Sussex Trauma Network

Guidelines for Management of:

Severe Chest Wall Injuries

February 2025

Management of Severe Chest Wall Injuries

Control Page

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1 Executive Summary

- Pre-hospital practitioners will use clinical judgement to detect conditions such as penetrating chest injury, open pneumothorax, and flail chest. They will triage patients to the most appropriate Emergency Department as described.
- Pre-hospital practitioners with the requisite competence may perform chest decompression by open thoracostomy or needle decompression, only in a patient with suspected tension pneumothorax if there is haemodynamic instability or severe respiratory compromise.
- Pre-hospital practitioners should cover the open pneumothorax with a simple occlusive dressing.
- Patients already in hospital with suspected tension pneumothorax, perform chest decompression before imaging only if they have either haemodynamic instability or severe respiratory compromise.
- Adult patients with tension pneumothorax should be treated using open thoracostomy followed by a chest drain. Children may be treated with needle compression first.
- Patient with chest wall injury should have a risk assessment to identify those at high risk of complication and poor outcome.
- In adults with suspected severe chest injury, whole-body contrast-enhanced CT (CT Traumagram) is the default imaging procedure of choice. A chest x-ray would only precede a CT scan if there were doubt about the side or presence of a pneumothorax in a patient with respiratory compromise.
- In children under 16 years old, chest x-ray is the first-line imaging for serious chest trauma with progression to CT scanning if pathology is identified on plain films.
- All patient with chest wall injury will require pain relief to promote ventilation. The mode of pain relief will depend on pain scores and risk assessment.
- All hospitals should have local policies and early access for providing adequate and early analgesia / anaesthesia for chest wall injuries.
- All patients admitted with rib fractures should receive respiratory support titrated to their individual needs.
- All hospitals should be able to initiate and provide respiratory support including ventilation.
- Physiotherapy should be started within 24 hours of admission in all patients to support ventilation and prevent complications.
- Adults with severe chest wall injury may be considered for surgical stabilisation of rib fractures. These patients may need transfer to an appropriate facility for this.
- All hospitals should have a local guideline for determining the speciality or specialities responsible for caring for patients with all levels of chest wall injury.

- Prior to discharge, patients should be given appropriate information and adequate analgesia.

2 Introduction

Blunt chest-wall trauma accounts for 10-15% of all trauma admissions to Emergency Departments (EDs) globally. Rib fractures may complicate up to two thirds of these injuries. Chest wall injury varies in severity from minor bruising or an isolated rib fracture, to severe crush injuries leading to respiratory compromise.

Rib fractures are markers of severe injury and are associated with significant morbidity and mortality. Patients with these injuries are at greater risk of complications and poor outcomes. Associated injuries occur in 94% of patients, typically concomitant thoracic trauma, but also injuries to the head, abdomen, and limbs.

Common immediate thoracic sequelae of rib fractures include pneumothorax, haemothorax, haemopneumothorax, pneumatocoele, pulmonary contusions. Solid organs, such as the liver, kidneys and spleen, may also sustain lacerations from broken ribs.

Pain is the most common symptom from rib fractures and a key component in pulmonary complications. Pain restricts tidal volume, leading to hypoventilation, and impairs coughing ability, leading to sputum retention; these combine to cause atelectasis and predispose to pneumonia. Additionally, injured lung tissue underlying the fractures has impaired ability to exchange gasses (leading to shunt and VQ mismatch) and reduced compliance. Compensatory increases in respiratory rate may increase oxygen consumption. Pneumonia occurs in up to 30% of cases, with or without sepsis, causing further respiratory compromise. The combination of hypoventilation, atelectasis and/or lobar collapse and impaired gas exchange results in hypoxaemia, respiratory failure and, in some cases, a need for mechanical ventilation. Respiratory complications typically develop at 48 – 72 hours post injury. Other respiratory complications include pulmonary embolus, pulmonary effusions, empyema and acute respiratory distress syndrome (ARDS).

Patients with rib fractures often require hospital admission, and in more significant injuries, to level 2 or 3 care.

Elderly patients (aged 65 years or older) have been consistently shown to have worse outcomes, higher complication rates and greater mortality after rib fractures than younger patients.

3 Purpose of the Guideline

The purpose of this guideline is to clearly define the care pathway for patients with severe chest wall injuries including referral pathways to and from the Major Trauma Centre (MTC) (Royal Sussex County Hospital (RSCH)) and network Trauma Units (TUs). It includes guidance

for pre-hospital and hospital management, indications for surgery, pain management and rehabilitation.

