

**Guideline for Care of the Patient Receiving
Local Anesthesia
Evidence Table**

Reference #	CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
1	Culp WC Jr, Culp WC. Practical application of local anesthetics. J Vasc Intervent Radiol. 2011;22(2):111-118.	Optimal use of local anesthetics & current strategies for minimizing and managing the potential risks.	VA	Literature review	Patients receiving local anesthesia	NA	NA	NA	NA
2	Bern S, Akpa BS, Kuo J, Weinberg G. Lipid resuscitation: a life-saving antidote for local anesthetic toxicity. Curr Pharm Biotechnol. 2011;12(2): 313-319.	The use of lipid emulsion resource has decreased fatalities from LAST. More research is needed to better understand the mechanism of LAST.	VA	Literature review	NA	NA	NA	NA	NA
3	Ciechanowicz S, Patil V. Lipid emulsion for local anesthetic systemic toxicity. Anesthesiol Res Pract. 2012;2012: 131784.	Pharmacology & pathophysiology of local anesthetics & toxicity, and the rationale for lipid emulsion therapy	VA	Literature review	Patients receiving local anesthesia	NA	NA	NA	NA
4	Morau D, Ahern S. Management of local anesthetic toxicity. Int Anesthesiol Clin. 2010;48(4):117-140.	Prevention of LAST & identification of patients at risk.	VB	Literature review	NA	NA	NA	NA	NA
5	Khatri KP, Rothschild L, Oswald S, Weinberg G. Current concepts in the management of systemic local anesthetic toxicity. Adv Anesth. 2010;28(1):147-159.	Recommendations for lipid rescue are complex and still evolving. ASRA & websites have published practice advisories.	VA	Literature review	NA	NA	NA	NA	NA
6	Clark MK. Lipid emulsion as rescue for local anesthetic related cardiotoxicity. J PeriAnesth Nurs. 2008;23(2):111-117.	Continuous nursing assessment is critical to the successful outcome for patients with local anesthesia toxicity	VB	Literature review	Patients receiving local anesthesia	NA	NA	NA	NA
7	Bourne E, Wright C, Royle C. A review of local anesthetic cardiotoxicity and treatment with lipid emulsion. Local Reg Anesth. 2010;3: 11-19.	A review of the mechanism of LAST and the rationale for li	VA	Literature review	NA	NA	NA	NA	NA
8	Liu W, Yang X, Li C, Mo A. Adverse drug reactions to local anesthetics: a systematic review. Oral Surg, Oral Med, Oral Pathol Oral Radiol. 2013;115(3):319-327.	There are no definitive human studies on the toxicity of local anesthetic mixtures. The additive effects of local anesthetics have been demonstrated in animal models.	IIIB	Systematic review	NA	NA	NA	NA	LAST
9	Fuzier R, Lapeyre-Mestre M, Samii K, Montastruc JL; French Association of Regional Pharmacovigilance Centres. Adverse drug reactions to local anaesthetics: a review of the French pharmacovigilance database. Drug Saf. 2009;32(4):345-356.	Frequency & seriousness of neurological and cardiovascular complications of local anesthetics and allergic reactions	IIIB	Retrospective , non-experimental study	Patients suffering adverse drug reactions from local anesthetics	NA	NA	1157	NA
10	Mercado P, Weinberg GL. Local anesthetic systemic toxicity: prevention and treatment. Anesthesiol Clin. 2011;29(2):233-242.	Clinical picture of LAST takes many forms.	VA	Literature review	NA	NA	NA	NA	NA
11	Jackson T, McLure HA. Pharmacology of local anesthetics. Ophthalmol Clin North Am. 2006;19(2):155-161.	Local anesthetics are widely used in ophthalmic procedures. Three are associated hazards.	VB	Literature review	NA	NA	NA	NA	NA
12	Bhole MV, Manson AL, Seneviratne SL, Misbah SA. IgE-mediated allergy to local anaesthetics: separating fact from perception: a UK perspective. Br J Anaesth. 2012;108(6):903-911.	Intravenous lipid emulsion 20% should be available whenever patients receive large doses of local anesthetics.	VA	Literature review	NA	NA	NA	NA	Na
13	Batinac T, Sotosek Tokmadzic V, Peharda V, Brajac I. Adverse reactions and alleged allergy to local anesthetics: Analysis of 331 patients. J Dermatol. 2013;40(7):522-527.	Allergic reactions to local anesthetics are rare	IIIA	Retrospective, non-experimental study	Patients with local anesthetic hypersensitivity from January 2000 to December 2012	Skin testing	NA	331	Adverse drug reaction
14	Standards of perioperative nursing. In: Perioperative standards and recommended practices. Denver, CO: AORN, Inc.; 2014:3-18.	The standards are authoritative statements that describe the responsibilities for which the perioperative RN are accountable and they reflect the values and priorities of the profession.	IVB	Clinical Practice Guideline	NA	NA	NA	NA	NA
15	American Nurses Association. Nursing: Scope and Standards of Practice. Silver Spring, MD: American Nurses Association; 2010.	The scope and standards outline the expectations of the professional role of the registered nurse, scope of practice, and competencies.	IVB	Consensus Statement	NA	NA	NA	NA	

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16	Neal JM, Bernards CM, Butterworth JF 4th, et al. ASRA practice advisory on local anesthetic systemic toxicity. Reg Anesth Pain Med. 2010;35(2):152-161.	Specific recommendations for the prevention, diagnosis, & treatment of local anesthetic systemic toxicity.	IVA	Practice guideline	NA	NA	NA	NA	NA
17	Petersen C. Perioperative Nursing Data Set: The Perioperative Nursing Vocabulary. 3rd ed. Denver, CO: AORN, Inc; 2011.	The Perioperative Nursing Data Set (PNDS) is a controlled, structured nursing vocabulary. It is the only language that focuses specifically on perioperative nursing. This vocabulary is an essential first step toward describing the contribution of perioperative registered nurses (RNs) to safe patient care. The building blocks forming the foundation for the PNDS are clearly defined data elements that are relative to the delivery of perioperative care. These data elements are common to all procedures in any surgical setting and apply to all phases of perioperative care—preoperative, intraoperative, and postoperative.	IVB	Clinical Practice Guideline	NA	NA	NA	NA	NA
18	Guideline for medication safety. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2015:291-329.	These recommended practices are intended to provide guidance to perioperative RNs to develop, implement, and evaluate safe medication management practices specific to the perioperative setting.	IVB	Clinical Practice Guideline	NA	NA	NA	NA	NA
19	Treasure T, Bennett J. Offi ce-based anesthesia. Oral Maxillofac Surg Clin North Am. 2007;19(1):45-57.	Protocols for maintaining quality anesthetic care include appropriate facilities, equipment, personnel, and evaluations.	VB	Literature review	NA	NA	NA	NA	NA
20	Byrne K, Engelbrecht C. Toxicity of local anaesthetic agents. Trends Anaesth Crit Care. 2013;3(1):25-30.	LAST still occurs despite improvement injection techniques. Lipid emulsion injection is a treatment but still in its infancy	VB	Literature review	Patients receiving local anesthesia	NA	NA	NA	NA
21	Weinberg GL. Current concepts in resuscitation of patients with local anesthetic cardiac toxicity. Reg Anesth Pain Med. 2002;27(6):568-575.	Prevention of local anesthetic overdose; divided doses, early response; novel modes of therapy; & research considerations	VB	Literature review	NA	NA	NA	NA	NA
22	ASA Physical Status Classification System. American Society of Anesthesiologists. http://www.asahq.org/Home/For-Members/Clinical-Information/ASA-Physical-Status-Classification-System . Accessed October 15, 2014.	The classification system assesses the patient's physical state prior to selecting the anesthetic or prior to performing surgery. The patients' preoperative physical status is used for documentation and for communication between health care professionals.	VA	Clinical Practice Guideline	Surgical patients	NA	NA	NA	NA
23	American Society of Anesthesiologists. Guidelines for Ambulatory Anesthesia and Surgery. American Society of Anesthesiologists. http://www.asahq.org/formembers/~//media/For%20Members/documents/Standards%20Guidelines%20Standards/Ambulatory%20Anesthesia%20and%20Surgery.aspx . Accessed October 15, 2014.	These guidelines encourage high quality patient care, but following them does not guarantee specific patient outcomes.	IVC	Clinical Practice Guideline	NA	NA	NA	NA	NA
24	Kataria T, Cutter TW, Apfelbaum JL. Patient selection in outpatient surgery. Clin Plast Surg. 2013;40(3):371-382.	Pre-procedure patient assessment for anesthesia provider sedation	VB	Expert opinion	Endoscopy patients		N/A	N/A	
25	AORN Position Statement on One Perioperative Registered Nurse Circulator Dedicated to Every Patient Undergoing an Operative or Other Invasive Procedure. AORN, Inc http://www.aorn.org/Clinical_Practice/Position_Statements/Position_Statements.aspx . Accessed October 15, 2014.	AORN is committed to the provision of safe perioperative nursing care by ensuring that every patient undergoing an operative or other invasive procedure is cared for by minimum of one registered nurse (RN) in the circulating role.	IVC	Consensus Statement					

