



CLINICAL GUIDELINE	
Intercostal Catheter (ICC) Insertion and Management	
Scope (Staff):	Nursing and Medical Staff
Scope (Area):	NICU KEMH, NICU PCH, NETS WA

This document should be read in conjunction with this [DISCLAIMER](#)

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Aim

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

Key Points

- 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 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 locations 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.

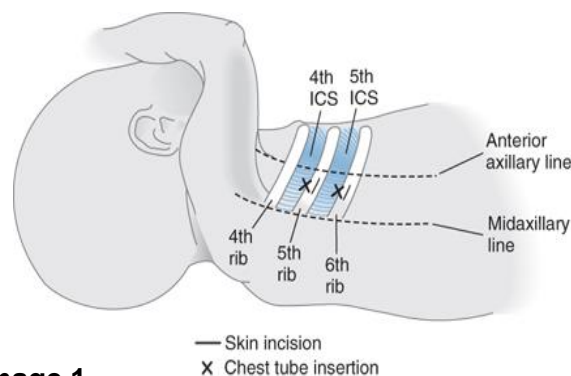
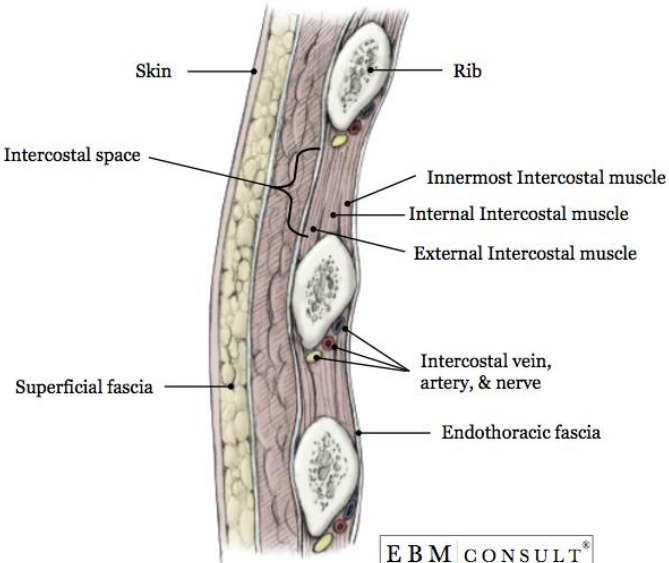


Image 1

Equipment

- Sterile instrument tray
- Sterile drapes
- Skin prep solution (≤ 27 weeks gestation – 10% povidone iodine, > 27 weeks 1% chlorhexidine/alcohol)
- Drawing up needle
- Lignocaine 0.5% with 1mL syringe and 25g needle
- Leukostrips
- Suction Equipment (See images [below](#))
 - Underwater seal drainage unit and sterile water
 - Suction tubing
 - Low pressure suction unit attached to panel
- Sterile gown and gloves
- Scalpel
- Suture and needle
- Appropriate size pigtail or argyle chest drain
- Tegaderm

Procedure

Steps	Additional Information
1. Give analgesia prior to procedure.	
2. Monitor heart rate, respirations and oxygen saturations during procedure	
3. Assemble appropriate drainage unit.	
4. Position infant supine and as directed with arm above the head	Ensure infant can still be visualised after draping.
Procedure TIME OUT to confirm correct side, site and equipment prior to starting the procedure.	
5. Prep the area with appropriate solution	
6. Infiltrate the area with lignocaine before making incision.	Lignocaine
7. Placement in most cases should be in the 4th intercostal space in the mid-axillary line. Avoid the nipple.	Refer to Image 1.
8. Make a 1cm incision through the skin and subcutaneous tissue.	
9. 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.	 <p>The diagram illustrates a cross-section of the intercostal space. On the left, the skin and superficial fascia are shown. Below these is the intercostal space, which contains the innermost intercostal muscle, the internal intercostal muscle, and the external intercostal muscle. The neurovascular bundle, consisting of the intercostal vein, artery, and nerve, is located below the external intercostal muscle. The rib is visible at the top, and the endothoracic fascia is at the bottom. Labels include: Skin, Intercostal space, Superficial fascia, Rib, Innermost Intercostal muscle, Internal Intercostal muscle, External Intercostal muscle, Intercostal vein, artery, & nerve, and Endothoracic fascia. The logo 'EBM CONSULT®' is in the bottom right corner.</p>

