



Severn Major Trauma  
Operational Delivery Network

# Chest Injury

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## Southmead Hospital Thoracic Injuries - Summary Information

	Children (0 - 15)		Adults		Total
	Blunt	Penetrating	Blunt	Penetrating	
<b>01 April 2017 to 31 December 2017</b>					
Thoracic Injuries - All Severities					
Direct Admissions	0	0	238	8	246
Transfers In	0	0	64	0	64
Thoracic Injuries - AIS 3+					
Direct Admissions	0	0	187	8	195
Transfers In	0	0	53	0	53

### 01 April 2016 to 31 March 2017

Thoracic Injuries - All Severities					
Direct Admissions	0	0	253	15	268
Transfers In	0	0	86	2	88
Thoracic Injuries - AIS 3+					
Direct Admissions	0	0	192	15	207
Transfers In	0	0	69	1	70

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## Southmead Hospital Management of chest wall injuries Patients with 3+ rib fractures

Date range	Total	Transfers in	Rib fixation	Aged under 65	Aged 65 and over
01 April 2017 to 31 December 2017	164	37 (22.6%)	0 (0%)	82 (50%)	82 (50%)
<b>MTC average</b>		21.8%	5.6%	55.2%	44.8%
01 April 2016 to 31 March 2017	180	52 (28.9%)	0 (0%)	114 (63.3%)	66 (36.7%)
<b>MTC average</b>		20.4%	5.6%	56.6%	43.4%



# Bad things that can happen

- Traumatic injury to chest may compromise:
  - Ventilation
  - Oxygenation
  - Circulation
- Two mechanisms of injury:
  - Blunt
  - Penetrating
- Two basic injury patterns
  - Closed
  - Open

**Table 1** Life-Threatening Chest Injuries

Immediately life-threatening chest injuries that must be detected and managed during the primary assessment:

1. Airway obstruction
2. Bronchial disruption
3. Diaphragmatic tear
4. Esophageal injury
5. Open pneumothorax
6. Tension pneumothorax
7. Hemothorax
8. Flail chest
9. Cardiac tamponade

Potentially lethal chest injuries that may be identified during the secondary assessment:

10. Traumatic aortic disruption
11. Myocardial contusion
12. Pulmonary contusion



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# Predictors of poor outcomes after significant chest trauma in multiply injured patients: a retrospective analysis from the German Trauma Registry (Trauma Register DGU®)

Stephan Huber<sup>1\*</sup>, Peter Biberthaler<sup>1</sup>, Patrick Delhey<sup>1</sup>, Heiko Trentzsch<sup>4</sup>, Hauke Winter<sup>3</sup>, Martijn van Griensven<sup>1</sup>, Rolf Lefering<sup>2</sup>, Stefan Huber-Wagner<sup>1</sup> and Trauma Register DGU<sup>5</sup>

**Results:** 22613 Patients were included (mean ISS  $30.5 \pm 12.6$ ; 74.7% male; Mean Age  $46.1 \pm 197$  years; mortality 17.5%; mean duration of ventilation  $7.3 \pm 11.5$ ; mean ICU stay  $11.7 \pm 14.1$  days).

Only a limited number of specific injuries had a significant impact on survival. Major thoracic vessel injuries (AIS  $\geq 5$ ), bilateral lung contusion, bilateral flail chest, structural heart injury (AIS  $\geq 3$ ) significantly influence mortality in study patients. Several extrathoracic factors (age, blood transfusion, systolic blood pressure and extrathoracic severe injuries) were also predictive of increased mortality.

Most injuries of the thoracic wall had no or only a moderate effect on the duration of ventilation. Injuries to the lung (laceration, contusion or pneumothoraces) had a moderate prolonging effect. Cardiac injuries and severe injuries to the thoracic vessels induced a substantially prolonged ventilation interval.

