

Queensland  
Trauma Education

**CHEST TRAUMA**

# Intercostal catheter and chest drain management

## Case discussion

Facilitator resource kit

**CSDS**



Clinical Skills Development Service

Metro North  
Health



Queensland  
Government

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## Queensland Trauma Education

The resources developed for Queensland Trauma Education are designed for use in any Queensland Health facility that cares for patients who have been injured as a result of trauma. Each resource can be modified by the facilitator and scaled to the learners needs as well as the environment in which the education is being delivered, from tertiary to rural and remote facilities.

## National Safety and Quality Health Service (NSQHS) Standards



## About this training resource kit

This resource kit provides healthcare workers with the knowledge and skills on how to optimise the management of a patient with an ICC and chest drainage systems following a traumatic chest injury.

### Target audience

Medical, nursing, and allied health staff.

### Duration

30 minutes.

### Group size

Small group participation (4-6 participants).

### Learning objectives

By the end of this session the participant will be able to:

- Describe the principles of chest drainage systems including underwater and dry seal drains.
- Understand strategies to troubleshoot and escalate care with chest drainage systems.

## Facilitator guide

1. Distribute participant resource kit to learners.
2. Distribute supporting documents and deliver case discussion to group.
3. Utilise the question and answer guide to support discussion around ICC and UWSD management.

## Participant resource kit

- Learning objectives.
- Overview of chest trauma and intercostal catheter management.
- Further reading.
- Recommended online learning.

# Overview of chest trauma and intercostal catheter management

Chest trauma is the second most common traumatic injury in non-intentional trauma.<sup>1</sup> Trauma to the chest is associated with the highest mortality; in some studies, up to 60% depending on the mechanism of injury.<sup>2</sup> The management of chest trauma often requires the insertion of intercostal catheter to treat life-threatening injuries including traumatic haemo-pneumothorax.

Clinicians caring for patients with intercostal catheters and chest drainage systems require knowledge and skills of the overarching principles of ICC management to optimise treatment and reduce the risk to patients. Patients with ICCs should be cared for in clinical environments where clinicians are competent in the assessment and ongoing management of ICC with the ability to effectively troubleshoot and escalate care where necessary.

## Further reading

NSW Agency for Clinical Innovation (2016), Pleural Drains in Adults – A Consensus Guideline, ACI Respiratory Network. <https://www.aci.health.nsw.gov.au/resources/respiratory/pleural-drains/pleural-drains-in-adults>

Porcel J. M. (2018), Chest Tube Drainage of the Pleural Space: A Concise Review for Pulmonologists. *Tuberculosis and respiratory diseases*, 81(2), 106–115. <https://doi.org/10.4046/trd.2017.0107>

Maskell, N. (2010), British Thoracic Society Pleural Disease Guidelines - 2010 update. *Thorax*, 65: 667-669. <http://dx.doi.org/10.1136/thx.2010.140236>

MNHHS RBWH Procedure 000634: Intercostal Catheter Management. <http://hi.bns.health.qld.gov.au/rbh/policies/procedures/000634.pdf>

## Recommended online learning

Chest Drain Course for Doctors, Clinical Skills Development Service, Queensland Health. <https://central.csds.qld.edu.au/central/courses/135>

Chest Drain Course for Nurses, Clinical Skills Development Service, Queensland Health. <https://central.csds.qld.edu.au/central/courses/138>

