



Intercostal Chest Drain in ICU SOP / LocSSIP

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Introduction and Objectives:

This SOP / LocSSIP aims to promote safe and effective intercostal chest drain insertion in ICU by:

- Ensuring compliance with British Thoracic Society guidelines.
- Establishing Local Standards for Safe Invasive Procedures (LocSSIP). This will be achieved by:
- Promoting a team approach to sterile procedures to reduce complications.
- Adherence to key procedure specific safety checks in the WHO checklist style.
- Ensure appropriate investigations are sent if samples are taken.

Indications:

The indications for insertion of an intercostal chest drain in ICU are to drain the pleural space of:

- Air (Pneumothorax)
- Fluid (Pleural Effusion)
- Blood (Haemothorax)
- Pus (Empyema)

Not all collections require drainage. The decision to insert an intercostal chest drain is a medical decision. A risk / benefit decision should be made as to whether intercostal drainage is required in an individual patient. Generally, except in an emergency, all such decisions should be made in consultation with the appropriate ICU Consultant.

Competence:

Intercostal chest drainage has a higher complication rate than most ICU procedures, which can be minimised in experienced hands. The risks are:

- Visceral injury
- Intrapleural infection
- Skin infection
- Displacement
- Blockage
- Pain

Operators should have the appropriate level of supervision for their competence as assessed by Direct Observation of Procedure assessment ie. Direct, Local, Distant or no supervision. Even experienced operators should consider whether risks could be reduced by involvement of outside specialties such as Cardiothoracic Surgery, Upper GI

Surgery or Radiology in patients of that specialty, or in complex cases such as placement outside of the triangle of safety, or known complex anatomy.

Consent:

An individual risk-benefit assessment should be performed to both decide whether insertion should be performed, and to select the suitable site.

Many patients lack capacity on Intensive Care. Chest drain insertion is sometimes a fundamental part of that package of care. In these patients chest drain insertion should proceed in the best interests of the patient. Where patients have capacity, verbal consent should be sought. Where chest drain insertion is expected to carry unusually high risks, consideration of completing a Consent 1 or Consent 4 form should be made. The manner of consent should be recorded on the chest drain procedure record.

Team Approach:

The whole team is responsible for the safety of the patient. Insertion should proceed in a WHO safety checklist style as detailed on the 'Chest drain insertion in the ICU' procedure record form / LocSSIP (see Appendix 1).

Chest drain Insertion requires a minimum of 2 people:

Operator: Chest drain insertion should be performed by an operator with appropriate competence and supervision for the proposed insertion.

Assistant: This is a sterile procedure and a dedicated assistant must be available throughout the procedure. This is usually the nurse caring for the patient. Their role is to:

- Promote patient comfort.
- Assist in key safety checks.
- Assist in ensuring equipment is available.
- Help manage the environment and reduce distractions to the operator.

Supervisor: The operator may (or may not) require either direct or indirect supervision from a supervisor.

Concerns about skill mix or staffing should be escalated as appropriate to the nursing zone leader, nursing shift co-ordinator or responsible consultant as appropriate.

Emergencies:

Non-urgent chest drain insertion is best done between 8am and 6pm when staffing is high and resources to mitigate complications are in place.

Clearly some insertions need to occur outside these hours. Some insertions need to proceed as emergencies where morbidity or mortality will occur without intervention. Operators are encouraged to follow the safety steps described below as much as is practical. If it is not possible to follow all steps, please document this in the medical notes.

