



CHEST TRAUMA

Intercostal catheter insertion and removal

Case discussion

Facilitator resource kit



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Queensland Trauma Education**Chest Trauma - Intercostal catheter insertion and removal: Case discussion - Facilitator resource kit
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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 to perform the insertion of an Intercostal catheter (ICC) to manage a patient with blunt chest trauma, including the indications and considerations for ICC placement.

Target audience

Emergency department 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:

- Recognise the indications for ICC insertion including:
 - Size of haemothorax/pneumothorax.
 - Timing of insertion and associated clinical features.
- Understand the considerations for ICC placement and management including:
 - Size of ICC.
 - Location of ICC insertion.
 - Potential complications of insertion and removal of chest drains.

Facilitator guide

1. Facilitator to provide participant resource kit to the learner.
2. Facilitator to distribute supporting documents and deliver case study to group.
3. Utilise question and answer guide to promote the group discussion around ICC insertion.

Participant resource kit

- Learning objectives.
- Overview of chest trauma.
- Further reading.
- Recommended online learning.

Overview of chest trauma

Chest trauma is the second most common traumatic injury in non-intentional trauma.¹ Trauma to the chest is associated with the highest mortality; in some studies, up to 60% depending on the mechanism of injury.² Blunt chest trauma accounts for 90% of thoracic injuries and requires prompt recognition and management to reduce morbidity and mortality.¹

Knowledge of likely sequelae of injury patterns are key factors for assessment, management and patient survival.

