

NHS Greater Glasgow & Clyde

# GRI Chest Trauma & Rib Fracture Pathway

September 2022 (FINAL)

**GRI Rib Fracture Group**  
**[Date]**

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**GRI CHEST TRAUMA/ RIB FRACTURE – ASSESSMENT & ANALGESIA**

Radiologically Confirmed Rib Fractures – either CXR or CT

**ASSESS RISK OF RESPIRATORY DETERIORATION**

**HIGH RISK INJURY FEATURES**

- MORE THAN 4 FRACTURED RIBS
- BILATERAL FRACTURES
- FLAIL SEGMENT
- ESCALATING OPIOID REQUIREMENT
- ESCALATING OXYGEN REQUIREMENT

**HIGH RISK COMORBIDITY FEATURES**

- SMOKER
- OBESE (BMI >40)
- CHRONIC RESPIRATORY DISEASE
- AGE >65
- OBSTRUCTIVE SLEEP APNOEA
- ANTICOAGULATION

**TWO OR MORE HIGH RISK FEATURES PRESENT?**

NO

YES

**LOW RISK BUNDLE**

**HIGH RISK BUNDLE**

1. Humidified oxygen
2. Regular paracetamol 1g every 6 hours if weight >50kg; reduce dose if <50kg body weight (15mg/kg unless high risk of paracetamol toxicity)
3. Regular ibuprofen 400mg tds (unless contraindicated; consider PPI)
4. Consider PO 10mg oramorph PRN 1-hourly (reduce dose in elderly, frail, renal impairment e.g. 2.5mg 4hourly)
5. Regular laxatives
6. PRN anti-emetics
7. Consider PCA opioid
8. Consider Lidocaine Plaster
9. Consider incentive spirometry
10. **Monitor for signs of deterioration**

**As per Low Risk Bundle PLUS:**

1. Ensure coagulation screen + FBC checked
2. Ensure regular strong opioid analgesia prescribed (eg morphine MR or QDS oramorph) or alternatively consider the use of opioid PCA
3. Consider referral to anaesthesia for potential regional anaesthetic technique\* (e.g. ESP block)
4. Consider referral for operative rib fixation to QEUH RFF service (see reverse for referral criteria)
5. Low threshold to consider critical care input
6. Consider use of ketamine/clonidine in selected patients (critical care environment & anaesthetic input mandatory)

**\*Regional anaesthesia/ blocks – these patients MUST be formally referred and accepted by general surgery AND have a general surgery/s-HDU/ICU bed confirmed BEFORE referring to anaesthesia.**

**Treatment Targets:**

- Improving/stable SpO2/PaO2
- Reducing/stable FiO2
- Improved analgesia
- Effective cough
- Able to complete incentive spirometry

**Signs of Deterioration → Refer to ICU:**

- Treatment targets not met
- Escalating FiO2
- Decreasing SpO2/PaO2
- Fluctuating GCS
- Haemodynamic instability
- Deteriorating pain scores

## GRI Rib Fracture Pathway

<b><u>Contraindications to Regional Technique (ESP/SA Block)</u></b>	
<p style="text-align: center;"><u>ABSOLUTE</u></p> <ul style="list-style-type: none"> <li>- Patient refusal</li> <li>- Infection over insertion site</li> <li>- Local anaesthetic allergy</li> </ul>	<p style="text-align: center;"><u>RELATIVE</u></p> <ul style="list-style-type: none"> <li>- Systemic infection</li> <li>- Coagulopathy</li> <li>- Prophylactic LMWH within 12hrs</li> <li>- Therapeutic LMWH within 24hrs</li> <li>- Difficult positioning</li> <li>- Transverse process fracture at level of insertion</li> </ul>
<b><u>Contraindications to Thoracic Epidural</u></b>	
<p style="text-align: center;"><u>ABSOLUTE</u></p> <ul style="list-style-type: none"> <li>- Patient refusal</li> <li>- Infection over insertion site</li> <li>- Local anaesthetic allergy</li> <li>- Spinal cord injury</li> <li>- Raised ICP</li> <li>- Platelets &lt;80</li> <li>- INR &gt;1.5</li> </ul>	<p style="text-align: center;"><u>RELATIVE</u></p> <ul style="list-style-type: none"> <li>- Systemic infection</li> <li>- Hypovolaemia</li> <li>- Anatomical abnormalities</li> <li>- Platelets 80-100</li> <li>- Clopidogrel within 7 days</li> <li>- Prophylactic LMWH within 12hrs</li> <li>- Therapeutic LMWH within 24hrs</li> </ul>

