

<b>Midlands Critical Care, Trauma and Burns Networks</b>
<b>Midlands Trauma Networks</b>
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### Version control and record of amendments

Date	Amendment	Lead
Oct 2018	<p>Made to draft version:</p> <ul style="list-style-type: none"> <li>• Editing of text body for accuracy and syntax</li> <li>• Reference to intercostal drain insertion network guideline</li> <li>• Clearer inclusion of BOAST 15 guidance</li> <li>• Revision of overall management plan: <ul style="list-style-type: none"> <li>• Life ± limb threatening transfer moved to be generic consideration &amp; made more clear when to decide</li> <li>• Minor errors in RAS scores shown within guidance corrected so there is no overlap / gaps in sequence</li> <li>• Advice to refer to rib fixation indications for range of RAS scores</li> <li>• Addition of planned review with MTC approximately 24h after injury for all major injury group patients remaining within trauma unit</li> <li>• Addition of additional consultation regarding rib fixation if worsening condition or poor pain control</li> <li>• Addition of consultation with thoracic surgeon if persistent air leak &gt; 48h</li> </ul> </li> <li>• Amendment to analgesia regime to include paediatric advice</li> <li>• Recommendation of common fixation decision-making tool</li> </ul>	J.Hulme, R.Steyn

## 1. Key messages:

- Multiple rib fractures are often associated with an underlying pulmonary contusion
- Patients with multiple fractured ribs are at risk of respiratory compromise if they are unable to cough and clear secretions due to pain
- Respiratory compromise may not be seen for 2-3 days after injury
- The risk of harm increases with increasing numbers of fractured ribs
- More than 3 fractured ribs should be considered a high risk injury
- Early CT scanning with contrast should be immediately available to define chest wall injuries and 3D surface rendered images should be available within 24 hours if rib fractures are identified
- Early effective pain management is necessary to reduce the risk of respiratory complications and facilitate rehabilitation and recovery
- Management is recommended as per the 'Chest Trauma management plan' (Appendix 1)
- Patients should be assessed using the 'Rib Fracture Score' assessment tool (Appendix 2)
- Pain management should be as per the 'Chest Trauma analgesia table' (Appendix 3)
- Decision making regarding rib fixation should use a commonly used decision-making tool (Appendix 4)
- Monitor the patient in an appropriate clinical setting according to injury / risk assessment score
- An acute Pain Team [or equivalent] should be available for any patients with fractured ribs
- Physiotherapy input is indicated for more serious injuries and should be sought early
- Patients with serious blunt chest trauma remaining in a trauma unit or local emergency hospital after consultation with a major trauma centre should have an early follow up assessment to establish progress and evaluate operative vs conservative management plan

## 2. Aims of Treatment

To provide appropriate effective timely and targeted pain management to prevent deterioration in patient condition/function and optimise respiratory function.

## 3. Background

Chest wall injury is extremely common following blunt trauma. It varies in severity from minor bruising or an isolated rib fracture to severe crush injuries of both hemithoraces leading to respiratory compromise.

Multiple rib fractures are often associated with an underlying pulmonary contusion, which may not be immediately apparent on an initial chest X-ray. Fractures of the lower ribs may be associated with diaphragmatic tears and spleen or liver injuries. Injuries to upper ribs are associated with injuries to adjacent great vessels. This is especially true of a first rib fracture, which requires a significant amount of force to break and indicates a major energy transfer. A fracture of the first rib should prompt a careful search for other injuries.

Note that the rib cage and sternum provide a significant amount of stability to the thoracic spine. Severe disruption of this 'fourth column' may convert what would otherwise be a stable thoracic spine fracture into an unstable one.

#### **4. Flail Chest**

A flail chest occurs when a segment of the thoracic cage is injured and moves freely in comparison from the rest of the chest wall. A segment of the chest wall that is flail is unable to contribute effectively to lung expansion. Large flail segments will involve a much greater proportion of the chest wall and may extend bilaterally or involve the sternum. In these cases the disruption of normal pulmonary mechanics may be large enough to require early mechanical ventilation.

