

Chest Wall Trauma (Blunt) - For In-Patient Use - Full Clinical Guideline - Derby Only

Reference no.: CG-SURGEN/2023/004

Introduction (adapted from Reference 1)

- Patients aged 65 years or older with 3 or more rib fractures fall into the high-risk group;
- The true incidence of bony injury to the chest wall may be underreported as up to 50% of rib fractures are undetected on plain CXR
- Mortality and morbidity from blunt chest wall trauma is often under appreciated (up to 22%, often due to delayed respiratory complications)
- Incidence of pulmonary complications is reported to be as high as 36% in isolated rib fracture patients aged 65 years or older and 20% in patients of all ages
- 35% of older patients (> 65 years) with isolated chest wall trauma required critical care management. (ICU/HDU/SDU)
- The mean hospital length of stay in older patients with isolated chest wall trauma is reported to be 14 days

Aim and Scope

- To ensure all patients receive optimal management to decrease the likelihood of secondary complications and achieve the shortest possible mean hospital length of stay.

Areas for Use

- This guideline is for the use on all wards for inpatient management and care. For details regarding management of blunt chest wall injury in the ED, please refer to the separate guidelines that can be found on intranet guidelines.

Abbreviations

APT	Acute Pain Team
CCOT	Critical Care Outreach Team
CXR	Chest X Ray
DME	Department of Medicine for the Elderly
ED	Emergency Department
FiO ₂	Fraction of inspired Oxygen
GCS	Glasgow Coma Scale
ICU/HDU	Intensive Care Unit/High Dependency Unit
IPPV	Intermittent Positive Pressure Ventilation
ISS	Injury Severity Score
MDT	Multidisciplinary team
MEWS	Modified Early Warning Score
MTC	Major Trauma Centre
NEWS	National Early Warning Score
NIV	Non-Invasive Ventilation
NSAID	Non steroidal anti-inflammatory drugs
PaCO ₂	Partial Pressure of arterial Carbon Dioxide
PaO ₂	Partial Pressure of arterial Oxygen
QMC	Queens Medical Centre, Nottingham University Hospitals NHS Foundation Trust
SAU	Surgical Admissions Unit
SDU	Step-Down Unit

TARN Trauma Audit & Research Network
TU Trauma Unit

Definitions

Rib Fractures: Injuries to the upper ribs are potentially associated with injuries to adjacent great vessels. A fracture of the 1st rib requires a significant amount of force to break and indicates a major energy transfer; it should prompt a careful search for such injuries. Fractures to the lower ribs may be associated with diaphragmatic tears, visceral injuries to spleen and/or liver.

Flail Chest: occurs when two or more adjacent ribs are fractured in two or more places resulting in a free or floating 'flail' segment of the chest wall. As a result the floating segment moves paradoxically with spontaneous ventilation (moving in during inhalation, and out during exhalation). This leads a significant decrease in vital capacity and functional residual capacity. It causes significant pain and is almost always associated with a lung injury such as lung contusion.

Lung contusion: is an injury to the lung parenchyma with loss of blood vessel integrity resulting in intra-parenchymal and alveolar haemorrhage. The end result is severe endothelial injury at the alveolar-capillary membrane which usually develops over the first 24 hours, but may be absent on initial presentation of the patient with blunt chest wall trauma in the ED. Lung contusion is often associated with rib fractures and the extent is proportional to the severity of the thoracic injury sustained

Risk Factors for poor outcomes in blunt chest wall trauma ⁽¹⁾

- Age 65 years or older
- Three or more rib fractured
- High/Mid chest wall rib fractures
- Flail Segments
- Chronic lung disease
- Onset of pneumonia post-injury
- Oxygen saturation < 90% in ED on air on presentation
- PaO₂/FiO₂ ratio < 33 on admission [*note:* normal is 12kPa : 0.21 ~ 57]
- Body Mass Index > 25kg/m²