<b><u>Indications for Rib Fracture Fixation – please contact T&amp;O team to discuss</u></b>		
<b><u>Referrals to QEUH RFF Service – made via GRI Orthopaedic Trauma Coordinator (07:30-19:00) or GRI Orthopaedic Registrar (OOH)*</u></b>		
<p style="text-align: center;"><u>INJURY-RELATED</u></p> <ul style="list-style-type: none"> <li>- Physiological flail</li> <li>- Significant clinical/radiological chest wall deformity</li> <li>- Bilateral chest wall injury</li> <li>- ≥8 rib fractures, with or without flail</li> </ul>	<p style="text-align: center;"><u>PHYSIOLOGY-RELATED</u></p> <ul style="list-style-type: none"> <li>- FiO<sub>2</sub> ≥ 0.4 required to maintain SpO<sub>2</sub> ≥ 95%</li> <li>- Increasing O<sub>2</sub> requirements with a background of respiratory disease</li> <li>- Incentive spirometry ≤ 1500ml</li> <li>- Failed extubation from mechanical ventilation</li> </ul>	<p style="text-align: center;"><u>PAIN-RELATED</u></p> <ul style="list-style-type: none"> <li>- Uncontrolled chest wall pain localising to site of rib fractures <b>inhibiting effective deep breathing or cough</b>, despite optimal oral and, when possible, regional analgesia</li> </ul>

**\*email and call QEUH MTC Coordinator – see later section on referral for RFF (page 15)**

<b><u>Useful Contact Numbers</u></b>
<p>On-Call Anaesthetists:</p> <ul style="list-style-type: none"> <li>- Consultant - Senior On: page #13259 – referrals for regional technique Mon-Fri 09:00-17:00</li> <li>- Registrar - Duty 1: page #13299 – for advice and troubleshooting OOH</li> <li>- Registrar - Duty 2: page #13298 – referrals OOH + alternative contact for above</li> </ul> <p>Acute Pain Team: page #13181 Mon-Fri 8am-4pm – to update if nerve block catheter inserted</p> <p>ICU Referrals: page #13002 – for the deteriorating patient</p> <p>General Surgical Registrar: #13436 – to discuss post-procedure bed for complex/ medical patients</p> <p>Orthopaedic Registrar: #13681 – for advice regarding surgical rib fixation</p> <p>Orthopaedic Trauma Coordinator: phone 07989681763 between 07:30 and 19:00</p>

**NB. This entire document is for guidance purposes only and is not prescriptive nor intended to replace individual clinical assessment and management of a particular patient**

## Referral Pathway for Regional Anaesthesia

### I. **Attending Doctor**

If clinically suspected/ radiologically confirmed rib fracture:

1. Initial assessment – ABC/ ATLS approach as indicated:
  - Define injuries & prioritise investigation and management
2. Rib fractures – assess for high risk features:
  - See Page 2 - assessment & analgesia
3. Institute low risk bundle for ALL patients
4. Consider ANAESTHETIC referral for regional anaesthesia (page #13259)  
(need to confirm general surgery accept patient + general surgery bed first)
5. Consider ICU referral if concerns about patient deterioration (page #13002)
6. If referring for regional anaesthesia:
  - Ensure FBC + Coagulation checked if referring for block
  - Ensure valid COVID testing – see current guidance
7. If accepted for regional anaesthetic by anaesthetist, contact THEATRE COORDINATOR to book case (phone theatre hub on 29438).
8. Consider post-procedure WARD placement
  - RA block/ LA infusions need a general surgery bed, s-HDU, or ICU (all QE building)
  - Complex or medical patients require discussion with surgical senior registrar and formally accepted before referral to anaesthesia for RA block.

