

<b>Standard Operating Procedure (SOP)</b>	<b>Adult Intravenous Lidocaine (Lignocaine) infusion for Perioperative Analgesia in critical care and recovery</b>
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## 1) SUMMARY

Lidocaine is a commonly used local anaesthetic agent, which has beneficial effects on postoperative pain when given by intravenous (IV) infusion. The best evidence of benefit is for use in intra-abdominal surgery including both laparoscopic and open techniques [1].

This document describes the SOP for administering and monitoring IV lidocaine for Theatres & Critical Care.

Adult IV lidocaine infusions should only be started and discontinued by the anaesthetic, critical care and pain services.

## 2) INTRODUCTION

The use of IV lidocaine infusion is an opioid sparing technique in peri-operative pain management. Intravenous lidocaine infusions can minimise opioid exposure without adversely affecting pain control or recovery whilst also reducing the undesirable opioid side-effect profile. Its mechanism of action involves sodium channel blockade, reducing action potential generation and propagation [2].

## 3) DEFINITIONS

**Pain** – pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage [3].

**Acute pain** - pain of recent onset and probable limited duration. It usually has an identifiable temporal and causal relationship to injury or disease [4].

**Chronic pain** – commonly persists beyond the time of healing of an injury and frequently there may not be any clearly identifiable cause [4].

**Complex pain** - Pain which does not respond to conventional analgesia, such as strong opioids. This is normally due to pain arising from complex pathophysiology, producing a mixture of neuropathic and nociceptive pain [5].

**Nociceptive pain** – pain that arises from actual or threatened damage to non-neural tissue and is due to the activation of nociceptors [3].

**Neuropathic pain** - pain caused by a lesion or disease of the somatosensory nervous system [3].

### **Opioids**

Any naturally occurring, semi-synthetic or synthetic compounds that binds specifically to opioid receptors reducing pain transmission.

**Pain** – pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage [3].

#### 4) **SCOPE**

This SOP applies within Imperial College Healthcare NHS Trust Theatres, Recovery and Critical Care settings. For initial dosing & maintenance dosing guidance please see **Section 5.3 for Critical Care** and **Section 5.4 for use in Theatres**. The remainder of the document applies to both clinical areas

This document is to guide Anaesthetists, Recovery and Critical Care staff in the safe use of IV lidocaine infusions for peri-operative analgesia in adults. This SOP does not apply to outpatient settings or any other setting where IV lidocaine may be used.

#### 5) **FULL GUIDELINE**

##### 5.1 **Indications:**

Intravenous lidocaine is usually used for complex pain. In the Intensive Care setting starting IV lignocaine should be discussed with an Intensive Care consultant. In theatres the decision to use IV lignocaine should be taken by a registrar or consultant.

##### **Indications:**

- To reduce opioid exposure in complex pain patients.
- If central neuraxial blockade or regional anaesthesia is contraindicated or difficult to site.
- As part of a multi-modal peri-operative pain management strategy.

**Table 1: Inclusion Criteria in which IV Lidocaine may be indicated [6]**

Summary of indications for i.v. lidocaine

	<b>Alternative to regional anaesthesia</b>	<b>Acute pain with pronociception (hyperalgesia)</b>
Intraoperative	<ol style="list-style-type: none"> <li>1. Epidural—contraindicated or failed</li> <li>2. Laparoscopic surgery</li> <li>3. Enhanced recovery protocols</li> <li>4. Trauma—multiple, significant injuries</li> </ol>	<ol style="list-style-type: none"> <li>1. Opioid dependence or tolerance</li> <li>2. Surgery at a site of chronic pain</li> <li>3. Previous experience of poorly controlled pain</li> <li>4. Substance abuse</li> </ol>
Postoperative	<ol style="list-style-type: none"> <li>1. Epidural—inadequate or failed</li> <li>2. Laparoscopic converted to open</li> <li>3. Trauma—burns, degloving, crush injury</li> <li>4. Rib, clavicle, or sternal fractures</li> <li>5. Prevention or treatment of ileus</li> </ol>	<ol style="list-style-type: none"> <li>1. Acute neuropathic pain—DN4+</li> <li>2. Opioid-sparing technique—obese, OSA, elderly, and those with opioid side-effects</li> <li>3. Difficult to treat patients—chronic pain/opioid tolerance/substance abuse</li> <li>4. Neuropathic pain models—spine surgery and limb amputations</li> </ol>

- The best evidence for beneficial effects from intravenous lidocaine is in patients undergoing laparoscopic or open abdominal procedures [1].

