

## Online Appendix 9 How to drain an Indwelling Pleural Catheter (IPC) with vacuum bottle

### Equipment

The equipment and tray set-up needed to drain an IPC is shown in Box 1 and Figure 1 respectively.

#### Box 1: Equipment needed to drain an IPC

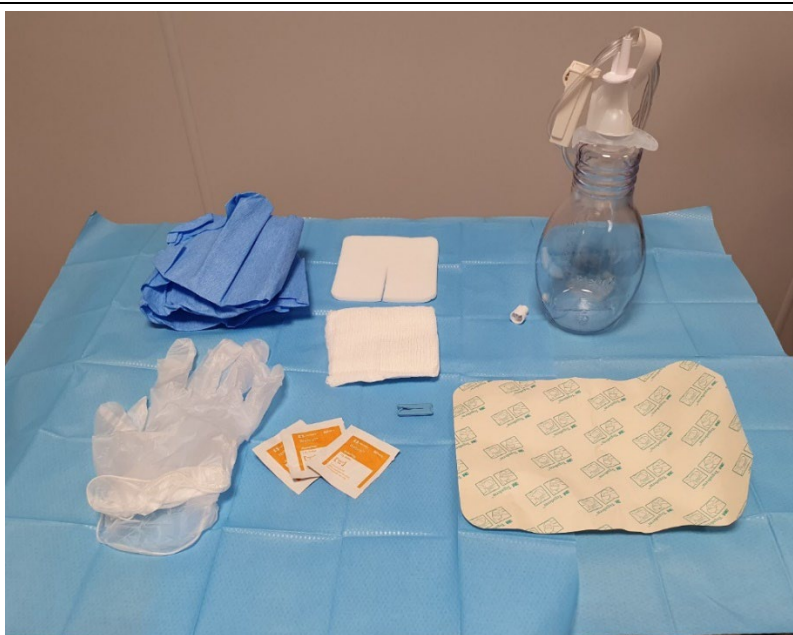
IPC dressing pack and bottle kit. This should include:

- Sterile gloves
- Split foam dressing
- Gauze swabs
- Clear dressing
- Alcohol wipes
- Side clamp
- New valve cap
- Clinical waste bag
- Vacuum drainage bottle

