

The American Society of Regional Anesthesia and Pain Medicine Checklist for Managing Local Anesthetic Systemic Toxicity 2017 Version

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Abstract: The American Society of Regional Anesthesia and Pain Medicine (ASRA) periodically revises and updates its checklist for the management of local anesthetic systemic toxicity. The 2017 update replaces the 2012 version and reflects new information contained in the third ASRA Practice Advisory on Local Anesthetic Systemic Toxicity. Electronic copies of the ASRA checklist can be downloaded from the ASRA Web site (www.asra.com) for inclusion in local anesthetic toxicity rescue kits or perioperative checklist repositories.

(*Reg Anesth Pain Med* 2018;43: 150–153)

The American Society of Regional Anesthesia and Pain Medicine (ASRA) created a checklist for the management of local anesthetic systemic toxicity (LAST) as part of the 2010 Second ASRA Practice Advisory on Local Anesthetic Systemic Toxicity.¹ The checklist was revised in 2012² in response to observations made during a study in which the ASRA checklist was used in a simulated episode of severe LAST.³ The current 2017 revision (Fig. 1) is based on updated knowledge derived from the Third ASRA Practice Advisory on Local Anesthetic Systemic Toxicity⁴ and additional insights gained through experience with the 2012 version when used during various simulation exercises.^{5,6} Table 1 summarizes content and visual presentation changes.

The checklist contains 3 content updates from the third practice advisory.⁴ First, consideration of lipid emulsion is now recommended at the first sign of a serious LAST event. Second, specific timeframes are recommended for postevent monitoring and are segregated by severity of the LAST event. Third, the upper limit of lipid emulsion dosing has increased slightly to 12 mL/kg, but with the caveat that smaller doses are the norm in most LAST events. Note that the use of lipid emulsion as an antidote for LAST is an off-label indication as defined by the US Food and Drug Administration.

Important visual alterations to the checklist involve emphasis of critical treatment decisions and simplification of drug dosing, as derived from simulation experiences.^{3,5,6} Treatment of LAST differs from other resuscitation scenarios involving cardiac arrest. Standard (1 mg) doses of epinephrine, vasoconstrictors such as vasopressin, drugs that impair cardiac contractility such as β -blockers

or calcium-channel blockers, and local anesthetic antiarrhythmics are all detrimental to the local anesthetic-toxic heart.⁴ Yet simulation exercises show that practitioners revert consistently to standard advanced cardiac life support protocols when LAST involves cardiac arrest, especially when the patient is recalcitrant to initial treatment.^{3,5} Based on this observation, the checklist now begins with the admonition that the practitioner is dealing with a different resuscitation scenario than that of a more typical cardiac arrest and thereafter provides specific recommendations for epinephrine dosing⁷ and drugs to avoid. Thompson⁶ reported confusion related to lipid emulsion dosing. In response to this, the 2017 checklist simplifies lipid emulsion dosing to include a fixed 100-mL bolus followed by the infusion of 200 to 250 mL over 15 to 20 minutes for all patients weighing more than 70 kg. Specific weight-based dosing is reserved for those patients weighing less than 70 kg, but even those recommendations emphasize that precise volume and flow rate are not critical. In further response to perceived ambiguous lipid emulsion dosing recommendations, the checklist now advises that a 30-minute resuscitation could involve lipid emulsion volumes approaching 1 L. Consequently, the suggested content for a “LAST Rescue Kit” is 1 total L of lipid emulsion 20%. Based on case report and simulation experience, the reverse side of the checklist recommends that local anesthetic dosing be part of the “surgical pause/time-out” discussion, especially for patients at increased risk of LAST.

Using an electronic decision support tool can assist the resuscitation team.⁵ To that end, ASRA created the ASRA LAST smartphone app, available from the Apple App Store or Google Play (Fig. 2). The app automatically updates to the latest version of the ASRA LAST Checklist and practice advisory.

