POLICY UNDER REVIEW

Please note that this policy is under review. It does, however, remain current Trust policy subject to any recent legislative changes, national policy instruction (NHS or Department of Health), or Trust Board decision. For guidance, please contact the Author/Owner.

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<td>Dr Ben Warrick, Clinical Lead Major</td>
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<tr>
<td>responsible (author/owner):</td>
<td>Trauma</td>
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Adult Chest Wall Injury Pathway

V2.0

May 2018
Blunt chest wall injury requiring admission. 
Trauma Call if appropriate. Strongly consider Trauma CT. 
Patients with multiple injuries or Chest Injury Score>30 should be discussed with TTL in Derriford ED 
Patients meeting criteria for cardiothoracic referral (see SOP) should be discussed with Cardiothoracic SpR.

**BOX 1**

Needs epidural or chest drain 
Chest injury score >20

Refer to Critical Care. 
Analgesia guided by Chest Injury Score (see SOP) 
Target: epidural in situ within 3hrs diagnosis – urgent pain team/anaesthetic referral. 
Recovery to await epidural, or if accepted by Critical Care and no bed.

**None of Box 1**

Multiple injuries 
Chest injury score 11-20

Consider Critical Care admission. 
Analgesia guided by Chest Injury Score (see SOP) 
Admit to CDU for first night. 
Tertiary survey from ED Consultant on CDU. 
Then admit Wellington if not needed to be on specialty ward. If need for multi-specialty involvement, decision-making should be at Registrar level or above.

**None of Box 1**

Isolated chest wall injuries. 
Chest injury score <11

Discharge or admit to CDU for first night, then admit Wellington. Analgesia as per chest score (see SOP).

---

**ALL PATIENTS ON CDU MUST HAVE TERTIARY SURVEY FROM ED CONSULTANT BEFORE LEAVING**

All patients going to Critical Care must have tertiary survey from senior doctor on admission. 
If no Critical Care bed available, patients are to go to Recovery until one found. It should not delay advanced analgesia such as epidural or PCA. 
Patients should go to Recovery to await epidural. 
If no Wellington bed available, patient to remain on CDU until one is found. Not for admission to general medical wards. 
Contact Site Co-ordinator on admission to CDU to facilitate anticipated need for Wellington bed. 
Complete admission checklist on SOP – refer to acute pain service, physiotherapy, Critical Care Outreach, Major Trauma Co-ordinator, general surgery, general medicine. Does patient meet cardiothoracic referral criteria? 
Treatment Escalation Plan to be documented before leaving ED. 
All injuries identified must have plan from appropriate team (Registrar or above) made at point of admission to ICU or discharge from CDU, with named Consultant for each injury. 
Inpatients newly identified to have chest wall injury whilst in hospital should be referred to the Major Trauma Co-ordinator (Mon-Fri) or Critical Care Outreach out of hours for assistance in implementing pathway measures.

- Observations – Regular observations including SpO₂ & pain scores
- Out of hours contact the On-call Physiotherapist through switchboard.
- Discharge criteria for rib fractures – Pain controlled on oral analgesia and any nerve block completely worn off
- Patients stepping down from Critical Care with blunt chest injuries, and not requiring care on specialist ward, must go to Wellington.
- Patients on Wellington should get daily review from: Medical Consultant (Resp during week, resp/endo at weekend), general surgery (once unless further trauma support for medical team requested) (SpR or above), Major Trauma coordinator (Mon-Fri), Critical Care Outreach, Acute Pain Service (Mon-Fri)/1st-on anaesthetist (Sat/Sun)(see Appendix 4 for contact details)
# Table of Contents

## Summary
1. Introduction .................................................................................................................. 6
2. Purpose of this Policy/Procedure .................................................................................. 6
3. Scope ............................................................................................................................. 6
4. Definitions / Glossary .................................................................................................... 6
5. Ownership and Responsibilities .................................................................................... 6
   5.8. Role of the Managers ............................................................................................. 7
   5.9. Role of the Major Trauma Review Group/Committee .............................................. 7
   5.10. Role of Individual Staff .......................................................................................... 7
6. Standards and Practice .................................................................................................... 7
7. Dissemination and Implementation ................................................................................. 13
8. Monitoring compliance and effectiveness ....................................................................... 13
9. Updating and Review ....................................................................................................... 13
10. Equality and Diversity .................................................................................................... 14

Appendix 1. Governance Information ................................................................................. 15
Appendix 2. Initial Equality Impact Assessment Form ....................................................... 17
Appendix 3. Chest Injury Score .......................................................................................... 20
Appendix 4. Adult Chest Wall Injury Pathway– RCH inpatient use .................................... 21
Appendix 5. Mobile Guideline for Adult Inpatient Rib Fracture Care Pathway ................. 25
1. **Introduction**
   1.1. This is a pathway designed to guide the assessment, admission, management and rehabilitation of adult patients who present to Royal Cornwall Hospital with a chest wall injury.
   1.2. This version supersedes any previous versions of this document.

