South Australian Perinatal Practice Guideline

Local Anaesthetic Systemic Toxicity

Note:

This guideline provides advice of a general nature. This statewide guideline has been prepared to promote and facilitate standardisation and consistency of practice, using a multidisciplinary approach. The guideline is based on a review of published evidence and expert opinion.

Information in this statewide guideline is current at the time of publication.

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Health practitioners in the South Australian public health sector are expected to review specific details of each patient and professionally assess the applicability of the relevant guideline to that clinical situation.

If for good clinical reasons, a decision is made to depart from the guideline, the responsible clinician must document in the patient's medical record, the decision made, by whom, and detailed reasons for the departure from the guideline.

This statewide guideline does not address all the elements of clinical practice and assumes that the individual clinicians are responsible for discussing care with consumers in an environment that is culturally appropriate, and which enables respectful confidential discussion. This includes:

- The use of interpreter services where necessary,
- Advising consumers of their choice and ensuring informed consent is obtained,
- Providing care within scope of practice, meeting all legislative requirements, and maintaining standards of professional conduct, and
- Documenting all care in accordance with mandatory and local requirements.

Note: The words woman/women/mother/she/her have been used throughout this guideline as most pregnant and birthing people identify with their birth sex. However, for the purpose of this guideline, these terms include people who do not identify as women or mothers, including those with a non-binary identity. All clinicians should ask the pregnant person what their preferred term is and ensure this is communicated to the healthcare team.

The term Aboriginal is used respectively in this document as an all-encompassing term for Aboriginal and Torres Strait Islander people and culture.

Australian Aboriginal Culture is the oldest living culture in the world yet Aboriginal people continue to experience the poorest health outcomes when compared to non-Aboriginal Australians. In South Australia, Aboriginal women are 2–5 times more likely to die in childbirth and their babies are 2–3 times more likely to be of low birth weight. The accumulative effects of stress, low socio-economic status, exposure to violence, historical trauma, culturally unsafe and discriminatory health services, and health systems are all major contributors to the disparities in Aboriginal maternal and birthing outcomes. Despite these unacceptable statistics, the birth of an Aboriginal baby is a celebration of life and an important cultural event bringing family together in celebration, obligation, and responsibility. The diversity between Aboriginal cultures, language and practices differ greatly and so it is imperative that perinatal services prepare to respectfully manage Aboriginal protocol and provide a culturally positive health care experience for Aboriginal people to ensure the best maternal, neonatal and child health outcomes.

Explanation of the Aboriginal artwork: The Aboriginal artwork used symbolises the connection to country and the circle shape shows the strong relationships amongst families and the Aboriginal culture. The horseshoe shape design shown in front of the generic statement symbolises a woman and those enclosing a smaller horseshoe shape depicts a pregnant woman. The smaller horseshoe shape in this instance represents the unborn child. The artwork shown before the specific statements within the document symbolises a footprint and demonstrates the need to move forward together in unison.

Purpose and Scope of PPG

The purpose of this guideline is to give clinicians information on the signs of local anaesthetic systemic toxicity (LAST) with subsequent management and follow up care.