Pain following major trauma poses many challenges for clinicians. Timely repeated thorough assessment and a multidisciplinary approach to pain management is essential. Evidence suggests a failure to manage acute pain effectively in the early stages increases the incidence of early and late complications and of chronic pain.

The impact of initial chest injury can worsen 2-3 days post injury and is likely to be worsened by inadequate pain control. It is vital that patients with thoracic injuries be monitored closely; any deterioration requires rapid escalation of treatment.

#### **5. Intercostal Drain Insertion**

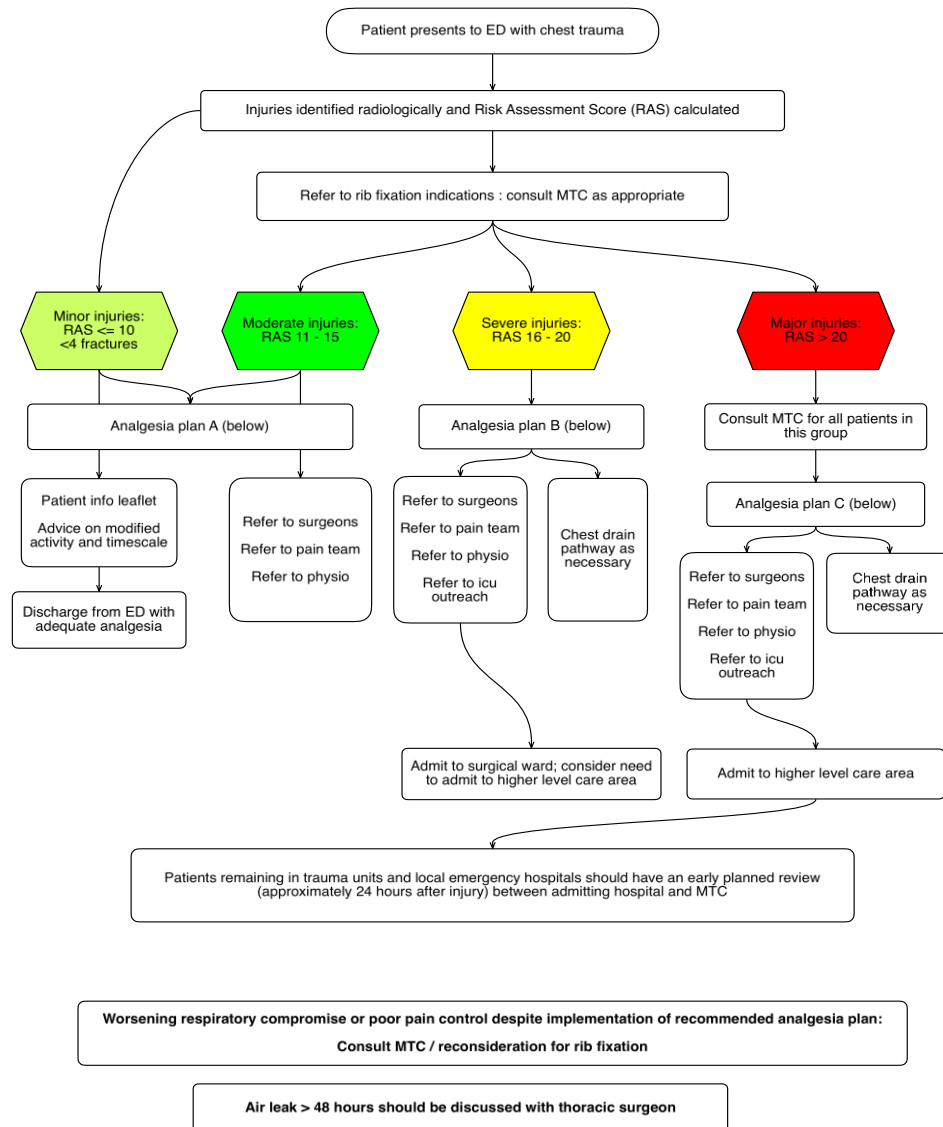
Some patients with chest injuries may need intercostal drains. Indications and technique are described within the tri-network guideline available the Midlands Trauma Network website.