2. **Purpose of this Policy/Procedure**
   2.1. Clinical Pathways aim to improve the quality, continuity and co-ordination of care for the patient across different disciplines and sectors.
   2.2. This pathway has been written to:
       - To ensure that patients within RCH sustaining a chest wall injury receive the correct care in the correct timeframe.
       - Improve the quality, continuity and coordination of care for the patient by a multidisciplinary team and reduce the risks associated with poor chest wall injury care.

3. **Scope**
   3.1. This pathway relates to the following staff who may be involved in the assessment and delivery of chest wall injury care:
       - Medical staff
       - Registered nurses
       - Physiotherapists & Occupational Therapists
       - Support workers

4. **Definitions / Glossary**
   TARN (Trauma, Audit and Research Network); NIV (Non-invasive ventilation)

5. **Ownership and Responsibilities**
   5.1. **Lead executive**
       - Medical Director
   5.2. **Responsible reporting group**
       - Quality Assurance Group
       - Major Trauma Review Group
   5.3. **Lead professional**
       - Clinical Lead for Major Trauma
   5.4. **Divisional management team**
       - ED Directorate
   5.5. **Line-managers**
       - Management Lead for Major Trauma
   5.6. **Specialist staff**
       - Medical and Nursing Staff in Emergency Medicine
       - Critical Care
5.7. Anaesthesia
- Acute Medicine
- Respiratory Medicine
- General Surgery
- Acute Pain Team

5.8. Role of the Managers
Line managers are responsible for:
- Ensuring this guideline is disseminated to the affected staff and reviewed at the appropriate time.

5.9. Role of the Major Trauma Review Group/Committee
The Major Trauma Review Group/Committee is responsible for:
- Review of this guideline and monitoring of its implementation.

5.10. Role of Individual Staff
All staff members are responsible for:
- Ensuring they have read this guideline and refer to it when managing patients with chest wall injury.

6. Standards and Practice
6.1. Background
In RCH we see one to two patients with significant thoracic trauma every week (TARN & local audit data). Rare in children, thoracic trauma is seen in all adult ages equally. Falls from LOW height (<2m) are a major cause in all ages but particularly the elderly, RTCs cause injuries of the under-65s. A third of thoracic injuries from low falls are classified major trauma (Injury Severity Score >15) whereas 60% from RTCs and 80% from high falls (>2m) are major trauma. Rib fractures are the most common injuries, with pneumothorax, lung contusions and haemothorax commonly associated. Sternal fractures are less common.

6.1.1. Although most patients with chest wall trauma present via the Emergency Department (ED) with a clear history of trauma, many patients with serious chest wall injuries are not diagnosed at the time of initial presentation. These patients are frequently frail and elderly who may present via the medical take after an episode of collapse and the diagnosis of chest wall injury can be delayed, by which time complications such as hypoxia and pneumonia are already established.

6.1.2. Patients with thoracic trauma are at risk of serious deterioration over the first 72 hours. Early identification, risk stratification and management with chest physiotherapy, regional anaesthesia with epidurals or nerve catheters, and/or PCA will provide a better patient journey, and reduce morbidity and mortality. Although early discharge on conventional analgesia may be considered inappropriate under this guideline, length of stay can be reduced by avoidance of complications.
• Underlying lung disease e.g. COPD
• Elderly age
• Rib fractures seen on CXR
• Bilateral rib fractures or flail chest seen on CT
• Consolidation (contusion or pneumonia) on CXR, especially if bilateral

6.2. Imaging
6.2.1. Less than 50% of pulmonary contusions are apparent on admission, compared to 92% at 24hrs (Pape et al 2000). Initial CXR misses rib fractures >50% of the time (Livingston et al 2008) and under-reports most of the rest.

6.2.2. All patients with suspected thoracic trauma should have a CXR as a minimum.

6.2.3. Consider CT in patients who have multiple risk factors for mortality (above) [expert opinion], or one of:
• An increased likelihood of bleeding e.g. on anticoagulants, known bleeding tendency, haemopoetic disorder
• Multiple co-morbidities
• Patients in whom clinical examination may have low utility in determining injuries e.g. elderly, low or altered GCS
• Severe Mechanism of injury (fall >2m, RTC, etc.)
• The RCH Trauma Team Activation criteria should be followed.
• The RCH Trauma CT guideline should be followed: consider whole-body (Trauma) CT in all patients meeting criteria for Trauma Team activation.
• Whole-body (Trauma) CT, or thorax-abdomen-pelvis CT, should be considered if there is suspicion of other injuries, especially intra-abdominal injury. Remember that chest wall injuries can be very painful and mask an associated spinal injury.
• CT scans performed for thoracic injury should have spinal reconstructions to exclude concomitant injury.