### II. **Senior-On Anaesthetist**

1. Take details & determine whether patient would benefit from RA block
2. Confirm patient booked with theatre co-ordinator on OPERA system
3. Find suitable anaesthetist – see list of trained anaesthetists (also on TEAMS)
4. Determine suitable location – ideally theatre suite

## GRI Rib Fracture Pathway

e.g. CEPOD (G/A) or Trauma theatres

Theatre Recovery – ONLY with agreement of nurse in charge

5. If unfit for transfer (e.g. HFNO2, COVID(+)) consider regional technique at Bedside. Requires monitored bed space.
6. Confirm post-procedure bed/ ward placement:
  - RA block/ LA infusions need a surgical bed (QE building)
  - Complex or medical patients require discussion with surgical senior registrar before RA block (page #13436).

### III. Theatre Coordinator/ Hub

1. Please book as per standard theatre case
2. \*PLEASE BOOK ALL CASES EVEN IF BLOCK DONE OUTSIDE THEATRE SUITE\*
3. Booking: OPERA OPS4 Code = “Y822 – Injection of LA NEC”
4. Booking: Operator = “Anaesthetist (surgeon)”
5. In theatre: add Anaesthetist, then change role to surgeon
6. ESP (erector spinae plane block) can be selected on OPERA in theatre

### IV. Regional Anaesthetist

1. Consider teaching opportunity for: consultants, RA fellow, trainees.
2. Consider most appropriate RA technique – see decision making guide (pg.6)
3. Follow SOP for ESP block and catheter insertion (pg.7).
4. Patient to stay in recovery 30mins post-procedure before transfer to ward.
5. Document procedure and observations on anaesthetic chart.
6. Document removal date in medical notes (maximum 5 days).
7. Handover to theatre recovery, duty team and on whiteboard in theatre hub.
8. Update acute pain team (pager #13181 Mon-Fri 8am-4pm/ OOH please  
email: [joanne.mcshane@ggc.scot.nhs.uk](mailto:joanne.mcshane@ggc.scot.nhs.uk) and  
[arianna.clanachan@ggc.scot.nhs.uk](mailto:arianna.clanachan@ggc.scot.nhs.uk)