Principles for Managing inpatients with Chest Wall injury

- Often involves patients with complex underlying comorbidities and frailty
- Multidisciplinary medical and other health care professional input is required to optimise outcome
 - Surgical/Medical team
 - Nursing teams familiar with complexity of pt and managing pts with rib fractures
 - Acute Pain
 - Department of Medicine for the Elderly
 - Physiotherapy
 - Critical Care Outreach team
 - +/- Orthopaedics/Respiratory
 - Major Trauma Rehab coordinator
- The majority of patients will be admitted under the general surgical team for acute pain control and management of underlying organ damage, to a surgical ward. This will be determined by the referral pathway from the Emergency Department.
 - SAU
 - Ward 308 /current cohort ward for inpatients with rib fracture
 - SDU
 - ICU/HDU
- Some patients may be admitted for specific acute medical management eg CCU/Stroke to a specialist medical ward

Inpatient Multidisciplinary Management

All patients admitted to the above wards should be assessed by the appropriate members of the MDT as contacted/informed by the Medical/Surgical/Nursing team.

The purpose of the cohort ward is to improve familiarity of all staff with the often complex needs of these patients, and initiate timely MDT input.

These referrals should be completed within 24 hrs of admission.

Multidisciplinary Team	Responsibilities	Contact
Surgical/Medical Team	<ul style="list-style-type: none"> - Forms the parent team responsible for the care during the admission - Ensure referral to the appropriate members of the MDT 	Emergency surgery SpR
Ward Nursing team	<ul style="list-style-type: none"> - Wards obs, analgesia delivery as per rib # order set, mobilise, sit out, refer to non-medical MDT members below within 24 hrs of admission 	
Acute Pain	<ul style="list-style-type: none"> - Review of all rib # inpatients - Liaise with SDU consultant as required - Mon – Friday 8-4 - Out of hours for pain advice +/- review – on-call anaesthetic team 	Pain team bleep 3078, 3365,1283 Anaes SpR. 2076 White board referral 07788 388426
Physiotherapy	<ul style="list-style-type: none"> - Incentive spirometry, mobilisation 	
CCOT	<ul style="list-style-type: none"> - Review of all rib # inpatients - Liaise with anaesthetic/SDU/ICU team as required - Every day 8am -9pm 	Bleep 3340 Out of hours message 07788388471
DME	<ul style="list-style-type: none"> - Medical review of patients above the age of 70 	Extramed referral
Orthopaedic	<ul style="list-style-type: none"> - Assessment of other ortho injuries +/- surgery. Development of rib fixation pathway 	On call Ortho SpR
Respiratory	<ul style="list-style-type: none"> - Refer for advice for severe chronic lung disease 	On call respiratory SpR
Major Trauma Rehab Coordinator	<ul style="list-style-type: none"> - Coordinate MDT input for patients <70 yrs. Facilitate discharge and appropriate follow up. 	Extramed white board referral under services

Analgesia (See Appendix 1 for order sets)

- Early effective analgesia must be established (defined as the ability to deep breathe and cough effectively)
- All patients should receive multi-modal analgesia with Paracetamol and NSAIDS unless contraindicated +/- opioids. (**Prescribe the appropriate 'Rib fracture' order set on EPMA for inpatients**)
- Patients with multiple rib fractures may require intravenous morphine as initial rescue followed by oral opioids and 'rescue' morphine subcutaneously as per the trust guideline 'Pain Management Guidelines for Adults' available on Koha.
- A regional anaesthetic technique (Erector spinae block/ Epidural) should be considered (contraindications such as coagulation disorders, platelet deficit, fractured thoracic vertebrae or suspected major haemorrhage may affect choice of technique) to:
 - Patients with ≥ 3 or more rib fractures
 - Patients aged ≥ 65 years
 - Patients with 1-2 rib fractures when:
 - Parenteral morphine fails to diminish pain scores to < 5 out of 10 or severe pain on coughing
 - There is an ineffective cough (unable to clear secretions) due to pain
 - Where the patient develops a lower respiratory tract infection indicated by the presence of pyrexia, productive sputum +/- CXR changes
- Where limb fractures co-exist with 3 or more rib fractures, epidural analgesia using standard infusions (0.1% plain Bupivacaine with 2mcg Fentanyl); can be combined with receiving parenteral morphine if patient is placed on SDU or ICU/HDU

