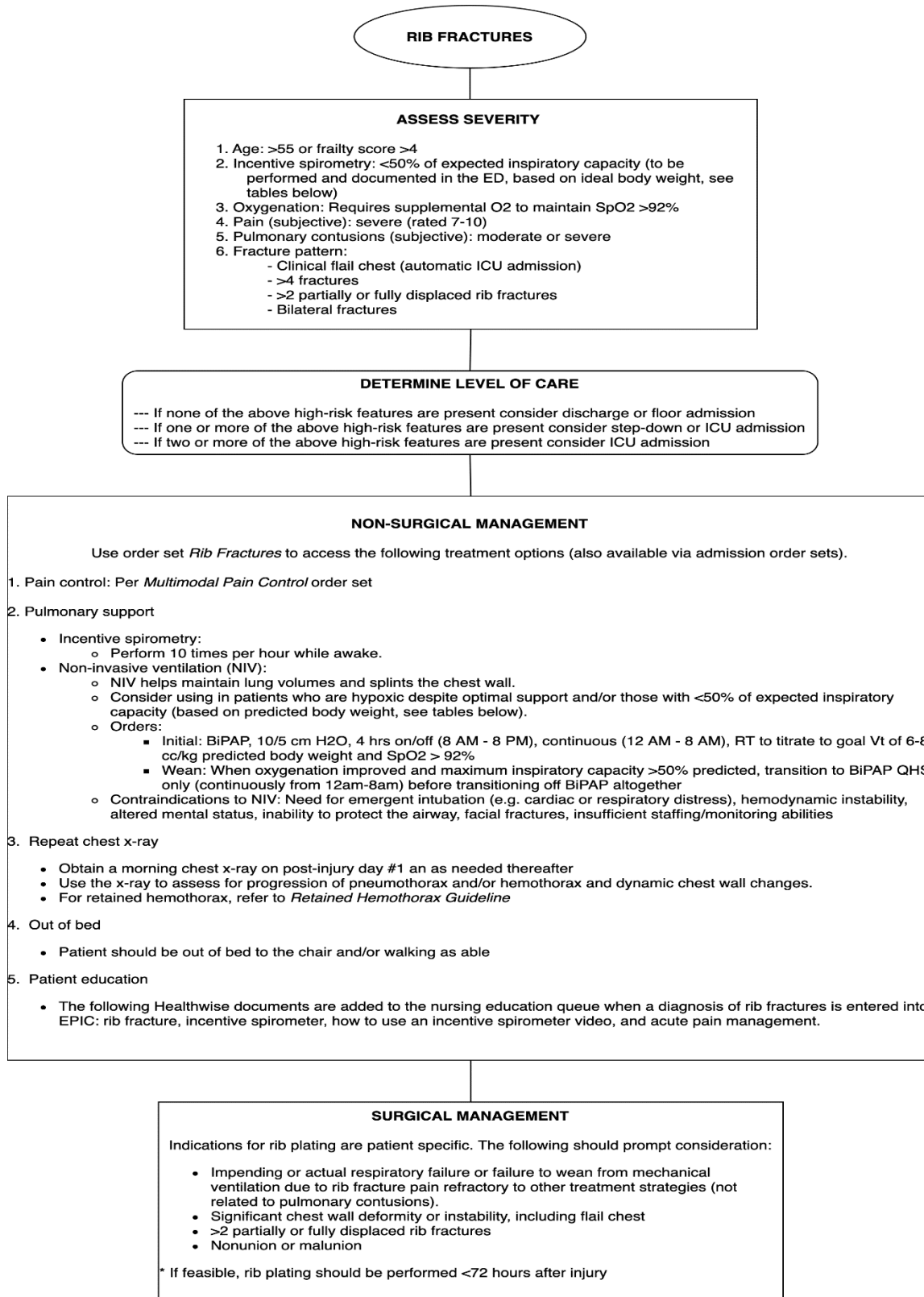


RIB FRACTURE MANAGEMENT GUIDELINE



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RADIOLOGIC EVALUATION

Definitions:

1. Location – anterior, lateral, posterior
 - a. Anterior = serratus anterior insertion tubercle to the distal end of the rib
 - b. Lateral = costal angle to the serratus anterior insertion tubercle
 - c. Posterior = the head and neck of the rib to the costal angle
2. Displacement – non-displaced, partially displaced, fully displaced
 - a. Non-displaced = No displacement
 - b. Partially displaced = Some cortical overlap, but not complete
 - c. Fully displaced = No cortical overlap
3. Fracture pattern – simple, wedge, comminuted
 - a. Simple = single fracture line
 - b. Wedge = a second fracture line that does not span the entire width of the rib
 - c. Comminuted = multiple fractures with > 2 bone fragments
4. Radiologic flail chest = 3 or more consecutive ribs with 2 or more fractures in each rib

ASSESSING SEVERITY OF INJURY

It's important to note that numerous rib fracture scoring systems exist. Some are based on clinical features of the injury, others entirely on cross-sectional imaging, and some use both clinical and radiologic features.

Unfortunately, none are widely used or well validated. Furthermore, no scoring system is able to adequately take into account the heterogeneity of patient presentation and response to injury. As such, assessing severity of injury requires clinical judgment. The following high-risk features help assess the severity of injury and determine what level of care and treatment the patient needs.