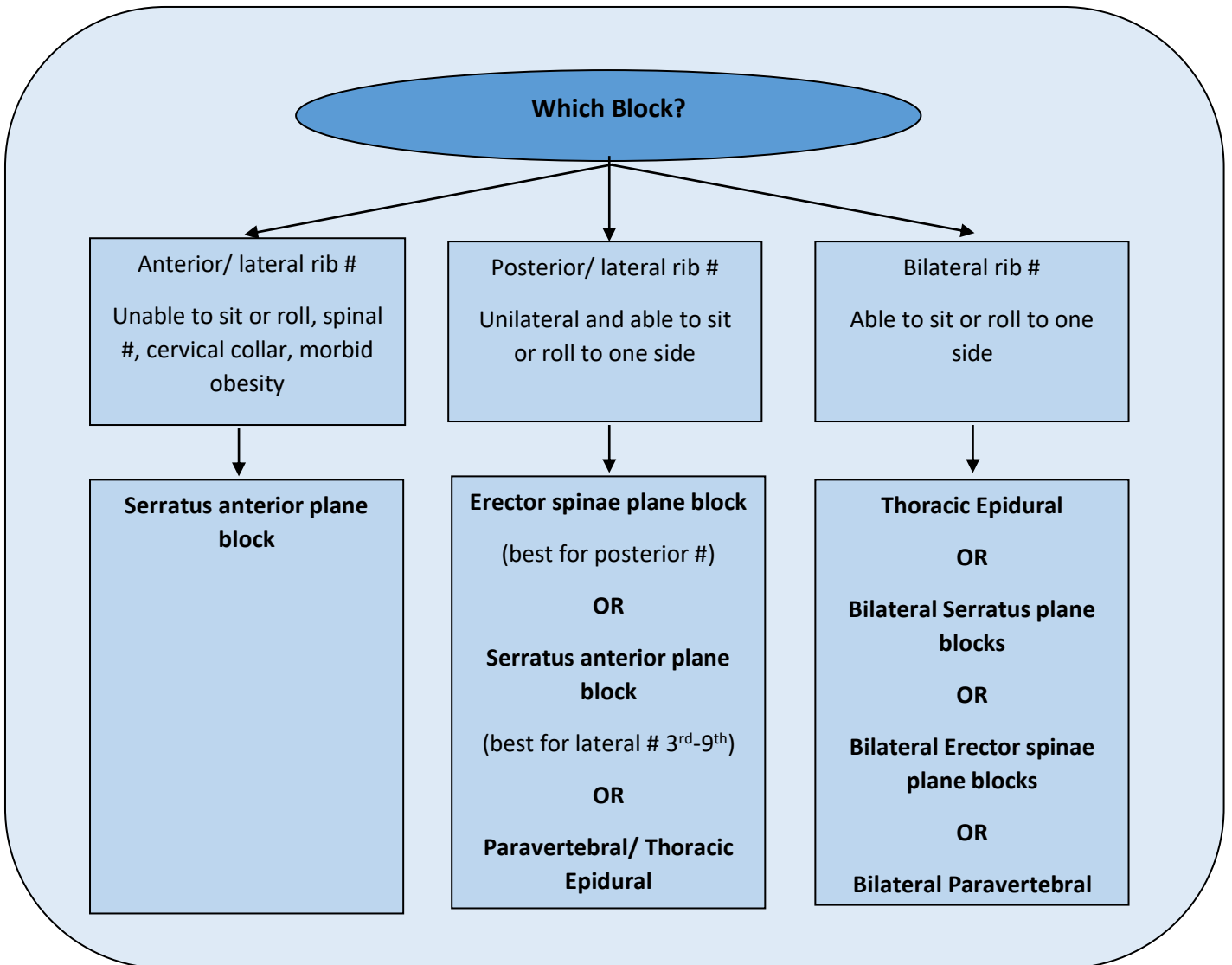
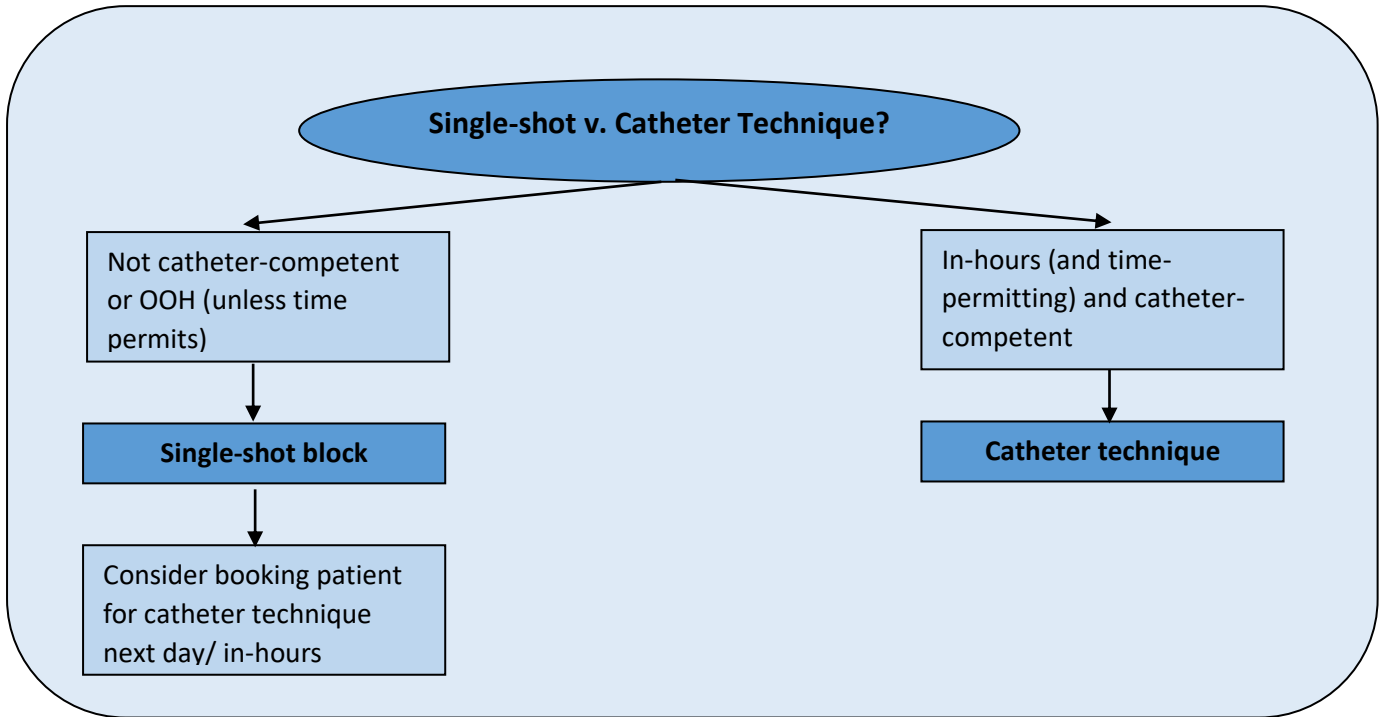
**V. Recovery**

