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Royal Cornwall Hospitals NHS Trust

Continuous Local Anaesthetic Infusions for Post-Operative Pain Relief in Adults Clinical Guideline

V3.0

August 2019

1. Aim/Purpose of this Guideline

1.1. Effective analgesia is crucial to patient outcome after major surgery to ensure comfort, mobilisation and decreased risk of potential post-operative complications such as DVT and chest infection.

1.2. As surgical techniques change and length of inpatient stay decreases, it is important to offer a safe, flexible method of analgesia which may be delivered in both a hospital and community environment if necessary.

1.3. Blockade of pain impulses by local anaesthetic has been shown to give effective pain relief and to decrease other methods of analgesia required – eg opioids with consequent decrease of side effects.

1.4. This document outlines the potential and actual use of Local Anaesthetic within RCHT and the precautions and care required.

1.5. Purpose:

- To ensure that there is a common understanding of use of local anaesthetic to ensure safe delivery of care by all health professionals involved in the care of post-operative patients.

- To ensure that the necessary knowledge and competencies are practised throughout the Trust for delivery - care of the patient, knowledge of the drugs, potential side effects and use of any equipment delivering infusions.

- To ensure that appropriate training in line with RCHT policies should be undertaken by those using the equipment or delivering bolus injections.

1.6. This version supersedes any previous versions of this document.

1.7. **Data Protection Act 2018 (General Data Protection Regulation – GDPR) Legislation**

The Trust has a duty under the DPA18 to ensure that there is a valid legal basis to process personal and sensitive data. The legal basis for processing must be identified and documented before the processing begins. In many cases we may need consent; this must be explicit, informed and documented. We can't rely on Opt out, it must be Opt in.

DPA18 is applicable to all staff; this includes those working as contractors and providers of services.

For more information about your obligations under the DPA18 please see the 'information use framework policy', or contact the Information Governance Team rch-tr.infogov@nhs.net

2. The Guidance

2.1. Roles and Responsibilities

2.1.1. Medical Staff

2.1.1.1. Local anaesthetic blocks are usually delivered by medical staff competent in the technique of nerve blockade either as a single injection or catheter placement for continuous infusion.

2.1.1.2. It would be expected that they have the appropriate knowledge of full aseptic technique, intravenous cannulation and resuscitation skills as per RCHT guidelines, as well as knowledge of the relevant anatomy and the drugs being used, together with treatment of side effects.

2.1.2. Medical Prescribers

2.1.2.1. Should be able to prescribe clearly in line with guidelines stating:

- the total dosage in mg/24 hours
- the volume
- the concentration to be delivered together with
- administration times e.g. hourly or as a timed bolus dose.

2.1.2.2. Knowledge of safe total dose per 24 hours period is essential together with the necessary observations required and treatment of side effects.

2.1.2.3. Prescribing teams should review all prescriptions on a daily basis together with the pain scores and analgesic needs of the patient.

2.1.3. Nursing Staff

2.1.3.1. Nursing staff should be responsible for the timely delivery of analgesia as prescribed – this may include changing an infusion

2.1.3.2. Nursing staff are responsible for the ongoing monitoring of pain scores on rest and movement, motor power and sensation and signs of local anaesthetic toxicity as well as the vital monitoring signs of pulse and respiratory rates, oxygen saturation and BP.

2.1.3.3. Adverse reactions should be reported to the prescriber or doctor on the ward and further instruction on administration received.

2.1.3.4. Nurses should contact the Acute Pain Team for further advice if required bleep 3233 during the working week or the anaesthetist on call out of hours. (1st on call Bleep 2746, Senior Anaesthetic Trainee 3513)

2.1.4. Pharmacists

As part of the regular monitoring, pharmacists should ensure adherence to guidelines with regards to appropriateness, accuracy, safety and clarity of prescribing.

2.2. **Physiology of Nerve Conduction and Mechanism of Local Anaesthetics**

2.2.1. Pain occurs because of stimulation of nerve receptors and the ongoing transmission of this stimulation via nerve fibres to the spinal cord and brain where it is registered as an unpleasant physical and emotional experience and will cause both physiological and subjective responses in a patient.

2.2.2. A selection of receptors in the skin and subcutaneous tissue can detect pain whilst the onward transmission occurs via the smaller nerve fibres.

2.2.3. There are a variety of nerve fibres with different size and function to include movement, sensation of heat and cold, touch and position as well as the sympathetic or autonomic nervous system which controls parameters such as dilation and constriction of blood vessels.

Table 1 Classification of nerve Fibres

Class	Size	Function
A – alpha	largest	Motor, propioception (movement and position sense
A – beta	▼	Touch and pressure
A- gamma	▼	Muscle tone
B	▼	Preganglionic autonomic (Sympathetic nervous system)
C	smallest	Pain/ Temperature Post ganglionic (sympathetic nervous system)

2.2.4. The smaller fibres do not have a protective sheath of myelin and therefore are more easily blocked than the larger ones. The dose of local anaesthetic which is required to block a larger nerve fibre for motor power or sensation will inevitably block the smaller fibres as well. The onset and recovery of nerve block, for example, for movement is usually preceded by the smaller nerve fibres often demonstrated by a change in sensation and blood pressure before motor power returns.

2.2.5. Once stimulated the nerve undergoes a process known as depolarisation to transmit the impulse – this is caused by a variety of changes within the nerve involving sodium channels in the nerve membrane

which open and allow sodium into the cell. Local anaesthetics block the sodium channels and hence ongoing transmission of painful stimuli.

2.2.6. Because nerve fibres connect via synapses throughout the body to reach the spinal cord and brain, local anaesthetics can be applied:

- Peripherally – to block skin/subcutaneous receptors
- To a particular nerve or nerve plexus
- To the epidural or spinal nerves

2.2.7. This document offers guidance on the use of peripheral and nerve plexus local anaesthetic blocks requiring either a bolus dose or infusion technique via a catheter (excluding epidural or spinal use which is covered in a specific document).

