LAST: adult rapid response

Local anesthetic systemic toxicity | Perform time-critical actions in parallel.

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STOP LOCAL ANESTHETIC | CALL 911 | GET LAST KIT + AED
If pulseless, begin CPR and apply the AED immediately.

Clinical reference for trained responders using authorized orders. Medical director adoption record: page 5.

Recognize a possible event [3,4]

After local anesthetic exposure: unexpected perioral numbness, metallic taste, tinnitus, confusion, seizure, unexplained hypotension, bradycardia, ventricular arrhythmia, or collapse. Onset may be delayed; cardiac collapse can occur without warning symptoms.

1. Stop + activate. Stop injections/infusions; remove topical anesthetic. Call 911 for suspected LAST. Bring supplies and assign response roles. [3,4]

2. Oxygen + airway. Give 100% oxygen. If breathing is inadequate, assist with an oxygen-connected **bag-valve-mask (BVM)**; suction as needed. Prevent hypoxia, carbon dioxide retention, and acidosis. [2,4]

3. Monitor + access. Check pulse; use ECG, SpO2, and frequent BP checks. Establish IV access; add capnography when available. Record weight and times. [6]

4. Seizure control. Give an IV benzodiazepine (page 2). Protect from injury and support ventilation. Do not give alprazolam or anything by mouth. [2,3,7]

5. Start 20% IV lipid early for serious suspected LAST [1,2]

Seizure, rapidly worsening neurologic toxicity, hemodynamic instability, or arrest: initiate rescue while supporting airway/circulation. Do not wait for cardiac arrest.

Adult dosing weight	Initial IV bolus	Then IV infusion
Up to 70 kg	**1.5 mL/kg** over 2-3 minutes	**0.25 mL/kg/min** (15 mL/kg/hour)
Over 70 kg	**Approximately 100 mL** over 2-3 minutes	**Approximately 250 mL** over 15-20 minutes

Still unstable: repeat the bolus and double the infusion rate. **After stability:** continue lipid for more than 15 minutes. **Cumulative ceiling: 12 mL/kg**, including every bolus and the infusion; this is not a target. For obesity, use the approved ideal/lean-body-weight plan. [1,5]

6. No pulse: CPR + AED immediately [8]

If no definite pulse within 10 seconds in an unresponsive patient with absent/abnormal breathing: start CPR, 100-120 compressions/min, 30:2 without an advanced airway; follow AED prompts. Do not delay CPR/defibrillation for lipid or IV access.

LAST modifies standard resuscitation: an ALS clinician should use smaller initial epinephrine doses, less than 1 mcg/kg IV. Avoid additional local anesthetics (including lidocaine as an antiarrhythmic), beta blockers, calcium channel blockers, and vasopressin. Continue resuscitation and transfer. [1]

Medication and airway guide

Adult doses only | Verify product concentration, route, and authorized orders.

Benzodiazepines treat seizures; lipid treats systemic toxicity [2]

Medication	Adult protocol reference	Practical requirements
Midazolam	**2-4 mg IV** for an adult LAST seizure, as listed in Stanford's LAST cognitive aid. Further dosing/escalation follows the responding clinician's seizure orders. [3]	Continuous respiratory and cardiovascular monitoring; BVM, oxygen, and suction ready. It can cause apnea and hypotension. Check vial strength before drawing up.
Lorazepam	An IV alternative. The adult status-epilepticus label uses **4 mg IV at no more than 2 mg/min**. This is a general seizure-label dose, not an ASRA-specific dose; use the adopted seizure order. [9]	Dilute for IV use exactly as the product label directs. Injectable lorazepam generally requires refrigeration and light protection. IM lorazepam is slower and is not preferred for urgent seizure control. [9]
No IV yet	Continue airway support and obtain access. IM or intranasal midazolam requires a separate, approved route-specific seizure order and suitable formulation/device. [10]	Do not substitute IV, IM, and nasal doses or products one-for-one. Persistent seizure or respiratory failure needs immediate ALS/advanced-airway escalation.
Alprazolam (Xanax; oral/ODT)	**Do not use as acute LAST rescue.** Oral peak concentration is typically 1-2 hours, which is unsuitable for this emergency. [7]	A dissolving tablet is still an oral product. Give no pills, liquids, or objects by mouth during a seizure or impaired consciousness.

Stop benzodiazepine administration when the seizure is controlled unless another indication exists. Additional doses must account for doses already given, respiratory status, and concurrent sedatives/opioids. Do not delay lipid or airway support while waiting for a benzodiazepine response.

