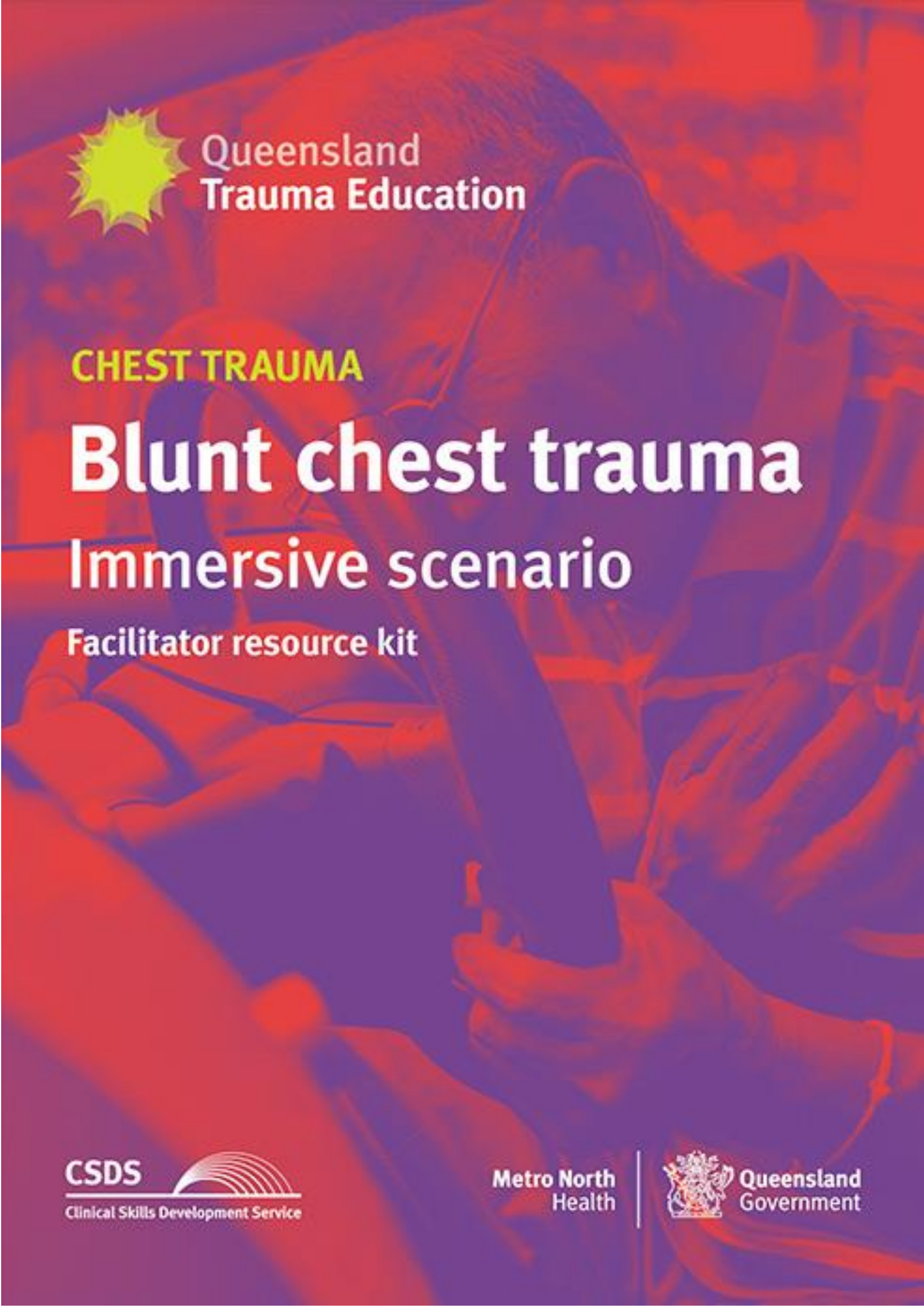

Queensland
Trauma Education

CHEST TRAUMA

Blunt chest trauma

Immersive scenario

Facilitator resource kit

CSDS
Clinical Skills Development Service

Metro North Health

Queensland Government

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.

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Queensland Trauma Education
Chest trauma - Blunt chest trauma: Immersive scenario - Facilitator resource kit Version 2.0

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About this training resource kit

This resource kit provides healthcare workers with the skills and knowledge to effectively assess and manage a patient suffering blunt chest trauma injuries.