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26	Di Gregorio G, Neal JM, Rosenquist RW, Weinberg GL. Clinical presentation of local anesthetic systemic toxicity: A review of published cases, 1979 to 2009. Reg Anesth Pain Med. 2010;35(2):181-187.	Need for development of a prospective, global registry of LAST for educating practitioners & optimizing management of LAST	VA	Literature review	Patients receiving local anesthesia	NA	NA	NA	NA
27	Fuzier R, Lapeyre-Mestre M. Safety of amide local anesthetics: new trends. Expert Opin Drug Saf. 2010;9(5):759-769.	Awareness of amide local anesthetic adverse reactions can prevent their occurrence & most appropriate treatment	VA	Literature review	Patients suffering adverse drug reactions from local anesthetics	NA	NA	NA	NA
28	Kosh MC, Miller AD, Michels JE. Intravenous lipid emulsion for treatment of local anesthetic toxicity. Ther Clin Risk Manag. 2010;6:449-451.	Intravenous lipid emulsion 20% should be available whenever patients receive large doses of local anesthetics.	VC	Literature review	Patients receiving large doses of local anesthetics	NA	NA	NA	1. Effect on mortality. 2. Residual disease or disability. 3. effective reversal of CV & neurological symptoms
29	Failure to monitor local anesthesia pt. before discharge. Case on point: Messer v. Martin, 2004 WL 1171736 N.W.2d -W(2004). Nurs Law Regan Rep. 2004;45(1): 2.	The deposition of the expert opinion witness asserted in the affidavit that vital signs should always be taken when a local anesthetic is used.	VB	Case report	NA	NA	NA	NA	NA
30	Becker DE, Reed KL. Local anesthetics: review of pharmacological considerations. Anesth Prog. 2012;59(2):90-101.	Local anesthetics have a proven history of safety and effective pain management. Adverse drug reactions may be overlooked. The purpose of the review is the pharmacology of the local anesthetics.	VA	Literature review	NA	NA	NA	NA	NA
31	Mulroy MF, Hejtmanek MR. Prevention of local anesthetic systemic toxicity. Reg Anesth Pain Med. 2010;35(2):177-180.	Primary focus should be prevention-minimum effective doses, careful aspiration, incremental injections.	VB	Literature review	NA	NA	NA	NA	NA
32	Tanawuttiwat T, Thisayakorn P, Viles-Gonzalez JF. LAST (Local Anesthetic Systemic Toxicity) but not least: systemic lidocaine toxicity during cardiac intervention. J Invasive Cardiol. 2014;26(1):E13-E15.	This case report emphasized the importance of adjusting the dose of the local anesthetic with advance heart failure; and discussed risk factors, preventive measures, and treatment.	VB	Case report	NA	NA	NA	NA	Toxicity
33	Butterworth JF 4th. Models and mechanisms of local anesthetic cardiac toxicity: a review. Reg Anesth Pain Med. 2010;35(2): 167-176.	Mechanisms of CV collapse and death after local anesthetic administration, particularly bupivacaine	VA	Literature review	Animal and human experimental models	Local anesthetics	NA	NA	Local cardiac toxicity
34	Mather LE. The acute toxicity of local anesthetics. Expert Opin Drug Metab Toxicol. 2010;6(11):1313-1332.	Equi-anesthetic doses of ropivacaine & levobupivacaine are less likely to produce serious toxicity than bupivacaine.	VA	Literature review	NA	NA	NA	NA	NA
35	Conroy PH, O'Rourke J. Tumescant anaesthesia. Surgeon. 2013;11(4):210-221.	When using tumescent anesthesia, be aware of contributing factors that include BMI, ASA classification, co-existing hepatic or renal insufficiency. Maximum dose of 7 mg/kg of local anesthetic.	VA	Literature review	Patients receiving tumescent anesthesia	NA	NA	NA	NA
36	Weinberg GL. Lipid emulsion infusion: resuscitation for local anesthetic and other drug overdose. Anesthesiology. 2012;117(1):180-187.	Airway management to ensure optimal oxygenation and ventilation; seizure suppression, then lipid emulsion infusion to reverse signs and symptoms of toxicity	VB	Literature review	NA	NA	NA	NA	NA
37	Manavi MV. Lipid infusion as a treatment for local anesthetic toxicity: a literature review. AANA J. 2010;78(1): 69-78.	Treatment of IV lipid emulsion has been used successfully to stabilize patients experiencing an adverse reaction to local anesthetics	VB	Literature review	Patients receiving local anesthetics	Lipid emulsion	NA	NA	NA
38	Wolfe JW, Butterworth JF. Local anesthetic systemic toxicity: update on mechanisms and treatment. Curr Opin Anaesthesiol. 2011;24(5):561-566.	There is mixed evidence as to the mechanisms of LAST, but it likely local anesthetic cardiotoxicity arises from a blockade of sodium channels. Treatment includes ventilation, oxygenation, chest compressions, lipid emulsion therapy.	VB	Literature review	NA	NA	NA	NA	NA

