

Multidisciplinary Clinical Pathway for Trauma Patients with Rib Fractures

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Purpose: Current practice guidelines for patients with isolated rib fractures were updated in order to streamline care and reduce overutilization of Surgical Intensive Care Unit (SICU) resources. The guidelines are designed to achieve this goal while maintaining excellent standard of care in different nursing units including the Intermediate Intensive Care Unit (I-ICU) setting as well as the Acute Care Unit. **I-ICU is a level of care (rather than a physical unit in the hospital) that can be designated on any unit when admitting patients. It signals nursing to perform more frequent vitals checks and provides closer patient monitoring.**

Background: A coordinated multidisciplinary approach to the trauma patient with rib fractures was undertaken. Rib fractures are present in approximately 20% of trauma patients and increase the risk of adverse outcomes, including pneumonia and death. Given these risks, early and optimal analgesia and pulmonary toilet is essential. Special consideration must be given to the modulation of pain in the elderly, particularly in terms of dosing, side effects and risks associated with polypharmacy. **With the implementation of the I-ICU (an intermediate level of care) on all units and the advent of new regional pain modalities, appropriate hemodynamic monitoring and nursing care can be provided in settings outside SICU for selected patients.** Therefore, the Departments of Surgery/section of trauma and surgical critical care, Anesthesiology, and Medicine/geriatric Medicine, along with coordination with Nursing, Respiratory Therapy and Physical Therapy, have derived consensus guidelines leading to a standardized protocol for implementation in trauma patients with rib fractures.

Guidelines outline:

- Admission criteria for SICU, I-ICU, and floor for patients who are admitted with a diagnosis of rib fractures.
- Recommended care pathways including:
 - Non-pharmacologic and pharmacologic care
 - Regional Anesthesia and Acute Pain Services consultation
 - Surgical fixation

1. Admission/transfer to SICU:

- Rib fracture patients with associated injury requiring SICU
- Rib fracture patients with significant comorbidities with high risk of decompensation (e.g cirrhosis, major cardiac disease, COPD, neuromuscular disease, on home O2)
- Rib fracture patients with any of the following:
 - o Hemodynamic instability
SBP< 90 or HR > 120
 - o Impending respiratory compromise
Requiring \geq 6L of oxygen to maintain SpO2 $>92\%$
Respiratory rate > 30 , accessory muscle use, patients with high likelihood of requiring mechanical ventilation.
 - o Rib fracture patients with hemothorax requiring transfusion or further operative intervention (not chest tube)
- Clinical judgement.

2. Admission/transfer to I-ICU level of care on K7:

***I-ICU could provide 3:1 nursing and q2h vitals of a single system (e.g. respiratory)**

Absence of above criteria dictating SICU admission and one or more of the following:

- New oxygen requirements (if requiring <6 L oxygen to maintain SpO2 $>92\%$)
- ≥ 80 with cognitive impairment, consider early GOC conversations and consider I-ICU as favorable over SICU
- Patients ≥ 45 years with 6 or more rib fractures
- Patients ≥ 65 years with 4 or more rib fractures
- Clinical judgement

3. Admission/transfer to Acute Care level of care on K7 (regular floor status):

- Absence of above criteria
- Need for in-patient pain control
- Need for hospital admission based on clinical criteria/judgement

4. Criteria to downgrade from SICU to I-ICU:

- Stabilization of other ICU needs
- Still requiring vitals checks more frequent than Q4hrs **OR**
- Pain score ≥ 4 at rest **OR**
- Pain score ≥ 6 with cough and deep inspiration

5. Criteria to downgrade from I-ICU to Acute Care:

- Stable pain control regimen for 24 hours

- Pain score <=4 at rest
- Pain score <=6 with cough and deep inspiration

Recommendations

Pain scores to be evaluated in two ways:

- Resting
- With deep inspiration/cough

MD to document all three pain scores on admission, on daily note and on meeting criteria to transition to a different LOC

RN to record all three pain scores on admission and at frequencies specified by LOC below

SICU: q1-2h pain scores, pre and post PRN analgesic administration (while awake and with routine assessments)

I-ICU: q1-2h pain scores (per provider order), pre and post PRN analgesic administration (while awake and with routine assessments)

Acute Care: q4h pain scores, pre and post PRN analgesic administration (while awake and with routine assessments)

Pulmonary Toilet and Multidisciplinary Care:

- Head of bed 30 degrees (unless contraindicated)
- Monitor O2 saturation (target >92%) (continuous in SICU/I-ICU, q4h on Acute Care)
- IS or flutter q1h while awake (target >15cc/kg of IBW)
- Early mobilization: Strict out of bed TID unless contraindicated
- Physical Therapy (PT) evaluation for mobility (within 24 hrs of admission)
- Occupational Therapy (OT) evaluation (Activities of Daily Living, non-pharmacologic pain techniques)
- Geriatrics consult for all patients 65 years and older
- Patient and family education re coughing and breathing exercises
- RN to notify MD if unable to mobilize OOB or participate in breathing exercises during shift due to pain.