References:

- 1) Battle C, Hutchings H and Evans PA (2013) Blunt Chest Wall Trauma: a review; *Trauma* 15(2): 156-175
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- 3) Pressley CM, Fry WR, Philp AS et al. (2012) Predicting outcome of patients with chest wall injury; *Am J Surg* 204(6): 910-913
- 4) Chen J, Jeremitsky E, Philp F et al. (2014) A chest trauma scoring system to predict outcomes *Surgery* 156(4): 988-933
- 5) Battle C, Hutchings H, Lovett S, et al. (2014) Predicting outcomes after blunt chest wall trauma: development and external validation of a new prognostic model; *Critical Care* 18; R98
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- 7) Forward DP, Ollivere BJ, et al. (2016) Current concepts in rib fracture fixation *Bone & Joint* 5(5): 2-7
- 8) Coary R, Skerritt C, Carey A, et al. (2020) New horizons in rib fracture management in the older adult. *Age and Ageing*; 49: 161–167

Documentation Controls

Development of Guideline:	Dr Paul Marval
Consultation with:	Full MDT: Acute pain/anaesthesia/critical care, DME, Gen surg, ward 308 (cohort ward),
Approved By:	Trauma review group members Surgical Division - 04/12/2020 Reviewed with no change – Authors and Pain Team
Review Date:	December 2026
Key Contact:	Dr Paul Marval

APPENDIX 1**ORDER SET 1: Rib Fractures – Under 75 and/or eGFR >60**

First Line (ward based interventions)

Regular

- Paracetamol PO 1g QDS
- Regular opiate - Codeine, tramadol or oramorph
- Ibuprofen PO 400mg TDS (For 7 days)
- Omeprazole PO 20mg OM (For 7 days) with NSAIDS
- Laxative – Docusate and senna
- Lidocaine patch 1-2 plasters OD for 5 days. *Apply plaster(s) to skin over fracture site and leave for 12 hours. Remove plaster(s) after 12 hours. Ensure 12 hours elapse before applying the next plaster(s) (Not to be used with bupivacaine infusions)*

PRN

- Paracetamol IV 1g QDS PRN
- Morphine Sulphate SC 5-10mg as per protocol (APP)
- Oramorph 10-20 mg prn APP
- Ondansetron PO 4mg 8 hourly PRN
- Ondansetron IV 4mg 8 hourly PRN
- Prochloroperazine Buc 3mg 8 hourly PRN

Second Line (Anaesthesia/Step down/Acute pain team only)

- Erector spinae catheter (ESC) bupivacaine infusion
- Fentanyl/Bupivacaine Epidural
- (Morphine PCA)

ORDER SET 2: Rib Fractures – Over 75 and/or eGFR <60

First Line (ward based interventions)

Regular

- Paracetamol PO 1g QDS
- Morphine Sulphate PO 5mg QDS
- Laxatives – docusate and senna
- Lidocaine patch 1-2 plasters OD for 5 days. *Apply plaster(s) to skin over fracture site and leave for 12 hours. Remove plaster(s) after 12 hours. Ensure 12 hours elapse before applying the next plaster(s) (Not to be used with bupivacaine infusions)*

PRN

- Paracetamol IV 1g QDS PRN
- Morphine Sulphate 2.5 – 5 mg SC as per protocol
- Ondansetron PO 4mg 8 hourly PRN
- Prochloroperazine Buc 3mg 8 hourly PRN

Second Line (Anaesthesia/Step down/Acute Pain team)

- Erector spinae catheter (ESC) bupivacaine infusion
- Fentanyl/Bupivacaine Epidural
- (Morphine PCA)