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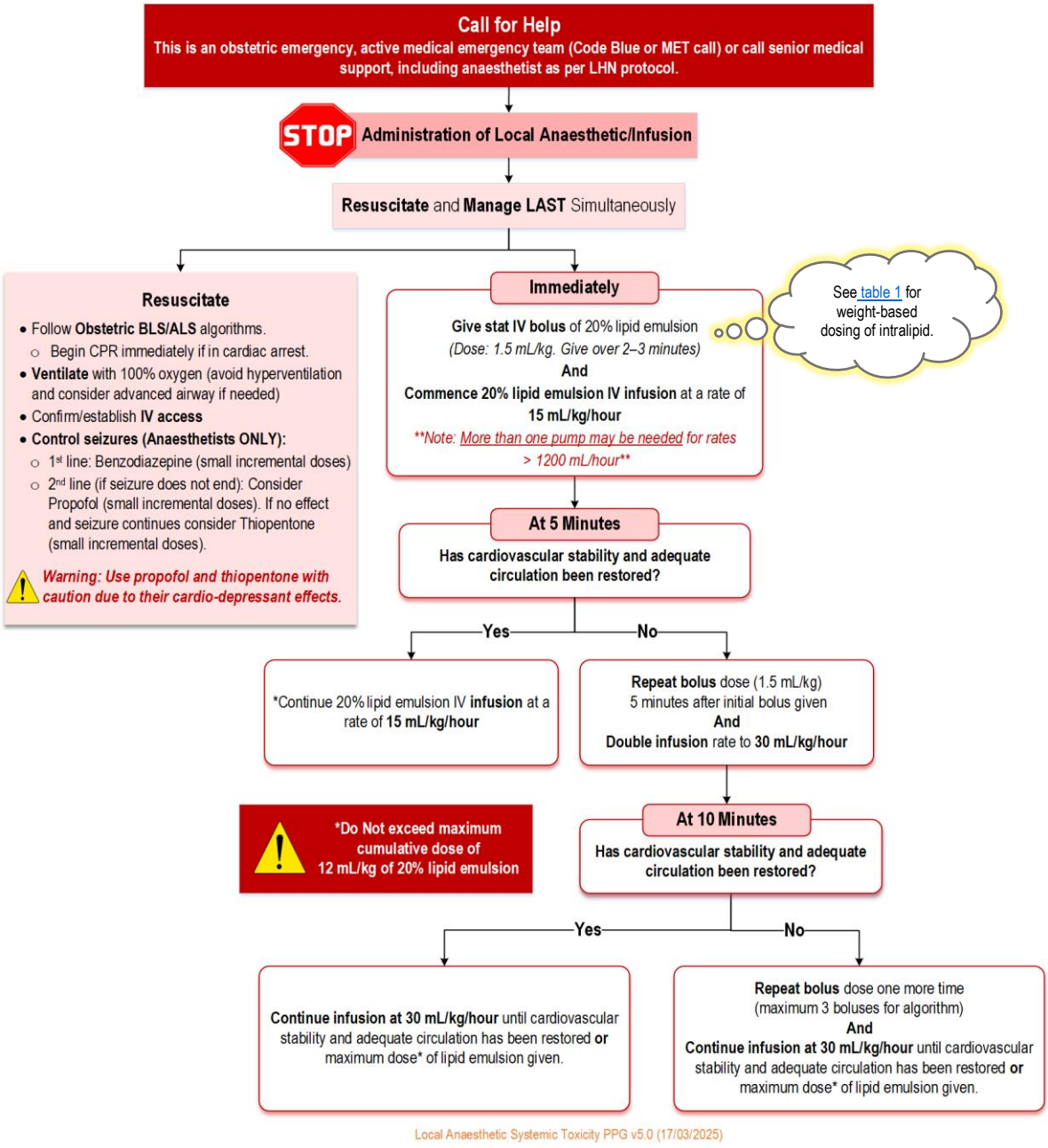
Flowchart 1| Immediate Management of Local Anaesthetic Systemic Toxicity (LAST)



Reference: Association of Anaesthetists 2023. Quick Reference Handbook Available from: https://anaesthetists.org/quick-reference-handbook (also see QRH_3-10_Local_anaesthetic_toxicity_v2_June 2023.pdf (anaesthetists.org))[1]

For a printable version see Appendix 1

Table 1| Weight Specific Intralipid Regime

	Immediately			At 5 and 10 minutes if: - cardiovascular stability not restored or - an adequate circulation deteriorates		At any time after 5 minutes if:	
Weight	**Initial Bolus**		**Initial Infusion**	**Repeat bolus (same dose)**		**Increased infusion**	**Maximum**
	1.5mL/kg over 2 - 3 minutes		Start at 15mL/kg	Same dose (can be repeated)		Increase infusion to 30mL/kg/h	12mL/kg
Kilograms	**mL**	**mL/hr over 3 minutes**	**mL/hr**	**mL**	**mL/hr over 3 minutes**	**mL/hr**	**mL**
40	60	1200	600	60	1200	1200	480
45	67.5	1350	675	67.5	1350	1350	540
50	75	1500	750	75	1500	1500	600
60	90	1800	900	90	1800	1800	720
70	105	2100	1050	105	2100	2100	840
80	120	2400	1200	120	2400	2400	960
90	135	2700	1350	135	2700	2700	1080
100	150	3000	1500	150	3000	3000	1200

Note:

- More than one infusion pump may be needed for rates > 1200 mL/hour
- Individual services should check the maximum infusion rates of the pumps that they have available for administering intralipid.
- If the pumps available have a maximum infusion rate below the rates in the table, a risk assessment of using additional methods to the use of one pump for intralipid administration should be considered.

Table of Contents

Summary of Practice Recommendations

Local anaesthetic system toxicity (LAST) is a medical emergency. Early recognition and prompt escalation and response is vital.