Recommendations

Initial management with scheduled multimodal analgesia within 1 hour of arrival (should be continued throughout admission):

Acetaminophen

- 1000mg PO or IV TID with meals
- [Max 3g/24hr]
- (Hold or decrease dose for no liver disease)

Celebrex

- 100mg PO BID
- [Max duration: 14 days then discontinue]
- (Hold if: TBI, spinal fracture or hematoma, GFR<40, on anticoagulation, recent GI bleed, recent MI, CHF, h/o CABG)

Gabapentin

- 100mg PO qhs and increase as tolerated
- [Max 300mg PO q8h]
- (Use with caution in the elderly. Avoid if baseline cognitive impairment, confused on admission, IV contrast within last 24 hrs, GFR<60)

Narcotic Pain control:

Encourage po medication use over IV

Early consideration for PCA

Age < 65

PO:

- Mild pain (pain score 1-3 resting): oxycodone 2.5mg po q4h prn
- Moderate pain (pain score 4-6 resting): oxycodone 5mg po q4h prn
- Severe pain (pain score 7-10 resting): 7.5mg po q4h prn

IV:

- Mild pain (1-3 resting): Dilaudid 0.2mg IV q2hr PRN (Alert MD after administering 2nd consecutive doses to consider consulting regional pain service)
- Moderate pain (4-6 resting): Dilaudid 0.4 mg IV q2hr PRN (Alert MD after administering 2nd consecutive doses to consider consulting regional pain service)
- Severe pain (7-10 resting): Dilaudid 0.4 IV q2hr PRN (Alert MD after administering 2nd consecutive doses to consider consulting regional pain service)

Age 65 +

PO:

- Mild pain (1-3 resting) Moderate pain (4-6 resting): oxycodone 2.5mg po q4h prn
- Severe pain (7-10 resting): 5mg po q4h prn

IV:

- Mild pain (1-3 resting): Dilaudid 0.1mg IV q2hr PRN (Alert MD after administering 2nd consecutive doses to consider consulting regional pain service)
- Moderate pain (4-6 resting): Dilaudid 0.2 mg IV q2h PRN (Alert MD after administering 2nd consecutive doses to consider consulting regional pain service)
- Severe pain (7-10 resting): Dilaudid 0.2mg IV q2hr PRN (Alert MD after administering 2nd consecutive doses to consider consulting regional pain service)

Lidocaine Therapy:

Lidocaine patch:

- to affected area for up to 12hrs per day

Lidocaine IV:

- For uncontrolled pain with Lidocaine patch, consider adding lidocaine IV gtt 1mg/kg/hour of ideal body weight (monitor lidocaine levels q12h)
- Lidocaine infusion may be ordered by the SICU team. If patient is on I-ICU/floor LOC, MUST consult Acute Pain Service (APS) for lidocaine order and management.
- **If patient transfers from SICU to floor on IV Lidocaine, MUST consult Acute Pain Service (APS) for lidocaine order and management.**

Recommendations

Patient selection criteria for Regional Pain Services (RPS):

- Call RPS for uncontrolled pain for 2hr despite maximization of above protocol
- Early activation at clinical discretion (e.g. 75 years and above at high risk for polypharmacy and/or patients with 4+ rib fractures)

Block options

ESP Block:

- Provides unilateral, regional numbness without sympathetic blockade
- Should be considered to be first line given its low risk profile
- Can be placed in anticoagulated patients and has low risk of hypotension.
- (Relative contraindications; delirious and uncooperative patients, morbid obesity)

Thoracic Epidural Catheter:

- Provides dermatomal numbness to bilateral chest wall with sympathetic blockade
- Epidural Catheter placement requires normal INR/PLT, no anticoagulants beyond heparin PPx
- Significant risk of hypotension
- (**Contraindications:** spine fractures near the site of rib fractures, neurologic deficits or evidence of spinal cord trauma, systemic or local skin infections, delirious or uncooperative patients)
- (**Relative contraindications:** Morbidly obese or immobile patients)

Serratus Anterior Plane Block:

- Is occasionally given to patients with anterior/lateral rib fractures in ED
- Be aware of the cumulative total dose of local anesthetic agent

Patient selection criteria for surgical stabilization of rib fractures:

Anatomic: fractures considered involve ribs 3-10

Flail chest

- Three or more consecutive rib fractures in 2 or more places

Displaced rib fractures

- Three or more ribs fractured with > 50% displacement

Physiologic:

If Ventilated: either

- Failure to pass 3 SBTs
- Intubation > 72 hours

If Not Ventilated: 2 or more of the following after maximal multimodal pain therapy for > 6 hours

- Resting pain score > 5
- Weak cough

- Incentive Spirometry (IS) <50% of predicted.
- Respiratory rate > 20