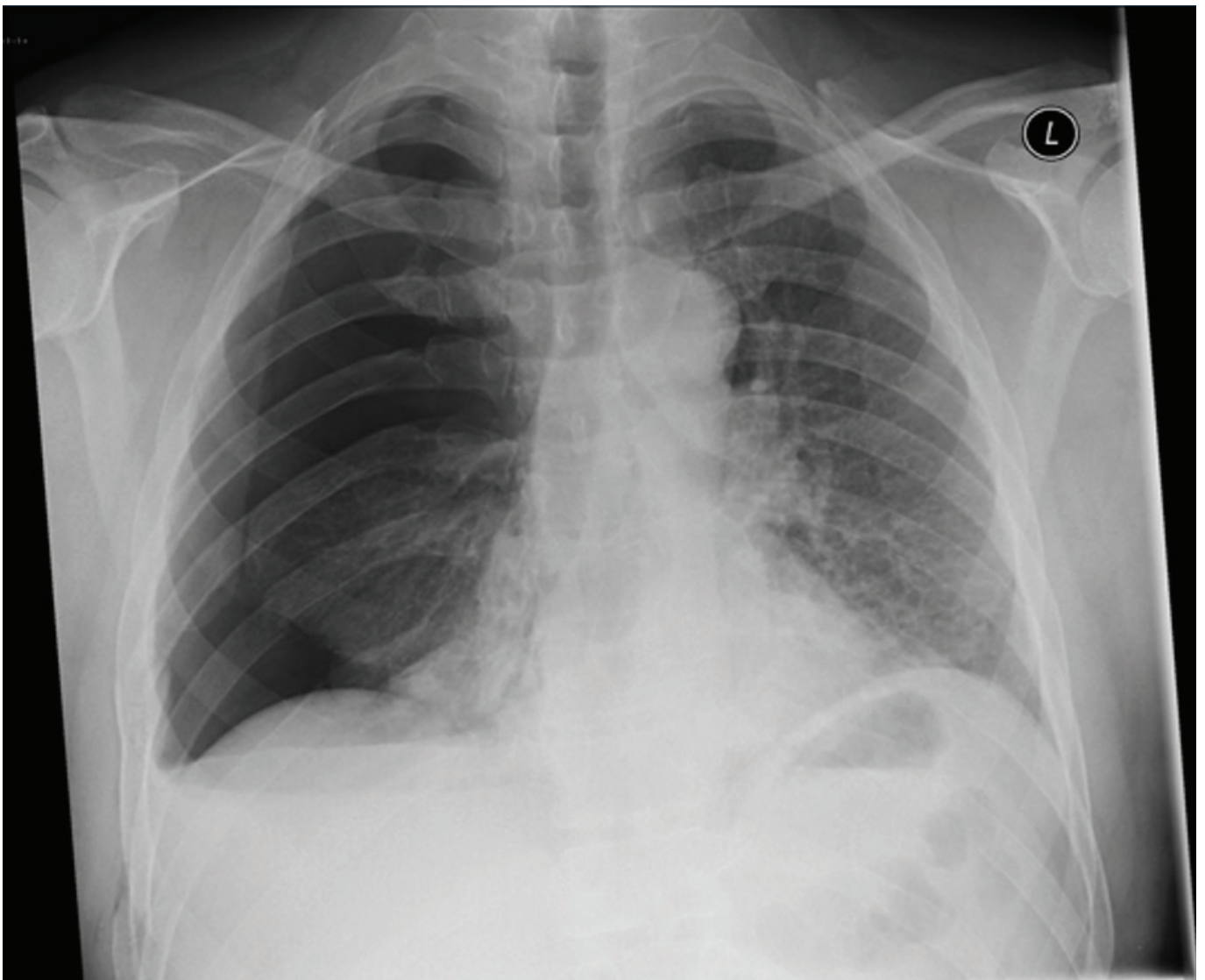
## Case discussion

### Case study

A 45-year-old man BIBA following a motor bike collision. He was travelling at approx. 40km/hr and struck the side of a parked car. He was wearing a helmet and protective clothing. No loss of consciousness and he recalls the accident.

Following assessment and investigations in ED, including a supine Chest XRAY, he was diagnosed with a large R) sided pneumothorax with R) # 8-10th ribs. An ICC was inserted in ED.

**Here is his pre-insertion CXR.**



Case courtesy of Dr Sajoscha Sorrentino, Radiopaedia.org, rID: 14780.

## Question and answer guide

### 1. 1. How do we know the ICC is in the correct position?

- a. Clinical
  - i. Patient clinically stable – normalisation of oxygen saturations, respiratory rate, HR and BP.
  - ii. ICC drainage – swing noted, bubbling only on expiration, may have drainage of fluid.
- b. Radiological
  - i. CXR – ICC tip positioned well in hemi thorax, away from mediastinal structures but all air ports within the thorax.

### 2. The ICC is connected to an Atrium Oasis dry suction water seal chest drainage system (widely utilised water seal drainage system). What is the difference between a dry and wet suction water seal chest drain?