3.1 Aims & Objectives

The aims and objectives of this guideline are:

- To provide a system-wide approach for management of patients with severe chest wall injuries
- To define appropriate patient pathways for these patients
- To list appropriate accepted routes of communication
- To highlight continuing areas of contention
- To help meet TQUIN requirements for creation of network-agreed guidelines for the Network and Trauma Units (TUs)

4 Definitions

4.1 Open Pneumothorax

Open pneumothorax is a pneumothorax involving an unsealed opening in the chest wall; when the opening is sufficiently large, respiratory mechanics are impaired.

4.2 Flail Chest

There has been significant variation and lack of agreement about the criteria for and definition of flail chest. Since October 2021, the Trauma Audit Research Network (TARN) has used the definition of flail chest as:

- 3 or more ipsilateral, consecutive ribs each fractured in two locations AND / OR
- Evidence of paradoxical motion of the flail chest wall segment

This concurs with the definition used by the Chest Wall Injury Society.

4.3 Thoracic Epidural (TE)

A fine bore catheter placed into the thoracic epidural space which is used to give analgesic drugs.

4.4 Paravertebral Block (PVB)

A regional anaesthetic technique providing analgesia to a segment of one hemithorax.

4.5 Erector Spinae Plane Block (ESPB)

The erector spinae plane block is a regional anaesthetic technique involving the infiltration and infusion of local anaesthetic along fascial planes containing dorsal and ventral rami of thoracic spinal nerves supplying the chest wall.

4.6 Serratus Anterior Plane Block (SAPB)

Ultrasound guided SAPB is a relatively new approach for providing regional analgesia to patients with anterior lateral rib fractures from ribs two to nine.

4.7 Patient Controlled Analgesia (PCA)

A method of allowing a patient to administer their own analgesia intravenously, usually opioid based.

5 Scope

The guideline covers all major trauma patients with severe chest wall injuries within the Sussex Trauma Network. It replaces and supersedes all relevant previous STN guidelines.

It is applicable to adults and children, but relevant sections contain statements where different processes apply to management of children.

It is acknowledged that commissioning pathways for surgical stabilization of rib fractures have not yet been finalised and this document will be updated when they are.

6 Relevant Documents and Guidance

This guideline refers to:

- NICE Guideline [CG176] – Major trauma: assessment and initial management
- NICE Interventional procedures guidance [IPG361] – Insertion of metal rib reinforcements to stabilise a flail chest wall
- BOAST 15 Guideline – The Management of Blunt Chest Wall Trauma - Apr 2016 - now archived.
- Chest Wall Injury Society – Guideline for Surgical Stabilization of Rib Fractures – Indication, Contraindications and Timings
- Wessex Children's Major Trauma Guidelines – on the Paediatric Innovation, Education and Research Network website (piernetwork.org)

This guideline also aspires to compliance with the relevant 2016 Major Trauma Service Quality Indicators (TQUINs) issued by the NHS England Quality Surveillance Team - tquins_resources_measures_major_trauma_measures_final_230416_7_.pdf (wymtn.com) and the subsequent 2020 version applying to Trauma Units.

The relevant extracts from the indicators are:

6.1 For Trauma Networks

- **T16-1C-107**
  There should be network agreed clinical guidelines for the management of:
  - analgesia for chest trauma with rib fractures

6.2 For Major Trauma Centres

- **T16-2B-118**
  There should be a 24/7 specialist acute pain service available for major trauma patients.
  The MTC should have pain management pathways for:
  - patients with severe chest injury and rib fractures
  - early access to epidural pain management (within 6 hours).

  The MTC should audit the pain management of major trauma patients including patients with severe chest injuries (AIS 3+), who were not ventilated and who received epidural analgesia.

6.3 For Trauma Units

- **T16-2C-305**
  There should be network agreed local management guidelines for the management of multiple rib fractures including:
  - pain management including early access to epidural
  - access to surgical advice.

7 Standard Operating Procedure

7.1 Pre-Hospital Care

Pre-hospital practitioners are required to use clinical judgement to detect conditions such as penetrating chest injury, open pneumothorax, and flail chest. According to the STN Patient Pathways document, an adult patient identified as having one of these conditions should be triaged to the adult Major Trauma Centre (MTC).