2.2.8. Protocols for specific more common techniques will be included as appendices:

- Subcutaneous infusions
- Rectus Sheath/TAPS
- Nerve plexus blocks
- Sub Pectoral Catheters

2.3. **Definition**

2.3.1. A peripheral nerve is one which lies outside of the central neural canal (i.e. excludes epidural and spinal blockade).

2.3.2. A continuous peripheral nerve blockade is achieved by placing a fine catheter close to a nerve or nerve receptors and infusing a solution of local anaesthetic either at an hourly rate or as prescribed bolus doses. The presence of the catheter allows the block to continue for a number of days post-surgery, thereby improving patient analgesia, and lessening the need for more invasive blocks or strong opiates.

2.3.3. Infusion rates will depend on the area being blocked and the expected rate of absorption from that area (depending on vascularity).

2.3.4. More than one nerve may supply an area and therefore this technique usually requires adjunct analgesia to avoid discomfort. Where there is major surgery which requires strong opioids, the total dose and risk of opioid side effects will be less.

2.4. Clinical Indications

Table 2 – Indications for peripheral nerve blockade

• Patients expected to experience pain after surgery • As an alternative to epidural analgesia • As part of a multimodal approach to analgesia to decrease opiate requirements, avoid urinary catheterisation and potentiate more rapid mobilisation

2.5. Contraindications

Table 3 – Contraindications for peripheral nerve blockade

• Patient refusal • Previous adverse effects with local anaesthetics • Superficial infection at site of potential insertion • Inadequate knowledge to perform block • Inadequately experienced ward staff to care for patient post operatively • Bleeding disorders

2.6. Guidelines for Catheter Insertion

2.6.1. Catheters should only be placed adjacent to nerves by experienced practitioners with knowledge of the relevant anatomy and an acceptable method for nerve location - electrical stimulation or ultrasound.

2.6.2. The patient should have had prior discussion of the technique and the potential complications of nerve damage and local anaesthetics effects.

2.6.3. Catheter insertion and consequent injection of local anaesthetic should be performed in a suitable environment where an aseptic technique can be performed and where there are adequate resuscitation facilities.

2.6.4. The choice of the catheter rests with the operator – nerve stimulator/ catheter specific sets are available, but the use of epidural catheters is acceptable.

2.6.5. Aseptic technique should include hand washing, sterile gloves, face mask and an appropriate skin cleansing preparation and sterile drapes around the injection site.

2.6.6. A trained assistant should be present to help with the trolley preparation, location of nerve and consequent insertion.

2.6.7. Where chlorhexidine 0.5% is used drying time should be allowed prior to insertion of any needle or catheter (1-2 minutes).

2.6.8. Insertion of catheters may have less associated risks if performed in the awake patient although, many patients prefer to be asleep for the procedure. They should be made aware of the potentially slightly increased risk of detection of neural damage.

2.6.9. The catheter should be inserted to a reasonable depth percutaneously prior to being secured to minimise movement – current use of the ‘lock it’ device and covered by a clear dressing allows visibility of insertion site

2.6.10. Where long term use is required or placement is in a mobile area tunnelling the catheter superficially may be considered.

2.6.11. Operators should be aware of local infection guidelines (including the use of antibiotics in special circumstances)

2.6.12. Operators should be aware of potential hazards in respect of insertion and removal in patients on anticoagulants or with impaired clotting.

2.6.13. Operators should be aware of the monitoring guidelines and be confident that the ward has adequate staff prior to the commencement of the procedure.

2.7. Prescribing Guidelines

2.7.1. Prior to surgery and the initiation of the infusion the operator will consider the suitability of the patient for specific infusions based on:

- Age and physiology
- Risk versus benefit
- Effectiveness of analgesia with respect to type of surgery
- Specific contraindications

2.7.2. All patients must have iv access maintained for the duration of the infusion and the infusion device and catheter must be clearly labelled 'Local Infusion' and the site to which it is attached.

2.7.3. Infusions should be prepared in a sterile environment or pre prepared where possible.

2.7.4. There are limitations on the drugs and concentrations which should be infused to ensure decreased risk of local anaesthetic toxicity.

2.7.5. All drug infusions should take account of patient weight and the recommended safe dose in mg/Kg as per BNF.

2.7.6. When prescribing the local anaesthetic drug the following information should be provided:

- Name of drug
- Site of catheter where drug is to be infused
- Concentration of solution being infused in % and mg/ml
- Hourly rate or frequency of bolus of required
- Maximum dose not to be exceeded over a 24 hour period – in ml and total no of mg

2.7.7. Currently at RCHT there is 0.125% (i.e. 1.25 mg per ml) Levobupivacaine, and 0.167% (i.e. 1.67 mg per ml) Bupivacaine available for local anaesthetic infusions via McKinley pumps.

2.7.8. Sterile 10 ml ampoules of Levobupivacaine are available in concentrations of 0.25% and 0.5% (i.e. 2.5 and 5 mg /ml respectively).

2.7.9. The upper recommended dose of bupivacaine as an initial loading dose is 2 mg/kg (lean body mass). Caution is advised dosing per kg actual body weight in morbid obesity – a pragmatic ceiling loading dose of 180mg is probably sensible in all but the most muscular of patients.

2.7.10. Maintenance doses as hourly rates of infusion should not normally exceed 0.5mg/kg or 2mg/kg at 4-6 hourly top ups.

2.7.11. BNF recommend a total dose of levobupivacaine per 24 hours period is 400mg.

2.7.12. This equates to:

80 ml/24 hours of 0.5 %	maximum rate	3ml/hr
160 ml/24 hours of 0.25%	maximum rate	6ml/hr
240ml/24 hours of 0.167%	maximum rate	10ml/hr
320ml/24 hours of 0.125%	maximum rate	13.3ml/hr
400ml/24 hours of 0.1%	maximum rate	16ml/hr

2.7.13. Dilute solutions are found to be effective for analgesia and concentrations over 0.25% are not usually necessary.