6.3. Chest Injury Score
All patients should have a chest injury score (see Appendix 3) calculated.

6.4. Transfer of patients for CT scan
The RCH ‘Safe Transfer of Patients’ policy should be adhered to.

6.5. Discussion with Major Trauma Centre – automatic acceptance
Any patient who has a chest injury score >30, or multiple injuries, especially with an injury severity score (ISS) known or suspected to be >15, should be considered for transfer to the Major Trauma Centre (MTC) at Derriford.

• Contact the Major Trauma Consultant on 01752 245066 for
advice.

- Any patient whose injuries cannot be managed at RCH will be automatically accepted for transfer to the MTC.

6.5.1. Cardiothoracic surgery is not available at RCH. Patients with massive haemothorax, tracheobronchial injury, mediastinal or great vessel injury are transferred to the MTC.

6.5.2. Patients meeting the referral criteria (see Appendix 4) are discussed with the cardiothoracic registrar via Derriford Switchboard.

6.6. **Transfer of Patients to Derriford Hospital**

The RCH ‘Safe Transfer of Patients’ policy should be adhered to.

6.7. **Admission of patients**

Admit any patient with significant chest wall trauma with one or more of the following features:
- Chest injury score >10
- Frailty and/or social isolation
- Significant co-morbidities especially underlying pulmonary disease
- Pain not controlled with conventional analgesia
- Clinical evidence of respiratory compromise
- Radiographical evidence of flail chest (may require CT to determine early before lung consolidation-collapse)
- Multiple injuries
- Other condition requiring admission

6.7.1. Patients with any of the following should be referred to Critical Care:
- Chest drain
- Need for truncal regional anaesthesia/epidural
- Chest injury score >20

6.7.2. Patients with multiple injuries should also be considered for Critical Care admission.
- Admit to the most appropriate ward for the most severe injury.

6.7.3. Patients with isolated chest wall injury and no requirement for a chest drain or epidural should be admitted to CDU. Advise site coordinator of need to identify a Wellington bed for the following day.

6.7.4. Refer patients to Critical Care Outreach team (bleep via switchboard).

6.7.5. Refer patients to the Acute Pain Team as per Appendix 4 and ensure ‘Major Trauma’ analgesia bundle is prescribed on EPMA as indicated by chest injury score (Appendix 3).

6.7.6. Ensure the Major Trauma Coordinator is aware of the patient by
using the SwiftPlus “Major Trauma” flag or entering the Major Trauma alert on PAS, and by phoning Major Trauma phone on 07917167942 – leave a voicemail if out of hours.

6.7.7. Refer to a respiratory Physiotherapist for assessment once they have received appropriate analgesia. During normal working hours contact the Physiotherapy team. After hours, the Doctor admitting the patient should record in the notes that physiotherapy assessment is indicated and that they should be contacted the next morning. Out of hours (between 1700 and 0830) call in the on-call Physiotherapist via switchboard for patients who have secretion retention or lobar collapse with respiratory failure.

6.7.8. Refer patient to on-call general surgery for review once on ward, and ongoing trauma support for medical team if needed. All open ‘surgical’ chest drains out with ICU and ED should be sited by general surgical team, and they are first port of call for trouble shooting.

6.7.9. Complete a Treatment Escalation Plan (TEP form) as appropriate. A ceiling of care should be established before the patient leaves ED, with senior Critical Care and ED input in circumstances where prognosis is likely to be poor, and institution of invasive regional anaesthesia is likely to be inappropriate.

6.7.10 Complete ‘Adult Chest Wall Injury Pathway – RCH inpatient use’ (Appendix 4) checklist and ensure that this is available in the patient medical notes, with reviewing clinician/date/time clearly documented.

6.8. **Tertiary survey**
The tertiary survey is a top-to-toe systematic assessment to identify all injuries.

- All patients admitted with a chest wall injury must have the need for a tertiary survey determined at the first post admission ward round.
- Those on CDU should have it performed by an ED senior.
- Those on ICU by an ICU senior.
- If a patient has not received one, contact the Major Trauma Coordinator via Major Trauma phone on 07917167942. (See also Tertiary Survey Policy)

6.9. **Observation & Treatment**
All of these patients should receive constant or frequent (initially 1-2 hourly) SpO2 monitoring for 24-72 hours.

