



Rib fractures are very common in patients admitted for trauma and are markers for other injuries. In this edition of *North Memorial Trauma Update* we will be discussing blunt chest injuries and rib fractures. We also want to introduce a new feature in *Trauma Update* called *Injury Prevention News*. Look for this section immediately following the article.

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## Blunt Chest Injuries and Rib Fractures

A 40-year-old male driver, and two passengers, ages 80 and 10, are involved in a head-on collision with another vehicle at 40 mph. Occupants of the car are restrained. They are all able to give good histories. All complain of chest pain in various locations and have tenderness on exam. Vitals remain relatively stable enroute to your hospital. All three have been placed on long back boards and have cervical collars in place.

### QUESTION #1:

**What would be your initial approach to these trauma patients?**

- A. Obtain portable chest x-rays immediately.
- B) Obtain cervical spine, chest and pelvic x-rays immediately.
- C) Evaluate all patients immediately for adequate airway, adequacy of breathing, and assess circulation for level of peripheral perfusion.
- D) Priority should be given to analgesia and appropriate sedation before further evaluation.
- E) Send patients immediately for CT scans of head, cervical spine, chest, abdomen, pelvis, and reconstructive views of the thoracic and lumbar spine.

As with all trauma patients, priority lies with evaluation of the "ABC's". These include: 1) rapid assessment/maintenance of the airway, while maintaining cervical spine immobilization, and possible interventions including endotracheal intubation; 2) evaluation for adequacy and patterns of breathing with oxygen supplementation; and 3) assessment of circulation with IV access and fluid administration. The other evaluations and treatments may be needed after the ABC's are done and the patient is found to be stable.

All patients remain alert and talking. Respiratory rates for them include: Father: 24-28; Grandmother: 28-32; Daughter: 32-40; All are hemodynamically stable and well-perfused with mild tachycardia. The father and daughter are healthy; Grandmother has COPD, coronary stents, and hypertension. All have various areas of tenderness over bilateral chest wall areas. None have crepitus. The father has paradoxical movement of an area of his left lateral chest wall. With oxygen supplementation all of the patients have oxygen saturations of greater than 95%. Chest x-rays are obtained. The father has at least four fractures noted on the left with no pneumothorax and some infiltrate in the left mid lung area. The daughter has no rib fractures but has some infiltrate in the right

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mid lung region. Grandmother has bilateral rib fractures and no obvious infiltrates. Mediastinum appears normal.

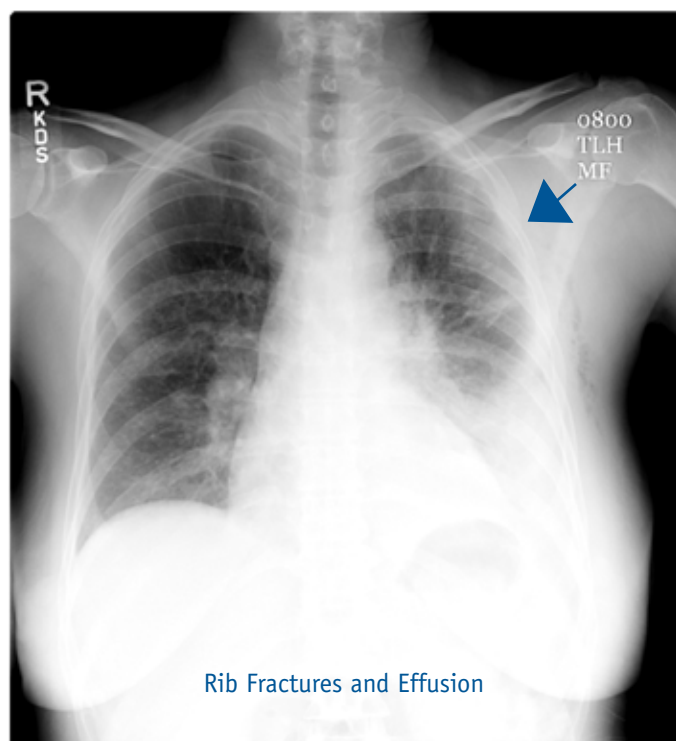
### QUESTION #2:

What statement about rib fractures is false?

