Removal of chest drains

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Chest drains are inserted to allow the removal of air, blood or fluids from the thoracic cavity and prevent them from re-entering (Gray, 2000).

**Removal criteria**
The decision to remove a drain is usually made by a medical practitioner. In certain areas, such as cardiothoracic surgery, protocols may be used to direct removal by other professionals once criteria have been met.

These criteria should include:
- Absence of an air leak into the chest drain bottle, usually noted when the patient exhales forcibly or coughs. In positive pressure ventilation this will coincide with the expiratory phase;
- The volume of fluid draining into the chest drain is minimal. Guidelines on what is minimal vary but less than 10ml per hour per drain has been suggested;
- There is no evidence of respiratory compromise or failure;
- There is no coagulation deficit or increased risk of bleeding;
- In many cases radiological evidence of the absence of air or fluid accumulation will be required before removal.

Advice should be sought from a medical practitioner if there is any doubt.

**Preventing air re-entry**
Guidelines on the removal of chest drains should ensure that the introduction of air into the pleural/mediastinal space is minimised and bacterial contamination avoided.

The risk of the introduction of air may be reduced by manipulating intrapleural pressures. This entails removing the drains at the height of expiration or when the patient exhales against a closed glottis (the Valsalva manoeuvre).

Removing the drains during inspiration must be avoided at all costs. If more than one drain is present and they are connected to the same collection system, a clamp may be used to prevent air being entrained by the remaining drain during removal. Any negative-pressure suction applied to drains is generally discontinued before removal but local policy may dictate otherwise.

Many patients have a purse-string suture, which is tied immediately as the drain is removed, which means two practitioners are needed for the procedure.

The exit site must be observed after removal to ensure no air is escaping. Occlusive dressings and sterile skin closure strips may be applied if this happens. The purse string should not be tied so tightly that it could cause tissue damage.

A repeat X-ray will be required following removal to detect any new fluid or air collection.

**Analgesics**
Chest drain removal can be painful (Avery, 2000), so analgesia and techniques to minimise pain should be used. Unfortunately, recommendations on the type and route of analgesia are mostly contradictory so local guidelines should be consulted or expert advice sought.

Providing reassurance and allaying anxiety will play a major role in making the procedure more tolerable for the patient.
Preparation
Two nurses/assistants are required for safe removal of a chest drain. One is required to tie the suture and seal the site, the other to remove the drain (Dougherty and Lister, 2004). Informed consent should be obtained.

The equipment required is:
- Sterile dressing pack;
- Gloves;
- Stitch cutter;
- Sterile swab;
- Skin-cleansing solution;
- Non-adherent dressing (and occlusive dressing, if required);
- Clinical waste bag;
- Clamps (if there is more than one drain in situ).

The procedure
- Ensure that effective analgesia has been administered, allowing time for it to have had effect. Teach inhalation and breath-holding technique for actual removal to ensure cooperation;
- Wash hands and don a protective apron;
- Discontinue any suction;
- Provide patient instructions;
- Remove dressing;
- Perform hand hygiene procedure and apply gloves;
- Identify the purse-string (securing) suture and offer this to the second practitioner (Fig 1);
- Cut anchor suture (the suture holding the drain in place) (Fig 2);
- Ask the second practitioner to prepare a half-knot (Fig 3);
- Instruct the patient to inhale and hold their breath. Remove the drain firmly. The second practitioner should immediately tie the purse string (Fig 4);
- Complete purse-string stitch-knot and tell the patient to breathe normally (Fig 5);
- Observe the exit site for escaping air (Fig 6);
- Clean the wound and apply a dressing (Fig 6);
- Dispose of equipment safely and wash hands;
- Document the procedure and arrange a chest X-ray as soon as possible.

Professional Responsibilities
All nurses who remove chest drains must have received approved training, undertaken supervised practice and demonstrated competence in the clinical area. The onus is also on the individual to ensure that knowledge and skills are maintained from both a theoretical and a practical perspective. Nurses should also undertake this role in accordance with an organisation’s protocols, policies and guidelines.

References
