

► RESPIRATORY • TRAUMA • ADULT HEALTH

Pulmonary *Contusion*

A bruised lung — the most common potentially lethal chest injury after blunt trauma. Symptoms peak 24–72 hours after impact, and gas exchange falls off a cliff if you miss it.

 **SOURCE TRANSPARENCY:** This topic is *not* present in Diane's uploaded reference notes. Content compiled from **Saunders Comprehensive Review for the NCLEX-RN 2026**, **Lippincott Illustrated Reviews**, **ATI Adult Medical-Surgical Nursing**, and **Eastern Association for the Surgery of Trauma (EAST) Guidelines**.

SECTION 01 • FOUNDATION



Definition & Overview

WHAT IT IS

Bruising (hemorrhage + edema) of the **lung parenchyma** caused by blunt chest trauma — MVA, falls, sports impact, blast injuries, CPR.

WHY IT MATTERS

Most common potentially **lethal chest injury**. Mortality 10–25%. Up to 50% develop ARDS. Symptoms **worsen for 24–72 hours** before improving.

COMMONLY PAIRED WITH

Rib fractures, flail chest, hemothorax, pneumothorax, cardiac contusion. Suspect with any high-impact mechanism — even *without* visible rib fracture (pediatrics).

DIAGNOSIS

CT scan is gold standard (sensitive immediately). Chest X-ray may appear normal for 4–6 hours then show patchy infiltrates. ABG, pulse ox, serial assessments.

SECTION 02 • MECHANISM

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Pathophysiology

STEP 01

Blunt force trauma transmits energy through chest wall to lung tissue

STEP 02

Alveolar capillaries rupture → blood + fluid leak into alveoli & interstitium

STEP 03

Surfactant disrupted → alveoli collapse (atelectasis)



STEP 04

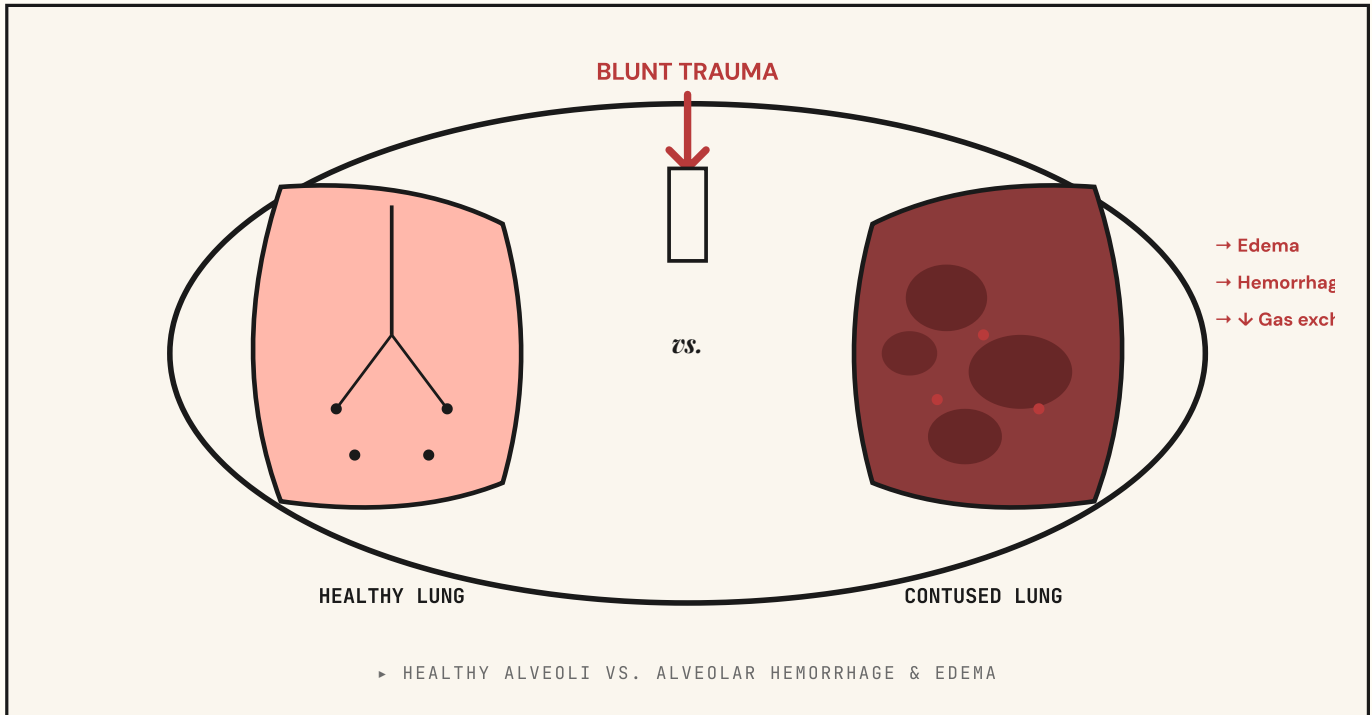
Inflammatory cascade activates → edema worsens over 24–72 hours