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39	Ozcan MS, Weinberg G. Update on the use of lipid emulsions in local anesthetic systemic toxicity: a focus on differential efficacy and lipid emulsion as part of advanced cardiac life support. <i>Int Anesthesiol Clin.</i> 2011;49(4):91-103.	There is experimental evidence & growing clinical experience to suggest that the early administration of lipid emulsion in conjunction with effective CPR for LAST might restore spontaneous circulation without the use of large doses of vasopressors. If lipid emulsion is not available then standard ACLS should be started.	VA	Literature review	NA	NA	NA	NA	NA
40	AAGBI Safety Guideline: Management of Severe Local Anaesthetic Toxicity. 2010. Association of Anaesthetists of Great Britain & Ireland. http://www.aagbi.org/sites/default/files/la_toxicity_2010_0.pdf . Accessed October 15, 2014.	The guideline for LAST includes recognition, immediate management, treatment, and follow-up.	IVC	Clinical Practice Guideline	Surgical patients	NA	NA	NA	NA
41	Vanden Hoek TL, Morrison LJ, Shuster M, et al. Part 12: Cardiac arrest in special situations: 2010 American heart association guidelines for cardiopulmonary resuscitation and emergency cardiovascular care. <i>Circulation.</i> 2010;122(18 Suppl 3):S829-61.	There are case reports of the return of spontaneous circulation in patients with prolonged cardiac arrest unresponsive to standard ACLS measures after the administration of lipid emulsion for LAST.	IVA	Clinical Practice Guideline	NA	NA	NA	NA	NA
42	Burch MS, McAllister RK, Meyer TA. Treatment of local-anesthetic toxicity with lipid emulsion therapy. <i>Am J Health Syst Pharm.</i> 2011;68(2):125-129.	Lipid emulsion has been reported to be useful in the treatment of LAST. The mechanism of action is unclear and evidence is from case reports only.	VB	Expert opinion	Patients receiving local anesthesia	Lipid emulsion therapy	NA	NA	NA
43	Gallagher C, Tan JM, Foster C-G. Lipid rescue for bupivacaine toxicity during cardiovascular procedures. <i>Heart Int.</i> 2010;5(1):20-21.	All clinical sites where local anesthetics are used should stock 20% lipid emulsion and the healthcare team should receive education on this therapy.	VB	Case Report	Patient receiving bupivacaine during an electrophysiology procedure	Lipid rescue	NA	NA	NA
44	Marwick PC, Levin AI, Coetzee AR. Recurrence of cardiotoxicity after lipid rescue from bupivacaine-induced cardiac arrest. <i>Anesth Analg.</i> 2009;108(4):1344-1346.	This case study suggests that that LAST may reoccur after the initial dose of lipid emulsion. Therefore a sufficient supply of lipid emulsion should be available.	VA	Case report	NA	NA	NA	NA	NA
45	Litz RJ, Roessel T, Heller AR, Stehr SN. Reversal of central nervous system and cardiac toxicity after local anesthetic intoxication by lipid emulsion injection. <i>Anesth Analg.</i> 2008;106(5):1575-1577.	There are no definitive human studies on the toxicity of local anesthetic mixtures. The additive effects of local anesthetics have been demonstrated in animal models.	VB	Case report	NA	NA	NA	NA	NA
46	Harboe T, Guttormsen AB, Aarebrot S, Dybendal T, Irgens A, Florvaag E. Suspected allergy to local anaesthetics: follow-up in 135 cases. <i>Acta Anaesthesiol Scand.</i> 2010;54(5):536-542.	Reactions to local anesthetics are rarely an IgE-mediated allergy. Other allergens should be tested.	III B	Retrospective, non-experimental study	Patients with alleged allergic reactions	NA	NA	135	Allergic reactions
47	Fuzier R, Lapeyre-Mestre M, Mertes PM, et al. Immediate- and delayed-type allergic reactions to amide local anesthetics: clinical features and skin testing. <i>Pharmacoepidemiol Drug Saf.</i> 2009;18(7):595-601.	Cutaneous symptoms are main feature but more serious symptoms may occur. Intradermal reaction and challenge tests with several local anesthetics are helpful in identification	IIIC	Retrospective, non-experimental study	Patients suffering allergic reactions to amide local anesthetics	NA	NA	16	NA
48	Grzanka A, Misiolek H, Filipowska A, Miśkiewicz-Orczyk K, Jarzab J. Adverse effects of local anaesthetics—allergy, toxic reactions or hypersensitivity. <i>Anestezjol Intens Ter.</i> 2010;42(4):175-178.	True allergic reactions to local anesthetics are rare; most are hypersensitivity. Any adverse event requires review of history, and testing of immediate and late allergic reactions to local anesthetics as well as latex and preservatives	IIIB	Non-experimental study	Patients who had a previous significant reaction to local anesthetics	Skin prick, intradermal injections & patch testing	NA	32	Allergic reaction to local anesthetic
49	Saito M, Abe M, Furukawa T, et al. Study on patients who underwent suspected diagnosis of allergy to amide-type local anesthetic agents by the leukocyte migration test. <i>Allergol Int.</i> 2014;63(2):267-277.	Patients with a past history of drug or food allergies have a high potential of manifesting adverse reactions to local amide anesthetics. Reactions to local amide anesthetics may be due to a pseudoallergy to the drug and that 80% may be allergic to paraben.	IIIA	Non-experimental study retrospective review	Suspected patients with hypersensitivity to amide local anesthetics	Leukocyte migration testing	NA	43 patients	Positive response to local anesthetic

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50	Levy J, Lifshitz T. Lidocaine hypersensitivity after subconjunctival injection. <i>Can J Ophthalmol.</i> 2006;41(2):204-206.	Rare case of hypersensitivity to subconjunctival lidocaine	VB	Case report	NA	NA	NA	NA	Rechallenge test with lidocaine resulted in same allergic reaction of erythema, swelling, & scaling of the eyelids & check.
51	Gunson TH, Greig DE. Allergic contact dermatitis to all three classes of local anaesthetic. <i>Contact Derm.</i> 2008;59(2):126-127.	Rare phenomenon of amide anesthetic allergy and possible cross-reactivity between agents within this class.	VB	Case report	NA	Patch testing	NA	NA	Positive skin tests
52	Timmermans MW, Bruynzeel DP, Rustemeyer T. Allergic contact dermatitis from EMLA cream: concomitant sensitization to both local anesthetics lidocaine and prilocaine. <i>J Deutschen Dermatologischen Gesellschaft [Journal of the German Society of Dermatology].</i> 2009;7(3):237-238.	Patient with positive patch test results to EMLA® cream also had a positive reaction to both constituents lidocaine and prilocaine	VA	Case report	NA	NA	NA	NA	NA
53	Yuen WY, Schuttelaar ML, Barkema LW, Coenraads PJ. Bullous allergic contact dermatitis to lidocaine. <i>Contact Derm.</i> 2009;61(5):300-301.	The patient had a cross-reactivity with bupivacaine, mepivacaine, and prilocaine and no cross reactivity with ester-type anesthetics.	VA	Case report	NA	NA	NA	NA	NA
54	Haugen RN, Brown CW. Case reports: type I hypersensitivity to lidocaine. <i>J Drugs Dermatol.</i> 2007;6(12):1222-1223.	True type 1 hypersensitivity to lidocaine hydrochloride is rare,	VA	Case report	Patient receiving local anesthetic	NA	NA	NA	NA
55	Caron AB. Allergy to multiple local anesthetics. <i>Allergy Asthma Proc.</i> 2007;28(5):600-601.	Anaphylactic reaction to local anesthetics-lidocaine, procaine, and bupivacaine	VC	Case report	NA	Skin-prick testing	NA	NA	Systemic reactions to local anesthetics
56	Fellinger C, Wantke F, Hemmer W, Sesztak-Greinecker G, Wohrl S. The rare case of a probably true IgE-mediated allergy to local anaesthetics. <i>Case Rep Med.</i> 2013;2013:201586.	Rare case of true IgE-mediated type 1 reactions to local anesthetics	VA	Case report	NA	Skin testing	NA	NA	Specific IgE
57	Gonzalez-Delgado P, Anton R, Soriano V, Zapater P, Niveiro E. Cross-reactivity among amide-type local anesthetics in a case of allergy to mepivacaine. <i>J Investig Allergol Clin Immunol.</i> 2006;16(5):311-313.	Extensive allergologic study must be done in the rare case of true allergic reaction to amide-type local anesthetic to rule out cross reactivity.	VB	Case report	NA	Skin prick and intraderm	NA	NA	Positive skin tests
58	Wobser M, Gaigl Z, Trautmann A. The concept of "compartment allergy": prilocaine injected into different skin layers. <i>Allergy Asthma Clin Immunol.</i> 2011;7(1):7.	Depending on the route of application, immunological sensitization against antigenic local anesthetic determinants is conferred by distinct antigen presenting cells in different skin compartments in the epidermal compartment and the interstitial, dermal dendrite cells in deeper subcutaneous tissue.	VB	Case report	NA	NA	NA	NA	NA
59	Amado A, Sood A, Taylor JS. Contact allergy to lidocaine: a report of sixteen cases. <i>Dermatitis.</i> 2007;18(4):215-220.	Lidocaine allergy should be considered in the differential diagnosis of a localized delayed-type-hypersensitivity reaction that develops & recurs at the surgical site.	VB	Case report	Patients patch tested in the Cleveland Clinic Department of Dermatology from January 2001-December 2005	Patch testing	NA	1143	Positive patch test
60	Mitchell M. Conscious surgery: influence of the environment on patient anxiety. <i>J Adv Nurs.</i> 2008;64(3):261-271.	Focusing care on managing the intra-operative experience and providing anesthetic information in advance might help limit anxiety and expel the apparent misapprehensions associated with conscious surgery.	IIIB	Non-experimental survey design	Adult surgery patients	Questionnaire regarding anxiety associated with the environment, hospital personnel, and local anesthesia.	NA	214	Providing information regarding the intraoperative experience may help reduce anxiety for the majority of patients.
61	Davis-Evans Chassidy. Alleviating anxiety and preventing panic attacks in the surgical patient. <i>AORN J.</i> 2013;97(3): 355-363.	Perioperative nurses should implement all available strategies to decrease surgical patients' anxiety including communication, humor, and music. Strategies should be individualized.	VB	Literature review	Surgical patients	NA	NA	NA	Anxiety levels