##### 5.2 **Contraindications:**

- Documented amide local anaesthetic allergy.

- Intravenous Lidocaine infusion should not be used in conjunction with other large volumes of local anaesthetic. This includes epidural and peripheral nerve blocks, especially continuous infusions with neural blockade catheters.
- Occasionally in theatre local anaesthetic techniques may be combined but the total local anaesthetic dose should remain below the maximum dose allowed.
- Acute tachyarrhythmia (fast AF) or concurrent amiodarone treatment
- Bradycardia
- Should be used with caution in patients with hepatic and renal impairment.

**Table 2: Relative Contraindications**

Cautions				
CVS	CNS	Renal	Hepatic	Other
Bradycardia (HR <50 bpm)	Epilepsy	Severe renal impairment (eGFR <30ml/min/1.73m <sup>2</sup> )	Liver cirrhosis	Pregnancy
Conduction defects	Myaesthesia gravis		Low plasma protein level (albumin<20g/l)	Beta- blockers
Stoke Adams Attacks				Acidosis
Wolff-Parkinson White syndrome				Hypoxia and Hypercapnia
< 3 months of myocardial infarction				
Reduced cardiac output state (LVEF < 35%)				

CVS = cardiovascular system, CNS = central nervous system

## 5.3 IV Lidocaine Use in Critical Care

### 5.3.1. Before Treatment

- IV lidocaine infusions should only be used for Critical Care patients where staff are able to establish with the patient if they are experiencing symptoms of local anaesthetic toxicity.
- Before starting treatment assess the patient's ability to communicate symptoms of toxicity.
- Ask the patient to inform staff if they experience symptoms of local anaesthetic toxicity. These symptoms include: perioral tingling or numbness, euphoria or feeling of drunkenness, metallic taste, tinnitus, blurred vision and dizziness.
- If patient develops signs or symptoms of local anaesthetic toxicity at any point during treatment **stop the infusion and inform the medical team for urgent, in person review.**
- Before starting an IV lidocaine infusion confirm that the nurse caring for the patient is aware of where IV intralipid is stored on the site where they are working.

### 5.3.2. Initial dosing:

- **The doctor giving the IV lidocaine should remain with the patient for 15 minutes after giving the bolus.**
- Dosing for IV lidocaine should be based on **ideal body weight**. If the patient's actual weight is less than their ideal body weight then use their actual body weight.
- Peri-operative lidocaine infusions are typically started with an initial loading dose of **1.5 mg/kg (max 120mg)**. The bolus should be given slowly over approximately **2-4 minutes**.
- For patients at increased risk of developing local anaesthetic toxicity the bolus dose can be reduced, given over a longer duration (1 hour) or omitted.
- Patients at increased risk of toxicity are those specified in **5.2 Table 2 Relative contraindications** or those previously receiving other local anaesthetic infusions.
- Patients previously receiving other local anaesthetic infusions, e.g. an epidural should not receive an initial bolus, see **5.3.4 IV Lidocaine following epidural or Peripheral Nerve local anaesthetic infusions.**
- Following the bolus assess and document any signs of CNS and CVS signs of toxicity.
- If potential toxicity is identified seek consultant review before starting maintenance dosing.
- If the patient develops symptoms or signs of toxicity further treatment can be adjusted (see Maintenance dosing) or avoided.

