Northern Trauma Network
Elderly Trauma Regional Working Group

The Elderly Trauma Regional Working Group has been meeting every 2 months since August 2016. Various strands of work have been undertaken by different subgroups addressing specific aspects of elderly major trauma. At the meeting of this working group held on 7th December 2016 the group focused on thoracic trauma and the following guidance was agreed:-

This guidance relates specifically to low impact mechanism trauma in the elderly (age range arbitrarily agreed as ≥65 years for the purposes of the group) ie usually a fall from standing

1. The group recommends that all patients who complain of chest pain or have chest tenderness post injury undergo thoracic imaging (CXR as a minimum). (Appendix 1: Imaging review)

2. All patients with abnormal observations, an abnormal CXR or being considered for admission should have senior doctor review. If no senior doctor is on site (eg MIU/UCC setting) then should be discussed with senior doctor.

3. The senior doctor should then make the clinical decisions around
    - Need for CT imaging if not already undertaken; suggest low threshold for patients requiring admission with abnormal CXR
    - Level of analgesia required (Appendix 2: Guide to analgesia)
    - Need for admission; suggest low threshold especially for frail
    - Need for set of ABGs completed before admission (suggest low threshold esp if pre-existing COPD (Appendix 3: Critical care review)

4. All patients that are in group 1, 2 or 3 (as described in appendix 3) should receive a critical care review asap and definitely within 24 hours of admission. Ideally this should be within the ED 4 hour window (Appendix 3: Critical care review)

5. The group would recommend the use of the evidence based analgesia tree attached (appendix 2). The group understands that provision of blocks 24/7 may be unachievable at present in some TUs however we would suggest that this is the gold standard and hope this information can be used to increase the availability within each Trust

6. All patients admitted with chest trauma forming at least part of their reason for admission should be seen by physio within 24 hours of admission. Ideally this should result in a plan for on-going physio requirements

7. All patients with 4 or more rib fractures should be considered for referral for rib fixation in line with the rib fixation pathway. (Appendix 4: NTN rib fixation referral pathway)

8. All patients admitted with chest trauma should be admitted to an area where staff are used to dealing with this type of injury. The group appreciates this can be much more difficult in achieving in the TU setting but advise that Trust specific plans are put in place to co-ordinate this

9. All frail patients (suggest use a validated score e.g. Clinical Frailty Score ≥5) with chest trauma undergo a CGA within 24 hours of admission. Again the group recognises that with the pressures on current services this may not be achievable in the short term but should be seen as the gold standard and a plan to work towards this put into place

10. The group would also recommend using a patient perspective information leaflet for these patients at point of discharge.

11. The group would recommend regular audit of these patients and suggest areas to consider would include

- Complication rate (including specifically pneumonia)
- Mortality rate
- LOS
- Pain scores
- Readmission rate

The above recommendations were agreed at the NTN CAG in January 2017.
Any comments or concerns please contact Charlotte Bates
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Appendix 1: Imaging evidence

Author/ Date/ Country	Patient group	Study type	Outcomes	Key results	Study weaknesses
Bokhari et al 2012 USA	676 pts presenting with trauma (523 with blunt trauma) over 19months. Mean age of blunt trauma pts = 35yrs	prospective study	physical examination (PE) (auscultation, tenderness/ pain, tachypnoea) and AP chest XR, to detect haemo/pneumothorax (HPX)	In blunt trauma - auscultation NPV= 100% chest pain/tenderness NPV = 99.3% tachypnoea NPV = 99.2% Auscultation is a good screening test to rule out HPX	single centre, small sample size, unpowered. relatively young patients (for my question) potential for sampling bias - states non-consecutive patients; PE carried out by different doctors of different grades. AP CXR (in trauma room so likely supine)
Rainer et al 2004 Hong Kong	88 consecutive patients with isolated blunt chest trauma of "mild to moderate force" >10yrs of age. Mean age 51yrs (SD19)	prospective study included followup at 3weeks	Physician impression of fracture (rib/ sternum) by their clinical assessment ("clinical acumen") PA Chest XR + coned view of injured area USS	Odds ratio (OR) (95% CI) of clinical acumen at detecting fracture 3.67 (0.44-30.30) OR of radiography at detecting fracture 3.41 (0.41-28.28) Clinical acumen and radiography have similar chances of detecting rib or sternal fractures. (in this study USS was superior)	selection bias - several exclusion criteria important in our ED pts (e.g. unconscious/ uncooperative) small sample size no indication of severity of injuries, and therefore clinical significance of the study.
Lavingia et al 2015 USA	156 pts with fall from standing or sitting, 9 excluded (intubated or GCS <13), 147pts included for analysis Mean age 69yrs (range 21-91) Trauma team activation was an inclusion criteria	retrospective study (chart review)	Physical examination (PE) findings and CT thorax	No patient with a normal PE had a significant thoracic or intraabdominal injury (NPV 100%) CT is unnecessary in patients with low impact injuries in the absence of physical findings. Most relevant paper found.	single centre, small sample. retrospective chart review, only trauma team activations- potential sampling bias No intermediate imaging - no inclusion of Xray, just CT (reflection of their treatment of trauma according to their guideline, not necessarily the same as our practice)

