



Clinical Practice Guideline

Guideline coverage includes NICU KEMH, NICU PMH and NETS WA

Intercostal Catheter (ICC) Insertion and Management

This document should be read in conjunction with the [Disclaimer](#)

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Aim

To remove air or fluid from the pleural space or to allow lung re-expansion following surgery.

Keypoints

- Insertion of ICC's is a surgical aseptic technique, requiring PPE and large aseptic field.
- This is a painful procedure, analgesia is recommended prior to the procedure.
- Ongoing [pain management and assesement](#) is required for the duration of chest drainage.
- Surgical chest drains should never be put on suction unless ordered by the surgeon.
- Pigtails are the ICC of choice in the drainage of pleural effusions.
- Consider a chest ultrasound prior to drainage of fluid to document any loculations and the point of maximal fluid collection.
- Insertion must be done with close attention to anatomy. The preferred location is the 4th or 5th intercostal space, above the rib (intercostal vessels run under the rib) in the mid axillary line well clear of the nipple.

Equipment

- Sterile instrument tray
- Sterile gown and gloves
- Sterile drapes
- Skin prep solution (≤ 27 weeks gestation – 10% povidone iodine, > 27 weeks 1% chlorhexidine/alcohol)
- Lignocaine 0.5% with 1mL syringe and 25g needle
- Drawing up needle
- Scalpel
- Appropriate size pigtail or argyle chest drain
- Suture and needle
- Leukostrips
- Tegaderm

Suction Equipment (See images [below](#))

- Underwater seal drainage unit and sterile water
- Suction tubing
- Low pressure suction unit attached to panel

Procedure for Argyle Chest Drain Insertion

- Give analgesia prior to procedure.
- Monitor heart rate, respirations and oxygen saturations during procedure.
- Assemble drainage unit.
- Position infant supine and as directed with arm above the head. Ensure infant can still be visualised after draping.

Procedure Time Out to

Confirm the **correct side** and **site** prior to starting the procedure.

1. Prep the area with appropriate solution.
2. Infiltrate the area with lignocaine before making incision.
3. Placement in most cases should be in the 4th intercostal space in the mid-axillary line. Avoid the nipple.
4. Make a 1cm incision through the skin and subcutaneous tissue.
5. Bluntly dissect away the subcutaneous tissue and intercostal muscles using using straight mosquito forceps to reach the parietal pleura. Aim to dissect a passage just above the rib border in order to avoid the neurovascular bundles running below each rib.
6. Insert argyle ICC directing it anteriorly or posteriorly as indicated.
7. Connect drain to tubing ensuring the water level is correct, the drainage system is 'on' and the suction is on (if applicable) or drain connected to [Heimlich valve](#) if applicable.
8. If drain for pleural effusion – send specimen for analysis.
9. Secure the ICC with a suture and/or leukostrips/tegaderm as applicable.
10. Secure the tubing and drainage unit to prevent dragging and accidental removal.
11. Confirm location of catheter with Xray
12. Document procedure in the medical notes, noting Xray findings.

Procedure for Pigtail 8.5 and 10.2Fr Chest Drain Insertion

- Give analgesia prior to procedure
- Monitor heart rate, respirations and oxygen saturations during procedure.
- Assemble drainage unit.
- Position infant supine and as directed with arm above the head. Ensure infant can still be visualised after draping.

Procedure Time Out to

Confirm the **correct side** and **site** prior to starting the procedure.

1. Prep the area with appropriate solution.
2. Infiltrate the area with lignocaine before making incision.
3. Placement in most cases should be in the 4th intercostal space in the mid-axillary line. Avoid the nipple.
4. Make a 1cm incision through the skin and subcutaneous tissue.
5. Bluntly dissect away the subcutaneous tissue and intercostal muscles using using straight mosquito forceps to reach the parietal pleura. Aim to dissect a passage just above the rib border in order to avoid the neurovascular bundles running below each rib.
6. Open the packet and assemble the needle and syringe.
7. If draining pleural fluid insert needle above the rib, aim posteriorly and aspirate until fluid obtained.
8. If draining air insert needle above the rib, aim anteriorly and aspirate until air obtained.

9. Remove the syringe and advance the soft tipped j-wire (j-end first) through the needle. Only about 5cm of the wire needs to be in the chest.
10. Remove the needle, holding onto the J-wire where it exits the body as soon as the needle tip leaves the skin to avoid inadvertently removing the j-wire.
11. Advance the dilator over the wire using a rotating action to pass through the chest wall. Only need the dilator to enter the chest cavity and remove the dilator (again holding onto the J-wire where it exits the body as soon as the dilator leaves the skin to avoid inadvertently removing the j-wire).
12. Feed the pigtail catheter over the wire, and advance through the chest wall into the chest cavity.
13. Suture or use steri-strips to anchor catheter to skin
14. Place tegaderm dressing over catheter insertion site, if gestation allows.
15. Connect the catheter to drainage unit, making sure there is a 3 way tap attached to the pigtail.
16. Confirm location of catheter with Xray
17. Document procedure in the medical notes, noting Xray findings.

Procedure for Pigtail 6Fr Chest Drain Insertion

- Give analgesia prior to procedure
- Monitor heart rate, respirations and oxygen saturations during procedure.
- Assemble drainage unit.
- Position infant supine and as directed with arm above the head. Ensure infant can still be visualised after draping.

Procedure Time Out to

Confirm the **correct side** and **site** prior to starting the procedure.