# Challenging Paradigms

## - From Clinical Judgement to Evidence Based Practice

- Just because we always do it that way doesn't necessarily mean it's the best way of doing it

# Needle thorocostomy

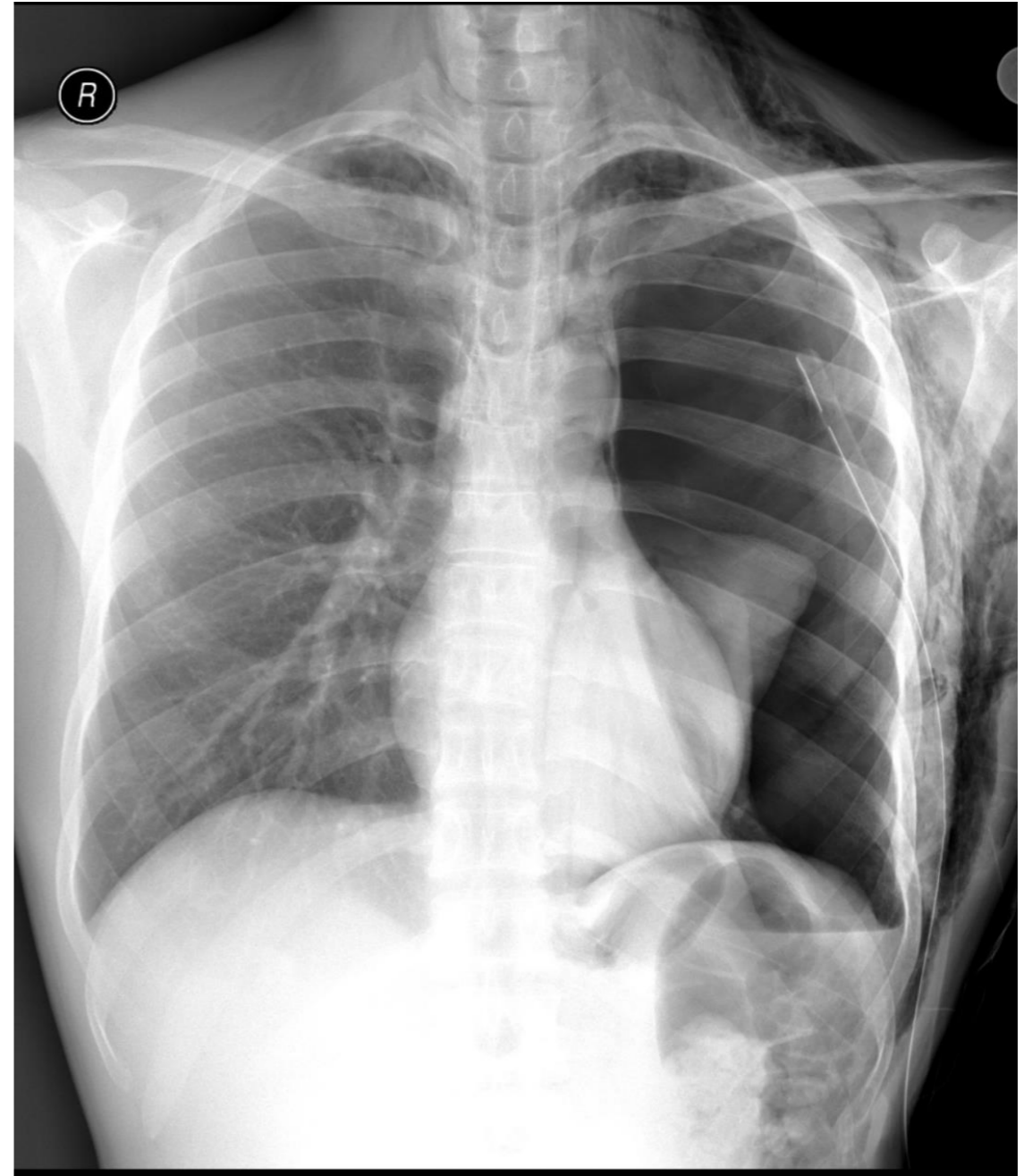
Complication	Incidence (%)	Reference (s)
<b>Never-events and miscellaneous</b>		
Incorrect patient	n/a	[15]
Wrong side/site procedure	n/a	[15]
Equipment malfunction	n/a	[15]
Inadequate analgesia/sedation	n/a	[15]
<b>Major</b>		
Lack of objective clinical improvement	> 90	[18]
Missed pneumothorax or Ineffective drainage	25-50	[1,6,19-21]
Pneumothorax	1.8-11	[18,22]
Hemothorax	< 1	[22]
Intrathoracic organ injury	< 1	[15,23]
Abdominal organ injury	< 1	[15,22]
Vascular injury (intercostal, parenchymal, great vessel, central vein, and pulmonary vessel)	< 1	[3,24,25]
Hemorrhage (significant)	< 1	[1,15]
Cardiac injury/tamponade	< 1	[1,15]
Neck or chest wall injury	n/a	[15]
Pneumonia/empyema	n/a	[1,15]
<b>Minor</b>		
Pain	22	[1,22]
Cough (symptom)	11	[21]
Hematoma (minor)	2	[1,22]
Fluid collection	< 1	[21]
Skin or cutaneous appendage injury	n/a	[15]
Nerve injury (e.g., intercostal)	n/a	[15,17]
Atelectasis	n/a	[1]