### 5.3.3. Maintenance dosing

- Start the continuous infusion **15 minutes** after the initial bolus at **0.5-2mg/kg/hour (max 180mg/hour)**. The usual starting dose is **1mg/kg/hour**.
- Use Ideal body weight to calculate the maintenance dose. If the patient's actual weight is less than their ideal body weight then use their actual weight.
- The rate can be titrated up or down to physiological response to pain or signs of toxicity (see 5.7 Recognising Lidocaine Toxicity).
- **Allow 8 hours to achieve steady-state before making dose adjustments.**

### **5.3.4. IV lidocaine following Epidural or Peripheral Nerve local anaesthetic infusions**

- IV lidocaine infusion can be started 4–8 h after the last epidural or regional catheter bolus and should be started without an initial IV lidocaine bolus dose.
- In the case of a failed epidural, as long as the epidural infusion was stopped without an epidural bolus, IV lidocaine can be started immediately, again without an initial IV lidocaine bolus dose.
- Be cautious when changing between local anaesthetic infusions for patients already at increased risk of local anaesthetic toxicity (see **Section 5.2 Table 2 Relative Contraindications**).
- For further advice please contact the In-patient pain service.

### **5.3.5. Monitoring during IV Lidocaine Infusions**

- ECG monitoring should be continuous while any patient remains on an IV lidocaine infusion.
- Record Richmond Agitation-Sedation Score (RASS), blood pressure (BP), heart rate (HR), respiratory rate (RR), and oxygen saturation (SpO<sub>2</sub>) monitoring every 15 minutes for the first hour, half hourly for two hours and then hourly thereafter.
- The cannula site (if peripheral) should be checked hourly.
- Assess patients for symptoms of local anaesthetic toxicity (See **Section 5.6 Recognising Local Anaesthetic Toxicity, Table 3**) hourly for the first 8 hours then 4 hourly thereafter.
- If patient develops signs or symptoms of local anaesthetic toxicity at any point during treatment **stop the infusion and inform the medical team for urgent, in person review**.

### **5.3.6 Discontinuing IV Lidocaine infusions**

- Continue to optimise multi-modal analgesia whilst the patient is receiving IV lidocaine infusions.
- IV lidocaine infusions may be discontinued once oral analgesics are tolerated and sufficient for pain control, e.g. pain score reported as mild or improved functional status.
- IV lidocaine infusions are typically used for 12 -72 hours. They may be extended at the discretion of the consultant intensivist but wouldn't be expected to be used for longer than 5 days.

## **5.4 IV Lidocaine Use in Theatres**

### **5.4.1. Initial dosing:**

- When starting the lidocaine infusion during induction or peri-operatively an initial loading dose of **1.5 mg/kg (max 120mg)** should be given as a slow bolus over approximately **2-4 minutes**.
- Dosing for IV lidocaine should be based on **ideal body weight**. If the patient's actual weight is less than their ideal body weight then use their actual body weight.
- When used intra-operatively the bolus should be given prior to surgical incision.

- In patients at increased risk of developing local anaesthetic toxicity (see **5.2 Table 2 Relative Contraindications**) the bolus dose can be reduced or given over a longer duration (1 hour).
- If the patient develops symptoms or signs of toxicity further treatment can be adjusted (see **5.4.2 Maintenance dosing**) or avoided.

#### **5.4.2. Maintenance dosing**

- Start the continuous infusion **15 minutes** after the initial bolus at **0.5-2mg/kg/hour (max 180mg/hour)**. The usual starting dose is **1mg/kg/hour**.
- Use Ideal body weight to calculate the maintenance dose. If the patient's actual weight is less than their ideal body weight then use their actual weight.
- **Allow 8 hours to achieve steady-state before making dose adjustments.**
- For most patients in theatre the case duration will be < 8 hours. Be cautious about using higher infusion rates in anaesthetised patients as it is more difficult to assess for early signs of lidocaine toxicity.

#### **5.4.3 Monitoring during IV lidocaine infusions**

- Continuous monitoring, to AAGBI standards, should be used during intra-operative IV lidocaine infusion.
- ECG monitoring should be continuous while any patient remains on an IV lidocaine infusion.
- The minimum frequency of postoperative observations including sedation score, BP, HR, RR, SpO2 monitoring should be taken every 15 minutes for the first hour. This should be followed by every half hourly for two hours and then hourly thereafter.
- The cannula site (if peripheral) should be checked hourly.
- Recovery nursing staff should check for symptoms of local anaesthetic toxicity with patients receiving IV lidocaine infusions hourly for the first 8 hours followed by four hourly thereafter (see **5.6 Recognising local anaesthetic toxicity**).
- If patient develops signs or symptoms of local anaesthetic toxicity at any point during treatment **stop the infusion and inform the medical team for urgent, in person review**.