1. Age: >55 or frailty score >4
2. Incentive spirometry: <50% of expected inspiratory capacity (to be performed and documented in the ED, based on ideal body weight, see tables below)
3. Oxygenation: Requires supplemental O₂ to maintain SpO₂ >92%
4. Pain (subjective): severe (rated 7-10)
5. Pulmonary contusions (subjective): moderate or severe
6. Fracture pattern:
 - a. Clinical flail chest (automatic ICU admission)
 - b. >4 fractures
 - c. >2 partially or fully displaced rib fractures
 - d. Bilateral fractures

→ If none of these high-risk features are present, consider discharge or floor admission

→ If one or more of these high-risk features are present, consider step-down or ICU admission

→ If two or more of these high-risk features are present, consider ICU admission

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NON-SURGICAL MANAGEMENT

Use order set *Rib Fractures* to access the following treatment options (also available via admission order sets).

1. Pain control: Per *Multimodal Pain Control* order set.
2. Pulmonary support
 - Incentive spirometry:
 - Perform 10 times per hour while awake.
3. Non-invasive ventilation (NIV):
 - NIV helps maintain lung volumes and splints the chest wall.
 - Consider using in patients who are hypoxic despite optimal support and/or those with <50% of expected inspiratory capacity (based on predicted body weight, see tables below).
 - Orders:
 - Initial: BiPAP, 10/5 cm H₂O, 4 hrs on/off (8 AM - 8 PM) & continuous (12 AM - 8 AM), RT to titrate to goal tidal volume of 6-8 cc/kg predicted body weight and SpO₂ > 92%
 - Wean: When oxygenation improved and maximum inspiratory capacity >50% predicted, transition to BiPAP QHS only (continuously from 12am-8am) before transitioning off BiPAP altogether
 - Contraindications to NIV: Need for emergent intubation (e.g. cardiac or respiratory distress), hemodynamic instability, altered mental status, inability to protect the airway, facial fractures, insufficient staffing/monitoring abilities
4. Repeat chest x-ray
 - Obtain a morning chest x-ray on post-injury day #1 and as needed thereafter
 - Use the x-ray to assess for progression of pneumothorax and/or hemothorax and dynamic chest wall changes.
 - For retained hemothorax, refer to *Retained Hemothorax Guideline*
5. Out of bed
 - Patient should be out of bed to chair and/or walking as able
6. Patient education
 - The following Healthwise documents are added to the nursing education queue when a diagnosis of rib fractures is entered into EPIC: rib fracture, incentive spirometer, how to use an incentive spirometer video, and acute pain management.
 - You can also add Healthwise information to the patient's discharge document in EPIC: Discharge Manager → Clinical References → Go to references/Attachments → Additional search

SURGICAL MANAGEMENT

Indications for rib plating are patient specific. Patients with one or more of these features should be considered for rib plating:

- Impending or actual respiratory failure or failure to wean from mechanical ventilation due to rib fracture pain refractory to other treatment strategies (not related to pulmonary contusions).
- Significant chest wall deformity or instability, including flail chest
- >2 partially or fully displaced rib fractures
- Nonunion or malunion

* If feasible, rib plating should be performed <72 hours after injury

FEMALE

		HEIGHT IN INCHES								
		58"	60"	62"	64"	66"	68"	70"	72"	74"
AGE IN YEARS	20	1900	2100	2300	2500	2700	2900	3100	3300	3500
	25	1850	2050	2250	2450	2650	2850	3050	3250	3450
	30	1800	2000	2200	2400	2600	2800	3000	3200	3400
	35	1750	1950	2150	2350	2550	2750	2950	3150	3350
	40	1700	1900	2100	2300	2500	2700	2900	3100	3300
	45	1650	1850	2050	2250	2450	2650	2850	3050	3250
	50	1600	1800	2000	2200	2400	2600	2800	3000	3200
	55	1550	1750	1950	2150	2350	2550	2750	2950	3150
	60	1500	1700	1900	2100	2300	2500	2700	2900	3100
	65	1450	1650	1850	2050	2250	2450	2650	2850	3050
	70	1400	1600	1800	2000	2200	2400	2600	2800	3000
	75	1350	1550	1750	1950	2150	2350	2550	2750	2950
	80	1300	1500	1700	1900	2100	2300	2500	2700	2900

MALE

		HEIGHT IN INCHES										
		58"	60"	62"	64"	66"	68"	70"	72"	74"	76"	78"
AGE IN YEARS	20	2000	2200	2400	2600	2800	3000	3200	3400	3600	3800	4000
	25	1950	2150	2350	2550	2750	2950	3150	3350	3550	3750	3950
	30	1900	2100	2300	2500	2700	2900	3100	3300	3500	3700	3900
	35	1800	2000	2200	2400	2600	2800	3000	3200	3400	3600	3800
	40	1750	1950	2150	2350	2550	2750	2950	3150	3350	3550	3750
	45	1700	1900	2100	2300	2500	2700	2900	3100	3300	3500	3700
	50	1650	1850	2050	2250	2450	2650	2850	3050	3250	3450	3650
	55	1550	1750	1950	2150	2350	2550	2750	2950	3150	3350	3550
	60	1500	1700	1900	2100	2300	2500	2700	2900	3100	3300	3500
	65	1400	1600	1800	2000	2200	2400	2600	2800	3000	3200	3400
	70	1350	1550	1750	1950	2150	2350	2550	2750	2950	3150	3350
	75	1300	1500	1700	1900	2100	2300	2500	2700	2900	3100	3300
	80	1250	1450	1650	1850	2050	2250	2450	2650	2850	3050	3250

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