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62	State Operations Manual Appendix L: Guidance for Surveyors: Ambulatory Surgical Centers. Rev 99; 2014. Centers for Medicare & Medicaid Services. http://www.cms.gov/Regulations-and-Guidance/Guidance/Manuals/downloads/som107ap_l_ambulatory.pdf . Accessed October 15, 2014.	NA	Reg	Regulatory	NA	NA	NA	NA	NA
63	State Operations Manual Appendix A: Survey Protocol, Regulations and Interpretive Guidelines for Hospitals. Rev 105;2014. Centers for Medicare & Medicaid Services. https://www.cms.gov/Regulations-and-Guidance/Guidance/Transmittals/Downloads/R105SO MA.pdf . Accessed October 15, 2014.	NA	Reg	Regulatory	NA	NA	NA	NA	NA

Recommendation I

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American Nurses Association. Nursing: Scope and Standards of Practice. Silver Spring, MD: American Nurses Association; 2010.	The scope and standards outline the expectations of the professional role of the registered nurse, scope of practice, and competencies.	IVB	Consensus Statement	NA	NA	NA	NA	NA
American Society of Anesthesiologists. Guidelines for Ambulatory Anesthesia and Surgery. American Society of Anesthesiologists. http://www.asahq.org/formembers/-/media/For%20Members/documents/Standards%20Guidelines%20Stmnts/Ambulatory%20Anesthesia%20and%20Surgery.aspx . Accessed October 15, 2014.	These guidelines encourage high quality patient care, but following them does not guarantee specific patient outcomes.	IVC	Clinical Practice Guideline	NA	NA	NA	NA	NA
AORN Position Statement on One Perioperative Registered Nurse Circulator Dedicated to Every Patient Undergoing an Operative or Other Invasive Procedure. AORN, Inc http://www.aorn.org/Clinical_Practice/Position_Statements/Position_Statements.aspx . Accessed October 15, 2014.	AORN is committed to the provision of safe perioperative nursing care by ensuring that every patient undergoing an operative or other invasive procedure is cared for by minimum of one registered nurse (RN) in the circulating role.	IVB	Consensus Statement	NA	NA	NA	NA	NA
ASA Physical Status Classification System. American Society of Anesthesiologists. http://www.asahq.org/Home/For-Members/Clinical-Information/ASA-Physical-Status-Classification-System . Accessed October 15, 2014.	The classification system assesses the patient's physical state prior to selecting the anesthetic or prior to performing surgery. The patients' preoperative physical status is used for documentation and for communication between health care professionals.	VA	Clinical Practice Guideline	Surgical patients	NA	NA	NA	NA
Bourne E, Wright C, Royle C. A review of local anesthetic cardiotoxicity and treatment with lipid emulsion. <i>Local Reg Anesth.</i> 2010;3: 11-19.	A review of the mechanism of LAST and the rationale for lipid emulsion therapy.	VA	Literature review	NA	NA	NA	NA	NA
Byrne K, Engelbrecht C. Toxicity of local anaesthetic agents. <i>Trends Anaesth Crit Care.</i> 2013;3(1):25-30.	LAST still occurs despite improvement injection techniques. Lipid emulsion injection is a treatment but still in its infancy	VB	Literature review	Patients receiving local anesthesia	NA	NA	NA	NA
Ciechanowicz S, Patel V. Lipid emulsion for local anesthetic systemic toxicity. <i>Anesthesiol Res Pract.</i> 2012;2012: 131784.	Pharmacology & pathophysiology of local anesthetics & toxicity, and the rationale for lipid emulsion therapy	VA	Literature review	Patients receiving local anesthesia	NA	NA	NA	NA
Clark MK. Lipid emulsion as rescue for local anesthetic-related cardiotoxicity. <i>J Perianesth Nurs.</i> 2008;23(2):111-117.	Continuous nursing assessment is critical to the successful outcome for patients with local anesthesia toxicity	VB	Literature review	Patients receiving local anesthesia	NA	NA	NA	NA
Culp Jr WC, Culp WC. Practical application of local anesthetics. <i>Journal of Vascular and Interventional Radiology.</i> 2011;22(2): 111-118.	Optimal use of local anesthetics & current strategies for minimizing and managing the potential risks.	VA	Literature review	Patients receiving local anesthesia	NA	NA	NA	NA
Guideline for medication safety. In: Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2015:291-329.	These recommended practices are intended to provide guidance to perioperative RNs to develop, implement, and evaluate safe medication management practices specific to the perioperative setting.	IVB	Clinical Practice Guideline	NA	NA	NA	NA	NA
Kataria T, Cutter TW, Apfelbaum JL. Patient selection in outpatient surgery. <i>Clin Plast Surg.</i> 2013;40(3): 371-382.	Pre-procedure patient assessment for anesthesia provider sedation	VB	Expert opinion	Endoscopy patients		N/A	N/A	
Liu W, Yang X, Li C, Mo A. Adverse drug reactions to local anesthetics: a systematic review. <i>Oral Surg, Oral Med, Oral Pathol Oral Radiol.</i> 2013;115(3):319-327.	Adverse drug reactions associated with local anesthetic can be avoided through awareness of dosage, concentration, and combinations of local anesthetics and intravascular injection	IIIB	Systematic review	Local anesthetic patients with adverse drug reactions	NA	NA	1645	NA
Mercado P, Weinberg GL. Local anesthetic systemic toxicity: prevention and treatment. <i>Anesthesiol Clin.</i> 2011;29(2): 233-242. doi:10.1016/j.anclin.2011.04.007; 10.1016/j.anclin.2011.04.007.	Clinical picture of LAST takes many forms.	VA	Literature review	NA	NA	NA	NA	NA
Neal JM, Bernards CM, Butterworth JF 4th, et al. ASRA practice advisory on local anesthetic systemic toxicity. <i>Reg Anesth Pain Med.</i> 2010;35(2):152-161.	Specific recommendations for the prevention, diagnosis, & treatment of local anesthetic systemic toxicity.	IVA	Practice guideline	NA	NA	NA	NA	NA
Petersen C. Perioperative Nursing Data Set: The Perioperative Nursing Vocabulary. 3rd ed. Denver, CO: AORN, Inc; 2011.	The Perioperative Nursing Data Set (PNDS) is a controlled, structured nursing vocabulary. It is the only language that focuses specifically on perioperative nursing. This vocabulary is an essential first step toward describing the contribution of perioperative registered nurses (RNs) to safe patient care. The building blocks forming the foundation for the PNDS are clearly defined data elements that are relative to the delivery of perioperative care. These data elements are common to all procedures in any surgical setting and apply to all phases of perioperative care—preoperative, intraoperative, and postoperative.	IVB	Clinical Practice Guideline	NA	NA	NA	NA	NA
Standards of perioperative nursing. In: Perioperative standards and recommended practices. Denver, CO: AORN, Inc; 2014:3-18.	The standards are authoritative statements that describe the responsibilities for which the perioperative RN are accountable and they reflect the values and priorities of the profession.	IV B	Clinical Practice Guideline	NA	NA	NA	NA	NA
Treasure T, Bennett J. Offi ce-based anesthesia. <i>Oral Maxillofac Surg Clin North Am.</i> 2007;19(1):45-57.	Protocols for maintaining quality anesthetic care include appropriate facilities, equipment, personnel, and evaluations.	VB	Literature review	NA	NA	NA	NA	NA
Weinberg GL. Current concepts in resuscitation of patients with local anesthetic cardiac toxicity. <i>Reg Anesth Pain Med.</i> 2002;27(6): 568-575.	Prevention of local anesthetic overdose; divided doses, early response; novel modes of therapy; & research considerations	V B	Literature review	NA	NA	NA	NA	NA