Signs of LAST do not always appear immediately post initial injection.

Signs may include:

- sudden alteration in mental status, severe agitation or, sudden loss of consciousness with or without tonic-clonic convulsions
- Cardiovascular collapse, sinus bradycardia, conduction blocks asystole and ventricular tachyarrhythmia may all occur.

Stop the administration of local anaesthetic immediately at first signs of LAST.

Call for help as per local health network protocol.

Resuscitate following the Basic Life Support (BLS) and Advanced Life Support (ALS) algorithms found in *Maternal Collapse PPG* found in the A-to-Z listing at www.sahealth.sa.gov.au/perinatal.

Give **intravenous 20% lipid emulsion** as per flowchart 1.

Note: *Benzodiazepines, thiopentone, propofol and neuromuscular blocking drugs **must only** be administered by a practitioner familiar with the use of these drugs and has advanced airway skills, or with an additional practitioner confident in these skills immediately available at the bedside*.

Recovery from local anaesthetic induced cardiac arrest may take longer than an hour. Continue resuscitation efforts for this time.

Abbreviations

>	Greater than
≥	Equal to or greater than
<	Less than
≤	Equal to or less than
ALS	Advanced life support
BLS	Basic life support
DR S ABC	Danger, response, send for help, airway, breathing, circulation
g	Gram(s)
IV	Intravenous
kg	Kilogram
LAST	Local anaesthetic systemic toxicity
MET	Medical emergency team
mg	Milligram(s)
mg/kg	Milligram per kilogram
mL	Millilitre(s)
Microg	Microgram(s)

Definitions

Local anaesthetic toxicity	A potentially fatal complication of regional anaesthesia. It can also occur in other situations with local anaesthetic injections.
Shared decision making	Shared decision making involves discussion and collaboration between a consumer and their healthcare providers. It is about bringing together the consumer's values, goals, and preferences with the best available evidence about benefits, risks and uncertainties of screening, investigations, and treatment, to reach the most appropriate healthcare decisions for that person.

Introduction

Local anaesthetic systemic toxicity (LAST) is a rare and potentially fatal complication that occurs in some instances where regional anaesthesia is used. Toxicity from local and infiltration anaesthetics can be either localised (neurovascular) or systemic (affecting the central nervous or cardiovascular systems).[2]

Signs of LAST do not always occur immediately after the initial injection. In some cases the onset of symptoms can be delayed up to several minutes.[3] It is therefore imperative to regularly monitor for signs of toxicity post anaesthetic administration.

Immediate Management of Local Anaesthetic Systemic Toxicity

Recognise: Signs of Severe Toxicity

Central Nervous System:

- sudden alteration in mental status
- severe agitation or
- sudden loss of consciousness with or without tonic-clonic convulsions.[4]

Cardiovascular System:

- cardiovascular collapse
- sinus bradycardia
- conduction blocks
- asystole and
- ventricular tachyarrhythmia may all occur.[4]

Respond and Escalate

Local anaesthetic systemic toxicity is an **emergency**.

Stop administering local anaesthetic, including infusions **immediately.**

Call for Help: state **'local anaesthetic toxicity'**

- Activate medical emergency team (Code Blue or MET call), or senior medical support, including anaesthetics as per local health network protocol.
- Commenced emergency management response:
  - follow basic life support (DR S ABC) and advanced life support algorithms as per the *Maternal Collapse PPG* found in the A-to-Z listing at www.sahealth.sa.gov.au/perinatal

- **Give 100% oxygen** and ensure adequate lung ventilation:
  - consider an endotracheal tube to maintain and secure the airway
  - avoid hypoxia and hypercarbia as both conditions worsen LAST.
- Confirm or establish **intravenous access**.[5]

Control Seizures: Pharmacological Management

Important: Benzodiazepines, thiopentone, propofol and neuromuscular blocking drugs **must** only be administered by a practitioner familiar with the use of these drugs and has advanced airway skills, or with an additional practitioner confident in these skills immediately available at the bedside.

First line:

Give small incremental doses of a benzodiazepine:

- **Midazolam (IV) 0.1–0.2 mg/kg, slow bolus** (i.e., 5 mg over two minutes or 10 mg over four minutes)

Second line (if seizures do not end):

- **Propofol (IV)**, **20 mg increments (titrated to effect)**
  - Use with caution.
  - Give small incremental doses.
  - Note the negative inotropic effects of propofol (and thiopentone).[5]
  - Monitor cardiovascular status closely.
- Consider neuromuscular blockade if seizures cannot be controlled, to avoid worsening acidosis from muscle activity (this will not affect cerebral activity).
- Consider drawing blood for analysis, but **do not** delay definitive treatment to do this.