2.7.14. Very large volumes could cause swelling and catheter displacement and leakage in more superficially placed catheters.

2.7.15. Infusion rates should rarely be over 5 ml per hour. If a larger volume is required the concentration should be decreased accordingly. This may be applicable for fascial plane catheters such as Erector Spinae Plane, Fascia Iliaca, and Serratus Anterior Plane.

2.7.16. For specific operations or conditions, there may be bilateral catheters inserted e.g. rectus sheath blocks for a laparotomy; bilateral mastectomies or hernias, when care should be taken to ensure that the sum of each catheter infusate does not exceed the total hourly recommended amount.

2.7.17. A range of rate of infusion should be prescribed together with the necessary supportive therapy such as oxygen according to the Trust guidelines and potential fluid bolus should hypotension occur.

2.7.18. IV, IM or oral opioids may be simultaneously administered without additional risks in line with RCHT policies for opiate administration.

2.7.19. The pain scores should be 0 or 1 on movement and 0 at rest.

2.8. Local Anaesthetic Toxicity

2.8.1. Local anaesthetics, if prescribed correctly, will rarely cause toxic effects however if there is direct infusion into a vein or the solution is absorbed rapidly or a patient is unduly sensitive then the signs and symptoms of toxicity may occur.

2.8.2. Signs are classified as per NEWS chart with relevant treatment guide.

2.8.3. All staff working with local anaesthetic infusions should be aware of the signs and treatments of LA toxicity. If not acted upon in the early stages then respiratory and cardiac arrest can occur which is very difficult to reverse because the ‘acidotic’ arrest state causes more of the drug to enter the cells and

worsen the situation.

2.8.4. Whilst treating the signs and symptoms symptomatically there are also directions for Intralipid Infusion treatment if the condition deteriorates.

2.8.5. All sites where local anaesthetics are used should have an Intralipid Rescue Pack and all staff involved in the care of local anaesthetic infusions should have knowledge of the location and use of the pack.

2.8.6. The infusion rate should be regularly checked and compared with the prescription to ensure correct rate is running and the site of infusion checked for leakage.

Table 4. Signs and symptoms of Local anaesthetic Toxicity (as shown on the NEWS chart)

score	signs	action
0	normal	observe
1	Lightheadedness, lip tingling Tinnitus or metallic taste in mouth	Stop LA infusion, Attach ECG monitor Maintain oxygenation and BP If symptoms deteriorate call for help
2	Visual disturbance Muscle twitching, convulsions	Stop LA infusion, Attach ECG monitor Maintain oxygenation and BP Call for help, give fluids for hypotension Treat convulsions with diazepam
3	Cardiac arrhythmias, hypotension Respiratory and cardiac arrest	As above and treat cardiac arrest with chest compressions and advanced life support. Treat toxicity with Intralipid protocol

2.8.7. Oxygen should be given immediately and supportive treatment commenced with fluid.

2.8.8. Call for medical help and if severe the intralipid protocol should be commenced.

Table 5. Intralipid Rescue

2.8.9. Treatment of cardiac arrest with intralipid 20% emulsion: (approximate doses are given in red for a 70-kg patient)

- Give an intravenous bolus injection of Intralipid® 20% 1.5 ml/kg over 1 min
  - Give a bolus of 100 ml
- Continue CPR
- Start an intravenous infusion of Intralipid® 20% at 15mg/kg/hr
  - Give at a rate of 1000mls/hr
- Repeat the bolus injection twice at 5 min intervals if an adequate circulation has not been restored
  - Give two further boluses of 100 ml at 5 min intervals
- After another 5 min, increase the rate to 30mg/kg/hr if an adequate circulation has not been restored
  - Give at a rate of 2000mls/hr

- Continue infusion until a stable and adequate circulation has been restored
    - Total dose 12ml/Kg – 840ml. (Ref: AAGBI 2010)

Table 6. Cardiac Arrest Treatment with Intralipid - Dose per Kg

Intralipid 20%	1.5ml/Kg over 1 minute
Immediate follow up infusion	15ml/kg/min
Continue chest compression to circulate lipid	
Repeat bolus every 3-5 mins	total dose: 3ml/kg
Continue infusion until haemodynamic stability restored	Increase rate to 30ml/kg if hypotension or unstable
Maximum total daily dose	**12ml/kg**

2.9. Local Anaesthetic infusion Devices

Local anaesthetic can be delivered via a catheter using a variety of devices:

- Specific Infusion Pump with a variety of protocols (for indefinite time period)
- Disposable elastomeric pump with pre-determined infusion rate (for up to 48 hours)
- Bolus dose administration by medical or nursing staff.

All devices and catheters are clearly labelled and the devices are kept exclusively for local anaesthetic use. They must be clearly different from devices used for epidural and intravenous infusion.

2.9.1. McKinley Infusion Pump

This is a specific pump to deliver the agreed preset protocols of LA infusions over a variety of mixes which will include patient controlled programme for additional bolus doses if required.

The standard infusion consists of 0.167% bupivacaine 500 ml which is available premixed from pharmacy.

0.167% bupivacaine can be delivered up to 10 ml per hour as a continuous infusion, alternatively as a 5-6 ml/hr and a 3-4ml bolus if required hourly.

More dilute infusions may be required and these could be requested from pharmacy to ensure that they are mixed in a sterile environment ideally only premixed infusions should be used.

In an emergency when pre prepared solution is not available, bupivacaine can be withdrawn and local saline 0.9% introduced to decrease the concentration. All calculations should be checked by 2 qualified practitioners to ensure that there are no drug errors and calculations entered in the notes and clearly noted on the prescription chart.