1. Require minimum 30minutes post-procedure observations
2. Consider documenting observations on anaesthetic chart
3. Patients will require a general surgery ward bed (QE building) or Level 2/3.

**VI. Ward**

1. For advice, troubleshooting and local anaesthetic top-ups, contact Duty 1 anaesthetist (#13298)
2. Regional anaesthetic catheters should be removed after a maximum of 5 days in-situ. When removing, use gentle traction and ensure blue tip seen.
3. AmbIT pumps are reusable and **should not be discarded** under any circumstance.
4. Please return ambit pumps to main theatre recovery in the same fashion that PCA pumps are currently.

### Regional Anaesthesia Decision-making Tool





## **SOP for ESP block and catheter placement**

### **I. Positioning**

1. The ESP block can be performed in patients awake, sedated or asleep.
2. The patient can be sitting or positioned semi prone, lateral decubitus or prone.

### **II. Equipment (also see attached equipment list)**

1. Ultrasound guidance is necessary to visualise sono-anatomical landmarks.
2. High frequency linear ultrasound probe is placed longitudinally approximately 5-6 cm from midline to identify ribs and pleura. Probe is then moved towards midline to identify costotransverse junction and more medially to identify transverse processes. This is usually 2.5-3cm from midline in thoracic region.
3. Echogenic regional anaesthesia needle should be used for single shot blocks.
4. Standard epidural kit (16G Tuohy needle and 18G epidural catheter – Smiths Medical) or Perineural kit can be used for continuous techniques.

### **III. Single shot technique**

1. After asepsis of patient skin with chlorhexidine 0.5% and sterile probe cover, needle is inserted in plane from cranial to caudal (mostly for abdominal indications) or caudal to cranial (for thoracic indications) passing through paravertebral muscles until bone contact with appropriate transverse process.
2. Real time visualisation in ultrasound is of paramount importance. Injection of LA results in separating paravertebral muscles (erector spinae muscle) from transverse processes and spread of LA in cranio-caudal direction.
3. For single shot injection the LA choice is 0.25 – 0.375% Levobupivacaine 20-30ml (15ml for small patients). Always check levobupivacaine maximum recommended dose for your patient (2mg/kg). Expected duration of action after single shot injection is 10-12 hours.