- Pain scores must be recorded with all observations, no less than 4-hourly.
- For patients with advanced analgesia (e.g. epidural, PCA), observation regime as per hospital protocol.
6.9.1. Beneficial treatments [Parris 2007; Duggal et al 2013; low grade evidence / expert opinion] are:
- Aggressive approach to analgesia (regular + prn Analgesics. PCA and epidural; refer to Acute Pain Team)
- Early diagnosis of deterioration (specify regular obs & SpO2 monitoring)
- Epidural or other regional anaesthesia / analgesia (talk to Critical Care / Anaesthetics)
- Chest physiotherapy for secretion retention or lung collapse (contact on-call Physiotherapist if needed out of hours)
- Humidified air / oxygen
- Non-invasive or invasive ventilatory support in selected patients (contact NIV Physio in working hours or Critical Care Outreach)

6.9.2. Constipation is a common consequence of chest wall injury. Regular laxatives should be prescribed, and can be omitted if not needed.

6.10. Regional anaesthesia in chest wall injury patients (epidurals or nerve catheters)
- Indicated for consideration in all patients with chest injury score>20 or where aggressive regular analgesia and PCA is ineffective in score 10-20.
- Catheter techniques are the option of choice due to the need for extended analgesia. Single shot blocks should only be used as last resort, ensuring longer duration analgesia is planned.
- Target: The epidural or catheter should be in situ by 3 hours from diagnosis of chest wall injury

6.10.1 Epidural procedure:
- It is the responsibility of the anaesthetic team to site epidurals or other regional anaesthesia. After Pain Team and Outreach review to identify need for such a procedure, referral should be made to the Consultant Anaesthetist covering Trauma in Theatre 6, or the Senior Anaesthetic Trainee at night as per Appendix 4. The patient should be booked on the Trauma theatre list as ‘Urgent’ (<3hrs).
- It is up to the anaesthetising individual to check they are happy to site the catheter, according to standard contraindications to epidural anaesthesia. Patients should not be sent for until the anaesthetist has confirmed they are happy to perform the procedure, and should not leave ED until secondary survey is complete and documented, CT report is available, and the ED component of the ‘Adult Chest Injury Pathway – RCH inpatient use’ (Appendix 4) is complete.
- If there are correct skills and personnel available,
consideration should be given to performing the epidural in ED Resus. In this case it should be loaded up here and the patient monitored with the anaesthetist present as if fully anaesthetised, bringing them up to ICU once bed available, or to recovery as below.

- Once referral has been accepted by the anaesthetic team, the patient should be transferred up to recovery to await the procedure. The Theatre 6 Anaesthetic Consultant will identify the next available slot with an anaesthetist in Trelawney Theatres.

- The epidural may take place in an anaesthetic room, or in recovery. The procedure does not require an ODP, just a pair of appropriately capable hands. The anaesthetist is responsible for consenting the patient however they wish. Documented verbal consent is default, as with labour epidurals. Patients do not require a theatre booklet.

- Epidural (or nerve catheter) sited and loaded at clinician discretion. Suggest loading of 20ml 0.125% Levobupivacaine with 2mcg/ml Fentanyl for epidural, but can increase if analgesia not complete with 20 minutes.

- Patient monitored as per RCHT clinical pain guidelines.

- Patient then transferred to ICU bed and pump is started.

- If ICU bed not yet available, patient is to remain in recovery until it is ready, under the care of the ICU team.

6.11. Rehabilitation
A rehabilitation prescription should be started within 72 hours of admission. Contact the Major Trauma Coordinator for further advice.

- The in-patient Physiotherapists will refer appropriately to Occupational Therapy, out-patient Physiotherapy or the appropriate Community team if on-going rehabilitation is required on discharge from hospital.

6.12. Discharge
Patients need to have been seen to be stable and managing on oral analgesia for 24hrs before discharge. If a patient has been dependent on a nerve block, then it must have entirely worn off before they go.

6.13. References

7. Dissemination and Implementation
• Publish to internet guidelines
• Provide link in ED handbook

8. Monitoring compliance and effectiveness
This part must provide information on the processes and methodology for monitoring compliance with, and effectiveness of, the policy/procedure using the table below.

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<td>Frequency</td>
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9. Updating and Review
Review 6 months after publication or substantial amendment and every 3 years thereafter.
10. Equality and Diversity

10.1 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.