Withdrawal of drug and consequent dilution must be performed using aseptic technique as per RCHT guidelines for drawing up injections:

An example using 0.167% bupivacaine in a 500 ml bag.
For a 0.1% solution withdraw 200 ml of bupivacaine and replace with 200 ml saline.

Initial mg in 500 ml of 0.167% bupivacaine = 835 mg (1.67mg/ml)
Required mg to produce 0.1% bupivacaine = 500 mg (1mg/ml)
Amount mg to be withdrawn to leave 500 mg = 835 - 500 = 335 mg
Amount of solution containing 335 mg = 335/1.675 = 200 ml
Withdraw 200 ml of 0.167% bupivacaine and replace with 200 ml 0.9% saline to produce 0.1% bupivacaine in a 500 ml bag

The use of the grey Mckinley pumps should be restricted to one sided analgesia and should only be used for dilute infusions of local anaesthetic.

There will be 4 protocols for infusion:

0.25% bupivacaine - special order from pharmacy for infusion rates 0 – 5 ml per hour
0.167% bupivacaine – 500 ml bag, available from pharmacy, for infusion rates of 0 – 10m/hr
0.125% bupivacaine – 100 ml bag, available from pharmacy, for infusion rates of 0 – 13.3ml/hr
0.1% bupivacaine – 250 ml (prepared as above) for infusion rates of 0 – 15 ml /hr

The weight of the patient should be taken into consideration before prescribing the rate

The infusion should be clearly labelled ‘Local Anaesthetic’ as should the catheter delivering the infusate.

The Mckinley pump will have a facility for an additional bolus which will be security coded enabling only anaesthetists, recovery nurses and pain nurses to access in a similar way to epidural pumps.

All bolus should be given under close monitoring conditions.

It is anticipated that these pumps will be used for:

- Infusions into specific nerves or plexi such as the femoral nerve or brachial plexus
- Infusions into fascial planes such as Serratus Anterior or Erector Spinae
- Infusions into specific areas such as sub pectoral post mastectomy
- Infusions subcutaneously into wounds

It would be expected that staff familiar in the use of the McKinley epidural pump would be able to operate the local infusion device, but, training by the pain nurses would be given to ensure knowledge is up to date

It is expected that all staff familiar with the care of local anaesthetic infusions via the epidural pump will be sufficiently trained to care for patients receiving a more peripheral local anaesthetic infusion.

2.9.2. The Pain Buster Infusion Device

This consists of an elastomeric ball and delivery tubing, which delivers a predetermined rate of infusate, depending on the size and initial volume of the balloon. The current sizes used are 100 and 250 ml delivering respectively infusion rates of 2ml/hour and 5ml/hour over a 48 hour period.

It is connected to the catheter which has been placed usually by the surgeon at the time of operation and tunnelled through the skin with a completely aseptic technique and fixed using a 'lock-it' device and clear dressing.

The balloon is filled according to the manufacturers' guidelines using an aseptic technique by the scrub nurse at the time of surgery. Elastomeric devices must only be filled by those Health Care Professionals who have received appropriate training.

The local anaesthetic mix should be checked by the anaesthetist and the scrub nurse prior to insertion and the ampoules or solution form a larger bag checked by the surgeon prior to the connection of the balloon to the catheter.

It is usual to administer small bolus dose of the same solution to prime the line.

Where the smaller balloon volume is used a higher concentration of local anaesthetic may be used e.g. 0.5% levobupivacaine at 2ml/hour although 0.375% (an equal mix of 0.5 and 0.25%) or 0.25% may be sufficient.

The pain buster device may be used where patient mobility is required or in the absence of local anaesthetic specific pump availability.

Examples where the use is indicated include:

- Joint surgery – where no drain is present
- Relatively Superficial body surface surgery e.g. breast, hernias
- Bilateral Rectus Sheath Blocks
- Nerve plexus infusions

N.B. The use of a specific infusion device such as this ensures that there is no confusion with other mechanical infusion pumps being used on the patient and serves as an additional safety measure for this technique.

The device must be clearly labelled as should the catheter leading to the balloon

Once the catheter is secured to the skin, the balloon is attached to the dressing by the clip.

The local anaesthetic should be clearly prescribed and the addition, if any, of

other drugs such as anti-inflammatory drugs into the mix clarified.

This is a single use only device and it is not expected that the device will be refilled and reused after 48 hours once it is deflated.

Table 7. Suggested Drug Regimes using Elastomeric devices (eg Pain Buster)

Surgical procedure/site	Drug/concentration	Infusion Rate
Joint surgery (where no drain)	Levobupivacaine 0.25% or 0.5% Potential addition of ketorolac 60mg if indicated	2ml/hour
Breast surgery/superficial body surgery *if more than one pain buster is to be used then 0.25% should be used to minimise the total dose in the 100ml balloons	Levobupivacaine 0.25% or 0.5% Levobupivacaine 0.25% for 2 pain busters	2ml/hr 2ml each /hr
Breast Surgery/superficial body surgery	Levobupivacaine 0.25% or 0.167% (from infusate bag) or 0.125% if more than one of larger volume pain buster used)	2ml or 5ml/hour (larger pain buster)
Plexus blocks	Levobupivacaine 0.25% or 0.167%	2ml/hr or 5ml/hr

The anaesthetist should be consulted at the time of insertion as to the appropriateness of the dose and all precautions should be taken to ensure the patient is monitored post operatively for signs of local anaesthesia toxicity.

If there is leakage from catheter site or balloon seek advice from the pain team.

2.10. Observations and Monitoring

All patients receiving an infusion of local anaesthetic should be monitored for sensation, motor power and signs of toxicity and the observations recorded with other vital signs on the NEWS chart.

