Rib Fractures

Study protocol –October 2025

Study Advisory Group

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Clinical Coordinators

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Non-clinical staff

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Introduction

Rib fractures are a very common clinical problem that frequently require hospital admission. They can cause immediate adverse effects on ventilation due to damage or distortion to the thorax. Displaced fractures can injure the lung and intercostal vessels, resulting in pneumothorax, with or without haemothorax. Early complications require prompt detection and management. In the hours and days post fracture, pleural contusions, with or without the consequences of inadequate analgesia, can exacerbate ventilatory failure. Pain from rib fractures limits chest wall movement resulting in reduced tidal volumes and the inability to effectively cough with associated sputum retention and associated lung collapse due to failed clearance. The retention of sputum can also increase the likelihood of pneumonia and accounts for much of the delayed mortality after chest wall trauma [1]. Therefore, appropriate pain management is of high clinical importance for patients with rib fracture to prevent subsequent complications [2].

Elderly individuals who have fallen from standing now make up most trauma patients. Thoracic injuries, including rib fractures, are the second most common injury in this population [3,4]. Elderly patients who sustain blunt chest trauma with rib fractures have twice the mortality and thoracic morbidity of younger patients with similar injuries. For each additional rib fracture in the elderly, mortality increases by 19% and the risk of pneumonia by 27% [5]. Pneumonia occurs in around a third patients aged over 65 yrs of age after rib fractures and is associated with an increased likelihood of death; in some studies, elderly patients were reported to have double the morbidity and mortality of patients under the age of 65 years [1]. Despite these outcomes, rib fracture patients, and in particular elderly patients, often receive less structured care compared to those with other serious conditions like hip fractures or emergency laparotomy. There are often delays in delivering basic interventions such as timely and effective analgesia or physiotherapy. Referrals to specialist teams, including pain services, anaesthetics, and physiotherapy, are inconsistent or delayed [6]. Access to regional analgesia such as nerve blocks varies widely, and interventions for elderly patients are often overlooked. Additionally, care is fragmented and determined by local or historical practices, rather than clinical need.

This work will complement the current national service evaluation being over seen by the National Trauma Research and Innovation Collaborative (NaTRIC), Management and outcomes of rib fractures in the UK (MORF-UK): a national service evaluation [7]. By reviewing and addressing the current shortcomings in care we can raise awareness of the high risks associated with rib fractures, especially among the elderly. Our study, along with the MORF-UK study, will be able to inform the development of national guidelines for the management of rib fractures, stimulate further research, and ultimately lead to improved outcomes and reduced preventable deaths.

References

1. Williams A, Bigham C & Marchbank A. Anaesthetic and surgical management of rib fractures. BJA Education. 2020; 10: 332-340

2. Beard L, Holt B, Snelson C, Parcha C, Smith FG & Veenith T. Analgesia of Patients with Multiple Rib Fractures in Critical Care: A Survey of Healthcare Professionals in the UK. Indian J Crit Care Med. 2020 Mar;24(3):184-189. doi: 10.5005/jp-journals-10071-23375. PMID: 32435097; PMCID: PMC7225763.

3. Kehoe A, Smith JE, Edwards A, Yates D, Lecky F. The changing face of major trauma in the UK. Emerg Med J 2015; 32: 911-915.

4. Birse F, Williams H, Shipway D*, et al.* Blunt chest trauma in the elderly: an expert practice review *Emergency Medicine Journal* 2020;**37:**73-78

5. Bulger EM, Arneson MA, Mock CN, Jurkovich GJ. Rib fractures in the elderly. J Trauma. 2000 ; 48: 1040-1046.

6. Battle C, Pelo C, Hsu J, Driscoll T, Whitbeck S, White T, Webb M. Expert consensus guidance on respiratory physiotherapy and rehabilitation of patients with rib fractures: An international, multidisciplinary e-Delphi study. J Trauma Acute Care Surg. 2023; 94: 578-583.

7. Bradley RA, Baker E, Caponi N, Cole E, Marsden M, Melia G, Naeem S, Vulliamy P, Battle C. Management and outcomes of rib fractures in the UK: a national service evaluation. J Surg Protoc Res Method. 2025; 2025: snaf001.

Guidelines and standards

There are multiple hospital guidelines advising on the management of rib fractures but no UK national guidelines.

Aim and objectives

Aim

To identify areas for improvement in the quality of care for patients presenting to hospital with one or more rib fracture.

Objectives

Organisational issues

- Protocols, standards and guidelines for the management of rib fractures
- Analgesia including access to nerve blocks and out of hours arrangements
- Acute pain teams
- Access to rib fracture stabilisation
- Physiotherapy input
- Frailty teams
- Breathing and motility assessment
- Falls/fracture prevention follow-up
- Audit of standards/guidelines

Clinical issues

Data can be collected from the clinical questionnaire, the reviewer assessment form and clinician survey.