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>

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>

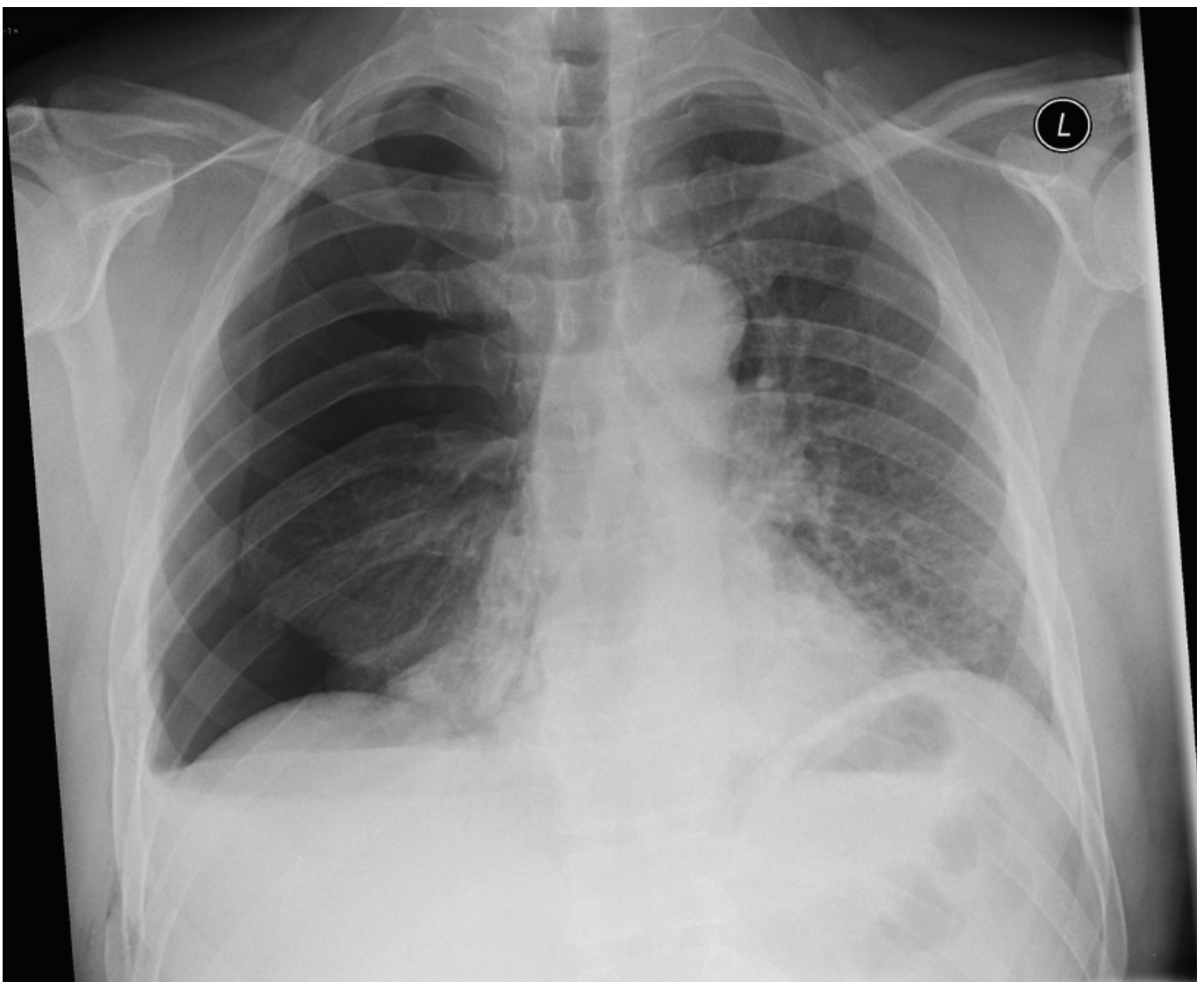
Case discussion

Case study

A 45-year-old man is brought into your emergency department following a motorbike 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 is able to recall the accident.

He is alert and orientated, complaining of R) sided chest pain. He is tachycardic at 100bpm, well perfused with a BP 130/80. His respiratory rate is 28 and saturations 93% on room air.

A CXR is performed on your patient.



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

Question and answer guide

1. What are the key findings on this CXR?

R) pneumothorax with # R) 8-10th ribs.

2. How do we decide whether to use a pigtail catheter or intercostal catheter?

a. Small bore pleural catheters <20Fr.

Indications: Spontaneous pneumothorax: free flowing pleural effusions or empyema.

b. Large bore intercostal catheter (ICC) >20Fr.

Indications: haemothorax, acute chest trauma, open thoracostomy, post cardiothoracic, oesophageal or spinal surgery.

3. What are the clinical features that determine if a drain is required? What other factors do you need to consider before inserting a chest drain?

The clinical status of your patient:

- Respiratory effort/distress.
- Respiratory compromise including hypoxaemia, hypercarbia.
- Circulatory compromise including tachycardia, hypotension or signs of shock.
- Size of pneumothorax and +/- haemothorax.
- Human resources – experienced/skilled operator and assistant for ICC insertion?
- Outside of business hours?
- Risk assessment – anticoagulated? Confused? Diaphragmatic injury?

You plan to insert an ICC to drain his pneumothorax.

4. What anticipated complications can occur directly following an ICC insertion?

- Tension pneumothorax.
- Incorrect tube position.
- Haemorrhage.
- Trauma to intrathoracic structures, intra-abdominal structures and intercostal muscles.
- Re-expansion pulmonary oedema.
- Subcutaneous emphysema.

5. Should an ICC be clamped?

Clamping a pleural drain is contraindicated in any patient receiving positive pressure ventilation or non-invasive ventilation.

Clamps (Howard Kelly: smooth angle bladed clamps) should always be kept at the patient bedside (for emergency use only) Note: this will be guided by local policy.

How the drainage system is clamped is dependent on the system in use:

UWSD eg. single chamber UWSD

Howard Kelly clamp.

Dry Seal Drainage System eg. Atrium Oasis

Removable slide clamp or Howard Kelly clamp.

Pleural drains should only be clamped on medical orders in specific circumstances which include:

- post pneumonectomy
- during drainage of large volumes of fluid
- in preparation for removal of large bore intercostal catheters
- for short periods to drain collected fluid from drain system tubing
- for change of bottle and /or tubing
- to assess for air leaks
- if it is not possible to maintain the drainage system below the patient's chest e.g. moving a patient from bed to bed.