Management of LAST in Cardiac Arrest

- Commence **cardiopulmonary resuscitation (CPR)** immediately.
  - See *Maternal Collapse PPG* found in the A-to-Z listing at www.sahealth.sa.gov.au/perinatal.
- Give **intravenous 20% lipid emulsion** as per flowchart 1.
  - Doses based on body weight (see Table 1)
  - **Do not** exceed maximum cumulative dose of 12 mL/kg.
  - In circumstances where high lipid emulsion infusion rates are required (e.g., 2000 mL/hr) and volumetric pumps to deliver these amounts, then consider using two pumps simultaneously to deliver the required amount.
- **Continue CPR** throughout treatment with lipid emulsion.
  - Consider the use of cardiopulmonary bypass if available.
  - Use smaller doses of adrenaline (i.e., give ≤ 1 microg/kg instead of 1 mg), to prevent afterload and impairing pulmonary flow.
  - Manage arrhythmias, recognising that arrhythmias may be refractory to treatment.
- Recovery from local anaesthetic induced cardiac arrest may take more than 1 hour.
- **Consider** perimortem caesarean section by 5 minutes post cardiac arrest in pregnant women beyond 24 weeks gestation as per *Maternal Collapse PPG* found in the A-to-Z listing at www.sahealth.sa.gov.au/perinatal.

Management of LAST Without Cardiac Arrest

- Strongly consider **intravenous 20% lipid emulsion** treatment (see flowchart 1).

- It is difficult to predict which patients will progress to cardiovascular collapse, but lipid emulsion is a low-risk intervention that may prevent this deterioration.
- Doses are based on body weight.
- **Do not** exceed maximum cumulative dose of 12 mL/kg.
- in circumstances where high lipid emulsion infusion rates are required (e.g., 2000 mL/hr) and volumetric pumps to deliver these amounts, then consider using two pumps simultaneously to deliver the required amount.
- Propofol is **not** a suitable substitute for lipid emulsion.

- Use conventional therapies to treat:
  - **Hypotension**
    - Avoid vasopressin.
  - **Bradycardia**
    - Consider atropine as first line.
  - **Tachyarrhythmia**
    - Consider amiodarone as first line.
    - Avoid beta-blockers, calcium channel antagonists and lidocaine (lignocaine), and other class 1 anti-arrhythmic (e.g., quinidine, procainamide, mexiletine).
- Hypoxia, hypercarbia, and acidosis worsen the negative inotropy seen in LAST, but it is unclear whether the risks of alkalinising a profoundly acidotic patient outweigh the benefits.
  - Sodium bicarbonate and significant hyperventilation **is not** recommended.
- Methemoglobinemia may rarely be associated with LAST, when the toxicity is caused by lignocaine and prilocaine.

Follow-up

- Arrange safe transfer to a clinical area with appropriate equipment and suitable staff is available until sustained recovery is achieved.
- Once stable:
  - post seizure: observe for 2 hours
  - post cardiovascular instability: observe for 4–6 hours
  - post cardiac arrest: as per senior medical advice.
- Side effects of lipid emulsion are rare but include pancreatitis and deep vein thrombosis.
  - Consider thromboprophylaxis (See *Thromboprophylaxis and Thromboembolic Disease in Pregnancy PPG* found in the A-to-Z listing at www.sahealth.sa.gov.au/perinatal).
  - Assays for amylase and lipase are unreliable in the diagnosis of pancreatitis.
  - Lipid emulsion may interfere with filters used for renal replacement therapy and may cause fat deposition and blood clots in cardiopulmonary bypass, and extracorporeal membrane oxygenator circuits.
- Notify hospital management in accordance with local clinical governance guidelines and complete a safety learning system (SLS) notification (see Safety Learning System | SA Health).
- Document events and debrief as per *Maternal Collapse PPG* found in the A-to-Z listing at www.sahealth.sa.gov.au/perinatal.