#### **5.4.4 Discontinuing IV Lidocaine infusions**

- The lidocaine infusion can be stopped **60 minutes** prior to local anaesthetic wound infiltration. Alternatively, local anaesthetic wound infiltration can be omitted and the IV lidocaine infusion can be continued into recovery.
- The infusion must be stopped **15 minutes** before the patient returns to the ward post-operatively.

### **5.5 Prescribing and administration**

- **Lidocaine 1 % (10mg/ml)** is drawn up neat into a **50ml syringe** for administration by infusion preferably via central line (if not available then via a large peripheral vein)
- Do not use 2% Lidocaine concentrations for bolus or continuous infusions.
- This should be administered via a syringe driver only, through a dedicated cannula or CVC port, both with an **anti-reflux valve**.

## 5.6 Recognising local anaesthetic toxicity

- Lidocaine infusions can be used safely and adverse reactions are rare at therapeutic levels (2.5-3.5 mcg/ml).
- Hypoxia, hypercapnia and acidosis can increase the free fraction of local anaesthetic. This can potentiate the risk of local anaesthetic toxicity (>5mcg/ml). Lidocaine infusions should be used with caution in these patients.

**Signs and symptoms** of local anaesthetic toxicity can be classified into central nervous system (CNS) and cardiovascular system (CVS) effects (Table 3).

**Table 3: Signs and symptoms of Local anaesthetic toxicity**

Signs and Symptoms	
CNS*	CVS
Perioral tingling/numbness	Conduction blocks
Paraesthesia	Bradycardia
Metallic taste	Tachycardias - ventricular and atrial
Tinnitus	Cardiac arrest
Dizziness	
Blurred vision	
Agitation	
Slurred speech	
Confusion	
Convulsions	
Coma	

(\*CNS effects will be difficult to detect under GA)

- The most common symptoms of toxicity include sedation, tinnitus, metallic taste and peri-oral numbness.
- If patient develops signs or symptoms of local anaesthetic toxicity at any point during treatment **stop the infusion and inform the medical team for urgent, in person review**, see **5.7 Management of local anaesthetic toxicity**.

## 5.7 Management of local anaesthetic toxicity

- If patient develops signs or symptoms of local anaesthetic toxicity at any point during treatment **stop the infusion and inform the medical team for urgent, in person review.**
- For the medical team consider midazolam 1-2mg IV PRN if the patient develops twitches or tremors.
- The infusion can be re-started at lower rate after **1-2 hours** if the signs and symptoms have resolved but this should be discussed with the Consultant Intensivist or Consultant Anaesthetist (depending on patient location).
- Local anaesthetic toxicity should be managed as per the **AAGBI guidelines** (Figure 2). [7]
- In the event of a cardiac arrest, call 2222 and manage the patient using advanced life support algorithms.