Major and minor complications are each listed from most to least common. When available, estimated incidence figures are provided. n/a = Not available



# Chest Drain Complications

- Incorrect tube position
- Re-expansion pulmonary oedema
- Tube dislodgement
- Subcutaneous emphysema
- Nerve injury
- Infection
- Cardiac / vessel injury
- Bronchopleural fistula



# Pneumothorax = Chest Drain

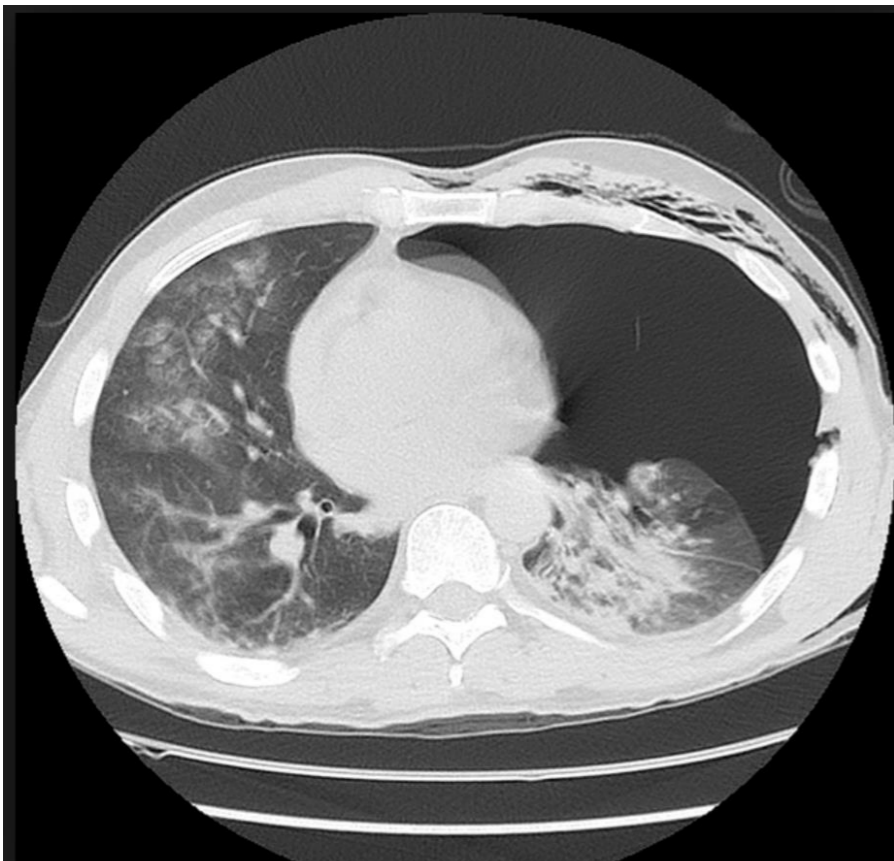
Chest. 2018 Apr;153(4):946-953. doi: 10.1016/j.chest.2017.10.015. Epub 2017 Nov 15.

## **Conservative Management in Traumatic Pneumothoraces: An Observational Study.**

Walker SP<sup>1</sup>, Barratt SL<sup>1</sup>, Thompson J<sup>2</sup>, Maskell NA<sup>1</sup>.

**BACKGROUND:** Traumatic pneumothoraces are a common consequence of major trauma. Despite this, there is a paucity of literature regarding their optimal management, including the role of conservative treatment. The aim of this study was to assess the treatment, complications, and outcomes of traumatic pneumothoraces in patients presenting to a major trauma center.

**CONCLUSIONS:** In the largest observational study of traumatic pneumothoraces published to date, > 90% of patients whose pneumothorax was managed conservatively never required subsequent tube drainage. Importantly, this also applies to patients requiring PPV, with no significant increased risk of failure of expectant management. These data support a role for conservative management in traumatic pneumothoraces.