Children identified or suspected of having sustained these injuries should be conveyed to the nearest paediatric MTC if within 60 minutes. If the nearest paediatric MTC is >60 minutes away the child should be taken to the nearest TU or adult MTC for stabilisation.

Pre-hospital practitioners with the requisite competence should only perform chest decompression in a patient with suspected tension pneumothorax if there is haemodynamic instability or severe respiratory compromise. For adults they should use open thoracostomy instead of needle decompression if the expertise is available, followed by a chest drain via the thoracostomy in patients who are breathing spontaneously.

In patients with an open pneumothorax, pre-hospital practitioners should cover the open pneumothorax with a simple occlusive dressing and observe for the development of a tension pneumothorax.

7.2 Hospital Care

7.2.1 Immediate Management

Management of chest wall injury is directed towards protecting the underlying lung, achieving adequate ventilation and oxygenation, and preventing infection. Analgesia sufficient to allow normal respiration and coughing may be adequate for mild cases. More severe cases require ventilatory support, and suction to remove mucus or secretions from the airways to prevent atelectasis.

In patients with suspected tension pneumothorax, perform chest decompression before imaging only if they have either haemodynamic instability or severe respiratory compromise.

Perform chest decompression in adult patients with tension pneumothorax using open thoracostomy followed by a chest drain.

For children with tension pneumothorax, it is acceptable to perform needle thoracocentesis prior to chest drain insertion – see page 34 of the Wessex Children's Major Trauma Guidelines on the Paediatric Innovation, Education and Research Network website (piernetwork.org)

7.2.2 Identifying the High-Risk Patient

Outcomes after chest wall injury have a wide range. Multiple risk factors have been identified for poor outcomes in rib fractures. Many scoring systems are available to predict the risk of complications after blunt chest trauma.

The RSCH Adult MTC uses an ED Initial Assessment algorithm (see Appendix 2). To stratify risk and guide the appropriate management in adults, the MTC uses the the STUMBL score (see Appendix 3). The Network strongly advises all Trauma Units (TUs) to follow a similar approach.

TU management of children with chest injuries should follow Wessex trauma network major trauma guidance – see Wessex Children's Major Trauma Guidelines on the Paediatric Innovation, Education and Research Network website (piernetwork.org).

7.2.3 Imaging

According to the STN – Imaging for Trauma Guideline, for seriously injured adult patients, whole-body contrast-enhanced head-to-thigh CT (CT Traumagram) is the default imaging procedure of choice. Digital x-rays should be available in the emergency department. However, a chest x-ray would only precede a CT scan if there were doubt about the side or presence of a pneumothorax in a patient with respiratory compromise.

However, if a CT is not being requested, then a standard chest x-ray can be requested to identified potential lung injury and rib fractures. Although identifying the number of fractures is part of the Rib Fracture Score, it is not appropriate to request or perform rib x-rays purely to count the fractures.

7.2.3.1 Chest wall Imaging for Children

For children under 16 years old, chest x-ray is the first-line imaging for serious chest trauma with progression to CT scanning if pathology is identified on plain films.

7.2.4 Intercostal Chest Drains

Intercostal chest drains are only used when there is reasonable evidence or suspicion of significant pneumothorax and/or haemothorax.

Indications include:

- Moderate and large pneumo/haemothoraces in self-ventilating patients
- In mechanically ventilated patients, or those having positive pressure ventilation, chest drain for small pneumothoraces is not absolutely required as long as there is frequent observation and no evidence of respiratory compromise of tensioning.

7.2.4.1 Adult Guidance

See the RSCH Adult ED Prompt Cards - Initial Assessment algorithm (see Appendix 2) and Intercostal Chest Drains (ICD) guidance (Appendix 5).

7.2.4.2 Paediatric Guidance

Chest drain insertion in children is usually carried out under general anaesthesia, using the specific guidance on page 36 of the Wessex Children's Major Trauma Guidelines.

7.2.5 Analgesic Options

Multiple rib fractures are very painful and in a conscious child can lead to shallow breathing, respiratory secretion poling, segmental lung collapse and hypoxaemia. As pain is a significant contributor to the morbidity arising from rib fractures, optimisation of analgesia is key to preventing complications. There are many options for managing pain from rib fractures including multimodal oral therapy, intravenous analgesia, topical treatments and a variety of regional anaesthetic blocks.

Management of pain should be guided by use of dynamic pain assessments incorporating numerical pain scoring tools in combination with a functional pain assessment.