### **IV. Catheter technique**

1. For the catheter technique it is possible to open the space using 5mls of normal saline and insert the catheter 3-4 cm into space.
2. Correct position of the catheter is then confirmed by injection of LA through catheter and visualisation of appropriate spread on ultrasound.
3. The catheter should be secured to the skin using tissue glue (Dermabond) and a transparent dressing (Tegaderm). A bacterial filter should be flushed with LA and attached.
4. As for other continuous techniques full asepsis (gown, hat, mask, gloves + full ultrasound sleeve & drape) is required.
5. It is recommended to give an initial bolus of 15-20 ml of 0.25 – 0.375% Levobupivacaine.
6. As the ESP block is a field block, the volume of LA is important to deliver successful analgesia.
7. Consider LA top-up regime – manual bolus, elastomeric pump, intermittent electronic bolus – see section below

8. Perineural catheters should be labelled clearly, and drug boluses and infusions prescribed on HEPMA.
9. The catheter should be removed after maximum 5 days. Individual assessment by an anaesthetist or the Acute Pain Team, including an inspection of the catheter insertion site for any signs of infection should be undertaken daily.
10. Please inform the acute pain team if you have inserted a regional anaesthetic catheter.

#### **V. LA Top-up**

1. 0.125% Levobupivacaine can be used for elastomeric pump/ intermittent boluses via pump.
2. We now have electronic pumps ('ambIT') with an intermittent programmable bolus programme – this is the preferred method.
3. If using the ambIT intermittent bolus pumps the first bolus will be delayed for 4 hours after pressing the start button. Intermittent boluses should be selected in volumes of 10-20 mls for unilateral catheters or 30-40mls in the case of bilateral catheters. The pump will deliver a bolus of LA every 4 hours.
4. There is a free phone 'app' for the ambIT system which is available to download. This explains exactly how to set up the pump.
5. The alternative option is to perform an initial manual bolus dose, followed by connection to elastomeric pump ('haggis') for continuous infusion.
6. Plan further top-up boluses of LA at 10am, 4pm, 10pm - ensure handover to Duty 1/2.
7. Remember not to exceed the maximum LA dose.

#### **VI. Care of the injection/insertion site**

1. Observe site for redness, excessive bruising, swelling and infection (i.e. pain, warmth, discharge).
2. Check dressing over insertion site 4 hourly and with each top-up injection.
3. Do not routinely replace the primary dressing.
4. Observe for a wet dressing indicating leakage of blood or medication. If dressing saturated, reinforce tape around dressing or replace dressing using aseptic technique. If concerned, notify Acute Pain Team or anaesthetist.
5. Ensure catheter is always securely taped.
6. Be cautious when moving or turning the patient so the catheter is not dislodged.
7. Check catheter tubing and pump connection for disconnection or kinking.
8. If the catheter becomes disconnected, call the Acute Pain Team/anaesthetist immediately.
9. Patient should not bathe or shower while catheter in situ.

## VII. Removing ESP Catheters

1. Supplies: clean gloves, 2 x 2 gauze, sterile, semi-permeable dressing (e.g. 4-sided Elastoplast, Opsite etc). If tip / site is to be cultured: Dressing tray, sterile scissors, sterile specimen container, microbiology swab, requisition and labels
2. Perform hand hygiene.
3. Position the patient so that catheter sites are easily accessible.
4. Turn off the infusion pump.
5. Place sterile field to receive catheter if tip culture is required.
6. Use sterile gloves.
7. Remove dressing and tape (if any). (*Note: Catheter may come out with dressing*)
8. Gently withdraw catheter steadily and place on sterile field if tip is to be sent for C&S
9. Assess the catheter site for unusual bleeding, bruising, swelling, or redness.
10. After catheter removal clean site with appropriate antiseptic solution (eg. Chlorhexidine 2%, Betadine) and apply an occlusive dressing.