6. What patient factors suggest the need for sedation for ICC insertion?

Assess patient disposition for:

- confusion
- agitation
- anxiety
- respiratory distress
- difficulty positioning patient.

Consider analgesia strategy:

- **Pre-medication:** Opioid and +/- benzodiazepine.
- **Sedation:** If conscious sedation required, human resources required to monitor patient throughout and following procedure.
- **Local Anaesthetic/regional blockade:** Local anaesthesia to be infiltrated to ICC insertion site. Consider regional blockade for ongoing analgesia.

7. What equipment do you need to perform insertion of an ICC in a safe manner? Is there a dedicated space/team for this in your environment?

- access to resuscitation equipment
- patient monitoring (namely continuous SpO2 monitoring)
- environment should be selected carefully, and patient safety considered when choosing the location to insert chest tube (unless deemed emergent).

8. What are your options to provide a one-way valve to the circuit?

Heimlich valve.



Indications: Portable one-way flutter valve used for intercostal catheter drainage (typically of air, not fluid). Typically used for patient transport as it is less cumbersome than usual chest drainage systems and isn't dependent on patient positioning.

Contraindications: Not utilised when large drainage of fluid is likely.

ICC position:

9. How do you know the ICC is correctly positioned?

- Improved clinical status e.g. increased oxygen saturations.
- Fogging/misting of the ICC on expiration.
- Swinging/tidalling/bubbling of UWSD.
- Drainage of fluid/air into UWSD.
- Post-insertion CXR.

10. How do you know the ICC is correctly positioned?

- Insert chest drain so the proximal holes are well inside the chest wall.
- Secure drain with a deep suture to skin, wrapped tightly around the tube to prevent slippage.
- Secure the drain at a second site by taping to the skin.
- Ensure adequate length of tubing to the UWSD to minimise traction on the chest tube.
- Take care when transferring the patient from bed to bed/bed to chair.
- Patient education.

11. What happens if the drain is no longer swinging? Bubbling?

Troubleshooting ICC: <https://www.aci.health.nsw.gov.au/resources/respiratory/pleural-drains/pleural-drains-in-adults/section-3-management/trouble-shooting>

ICC removal:

12. What equipment do you need for an ICC removal?

Refer to local policy and procedures for ICC removal.

- Dressing pack.
- Gauze squares x 6.
- 0.9% saline for skin cleansing.
- Skin closure strips (if no mattress/anchoring suture).
- Scissors to release locking mechanism of a small bore catheter (as applicable).
- Suture cutter.
- Occlusive dressing.
- Plastic backed protective sheet.
- PPE (clinically clean gloves for removal of dressing, impervious gown/plastic apron, eye protection, mask).
- Sterile gloves are required for Medical Officer or RN removing the pleural drain and for the RN tying the suture or applying steri-strips and dressing.

13. What patient instructions are given prior to ICC removal?

- Administer analgesia and wait for it to be effective.
- Explain procedure to patient and advise that they may experience a brief sensation of burning or pain as the drain is removed.
- Explain how you want the patient to breathe during the procedure and get the patient to demonstrate.
- Place plastic backed sheet under the patient.
- Position the patient in a semi-fowlers to upright position to allow for ease of access to the pleural drain insertion site, while maintaining patient privacy and comfort.
- Support tubing throughout to prevent tension on the insertion site.