All Trauma Units and the MTC should have local policies for providing adequate and early analgesia / anaesthesia for chest wall injuries.

7.2.5.1 Adult Guidance

The RSCH Adult ED uses a Blunt Chest Trauma Pain Management Protocol (see Appendix 3 and Appendix 4), which incorporates the STUMBL Score tool.

For patients with a STUMBL score of <=10, aim to use oral or topical analgesia such as lidocaine 5% patch. Above that, especially patients unable to adequately deep breathe or cough as a result of pain, should be referred to Anaesthetics for Regional Anaesthesia using one of the options below.

7.2.5.2 Paediatric Guidance

Adequate analgesia with intravenous opioid agents can add to respiratory compromise. Therefore, placement of a thoracic epidural is recommended for children with multiple painful rib fractures.

Epidural placement is organised through the paediatric pain team and is achieved under general anaesthesia in theatre.

7.2.5.3 Regional Anaesthesia for chest wall injury

All hospitals should provide early access to appropriate regional anaesthesia. Suitable modalities may include:

- thoracic epidural
- serratus anterior plane and erector spinae plane continuous nerve blocks - easier, safer and more reproducible block for the majority of anaesthetists to do
- intercostal, interpleural and paravertebral blocks

7.2.6 Ventilation Management

Rib fractures are commonly associated with underlying pulmonary contusions and pleural injuries such as pneumothorax and haemothorax. These, combined with pain, can lead to respiratory failure.

To prevent complications and ensure a timely recovery, all patients admitted with rib fractures should receive respiratory support titrated to their individual needs. Patients should be managed on wards with nursing staff familiar with the injury. Supplemental oxygen should be prescribed and administered at the lowest concentration required to achieve peripheral oxygen saturations (SpO_2) of 94-98%, or 88-92% in patients at risk of carbon dioxide retention. If more than 2-4L/min via nasal cannula is required, administered oxygen should be humidified to loosen secretions. Sodium chloride (NaCl) 0.9% nebulisers may be prescribed as required or regularly to assist expectoration. Salbutamol nebulisers can be prescribed for

bronchospasm. Patients should be mobilised where possible and when in bed, be nursed sitting as upright as possible with attention to pressure area care. All rib fracture patients should receive physiotherapy input at least once a day (see below) until respiratory function normalises and mobility restored to baseline.

Advanced respiratory support including Continuous Positive Airways Pressure (CPAP), Non-Invasive Ventilation (NIV) and Nasal high flow oxygen can be considered, in liaison with critical care staff, for patients with anticipated or deteriorating respiratory failure. Decisions regarding which of these treatment modalities is appropriate will be specific to individual patients and determined by the clinical judgement of the attending trauma, anaesthetic and critical care teams.

Patients with significant flail segments in particular should be referred early for critical care review regarding advanced respiratory support, even without evidence of respiratory failure, with the goal of maintaining lung volume and effective cough. A proactive approach to chest x-Rays should be adopted for patients with flail segments; changes such as atelectasis warrant prompt referral to critical care. Preventative ventilatory support is a key strategy that must be adopted.

7.2.7 Physiotherapy

Physiotherapy should be started within 24 hours of admission in all patients to support ventilation and prevent complications. The ability of patients to participate in physiotherapy is dependent on adequate analgesia using non-sedative doses.

7.2.8 Surgical Treatment – Surgical Stabilisation of Rib Fractures (SSRF)

Surgical stabilisation with metal rib reinforcements aims to allow earlier weaning from ventilator support, reduce acute complications, and avoid chronic pain sometimes associated with permanent deformity of the chest wall.

Current evidence on insertion of metal rib reinforcements to stabilise a flail chest wall is limited in quantity but consistently shows efficacy. In addition, there are no major safety concerns in the context of patients who have had severe trauma with impaired pulmonary function. Therefore, the procedure may be used provided that normal arrangements are in place for clinical governance, consent and audit.

The supportive evidence for SSRF is predominantly in adults. Although, there are small studies showing benefit in selected children, all such children would already be in a Paediatric MTC. The following guidance is only relevant for adult patients.

7.2.8.1 Indications for SSRF

The full list of indications shown below represent the guidance of the Chest Wall Injury Society. However, in the Sussex Trauma Network at the moment, the main indications for SSRF will be multiple rib-fractures with a “stove-in” chest.