Author/ Date/ Country	Patient group	Study type	Outcomes	Key results	Study weaknesses
Shyr-Chyr Chen et al 1998 Taiwan	148 pts with chest injuries (125 pts with blunt injuries) Mean age 29yrs (range 15-65yrs)	prospective study	Physical examination (PE) findings and chest XR (standing or supine)	Auscultation at detecting HPX as seen on CXR - sensitivity 84% concluded even patients with no positive findings on auscultation should have a CXR.	small sample difference in the standard being compared (supine and standing CXRs have different accuracy in detecting injury), and may reflect differences in the severity of injury of pts included. no indication of grade of assessing physician, or of any blinding of radiologists.
Sears et al 2005 USA	772 pts, mean age 34.4 +/- 21.1 (SD), range 0-102yrs. 667pts blunt trauma over 12 months	prospective study	Physical examination (PE) and symptoms "surgeon judgement" as to whether the CXR would be normal AP supine (but tilted) CXR	Only 9.9% of CXRs were abnormal 29% had 1 or more of the clinical signs/symptoms A combination of absence of: SOB, bony crepitus, point tenderness, chest abrasion, BP<90, or chest pain, had NPV of 95.11 in blunt trauma (of a normal CXR)	single centre supine CXR, and ?hence a low incidence of abnormal films, or underpowered? mostly MVCs therefore their NPV improved including a rapid deceleration mechanism. variation between surgeons in judgement (not standardised) no indication of severity of injuries - given large numbers with no signs/ sx and normal CXR, would any of them have had a CXR in the UK system to start with?
Wishbach et al 2007 USA	1000 pts, consecutive over 7months. mean age 38 mean ISS 10 86% blunt trauma	retrospective study	Physical examination (PE) CXR (trauma room) CT	Primarily looked at the value of an INITIAL CXR in trauma. Noted low findings of clinical significance on CT in pts with a normal PE In stable pts with normal PE, only 2 of the pts having CT needed intervention, and would have been noted on CXR.	single centre "gold standard" (CT) not applied to all groups therefore comparison difficult.

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Forouzanfar et al 2014 Iran	2607 pts, mean age 34.1 +/- 15yrs blunt trauma	prospective (although unclear)	decision rule criteria (age >60, crepitation, LOC, decrease in pulmonary sounds, chest wall pain, tenderness, dyspnoea, abrasion.) CXR	Aimed to evaluate the relationship between clinical and radiological findings to avoid unnecessary CXRs. 14 pts had positive CXR findings without any signs/ symptoms - all >60yrs. Rule out not rule in - if any of the criteria present, then CXR. CXRs looked at by ED physicians - intraobserver agreement checked (using radiologists)	3 centres but all same city. one emergency physician in each hospital responsible for data collection - ?convenience sampling - unclear No CT comparisons (which would be the gold standard) CXR was either normal or abnormal, no indication of clinical significance of injuries
Rodriguez et al 2011 USA	2628 pts, mean age 45 +/- 19.8 age 14yrs + Significant intrathoracic injury (SITI) 10% CXR alone 78% CXR +CT 21% CT alone 1%	prospective study (NEXUS derivation study)	decision rule criteria (chest pain, distracting injury, tenderness, intoxication, age >60yrs, rapid deceleration, altered mental status) CXR/ CT	highly sensitive and high NPV decision rule to allow selective chest imaging. Rule out not rule in - i.e. if none of the 7 criteria present very low risk of significant injury	radiologists looked at all imaging doesn't advise what imaging to do - leaves this up to the clinician. no classification of the significance of injuries seen - just "any injury" (other than single rib fracture)