Recommendation II

CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
American Nurses Association. Nursing : scope and standards of practice. Silver Spring, Md.: American Nurses Association; 2010.	The scope and standards outline the expectations of the professional role of the registered nurse, scope of practice, and competencies.	IVB	Consensus Statement	NA	NA	NA	NA	
Standards of perioperative nursing. In: Perioperative standards and recommended practices. Denver, CO: AORN, Inc.; 2014:3-18.	The standards are authoritative statements that describe the responsibilities for which the perioperative RN are accountable and they reflect the values and priorities of the profession.	IVB	Clinical Practice Guideline	NA	NA	NA	NA	NA
Bourne E, Wright C, Royse C. A review of local anesthetic cardiotoxicity and treatment with lipid emulsion. Local Reg Anesth. 2010;3: 11-19.	A review of the mechanism of LAST and the rationale for lipid emulsion therapy.	VA	Literature review	NA	NA	NA	NA	NA
Byrne K, Engelbrecht C. Toxicity of local anaesthetic agents. Trends Anaesth Crit Care. 2013;3(1):25-30.	LAST still occurs despite improvement injection techniques. Lipid emulsion injection is a treatment but still in its infancy	VB	Literature review	Patients receiving local anesthesia	NA	NA	NA	NA
Clark MK. Lipid emulsion as rescue for local anesthetic-related cardiotoxicity. J Perianesth Nurs. 2008;23(2):111-117.	Continuous nursing assessment is critical to the successful outcome for patients with local anesthesia toxicity	VB	Literature review	Patients receiving local anesthesia	NA	NA	NA	NA
Culp Jr WC, Culp WC. Practical application of local anesthetics. Journal of Vascular and Interventional Radiology. 2011;22(2): 111-118.	Optimal use of local anesthetics & current strategies for minimizing and managing the potential risks.	VA	Literature review	Patients receiving local anesthesia	NA	NA	NA	NA
Di Gregorio G, Neal JM, Rosenquist RW, Weinberg GL. Clinical presentation of local anesthetic systemic toxicity: A review of published cases, 1979 to 2009. Reg Anesth Pain Med. 2010;35(2):181-187.	Need for development of a prospective, global registry of LAST for educating practitioners & optimizing management of LAST	VA	Literature review	Patients receiving local anesthesia	NA	NA	NA	NA
Failure to monitor local anesthesia pt. before discharge. Case on point: Messer v. Martin, 2004 WL 1171736 N.W.2d -WI(2004). Nurs Law Regan Rep. 2004;45(1): 2.	The deposition of the expert opinion witness asserted in the affidavit that vital signs should always be taken when a local anesthetic is used.	VB	Case report	NA	N/A	N/A	309	
Fuzier R, Lapeyre-Mestre M. Safety of amide local anesthetics: new trends. Expert Opin Drug Saf. 2010;9(5):759-769.	Awareness of amide local anesthetic adverse reactions can prevent their occurrence & most appropriate treatment	VA	Literature review	Patients suffering adverse drug reactions from local anesthetics	NA	NA	NA	NA
Khatri KP, Rothschild L, Oswald S, Weinberg G. Current concepts in the management of systemic local anesthetic toxicity. Adv Anesth. 2010;28(1):147-159.	Recommendations for lipid rescue are complex and still evolving. ASRA & websites have published practice advisories.	VA	Literature review	NA	NA	NA	NA	NA
Kosh MC, Miller AD, Michels JE. Intravenous lipid emulsion for treatment of local anesthetic toxicity. Ther Clin Risk Manag. 2010;6:449-451.	Intravenous lipid emulsion 20% should be available whenever patients receive large doses of local anesthetics.	VC	Literature review	Patients receiving large doses of local anesthetics	NA	NA	NA	1. Effect on mortality. 2. Residual disease or disability. 3. effective reversal of CV & neurological symptoms
Morau D, Ahern S. Management of local anesthetic toxicity. Int Anesthesiol Clin. 2010;48(4):117-140.	Prevention of LAST & identification of patients at risk.	VB	Literature review	NA	NA	NA	NA	NA
Neal JM, Bernardis CM, Butterworth JF 4th, et al. ASRA practice advisory on local anesthetic systemic toxicity. Reg Anesth Pain Med. 2010;35(2):152-161.	Specific recommendations for the prevention, diagnosis, & treatment of local anesthetic systemic toxicity.	IVA	Practice guideline	NA	NA	NA	NA	NA
Treasure T, Bennett J. Offi ce-based anesthesia. Oral Maxillofac Surg Clin North Am. 2007;19(1):45-57.	Protocols for maintaining quality anesthetic care include appropriate facilities, equipment, personnel, and evaluations.	VB	Literature review	NA	NA	NA	NA	NA