The full list is:

- Non-ventilated Patients
    - Chest wall instability
        - Three rib flail chest
        - Three bi-cortically displaced/offset ribs
        - Clinical finding of paradoxical motion
        - Instability or "clicking" on palpation or as reported by the patient
    - Three or more displaced rib fractures (≥ 50% of the rib width) with two or more pulmonary physiologic derangements
        - Respiratory rate ≥ 20
        - Measured volumes on incentive spirometry < 50% of predicted
        - Numerical pain score > 5/10
        - Poor cough
- Ventilated Patients
    - Chest wall instability (see above)
    - Failure to wean

7.2.8.2 Contraindications

- Absolute
    - Shock/Ongoing resuscitation
    - Severe traumatic brain injury
    - Fractures outside of ribs 3-10
    - Acute myocardial infarction
- Relative
    - Age less than 18 years
    - Significant co-morbidities
    - Mild/moderate traumatic brain injury (TBI)
    - Spinal cord injury/Unstable spinal fracture
    - Empyema
    - History of chest wall radiation

7.2.8.3 Timing of SSRF

- Non-ventilated patients
    - When feasible, less than 24 hours is optimal
    - Should be performed within 72 hours of injury
    - SSRF should be delayed in the face of higher priority injuries
- Ventilated patients
    - Earliest feasible time for flail indication
    - Should be performed within 72 hours of injury for non-flail indications
    - SSRF should be delayed in the face of higher priority injuries

7.2.8.4 Referral for SSRF

Although, the network's MTC, Royal Sussex County Hospital, does not have a thoracic surgery unit, SSRF can be performed on selected patients by 4 of our surgeons, two orthopaedic, one vascular and one general surgeon.

To make a referral for SSRF do one of the following:

- **Preferred method** - complete the online referral form on the STN website – via the link near the bottom of the STN homepage – www.uhsussex.nhs.uk/sussex-trauma-network/.
- Alternatively contact the Major Trauma Practitioners at the Royal Sussex County Hospital. They do not work 24/7, but these referrals do not require to be done out of hours. The Major Trauma Practitioners may be involved in acute patient care so may not be available for immediate telephone conversation. They can be contacted via (in order of preference):
    - E-mail to uhsussex.major.trauma@nhs.net
    - Call to hospital switchboard – 01273 696955 – and bleep 8208
    - Call to mobile number - 07788 623412 – but there is poor reception in some parts of the hospital

Before all referrals for SSRF, ensure you have available the information and images required as shown in Appendix 6. If e-mailing a request, use one of the template forms available on www.uhsussex.nhs.uk/sussex-trauma-network/documents/.

For patients in the west of the network, also consider referral to the Thoracic Surgery Department of University Hospital Southampton NHS Foundation Trust.

7.2.9 Admission

All TUs should be able to manage an adult patient with chest wall injury requiring regional anaesthesia and or ventilation support. So, chest wall injury of itself in these patients does not require secondary transfer to the MTC, unless SSRF is appropriate, such as in flail chest or chest wall instability (see Indications for SSRF), or for other concomitant injuries.

All hospitals should have a local guideline for determining the speciality or specialities responsible for caring for patients with all levels of chest wall injury. Those specialities should be aware of and follow the guidance of this document.

7.2.10 Discharge

Prior to discharge, patients should be given information, for example the NHS choices rib injury sheet, to ensure their progress after discharge is optimal. Pain should be adequately controlled such that patients are discharged with weak opioids (as well as other multimodal agents) in the TTO pack. If stronger opioids, e.g. morphine, are still in use, a clear weaning plan should be in place for the GP. Patients should be advised to see their GP if the pain isn't

responding to prescribed analgesics or if they develop features of chest infection. Other simple interventions that can be recommended for completion at home include continued use of the active cycle breathing technique, use of ice packs, use of splints when coughing (e.g. a rolled-up towel), encouragement of mobilisation but avoidance of heavy strenuous exercise or work. Patients who have received surgical rib fracture fixation should be followed up in fracture clinic at 6 weeks after discharge.

7.3 Rehabilitation

No specific guidance at present.

7.4 Audit

Management of severe chest wall injury should be audited through TARN.

8 Training Implications

This document represents the standard of practice acceptable for trauma networks and so all participating clinicians should already have relevant skills and training. No extra training requirements have been identified.

Staff in both TUs and the MTC should have training sufficient to allow adequate care for patients with chest wall injury. This includes nursing on general and trauma wards.