10.2 Royal Cornwall Hospitals NHS Trust is committed to a Policy of Equal Opportunities in employment. The aim of this policy is to ensure that no job applicant or employee receives less favourable treatment because of their race, colour, nationality, ethnic or national origin, or on the grounds of their age, gender, gender reassignment, marital status, domestic circumstances, disability, HIV status, sexual orientation, religion, belief, political affiliation or trade union membership, social or employment status or is disadvantaged by conditions or requirements which are not justified by the job to be done. This policy concerns all aspects of employment for existing staff and potential employees.

10.3 Equality Impact Assessment

The Initial Equality Impact Assessment Screening Form is in Appendix 2. Governance Information table is in Appendix 1.
## Appendix 1. Governance Information

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### Links to key external standards

http://www.peninsulatraumanetwork.nhs.uk/download.cfm?doc=docm93jjjm4n1307.pdf&ver=1560

### Related Documents:

### Training Need Identified?

No

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<td>New policy</td>
<td>Dr Ben Warrick, Consultant Anaesthetist</td>
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<tr>
<td>09.05.18</td>
<td>V2.0</td>
<td>Appendix 4 Insertion of ‘Adult Chest Wall Pathway – RCH inpatient use’ to update standard of operation (SOP) pathway document and replace previous SOP within Appendix 2 of V1.1. Appendix 4 ratified and minuted by Major Trauma Review Group (January 2018). Appendix 3 Mobile Guideline link inserted Updated Governance and IEIA forms</td>
<td>Dr Ben Warrick Clinical Lead – Major Trauma</td>
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This document is to be retained for 10 years from the date of expiry.

This document is only valid on the day of printing

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Appendix 2. Initial Equality Impact Assessment Form

This assessment will need to be completed in stages to allow for adequate consultation with the relevant groups.

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<tr>
<td>Name of individual completing assessment: Mark Jadav</td>
<td>Telephone: 01872 252452</td>
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1. **Policy Aim**

   **Who is the strategy / policy / proposal / service function aimed at?**

   This is a pathway designed to guide the assessment, admission, management and rehabilitation of adult patients who present to Royal Cornwall Hospital with a chest wall injury.

2. **Policy Objectives**

   **This pathway has been written to:**
   - To ensure that patients within RCH sustaining a chest wall injury receive the correct care in the correct timeframe.
   - Improve the quality, continuity and coordination of care for the patient by a multidisciplinary team and reduce the risks associated with poor chest wall injury care.

3. **Policy – intended Outcomes**

   - To ensure that patients within RCH sustaining a chest wall injury receive the correct care in the correct timeframe.
   - Improve the quality, continuity and coordination of care for the patient by a multidisciplinary team and reduce the risks associated with poor chest wall injury care.

4. **How will you measure the outcome?**

   As per audit schedule within the policy.

5. **Who is intended to benefit from the policy?**

   Patients with chest wall injury

6a. **Who did you consult with?**

   - Workforce
   - Patients
   - Local groups
   - External organisations
   - Other

   ✓

   b). **Please identify the groups who have been consulted about this procedure.**

   Please record specific names of groups

   Representatives from ED, Critical Care, General Surgery, Respiratory Medicine, Acute Medicine, Orthogeriatrics and Pain Management. Clinical Directors Group. Medical Director & Director of Nursing.

7. **What was the outcome of the consultation?**

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:

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

**Rationale for Assessment / Existing Evidence**

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.  

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

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

Signature of policy developer / lead manager / director

Mark Jadav  
24th May 2018

Names and signatures of members carrying out the Screening Assessment

1. Mark Jadav
2. Human Rights, Equality & Inclusion Lead
Keep one copy and send a copy to the Human Rights, Equality and Inclusion Lead
c/o Royal Cornwall Hospitals NHS Trust, Human Resources Department, Knowledge Spa,
Truro, Cornwall, TR1 3HD

This EIA will not be uploaded to the Trust website without the signature of the
Human Rights, Equality & Inclusion Lead.

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

Signed  Mark Jadav
Date  24th May 2018
Appendix 3. Chest Injury Score

- **Age:** +1 for each 10 years over age 10
- **Ribs:** +3 for each individual fracture
- **Chronic lung disease:** +5 if present
- **Anti-coagulant or anti-platelet use:** +4 (exclude Aspirin 75mg)
- **Oxygen saturation on air (see ambulance chart):** +2 for each 5% decrease below 95%
Appendix 4. Adult Chest Wall Injury Pathway—RCH inpatient use

Rib fractures are a significant yet often unappreciated injury. 30-day mortality at RCHT is higher than emergency laparotomy. Rib fractures and pneumonia in combination are associated with a 30% 30-day mortality. Median ICU length of stay is 3 days, with median hospital length of stay 6 days.1 Thorough assessment and aggressive early care as suggested here should help reduce the mortality and morbidity for these patients.