The 2017 ASRA LAST Checklist underwent basic testing for readability and design at the Stanford Center for Immersion and Simulation-Based Learning. The resulting 2017 version is appended. Practitioners are urged to update previous versions and/or to include the checklist in their LAST Rescue Kit or perioperative checklist repositories. If a LAST event occurs, having a designated “reader” improves adherence to recommended treatment guidelines.⁵ Electronic copies of the checklist can be obtained from the ASRA Web site (www.asra.com) and are suitable for lamination.*

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The American Society of Regional Anesthesia and Pain Medicine (ASRA) receives revenue from sale of the ASRA LAST app.

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AMERICAN SOCIETY OF REGIONAL ANESTHESIA AND PAIN MEDICINE

CHECKLIST FOR TREATMENT OF LOCAL ANESTHETIC SYSTEMIC TOXICITY (LAST)

The Pharmacologic Treatment of LAST is Different from Other Cardiac Arrest Scenarios

- ❖ Reduce individual epinephrine boluses to ≤ 1 mcg/kg
- ❖ Avoid vasopressin, calcium channel blockers, beta blockers, or other local anesthetics
- Stop injecting local anesthetic
- Get help
 - Consider lipid emulsion therapy at the first sign of a serious LAST event
 - Call for the LAST Rescue Kit
 - Alert the nearest cardiopulmonary bypass team - resuscitation may be prolonged
- Airway management
 - Ventilate with 100% oxygen / avoid hyperventilation / advanced airway device if necessary
- Control seizures
 - Benzodiazepines preferred
 - Avoid large doses of propofol, especially in hemodynamically unstable patients
- Treat hypotension and bradycardia – If pulseless, start CPR

Lipid Emulsion 20% (Precise volume and flow rate are not crucial)	
Greater than 70 kg patient	Less than 70 kg patient
Bolus 100 mL Lipid Emulsion 20% rapidly over 2-3 minutes <ul style="list-style-type: none"> • Lipid emulsion infusion 200-250 mL over 15-20 minutes 	Bolus 1.5 mL/kg Lipid Emulsion 20% rapidly over 2-3 minutes <ul style="list-style-type: none"> • Lipid emulsion infusion ~0.25 mL/kg/min (ideal body weight)
If patient remains unstable: <ul style="list-style-type: none"> • Re-bolus once or twice at the same dose and double infusion rate; be aware of dosing limit (12mL/kg) • Total volume of lipid emulsion can approach 1 L in a prolonged resuscitation (e.g., > 30 minutes) 	

- Continue monitoring
 - At least 4-6 hours after a cardiovascular event
 - Or, at least 2 hours after a limited CNS event
- Do not exceed 12 mL/kg lipid emulsion (particularly important in the small adult or child)
 - Much smaller doses are typically needed for LAST treatment
- See reverse side of this checklist for further details



FIGURE 1. ASRA LAST Checklist.

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Risk Reduction (Be sensible)

- Use the least dose of local anesthetic necessary to achieve the desired extent and duration of block.
- Local anesthetic blood levels are influenced by site of injection and dose. It is important to identify patients at increased risk of LAST prior to using local anesthetics, e.g., infants <6 months old, small patient size, advanced age and frailty, heart failure, ischemic heart disease, conduction abnormalities, or rhythm disorders, metabolic (e.g., mitochondrial) disease, liver disease, low plasma protein concentration, acidosis, and medications that inhibit sodium channels. Patients with very low ejection fraction are more sensitive to LAST and may be especially prone to elevated local anesthetic levels associated with 'stacked' injections.
- Consider using a pharmacologic marker and/or test dose, e.g. epinephrine 2.5 to 5 mcg/mL (total 10-15 mcg). Know the expected response, onset, duration, and limitations of a "test dose" in identifying intravascular injection.
- Aspirate the syringe prior to each injection while observing for blood in the syringe or tubing
- Inject incrementally, while observing for signs and inquiring for symptoms of toxicity between each injection.
- Consider discussing local anesthetic dose as part of the pre-procedural or pre-surgical pause ("time out").

