may have detrimental effect on quadricep muscle recovery	IB
184	Kim E, Cho MR, Byun SH, et al. Sympathetic predominance before tourniquet deflation is associated with a reduction in arterial blood pressure after tourniquet deflation during total knee arthroplasty. Physiol Res. 2021;70(3):401-412.	Nonexperimental	58 pts	n/a	n/a	sympathovagal balance before tourniquet deflation	Sympathetic predominance results in lower blood pressure after tourniquet deflation; hemodynamic instability may result in patients following tourniquet deflation	IIIB
185	Huh IY, Kim DY, Lee JH, Shin SJ, Cho YW, Park SE. Relation between preoperative autonomic function and blood pressure change after tourniquet deflation during total knee replacement arthroplasty. Korean J Anesthesiol. 2012;62(2):154-160.	Nonexperimental	86 TKA	n/a	n/a	heart rate variability, SBP variability, baroreflex sensitivity (BRS)	Baroreflex sensitivity & SBP variability correlated with BP changes, low baroreflex sensitivity associated with hypotension & requires regulation intraoperatively.	IIIB
186	Chon JY, Lee JY. The effects of surgery type and duration of tourniquet inflation on body temperature. J Int Med Res. 2012;40(1):358-365.	Nonexperimental	60 pt	n/a	n/a	core temperature after pneumatic tourniquet deflation, type of surgery, pneumatic tourniquet time	Pneumatic tourniquet time & type of surgery influence temperature, anesthesia should be aware of potential hypothermia in these patients.	IIIB
187	Tsunoda K, Sonohata M, Kugisaki H, et al. The effect of air tourniquet on interleukin-6 levels in total knee arthroplasty. Open Orthop J. 2017;11:20-28.	Quasi-experimental	20 PT; 5 cleaned	no PT	PT	temperature, Interleukin 6, C-reactive protein, Creatine Phosphokinase, white blood cells, preop & at 24 hour postop & postop day 7	No difference in DVT incidence, perioperative factors, operative time, or EBL; conclude pneumatic tourniquet not significant influence on patients' surgical stress response.	IIC

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188	Pintar V, Brookes C, Trompeter A, Bridgens A, Hing C, Gelfer Y. A systematic review of tourniquet use in paediatric orthopaedic surgery: can we extrapolate from adult guidelines? EFORT Open Rev. 2024;9(1):80-91.	Systematic Review	n/a	n/a	n/a	n/a	1969-2023, 39 studies, included RCTs, case reports, experimental studies, cohort studies, and retrospective reviews; Use of tourniquets in pediatric patients has shown severe complications are rare but occur; need for further research addressing benefits, indications, and safe use	IIIB
189	Pfitzner T, von Roth P, Voerkelius N, Mayr H, Perka C, Hube R. Influence of the tourniquet on tibial cement mantle thickness in primary total knee arthroplasty. Knee Surg Sports Traumatol Arthrosc. 2016;24(1):96-101.	RCT	90 pt	PT	no PT	cement mantle thickness, EBL, pain; measurements in 6 zones & cement mantle at tibial baseplate	No loosening of implant without pneumatic tourniquet use but increased EBL without pneumatic tourniquet.	IA
190	Ejaz A, Laursen AC, Kappel A, et al. Faster recovery without the use of a tourniquet in total knee arthroplasty. Acta Orthop. 2014;85(4):422-426.	RCT	62 pt	no PT	PT	ischemic metabolites - glucose, pyruvate, lactate, glycerol, Lactate/Pyruvate ratio	Pneumatic tourniquet associated with increased ischemia.	IB
191	Liu D, Graham D, Gillies K, Gillies RM. Effects of tourniquet use on quadriceps function and pain in total knee arthroplasty. Knee Surg Relat Res. 2014;26(4):207-213.	RCT	20 TKA	PT	no PT	Visual analog scale average of 4 points each day, drainage, transfusion, swelling, morphine, length of stay, range of motion, Oxford Knee Score, knee extension preop, 6 week, 6, & 12 month	Operative time & Visual analog scale postop day 2 & 4 higher with PT, but transfusion higher with no PT; concluded there is no obvious disadvantage to not using PT.	IB
192	Jawhar A, Stetzelberger V, Kollowa K, Obertacke U. Tourniquet application does not affect the periprosthetic bone cement penetration in total knee arthroplasty. Knee Surg Sports Traumatol Arthrosc. 2019;27(7):2071-2081.	RCT	86 pts	No tourniquet	Tourniquet	cement penetration [Knee Society Score (KSS)], pain, blood loss (intraop, total), opioid consumption, operative time, LOS, complication rate	Tourniquet use did not affect bone cement penetration significantly; intraop blood loss was decreased w/ use of tourniquet but total blood loss was comparable between groups; postop pain and opioid consumption was higher with tourniquet use; authors state available data do not support routine tourniquet use in TKA	IB
193	Guideline for patient information management. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2025:375-412.	Guideline	n/a	n/a	n/a	n/a	Guidance on documentation as important to patient safety & continuity of care.	IVA
194	State Operations Manual Appendix A – Survey Protocol, Regulations and Interpretive Guidelines for Hospitals. Rev 220, 04-19-24. Centers for Medicare & Medicaid Services. Accessed February 7, 2025. https://www.cms.gov/Regulations-and-Guidance/Guidance/Manuals/downloads/som107ap_a_hospitals.pdf	Regulatory	n/a	n/a	n/a	n/a	Equipment must be monitored, inspected, tested, & maintained by biomedical program & laws, guidelines, & manufacturer's recommendations.	n/a
195	21 CFR 803. Medical device reporting. Code of Federal Regulations. Accessed February 7, 2025. https://www.ecfr.gov/current/title-21/chapter-I/subchapter-H/part-803	Regulatory	n/a	n/a	n/a	n/a	Regulations for reporting of injury or death related to medical device use.	n/a
196	Medical Device Reporting (MDR): How to report medical device problems. US Food and Drug Administration. August 28, 2024. Accessed February 7, 2025. https://www.fda.gov/medical-devices/medical-device-safety/medical-device-reporting-mdr-how-report-medical-device-problems	Regulatory	n/a	n/a	n/a	n/a	Guidance on how to report medical device malfunctions or problems.	n/a

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197	Sahu SK, Tudu B, Mall PK. Microbial colonisation of orthopaedic tourniquets: a potential risk for surgical site infection. Indian J Med Microbiol. 2015;(33 Suppl):115-118.	Quasi-experimental	16 pneumatic tourniquet, 4 areas each	Savlon cleaner	Sterillium cleaner	colonies counted & identified on morphology	All tourniquets were colonized & there was a 92-95% reduction in colony count with either cleaner; recommend routine disinfectant with alcohol-based solution.	IIB
198	Guideline for environmental cleaning. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2025:197-226.	Guideline	n/a	n/a	n/a	n/a	Guideline for best practices and recommendations for environmental cleaning in the perioperative setting	IVA