This document acts as an SOP, gold standard pathway and audit tool to enable performance improvement. To be stored in patient notes. Please complete in full, and sign, time and date each entry.

Clinical course
- Rib fractures imply a damaging transfer of energy from object to patient. Whilst patients with rib fractures may appear well at first, they often have significant underlying lung injury, whether this is haemo/pneumothorax or pulmonary contusion. They may also have associated injuries outside the chest (eg. spinal fractures).
- Pulmonary contusions evolve over the first 48 - 72hrs, leading to deterioration in respiratory function.
- Inadequate analgesia leads to decreased tidal volumes, atelectasis and pneumonia2
- Damage to the structure of the chest wall (eg. flail segment) affects respiratory mechanics and increases the work of breathing
- Patients struggle to cough and clear secretions, leading to sputum retention and pneumonia.

At presentation in ED (to be completed by ED doctor at review):

1. Trauma response and identification of injuries:

Trauma call - Trauma call is indicated if: Serious mechanism of injury, abnormal physiology or anatomical features of major trauma, or if high risk group (elderly, pregnant)

Type of trauma call: Hospital ☐  ED ☐  None ☐
Date:  Time:  Signature:

Imaging - CXR has poor sensitivity for significant and associated chest injury. All patients requiring admission for rib fractures should have at least a CT chest. Full Trauma CT will often be more clinically appropriate. Threshold for full body scan should decrease with age.

Imaging:  Trauma CT ☐  Chest CT ☐  CXR ☐
Date:  Time:  Print name:  Signature:
2. Risk stratification:
Calculate and document the Chest Injury Score. This should be used to stratify risk of complications and hence further care.

Chest injury score =
Date: ____________________________    Time: ____________________________
Signature: ____________________________

Multiple injuries or Chest Injury Score>30 should be discussed with Trauma Team Leader at Denniford ED for consideration of secondary transfer.

Chest injury score:
- Age: +1 for each 10 years over age 10
- Rib fractures: +3 for each individual fracture (i.e., 2 fractures on 1 rib = +6)
- Chronic lung disease: +5 if present (not smoking alone)
- Anti-coagulant or anti-platelet use: +4 (exclude Aspirin 75mg)
- Oxygen saturation on air (see ambulance chart): +2 for each 5% decrease below 95%

3. Analgesia
ED Doctor to prescribe EPMA Major Trauma Chest Injury bundle: ☐
Date: ____________________________    Time: ____________________________
Signature: ____________________________

Acute pain control as needed in ED as per bundle
Then ongoing analgesia stratified by chest injury score:

0 - 10 Conservative
Regular oral analgesia. Consider for home discharge if pain sufficiently managed.
PCA if pain persistent despite optimisation of oral analgesia.
Date: ____________________________    Time: ____________________________
Signature: ____________________________

11 - 20 Progressive
Regular oral analgesia. PCA. If pain persistent despite appropriate use of PCA, consider epidural or other appropriate regional technique.
Date: ____________________________    Time: ____________________________
Signature: ____________________________

21 - 30 Aggressive
Regular oral analgesia. Refer for epidural. Refer to Critical Care.
(To remain in ED Resus or go to Recovery whilst awaiting bed).
Date: ____________________________    Time: ____________________________
Signature: ____________________________

>31 Emergent
Regular oral analgesia. Refer for epidural. Refer to Critical Care.
(To remain in ED Resus or go to Recovery whilst awaiting bed).
Date: ____________________________    Time: ____________________________
Signature: ____________________________

Patients should be able to cough and take a deep breath. If they cannot, consider escalating their analgesia. If epidural contraindicated, consider regional nerve catheter.

4. Escalation plan (to be completed prior to leaving ED)
Full escalation ☐  TEP completed in notes ☐
Date: ____________________________    Time: ____________________________
Print name: ____________________________    Signature: ____________________________

CHA3545 V1 02/2018
Review due: 02/2018

2 of 4
5. Referrals to be made (at presentation):

Date: __________________________ Time: __________________________ Signature: __________________________

☐ Discuss with the Acute Pain Service:
  - Mon - Fri: Acute Pain Team (0830-1630 Mon-Fri) via bleep 3233. 1st-on call anaesthetist (1630-2000 bleep via Switch), Senior Anaesthetic Trainee (2000-0800) via Switch
  - Sat - Sun / Bank holidays: 1st-on call anaesthetist (1300-2000, bleep via Switch), Senior Anaesthetic Trainee (2000-0800, 0800-1300, bleep via Switch)
  - If unable to reach above anaesthetic trainees out of hours via bleep - suggest phoning CEPOD or Trauma theatre to discuss patient.