To explore and investigate areas for improvement in the following areas:

- Initial observations and investigations
- Pain management pre-hospital, in ED and following admission
    - Timeliness of analgesia
    - Type and appropriateness of analgesia
- Risk stratification
    - Use of STUMBL (Battle) scores
    - Sequential Clinical Assessment of Respiratory Function (SCARF) scores
    - RibScore
    - Clinical Frailty scores
- Ventilatory support
- Specialist rehabilitation input
    - Mobilisation
- Rib fracture stabilisation
- Complications
    - Readmissions
- Falls/fracture prevention follow-up

Methods

Inclusion criteria

- Patients aged 18 and older who were admitted to hospital as an emergency between 01/01/2025 and 30/06/2025 with one or more rib fracture. ICD10 coding will be used to identify patients.

Exclusions

- Rib fractures related to fall or injury during admission.
- Rib fractures related to in-hospital CPR.

Data sampling

- Up to 6 patients per hospital will be selected for inclusion in the study.

Participating providers of healthcare

- Data will be collected from all hospitals in England, Wales, Northern Ireland and Jersey, which admit and treat patients with rib fractures as an emergency.

Incidence and prevalence

Table 1: HES data: Number of admissions for relevant ICD10 codes related to rib fractures

ICD10	Description	Number of admissions 22/23	Median LOS	Mean age	Emergency admissions
S223	**Fracture of rib**	2,788	2	73	2,711
S224	**Multiple fractures of ribs**	12,603	5	73	12,278
S225	**Flail chest**	1,489	7	72	1,448

Table 2: HES data: Number of admissions for 'other' associated chest injuries

ICD10	Description	Number of admissions 22/23	Median LOS	Mean age	Emergency admissions
S220	**Fracture of thoracic vertebra**	4,776	5	71	4,504
S221	**Multiple fractures of thoracic spine**	1,695	7	66	1,592
S222	**Fracture of sternum**	1,340	4	73	1,301
S228	**Fracture of other parts of bony thorax**	16	5	70	12
S229	**Fracture of bony thorax, part unspecified**	7	11	76	7

Study promotion

- Prior to data collection, NCEPOD will contact all hospitals providing care to this group of patients.
- The study will also be promoted via NCEPOD Local Reporters (sending the study poster on to the relevant departments), the relevant Colleges and Associations, and any relevant patient groups and third sector organisations.

Study method test

- The data collection methods and tools will be tested to ensure they are robust to collect sufficient information to address the study objectives before the full study is undertaken.

Methods of data collection

There will be five main methods of collecting data for the study:

1. Patient and carer views will be collected through an online anonymous survey. We will work with Local Reporters, study contacts and relevant charities to encourage involvement.

2. Clinician views will be collected through an anonymous online survey for healthcare professionals who treat patients with rib fractures. This questionnaire will be targeted at, but not limited to, clinicians and allied health professionals working in hospitals who treat patients with rib fractures.

3. An organisational questionnaire will be sent to all hospitals that treat patients with rib fractures.

4. Clinical data collection – retrospective data collection: For a sample of patients, a questionnaire will be sent to the clinician responsible for the patient at the time of discharge (clinician questionnaire).

5. Case note review: Copies of the relevant case notes related to the admission with the rib fracture for the sample of patients selected above will be collected for detailed peer review.

Further details on the methods of each method of data collection are given below.

1. Anonymous online patient/carer survey

The survey will gather data on the patient/ carer views of the services available to them and their experience of rib fracture management. It will also collect information about support services and information they were provided. The data will not be linked to any other aspects of data collection.

2.Anonymous online clinician survey

The survey will gather data on clinician views of the services available for them to provide care to patients who require rib fracture management. It will also collect information around confidence, competency, training and support available when providing care to this group of patients. The data will not be linked to any other aspects of data collection.

3. Organisational questionnaire

Data will be collected at a hospital level and will collect information around decision making tools, the organisation of services, protocols and pathways of care, networks of care, transfer arrangements, staffing arrangements, the availability of information, training, and audit and data collection. An organisational questionnaire will be sent to all participating hospitals via the online questionnaire system.

4. Clinical data collection – retrospective data collection

Patient identification

The Local Reporter will be asked to complete the patient identification spreadsheet with the details of all patients who were admitted with one or more rib fractures.

Table 3: Included ICD10 codes

ICD10	Description
S223	**Fracture of rib**
S224	**Multiple fractures of ribs**
S225	**Flail chest**

The data fields requested will include NHS number, hospital number, date of birth, sex, ethnicity, date of admission, source of admission, ICD10 codes, OPCS codes, critical care

admission, discharge destination, date of discharge, clinician code and specialty for the consultant responsible at the time of discharge.