NB:

- If unable to remove the catheter or there is any resistance upon removing catheter, stop and notify anaesthetist immediately.
- If evidence of infection, obtain swab for C & S from the site and notify surgical team.
- Check catheter tip to ensure it is intact. If not intact notify the anaesthetist immediately.

## VIII. If the ESP catheter is suspected as a source of infection

1. Use sterile scissors to remove 5 cm from the distal end of catheter and place in sterile container and label specimen container at bedside.
2. Recheck site one hour following catheter removal for any persistent fluid leakage, localized bleeding, expansion of bruising or hematoma. If present notify the anaesthetist immediately.
3. Remove sterile semi-permeable dressing (e.g. 4-sided Elastoplast) in 24 hours.
4. Document: Date and time of removal, Condition of insertion site, Condition of catheter tip, If any bleeding, fluid drainage, hematoma at catheter site present, Whether tip / site was cultured, Patient response to procedure, Complications and intervention
5. Report to the anaesthetist if there is: Persistent fluid leak, localized bleeding or expansion of bruising or hematoma is noted.

*Adapted from: SHSCT (NI) via RA-UK*

## Storage & Return of ambIT Pumps

1. AmbIT pumps will be kept in the locked cupboard next to the 'Wee Room' near main theatre recovery.
2. AmbIT pumps will be labelled clearly that they should not be disposed of and should be returned to theatre recovery after use (as per current protocol for PCA pumps)



### Equipment List for ESP Block

Item	Notes
Sterile pack	
Sterile gloves and gown	
Theatre hat and facemask	
Chlorhexidine 0.5% spray	
Sterile ultrasound probe cover and gel	
Selection of needles	Orange, blue, green
Selection of syringes	5ml, 10ml, 20ml
Lidocaine 1%	5ml vial
Epidural Needle/Catheter Kit 18G (1 <sup>st</sup> Line)	If unavailable, alternative peri-neural kit: Pajunk Plexolong Sono Nanoline 18G x 50mm Pajunk Sonolong Echo Nanoline 19G x 100mm
Sterile Saline	100ml bag
Levobupivacaine – Bolus Dose	Approximately 20ml per side blocked. Concentration depending on patient weight.
Levobupivacaine - Infusion	Levobupivacaine 0.125% Volume - 400mls required per 'haggis' pump
Skin glue	Found in theatre fridge
Epidural 'lock-it' dressing 18G	
Clear dressings – small, large (x2 each)	e.g. Tegaderm
Elastomeric pump	e.g. Avonos On-Q pump ('haggis')
Labels for catheter & pump	

Affix patient label

## Local Anaesthetic Bolus/Infusion via AmbIT Pump

<b>DRUG:</b> Levobupivacaine	<b>CONCENTRATION:</b> 1.25mg/ml = 0.125%	<b>VOLUME:</b> 200ml bag
<b>MODE:</b> Programmed Intermittent Bolus (PIB) <input type="checkbox"/>	<b>ROUTE:</b> Rectus Sheath <input type="checkbox"/> Erector Spinae Plane <input type="checkbox"/> Serratus Anterior Plane <input type="checkbox"/> Other _____	
<b>BOLUS DOSE</b> ___ml/___hourly <input type="checkbox"/>	<b>PRESCRIBER (PRINT/SIGN)</b>	<b>START DATE and TIME</b> <hr/> <div style="background-color: yellow; text-align: center;"><b>END DATE and TIME</b></div> <hr/>

Prescribe "Levobupivacaine as per local anaesthetic chart" on patient electronic prescribing record – HEPMA/ Carevue. Complete information below when setting up ambIT Pump and with each infusion bag change.