Lipid handling and dose check [1,5]

Use **20% intravenous lipid emulsion**, such as Intralipid 20%, with IV-compatible administration supplies. Read dosing in **mL**, not mg. Use the page 1 regimen. Propofol cannot replace lipid rescue.

60 kg example: 90 mL initial bolus; initial infusion 15 mL/min (900 mL/hour); cumulative ceiling 720 mL. A doubled infusion is 30 mL/min (1,800 mL/hour). Count boluses plus infused volume against the ceiling.

Advanced resuscitation decisions [1,2,4]

Epinephrine: the LAST initial dose is expressed in **micrograms**, not milligrams. The reduced IV regimen is for the ALS clinician; an anaphylaxis autoinjector is not its substitute. Keep concentrations and indications clearly separated.

Arrhythmia: use amiodarone when indicated under the rhythm-specific ALS algorithm. **Avoid lidocaine and procainamide.** AHA supports **sodium bicarbonate for life-threatening wide-complex tachycardia** from local-anesthetic toxicity, not routine use for every suspected event. [2,4,5]

Escalation: refractory shock/arrest warrants early hospital discussion of extracorporeal life support (ECMO/bypass). Flumazenil does not reverse LAST and may provoke seizures. Propofol can worsen cardiovascular depression; it is not part of this mobile rescue medication plan. [2,3]

Ventilation branch [8]

Pulse present, breathing absent/inadequate: give one assisted breath every 6 seconds with visible chest rise. Recheck pulse every 2 minutes; if pulseless, switch to CPR/AED.

Rescue kit and team readiness

Suggested THCB implementation checklist | Check before each procedure session.

Keep the labeled kit at the treatment site. Assign equipment checks and response roles to trained staff. [6]

Check	Stock and verify
☐ **Lipid rescue**	**At least 1 L of 20% IV lipid emulsion** as a practical adult kit stock; increase for the adopted dosing plan and transport conditions. Check seals, expiration, storage, and sufficient stock for repeat dosing. [6,11]
☐ **Oxygen**	Medical oxygen cylinder, regulator/flowmeter, correct connectors/key, tubing, non-rebreather mask, and a secure transport holder. Verify pressure, operation, and usable supply for the expected response interval.
☐ **Ventilation**	Adult BVM with reservoir and fitting masks; portable working suction with catheter; airway adjuncts sized for adults. Supraglottic/advanced-airway equipment only with trained personnel and approved use. [6,8]
☐ **Monitoring**	AED/defibrillator with adult pads and functioning battery; ECG monitor, BP cuff, pulse oximeter, stethoscope, timer, and capnography when available. A pulse oximeter does not replace ECG or ventilation assessment. [6]
☐ **IV supplies**	Catheters, tourniquet, antiseptic, dressings, saline flushes, IV tubing, connectors, 50-60 mL syringes, labels, and a practical infusion delivery method. Do not delay rescue to locate a pump.
☐ **Medication orders**	Authorized seizure-rescue medication with its route-specific order; verify concentration and temperature limits. Keep any ALS drugs clearly labeled for their intended indication and concentration.
☐ **Communication**	Charged phone; exact address, unit/floor, entry code, access route, emergency contacts, printed protocol, medication log, and copy of local-anesthetic product information.

Assign roles before starting

Role	Assignment
Clinical leader	Directs response, calls out orders, and gives the EMS handoff.
Airway / CPR	Provides oxygen, suction, BVM, pulse checks, CPR, and AED.
Medication / recorder	Prepares rescue drugs; checks units; tracks doses, lipid volume, vitals, and times.
Caller / access	Calls 911, brings supplies, opens access, and directs responders.

Transfer and observation [1,4,12]

Transfer suspected serious LAST by EMS even if symptoms improve. Tell dispatch: "Suspected local anesthetic systemic toxicity after [drug]; [seizure/unstable vitals/arrest]; lipid rescue [started/not yet available]." Give the exact address and access instructions.

Receiving-facility monitoring: at least **2 hours after seizure** and **4-6 hours after cardiovascular instability**; longer monitoring/ICU care after arrest or as clinically indicated. These are hospital observation guides, not a home-discharge rule. Poison Control: **1-800-222-1222**, after EMS activation. [1,12]

Kit checked by / date: _____

Treatment-site address / entry details: _____

LAST event record and handoff

Complete during the response when staffing allows. Never delay patient care to document.