# Rib Fixation

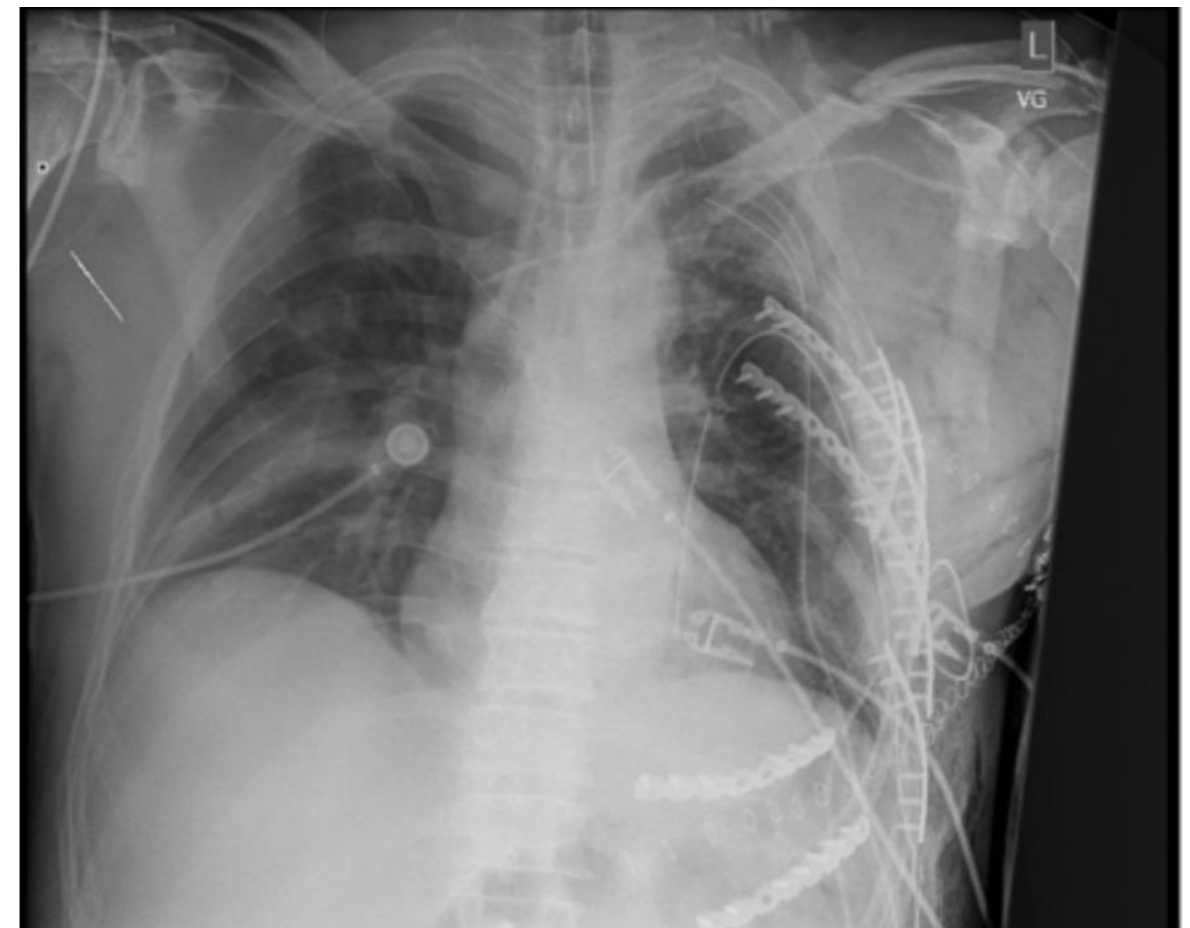