STEP 05

V/Q mismatch → hypoxemia, hypercapnia, increased work of breathing

STEP 06

Progression risk: pneumonia, ARDS, respiratory failure



SECTION 03 • ASSESSMENT

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Signs & Symptoms

🕒 EARLY (0–24 hrs)

- ▶ Tachypnea (RR > 20)
- ▶ Tachycardia
- ▶ Mild dyspnea on exertion
- ▶ Chest wall bruising / abrasions
- ▶ Localized chest pain
- ▶ Crackles or diminished breath sounds
- ▶ SpO₂ 90–95% on room air

⚠️ LATE (24–72 hrs)

- ▶ Severe dyspnea at rest
- ▶ Hemoptysis (blood-tinged sputum)
- ▶ Cyanosis (lips, nail beds)
- ▶ Increased work of breathing — retractions, accessory muscles
- ▶ SpO₂ < 90% on supplemental O₂
- ▶ Restlessness → confusion (hypoxia)
- ▶ Progression to ARDS



RED FLAG FINDINGS — Call HCP / Rapid Response

- | | |
|---|---|
| ❗ SpO ₂ < 90% despite O ₂ therapy | ❗ PaO ₂ < 60 mmHg on ABG |
| ❗ Frank hemoptysis or frothy pink sputum | ❗ Paradoxical chest movement (flail chest) |
| ❗ Worsening LOC / altered mental status | ❗ Respiratory rate > 30 or < 10 |
| ❗ Bilateral crackles + JVD (overload risk) | ❗ PaCO ₂ rising → respiratory acidosis |

SECTION 04 • ABC FRAMEWORK

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Priority Nursing Interventions

A

AIRWAY

- ✓ Assess patency continuously
- ✓ Suction PRN for secretions / blood
- ✓ Prepare for intubation if PaO_2 falls or $\text{RR} > 35$
- ✓ Keep emergency airway equipment at bedside

B

BREATHING

- ✓ Administer **humidified O_2** — target $\text{SpO}_2 > 92\%$
- ✓ Position **semi-Fowler's (HOB 30–45°)**
- ✓ Encourage deep breathing & **incentive spirometer q1h while awake**
- ✓ Auscultate breath sounds q1–2h
- ✓ Monitor ABGs, capnography
- ✓ Prepare for mechanical ventilation with PEEP if hypoxemia worsens

C

CIRCULATION

- ✓ Continuous cardiac monitoring (suspect concurrent cardiac contusion)
- ✓ **Cautious fluid resuscitation** — over-resuscitation worsens pulmonary edema
- ✓ Strict I&O — monitor for fluid overload
- ✓ Assess perfusion: cap refill, peripheral pulses, BP

S

SAFETY & PAIN

- ✓ **Pain control = better breathing** (splinting prevents deep breaths)
- ✓ Multimodal analgesia: opioids + acetaminophen + regional blocks
- ✓ Monitor sedation level (RASS) — avoid respiratory depression
- ✓ Splint chest with pillow when coughing
- ✓ Early mobilization as tolerated