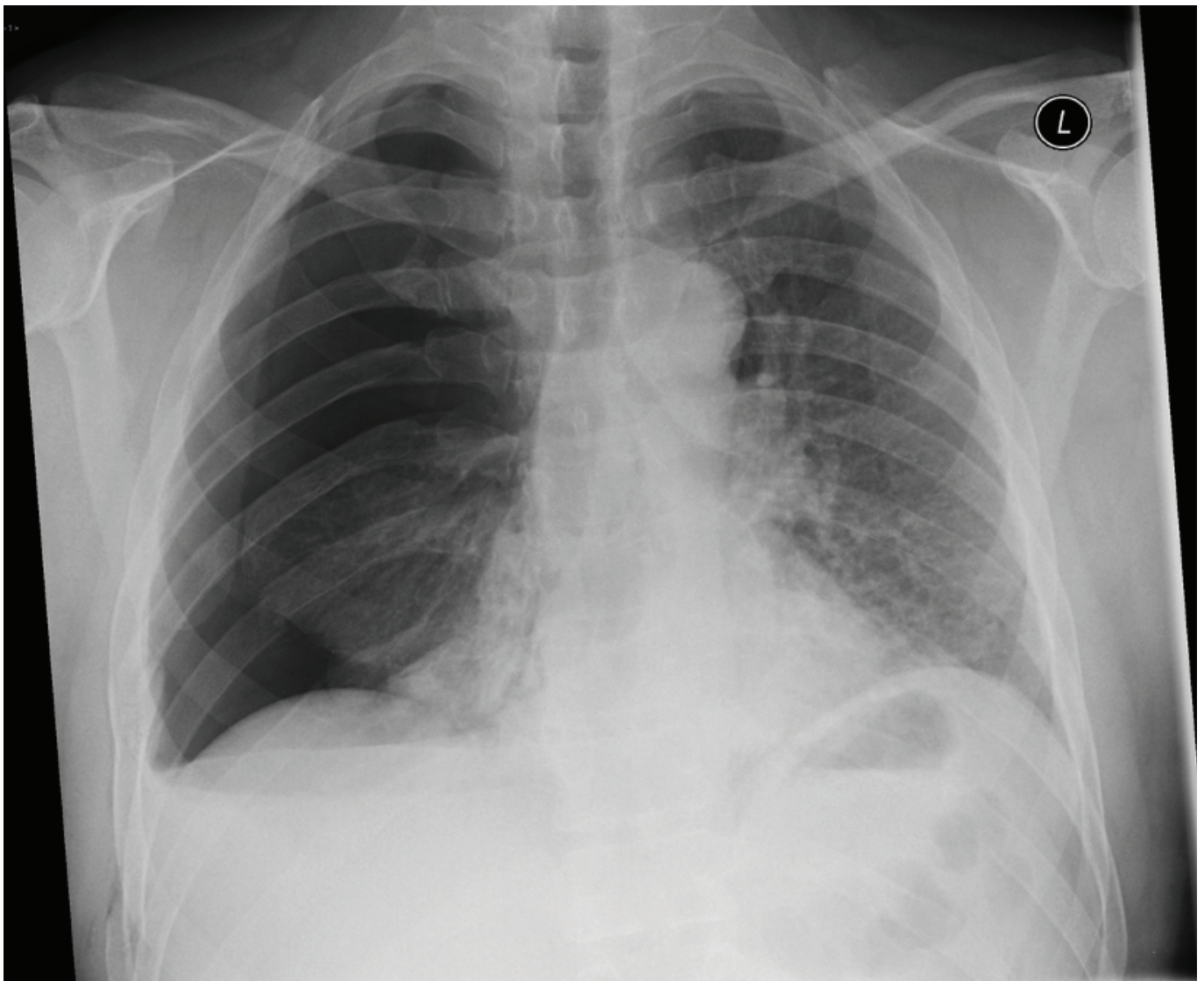
14. What complications can occur following ICC removal?

- Re-accumulation of pneumothorax and/or pleural fluid.
- Air leak following removal.
- Adhesions.
- Infection.
- Wound dehiscence.