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Rodriguez et al 2013 USA	9905 pts, mean age 46 (IQ range 29-60) 14.9% had injury seen on imaging CXR alone 43% CXR + CT 42% CT alone 2.6%	prospective study (NEXUS validation study)	decision rules (7 as above) CXR/CT	high sensitivity and NPV Injuries seen split into major/ minor/ no clinical significance few were missed by decision rule (false negatives) - But several of these should have been included as having "distracting injury", and others raised suspicion of chest injury from other injuries e.g. scapula fracture. Only 1 false negative was of major clinical significance - they had other significant injures.	convenience sampling no guidance as to what imaging to do - leaves this up to the clinician.
Raja et al 2016 USA	5169 pts who had CT chest during either of the NEXUS studies. median age 45 (29-61) not major trauma	prospective study secondary analysis of derivation + validation NEXUS studies	decision rules (7 as above) CT result	Gave further information to clinicians about significance of individual criteria to incidence of injury If have 1 clinical criterion (other than an abnormal CXR), then have a very low risk for clinically major injury (1.1 %) Injuries found in 28.9% (on CT), of major clinical significance in 5.2% Of the 7 criteria, abnormal CXR had the best screening performance - NPV 98.1% for major injury, 80.4% for minor injury	secondary analysis of individual criteria and CT - not what original study was designed/ powered for. As original studies left the decision as to type of imaging up to the clinician, those having CT are likely to be those believed to be at greater risk of injury to start with (selection bias)

Appendix 2: Analgesia for the elderly

- Paracetamol
- Weak opioids
  - Carriers of inactive alleles of the CYP2D6 gene – 2-11% of population have reduced response to codeine and 5-10% have little to none.
  - Attendant risks of opioids – delirium, constipation, cough suppression etc.
- NSAIDs
  - Risk of AKI starts at around 5/7.
  - Na+ retention may worsen heart failure.
- Tramadol
  - Hallucinogenic and emetogenic.
  - CYP2D6 also influences tramadol metabolism.
- Nefopam
  - Anticholinergic.
- Lignocaine Patch
  - No evidence of efficacy compared to placebo in previous trials.

PCA

- Easy, generally safe.
- Used on any ward environment.
- Requires patient understanding and co-operation.
- Higher incidence of opioid side effects.
- Longer LoS.
- Higher pain scores - may be influenced patient selection and compliance.

Epidural

- Lower pain scores.
- Reduced ITU LoS.
- Minimal opioid side effects.
- Reduced incidence of pulmonary complications.
- Requires HDU/ITU.
- Skilled insertion.
- Hypotension.
- Significant number contraindications.

Paravertebral Blocks

- Direct comparison study PCA vs TEA vs PVB ongoing.
- Improved outcomes in studies of post-operative patients compared to TEA.
- Comparable pain scores/LoS etc.
- Less hypotension/urinary retention/n&v.
- Reduced incidence of pulmonary complications.
- Able to mobilise.