2.10.1. General Observations

Nursing staff must be aware of the potential side effects and complications of local anaesthesia and their management. It is assumed that nurses with training for care of epidurals and knowledge of the side effects and potential signs of toxicity will be able to care for patients with local infusions.

Timely observations are necessary for the safe delivery of this method of analgesia.

All observations will be recorded on the RCHT NEWS chart which combines the regular observations of vital functions (RR, BP, HR, oxygen saturation and urine

output) with those more specific parameters and scores necessary for safe and effective local analgesia delivery:

Pain at rest and movement, sedation, sensation, power and signs of LA toxicity.

Scoring criteria are at the bottom of the NEWS observation chart and those scores within red area would indicate that there are potential side effects occurring and the algorithms on the reverse of the form should be referred to.

Observations should be more frequent in the first 6 hours or if the rate of infusion is changed – frequency of observations required are on the reverse of the NEWS chart

The rate of infusion should be recorded with every observation.

General observations when local anaesthetic technique is not accompanied by strong opiates

Table 8 – Necessary frequency of observations

Monitoring parameter	1st hour	Following 2 hours	thereafter
Respiratory Rate	Every 15 mins	hrly	2Hrly for 24 hrs
Blood Pressure	Every 15 mins		2Hrly for 24 hrs
Heart Rate/sats	Every 15 mins		2Hrly for 24 hrs
Pain score at rest	Every 15 mins		2Hrly for 24 hrs
Pain score on movement	Every 15 mins		2Hrly for 24 hrs
Sedation	Every 15 mins		2Hrly for 24 hrs
Motor power	once	2 hrly	4Hrly for 24 hrs
sensation	With pain scores		
LA toxicity	hrly	2 hrly	4 Hrly

*If patient is stable and infusion rate remains unchanged monitor 4 hrly after this, if patient is in pain, the rate of infusion changes or the patient is in labile condition the continue with observations more frequently.

2.10.2. Respiratory Rate

Regular monitoring of the respiratory rate should accompany the monitoring of the use of local anaesthetic particularly if it is being used in conjunction with strong opiates e.g. with a PCA as a multimodal approach when observations should be as for those patients with a PCA and epidural infusions.

Table 9. Necessary frequency of observations with LA infusion and parenteral opiates.

Monitoring parameter	1st hour	Following 2 hours	thereafter
Respiratory Rate	Every 15 mins	Every 30 mins	Hrly for 24 hrs
Blood Pressure	Every 15 mins	Every 30 mins	Hrly for 12 hrs, then 2hrly if stabe
Heart Rate/sats	Every 15 mins	Every 30 mins	Hrly for 12 hrs then 2hrly if stabe
Pain score at rest	Every 15 mins	Every 30 mins	Hrly for 24 hrs
Pain score on movement	Every 15 mins	Every 30 mins	Hrly for 24 hrs
Sedation	Every 15 mins	Every 30 mins	Hrly for 24 hrs
Motor power	once	*Every hr	4-6 hrly for 24 hrs
sensation	With pain scores		
LA toxicity	hrly	2 hrly	4-6 hrly

If respiratory rate falls below 8 when local analgesia is used in conjuction with a PCA, give oxygen and follow algorithm on NEWS chart.

The decrease in respiratory rate is more likely to be due to the opiates if no other signs of toxicity are detected and the PCA should be temporarily stopped and observations increased.

Table 10. Recommended action for decreased respiratory rate with LA infusion and PCA.

Resp Rate	Action to take
≤ 10	Increase frequency of Observations
≤ 8	Stop PCA infusion, give oxygen, observe and consider naloxone
≤ 5	As above and give naloxone immediately and stop LA infusions

Table 11 – Naloxone mixture

400microgms of Naloxone should be diluted in 3ml of o.9%NaCl Give in 1 ml increments every 5 mins Give until resp rate increases to 8 and sedation score greater than 2 Seek medical advice if resp rate remains low

2.10.3. Management of hypotension

Sympathetic blockade by local anaesthetic can sometimes occur, particularly when catheter is in close proximity to sympathetic nerves or is causing vasodilation.

Other causes for decrease in blood pressure should be excluded before assuming they are due to the local infusion.

Systolic blood pressure should be greater than 90mmHg systolic unless

otherwise stated. Hypertensive patients may require a higher baseline to maintain organ function – particularly urine output. It would be expected that the anaesthetist involved in the catheter insertion would state acceptable parameters for systolic pressure (level and time period) after which intervention would be required in terms of fluid bolus as per chart.

Table12. Recommended Action for hypotension

Consciousness/saturation	action
Alert Normal saturation	Lie patient flat Give oxygen 8 litre/min Give plasma expander – 250ml of crystalloid Do not put patient head down only if LA infusion above waist.
Drowsy Saturation less than 92%	Lie patient flat Do not put head down if LA infusion above waist Give oxygen Give plasma expander – up to 500ml Call for medical help Give ephedrine 3-9mg iv

Following the adminstration of a bolus dose of fluid the blood pressure must be observed at 5 min intervals until increasing or for 30 mins after stable.

2.10.4. Heart Rate

Monitor heart rate as per requirements along with BP

- If there is a bradycardia with normal BP check level at which patient is numb
- Call for medical help if rate 10-20 below normal base rate
- Administer either ephedrine (to increase pulse and BP) 3- 6 mg bolus or
- Give Atropine 600microgm for persistent bradycardia
- If heart rate falls below 40/min or patient is compromised put out urgent response bleep or crash call.

2.10.5. Pain Score and sensation

Pain scores and sensation should be recorded and documented regularly with every observation when patient is awake – both at rest and on movement. If patient is asleep then this may be recorded but not for more than 3 successive observations.

If pain score is higher than 1 adjust rate of infusion to maximum, ensure multimodal analgesia is given and if pain continues contact medical staff for advice

N.B. Strong opiates may be given with LA infusions

2.10.6. Sedation

If Sedation score is greater than 2 then medical help should be sought.