#### **6. Surgical Fixation**

The indications for rib fixation extend beyond producing structural fixation of the thoracic cage to enhancing sputum expectoration and effectiveness of respiratory interventions to minimise respiratory morbidity. There are no universally agreed criteria for fixation although current guidelines do emphasise severity of injury, physiological effects and as a strategy for pain management.

## Appendix 1 – Chest Trauma management plan

Patients presenting to trauma units and local emergency hospitals : if there is there an immediate threat to life transfer to a major trauma centre



## Appendix 2 – Rib Fracture Score Assessment Tool

RISK FACTOR	PATIENT	RANGE	SCORE
AGE	11 - 20	1	
	21 - 30	2	
	31 - 40	3	
	41 - 50	4	
	51 - 60	5	
	61 - 70	6	
	71 - 80	7	
	81 - 90	8	
	91 - 100	9	
NUMBER OF RIB FRACTURES	3 points per fractured rib		
CHRONIC LUNG DISEASE	YES	5	
PRE-INJURY ANTICOAGULANT USE	YES	4	
OXYGEN SATURATION LEVELS	95 - 100%	0	
	90- 94%	2	
	85 - 89%	4	
	80 - 84%	6	
	75 - 79%	8	
	70- 74%	10	
		TOTAL =	

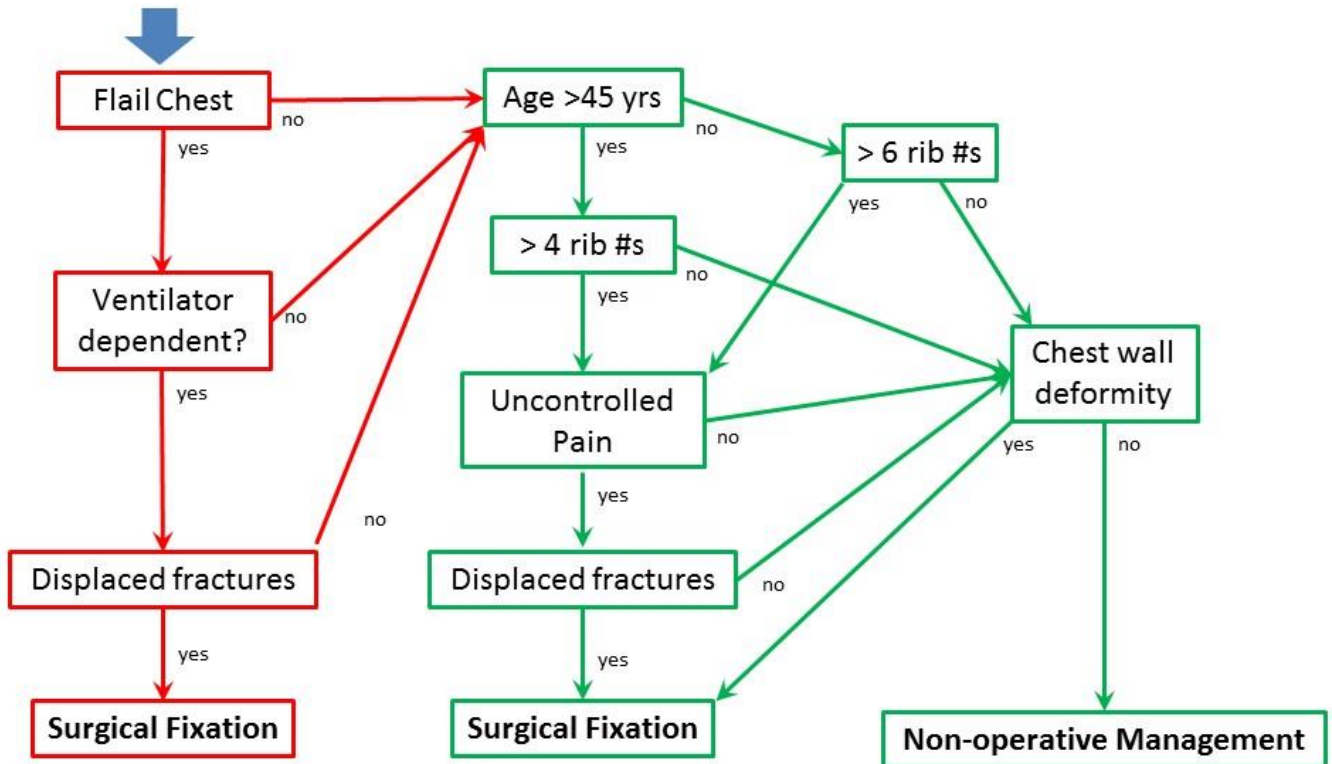
### Appendix 3 – Chest Trauma analgesia table