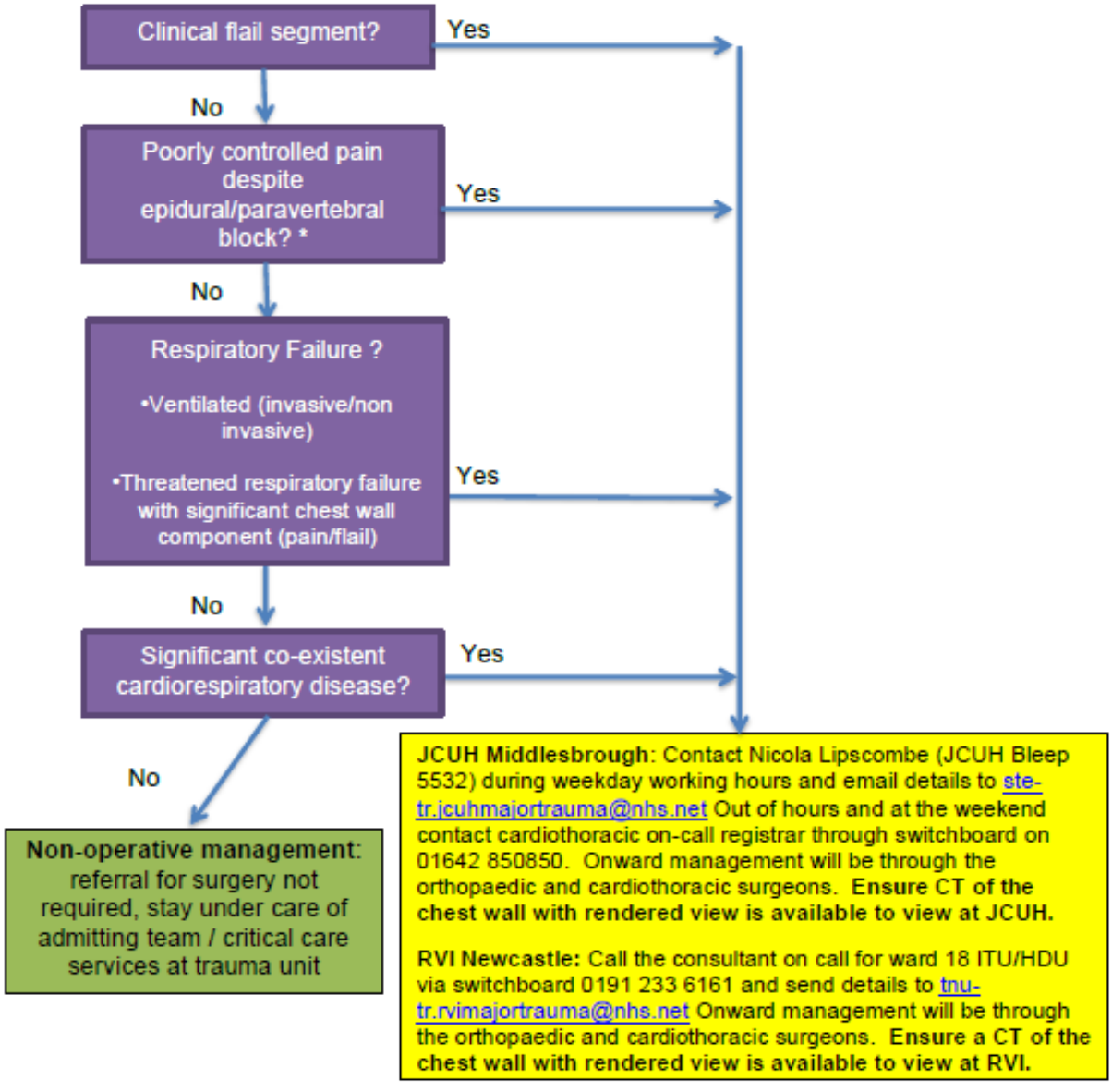
Appendix 3: Indications for a Critical Care Review

Group 1	Group 2	Group 3
Other traumatic injury requiring organ support Respiratory failure from the outset	4+ rib #s PLUS 1 or more of: Age >65. Chronic lung disease. CVS disease.	PaO2 <8kPa on high flow O2 or PaCO2 >6.5kPa. Increased work of breathing. Poor deep breathing/cough despite adequate analgesia. Significant early pulmonary contusions.

Taken from the Newcastle Upon Tyne Hospitals Blunt Chest Injury Guideline

Appendix 4: Rib fracture fixation referral

Referral algorithm for surgery in patients with four or more rib fractures



* Pain

Pain management is a key feature of chest wall trauma across all injury mechanisms and ages. All patients with chest wall trauma should receive early multimodal analgesia, regular pain scoring and should be reviewed by local pain services with a view to early neuraxial analgesia.

NTN Chest Wall Trauma Referral Guideline Version 2/ Review April 2018