2.10.7. Nausea Score

Patients should be regularly checked for feelings of nausea and vomiting and all should have appropriate anti emetics prescribed as per RCHT guidelines.

2.11. Catheter Management

2.11.1. Catheter Site Care

Catheters are not sutured in place and therefore may easily fall out.

Dressing changes to the catheter exit site should only be carried out by the Acute Pain team or an anaesthetist when it is necessary.

The aims are to ensure sterility and security of the system and prevent entry of bacteria into the potential space and allow visibility of the catheter.

If changing the dressing all sterile precautions should be taken in accordance with RCHT policy.

The catheter is fixed with a 'lockit clip'; removal of this clip would necessitate disconnection of the catheter and its threading through the lock it port – this should only be undertaken by trained acute pain nurses and anaesthetists as there is a high risk of catheter dislodgement.

If the old dressing needs to be removed the 'lock it' should be retained and covered with a clear adherent dressing.

The dressing should be smooth and there should be no kinks in the catheter.

It is the nurses' responsibility to check the catheter site regularly (eg twice daily) to check that the dressing is secure and remains covering the catheter.

If the dressing is insecure or there is a leak of fluid, it should be secured with additional tape and pad.

2.11.2. Catheter Line and Filter

Nursing management of the line and filter should aim to prevent disconnection of the filter from the catheter and maintain the integrity of the system as well as promoting comfort at the filter site.

Effective management of the catheter line is essential in preventing any pulling of the actual catheter and its potential dislodgement or disconnection.

If the catheter becomes disconnected or dislodged it should not usually be replaced and will usually require removal which can be undertaken by any competent health professional trained in aseptic technique. (see removal) If

there is reluctance to remove the catheter and further advice is needed:

- Wrap the filter and catheter in gauze
- Stop the infusion
- Contact the acute pain team or the anaesthetist on call.

2.11.3. Removal of Catheters

Local anaesthetic infusion catheters can be removed by registered nurses who have been trained and assessed as competent in aseptic technique.

The catheter should be removed taking into consideration the timing of any prophylactic anticoagulation (see section 2.12). Catheter removal early in the day will ensure sufficient time to monitor patient during working hours for any signs of haematoma at the site of entry and exit.

Catheter removal should not routinely occur unless the patient's clotting is normal or within an accepted range - INR≤1.5 and a platelet count of ≥ 80/nl.

It would be expected that if the bleeding history is negative that routine coagulation screening prior to removal would not be required. (FBC prior to surgery to confirm platelet count would be acceptable)

Catheters have not been fixed within the space and once the 'lock-it' is removed the catheter should be freed with minimal pressure.

If the catheter feels as if there is some resistance do not force and contact the acute pain team or the anaesthetist on call for advice.

Check the catheter after removal to ensure the entire length has been removed and that a rounded tip is present.

Procedure for Removal of Catheter

- Wash hands as per RCHT hand hygiene policy
- Gather equipment – a small dressing and gloves
- Explain the procedure to the patient
- Position the patient comfortably where access to the catheter is easiest
- Remove the catheter slowly
- Observe the site for leakage, fluid or signs of infection.
- Check catheter to ensure tip is complete – if not contact Acute Pain Team for advice.
- Clean with NaCl 0.9% and apply adhesive dressing over site

- Check for any signs of infection such as pus or redness at site of entry – if there are any signs save the catheter tip for Culture and sensitivity and swab the insertion site.

2.12. Anticoagulants and Local Infusion Catheters

Consideration must be paid to the patients' anticoagulation status prior to catheter removal and should be in line with RCHT anticoagulation/DVT prophylaxis policy.

The Association of Anaesthetists of Great Britain & Ireland and Regional Anaesthesia UK have produced a very useful consensus guideline on this topic (https://www.aagbi.org/sites/default/files/rapac_2013_web.pdf), on which the below guidance is based. It ranks catheter sites in order of risk, as well as giving specific timings for all the currently available anticoagulants.

Risk of thrombosis due to withheld anticoagulants versus risk of haematoma at catheter insertion/withdrawal site should be considered. For low risk sites (eg wound-site infusions and fascial plane blocks) in high risk patients (eg mechanical heart valve, recent PE), continuing treatment doses and removing catheter in a relatively low risk period (eg 18-20 hours after last dose and 4-6 hours prior to next due dose) may represent the overall lowest risk strategy. Involvement of senior decision makers and documentation of rationale is advised in such cases.

It is unlikely that removal of catheter will cause bleeding and if this is the case then local pressure should be applied for 5 minutes or until it has decreased.

Specific advice for common anticoagulants follows.

2.12.1. IV Heparin

There may be increased incidence of haematoma if patient is receiving iv heparin particularly if the therapeutic ratio is ≥2 – 2.5

Catheters placed prior to heparin administration should not present a problem

If the patient remains on heparin and it is considered essential to place a catheter for LA infusion then Heparin should be stopped 2-4 hours pre procedure (insertion and removal) and checking an urgent APTT ratio 2 hours prior to procedure.

If required the IV heparin infusion can be restarted at least 1 hour after catheter insertion.

Patients receiving peri operative heparinsation, such as those undergoing vascular surgery, should have the insertion of catheter prior to heparinisation, and not have the catheter removed for at least 12hours post operatively after a coagulation check is normal.

2.12.2. Dalteparin

Careful consideration as to the need for indwelling LA infusions should occur prior to this method of analgesia being selected when the following precautions

are suggested should be taken:

Prophylactic dose (eg 5000u s/c)
- Wait 6 hours after catheter insertion / removal before administering;
- Wait 12 hours after administering before inserting/removing catheter.
- This gives a 6 hour window for removal if administration times are to be unchanged (eg for 22:00 dosing, removal window 10:00-16:00).