Detection (Be vigilant)

- Monitor the patient during and after completing injection. Clinical toxicity can be delayed 30 minutes or longer.
- Use standard American Society of Anesthesiologists (ASA) monitors.
- Communicate frequently with the patient to query for symptoms of toxicity.
- Consider LAST in any patient with altered mental status, neurological symptoms or signs of cardiovascular instability after a regional anesthetic (e.g., change in HR, BP, ECG). Consider LAST even when the local anesthetic doses is 1) small (susceptible patient), 2) atypically administered (subcutaneous, mucosal, topical), 3) administered by the surgeon, or 4) after recent tourniquet deflation.
- Central nervous system signs (may be subtle, atypical, or absent)
 - o Excitation (agitation, confusion, vocalization, muscle twitching, seizure)
 - o Depression (drowsiness, obtundation, coma, or apnea)
- Non-specific (metallic taste, circumoral numbness, diplopia, tinnitus, dizziness)

- Cardiovascular signs (occasionally the only manifestation of severe LAST)
 - o Initially may be hyperdynamic (hypertension, tachycardia, ventricular arrhythmias), then
 - o Progressive hypotension
 - o Conduction block, bradycardia or asystole
 - o Ventricular arrhythmia (ventricular tachycardia, Torsades de Pointes, ventricular fibrillation or asystole)
- Sedation may abolish the patient's ability to recognize or report LAST-related symptoms.

Treatment**Suggested components of a "LAST Rescue Kit"**

- 1 L (total) lipid emulsion 20%
- Several large syringes and needles for administration
- Standard IV tubing
- ASRA LAST Checklist

- Administer lipid emulsion at the first sign of a serious LAST event.
- Lipid emulsion can be used to treat LAST caused by any local anesthetic.
- Standard dose epinephrine (1 mg) can impair resuscitation from LAST and reduce the efficacy of lipid rescue. Use smaller doses than typical for ACLS, e.g., ≤ 1 mcg/kg boluses, or for treating hypotension.
- Propofol should not be used when there are signs of cardiovascular instability.
- Prolonged monitoring (2-6 hours) is recommended after any signs of LAST, since cardiovascular depression due to local anesthetics can persist or recur after treatment.
 - o If LAST event is short-lived and without signs of cardiovascular instability, one may consider proceeding with surgery after an uneventful ~30 minute interval of monitoring.

Please report LAST events to www.lipidrescue.org

The Third American Society of Regional Anesthesia and Pain Medicine Practice Advisory on Local Anesthetic Systemic Toxicity. Executive Summary 2017. Reg Anesth Pain Med 2018;43:113-123

The ASRA LAST™ smart phone app can be purchased from The Apple App Store or Google Play



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FIGURE 1. Continued

TABLE 1. Changes to LAST Checklist**Content Updates**

Timing of lipid emulsion therapy	Consider administering lipid emulsion at the first sign of a serious LAST event
Timeframe for postevent monitoring	Specific times are recommended and segregated based on severity of the event
Upper limit of lipid emulsion dosing	Increased to 12 mL/kg with the caveat that smaller doses are the norm
Visual Presentation Adjustments	
Resuscitation is different than standard advanced cardiac life support	Prominently displayed at the top of the checklist, including drug-specific dose modifications
Alert cardiopulmonary bypass team	Moved higher on the checklist, coincident with calling for help
Lipid emulsion dosing	Simplified: <ul style="list-style-type: none"> • Precise volumes and rate of administration are not crucial • Weight-based dosing only for patients <70 kg • All patients >70 kg receive a fixed bolus and infusion rate • Reminder that prolonged resuscitation may require volumes of lipid emulsion approaching 1 L
“Reverse side”	<ul style="list-style-type: none"> • Updated to reflect evolving knowledge • Suggested contents for a LAST Rescue Kit

**FIGURE 2.** ASRA's LAST smart phone app logo.

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