Policy Description:

Managing patients with multiple rib fractures or flail chest requires significant health care resources including intensive care unit monitoring, ventilator management, surveillance and treatment of pneumonia, and pain management protocols.\(^1\)\(^-\)\(^3\) Both acute complications and long term disabilities occur as a result of this very common pattern of thoracic trauma.

In a recent retrospective review of 64,750 civilian trauma patients in the National Trauma Databank (NTDB) with 1 or more rib fractures, mortality in the entire cohort was 10%.\(^1\) Mortality increased stepwise with each additional fracture to a maximum of 34.4% with 8 or more fractures. Epidural analgesia was used in only 2.2% of patients but significantly reduced mortality in patients with 2 rib fractures and 4 or more rib fractures. For patients with 8 rib fractures, only 7% received an epidural catheter; however, those who did had a 98% survival as compared to a 65% survival without an epidural. Consideration for single or multiple paravertebral catheters should also be considered when an epidural catheter is contraindicated or technically unsuccessful as there is evidence of efficacy similar to epidurals with fewer contraindications and hypotension.\(^8\)

Use of a rib fracture protocol has recently been shown to reduce ICU length of stay, hospital length of stay, and pneumonia in patients with rib fractures.\(^3\) There was also a trend towards reduced mortality. This protocol involved a multidisciplinary approach involving the trauma team, anesthesia pain service, advanced care practitioners, physical therapy, and nutrition.

Long-term outcomes are similarly poor in these patients. Recent civilian studies indicate that the morbidity and lost productivity in patients suffering thoracic trauma is substantial even in the relatively young and those with minimal injuries. For example, patients with rib fractures are significantly more disabled at 30 days post injury when compared with patients with chronic medical illness and lose an average of 70 days of work or usual activity during their acute recovery.\(^4\)

From a functional standpoint, a recent study found that for up to 2 years after pulmonary contusion and rib fractures, multiple PFT parameters and exercise tolerance are compromised with VO2max of 60% predicted.\(^5\) In patients with flail chest, 50 to 60% develop permanent morbidity with persistent chest wall pain or deformity being the
most common long-term problems. As many as 40% of these patients still had not returned to work one year after their injury.

The challenge, therefore, is to identify treatment strategies that improve both short and long term outcomes in patients with severe chest wall trauma. We believe a multidisciplinary approach is warranted at VUH given the frequency of rib fractures in our patient population and the potential benefits to having a treatment protocol for managing acute fractures and a multi-modal approach to avoiding long-term disability (Appendix A).

Policy Statement:

1. This policy applies to trauma patients with rib fractures who are on the Trauma Surgical team. Patients who have both an A criteria (age and/or number of fractures) and a B criteria (poor pain control) will be managed according to this protocol as detailed in Appendix A.

2. The key management decisions are: 1) patient disposition (ICU vs. Ward); 2) Comprehensive Pain Service (CPS) consult for epidural or paravertebral catheter analgesia; 3) the need for operative stabilization of dislocated fractures or a flail chest. An attending trauma surgeon and staff anesthesiologist will be involved in these decisions, and any decision by the CPS staff to NOT place an epidural catheter will be communicated to the responsible trauma staff.

3. If the patient has dislocated rib fractures, a flail chest, a need for surgical intervention in the chest in the setting of multiple rib fractures, or chronic pain from rib fractures, operative stabilization of the fractures should be considered. The supplies for operative stabilization can be obtained through the operating room on a case by case basis.

References:


VANDERBILT CHEST PROTOCOL

Rib Fractures

Screen for VCP

Criteria A: Any 1 of the following
- Age >= 45
- >= 3 rib fractures

Criteria B: Any 1 of the following
- Incentive Spirometry <=15 mL/kg PBW
- Pain >=5/10 on current regimen

A + B Present

No
Continue current care

Yes
Initiate VCP

VCP Initial Management
- ICU admission preferred
- Keep euvoemic
- Chest PT
- Supervised incentive spirometry
- Consult CPS for epidural placement after spine clearance

CPS Consult Considerations
- Initial evaluation within 6 hours of consultation; placement up to 12 hours
- Contraindication* - see following list
- Consider paravertebral catheter if epidural contraindicated or unilateral injury,
- Appropriate consent and discussion of benefit from existing literature
- Consider for intubated patients (RASS -2 to +1) with anticipated extubation in the next 24hrs
- Discuss with Trauma Faculty if contra-indicated
- Leave in place for 3-5 days, up to 7 for special circumstances
**Contraindications to Thoracic Epidural**

- Patient Refusal or inability to obtain consent
- Platelets < 50,000
- Infection at site of insertion
- Epidural or spinal cord hematoma
- INR > 1.5
- Prophylactic LMW heparin within 10 hrs, therapeutic dose within 24
- Major TBI (GCS < 9)
- Hemodynamic Instability
- Deeply sedated < RASS -3

**Contraindications for Paravertebral Catheter(s)**

- Patient Refusal or inability to obtain consent
- Platelets < 50,000
- Infection at site of insertion
- Major TBI (GCS < 9)
- INR > 1.7
- Transverse process fracture in proximity to level of insertion

**CPS Consent Statement:**

**Benefit:** We believe the literature points to a decrease in mortality (2% vs 35% for patients with 8 or more rib fractures), better pain control and pulmonary mechanics.

**Risks:** Serious risks include bleeding (1/150000), infection (1/1000-10000), nerve damage (1/10000) and pneumothorax (<.1%). Fortunately, these risks are relatively rare but may be slightly higher in the trauma population. Less serious and treatable risks include inability to place, catheter migration, reactions to medications including low blood pressure occurs approximately 6-25%.

We feel the benefits outweigh the risk.

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