Treatment dose (eg 100units/kg sc)
- Wait 6 hours after catheter insertion / removal before administering.
- Wait 24 hours after administering before catheter insertion/removal.
- Following both the above timings will necessitate a ≥6 hour extra wait between doses (total ≥30 hour interval between two doses).

If the patient has received a larger dose then avoid regional techniques.

2.12.3. Warfarin

Ideally the INR should be < 1.5 before catheter is inserted or removed, but consider risk/benefit of stopping anticoagulant therapy. Involvement of senior decision makers and documentation of rationale is advised.

If a local infusion catheter inadvertently falls/is removed whilst a patient is anti coagulated there may be an increased risk of haematoma and a pressure dressing to the area should be applied

2.12.4 Rivaroxaban

Prophylactic dose (eg 2.5 or 10 mg once daily)
- Wait 6 hours after catheter insertion / removal before administering;
- Wait 18 hours after administering before inserting/removing catheter.
- (eg for 22:00 dosing, remove at 16:00)

Treatment dose (eg 15 or 20 mg once daily)
- Wait 6 hours after catheter insertion / removal before administering;
- Wait 48 hours after administering before inserting/removing catheter.

2.13. Discontinuing local anaesthetic infusion.

Removal of catheter usually occurs after 72 hours. The risk of infection increases after with time.

This risk may increase in immunocompromised and diabetic patients.

There may be occasions when there needs to be more prolonged analgesia. The catheter could stay in situ provided there is no leakage or sign of inflammation.

Anticipated long term LA analgesia should have a tunneled catheter inserted and advice of the acute pain team or pain consultants may be needed.

Factors to Consider Prior to Discontinuation

2.13.1. Severity of pain expected.

- Patient's ability to tolerate other routes of analgesia.
- It would be anticipated that this has been part of a multimodal analgesic approach therefore other analgesia has probably been administered, however if this is not the case, then analgesia must be prescribed before the infusion is stopped. Analgesia should be prescribed as regular as well as prn.
- Regular pain assessment should continue to ensure patient's pain control is well managed

2.13.2. Patient preference.

- Patients or carers wishes should be taken into consideration. If a patient requests they no longer wish to receive local anaesthetic infusions then alternative options should be discussed ensuring the patient is fully informed prior to making a choice.

3. Monitoring compliance and effectiveness

Element to be monitored	Adherence to RCHT guidelines
Lead	Acute pain lead
Tool	Regular audits and regular surveillance will occur throughout the year and reported at the regular acute pain meetings and appropriate governance meetings
Frequency	Yearly audit as required by NPSA guidelines will be undertaken.
Reporting arrangements	The committee reviewing the cases will be the anaesthesia directorate. Cases will be discussed at audit meetings and the details will be recorded in the minutes.
Acting on recommendations and Lead(s)	See above
Change in practice and lessons to be shared	Required changes to practice will be identified and implemented within a month. A lead member of the team will be identified to take each change forward where appropriate. Lessons will be shared with all the relevant stakeholders

4. Equality and Diversity

4.1. This document complies with the Royal Cornwall Hospitals NHS Trust service Equality and Diversity statement which can be found in the 'Equality, Diversity & Human Rights Policy' or the Equality and Diversity website.

4.2. Equality Impact Assessment

The Initial Equality Impact Assessment Screening Form is at Appendix 2.

Appendix 1. Governance Information

Document Title	Continuous Local Anaesthetic Infusions for Post-Operative Pain Relief in Adults Clinical Guideline V3.0					
Date Issued/Approved:	July 2019					
Date Valid From:	August 2019					
Date Valid To:	August 2022					
Directorate / Department responsible (author/owner):	Anaesthesia and Theatre Directorate Acute Pain Team Current owner: Dr Nicholas Marshall					
Contact details:	01872 253392					
Brief summary of contents	This document outlines the potential and actual use of Local Anaesthetic with in RCHT and the precautions and care required.					
Suggested Keywords:	Pain buster, Nerve infusion, Nerve Block, Local Anaesthesia, Bupivicaine.					
Target Audience	RCHT	CFT	KCCG			
	✓					
Executive Director responsible for Policy:	Dr Rob Parry, Medical Director					
Date revised:	July 2019					
This document replaces (exact title of previous version):	Continuous Local Anaesthetic Infusions For Post-Operative Pain Relief V2.2					
Approval route (names of committees)/consultation:	Anaesthetic Department					
Care Group Manager confirming approval processes	Specialty Director: Dr Gary Matthews Divisional Manager: Miss Roberta Fuller					
Name and Post Title of additional signatories	Speciality leads of General Anaesthesia, critical care and pain					
Signature of Executive Director giving approval	{Original Copy Signed}					
Publication Location (refer to Policy on Policies – Approvals and Ratification):	Internet & Intranet	✓	Intranet Only			
Document Library Folder/Sub Folder	Clinical / Anaesthesia					
Links to key external standards	AAGBI Royal College of Anaesthetists ESRA British Pain Society					

Related Documents:	None
Training Need Identified?	No

Version Control Table

Date	Version No	Summary of Changes	Changes Made by *(Name and Job Title)*
07 Jan 12	V1.0	Initial Issue	Dr Anne Dingwall Consultant Anaesthetist
09 Feb 15	V2.0	Updated guideline. Addition of Monitoring Compliance table.	Dr Juan Graterol Consultant Anesthetist
09 Feb 15	V2.1	Governance information moved to an appendix. EIA updated. Governance information amended to align with format of Document Manager Upload	Dr Juan Graterol Consultant Anesthetist
09 Feb 15	V2.2	Updated governance information table to include KCCG.	Dr Juan Graterol Consultant Anesthetist
July 19	V3.0	Updated, reviewed and new format	Dr Nick Marshall Consultant Anaesthetist

All or part of this document can be released under the Freedom of Information Act 2000

This document is to be retained for 10 years from the date of expiry.