- A. Approximately 10% of trauma admissions have rib fractures.
- B. Approximately 90% of patients with rib fractures will have associated injuries.
- C. Up to 50% of rib fractures are missed on a CXR.
- D. Mortality rates for all patients with rib fractures are less than 5%.
- E. Mortality rates and pulmonary complications increase as number of rib fractures increase.

Rib fractures are very common in those admitted for trauma. (Figure 1) Rib fractures are markers for other injuries. A 1994 study found associated injuries in 94% of patients. CT scan studies have shown other injuries in 67%. The risk for splenic injuries and liver injuries increases dramatically when rib fractures are seen. CXR's are not sensitive in diagnoses, missing up to 50% of rib fractures, which are often found on CT scans. As the number of rib fractures increase to greater than 3 seen on CXR, the mortality rate increases, although the cause of death is often not from respiratory complications. The overall mortality in patients with rib fractures is over 10% and in the elderly it is about 20%.

Figure 1



### QUESTION #3:

In comparing younger adult patients with those over the age of 65, which statement about rib fractures is false?

- A. Elderly patients have more pneumothoraces and sternal fractures.
- B. Elderly patients develop pneumonia more frequently.
- C. ICU and hospital length of stay are longer in the younger patients due to more severe injuries.
- D. Fewer of the elderly trauma patients return home at time of hospital discharge.
- E. Severity of injury is often less in elderly patients due to mechanism of injury.

The bony chest wall becomes less compliant with age, and there is often less muscle and soft tissue protection. The elderly have more pneumothoraces and sternal fractures than the younger patients. Pneumonia rates are also higher in the elderly with rib fractures, the incidence being twice that of younger patients in several studies, occurring in up to 30% of the elderly. Though severity of injury may be higher in younger patients, due to their mechanism of injury, the elderly patient with blunt chest injury will have longer ICU and hospital lengths of stay. The elderly more frequently are discharged to transitional care units.

All of the above patients remain hemodynamically stable. Pain is initially managed successfully with parenteral narcotics. The CT scan tech stops by to ask you if any CT scans are needed.

### QUESTION #4:

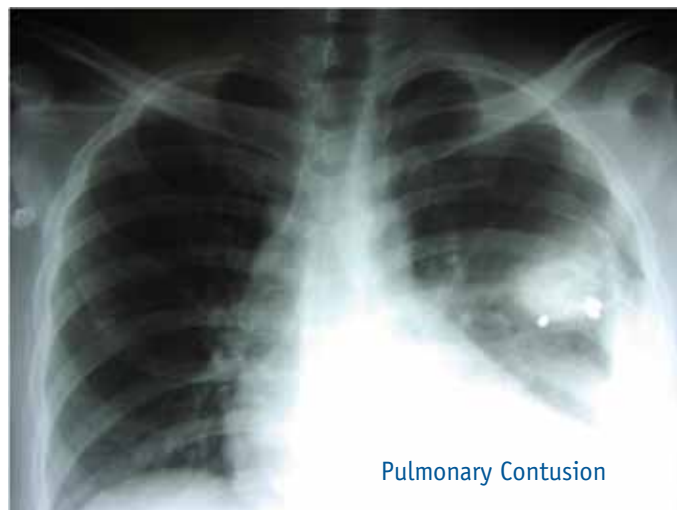
Which of the following statements about chest imaging in patients with blunt chest injuries is false?

- A. CT scans of the abdomen and chest will find unsuspected injuries in up to 90% of patients.
- B. Unsuspected findings on the CT scan of chest, will lead to a change in treatment in about 75% of patients.
- C. In those with a "normal" CXR, CT scans have been shown to diagnose an average of 3 missed rib fractures.
- D. If there are multiple areas of rib fractures noted; i.e. bilateral; the risk for respiratory failure doubles and may approach 25%.
- E. Parenchymal injury; i.e.; contusion; on CXR will increase mortality, pneumonia, respiratory failure and even need for tracheostomy.

