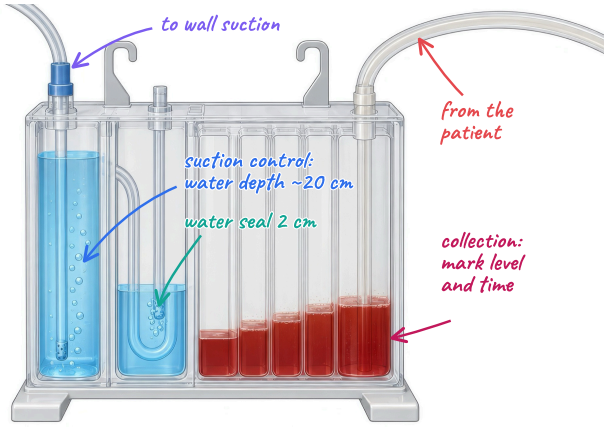
ER BASICS · ONE-PAGER

Chest Tubes and Pneumothorax

Tension pneumothorax, the drainage system, bubbling and tidaling, troubleshooting and removal

14 sources + more detail
erbasics.com/sheets/chest-tubes.html
checked Nov 2026

SET-UP The drainage unit: three bottles in one



1 Pneumothorax and hemothorax

TYPE	CLUES	ACTION
Tension	Hypotension, absent breath sounds, JVD, rising airway pressures; tracheal shift is late	Decompress now (needle or finger), then chest tube
Simple	Pleuritic pain, decreased breath sounds	Observe, aspirate or tube by size and symptoms
Massive hemothorax	1,500 mL at insertion, or 200 mL/h for 2–4 h	Surgery (thoracotomy)

Needle site (ATLS): 4th or 5th intercostal space just anterior to the mid-axillary line in adults; 2nd space mid-clavicular in children. ATLS 11 teaches finger and tube thoracostomy as the core skills.

⚠ **SAFETY** Ventilated patient with sudden hypotension and high peak and plateau pressures: think tension pneumothorax first.

2 The drainage system

On positive-pressure ventilation, tidaling reverses (falls with inspiration).

CHAMBER	NORMAL	ABNORMAL
Collection	Drainage slows over time	Over 100–200 mL/h, or bright red: report
Water seal (2 cm)	Tidaling: rises with spontaneous inspiration	Continuous bubbling = air leak
Suction control	Wet: gentle steady bubbling at set level; dry: indicator showing	Vigorous bubbling only evaporates water

- Intermittent bubbling on exhalation or cough: expected with a pneumothorax (air leaving the pleura)
- Continuous bubbling: find the leak; brief clamping from the chest wall outward shows whether it is the patient or the tubing
- No tidaling: lung re-expanded, or the tube is kinked, clotted or blocked
- Keep the unit below the chest, upright, with no dependent loops; do not strip tubes routinely

3 Troubleshooting

EVENT	FIRST MOVES
Tubing disconnects	Put the tube end 2–3 cm under sterile water (or reconnect a new system); avoid clamping
Unit tips over	Set upright; check water seal level; refill or replace
Tube pulls out of the chest	Cover with a sterile occlusive dressing; watch for tension, lift an edge if it develops; notify
New respiratory distress	Check the patient, then the system from chest to unit

⚠ **SAFETY** Never clamp a chest tube that has an air leak for long: air has nowhere to go and tension can develop.

4 Removal and complications

- Remove at end-expiration or during Valsalva (spontaneous breathing); occlusive dressing; chest x-ray after
- Re-expansion pulmonary edema: drain large effusions slowly and stop at about 1.5 L or chest discomfort
- Subcutaneous emphysema: crackling under the skin; mark and track its spread
- Infection (empyema) and bleeding at the site

MORE Pleural physiology and pressures

The pleural space is a film 10–20 µm wide holding about 0.26 mL/kg of fluid in total (Noppen 2000). Fluid filters from parietal pleural capillaries and drains through parietal lymphatic stomata, mostly over the diaphragm, turning over about 0.15 mL/kg/h; lymph flow can rise to roughly 30 mL/h before an effusion accumulates (Miserocchi 1997).

Lung recoil and chest wall spring keep pleural pressure subatmospheric: about −5 cm H_2O at functional residual capacity and −8 at the end of a quiet breath in (West). When air or fluid enters, the lung recoils toward its unstressed volume; the swings below are what the drain shows.

Hypoxic vasoconstriction limits the fall in PaO_2, so a young patient may keep a normal SpO_2 with a large primary pneumothorax while a small one can decompensate COPD. Breathlessness from a large effusion tracks diaphragm mechanics more than oxygenation: in PLEASE (Muruganandan 2020), drainage relieved it in 73% with no change in oxygenation, and a flattened or inverted hemidiaphragm predicted relief.

SITUATION	PLEURAL PRESSURE	WATER-SEAL COLUMN
Quiet spontaneous inspiration	Falls to about −8 cm H_2O	Rises (tidaling)
Spontaneous expiration	Returns to about −5 cm H_2O	Falls back
Cough or forced expiration	Strongly positive	Falls; air in the space bubbles out
Ventilator breath	Rises, often above zero	Falls on inspiration (reversed)

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