# AAGBI Safety Guideline

## Management of Severe Local Anaesthetic Toxicity

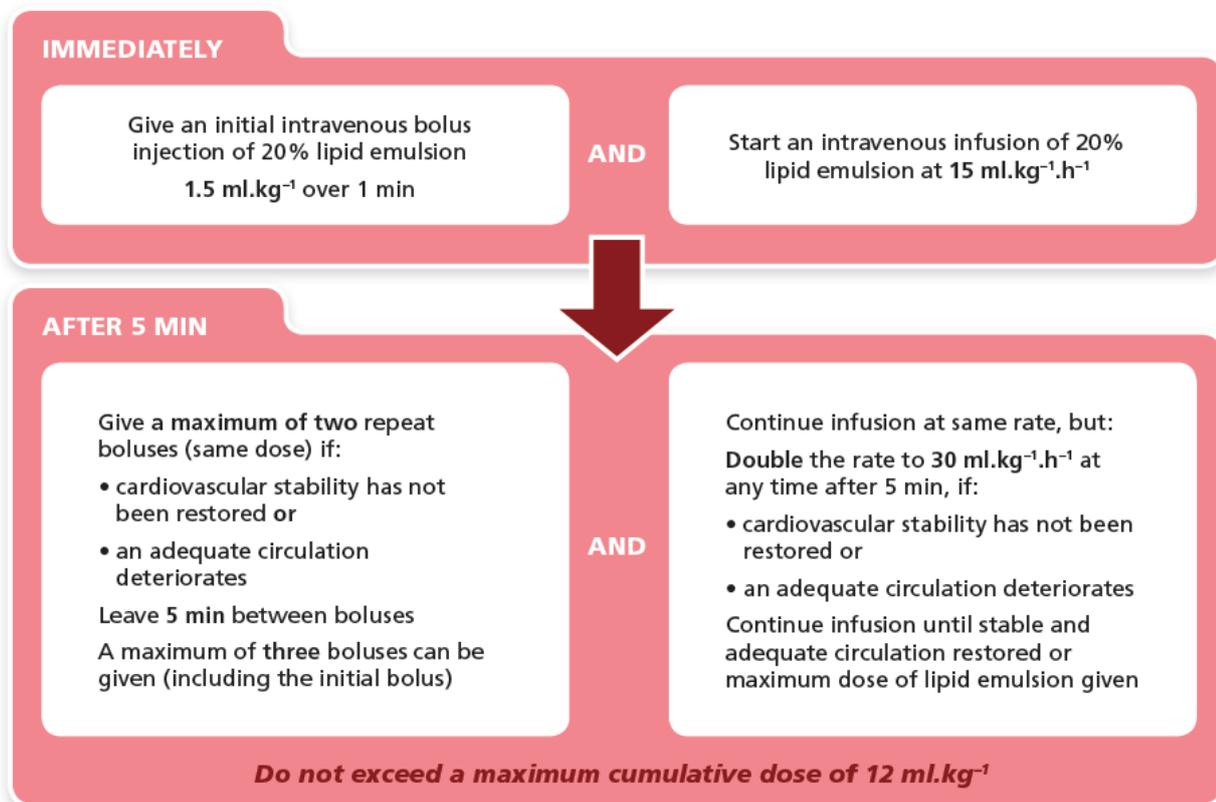


<b>1</b> <b>Recognition</b>	<b>Signs of severe toxicity:</b> <ul style="list-style-type: none"><li>• Sudden alteration in mental status, severe agitation or loss of consciousness, with or without tonic-clonic convulsions</li><li>• Cardiovascular collapse: sinus bradycardia, conduction blocks, asystole and ventricular tachyarrhythmias may all occur</li><li>• Local anaesthetic (LA) toxicity may occur some time after an initial injection</li></ul>	
<b>2</b> <b>Immediate management</b>	<ul style="list-style-type: none"><li>• Stop injecting the LA</li><li>• Call for help</li><li>• Maintain the airway and, if necessary, secure it with a tracheal tube</li><li>• Give 100% oxygen and ensure adequate lung ventilation (hyperventilation may help by increasing plasma pH in the presence of metabolic acidosis)</li><li>• Confirm or establish intravenous access</li><li>• Control seizures: give a benzodiazepine, thiopental or propofol in small incremental doses</li><li>• Assess cardiovascular status throughout</li><li>• Consider drawing blood for analysis, but do not delay definitive treatment to do this</li></ul>	
<b>3</b> <b>Treatment</b>	<b>IN CIRCULATORY ARREST</b> <ul style="list-style-type: none"><li>• Start cardiopulmonary resuscitation (CPR) using standard protocols</li><li>• Manage arrhythmias using the same protocols, recognising that arrhythmias may be very refractory to treatment</li><li>• Consider the use of cardiopulmonary bypass if available</li></ul> <b>GIVE INTRAVENOUS LIPID EMULSION</b> (following the regimen overleaf) <ul style="list-style-type: none"><li>• Continue CPR throughout treatment with lipid emulsion</li><li>• Recovery from LA-induced cardiac arrest may take &gt;1 h</li><li>• Propofol is not a suitable substitute for lipid emulsion</li><li>• Lidocaine should not be used as an anti-arrhythmic therapy</li></ul>	<b>WITHOUT CIRCULATORY ARREST</b> Use conventional therapies to treat: <ul style="list-style-type: none"><li>• hypotension,</li><li>• bradycardia,</li><li>• tachyarrhythmia</li></ul> <b>CONSIDER INTRAVENOUS LIPID EMULSION</b> (following the regimen overleaf) <ul style="list-style-type: none"><li>• Propofol is not a suitable substitute for lipid emulsion</li><li>• Lidocaine should not be used as an anti-arrhythmic therapy</li></ul>
<b>4</b> <b>Follow-up</b>	<ul style="list-style-type: none"><li>• Arrange safe transfer to a clinical area with appropriate equipment and suitable staff until sustained recovery is achieved</li><li>• Exclude pancreatitis by regular clinical review, including daily amylase or lipase assays for two days</li><li>• Report cases as follows:<ul style="list-style-type: none"><li>in the United Kingdom to the National Patient Safety Agency (via <a href="http://www.npsa.nhs.uk">www.npsa.nhs.uk</a>)</li><li>in the Republic of Ireland to the Irish Medicines Board (via <a href="http://www.imb.ie">www.imb.ie</a>)</li></ul></li></ul> If Lipid has been given, please also report its use to the international registry at <a href="http://www.lipidregistry.org">www.lipidregistry.org</a> . Details may also be posted at <a href="http://www.lipidrescue.org">www.lipidrescue.org</a>	

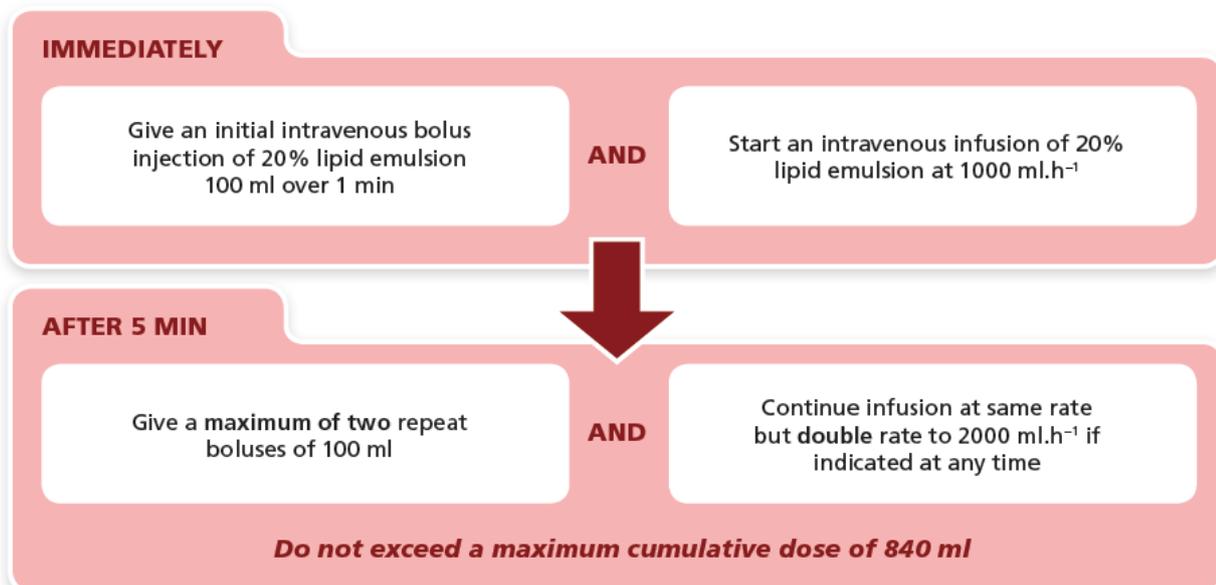
**Your nearest bag of Lipid Emulsion is kept .....**

This guideline is not a standard of medical care. The ultimate judgement with regard to a particular clinical procedure or treatment plan must be made by the clinician in the light of the clinical data presented and the diagnostic and treatment options available.