Recommendation III

CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
AAGBI Safety Guideline: Management of Severe Local Anaesthetic Toxicity. 2010. Association of Anaesthetists of Great Britain & Ireland. http://www.aagbi.org/sites/default/files/la_toxicity_2010_0.pdf . Accessed October 15, 2014.	The guideline for LAST includes recognition, immediate management, treatment, and follow-up.	IVC	Clinical Practice Guideline	Surgical patients	NA	NA	NA	NA
Amado A, Sood A, Taylor JS. Contact allergy to lidocaine: a report of sixteen cases. <i>Dermatitis</i> . 2007;18(4):215-220.	Lidocaine allergy should be considered in the differential diagnosis of a localized delayed-type-hypersensitivity reaction that develops & recurs at the surgical site.	VB	Case report	Patients patch tested in the Cleveland Clinic Department of Dermatology from January 2001-December 2005	Patch testing	NA	1143	Positive patch test
American Nurses Association. <i>Nursing: Scope and Standards of Practice</i> . Silver Spring, MD: American Nurses Association; 2010.	The scope and standards outline the expectations of the professional role of the registered nurse, scope of practice, and competencies.	IVB	Consensus Statement	NA	NA	NA	NA	NA
American Society of Anesthesiologists. <i>Guidelines for Ambulatory Anesthesia and Surgery</i> . American Society of Anesthesiologists. http://www.asahq.org/formembers/-/media/For%20Members/documents/Standards%20Guidelines%20Ambulatory%20Anesthesia%20and%20Surgery.ashx . Accessed October 15, 2014.	The guidelines encourage high quality patient care, but following them does not guarantee specific patient outcomes.	IVC	Clinical Practice Guideline	NA	NA	NA	NA	NA
ASA Physical Status Classification System. American Society of Anesthesiologists. http://www.asahq.org/Home/For-Members/Clinical-Information/ASA-Physical-Status-Classification-System . Accessed October 15, 2014.	The classification system assesses the patient's physical state prior to selecting the anesthetic or prior to performing surgery. The patients' preoperative physical status is used for documentation and for communication between health care professionals.	VA	Clinical Practice Guideline	Surgical patients	NA	NA	NA	NA
Batinac T, Sotosek Tokmadzic V, Peharda V, Brajac I. Adverse reactions and alleged allergy to local anesthetics: Analysis of 331 patients. <i>J Dermatol</i> . 2013;40(7):522-527.	Allergic reactions to local anesthetics are rare	IIIA	Retrospective, non-experimental study	Patients with local anesthetic hypersensitivity from January 2000 to December 2012	Skin testing	NA	331	Adverse drug reaction
Becker DE, Reed KL. Local anesthetics: review of pharmacological considerations. <i>Anesth Prog</i> . 2012;59(2):90-101.	Local anesthetics have a proven history of safety and effective pain management. Adverse drug reactions may be overlooked. The purpose of the review is the pharmacology of the local anesthetics.	VA	Literature review	NA	NA	NA	NA	NA
Bern S, Akpa BS, Kuo I, Weinberg G. Lipid resuscitation: a life-saving antidote for local anesthetic toxicity. <i>Curr Pharm Biotechnol</i> . 2011;12(2): 313-319.	The use of lipid emulsion resource has decreased fatalities from LAST. More research is needed to better understand the mechanism of LAST.	VA	Literature review	NA	NA	NA	NA	NA
Bhole MV, Manson AL, Seneviratne SL, Misbah SA. IgE-mediated allergy to local anesthetics: separating fact from perception: a UK perspective. <i>Br J Anaesth</i> . 2012;108(6):903-911.	Intravenous lipid emulsion 20% should be available whenever patients receive large doses of local anesthetics.	VA	Literature review	NA	NA	NA	NA	Na
Bourne E, Wright C, Royle C. A review of local anesthetic cardiotoxicity and treatment with lipid emulsion. <i>Local Reg Anesth</i> . 2010;3: 11-19.	A review of the mechanism of LAST and the rationale for lipid emulsion therapy.	VA	Literature review	NA	NA	NA	NA	NA
Burch MS, McAllister RK, Meyer TA. Treatment of local-anesthetic toxicity with lipid emulsion therapy. <i>Am J Health Syst Pharm</i> . 2011;68(2):125-129.	Lipid emulsion has been reported to be useful in the treatment of LAST. The mechanism of action is unclear and evidence is from case reports only.	VB	Expert opinion	Patients receiving local anesthesia	Lipid emulsion therapy	NA	NA	NA
Butterworth JF 4th. Models and mechanisms of local anesthetic cardiac toxicity: a review. <i>Reg Anesth Pain Med</i> . 2010;35(2): 167-176.	Mechanisms of CV collapse and death after local anesthetic administration, particularly bupivacaine	VA	Literature review	Animal and human experimental models	Local anesthetics	NA	NA	Local cardiac toxicity
Byrne K, Engelbrecht C. Toxicity of local anaesthetic agents. <i>Trends Anaesth Crit Care</i> . 2013;3(1):25-30.	LAST still occurs despite improvement injection techniques. Lipid emulsion injection is a treatment but still in its infancy	VB	Literature review	Patients receiving local anesthesia	NA	NA	NA	NA
Caron AB. Allergy to multiple local anesthetics. <i>Allergy Asthma Proc</i> . 2007;28(5):600-601.	Anaphylactic reaction to local anesthetics-lidocaine, procaine, and bupivacaine	VC	Case report	NA	Skin-prick testing	NA	NA	Systemic reactions to local anesthetics
Ciechanowicz S, Patil V. Lipid emulsion for local anesthetic systemic toxicity. <i>Anesthesiol Res Pract</i> . 2012;2012: 131784.	Pharmacology & pathophysiology of local anesthetics & toxicity, and the rationale for lipid emulsion therapy	VA	Literature review	Patients receiving local anesthesia	NA	NA	NA	NA
Clark MK. Lipid emulsion as rescue for local anesthetic-related cardiotoxicity. <i>J Perianesth Nurs</i> . 2008;23(2):111-117.	Continuous nursing assessment is critical to the successful outcome for patients with local anesthesia toxicity	VB	Literature review	Patients receiving local anesthesia	NA	NA	NA	NA
Conroy PH, O'Rourke J. Tumescence anaesthesia. <i>Surgeon</i> . 2013;11(4):210-221.	When using tumescence anaesthesia, be aware of contributing factors that include BMI, ASA classification, co-existing hepatic or renal insufficiency. Maximum dose of 7 mg/kg of local anesthetic.	VA	Literature review	Patients receiving tumescence anaesthesia	NA	NA	NA	NA
Culp WC Jr, Culp WC. Practical application of local anesthetics. <i>J Vasc Intervent Radiol</i> . 2011;22(2):111-118.	Optimal use of local anesthetics & current strategies for minimizing and managing the potential risks.	VA	Literature review	Patients receiving local anesthesia	NA	NA	NA	NA
Di Gregorio G, Neal JM, Rosenquist RW, Weinberg GL. Clinical presentation of local anesthetic systemic toxicity: A review of published cases, 1979 to 2009. <i>Reg Anesth Pain Med</i> . 2010;35(2):181-187.	Need for development of a prospective, global registry of LAST for educating practitioners & optimizing management of LAST	VA	Literature review	Patients receiving local anesthesia	NA	NA	NA	NA
Fellinger C, Wankte F, Hemmer W, Sesztak-Greinecker G, Wohrl S. The rare case of a probably true IgE-mediated allergy to local anaesthetics. <i>Case Rep Med</i> . 2013;2013:201586.	Rare case of true IgE-mediated type 1 reactions to local anesthetics	VA	Case report	NA	Skin testing	NA	NA	Specific IgE
Fuzier R, Lapeyre-Mestre M, Mertes PM, et al. Immediate- and delayed-type allergic reactions to amide local anesthetics: clinical features and skin testing. <i>Pharmacoevidemol Drug Saf</i> . 2009;18(7):595-601.	Cutaneous symptoms are main feature but more serious symptoms may occur. Intradermal reaction and challenge tests with several local anesthetics are helpful in identification	IIIC	Retrospective, non-experimental study	Patients suffering allergic reactions to amide local anesthetics	NA	NA	16	NA
Fuzier R, Lapeyre-Mestre M, Samii K, Montastruc JL; French Association of Regional Pharmacovigilance Centres. Adverse drug reactions to local anesthetics: a review of the French pharmacovigilance database. <i>Drug Saf</i> . 2009;32(4):345-356.	Frequency & seriousness of neurological and cardiovascular complications of local anesthetics and allergic reactions	IIIB	Retrospective, non-experimental study	Patients suffering adverse drug reactions from local anesthetics	NA	NA	1157	NA
Fuzier R, Lapeyre-Mestre M. Safety of amide local anesthetics: new trends. <i>Expert Opin Drug Saf</i> . 2010;9(5):759-769.	Awareness of amide local anesthetic adverse reactions can prevent their occurrence & most appropriate treatment	VA	Literature review	Patients suffering adverse drug reactions from local anesthetics	NA	NA	NA	NA
Gallagher C, Tan JM, Foster C-G. Lipid rescue for bupivacaine toxicity during cardiovascular procedures. <i>Heart International</i> . 2010;5(1): 20-21.	All clinical sites where local anesthetics are used should stock 20% lipid emulsion and the healthcare team should receive education on this therapy.	VB	Case Report	Patient receiving bupivacaine during an electrophysiology procedure	Lipid rescue	NA	NA	NA
Gonzalez-Delgado P, Anton R, Soriano V, Zapater P, Niveiro E. Cross-reactivity among amide-type local anesthetics in a case of allergy to mepivacaine. <i>J Investig Allergol Clin Immunol</i> . 2006;16(5):311-313.	Extensive allergologic study must be done in the rare case of true allergic reaction to amide-type local anesthetic to rule out cross reactivity.	VB	Case report	NA	Skin prick and intradermal testin	NA	NA	Positive skin tests