SECTION 05 • MEDICATIONS

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Pharmacology

DRUG / CLASS	MECHANISM	KEY SIDE EFFECTS	NURSING CONSIDERATIONS
Morphine / Fentanyl OPIOID ANALGESICS	Bind opioid receptors → ↓ pain perception	Respiratory depression, hypotension, constipation, sedation	Monitor RR (hold if <12), sedation score; have naloxone available; titrate to allow effective coughing
Albuterol β ₂ AGONIST (BRONCHODILATOR)	Smooth muscle relaxation in airways → bronchodilation	Tachycardia, tremors, anxiety, hypokalemia	Monitor HR before/after; assess lung sounds; nebulizer per protocol
Furosemide (Lasix) LOOP DIURETIC	Inhibits Na/K/2Cl in Loop of Henle → diuresis	Hypokalemia, hypotension, dehydration, ototoxicity	Only if pulmonary edema confirmed ; monitor K ⁺ and I&O strictly; daily weights
Acetaminophen / Ketorolac NON-OPIOID ANALGESICS	↓ Prostaglandin synthesis / central pain pathways	Hepatotoxicity (APAP), GI bleed / renal injury (ketorolac)	Use as opioid-sparing; max APAP 4g/day; ketorolac max 5 days
Methylprednisolone CORTICOSTEROID (CONTROVERSIAL)	↓ Inflammatory cascade → ↓ alveolar edema	Hyperglycemia, immunosuppression, mood changes	NOT routine — only if ARDS develops; monitor glucose & infection

⚠ **DO NOT** give prophylactic antibiotics. **DO NOT** over-resuscitate with IV fluids — this is the #1 iatrogenic worsening factor. Diuretics are **only** for confirmed overload.

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SECTION 06 • CRITICAL THINKING

NCLEX Test Traps

✗ WRONG ANSWER

"Administer 2 L of NS bolus aggressively to support BP."



✓ CORRECT ANSWER

Cautious fluid management. Over-resuscitation worsens alveolar edema and progresses to ARDS.

✗ WRONG ANSWER

"Chest X-ray is normal — patient can be discharged."



✓ CORRECT ANSWER

CXR may be **normal for 4–6 hours**. Order CT scan; admit for 24–72 hour observation — symptoms peak *after* arrival.

✗ WRONG ANSWER

"Give high-dose opioids to keep patient comfortable and quiet."



✓ CORRECT ANSWER

Multimodal pain control — adequate analgesia *enables* deep breathing. Over-sedation suppresses respiratory drive.

✗ WRONG ANSWER

"Patient is stable at 4 hours — transfer to floor and downgrade monitoring."



✓ CORRECT ANSWER

Symptoms worsen over **24–72 hours**. Continue ICU/step-down monitoring through peak deterioration window.

✗ WRONG ANSWER

"Bedrest is best — restrict ambulation completely."



✓ CORRECT ANSWER

Early mobilization & positioning prevent atelectasis & pneumonia. Bedrest worsens lung complications.

✗ WRONG ANSWER

"Suspect pulmonary contusion only if ribs are fractured."



✓ CORRECT ANSWER

Pediatric patients have flexible ribs — can have severe contusion **without** rib fracture. Mechanism alone is enough to suspect.

SECTION 07 • DISCHARGE TEACHING

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Patient & Family Education



Incentive Spirometer

Use 10 times every hour while awake. Prevents atelectasis & pneumonia during recovery.



Pain Management

Take pain meds on schedule, *not* only when severe. Better pain control = better breathing.



Splint & Cough

Hold a pillow firmly against chest when coughing or deep breathing. Reduces pain, encourages clearance.



When to Call HCP

Worsening shortness of breath, fever, increased pain, blood in sputum, confusion — call 911 if severe.



No Smoking

Smoking severely impairs lung healing. Provide cessation resources, nicotine replacement options.



Recovery Timeline

Full healing takes **4–6 weeks**. Avoid heavy lifting, return to activity gradually. Follow-up imaging.



Hydration (Balanced)

Drink fluids to thin secretions, but avoid excessive intake — could worsen lung edema during early recovery.



Gradual Activity

Walk daily as tolerated. Avoid contact sports, heavy lifting (>10 lbs) for at least 6 weeks.