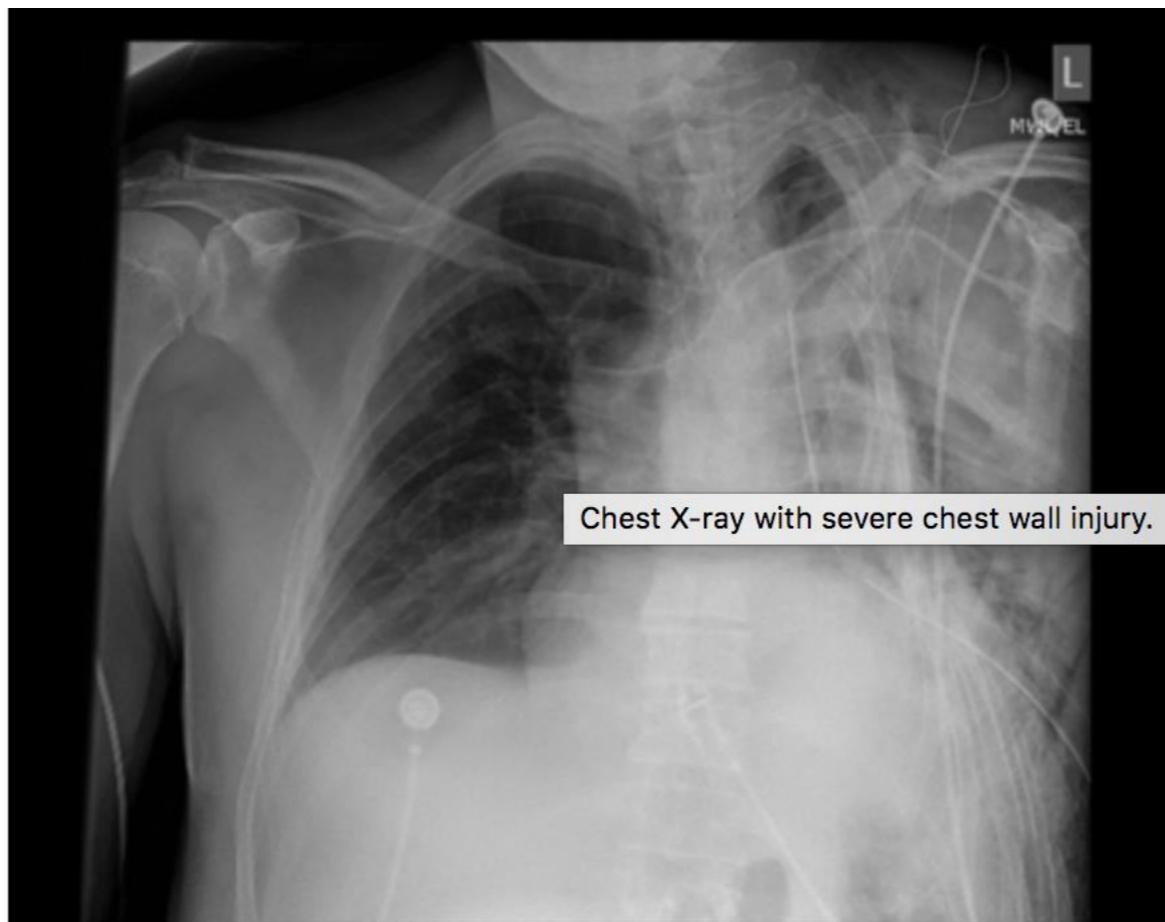
## Box 1 Indications