9 Documentation

There is no formal documentation of these processes, other than the following:

- Written and computer patient medical records
- Electronic order comms records
- PACS images
- Paper and/or electronic imaging reports

10 Monitoring Arrangements

These include:

- STN Clinical Governance Framework
- National major trauma registry (NMTR)

11 Equality Impact Assessment Screening

None in process.

12 Links to other SOPs and Trust policies

This guidance refers to and links with the following STN and Trust publications:

- STN Patient Pathways
- STN Imaging for Trauma – adults and children
- Processes for Urgent Referral to the Trauma and Orthopaedic Service at the Major Trauma Centre at the Royal Sussex County Hospital

13 References

- NICE Guideline [CG176] – Major trauma: assessment and initial management
- NICE Interventional procedures guidance [IPG361] – Insertion of metal rib reinforcements to stabilise a flail chest wall
- BOAST 15 Guideline – The Management of Blunt Chest Wall Trauma - Apr 2016 - now archived
- Chest Wall Injury Society – Guideline for Surgical Stabilization of Rib Fractures – Indication, Contraindications and Timings
- Wessex Children's Major Trauma Guidelines – on the Paediatric Innovation, Education and Research Network website (piernetwork.org)

14 Appendices

14.1 Appendix 1 – Abbreviations

AIS	Abbreviated Injury Score
ARDS	Acute Respiratory Distress Syndrome
CPAP	Continuous Positive Airways Pressure
CT	Computerised Tomography
ED	Emergency Department
ESPB	Erector Spinae Plane Block
ICD	Intercostal Chest Drain
ICU	Intensive Care Unit
INR	International Normalised Ratio
EDs	Emergency Departments
NIV	Non-Invasive Ventilation
MTC	Major Trauma Centre
PACS	Picture Archiving and Communication System
PCA	Patient Controlled Analgesia
PVB	Paravertebral Block
RFS	Rib Fracture Score
RSCH	Royal Sussex County Hospital
SAPB	Serratus Anterior Plane Block
SSRF	Surgical Stabilisation of Rib Fractures
STN	Sussex Trauma Network
TARN	Trauma Audit Research Network
TBI	Traumatic Brain Injury
TE	Thoracic Epidural
TQUIN	Trauma Quality Indicator
TTO	To Take Out (medications)
TU	Trauma Unit
TUs	Trauma Units
VQ	Ventilation/Perfusion

14.2 Appendix 2 – RSCH Adult ED Prompt Card - Blunt Chest Trauma: Initial Assessment

NHS University Hospitals Sussex NHS Foundation Trust

Blunt Chest Trauma: Initial Assessment

Survey

- Complete trauma primary survey
- If airway concerns then discuss with Anaesthetics for airway management
- Use physiological parameters and gestalt to risk stratify patients into one of the following three groups

Respiratory and Haemodynamically Normal

- Imaging: Chest CT with contrast if required as per Trauma guidance
- Follow individual management of rib, sternal and blunt cardiac injury as per 'Blunt Chest Trauma: Management' card
- Consider when Intercostal Chest Drain insertion is required as per below

Respiratory Compromise, Signs of PTX Haemodynamically Normal

- Consider clinical need for PTX decompression
- Use portable CXR and US if too unstable to transfer to CT
- Consider when Intercostal Chest Drain is required as below
- Manage pain and oxygen requirements

Respiratory compromise, Signs of PTX Haemodynamic compromise

- Treat as **'Code Red Trauma'** and put out the call
- Immediate chest decompression prior to imaging
- Intercostal Chest Drain (ICD) insertion following decompression
- If ICD output >1000ml then immediately discuss with Cardiothoracic surgeons

Drains

Indications

- In the self-ventilating an Intercostal Chest Drain (ICD) is required for moderate and large pneumo/ haemopneumothoraces
- In the mechanically ventilated or those undergoing PPV, an ICD is not absolutely indicated for small pneumothoraces but there should be frequent monitoring and low threshold for drain if respiratory compromise or signs of tension
- A drain can be inserted through a thoracostomy if performed within one hour of the thoracostomy procedure

Lead: D Bootland, J Chan	Prompt Card created by: J Castle	Implemented Oct 2021	Version 6.0	Review Oct 2023

14.3 Appendix 3 – RSCH Blunt Chest Trauma Pain Management Protocol 1

Clinical Protocol 14682 | Due for review: January 2028 | Blunt Chest Trauma: Pain Management Protocol | **For use at: RSCH**