Patient: _____ **DOB:** _____ **Date:** _____

Site / procedure: _____

Weight: _____ kg **Lipid dosing weight / basis:** _____

Allergies / relevant conditions / other sedatives or opioids: _____

_____

Local anesthetic exposure

Include injected, topical, compounded, and local anesthetic contained in other products. Record each agent separately; toxicity from multiple local anesthetics is additive. [5]

Agent / product / lot	Strength (mg/mL or %)	Amount / route / site	Total mg	Time

Calculation: injected dose (mg) = concentration (mg/mL) x volume (mL). For standard % w/v solutions, 1% = 10 mg/mL. Topical amount applied does not equal amount absorbed; preserve the product label.

Recognition and activation

First symptoms / time: _____

Initial pulse / BP / SpO2 / rhythm: _____

911 called: _____ **CPR started:** _____ **EMS arrived:** _____

Treatment timeline

Time	Drug / action / concentration / route	Dose / volume	Vitals / rhythm / response

Lipid: bolus total _____ mL + infusion total _____ mL = cumulative _____ mL

Calculated lipid ceiling: _____ mL **Time hemodynamically stable:** _____

Transfer destination / departure: _____

EMS handoff clinician: _____ **Receiving clinician:** _____

Send with EMS: event timeline; all drug names, strengths, doses and routes; total lipid volume and current rate; anesthetic packaging/labels; history/allergies; vital-sign/rhythm record; clinic contact information.

Recorder / signature: _____

Clinical adoption and references

Prepared 04 November 2026 | Adult outpatient/mobile-care reference | Version 1.1

Before adopting this protocol

The medical director should approve the medication orders, concentrations, non-IV seizure option, obesity dosing-weight method, equipment, staff competencies, and EMS transfer process. This document does not establish prescribing authority or certify that a mobile service has these capabilities. Pediatric care requires its own protocol.

Before local anesthetic use: document the agent, concentration, total planned milligrams, patient weight, and all other local-anesthetic exposures; use the lowest effective dose and appropriate injection precautions. A dose below a published maximum does not eliminate intravascular-injection risk. Rehearse the response and review kit readiness. [5,6]

After an event: complete clinical documentation, review the timeline, replenish and recheck equipment, and revise the response plan. Record LAST as suspected toxicity with the actual drug details; do not automatically label it an allergy.

Medical director: _____ Signature: _____

Effective date: _____ Next review: _____ Seizure order ID: _____

Clinical lead / phone: _____ Kit location: _____

Source notes

ASRA's currently posted LAST checklist remains the 2020 version; its website anticipates an update in early 2027. Recheck when that update appears. This custom THCB protocol summarizes selected guidance; it is not an ASRA/AHA-issued or endorsed document. Numbered citations identify supporting sources.

[1] ASRA Pain Medicine. LAST checklist, 2020 v1.1; current checklist page. Open source
Lipid regimen, resuscitation modifications, observation; check for updates.

[2] American Heart Association. 2025 Special Circumstances of Resuscitation, section 21.9. Open source
Lipid, seizure control, bicarbonate for wide-complex tachycardia, ECLS.

[3] Stanford Anesthesia Cognitive Aid Program. Emergency Manual v4.4 (2022), event 18. Open source
Adult LAST seizure example: midazolam 2-4 mg IV; crisis response.

[4] UCSF Pain Management Education. Local Anesthetic Systemic Toxicity. Open source
Recognition, airway/circulatory priorities, amiodarone and transfer. Current ASRA timing takes precedence where details differ.

[5] Neal JM et al. Third ASRA Practice Advisory on LAST: Executive Summary 2017. RAPM 2018;43:113-123. Open source
Prevention, additive toxicity, weight considerations. DOI: 10.1097/AAP.0000000000000720.

[6] Royal College of Anaesthetists. Regional Anaesthesia Services, GPAS chapter 8. Open source
Equipment, monitoring, medication access and staff readiness; used for clinical planning, not as a California legal standard.

[7] FDA. Xanax (alprazolam) prescribing information, 2021. Open source
Oral absorption/peak concentrations. Exclusion from acute LAST rescue is a clinical route/onset judgment.

[8] American Heart Association. 2025 Adult Basic Life Support. Open source
Pulse assessment, CPR/AED, and rescue breathing.

[9] DailyMed. Lorazepam injection prescribing information. Open source
Adult status-epilepticus IV dose, injection rate, dilution and storage. Verify the dispensed product label.

[10] American Epilepsy Society. Convulsive status epilepticus treatment guideline (2016). Open source
Route-specific seizure treatment evidence; does not create a LAST-specific standing order.

[11] Royal College of Anaesthetists. Audit Recipe Book 2024, section 11.8. Open source
Adult lipid stock benchmark: 1,000 mL of 20% lipid emulsion.

[12] California Poison Control System. Poison Emergency. Open source
U.S. Poison Control contact and 911 escalation.