Recommendation III

CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
Grzanka A, Misiolek H, Filipowska A, Miśkiewicz-Orczyk K, Jarzab J. Adverse effects of local anaesthetics—allergy, toxic reactions or hypersensitivity. <i>Anestezjol Intens Ter.</i> 2010;42(4):175-178.	True allergic reactions to local anesthetics are rare; most are hypersensitivity. Any adverse event requires review of history, and testing of immediate and late allergic reactions to local anesthetics as well as latex and preservatives	IIIB	Non-experimental study	Patients who had a previous significant reaction to local anesthetics	Skin prick, intradermal injections & patch testing		32	Allergic reaction to local anesthetic
Guideline for medication safety. In: <i>Guidelines for Perioperative Practice.</i> Denver, CO: AORN, Inc; 2015:291-329.	These recommended practices are intended to provide guidance to perioperative RNs to develop, implement, and evaluate safe medication management practices specific to the perioperative setting.	IV B	Clinical Practice Guideline	NA	NA	NA	NA	NA
Gunson TH, Greig DE. Allergic contact dermatitis to all three classes of local anesthetic. <i>Contact Derm.</i> 2008;59(2):126-127.	Rare phenomenon of amide anesthetic allergy and possible cross-reactivity between agents within this class.	VB	Case report	NA	Patch testing	NA	NA	Positive skin tests
Harboe T, Guttormsen AB, Aarebrot S, Dybdendal T, Irgens A, Florvaag E. Suspected allergy to local anaesthetics: follow-up in 135 cases. <i>Acta Anaesthesiol Scand.</i> 2010;54(5):536-542.	Reactions to local anesthetics are rarely an IgE-mediated allergy. Other allergens should be tested.	IIIB	Retrospective, non-experimental study	Patients with alleged allergic reactions	NA	NA	135	Allergic reactions
Jackson T, McLure HA. Pharmacology of local anesthetics. <i>Ophthalmol Clin North Am.</i> 2006;19(2):155-161.	Local anesthetics are widely used in ophthalmic procedures. Three are associated hazards.	VB	Literature review	NA	NA	NA	NA	NA
Khatrri KP, Rothschild L, Oswald S, Weinberg G. Current concepts in the management of systemic local anesthetic toxicity. <i>Adv Anesth.</i> 2010;28(1):147-159.	Recommendations for lipid rescue are complex and still evolving. ASRA & websites have published practice advisories.	VA	Literature review	NA	NA	NA	NA	NA
Kosh MC, Miller AD, Michels JE. Intravenous lipid emulsion for treatment of local anesthetic toxicity. <i>Ther Clin Risk Manag.</i> 2010;6:449-451.	Intravenous lipid emulsion 20% should be available whenever patients receive large doses of local anesthetics.	VC	Literature review	Patients receiving large doses of local anesthetics	NA	NA	NA	1. Effect on mortality. 2. Residual disease or disability. 3. effective reversal of CV & neurological symptoms
Levy J, Lifshitz T. Lidocaine hypersensitivity after subconjunctival injection. <i>Can J Ophthalmol.</i> 2006;41(2):204-206.	Rare case of hypersensitivity to subconjunctival lidocaine	VB	Case report	NA	NA	NA	NA	Rechallenge test with lidocaine resulted in same allergic reaction of erythema, swelling, & scaling of the eyelids & check.
Litz RJ, Roessel T, Heller AR, Stehr SN. Reversal of central nervous system and cardiac toxicity after local anesthetic intoxication by lipid emulsion injection. <i>Anesth Analg.</i> 2008;106(5):1575-1577.	There are no definitive human studies on the toxicity of local anesthetic mixtures. The additive effects of local anesthetics have been demonstrated in animal models.	VB	Case report	NA	NA	NA	NA	LAST
Liu W, Yang X, Li C, Mo A. Adverse drug reactions to local anesthetics: a systematic review. <i>Oral Surg, Oral Med, Oral Pathol Oral Radiol.</i> 2013;115(3):319-327.	Adverse drug reactions associated with local anesthetic can be avoided through awareness of dosage, concentration, and combinations of local anesthetics and intravascular injection	IIIB	Systematic review	Local anesthetic patients with adverse drug reactions	NA	NA	1645	NA
Manavi MV. Lipid infusion as a treatment for local anesthetic toxicity: a literature review. <i>AANA J.</i> 2010;78(1): 69-78.	Treatment of IV lipid emulsion has been used successfully to stabilize patients experiencing an adverse reaction to local anesthetics	VB	Literature review	Patients receiving local anesthetics	Lipid emulsion	NA	NA	NA
Marwick PC, Levin AJ, Coetzee AR. Recurrence of cardiotoxicity after lipid rescue from bupivacaine-induced cardiac arrest. <i>Anesth Analg.</i> 2009;108(4):1344-1346.	This case study suggests that that LAST may recur after the initial dose of lipid emulsion. Therefore a sufficient supply of lipid emulsion should be available.	V A	Case report	NA	NA	NA	NA	NA
Mather LE. The acute toxicity of local anesthetics. <i>Expert Opin Drug Metab Toxicol.</i> 2010;6(11):1313-1332.	Equi-anesthetic doses of ropivacaine & levobupivacaine are less likely to produce serious toxicity than bupivacaine.	VA	Literature review	NA	NA	NA	NA	NA
Mercado P, Weinberg GL. Local anesthetic systemic toxicity: prevention and treatment. <i>Anesthesiol Clin.</i> 2011;29(2):233-242.	Clinical picture of LAST takes many forms.	VA	Literature review	NA	NA	NA	NA	NA
Morau D, Ahern S. Management of local anesthetic toxicity. <i>Int Anesthesiol Clin.</i> 2010;48(4):117-140.	Prevention of LAST & identification of patients at risk.	VB	Literature review	NA	NA	NA	NA	NA
Mulroy MF, Hejtmánek MR. Prevention of local anesthetic systemic toxicity. <i>Reg Anesth Pain Med.</i> 2010;35(2):177-180.	Primary focus should be prevention—minimum effective doses, careful aspiration, incremental injections.	VB	Literature review	NA	NA	NA	NA	NA
Neal JM, Bernardis CM, Butterworth JF 4th, et al. ASRA practice advisory on local anesthetic systemic toxicity. <i>Reg Anesth Pain Med.</i> 2010;35(2):152-161.	Specific recommendations for the prevention, diagnosis, & treatment of local anesthetic systemic toxicity.	IVA	Practice guideline	NA	NA	NA	NA	NA
Ozcan MS, Weinberg G. Update on the use of lipid emulsions in local anesthetic systemic toxicity: a focus on differential efficacy and lipid emulsion as part of advanced cardiac life support. <i>Int Anesthesiol Clin.</i> 2011;49(4):91-103.	There is experimental evidence & growing clinical experience to suggest that the early administration of lipid emulsion in conjunction with effective CPR for LAST might restore spontaneous circulation without the use of large doses of vasopressors. If lipid emulsion is not available then standard ACLS should be started.	VA	Literature review	NA	NA	NA	NA	NA
Saito M, Abe M, Furukawa T, et al. Study on patients who underwent suspected diagnosis of allergy to amide-type local anesthetic agents by the leukocyte migration test. <i>Allergol Int.</i> 2014;63(2):267-277.	Patients with a past history of drug or food allergies have a high potential of manifesting adverse reactions to local amide anesthetics. Reactions to local amide anesthetics may be due to a pseudoallergy to the drug and that 80% may be allergic to paraben.	III A	Non-experimental study-retrospective review	Suspected patients with hypersensitivity to amide local anesthetics	Leukocyte migration testing	NA	43 patients	Positive response to local anesthetic
Standards of perioperative nursing. In: <i>Perioperative standards and recommended practices.</i> Denver, CO: AORN, Inc.; 2014:3-18.	The standards are authoritative statements that describe the responsibilities for which the perioperative RN are accountable and they reflect the values and priorities of the profession.	IVB	Clinical Practice Guideline	NA	NA	NA	NA	NA
Tanawuttiwat T, Thisayakorn P, Viles-Gonzalez JF. LAST (local anesthetic systemic toxicity) but not least: Systemic lidocaine toxicity during cardiac intervention. <i>J Invasive Cardiol.</i> 2014;26(1):E13-5.	This case report emphasized the importance of adjusting the dose of the local anesthetic with advance heart failure; and discussed risk factors, preventive measures, and treatment.	VB	Case report	NA	NA	NA	NA	Toxicity
Timmermans MW, Bruynzeel DP, Rustemeyer T. Allergic contact dermatitis from EMLA cream: concomitant sensitization to both local anesthetics lidocaine and prilocaine. <i>J Deutschen Dermatologischen Gesellschaft [Journal of the German Society of Dermatology].</i> 2009;7(3):237-238.	Patient with positive patch test results to EMLA® cream also had a positive reaction to both constituents lidocaine and prilocaine	VA	Case report	NA	NA	NA	NA	NA
Vanden Hoek TL, Morrison LJ, Shuster M, et al. Part 12: Cardiac arrest in special situations: 2010 american heart association guidelines for cardiopulmonary resuscitation and emergency cardiovascular care. <i>Circulation.</i> 2010;122(18 Suppl 3):S829-61.	There are case reports of the return of spontaneous circulation in patients with prolonged cardiac arrest unresponsive to standard ACLS measures after the administration of lipid emulsion for LAST.	IVA	Clinical Practice Guideline	NA	NA	NA	NA	NA
Weinberg GL. Current concepts in resuscitation of patients with local anesthetic cardiac toxicity. <i>Reg Anesth Pain Med.</i> 2002;27(6):568-575.	Prevention of local anesthetic overdose; divided doses, early response; novel modes of therapy; & research considerations	VB	Literature review	NA	NA	NA	NA	NA