Pre-procedure checks:

- Appropriate team members available.
- If possible, clotting should be normalised as much as possible with INR <1.5.
- A recent CXR or CT should be reviewed and available.
- For planned chest drainage between the hours of 8am and 6pm, if possible, Consent 1 or 4 should be provided. In emergency situations drainage should proceed if deemed to be in the patient's best interests.
- Prophylactic antibiotics are not required.
- Strong consideration should be given to pre-emptive administration of intravenous analgesia.
- The patient should be positioned at 45 degrees with their arm raised, which may need support from a further (unskilled) assistant. Alternatively, the patient may be positioned in the lateral position with the affected side uppermost.
- Thoracic ultrasound should be used for all procedures for fluid. It is advisable to examine the effusion to assess risk / benefit before preparing to drain, and use sterile ultrasound during the procedure.
- The operator should wear a hat and mask, scrub with antiseptic soap and don a sterile gown and gloves. A procedure trolley should be covered with a sterile drape and equipment laid out on it. The patient's skin should be cleaned with 2% chlorhexidine, and a large surgical drape applied around the insertion site. A sterile cover should be used for the ultrasound.
- The most appropriate chest drain should be selected. Chest drains are available in sizes 10Ch to 38Ch. Generally, size 10 Seldinger drains are most suitable for drainage of air or free flowing fluid, with larger 'surgical' drains best suited to blood or pus.
- A '**time out**' should be performed as per the 'chest drain insertion in ICU procedure record / LocSSIP'.
- The most common insertion site is in the 5th intercostal space, in the mid clavicular line. Insertion should generally be within the 'triangle of safety' defined as lying within the anterior border of latissimus dorsi, lateral border of pectoralis major, a line superior to the horizontal level of the nipple and an apex below the axilla. Insertion should be just superior to a rib to avoid damage to intercostal vessels and nerves on inferior border of the rib. Occasionally insertion may be justified outside this area, such as when guided by ultrasound or in the anterior 2nd intercostal space for significant anterior pneumothorax. Seek experienced help in these circumstances.
- Use up to 3ml/kg of 1% lignocaine for local anaesthesia in all layers to be breached. Allow time for this to take effect.

- It is advisable to make a superficial horizontal incision wide enough to eventually allow passage of the chest drain.
- When draining fluid, in addition to the use of ultrasound, consider initially tapping the pleura space with a green needle to confirm the presence of fluid before drain insertion.
- When using the Seldinger technique, the wire should be controlled at all times. The dilator should not be advanced deeper than 1cm greater than the distance from skin to pleural space as seen on ultrasound.
- For Seldinger drains, a two person check (operator and assistant) should be made to verify removal of an intact guidewire.
- When using a surgical drain, blunt dissection will be needed. Do not use a trocar. Avoid excessive force. Sweeping a finger within the thoracic cavity will assist blunt dissection and assist confirmation of entry. All drain holes must lie in the pleural space to avoid surgical emphysema.
- Generally drains for fluid should be directed inferiorly and those for air directed superiorly, though it is not always possible to fully control the path of the drain.
- Consider sending the following samples for all effusions aspirated:
 1. A pleural sample via the Arterial Blood Gas Machine (this is safe to do if non-particulate) for pH, Glucose and Lactate.
 2. A paired Arterial Blood Gas for pH, Glucose and Lactate.
 3. 5ml in white top universal container for WCC differential, microscopy & Gram stain (microbiology form).
 4. 5ml in each of 2 blood culture bottles (microbiology form).
 5. 2-5ml in white top universal container for pleural protein, LDH, pH (biochemistry form).
 6. 1-2ml in grey top bottle for pleural glucose (biochemistry form).
 7. >20ml in white top universal container for cellular pathology (cellular pathology form).
 8. Serum for LDH, protein and glucose.
 9. Special circumstances: Universal white top container for biochemistry for amylase (pancreatitis), triglyceride and cholesterol (chylothorax). For possible TB send an additional 5ml white top sample with separate form to UHL. Immunocompromised, additional white top universal for fungal culture.
- Large skin holes can be closed with a 2/0 silk suture either side of the drain. Avoid purse strings and they are uncomfortable and cause scarring. Use a 1/0 silk stitch to create an anchoring stitch beside the drain and secure the drain in a 'Roman sandals' fashion. The site should be covered by a clear dressing to allow observation of the site. An 'omental tag' of sleek should be applied as an extra layer of security.
- A Chest x ray should be performed within 2 hours of insertion, or as soon as possible if complications arise. If malposition is suspected and a chest x ray is not helpful, CT is modality of choice.