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**An approximate dose regimen for a 70-kg patient would be as follows:**



This AAGBI Safety Guideline was produced by a Working Party that comprised:  
Grant Cave, Will Harrop-Griffiths (Chair), Martyn Harvey, Tim Meek, John Picard, Tim Short and Guy Weinberg.

This Safety Guideline is endorsed by the Australian and New Zealand College of Anaesthetists (ANZCA).

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**Figure 2: AAGBI Safety Guideline for the Management of Severe Local Anaesthetic Toxicity** ([https://www.aagbi.org/sites/default/files/la\\_toxicity\\_2010\\_0.pdf](https://www.aagbi.org/sites/default/files/la_toxicity_2010_0.pdf))

## 6) IMPLEMENTATION

<b>Training required for staff</b>	<input type="checkbox"/> Yes <input type="checkbox"/> No
<b>If yes, who will provide training:</b> (	<i>Critical Care Nurse educators Dr Illingworth, Dr Lambert</i>
<b>When will training be provided?</b> (	July/August 2020
<b>Date for implementation of guideline:</b> (	July/August 2020

## 7) MONITORING / AUDIT

<b>When will this guideline be audited?</b> <i>(Please give approximate date)</i>	6 months after implementation
<b>Who will be responsible for auditing this guideline?</b> <i>(Please give name/post)</i>	Chris Lambert Consultant in Critical Care
<b>Are there any other specific recommendations for audit?</b>	

## 8) REVIEW

<b>Frequency of review</b>	<b>Please indicate frequency of review:</b> <i>THREE YEARS</i>  <b>Person and post responsible for the review:</b> Dr Jenny Illingworth, Dr Chris Lambert
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## 9) REFERENCES

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7. Association of Anaesthetists of Great Britain and Ireland (AAGBI), 2010. AAGBI Safety Guideline for the Management of Severe Local Anaesthetic Toxicity [online]. Available at: [https://www.aagbi.org/sites/default/files/la\\_toxicity\\_2010\\_0.pdf](https://www.aagbi.org/sites/default/files/la_toxicity_2010_0.pdf) (Accessed: 20th November 2019)

## 10) GUIDELINE DETAIL

<b>Start Date:</b> <i>(Date of final approval by Division)</i>	<b>7.2020</b>
<b>Approval Dates</b>	<b>Name of Divisional group:</b> <b>Date of ratification:</b>
	<b>Name of Directorate group: CCGG 26.6.20</b> <b>Date of ratification:</b>
<b>Has all relevant legislation, national guidance, recommendations, alerts and Trust action plans been considered, and included as appropriate in the development of this guideline?</b>	<b>Please list ALL guidance considered:</b>  Please see reference list
<b>Have all relevant stakeholders been included in the development of this guideline</b>	<b>Please list all (name and role):</b> Anaesthetics, St Mary's Hospital Critical care guidelines group (CCGG)
<b>Who will you be notifying of the existence of this guidance?</b>	<b>Please give names/depts:</b> It will be advertised on the intranet All staff in critical care
<b>Related documents</b>	None
<b>Author/further information</b>	Dr Jennifer Illingworth (Consultant Anaesthetist) Dr Chris Lambert (Consultant Intensivist) Dr Jawaad Saleem Malik (Anaesthetic SpR)  Anaesthetic Department St Mary's hospital Trust email address: <a href="mailto:jennifer.illingworth@nhs.net">jennifer.illingworth@nhs.net</a> <a href="mailto:c.lambert@nhs.net">c.lambert@nhs.net</a>
<b>Document review history</b>	<b>Next review due:</b> <b>Next review due: 01 July 2023</b> V2.0 – Revised guideline V3.0 – Finalised version
<b>THIS GUIDELINE REPLACES:</b>	