Management of Rib Fractures

STEP 1: Calculate STUMBL score

[2] Calculate and document STUMBL Risk Score2 – add for total risk score	
	Predictor Points
Chronic Lung Disease (COPD/productive chest disease)	Yes – 5 No – 0
Anticoagulation pre-injury	Yes – 4 No – 0
Number of ribs fractured	3 points per rib 6 points per flail
Oxygen saturations on Room Air at initial assessment	<94% = 2 <89% = 4 <85% = 6 <80% = 8 <75% = 10
Age	1 point per complete decade

STEP 2: Determine management plan (RSCH)

Score 2-10	• **Ensure analgesia is prescribed (page 2)**
Score 11-25	**CONSIDER NERVE CATHETER** • **Ensure analgesia is prescribed (page 2)** • **Refer for Nerve Catheter (see below)** • **If urgent contact anaesthetics**
Score 26 +	**NERVE CATHETER ADVISED** • **Ensure analgesia is prescribed (page 2)** • **Refer for Nerve Catheter (see below)** • **If urgent contact anaesthetics**

Refer to General Surgery if STUMBL Score 11 or more

NERVE CATHETER REFERRALS

ALL **RSCH** referrals via Panda (out of hours also contact anaesthetics)
Other sites refer via Pain Service or On-call Anaesthetist

REGARDLESS OF STUMBL SCORE:

Refer for PCA and/or Regional Anaesthesia if:
- **Significant multiple injuries or high impact injury**
- **Evidence of lung contusions**
- **Clinical deterioration:**
  <94%, RR >24 or increasing O2 requirements
- **Significant respiratory or cardiac disease**

Refer to Critical Care if:
- **Flail chest or STUMBL score greater than 21**
- **Pneumothorax**
- **Significant multiple injuries**
- **Clinical deterioration:**
  <94%, RR >30 or O2 requirements 40% or more
- **Significant respiratory or cardiac disease**

Refer for chest physiotherapy if:
- **New oxygen requirement**
- **Retention of secretions**

Consideration of rib fixation: referral form
UHS Intranet homepage > Sussex Trauma Network

14.4 Appendix 4 – RSCH Blunt Chest Trauma Pain Management Protocol 2

Clinical Protocol 14682 | Due for review: January 2028 | Blunt Chest Trauma: Pain Management Protocol | **For use at: RSCH**

Analgesia Protocol for Chest Injuries

Parent teams: Analgesia should be optimised using the following protocol

Age < 65 years & normal renal function	Age > 65 years age & normal renal function	Abnormal renal function (any age)
Paracetamol 1 gram QDS. Reduce dose to 500mg QDS if patient weighs ≤50kg		
Lidocaine plasters: 1 to 3 plasters over **fractured ribs**: apply **for 12 hours** (e.g. 8am to 8pm), remove for 12 hours (e.g. 8pm to 8 am)		
Use an NSAID if no contraindications: **Ibuprofen** 400mg PO TDS or **Naproxen** 500mg PO BD	**Avoid NSAIDS**	**Avoid NSAIDS**
Morphine (IR) 5 - 20 mg 2 hourly PO PRN lowest effective dose - monitor renal function IF intractable side effects with morphine switch to **Oxycodone (IR) 2.5 - 10mg 2 hourly PO PRN**	**Morphine (IR) 2.5 - 10 mg 2 hourly PO PRN** lowest effective dose - monitor renal function **Age>85: Morphine (IR) 2.5-5 mg 4 hourly PO PRN** IF intractable side effects with morphine switch to **Oxycodone (IR) 1.5 - 5 mg 2 hourly PO PRN** **Age>85: Oxycodone (IR) 1.5-2.5 mg 4 hourly PO PRN**	**eGFR 30 - 60** **Morphine (IR) 2.5 - 5mg 4 hourly PO PRN** IF intractable side effects with morphine switch to **Oxycodone (IR) 1.5 - 2.5mg 4 hourly PO PRN** **IF eGFR < 30** **Oxycodone (IR) 1.5 - 2.5mg 6 hourly PRN, or** **Consider referring for Fentanyl PCA**
Consider Gabapentin if **chest drain** in situ or evidence of **neuropathic pain:**		
Gabapentin 300mg PO TDS	**Gabapentin 300mg PO TDS** Give 100-200mg for patients with co-morbidities	**eGFR 30-60 Gabapentin 100mg to 200mg PO TDS** **eGFR <30 Gabapentin 100mg PO BD**