Argyle Chest Drain Insertion

Steps	Additional Information
1. Insert argyle ICC directing it anteriorly or posteriorly as indicated	
2. 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.	If drain for pleural effusion – send specimen for analysis
3. Secure the ICC with a suture and/or leukostrips/tegaderm as applicable	
4. Secure the tubing and drainage unit to prevent dragging and accidental removal	
5. Confirm location of catheter with Xray	
6. Document procedure in the medical notes, noting Xray findings. Update parents	

Pigtail 8.5 and 10.2Fr Chest Drain Insertion

Steps	Additional Information
1. Open the packet and assemble the needle and syringe.	
2. If draining pleural fluid insert needle above the rib, aim posteriorly and aspirate until fluid obtained.	
3. If draining air insert needle above the rib, aim anteriorly and aspirate until air obtained.	
4. 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.
5. 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.	
6. 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	

Steps	Additional Information
removing the j-wire.	
7. Feed the pigtail catheter over the wire, and advance through the chest wall into the chest cavity	
8. Suture or use steri-strips to anchor catheter to skin	
9. Place tegaderm dressing over catheter insertion site, if gestation allows.	
10. Connect the catheter to drainage unit, making sure there is a 3 way tap attached to the pigtail.	
11. Confirm location of catheter with Xray	
12. Document procedure in the medical notes, noting Xray findings. Update parents	

Pigtail 6Fr Chest Drain Insertion

Steps	Additional Information
1. Open the packet and assemble the catheter and needle, using the grey plastic straightener and then peel this off	
2. Attach a syringe to the needle	
3. 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	
4. Connect a 3-way tap and luerlock to drainage unit	
5. Suture or use steri-strips to anchor catheter to skin	
6. Place tegaderm dressing over catheter insertion site, if gestation allows.	
7. Confirm location of catheter with Xray	
8. Document procedure in the medical notes, noting Xray findings. Update parents	

Management


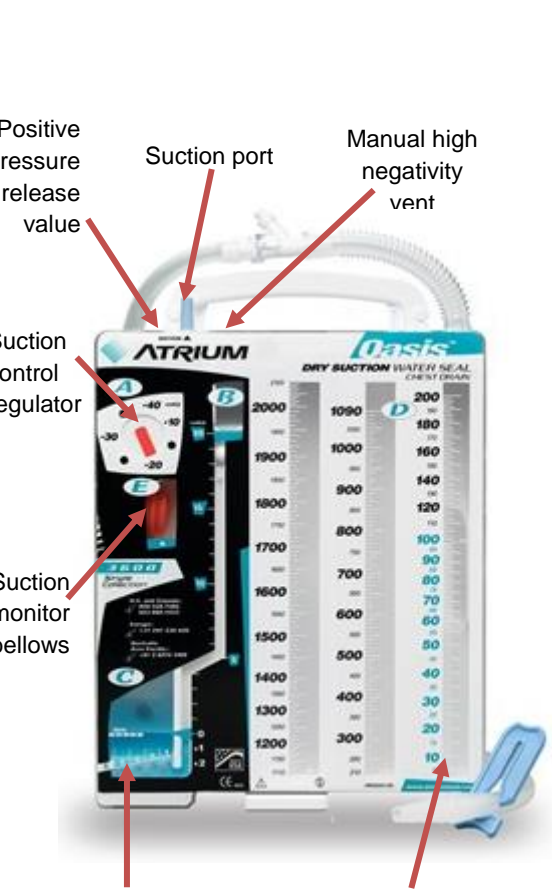
The purpose of drainage devices are to help expand the lungs and re-establish normal negative pressure in the thoracic cavity by removing air, blood or fluid in a sterile closed unit, whilst preventing backflow to the pleural space.





There are 2 systems in use: the Atrium Ocean (3B 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 patient's 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, turn tap to the off position briefly whilst repositioning or changing drainage unit.
- For Argyle trochars - A non-toothed clamp is to be 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	
	<ol style="list-style-type: none"> 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'.
Atrium Oasis Dry Suction Chest drain- Latex free. Used on 3B	
	<p>This drain is used in the treatment of a Pneumothorax, treatment of infants pre-TOF repair and post-op wound drainage <i>(Wound drain is not connected to suction unless specified by Surgeon.)</i></p> <ol style="list-style-type: none"> 1. Remove the ampoule of sterile water from the back of the drain. Twist off the top of the ampoule. Add water to the water seal chamber through the suction port. Fill the water seal chamber to the 2cm fill line 2. Dial the Suction control to -10. This can be increased as per medical order. 3. Connect suction, to suction port. Set the wall suction pressure at a minimum of -80mmHg. Normal suction wall suction. 4. Ensure that the bellows expand to the delta mark. This demonstrates that the suction is working. If the bellows is not at or past the delta mark, increase suction pressure at the wall. 5. 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'. 6. If the chest drain is not used with suction: the suction outlet port (BLUE) MUST remain open to air to allow air to