Apron

Drainage record documentation

**Figure 1:** Tray set up for draining an IPC

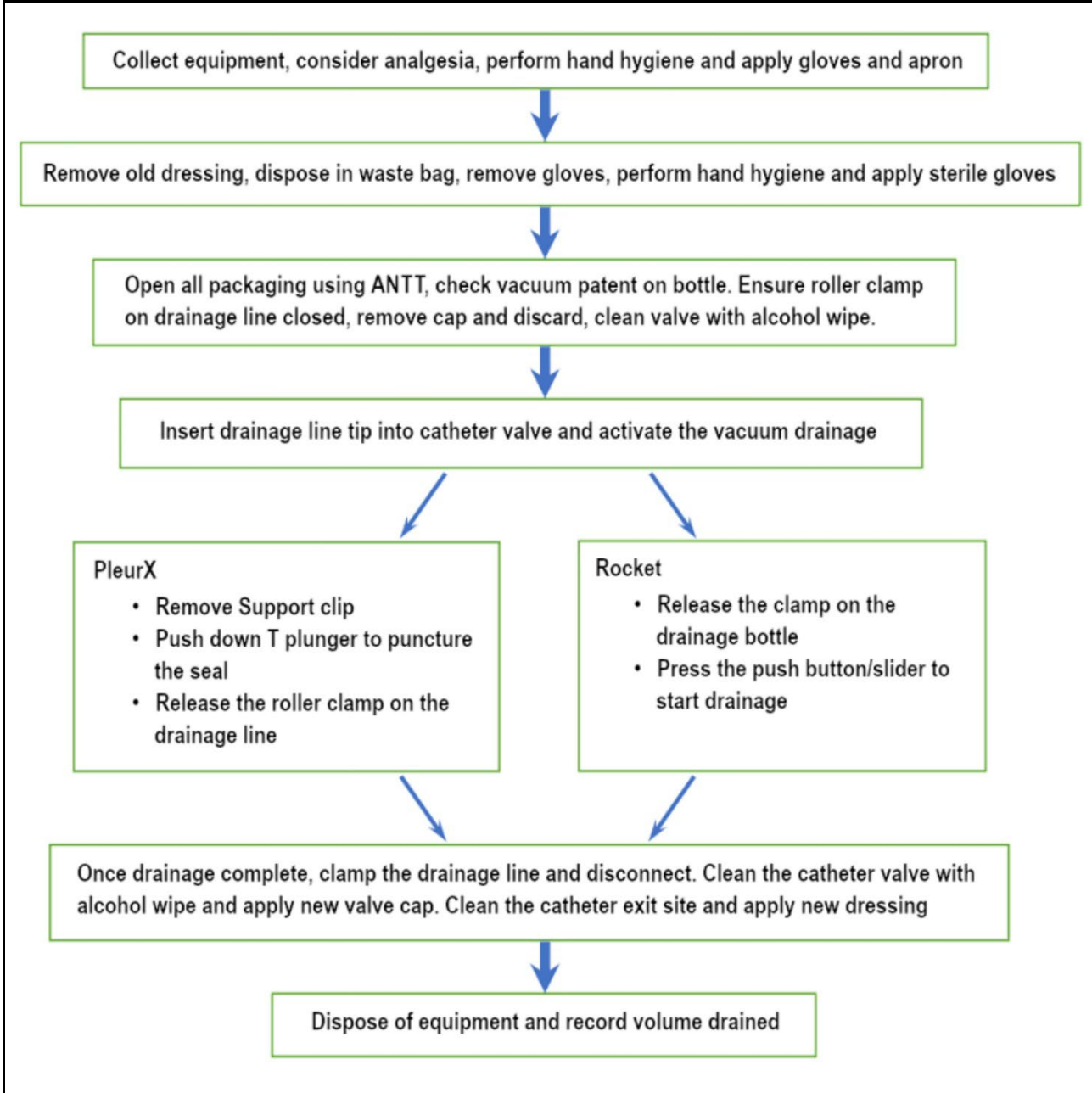


### Procedure

A summary of the procedure and visual instruction sheet are shown in Box 2 and Box 3 respectively.

IPCs should be drained using the manufacturers' vacuum bottles according to their licensed use. In some Trusts, flutter bags have been used for selected patients in the community who find vacuum drainage uncomfortable (information from the Torbay and South Devon NHS Foundation Trust). Attachment to an underwater seal drain may also be considered for in-patients to reduce costs associated with vacuum bottles or to drain an infected pleural effusion (see Supplementary Online Appendix 8: How to set up a chest drain bottle/ underwater seal drain).

**Box 2: Summary of process to drain an IPC with a vacuum bottle**



**Box 3: How to drain an IPC**



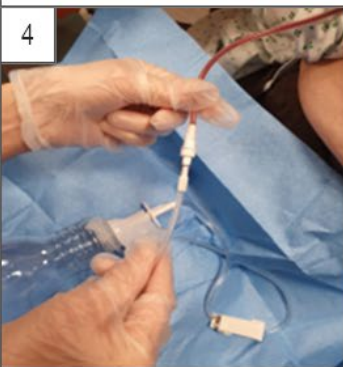
1 Remove dressing and cap.



2 Clean catheter exit site and valve.



3 Ensure roller clamp closed.



4 Attach drainage line to IPC.



5 Remove collar from plunger.



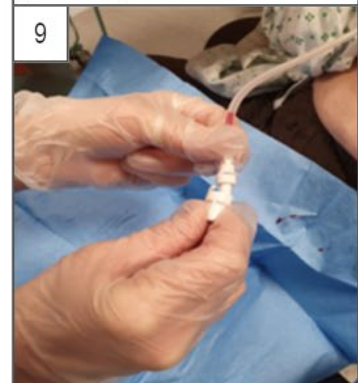
6 Depress plunger to break seal (if PleurX).



7 Release roller clamp to allow drainage.



8 Disconnect drainage line once drainage complete.



9 Clean valve and attach new cap.



10 Coil IPC on foam dressing.



11 Cover with gauze and clear film dressing.



12 Ensure IPC completely covered.

## Potential complications

### Infection

Pleural infection affects less than 5% of patients with IPCs and is usually responsive to antibiotic treatment without the need for catheter removal or surgery.<sup>1</sup> If the catheter exit site or subcutaneous tract appear infected a swab should be taken and appropriate antibiotic therapy commenced. If the nature of the fluid changes, becoming turbid, creamy or malodourous the respiratory team should be contacted to arrange assessment for intravenous therapy and possible hospital admission.