Clinician questionnaires

A clinician questionnaire will be used to collect clinical data that may not be found in the case notes for this study. It will have key questions about the care this patient received before, during and after their presentation with one or more rib fracture. Clinician questionnaires are completed by the relevant consultant responsible for the patient during their admission via the NCEPOD online questionnaire portal.

Questionnaires will be sent to the NCEPOD Local Reporter for dissemination via the online questionnaire system. A reminder will be sent at six weeks and ten weeks where the data is outstanding. Up to 6 patients per hospital will be sampled for inclusion in the study.

5. Case note review

Photocopied/scanned/downloaded case notes related to the admission with the rib fracture will be requested for each patient included in the study sample.

Notes requested will include:

- Ambulance patient report form
- Emergency department notes
- Medical, nursing and other notes from arrival/admission to discharge
- Imaging reports
- Operation notes (if applicable)
- Observation charts (including fluid balance charts)
- Consent forms (should be in medical notes but would state specifically)
- Investigation results
- Drug charts
- Anaesthetic charts and notes (if applicable)
- Discharge summary
- Follow up letters/clinic notes

30-day readmissions related to the rib fracture admission

- All above for readmission(s)

Upon receipt at NCEPOD the case notes will be redacted if not already done so prior to sending.

Reviewer assessment form

A multidisciplinary group of reviewers (detailed below) will be recruited to assess the case notes and questionnaires and provide their opinion on what went well and what did not go well during the process of care via the reviewer assessment form.

Table 4 summarises the data sources for significant points along the pathway.

Area of enquiry	Method of data collection	Confidentiality
Acute care	Case notes, clinician questionnaire, organisational questionnaire	Identifiable
	Online clinician survey	Anonymous

Table 5 Anticipated sample sizes of each type of data collected:

Data source	Target number
Organisational questionnaire	~200
Clinician questionnaires	Up to a maximum of 6 per hospital
Case note review	Up to a maximum of 6 per hospital
Clinician online survey (non-identifiable)	300
Patient survey	Up to 100

Reviewers

A multidisciplinary group of reviewers will be recruited to assess the case notes and questionnaires and provide their opinion on what went well and what did not go well during the admission.

- Acute physicians
- Advanced nurse practitioner/ advanced clinical practitioners
- Anaesthetists
- Cardiothoracic surgeons
- Critical care physicians
- Emergency medicine clinicians
- General nurses
- General physicians
- General surgeons
- Physiotherapists
- Radiologists
- Respiratory physicians
- Resident doctors

An advertisement will be sent to NCEPOD Local Reporters to disseminate throughout the relevant departments. It will also be placed on the NCEPOD website and social media channels. Successful applicants will be asked to attend a training day where they will each assess cases to ensure consistent assessment. A number of case review meeting dates will be arranged, and each reviewer will then be asked to attend a minimum of a further 4 meetings. NCEPOD staff will ensure there is a mix of specialties at each meeting from across the UK. Each meeting will be chaired by an NCEPOD clinical coordinator who will lead discussion around the cases under review. The meetings will either be held in person in the NCEPOD office, or over Microsoft Teams with secure and temporary access to the case notes for review (not downloadable or printable by the case reviewer).

Confidentiality and data protection

All electronic data are held in password protected files and all paper documents in locked filing cabinets. As soon as possible after receipt of data NCEPOD will encrypt electronic identifiers and anonymise paper documents. Section 251 approval has been obtained to perform this study without the use of patient consent in England and Wales.

Ethical approval will not be required to undertake this study. Duty of candour is covered by the NCEPOD Cause for Concern policy, which ensure that any cases reviewed as less that satisfactory and as a cause for concern are discussed and action taken where required.

Analysis and Review of Data

Towards the end of the study the study advisory group and case note reviewers will be invited to attend a meeting where the initial data analysis will be presented and discussed with them, for comment and suggestion on whether further analysis is required and the potential study recommendations.

The NCEPOD steering group, NCEPOD clinical and non-clinical coordinators, study advisory group and case note reviewers will be sent two copies of the draft report and the draft recommendations for their comment.