### Recommended:

- $\geq 5$  rib flail chest requiring mechanical ventilation;
- Symptomatic non-union;
- Severe displacement found during a thoracotomy for another reason.

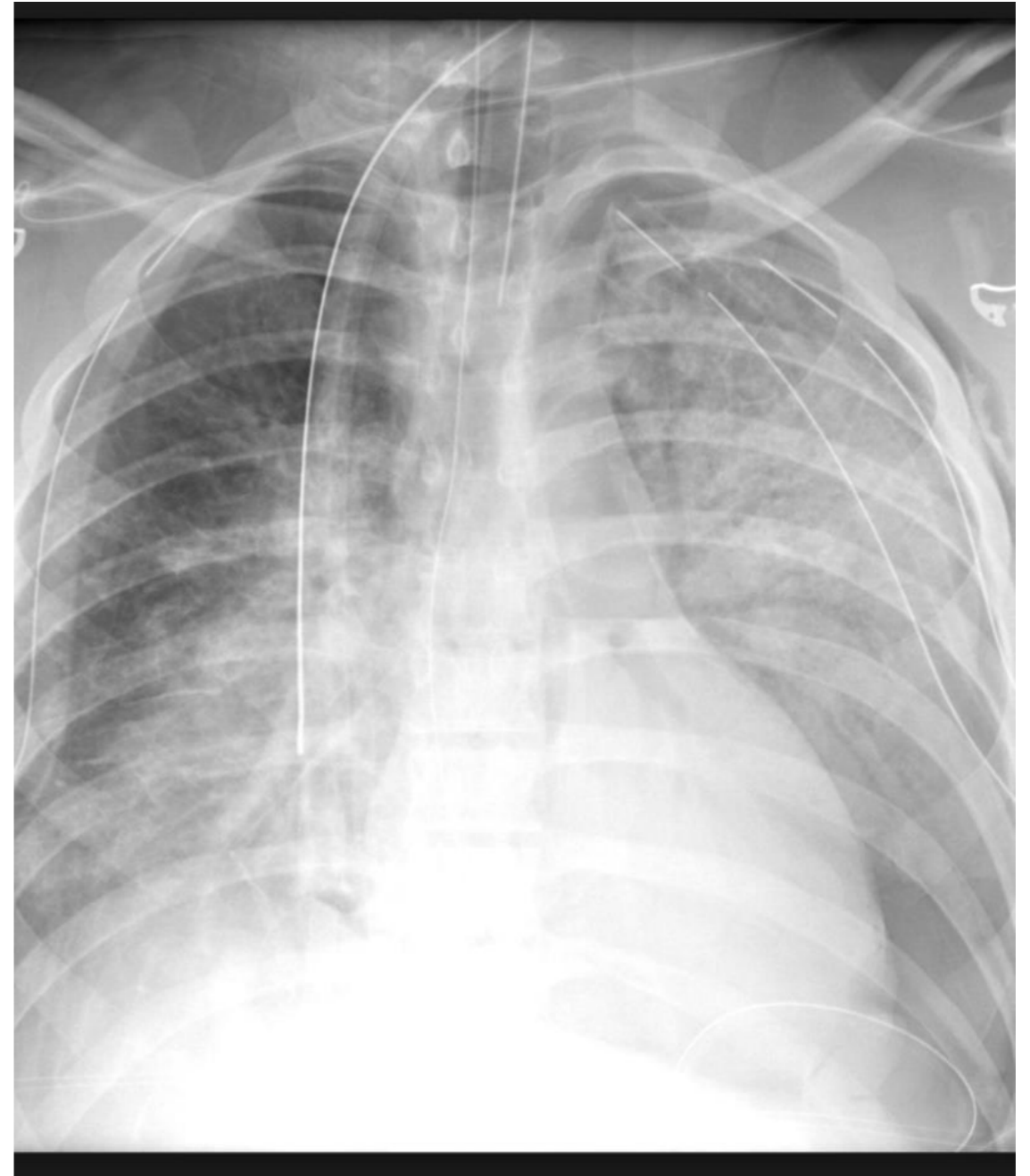
### Consider:

- $\geq 3$  rib flail not requiring mechanical ventilation;
- $\geq 3$  ribs with severely displaced fractures (bi-cortical displacement);
- $\geq 3$  ribs with mild to moderate displacement and 50% reduction of expected forced vital capacity percent despite optimal pain management.



# Delayed Badness

- Pulmonary Contusion
- SIRS
- Sepsis



# Analgesia, analgesia, analgesia

## Rib Fracture Analgesia Algorithm

Uncontrolled pain and presence of risk factors require more advanced analgesia

### A. Risk Factors

Presence of more risk factors predicts increased risk of complications

- |                                                                        |                                        |
|------------------------------------------------------------------------|----------------------------------------|
| 1. Age > 60                                                            | 5. Smoker and/or chronic resp. disease |
| 2. ↓SpO <sub>2</sub>                                                   | 6. Anticoagulated                      |
| 3. Obesity/malnourished                                                | 7. Major Trauma                        |
| 4. ≥ 3 rib #, flail segment, pulmonary contusion or other chest injury |                                        |

### Notes

- ≥ 2 risk factors ensure referred to
1. Acute Pain Team (Bleep 1509 or 9670)
  2. Physiotherapy (Bleep 1395 or 9552)

### B. Pain Score

Assess pain on deep inspiration and coughing on Verbal Rating Scale (VRS) or equivalent

	"No Pain"	"Mild"	"Moderate"	"Severe"
VRS	0	1	2	3
VAS	0-1	2-4	5-7	8-10
Abbey	0-2	3-7	8-13	14

### Notes

1. Instigate analgesia ASAP to achieve VRS 0 or 1 (or equivalent VAS/Abbey score)

### C. Analgesia Strategy

Escalate analgesia to achieve VRS of 0 or 1

#### STEP 1

Paracetamol  
NSAID\*  
(\*Unless contraindicated)  
Codeine/Tramadol

#### STEP 2

Paracetamol  
NSAID  
Opioid PCA  
Consider Regional Technique

#### STEP 3

Paracetamol  
NSAID  
Opioid PCA  
Regional Technique

### Notes

1. Alternatives to consider: Lignocaine patch, ketamine infusion and/or gabapentin
2. Ensure antiemetics and laxatives are prescribed
3. ≥ Step 2 refer Acute Pain Team and Physiotherapy

# How can things improve?