- a. **Dry suction** water seal chest drain (eg. Atrium Oasis) – Dry suction control systems regulate suction pressure mechanically rather than with a column of water.  
[https://www.getinge.com/siteassets/products-a-z/express-dry-seal-chest-drain/express-dry-seal-chest\\_drain-rev.pdf](https://www.getinge.com/siteassets/products-a-z/express-dry-seal-chest-drain/express-dry-seal-chest_drain-rev.pdf)
- b. **Wet suction** water seal chest drain (eg. Atrium Ocean) – Wet suction control systems regulate suction pressure by the height of the column of water in the suction control chamber.  
[https://www.getinge.com/siteassets/products-a-z/ocean-wet-suction-water-seal-chest-drain/ocean-wet-suction-drain\\_rev-c.pdf](https://www.getinge.com/siteassets/products-a-z/ocean-wet-suction-water-seal-chest-drain/ocean-wet-suction-drain_rev-c.pdf)

### 3. Suddenly the patient complains of increased pain to R) chest and difficulty breathing. What could be the cause of this?

- a. Recurrence of pneumothorax.
  - i. ICC issues – kinking of tube, misplaced- too far in/fallen out, in fissure/lung parenchyma.
  - ii. UWSD issues – leak, no seal, knocked over.
- b. Rapid expansion of pneumothorax.
  - i. Less common, especially with acute and small/moderate air collections.
- c. ICC discomfort – LA worn off.
- d. Rib fracture discomfort- consider IV analgesia, PCA or regional block.

### 4. The chest drain is accidentally knocked over and the water in the canister is dislodged. How do you immediately manage this situation? Does the chest drainage system need to be replaced?

- a. **The water-seal has been lost and air can enter the pleural space.**
- b. Place the system upright and ensure the water-seal is restored.
- c. Using aseptic non-touch technique, add more sterile water if needed (for water-seal rod needs to be 2cm below water level).
- d. Check all connections to ensure a seal; encourage the patient to exhale hard or cough to force out accumulated air.
- e. Check that the amount of pleural drainage is not less than before.
- f. Notify the medical officer and team leader.
- g. The UWSD does not need to be replaced if you have restored the water-seal and the patient remains clinically stable. Ensure this is discussed with the medical officer and team leader.

5. **On the morning rounds, the medical officer orders suction of – 20cm H2O be commenced on your patient. How do you go about introducing suction to the atrium oasis dry suction water seal drain?**
- Wall suction setup will always be dependent on the drainage system used and the wall suction available in your clinical environment. Always follow the specific chest drainage system manufacturer instructions.**
  - Set suction control according to the specific drainage system instruction.
  - In the absence of an inbuilt suction control mechanism, use low pressure wall suction set to the correct pressure as ordered.
  - In hospitals where high level wall suction gauges are available, these should be changed to low suction gauges before any suction is applied to an UWSD system which requires low range suction.
  - Low wall suction refers to -20mmHg or 3 KPa.
  - High wall suction refers to -80mmHg or greater.
  - Chest drainage systems with an inbuilt suction control mechanism will typically display measurements in cmH2O.
  - Staff should take care to accurately read suction pressure when selecting low wall suction pressure.
6. **Day 7 the ICC remains in-situ on the ward. The patient develops a fever and increasing SOB. What does this indicate?**
- The patient may have developed an empyema. A CXR and USS needs to be performed to identify if a collection is present and a sample taken for gram stain. If not drained by ICC the patient is referred for a VATS.