Study outputs

On completion of the study a report will be published and widely disseminated to all stakeholders to encourage local quality improvement (QI). In addition to the report, supporting tools will be made available including:

- A summary report and summary sheet
- A patient information leaflet
- Infographics
- The recommendation checklist
- An audit tool
- A slide set
- A guide for commissioners
- Quality improvement tools
- Useful links

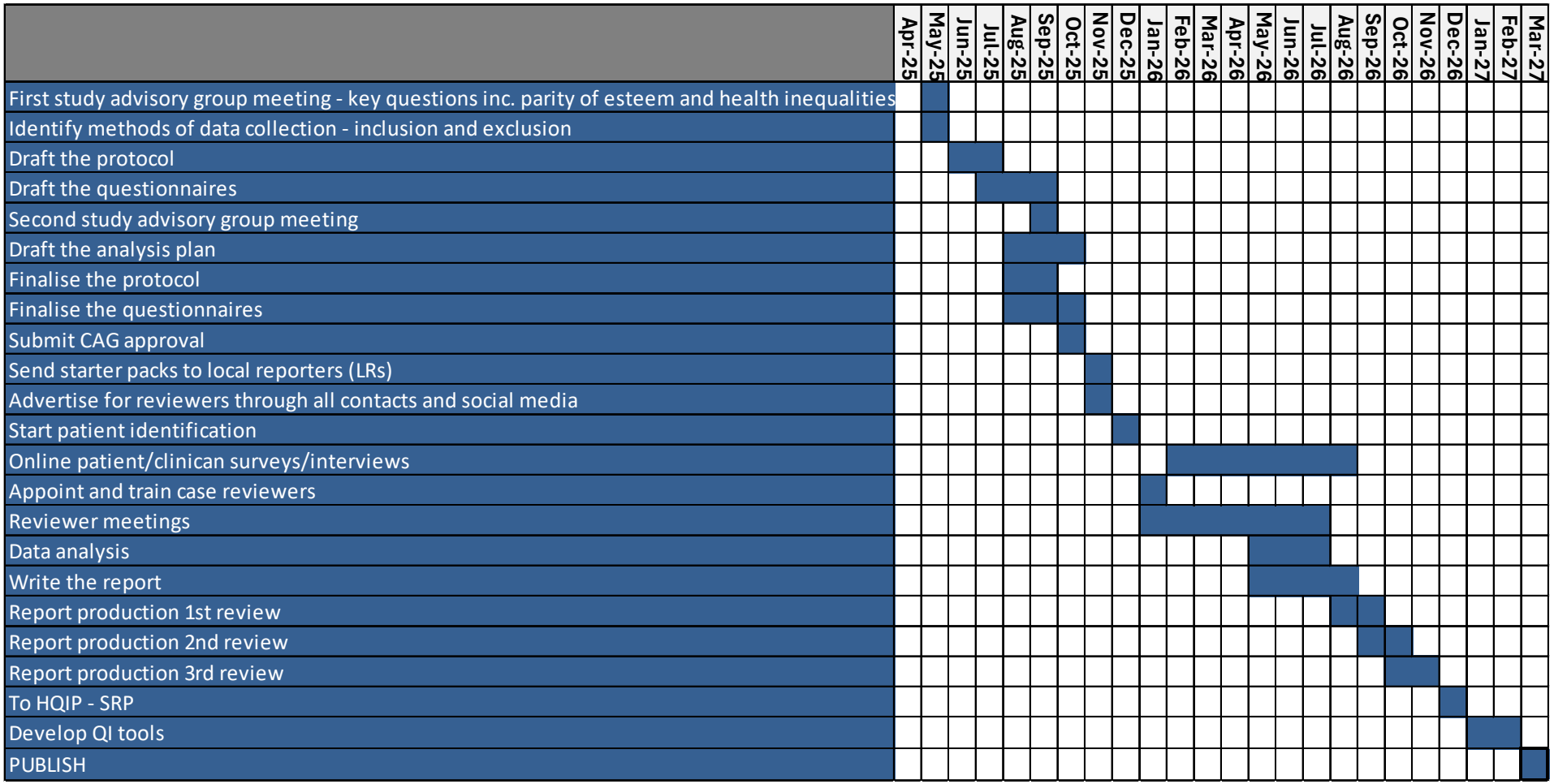
Examples of good practice will be shared, and additional QI tools will be developed where appropriate. Key messages from the report will be shared via social media.

Following publication, the report findings will be shared at national and local conferences, study days and other events; and papers submitted to journal for consideration for publication.

Data sharing

Post publication of the study there is the potential to share anonymised data sets with interested parties working in the same field. This will be undertaken following a strict process and will ensure the data does not become identifiable in their nature due to small numbers.

Timescale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First study advisory group meeting - key questions inc. parity of esteem and health inequalities
Identify methods of data collection - inclusion and exclusion
Draft the protocol
Draft the questionnaires
Second study advisory group meeting
Draft the analysis plan
Finalise the protocol
Finalise the questionnaires
Submit CAG approval
Send starter packs to local reporters (LRs)
Advertise for reviewers through all contacts and social media
Start patient identification
Online patient/clinican surveys/interviews
Appoint and train case reviewers
Reviewer meetings
Data analysis
Write the report
Report production 1st review
Report production 2nd review
Report production 3rd review
To HQIP - SRP
Develop QI tools
PUBLISH