SECTION 08 • MNEMONICS

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Memory Boosters

"BRUISED"

► PULMONARY CONTUSION RECOGNITION

B

Blunt chest trauma

R

Respiratory distress
(delayed)

U

Unilateral or
bilateral crackles

I

Imaging — CT > CXR

S

SpO₂ falls 24–72h
post-injury

E

Edema worsens —
restrict fluids

D

Deep breathing & IS
= priority

The 24–72 Rule

Symptoms get *worse before better*. Peak severity is at 24–72 hours. Don't downgrade monitoring too soon.

"Dry the Lungs"

Cautious fluid management. Wet lungs = bad outcome. NS bolus is *not* always the answer in trauma.

Pain ≠ Sedation

Pain relief enables breathing. Sedation suppresses it. Find the sweet spot — alert + comfortable.

Kids & Contusion

Pediatric ribs are flexible — they can have severe pulmonary contusion *without* rib fracture. Don't be fooled.

CXR vs CT

Chest X-ray can be falsely normal for hours. CT scan picks it up immediately. If high mechanism — get CT.

IS Every Hour

Incentive spirometer 10× every hour while awake = atelectasis & pneumonia prevention. Top patient teaching point.



SECTION 09 • NCJMM 2026

Clinical Judgment Scenario

► CASE STUDY

"A 24-year-old male presents to the ED after a motor vehicle collision (unrestrained driver, frontal impact at 45 mph). On arrival: alert, RR 22, HR 108, BP 124/78, SpO₂ 94% on room air, chest wall ecchymosis over right anterior thorax, mild dyspnea, crackles in right lower lobe. Chest X-ray shows no acute findings. CT chest reveals patchy right-sided lung opacities consistent with pulmonary contusion. No rib fractures. Patient is admitted to step-down unit."

1

STEP 1 • RECOGNIZE CUES

What clinical data is most relevant?

Relevant cues: High-mechanism MVA, chest wall ecchymosis, RR 22, SpO₂ 94% on room air, crackles RLL, CT-confirmed contusion. **Concerning trend:** Symptoms will likely *worsen* over 24–72 hours even though presentation looks mild now.

2

STEP 2 • ANALYZE CUES

What do the cues mean together?

Patient has a confirmed pulmonary contusion in early phase. Alveolar hemorrhage & edema will progress as inflammatory cascade peaks. Risk for hypoxemia, atelectasis, pneumonia, and ARDS rises with each passing hour through 72-hour window. Currently compensating — but compensation can fail rapidly.

3

STEP 3 • PRIORITIZE HYPOTHESES

What problem is most urgent?

#1 Priority: Risk for impaired gas exchange related to alveolar hemorrhage & edema. **#2:** Acute pain (impairs deep breathing). **#3:** Risk for fluid volume excess (iatrogenic if over-resuscitated). **#4:** Risk for pneumonia / ARDS development.

4

STEP 4 • GENERATE SOLUTIONS

What interventions are appropriate?

Apply humidified O₂ via NC titrated to SpO₂ > 92%. Position HOB 30–45°. Incentive spirometer q1h while awake. Multimodal analgesia (acetaminophen + low-dose opioid). Continuous pulse ox & cardiac monitoring. Strict I&O — maintenance fluids only, no bolus unless hypotensive. ABG if SpO₂ drops. Encourage early ambulation as tolerated.

5

STEP 5 • TAKE ACTION

What does the nurse do first?

Immediate priority action: Apply supplemental O₂ via humidified nasal cannula (start at 2 L/min) and position HOB at 30–45° (semi-Fowler's). Establish continuous pulse oximetry and respiratory monitoring. Initiate incentive spirometer teaching *now*, before symptoms worsen.

6

STEP 6 • EVALUATE OUTCOMES

How do you know if interventions worked?

Desired outcomes (in 24h): $\text{SpO}_2 \geq 92\%$ on minimal O_2 . RR 12–20. Lungs clearing on auscultation. Patient using IS effectively (target volume met). Pain $\leq 4/10$ with deep breathing tolerated. No signs of fluid overload (clear lungs, no JVD, stable weight). No progression to mechanical ventilation. Mentation intact.

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