Date	Time	Batch Number	ambIT Pump Number	PREPARED BY (PRINT/SIGN)	CHECKED BY
1)					
2)					
3)					

Analgesics (including PCA) may be given at the same time as this local anaesthetic infusion. Intravenous access must be maintained for the duration of this local anaesthetic infusion. Local anaesthetic toxicity can occur, especially if there is rapid absorption into the bloodstream, or if inadvertently administered intravenously. This is very rare, but please observe patient for the following signs:

Signs of increasing toxicity	Frequency of monitoring	Clinical response
Numbness of tongue, mouth Tinnitus Dizziness Slurring of speech Sedation	Increased frequency to a minimum of hourly	Ensure oxygen therapy is in progress Stop local anaesthetic bolus or infusion Ensure the Acute Pain Service or anaesthetist is contacted Trained nurse assessment Inform medical team caring for the patient Urgent assessment by a medical/surgical/nursing team with core competencies to assess acutely ill patients Consider level of monitoring required in relation to clinical care.
Muscular twitching Convulsions Cardiac arrest	Continuous monitoring of vital signs	Emergency 'ABC' assessment of patient required. In event of cardiac arrest '2222' call for arrest team to attend. Ensure oxygen therapy is in progress. Stop local anaesthetic bolus or infusion. Inform senior medical staff and ensure the Acute Pain Service or anaesthetist is contacted immediately. Collect bag of intralipid – see section below in red. Follow AoA guideline on management of severe LA toxicity. Consider referral to critical care.



## Referral for Rib Fixation – QEUH RFF Service

**\*Please refer also to the West of Scotland MTC Rib Fracture Fixation Document.**

**Who fixes rib fractures? The RFF Surgeons.**

Miss Sarah Gill & Mr Andrew Marsh, both T&O Consultants based at QEUH

**Which patients should be referred? Follow the QEUH MTC Referral Criteria.**

Please see 'Assessment and Analgesia' section, **page 3** of this document.

**Who Makes the Referral?**

Referral should be made via GRI Trauma Coordinator (07:30-19:00) or Orthopaedic Registrar (OOH).

**What Information do you Need?**

The following **Clinical Referral Details** (\*required in full before making referral):

Patient Name & CHI	
Age	
Referring Hospital/ Unit	
Referring Consultant	
Referring Clinician & Direct Contact Details	
Date & Mechanism of Injury	
Reported Rib #(s)	
Indication Met for Referral	
Current O2 Requirements & Saturations	
Latest ABG with Date/Time	
Current Analgesic regime including Type/timing of Regional Block	
PMHx	
Associated Injuries & Treatment Plan	
Does the Patient have an Effective Deep Breath & Cough? If not, why?	
Any other Clinically Relevant Details	

**How to Make a Referral? Email and Phone.**

Email clinical referral details above to QEUH MTC Coordinator = [MTC.QEUH@ggc.scot.nhs.uk](mailto:MTC.QEUH@ggc.scot.nhs.uk)

**AND** call them on 0141 452 2149 or 0141 452 2150 to discuss the referral.



## References

1. Centre for Trauma Sciences Website – Pan-London Rib Injury Toolkit  
[Clinical Management - Centre For Trauma Sciences \(qmul.ac.uk\)](https://www.c4ts.qmul.ac.uk/rib-injury-toolkit/clinical-management)  
<https://www.c4ts.qmul.ac.uk/rib-injury-toolkit/clinical-management>
2. RA-UK Website  
[Home \(ra-uk.org\)](https://www.ra-uk.org)  
<https://www.ra-uk.org>
3. Association of Anaesthetists  
[Regional anaesthesia and patients with abnormalities of coagulation \(anaesthetists.org\)](https://anaesthetists.org)  
<https://anaesthetists.org/Home/Resources-publications/Guidelines/Regional-anaesthesia-and-patients-with-abnormalities-of-coagulation>

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