Important:

- **Analgesia must be optimised prior to physiotherapy**
- **Use Bolton Pain Assessment tool for patients with cognitive impairment**

14.5 Appendix 5 – RSCH Adult ED Prompt Card - Intercostal Chest Drains (ICD)

NHS University Hospitals Sussex NHS Foundation Trust

Intercostal Chest Drain (ICD)

Indications

Medium to large pneumothoraces/haemothoraces in the self-ventilating

Following chest decompression

Pre-procedure

Are there enough of you and allocate roles:
- 1 doctor for drain insertion
- 1 doctor for analgesia +/- sedation
- Nurse for assistance

Is pre-medication/sedation and further analgesia required?

Is ED the best place for this to be done?

Has appropriate informed consent been obtained or best interests decision been documented?

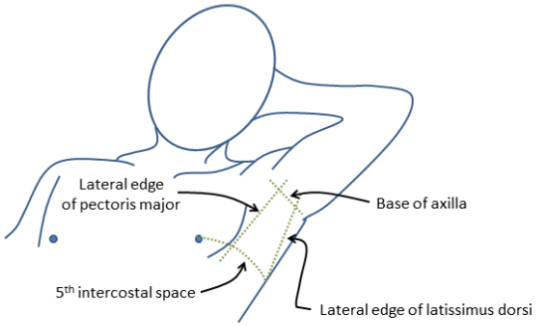
Is all the equipment available as listed on the chest drain kit, +/- US machine?

Have coagulation and platelets been checked?

⚠ Checklist

- Confirm patient identity
- Confirm site of clinical and radiological abnormality
- Confirm chest drain insertion site
- Has the patient had adequate analgesia and sedation?
- Is position optimal?
- Have the landmarks been identified and marked?
- Has the proposed incision site been marked?
- Is the patient on high flow oxygen +/- adequate ventilator settings?
- Are there particular concerns for the procedure?
- What are your emergency plans for sedation and procedural complications?
- Do you need further help?

Commence procedure only when everyone is happy



Post-procedure

Is the tube secured with sutures, dressing and tegaderm?

Advise the patient about care and to not elevate the drain above the chest

Is analgesia prescribed? **See 'Trauma: Analgesia' Prompt**

CXR to confirm adequate position

Handover verbally to nursing staff and admitting team

Fully document the procedure and any complications in the notes and sedation database

Lead: D Bootland, J Chan | Implemented May 2021 | Version 5.0 | For review May 2023

14.6 Appendix 6 – Information required for referral for Surgical Stabilisation of Rib Fractures

The following is the information required for referral of all patients in acute hospitals within the Sussex Trauma Network who have had major trauma and who may benefit from Surgical Stabilisation of Rib Fractures. Please see Surgical Treatment – Surgical Stabilisation of Rib Fractures (SSRF) to determine which patients may be suitable for such referral. See Referral for SSRF for information about how to make such a referral.

Prior to making the referral, you must ensure that the patient has had a CT scan of the thorax with 3D reconstruction showing the chest wall injuries. You must also ensure that the relevant CT scans and reconstruction images have been made available on the PACS service at the RSCH.

The information required is: Mandatory fields have a red asterisk *

- Patient name *
- Gender *
- Patient date of birth OR Approximate Age
- NHS Number
- Local Hospital Number *
- Referring Hospital *
- Referring Speciality *
- Ward *
- Referring Consultant *
- Name of referrer *
- E-mail address of referrer *
- Contact number (mobile/bleep) *
- Mechanism of Injury *
- Progress since admission *
- Current status (HR, BP, RR, sats, being ventilated?) *
- Mobility (choice from a list of options) *
- Analgesia (oral, PCA, LA plasters, thoracic epidural, block) *
- Reason for referral (choice from a list of options) *
- Other comments

Confirmation that all CTs and CT 3D reconstruction images are available for review *

14.7 Appendix 7 – Version Changes

Version	Changes
1.1	• 7.2.8.4 Referral for SSRF. The pathways for this have been agreed and described. • Update local links • Appendix 6 and 7 added
1.1	• 7.2.2, 7.2.5 and Appendices 3 to 5 changed to reflect a change at the Adult MTC to using the STUMBL Score for risk assessment and guidance for analgesia.