Resources

SAPPGs Web-based App:
Practice Guidelines (sahealth.sa.gov.au)

Medicines Information: (sahealthlibrary.sa.gov.au)
https://sahealthlibrary.sa.gov.au/friendly.php?s=SAPharmacy

SA Health Pregnancy:
Pregnancy | SA Health

Australian Government Pregnancy, Birth and Baby: (www.pregnancybirthbaby.org.au)
Pregnancy, Birth and Baby | Pregnancy Birth and Baby (pregnancybirthbaby.org.au)

Pathology Tests Explained: (https://pathologytestsexplained.org.au/)
Pathology Tests Explained

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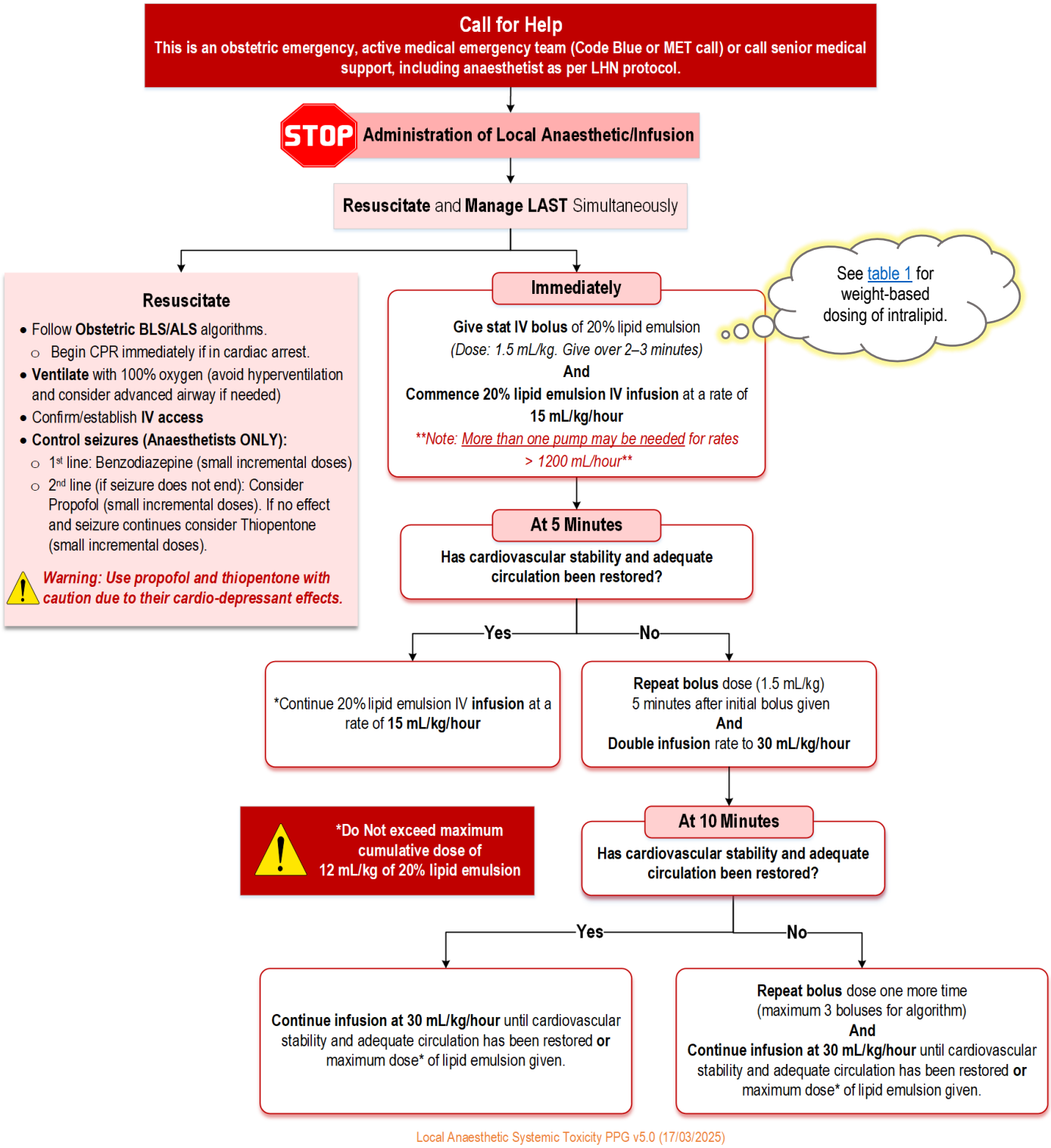

Reference: Association of Anaesthetists 2023. Quick Reference Handbook Available from: https://anaesthetists.org/quick-reference-handbook (also see QRH_3-10_Local_anaesthetic_toxicity_v2_June 2023.pdf (anaesthetists.org))

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