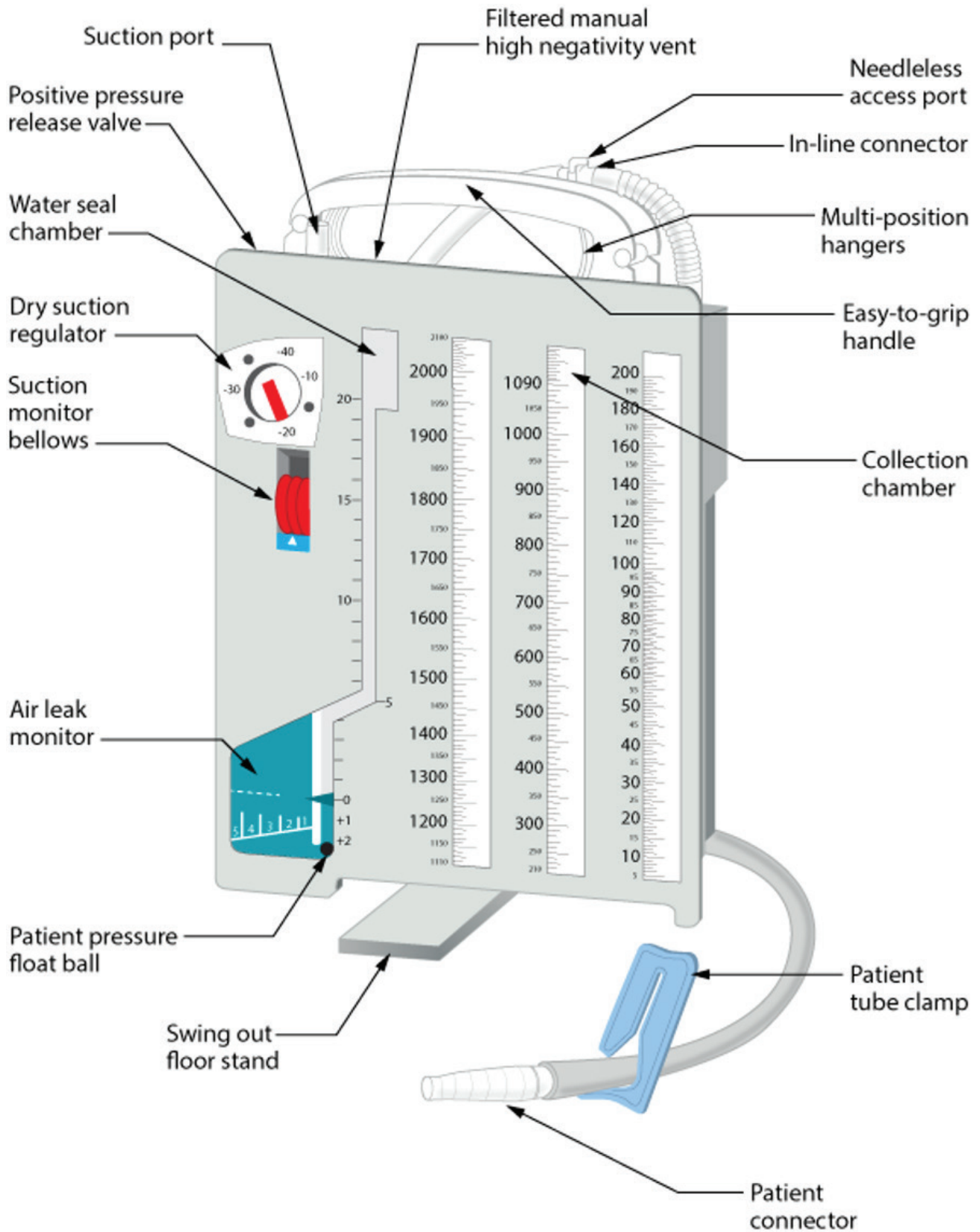


## Supporting documents

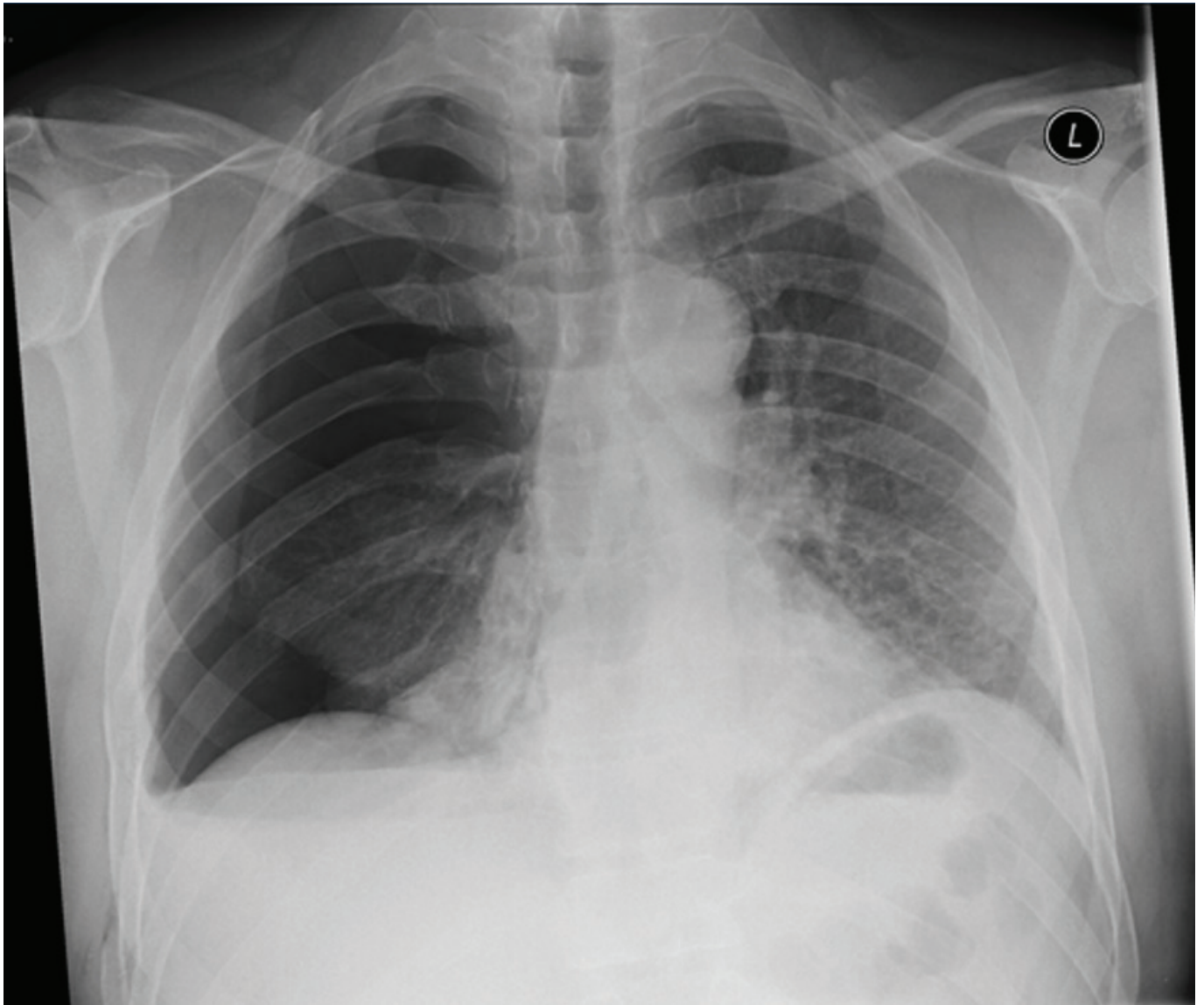
The following supporting documents are provided for this case discussion:

1. Dry suction water seal chest drain infographic (eg. Atrium oasis).
2. CXR.

### Dry suction water seal chest drain infographic (eg. Atrium oasis)



**CXR**



## Acronyms and abbreviations

<b>ICC</b>	intercostal catheter
<b>UWSD</b>	underwater seal drain
<b>VATS</b>	video assisted thoracoscopic surgery

## References

1. NSW Agency for Clinical Innovation (2016) Pleural Drains in Adults – A Consensus Guideline, ACI Respiratory Network <https://www.aci.health.nsw.gov.au/resources/respiratory/pleural-drains/pleural-drains-in-adults>
2. Doyle, G.R., McCutcheon, J.A. (2015). *Clinical Procedures for Safer Patient Care*. Victoria, BC: BCcampus. Retrieved from <https://opentextbc.ca/clinicalskills/chapter/10-7-chest-drainage-systems/>
3. MNHHS RBWH Procedure 000634: Intercostal Catheter Management <http://hi.bns.health.qld.gov.au/rbh/policies/procedures/000634.pdf>
4. Millar F R, Hillman T. (2018) Managing chest drains on medical wards *BMJ*, 363 :k4639 <https://doi.org/10.1136/bmj.k4639>

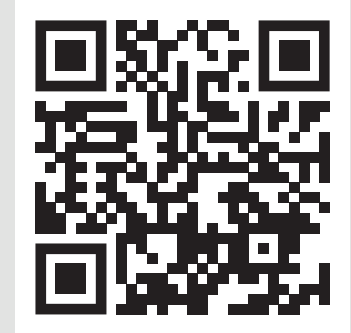
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