

4. THORACIC INJURY
A. Rib Fractures

OBJECTIVE: To define the management of patients with multiple rib fractures.

GUIDELINE: The following guidelines include our own experience with patients with multiple rib fractures, as well as the published guidelines by the Eastern Association for the Surgery of Trauma^{1, 2}.

The decision about the disposition and the management of patients with rib fracture(s) should be based on the following factors:

1. The age of the patient, including the presence of co-morbid conditions such as diabetes and cardiac/pulmonary co-morbidity
2. The measured vital capacity at the time of the initial evaluation.
3. The number of rib fractures.
4. The presence or absence of pulmonary contusion.
5. The presence or absence of pneumo/hemothorax and/or flail chest.

Disposition and Management

1. Patients younger than 65 years of age with 1-3 rib fractures and a vital capacity (VC) assessed by incentive spirometry ≥ 15 mL/kg may be discharged home from the emergency department.
2. Patients younger than 65 years of age with ≥ 4 rib fractures and a VC ≥ 15 mL/kg will be admitted to the floor with measurements of their VC. If the VC remains ≥ 15 mL/kg, they will be monitored for 24 hours, at which time they will be evaluated for possible discharge home. If their VC decreases below 15 mL/kg, they will be transitioned to a combination of IV narcotics and multimodal analgesia (Level 2). For worsening VC, consider upgrade to step-down unit or ICU as clinically appropriate. They will undergo further measurements of their VC to assess whether they've reached the threshold value of 15 mL/kg. Patients with VC less than 15 mL/kg will be admitted to the ICU for management with IV narcotics and lidocaine patch. They will undergo serial measurement of their VC, and if the VC does not reach the threshold value of 15 mL/kg, they will be referred for placement of epidural analgesia.
3. Patients older than 65 with ≥ 4 rib fractures will be stratified according to the presence or absence of pulmonary contusion (PC) and/or flail chest (FC). These patients will be preferentially admitted to the intensive care unit. Patients will be treated with multimodal analgesia using a combination of multimodal analgesia, including narcotics, independent of their VC. These patients will be evaluated by the regional anesthesia team for neuraxial block (paravertebral, erector-spinae, or epidural analgesia). Incentive spirometry will be used routinely.
4. All patients with multiple rib fractures showing signs of respiratory failure will be treated with supplemental nasal cannula, high flow nasal cannula, CPAP/BiPAP as needed with progression to endotracheal intubation and support with mechanical ventilation as needed.
6. Patients with multiple rib fractures, severely displaced rib fractures, flail chest, and/or

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severe pain including those requiring mechanical ventilation will be considered on an individual basis for rib plating (Level 3).

7. Patients with survivable injuries who have severe respiratory failure will be evaluated for extracorporeal membrane oxygenation (ECMO).

References

1. Simon BJ et al. Pain management guidelines for blunt thoracic trauma. J Trauma 59 (5):1256–1267, 2005
2. Simon BJ et al. Management of pulmonary contusion and flail chest: An Eastern Association for the Surgery of Trauma practice management guideline. J. Trauma 73: s 351 – s361, 2012.
3. Tanaka H et al. pneumatic stability sedation for flail chest injury: An 11 year study. Surg Today 31: 12-17, 2001.
4. Gunduz M et al. A comparative study of continuous positive airway pressure and intermittent positive pressure ventilation in patients with flail chest. Emerg Med J 22 (5): 325-329, 20
5. Mukherjee, K., Schubl, S., Tominaga, G. T., Cantrell, S., Kim, B., Haines, K., Kaups, K. L., Barraco, R. D., Staudenmayer, K., Knowlton, L. M., Shiroff, A., Bauman, Z. M., Brooks, S. E., Kaafarani, H., Crandall, M., Nirula, R., Agarwal, S., Como, J. J., Haut, E. R., & Kasotakis, G. (2022). Non- surgical management and analgesia strategies for older adults with multiple rib fractures: A systematic review, meta-analysis, and practice management guideline from the Eastern Association for the Surgery of Trauma and the Chest Wall Injury Society. *Journal of Trauma and Acute Care Surgery*, 94(3), 398–407. <https://doi.org/10.1097/ta.0000000000003830>

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