☐ Place a pain referral on Maxims
☐ Refer to Critical Care Outreach (bleep via Switchboard)
☐ Refer to Major Trauma Co-ordinator at RCHT (via phone or on PAS / Swiftplus)
  - Major Trauma phone (leave voicemail out of hours): 07917 167942
☐ Refer for chest physiotherapy if indicated
  - Referral route will depend on destination ward and time of day - contact On-call physio if out-of-hours.
  - Urgent referrals only overnight - non urgent to be referred next day if overnight admission.

6. Destination of care and management of other injuries and acute pain control.

<table>
<thead>
<tr>
<th>Chest injury score &lt;11</th>
<th>Chest injury score 11-20</th>
<th>Chest injury score &gt;21</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discharge or admit to CDU for first night and transfer to Wellington post tertiary survey and pain review.</td>
<td>Admit to CDU for first night and admit to Wellington ward post tertiary survey and pain review if specialty care not indicated. Consider Critical Care admission.</td>
<td>Refer to Critical Care for admission if score &gt;20, chest drain, regional anaesthesia or multiple injuries. Transfer to recovery unit to await advanced regional technique or if accepted by Critical Care and bed unavailable. Urgent pain / anaesthetic review indicated.</td>
</tr>
</tbody>
</table>

Destination post ED: CDU ☐ Wellington ☐ Critical Care ☐ Other ☐

Date: __________________________ Time: __________________________ Signature: __________________________

Patients not to go to wards other than those specified on pathway unless indicated for specialist care which must be documented in medical notes. Patients must not go straight to Wellington ward without CDU admission for tertiary survey and acute pain control.

NEXT MORNING (TO BE COMPLETED BY CDU OR ICU DOCTOR)

7. Tertiary survey to be completed and documented (on formal tertiary survey paperwork) either by ED consultant prior to leaving CDU, or senior ICU doctor on admission to Critical Care.

Date: __________________________ Time: __________________________ Print name: __________________________ Signature: __________________________

CHA3949 V1 02/2018 Review due: 02/2018
8. Other injuries identified? Make all referrals and get a plan at point of review in ED. All injuries should have a documented plan from either Registrar or Consultant from the relevant specialty.

- Orthopaedics - Limb or pelvic fractures and wounds
- General Surgery - Intra-abdominal injury and all open 'surgical' chest drains outside ED/ICU
- Urology - Urinary or renal tract injury
- Neurosurgeons - Head or spinal injury
- Thoracics - Cardiac or lung injury
- Max fax or ENT - Facial or soft tissue neck injuries

9. Refer to General Surgical Team for shared care and to make thoracics referral if indicated:
Thoracics referral criteria:
- Fail chest
- 3 or more consecutive ribs involved
- Significant co-morbidities
- Chest injury score > 21
- Complications eg. open injury or significant haemo - or pneumothorax
- Difficult analgesic management
- Failure to wean from ventilatory support
- Discuss anyone if in doubt

Thoracics SpR in working hours, Cardiothoracics out of hours.

☐ Date: Time:
Print name: Signature:

10. Refer to Respiratory Medicine for shared care
☐ Date: Time:
Signature: Print name:

11. Refer to Physiotherapy if not already done
☐ Date: Time:
Signature: Print name:

12. Inform Site Co-ordinator/Bed Manager of Impending need for Wellington Bed
☐ Date: Time:
Signature: Print name:

13. Check that all previous steps complete on pathway form. Complete any missed steps and consider DATIX if required.

☐ Date: Time:
Print name: Signature:

Any queries or suggestions for this document? Please email Ben Warrick, Consultant in Anaesthesia and Pre-Hospital Care, RCHT Lead for Major Trauma. Email: benwarrick@nhs.net

References:
Appendix 5. Mobile Guideline for Adult Inpatient Rib Fracture Care Pathway

Clinical course

- Rib fractures imply a damaging transfer of energy from object to patient. Whilst patients with rib fractures may appear well at first, they often have significant underlying lung injury, whether this is haemo/pneumothorax or pulmonary contusion. They may also have associated injuries outside the chest (e.g. spinal fractures).
- Pulmonary contusions evolve over the first 48-72hrs, leading to deterioration in respiratory function.
- Inadequate analgesia leads to decreased tidal volumes, atelectasis and pneumonia.
- Damage to the structure of the chest wall (e.g. flail segment) affects respiratory mechanics and increases the work of breathing.
- Patients struggle to cough and clear secretions, leading to sputum retention and pneumonia.
- Patients are at high risk of tiring and succumbing to respiratory failure if not properly managed.