1. Prep the area with appropriate solution.
2. Infiltrate the area with lignocaine before making incision.
3. Placement in most cases should be in the 4th intercostal space in the mid-axillary line. Avoid the nipple.
4. Make a 1cm incision through the skin and subcutaneous tissue.
5. Bluntly dissect away the subcutaneous tissue and intercostal muscles using using straight mosquito forceps to reach the parietal pleura. Aim to dissect a passage just above the rib border in order to avoid the neurovascular bundles running below each rib.
6. Open the packet and assemble the catheter and needle, using the grey plastic straightener and then peel this off.
7. Attach a syringe to the needle
8. Pass the needle through the chest wall and as soon as air is aspirated, maintain a stable position and slide the pigtail catheter off the introducer needle
9. Connect a 3-way tap and luerlock to drainage unit.
10. Suture or use steri-strips to anchor catheter to skin

11. Place tegaderm dressing over catheter insertion site, if gestation allows.
12. Confirm location of catheter with Xray.
13. Document procedure in the medical notes, noting Xray findings.

Management

Drainage Devices

The purpose of drainage devices are to help expand the lungs and re-establish normal negative pressure in the thoracic cavity by removing air, blood or fluid in a sterile closed unit, whilst preventing backflow to the pleural space.

There are 2 systems in use: the Atrium Ocean (6B and in the management of pleural collections) and under water sealed drains (SCN/ primarily air leak).

Key Points

- Attachment is undertaken by the person performing ICC insertion maintaining strict aseptic technique.
- The unit and all tubing should be below the patients chest level to facilitate drainage.
- The addition of suction assists the rate of clearance of air and fluid from the pleural space. Avoid “milking” of chest drains as this generates a high negative pressure and may cause pain and lung tissue trauma.
- An air leak will be characterised by intermittent bubbling in the water seal chamber and a rise and fall (swing or oscillation) with respirations. Hourly observations of bubbling, swinging and drainage measurements should be recorded on the observation chart.
- Bubbling will diminish as the pneumothorax resolves however continuous/excessive bubbling or a sudden decrease in bubbling may indicate a system leak or bronchopleural fistula, or development of a tension pneumothorax.
- Unexpected cessation of swing may indicate the tube is blocked or kinked and may potentially result in a tension pneumothorax or surgical emphysema.
- Chest drains should not be clamped whilst an air leak is present due to risk of the patient developing a tension pneumothorax.
- Avoid lifting the drain above chest level. If necessary, a non-toothed clamp may be applied briefly whilst repositioning or changing drainage unit.
- For Argyle trochars - A non-toothed clamp is to kept at the bedside for each chest drain (for use in emergency if accidental disconnection occurs from suction unit).
- Label drainage units if there is more than one. Mark the level of drainage per shift
- The drainage unit or tubing should not be changed routinely as this can increase the incidence of infection. It is safe practice to leave drainage units and tubing in place for 6 days.

Drainage Units

Atrium Ocean

Suction control chamber

Water seal chamber

Air leak monitor



Collection chamber

1. Fill suction control (A) to 5 cmH₂O unless directed otherwise.
2. Fill water seal (B) to 2 cm line. This compartment is where you observe for bubbling, swinging NOT column A.
3. The suction control stopcock must be ON for initial setup and should not be turned OFF during patient use.
4. To connect multiple chest drains to one suction source insert a 'Y' connector onto the wall suction tubing then connect each drain onto one end of the 'Y'.



Low flow suction unit. Commence at 40mmHg.



Drainage unit. Fill water to marked line for provide 3cm water seal.

Water level.



Heimlich valve

Dressings

- Observe catheter insertion site for signs of infection and inflammation and ensure dressing remains clean and intact.
- The dressing may be changed under aseptic technique if there is obvious blood or exudate staining.
- If dressing requires changing caution must be maintained given a procedural risk for non-intentional catheter displacement or removal.
- Consider pain relief for dressing changes.
- Document dressing changes and site inspections in progress notes.

Documentation

- At least hourly documentation of bubbling, swing and drainage on MR489.
- Check suction flow hourly.
- Water level in the suction chamber must be read and documented every 4 hours. Refill water level to correct level if required.

Removal

Chest drains are removed on medical orders when air and fluid accumulation has resolved. This is indicated when drainage, bubbling and fluid fluctuations have ceased, air movement is symmetrical and lung fields are clear and equal. The chest tube should be clamped for up to 6 hours prior to removal.

Chest X-ray confirmation of resolution should be obtained prior to removing the drain. Chest drains can be removed by medical staff or a nurse deemed competent in the procedure, however because of the risk of reaccumulation, a medical officer should be in the unit when the drain is removed. This is a standard aseptic technique.

Provide appropriate sedation / analgesia.

Equipment

- Dressing pack
- Gauze
- Sodium Chloride
- Sterile scissors
- Leukostrips
- Tegaderm (optional)
 1. Clamp drain and turn off suction if not already done.
 2. Remove existing dressing and suture.
 3. Place gauze over drain site and remove drain on expiration. Send tip if indicated.
 4. Seal insertion site with gauze and tegaderm (may need leukostrips if large incision).
 5. Watch for signs of re-accumulation.
 6. Repeat CXR as necessary.
 7. Document the chest drain removal in the infant's progress notes and on the observation chart. The volume of exudate in the drainage unit should be documented in the output column of the observation chart.

References

1. MacDonald MG, Ramasethu J, Rais-Bahrami K. Atlas of procedures in neonatology. Philadelphia: Lippincott Williams & Wilkins; 2013.
2. Eichenwald EC, Hansen AR, Martin C, and Stark AR. Cloherty and Stark's manual of neonatal care. Philadelphia: Lippincott Williams & Wilkins; 2017

Related WNHS policies, procedures and guidelines

Neonatal Clinical Guidelines - [Pneumothorax](#)
 - [Needle Aspiration of the Chest](#)
 - [Pain Assessment and Management](#)

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