	<p>vent from the system. If suction is ceased, disconnect suction tubing from the top of the drain and from the wall suction</p>		
	<p>Low flow suction unit. Commence at 40mmHg</p>		<p>Drainage unit. Fill water to marked line for provide 3cm water seal.</p> <p>Water level</p>
 <p>Heimlich valve</p>		<p>Pneumonstat Chest Drain</p>	

Specimen Collection

Drainage specimens are collected culture by sampling through the needless sampling port located by the in line connector.

Equipment

- Specimen container
- 10ml Syringe
- Gloves
- Alcohol swab
- Dressing pack
- Eye protection

Procedure

Steps	Additional Information
1. Aseptic Technique	Aseptic Technique
2. Wait for the fluid to collect in a loop of the tubing	
3. Perform hand hygiene, then don eye protection and gloves	

4. Clean the sampling port, or for smaller sampling volumes you can use the patent tube, with an alcohol wipe and leave to dry for 20 seconds	
5. Clamp the tubing above where the fluid has collected	With three-way tap or clamp depending on the drain in use
6. Connect a 10ml Luer lock syringe to the sampling port and aspirate the fluid out of the tubing. If using the patient tube clamp the tubing then use a 20 gauge needle with syringe to aspirate specimen.	
7. Place fluid in sterile specimen container	
8. Once the syringe is disconnected remove all clamps and kinks	
9. Perform hand hygiene, document volume removed and send specimen to lab.	

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.
- *Atrium Ocean*: water level in the suction chamber must be read and documented every 4 hours. Refill water level to correct level if required.

Removal of Intercostal Catheter

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 re-accumulation, a medical officer should be in the unit when the drain is removed. This is a standard aseptic technique.

Equipment

- Dressing pack
- Sodium Chloride
- Leukostrips
- Gauze
- Sterile scissors
- Tegaderm (optional)

Procedure

Steps	Additional Information
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 leucostrips 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

Complications and Troubleshooting

Complication	Action
Pneumothorax	<ul style="list-style-type: none"> - Signs and symptoms include: decrease SpO2, increase WOB, diminished breath sounds, decreased chest movement, tachycardia or bradycardia, hypotension - Notify medical staff, they will request urgent chest x-ray - Ensure drain system is intact with no leaks, or blockages such as kinks or clamps - Prepare for emergency chest aspiration, insertion/repositioning of chest drain

Intercostal Catheter Insertion and Management


Bleeding at the Drain Site	<ul style="list-style-type: none"> - Don gloves and apply pressure to the insertion site - Place occlusive dressing over the site - Notify medical staff - Check coagulation results - Check drain chamber to ensure no excessive blood loss
Infection of insertion site	<ul style="list-style-type: none"> - Notify medical staff - Swab wound site - Consider blood cultures
Accidental disconnection of system	<ul style="list-style-type: none"> - Clamp the drain tubing at the patent end. Clean ends of drain and reconnect. If a new drainage system is needed cover the exposed patient end of the drain with sterile dressing while new drain is set up. Ensure clamp is removed when problem resolved. - Check vital signs - Alert medical staff and complete a CIMS
Accidental Drain Dislodgement	<ul style="list-style-type: none"> - Apply pressure to the exit site and seal with an occlusive dressing over the top - Check vital signs - Alert medical staff and complete a CIMS
Unable to Remove Chest Drain	<ul style="list-style-type: none"> - If the drain is unable to be removed with reasonable traction being applied, notify the responsible medical team

Related CAHS internal policies, procedures and guidelines
<p>Needle Aspiration of the Chest</p> <p>Pneumothorax</p> <p>Pain Assessment and Management</p>

References and related external legislation, policies, and guidelines
<p>1. MacDonald MG, Ramasethu J, Rais-Bahrami K. Atlas of procedures in neonatology. Philadelphia: Lippincott Williams & Wilkins; 2013.</p>

Intercostal Catheter Insertion and Management

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