- A mal-positioned drain may be partially withdrawn if, for example, it is kinked. Drains should not be advanced once the sterile field is removed. The practice of siting new drains through an old chest drain holes risks infection.
- The drain should be connected to valve system that allows drainage of fluid and air but not re-entry to the pleural cavity.
- Chest drains should generally not be clamped. Clamping risks unrevealed haemorrhage, or if bubbling, risks tension pneumothorax. Very occasionally temporary clamping should be considered for patients who have drained 1.5L drain of pleural fluid in the first hour to prevent re-expansion pulmonary oedema.
- Observations should be undertaken as per guidance in the nursing documentation. Observations should take place every 15 minutes for the first hour, then hourly thereafter. There should be inspection to ensure the drain is safely positioned below the chest, the insertion site is satisfactory and for the presence of bubbling, swinging, fluid type and volume.
- The site should be inspected daily for local infection or fluid discharge and surgical emphysema.

Audit Criteria:

Procedure records will be audited periodically for compliance with this SOP.

Significant morbidity events will be followed up via the Critical Care departmental M&M process.

References and Further Reading:

BTS Pleural Disease Guideline 2010. Thorax Aug 2010, Volume 65, sup2, p1-76

Appendix 1: Procedure record / LocSSIP:



Bwrdd Iechyd Prifysgol
Caerdydd a'r Ffr
Cardiff and Vale
University Health Board



ICU LocSSIP: Intercostal Chest Drain

Minimum 2 person Team

TIME & DATE:

Patient ID sticker

OPERATOR & GRADE:

ASSISTANT & GRADE:

ADDITIONAL STAFF (inc SUPERVISION):

TEAM CHECKS BEFORE

IN AN EMERGENCY, PLEASE TAILOR THIS CHECKLIST DOWN AS NEEDED

Patient ID confirmed?

Consent? (circle).....Verbal consent / best interests decision / other indication? (specify).....

Correct Drain Type & Size? (circle).....Seldinger / Surgical Fr

Most recent CXR / CT/ USS imaging reviewed to confirm site.....

Mandatory assistant present +/- direct supervision / considered if specialist help could make this procedure safer?.....

All equipment and monitoring present including US & sterile probe cover which should be used if draining fluid?.....

ALLERGIES, CLOTTING & PLATELET LEVELS CHECKED.....

Drain site (circle)

R Anterior
L Anterior

R Axillary
L Axillary



Exact Location: _____

Emergency
Elective

Rest done 8am to 5pm

ASSISTANT TO READ TIME OUT!

Have all team members ID'd & roles been assigned?

Patient position optimised?.....

Is patient adequately sedated/ analgesed?

Skin cleaned with 2% chlorhexidine & sterile field (drape) in place

Operator: hat and mask & has washed hands with anti-septic soap prior gowning and gloving?.....

Any concerns raised by team members?

OPERATOR DURING PROCEDURE

Anatomy confirmed using..... Landmarks USS

Details of local anaesthetic used: _____

Sterile field maintained?

For fluid, record results, or circle if requested. Only use gas analyser if sample non-particulate:

Pleural sample (gas analyser):	pH	Glucose	Lactate
ABG sample (gas analyser)	pH	Glucose	Lactate
Pleural sample (to lab)	pH	Glucose	Protein
	LDH	WCC + MCRS	Cytology
Blood Cultures (aerobic & anaerobic samples)			
Serum samples (to lab)	Glucose	Protein	LDH (paired)

All lab pleural samples should be 2-5mls fluid in a white top container with the exception of blood cultures and glucose which go in their own containers. Please label these specimens clearly and ensure delivery to the lab.

See reverse side for Sign out

CHEST DRAIN