Recommendation III

CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
Weinberg GL. Lipid emulsion infusion: resuscitation for local anesthetic and other drug overdose. <i>Anesthesiology</i> . 2012;117(1):180-187.	Airway management to ensure optimal oxygenation and ventilation; seizure suppression, then lipid emulsion infusion to reverse signs and symptoms of toxicity	VB	Literature review	NA	NA	NA	NA	NA
Wobser M, Gaigl Z, Trautmann A. The concept of "compartment allergy": Prilocaine injected into different skin layers. <i>Allergy, Asthma, & Clinical Immunology : Official Journal of the Canadian Society of Allergy & Clinical Immunology</i> . 2011;7(1):7.	Depending on the route of application, immunological sensitization against antigenic local anesthetic determinants is conferred by distinct antigen presenting cells in different skin compartments in the epidermal compartment and the interstitial, dermal dendrite cells in deeper subcutaneous tissue.	VB	Case report	NA	NA	NA	NA	NA
Wolfe JW, Butterworth JF. Local anesthetic systemic toxicity: update on mechanisms and treatment. <i>Curr Opin Anaesthesiol</i> . 2011;24(5):561-566.	There is mixed evidence as to the mechanisms of LAST, but it likely local anesthetic cardiotoxicity arises from a blockade of sodium channels. Treatment includes ventilation, oxygenation, chest compressions, lipid emulsion therapy.	VB	Literature review	NA	NA	NA	NA	NA
Yuen WY, Schuttelaar ML, Barkema LW, Coenraads PJ. Bullous allergic contact dermatitis to lidocaine. <i>Contact Derm</i> . 2009;61(5):300-301.	The patient had a cross-reactivity with bupivacaine, mepivacaine, and prilocaine and no cross reactivity with ester-type anesthetics.	VA	Case report	NA	NA	NA	NA	NA

Recommendation IV

CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
Davis-Evans Chassidy. Alleviating anxiety and preventing panic attacks in the surgical patient. AORN J. 2013;97(3): 355-363.	Perioperative nurses should implement all available strategies to decrease surgical patients' anxiety including communication, humor, and music. Strategies should be individualized.	VB	Literature review	Surgical patients	NA	NA	NA	Anxiety levels
Mitchell M. Conscious surgery: influence of the environment on patient anxiety. J Adv Nurs. 2008;64(3):261-271.	Focusing care on managing the intra-operative experience and providing anesthetic information in advance might help limit anxiety and expel the apparent misapprehensions associated with conscious surgery.	IIIB	Non-experimental survey design	Adult surgery patients	Questionnaire regarding anxiety associated with the environment, hospital personnel, and local anesthesia.	NA	214	Providing information regarding the intraoperative experience may help reduce anxiety for the majority of patients.
Standards of perioperative nursing. In: Perioperative standards and recommended practices. Denver, CO: AORN, Inc.; 2014:3-18.	The standards are authoritative statements that describe the responsibilities for which the perioperative RN are accountable and they reflect the values and priorities of the profession.	IVB	Clinical Practice Guideline	NA	NA	NA	NA	NA

Recommendation V

CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
American Society of Anesthesiologists. Guidelines for Ambulatory Anesthesia and Surgery. American Society of Anesthesiologists. http://www.asahq.org/formembers/~media/For%20Members/documents/Standards%20Guidelines%20Stmts/Ambulatory%20Anesthesia%20and%20Surgery.ashx . Accessed October 15, 2014.	These guidelines encourage high quality patient care, but following them does not guarantee specific patient outcomes.	IVC	Clinical Practice Guideline	NA	NA	NA	NA	NA
AAGBI Safety Guideline: Management of Severe Local Anaesthetic Toxicity. 2010. Association of Anaesthetists of Great Britain & Ireland. http://www.aagbi.org/sites/default/files/la_toxicity_2010_0.pdf . Accessed October 15, 2014.	The guideline for LAST includes recognition, immediate management, treatment, and follow-up.	IVC	Clinical Practice Guideline	Surgical patients	NA	NA	NA	NA
State Operations Manual Appendix A: Survey Protocol, Regulations and Interpretive Guidelines for Hospitals. Rev 105;2014. Centers for Medicare & Medicaid Services. https://www.cms.gov/Regulations-and-Guidance/Guidance/Transmittals/Downloads/R105SOMA.pdf . Accessed October 15, 2014.	NA	Reg	Regulatory	NA	NA	NA	NA	NA
State Operations Manual Appendix L: Guidance for Surveyors: Ambulatory Surgical Centers. Rev 99; 2014. Centers for Medicare & Medicaid Services. http://www.cms.gov/Regulations-and-Guidance/Guidance/Manuals/downloads/som107ap_l_ambulatory.pdf . Accessed October 15, 2014.	NA	Reg	Regulatory	NA	NA	NA	NA	NA
Clark MK. Lipid emulsion as rescue for local anesthetic-related cardiotoxicity. J Perianesth Nurs. 2008;23(2):111-117.	Continuous nursing assessment is critical to the successful outcome for patients with local anesthesia toxicity	VB	Literature review	Patients receiving local anesthesia	NA	NA	NA	NA
Kosh MC, Miller AD, Michels JE. Intravenous lipid emulsion for treatment of local anesthetic toxicity. Ther Clin Risk Manag. 2010;6:449-451.	Intravenous lipid emulsion 20% should be available whenever patients receive large doses of local anesthetics.	VC	Literature review	Patients receiving large doses of local anesthetics	NA	NA	NA	1. Effect on mortality. 2. Residual disease or disability. 3. effective reversal of CV & neurological symptoms
Neal JM, Bernard CM, Butterworth JF 4th, et al. ASRA practice advisory on local anesthetic systemic toxicity. Reg Anesth Pain Med. 2010;35(2): 152-161. doi:10.1097/AAP.0b013e3181d22fcd; 10.1097/AAP.0b013e3181d22fcd.	Specific recommendations for the prevention, diagnosis, & treatment of local anesthetic systemic toxicity.	IVA	Practice guideline	NA	NA	NA	NA	NA