Evidence-based Care of Patients with Chest Tubes

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Evidence

Evidence is more than research; it incorporates scientific nursing and medical research in combination with clinical guidelines, clinical judgment, expertise, patient preferences and the clinical context for care.

We are focusing on the literature because the other aspects are individualized to the healthcare organization, the individual nurse and the patients for whom you care.
Literature Model

Carroll Literature Assessment Model

**Strong guidance:** multiple studies generally agree

**Equivocal:** multiple studies, without clear advice on clinical action

**Avoid:** multiple studies agree on not taking a course of action

**No information:** insufficient data to make a recommendation

No evidence that has established -20 cmH2O as the “magic number;” likely it was just the height of the bottles

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1. Carroll 2003
Applying Suction

Many studies have compared using suction with leaving chest drains to simple gravity drainage after lung resection surgery. Study outcomes vary and include:

- Duration of air leak (visible bubbles in the water seal)
- Duration of chest tube (in place in the chest)
- Hospital length of stay (LOS)

**Strong guidance says that when all patients having lung resection are randomized at the time of surgery, time with chest tube and LOS were significantly lower when limited or no suction was used, without an increase in complications**²⁻⁷
We are learning through research that when suction increases flow by pulling air through tiny openings in the suture/staple line, it keeps tissue apart; this lack of approximation slows and may prevent healing (and thus, sealing of any tiny leaks).\textsuperscript{4}

Increased fluid drainage that may be seen can be caused by pleural irritation and “weeping” -- not by superior drainage of normal postop fluids.\textsuperscript{21}

We are also now realizing that not all air spaces seen on CXR (see blue arrows) are what we would normally think of as PTX; some are pleural deficits that occur when persons with COPD have lobectomy and the remaining lung is not able to immediately expand to fill the remaining space.\textsuperscript{4}

Also, remember that most persons having lobectomy have a measure of COPD, so anesthesia’s effect on secretion mobility can result in atelectasis with reduced lung expansion in the immediate postoperative phase as well.
Evaluating Research

Many patients in the “no suction” arms actually had suction overnight day of surgery and were not randomized until POD 1; in others, only patients with air leaks on POD 1 were randomized. Know what method was used and whether all resection patients were included when reviewing research.\(^8,9\)

These are samples of the literature;\(^2-3,8-11\) for more summaries of the literature on suction and gravity drainage, see the annotated references on AtriumU.com (click on Evidence).
Tube Manipulation

Research has demonstrated no benefit to tube manipulation of pleural or mediastinal tubes and potential for significant tissue damage due to high pressures.\textsuperscript{12-21}

Possible that increased fluid with manipulation is due to tissue irritation, not better postop drainage\textsuperscript{21}

**Do not strip or milk tubing**

Tube positioning is key to effective drainage; dependent loops can create positive pressure in the pleural space\textsuperscript{16,18,20,22-24}

**Avoid dependent loops in tubing**
“Occult pneumothorax” is the term for pneumothorax seen on CT that was not visible on traditional chest x-ray. We are now more aware of them since more patients have chest CT, but they have always been there.25,26,30,31 Ultrasound’s ability to detect pneumothorax is equivalent to CT, and will likely see more use in the future.25-29 Ultrasound can be done by APRNs, less expensive and much less time32-33. We once thought that if pneumothorax was visible and patient was receiving positive pressure ventilation, chest tube was essential; now we know that watchful waiting is a reasonable option.25,30,31

Can observe asymptomatic pneumothorax not initially detected on CXR
Malpositioned chest tubes is the other diagnostic challenge for traditional chest x-ray; malpositioning often only detected on CT.

First research on chest tube dressings reported at 2013 NTI; poster session reported low incidence of air leak and infection when petroleum gauze eliminated.

Unfortunately, no peer-reviewed research has been published on chest tube dressings.
Dressings

A bench test examined the effect of petroleum on suture materials and discovered knots failed\(^{35}\).

If we extrapolate from research done on dressings for median sternotomy: there is no evidence to support routine dressing changes; use a simple dry, sterile dressing; and secure the dressing with wide paper tape; this provides cover for the wound with the least damage to the surrounding skin\(^{36-38}\).
Tube Removal

Trend is toward earlier removal because duration of chest tube is the main determinant of hospital LOS in lung surgery patients.\textsuperscript{39-40}

In ICU, duration of chest tube is related to risk of hospital-acquired infection.\textsuperscript{39}

Chest tube duration > 18d associated with higher ICU mortality and ICU LOS.\textsuperscript{41}

Small amount of bubbling not a contraindication to chest tube removal; key is to assess whole patient situation

Patients do not need to have a chest tube just because they are receiving mechanical ventilation.\textsuperscript{48}
Tube Removal

Trending\textsuperscript{42} can be useful when surgeons want information about patient air leak to decide whether to remove tube and are only at the bedside once in the morning before surgery.

Pleural fluid thresholds for tube removal vary between about 200mL/d to about 400mL/d (5 mL/kg/d in pediatrics)\textsuperscript{43-49}
Tube Removal

Cardiac surgery fluid thresholds vary in volume and timeframe\textsuperscript{50-52}

Statistically, by the time you get to postop hour 8, drainage is about 31 mL/h or less; in cardiac surgery, patients are either bleeding or not; there is usually not much of a question\textsuperscript{50-53}

An interesting study of pleural tube removal technique in which there was less pneumothorax when tubes were removed at full exhalation compared with full inspiration\textsuperscript{54}

“This supports the importance of prospective randomized trials and the need to question surgical dogma. Despite our traditions and opinions, often our biases are proven incorrect.”
Historically, it has been routine to get a chest x-ray after chest tube removal. Research shows that whether it is pleural or mediastinal tubes, routine chest x-rays are not needed; instead, “on demand” imaging based on changes in patient condition (e.g., increased RR, dyspnea, desaturation) provide more useful information, reduce radiation exposure, and save money.  

If a routine CXR shows a pneumothorax after tube removal and the patient is fine, is a tube going to be reinserted? Treat the patient, not the picture.

 Avoid routine CXR that are not related to patient condition
Summary

- Treat the patient, not an image
- Trust the body’s healing power
- Use technology wisely to complete physical assessment, not to replace it
- Just because we’ve always done it doesn’t mean we should always continue to do it

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www.AtriumU.com
References


References


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