This document is only valid on the day of printing

Controlled Document

This document has been created following the Royal Cornwall Hospitals NHS Trust Policy on Document Production. It should not be altered in any way without the express permission of the author or their Line Manager.

Appendix 2. Initial Equality Impact Assessment Form

<table>
<tr><td colspan="6">Name of the strategy / policy /proposal / service function to be assessed

Continuous Local Anaesthetic Infusions for Post-Operative Pain Relief in Adults Clinical Guideline V3.0</td></tr>
<tr><td colspan="3">Directorate and service area:
Anaesthesia</td><td colspan="3">New or existing document:
Existing</td></tr>
<tr><td colspan="3">Name of individual completing assessment:
Dr Nick Marshall, Consultant Anaesthetist</td><td colspan="3">Telephone:
01872 253392</td></tr>
<tr><td>1. Policy Aim*

Who is the strategy / policy / proposal / service function aimed at?</td><td colspan="5">To provide guidelines for those caring for a patient with a local anaesthesia nerve infusion. Doctors and Nurses.</td></tr>
<tr><td>2. Policy Objectives*</td><td colspan="5">To provide information for the setup and safe use of a local anaesthesia nerve infusion in the ward environment.</td></tr>
<tr><td>3. Policy – intended Outcomes*</td><td colspan="5">Safe and appropriate use of local anaesthetic infusions on the ward.</td></tr>
<tr><td>4. *How will you measure the outcome?</td><td colspan="5">Monitoring through audit and case discussion at governance meetings.</td></tr>
<tr><td>5. Who is intended to benefit from the policy?</td><td colspan="5">Patients</td></tr>
<tr><td rowspan="3">6a Who did you consult with

b). Please identify the groups who have been consulted about this procedure.</td><td>Workforce</td><td>Patients</td><td>Local groups</td><td>External organisations</td><td>Other</td></tr>
<tr><td>X</td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="5">Please record specific names of groups

Anaesthetic Department</td></tr>
<tr><td>What was the outcome of the consultation?</td><td colspan="5">Agreed.</td></tr>
</table>

7. The Impact
Please complete the following table. **If you are unsure/don't know if there is a negative impact you need to repeat the consultation step**.

Are there concerns that the policy **could** have differential impact on:

Equality Strands:	Yes	No	Unsure	Rationale for Assessment / Existing Evidence
Age		**X**		
Sex (male, female, trans-gender / gender reassignment)		**X**		
Race / Ethnic communities /groups		**X**		
Disability - Learning disability, physical impairment, sensory impairment, mental health conditions and some long term health conditions.		**X**		
Religion / other beliefs		**X**		
Marriage and Civil partnership		**X**		
Pregnancy and maternity		**X**		
Sexual Orientation, Bisexual, Gay, heterosexual, Lesbian		**X**		

You will need to continue to a full Equality Impact Assessment if the following have been highlighted:

- You have ticked "Yes" in any column above and
- No consultation or evidence of there being consultation- this excludes any *policies* which have been identified as not requiring consultation**. or**
- Major this relates to service redesign or development

8. Please indicate if a full equality analysis is recommended.	**Yes**		**No**	**X**

9. If you are **not** recommending a Full Impact assessment please explain why.

Not indicated

Date of completion and submission	July 19	Members approving screening assessment	Policy Review Group (PRG) **APPROVED**

This EIA will not be uploaded to the Trust website without the approval of the Policy Review Group.

A summary of the results will be published on the Trust's web site.

Appendix 3. Identification and Management of Local Anaesthetic Toxicity

Local and regional nerve blocks allow patients to be pain free following surgery and mean that less strong painkillers are necessary.

Local anaesthetic lasts for a limited time period, therefore to ensure that the patient remains comfortable further local anaesthetic should be given either via a continuous infusion or regular top up bolus doses.

Very rarely there may be rapid absorption into the blood stream when signs of toxicity may occur.

This is very rare but it is very important that the signs are recognised

IT IS IMPORTANT THAT ALL PATIENTS RECEIVING A LOCAL ANAESTHETIC INFUSION OR BOLUS ARE REGULARLY MONITORED FOR EARLY DETECTION OF TOXICITY

ESSENTIAL MONITORING (INFUSIONS OR POST BOLUS DOSE)

Hourly BP and pulse rate and saturation levels and respiratory rate
Question patient for signs of light headedness and numbness of tongue or double vision
Look for restlessness or muscle twitching or change in level of consciousness

Signs of toxicity

Mild (1)

restlessness/confusion
light-headedness
numbness of tongue and lips (lip smacking)
tinnitus
double vision, blurring of eyesight

moderate(2)

heaviness of limbs
muscular twitching
generalised convulsions

severe(3)
Cardiac arrythmias (particularly bupivicaine)
Hypotension
Respiratory arrest
Cardiac arrest

Identify symptoms as mild: group 1

- Stop local anaesthetic infusions and observe
- Attach ecg and monitors
- Maintain oxygenation and BP
- Consult with pain team or anaesthetist on call
- If symptoms deteriorate phone for help if urgent - cardiac arrest call

Lipid Rescue
For LA induced cardiac arrest
CPR + intralipid 20%
Intralipid 20% 1.5ml/kg over 1 minute
Immediate follow up infusion – 15ml/kg/min
Continue chest compression to circulate lipid
Repeat bolus every 3-5 mins (total dose:3ml/kg)
Continue infusion until haemodynamic stability restored
Increase rate to 30ml/kg if hypotension or unstable
Maximun total daily dose: 12ml/Kg

If symptoms are group 2 or 3

- Stop infusion of local anaesthetic, attach monitors
- Maintain oxygenation and cardiac output
- Phone for help immediately – cardiac/urgent bleep
- Treat hypotension with fluids
- Treat convulsions with diazepam
- Treat cardiac arrest with ECM and intralipid
- Treat toxicity with local intralipid protocol - rescue box available from all theatre recovery areas