*A: Risk Assessment Score $\leq$ 15	** B: Risk Assessment Score 16-20	*** C: Risk Assessment Score $\geq$ 20
Mild to Moderate Pain	Severe Pain	Severe pain with high risk features eg advanced age, complications or inadequate pain control  These patients should normally be transferred to a higher-level care area. Early intubation & ventilation may be needed. Consider need to transfer to a major trauma centre due to expected significant morbidity and mortality
Regular Paracetamol 1g 4-6 hourly IV/PO (start in ED)  Initial dose should preferably be IV loading dose	Multimodal simple analgesia: Regular paracetamol & NSAIDs if possible	Multimodal simple analgesia: Regular paracetamol & NSAIDs if possible
Regular NSAIDs if not contraindicated ie Ibuprofen 400mg 6-8 hourly PO (start in ED)	Morphine 0.1 mg/kg slow IV titration to effect, repeated as necessary (started in ED)	Unless over riding reasons not to, provide early regional analgesia via catheter insertion and continuous bupivacaine, levobupivacaine or ropivacaine infusion depending on local policy and expertise:  Thoracic epidural (multiple bilateral fractures) Paravertebral or serratus anterior block (multiple unilateral fractures) Intercostal blocks (few unilateral fractures)
$\pm$ Codeine 30-60 mg PO 4-6 hourly OR Tramadol 50-100 mg PO/IV 4-6 hourly  (not in children: consultant paediatric team) $\pm$ Oral Morphine 10-20 mg PRN for breakthrough pain	Opioid Patient Controlled Analgesia (PCA) as soon as possible in ED	
Whenever opioids are prescribed, consider prescribing PRN antiemetic & regular laxatives		
When clinically stabilise, severe pain is under control & able to take oral medications convert to oral analgesia as guided by pain team:  Multimodal simple analgesia AND Oral Morphine (Oramorph 10mg/5ml liquid) 10–20 mg 4 hourly or Oral Morphine MR (Zomorph) 20–40 mg BD (typical dose)		

## Appendix 4 – Rib fixation indications

This guideline is not wholly inclusive of the patients who may be considered or recommended for rib fixation surgery but is recommended as a common core decision making tool to assist discussions between local emergency hospital / trauma units and major trauma centre.

## Sheffield Rib Fracture Management Guideline

**Flail Guideline****Isolated Rib Fracture Guideline**

References:

Battle CE, Hutchings H, Lovett S, et al. Predicting outcomes after blunt chest wall trauma: development and external validation of a new prognostic model. *Critical Care*. 2014;18(3):R98. Doi:10.1186/cc13873

British Orthopaedic Association Standards for Trauma (BOASTs): BOAST 15: The management of blunt chest wall trauma. 2016

Sarani B. Inpatient management of traumatic rib fractures. [www.uptodate.com](http://www.uptodate.com). Accessed 20 Nov 2017