### Troubleshooting

<i>Failure to drain fluid</i>	<p>Failure of the catheter to drain any fluid could suggest a failure of the vacuum on the drainage bottle, blockage of the catheter lumen, no fluid to drain or a trapped lung.</p> <ul style="list-style-type: none"><li>• The T plunger on a PleurX bottle should be checked to make sure it is fully compressed and seal pierced.</li><li>• If the blue vacuum indicator on a Rocket or similar bottle has expanded, then the vacuum in the bottle has been lost.</li><li>• If the suction/vacuum has been lost a new bottle should be attached.</li><li>• The catheter should be checked for kinks and to ensure the clamp on the drainage line is open and the drainage line and valve are securely connected.</li><li>• If the catheter itself is clogged, rolling it between the fingers may loosen the blockage and allow fluid to drain, and use of small amounts of saline flush or fibrinolytic should be considered.</li><li>• If fluid still does not drain it could indicate that there is no fluid to drain or that autopleurodesis has occurred, but if the patient is more breathless could suggest that the catheter lumen is blocked with fibrin clots or that pleural loculations have developed.</li></ul> <p>Pleural loculations may develop over time limiting drainage in 10% of patients.<sup>1</sup></p> <ul style="list-style-type: none"><li>• In this event assessment by the respiratory team is required to consider whether catheter flushing with saline or intrapleural fibrinolytic therapy is indicated.</li><li>• If the patient is not breathless and drainage is minimal, the frequency of drainage attempts can be reduced to twice weekly or once weekly depending on the previous drainage regime.</li><li>• Spontaneous pleurodesis can develop in 25% of IPC treated patients who are drained in response to symptoms alone.<sup>2,3</sup> If the catheter drains less than 50 ml on three consecutive occasions the respiratory team should be contacted for consideration of catheter removal.</li></ul>
<i>Pain</i>	<p>During or following drainage under suction, excessively negative pressure may develop inside the pleural cavity resulting in pain, this is often more intense in the presence of trapped lung.<sup>4</sup></p> <ul style="list-style-type: none"><li>• This can be alleviated by slowing or stopping drainage, reducing the volume of fluid drained and providing pain relief prior to drainage.</li></ul>
<i>Catheter damage</i>	<ul style="list-style-type: none"><li>• In the rare event of damage to the catheter or its valve the catheter should be clamped to avoid air entry to the pleural cavity or leakage of pleural fluid.</li><li>• If the catheter displaces or comes out completely the site should be 'steri-stripped' and covered with an occlusive dressing and the respiratory team contacted to review in case another drain is required.</li></ul>

## Clinical practice points

- All manufacturers' drainage packs contain comprehensive procedure guidelines which should be adhered to.
- The rate of fluid drainage should be slowed or stopped if pain is experienced during drainage.
- Antibiotic therapy should be commenced if IPC related infection is suspected.
- Prompt referral to the respiratory team is required if pleural infection/empyema is suspected.
- Secondary care advice should be sought in the event drainage stops in the presence of worsening breathlessness.
- If the catheter drains less than 50 ml on three consecutive occasions the respiratory team should be contacted for consideration of catheter removal.

## Waste disposal

All drainage kits are single use only and should be disposed of in line with local clinical waste guidelines. If the patient is not receiving chemotherapy/immunotherapy the drainage fluid can be disposed of down the toilet and the bottle with the household rubbish. If the patient is receiving chemotherapy/cytotoxic treatment please check local clinical waste guidelines, these may require the bottle to be clamped and put into a clinical waste bag for collection.

## References

1. Lui MM, Thomas R, Lee YC. Complications of indwelling pleural catheter use and their management. *BMJ Open Respir Res.* 2016;3(1):e000123.
2. Bhatnagar R, Keenan EK, Morley AJ, et al. Outpatient talc administration by indwelling pleural catheter for malignant effusion. *N Engl J Med.* 2018;378(14):1313-1322.
3. Muruganandan S, Azzopardi M, Fitzgerald DB, et al. Aggressive versus symptom-guided drainage of malignant pleural effusion via indwelling pleural catheters (AMPLE-2): an open-label randomised trial. *Lancet Respir Med.* 2018;6(9):671-680.
4. Chalhoub M, Saqib A, Castellano M. Indwelling pleural catheters: complications and management strategies. *J Thorac Dis.* 2018;10(7):4659-4666.