Important Interventions

- Identification and early stratification of injury severity
- Identification and management of all other injuries
- Early analgesia stratified according to injury severity with regular evaluation of effectiveness. This may require advanced analgesia with PCA, epidural or other regional anaesthetic.
- Chest physiotherapy
- Oxygenation or ventilatory support if required
- Vigilance for and management of pneumonia
- Rib fixation in selected patients (see Thoracics referral criteria)

PATIENTS MUST BE ABLE TO TAKE A DEEP BREATH AND COUGH EFFECTIVELY

Is a trauma call indicated?

Serious mechanism of injury with abnormal physiology or anatomical features of major trauma
Or
High risk group (elderly / pregnant)

Imaging obtained?

In view of the poor sensitivity of CXR for significant and associated chest injury, all patients requiring admission for rib fractures should have at least a CT chest. However, a full Trauma CT will often be more clinically appropriate. The threshold for a full body scan should decrease with age.

Risk Stratification

Calculate and document the Chest Injury Score following imaging. This should be used to stratify analgesia, risk of complications and hence further care.

Multiple injuries or Chest Injury Score>30 should be discussed with Trauma Team Leader at Derriford ED for consideration of secondary transfer.

Chest Injury Score

- Age: +1 for each 10 years over age 10
- Rib fractures: +3 for each individual fracture (i.e. 2 fractures on 1 rib = +6)
- Chronic lung disease: +5 if present
- Anti-coagulant or anti-platelet use: +4 (exclude Aspirin 75mg)
- Oxygen saturation on air (see ambulance chart): +2 for each 5% decrease below 95%

Analgesia


Patients should be able to cough and take a deep breath. If they cannot, consider escalating their analgesia.
If epidural contraindicated, consider alternative regional nerve catheter technique.

0-10 Conservative
Regular oral analgesia. Consider for home discharge if pain sufficiently managed. PCA if pain persistent despite optimisation of oral analgesia.

11-20 Progressive
Regular oral analgesia. PCA. If pain persistent despite appropriate use of PCA, consider epidural or other appropriate regional technique.

21-30 Aggressive
Regular oral analgesia. Refer for epidural. Refer to Critical Care. (To remain in ED Resus or go to Recovery whilst awaiting bed).

>31 Emergent
Regular oral analgesia. Refer for epidural. Refer to Critical Care. (To remain in ED Resus or go to Recovery whilst awaiting bed).
On presentation to ED

- Calculate and document Chest Injury Score
- Prescribe ‘Major Trauma’ analgesia chest injury bundle on EPMA according to Chest Injury Score
- Refer to Acute Pain Service:
  - Mon-Fri: Acute Pain Team (0830-1630 Mon-Fri) via bleep 3233. 1st on call anaesthetist (1630-2000 bleep via Switch), Senior Anaesthetic Trainee (2000-0800 via Switch)
  - Sat-Sun/Bank holidays: 1st on call anaesthetist (1300-2000, bleep via Switch), Senior Anaesthetic Trainee (2000-0800, 0800-1300, bleep via Switch)
  - If unable to reach above anaesthetic trainees out of hours via bleep – suggest phoning CEPOD or Trauma theatre to discuss patient
  - Place an inpatient Pain referral on Maxims
- Refer to Critical Care Outreach (bleep via Switchboard)
- Refer to Major Trauma Co-ordinator at RCHT via phone 07917167942 (leave voicemail out of hours) or via PAS/Switpluse
- Refer for chest physiotherapy
  - Referral route will depend on destination ward and time of day – contact On-call Physio if out-of-hours. Urgent referrals for secretion retention or lung collapse only overnight – non-urgent to be referred the next day if overnight admission.
- Escalation plan for all patients before leaving ED (in conjunction with Critical Care Outreach/SAT)
Next morning (Prior to leaving CDU or as part of ICU morning review)

- Tertiary survey to be completed and documented (on formal tertiary paperwork) and plan for all other injuries (senior ED/ICU doctor)
- Refer to Physio if not already done (via destination ward)
- Refer to General Surgery on-call team for shared care and to make Thoracics referral
- Refer to Thoracics as per referral criteria (Thoracics SpR in working hours, Cardiothoracic SpR out of hours via Derriford Switchboard)
- Refer to Medicine (Respiratory team for ICU discharges) for shared care
- Inform Site Coordinator of impending Wellington admission
- In terms of rib fractures, patients may be classed as medically fit for discharge when established on oral analgesia (+/- oral antibiotics) and any nerve blockade has resolved.
- Ensure printed ‘Adult Chest Wall Injury Pathway – RCH inpatient use’ (CHA3949) completed and available in patient notes