Though it is true that CT scans can find a high incidence of other injuries, about 30% of those injuries in the chest, will require a change in treatment; most commonly a chest tube for a pneumothorax not seen on CXR. Even on a normal CXR, numerous additional rib fractures can be found on CT scan. Finding any parenchymal injuries

on a CXR increases the risk for significant complications, including respiratory failure. (Figure 2)

Figure 2



**QUESTION #5:**

**Which of the following statements about blunt chest injuries in children is false?**

- A. Pulmonary contusions are rare in children due to the increased compliance of the lung.
- B. Because of the smaller body surface area of children, there is often more concentrated forces at work with blunt trauma.
- C. Childhood rib fractures requires significant force to the chest wall, as ribs are much more pliable than those of the adult.
- D. Tension pneumothoraces are more common in children due to mobility of the mediastinum.
- E. Rib fractures reportedly caused by modest force, should be suspected as due to child abuse.

Because of less soft tissue and muscle in most children and because of the ribs being more pliable, the risk for developing a pulmonary contusion are relatively frequent. The smaller body surface area causes more concentrated force to be applied to the body. Children carry a higher risk for tension pneumothoraces due to a mobile mediastinum. Rib fractures in children require significant force. If the story does not match the injury, abuse needs to be considered.

**QUESTION #6:**

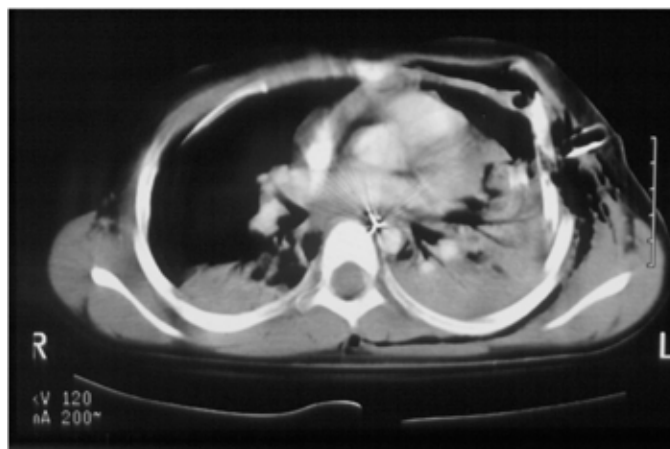
**Which of the following statements about a flail chest injury is false?**

- A. The diagnoses of flail chest is a bedside diagnoses.
- B. Most patients with a flail chest do not need to be intubated.

- C. The most common reason for respiratory failure is due to paradoxical chest wall movement and hypoventilation.
- D. Pain control and pulmonary toilet are the keys to treatment of flail chest.
- E. Chest wall surgery will rarely be needed for bony stabilization.

Flail chest is caused by at least three ribs, each fractured in two places, allowing for the paradoxical movement of the chest wall. (Figure 3) This is seen at the bedside in someone who is not on positive pressure ventilation. Many patients will be seen to have multiple fractures on imaging, but will not have a flail chest on exam. The most common reason for respiratory failure in these patients is due to the associated pulmonary contusion and hypoxia, rather than the abnormal movement of the chest wall and hypoventilation. Pain control is the key to treatment. Coughing, deep breathing, the use of an incentive spirometer, and learning how to “pillow splint” the chest

Figure 3



wall are all helpful adjuncts in prevention and treatment of atelectasis, as well as clearing secretions. Rib belts are not recommended, especially in the acute setting, as they may limit tidal volumes, increase atelectasis, and lead to more frequent hemothoraces and skin breakdown. In limited studies the belts provide inconsistent pain control. There are a number of surgical treatments that have been done for stabilization of the ribs, but none have been shown superior to medical management, which includes aggressive, effective pulmonary toilet, as described above.