Supporting documents

The following supporting documents are provided for this case discussion:

1. CXR.
2. Heimlich valve.
3. Insertion of chest drain guideline.

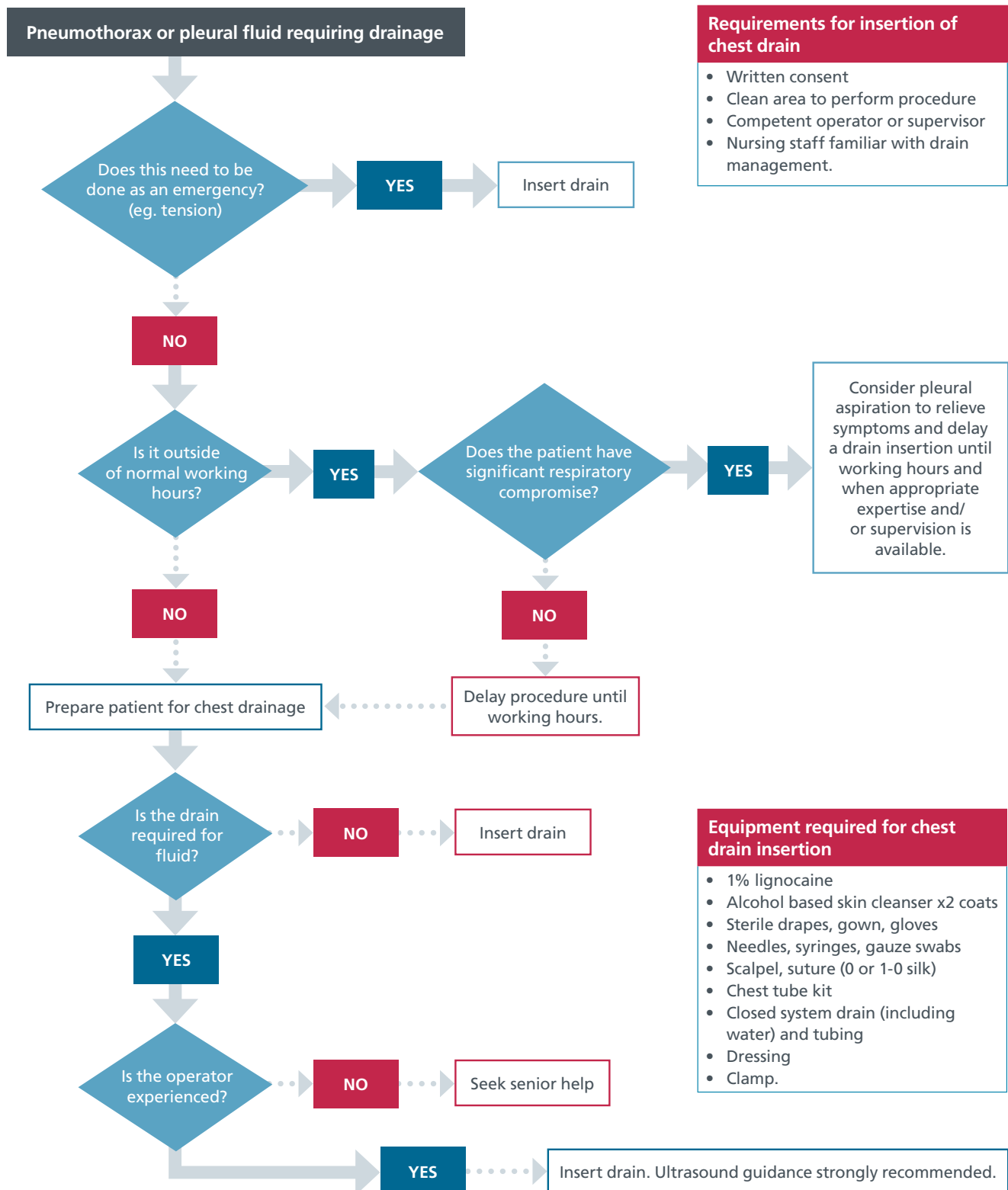
CXR

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

Heimlich valve



Insertion of chest drain guideline



Havelock T et al. Thorax 2010;65:i61-i76. Copyright © BMJ Publish Group Ltd and British Thoracic Society. All rights reserved.

Acronyms and abbreviations

ICC	intercostal catheter
Fr	french
UWSD	underwater seal drain
PPE	personal protective equipment

References

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