## 11) INTRANET HOUSEKEEPING

<b>Key words</b>	Lidocaine, pain, complex pain, postoperative pain, critical care
<b>Which Division/Directorate category does this belong to?</b>	SCC
<b>Which specialty should this belong to when appearing on the Source?</b>	Anaesthetics, Intensive care and Pain management

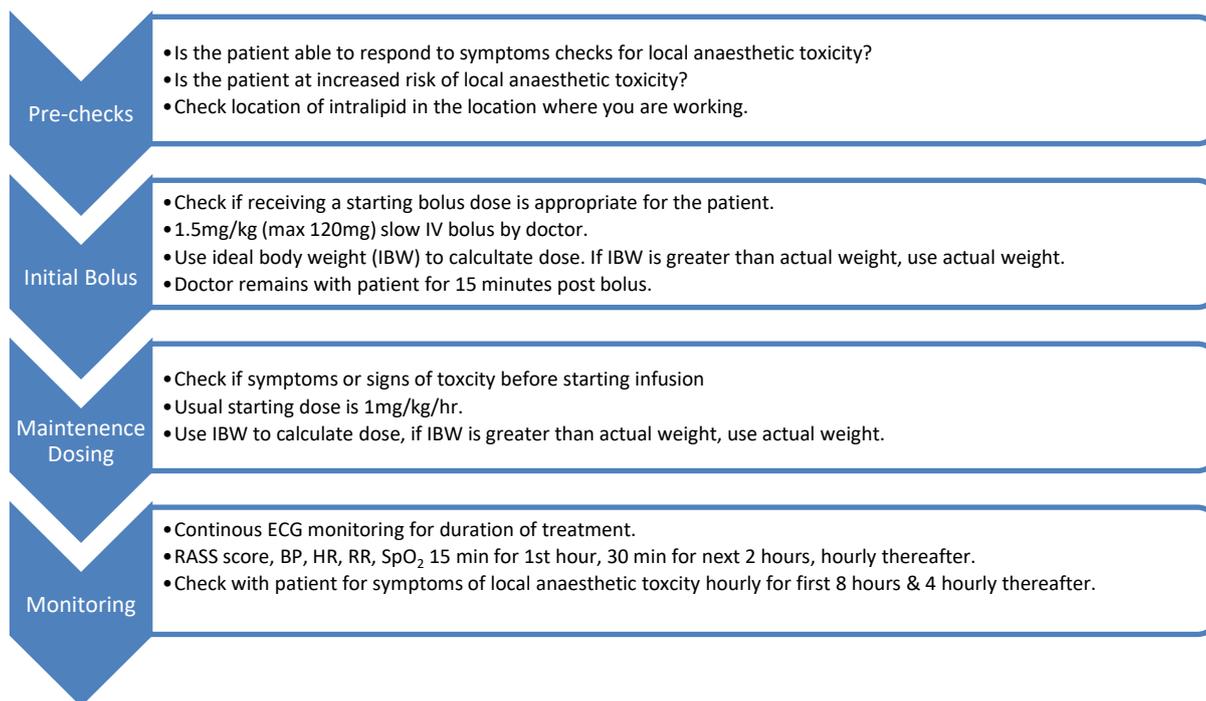
**12) EQUALITY IMPACT OF GUIDELINE**

Is this guideline anticipated to have any significant equality-related impact on patients, carers or staff?

Yes

No

## Appendix 1: Flowchart for IV Lidocaine in Critical Care



### Patients at increased risk of local anaesthetic toxicity:

Cardiac conduction defects	Renal failure
Low cardiac output states	Acid base disturbances
Use of Beta blockers	Hypoxia, hypercapnia
Liver failure	Low albumin
Changing from other local anaesthetic infusion, e.g. epidural	

## Symptoms of local anesthetic toxicity

Peri-oral tingling or numbness  
 metallic taste  
 slurred speech  
 visual disturbances  
 tinnitus  
 parasthesia

nausea & vomiting  
 tremors  
 BP instability  
 Bradycardia  
 Confusion

Reduced consciousness  
 twitching  
 seizures  
 cardiac arrhythmias  
 cardiac arrest

**If any symptoms stop infusion & urgent medical review of patient.**