The key to any blunt chest injury in any age group is pain control and treatment of any complications such as a pneumothorax or hemothorax. A variety of pain control measures are available including oral, parenteral and transcutaneous narcotics, oral and parenteral non-steroidal anti-inflammatories, transcutaneous local anesthetics, intercostal nerve blocks, epidural narcotics

and local anesthetics, as well as subcutaneous continuous infiltration of local anesthetic.

With the above patients, further imaging did not find any other significant internal injuries.

#### QUESTION #7:

#### What is the most reasonable decision about admission and discharge for these three patients?

- A. Since the flail chest segment is not usually a problem, if pain control can be managed early, and oxygen requirements are not significant, there is a good chance that discharge can occur in less than 24 hours for the driver.
- B. The pediatric patient should be transferred to a pediatric specialty hospital.
- C. The elderly patient should be admitted and best cared for in their community hospital if patient and family agree.
- D. It is never unreasonable to admit a patient with rib fractures, even if it is an isolated injury.
- E. All patients should be transferred to a Level 1 trauma center.

Pain control is the key to treatment of blunt chest injuries, and since every patient has different pain control requirements, most patients with multiple rib fractures will need to be admitted. The risk for complications with rib fractures in the elderly and a flail chest injury is high. Not all rib fracture patients need to be cared for in a specialty hospital, whether young or old. However, there needs to be a committed team of caregivers who are experienced and comfortable with a variety of pain management skills, as well as respiratory care support. Caregivers need to be prepared for worsening of the patient's respiratory status, which may even include the need for ventilator management. Hospitalizations could be lengthy for any of these patients. It needs to be repeated that the mortality rate for elderly patients and the risks for pneumonia are significant. It is better to be proactive with aggressive management of pain and pulmonary toilet, than to wait passively for problems to arise.

Answers: 1c, 2d, 3c, 4b, 5a 6c, 7d

## Injury Prevention News

North Memorial Trauma Update is proud to introduce a new feature called Injury Prevention News! In this section look for information on injury prevention, community opportunities and information about the latest, evidence-based practices for conducting injury prevention.

The North Memorial Injury Prevention program is also in the process of launching a new Injury Prevention Tool-kit. This tool-kit will contain education and event ideas, resource lists and links, print-ready newsletter articles and all the information you will need to successfully implement injury prevention initiatives in your community. This tool-kit will be available to our outstate

hospital partners within the next few weeks. If you would like more information or to receive notification that the tool-kit is available, please email North Memorial's Injury Prevention Program Coordinator, Alison Pence, at [Alison.Pence@Northmemorial.com](mailto:Alison.Pence@Northmemorial.com) or call (763) 520-4145.

#### Seat Check Saturday

Did you know that September is National Child Passenger Safety month? Numerous local agencies are conducting car seat inspection clinics on Seat Check Saturday, which is Saturday, September 25th, 2010. To find an event near you, check out [www.buckleupkids.state.mn.us](http://www.buckleupkids.state.mn.us) or <http://www.nhtsa.gov/cps/cpsfitting/index.cfm>.

## 2010 CME Opportunity

ATLS (Advanced Trauma Life Support)

October 14 & 15, December 2 & 3

This program was developed by the *American College of Surgeons Committee* on Trauma and is designed to assist physicians in providing the first hour of emergency care to trauma patients. Training combines didactic lectures and practical skills stations, allowing time to perfect skills in the initial assessment; and management and stabilization phases of trauma patients.

*For more information and to register online for classes, visit us at [www.northmemorial.com/emsED](http://www.northmemorial.com/emsED).*

*For questions please call (763) 520-5451.*

## 2010 Trauma Nursing Education

Trauma 201

October 25

This program builds on the basics presented in Trauma 101. Discussions and case presentations cover the critical care needs of the injured patient. Trauma 101 is strongly recommended as a prerequisite to this class.

*For registration and/or questions, please call (763) 520-5940 or email, [ce@northmemorial.com](mailto:ce@northmemorial.com)*

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