The scenario encompasses the decision making and procedural skill for insertion of an intercostal catheter to manage a traumatic haemo-pneumothorax.

National Safety and Quality Health Service (NSQHS) Standards

Target audience

Emergency department medical and nursing clinicians.

Duration

45-60 minutes.

Group size

Suited to small group participation.

Learning objectives

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

- Demonstrate the assessment of a trauma patient with blunt chest injury.
- Recognise and effectively manage a patient with immediately life-threatening blunt chest trauma.

Facilitation guide

- Facilitator to discuss the pre-simulation briefing and deliver the immersive scenario on blunt chest trauma.
- Utilise the supporting documents to maximise the learning throughout immersive scenario.
- Utilise the debriefing guide to evaluate participant performance and provide feedback.

Supporting resources (in Printable Resources)

The following supporting documents are provided for this immersive scenario:

1. CXR 1: Pre-ICC insertion: R Pneumothorax, pulmonary contusions bilaterally, multiple R sided rib fractures.
2. CXR 2: Post-ICC insertion: R ICC insitu.
3. Pelvic X-ray.
4. EFAST: Morrison's/RUQ: Negative.
5. EFAST: Splenorenal/LUQ: Negative.

6. EFAST: Subxiphoid/cardiac: Negative.
7. EFAST: Pelvis: Negative.
8. EFAST: L lung: Negative.
9. EFAST: R lung: Positive.
10. Venous blood gas.

Simulation event

This section contains the following:

1. Immersive scenario
2. Resource requirements
3. Handover card
4. Scenario progression
    a. State 1
    b. State 2
    c. State 3
    d. State 4
5. Debriefing guide
6. Pre-briefing simulation poster
7. Structured assessment

Immersive scenario

Type	Immersive scenario
Target audience	Emergency department medical and nursing staff.
Overview	62yr old male driver. Involved in high speed RTC approximately 1 hour ago. He was restrained, airbags deployed and was assisted out of the vehicle on ambulance arrival. The patient is brought to the emergency department by ambulance complaining of central chest pain and difficulty taking a deep breath. His vital signs with the ambulance are HR 100 BP 120/80 sats 91% RA and RR 28. He has a seatbelt mark across his chest wall. He has significant cardio-respiratory collapse that will require prompt assessment, recognition and management necessitating intercostal catheter (ICC) insertion.
Learning objectives	• Demonstrate the assessment of a trauma patient with chest injuries. • Recognise and effectively manage a patient with immediately life-threatening blunt chest trauma.

Duration	45 minutes, including debrief.

Resource requirements

Physical resources

Room setup	Resus bay in emergency.
Simulator/s	1 manikin – SimMan3G / ALS Simulator - with ICC insertion part.
Simulator set up	• Street clothes, lying supine, cervical collar insitu. • Moulage: seatbelt mark across R chest. No other injuries.
Clinical equipment	• ICCs, sterile insertion pack, ICC Drain set (Under Water Seal Drain (UWSD)/Dry Drainage System). • PPE – gown, sterile gloves, goggles, surgical mask. • Medications – local anaesthetic, +/-sedatives, analgesia.
Access	2x PIVC setups, with 1x “NO IV” sticker attached.
Other	ED chart and relevant paperwork.

Human resources

Faculty	2 facilitators (Dr/Nurse with debriefing experience) to take on roles of scenario commander and primary debrief.
Simulation coordinators	1 for manikin set up and control.
Confederates	Optional QAS officer to provide handover.
Other	1 nurse and 1 doctor in room. Add more team members as available to full trauma team composition (if applicable to your work area).

Handover card

Handover from ambulance officer

This is Mark. He is a normally well 62-year-old man who was the driver involved in a single vehicle high speed RTC at approximately 100km/hr 1 hour ago. He missed the corner and has collided with a telegraph pole splitting it in half. He was wearing a seatbelt and airbags deployed. We had to help him out of the car due to his pain, he was not entrapped. He has significant pain across his chest, there is a large seatbelt mark and he is complaining of difficulty breathing.

His vital signs currently are GCS 15, HR 100 BP 120/80 sats 91% RA and respiratory rate 28.

He has had 10mg IV morphine with minimal relief.

He has no PMHx, no regular medications and no allergies. Thanks for looking after him.

Scenario progression

<table>
<tr><th colspan="4">STATE 1: INITIAL ASSESSMENT</th></tr>
<tr><th colspan="2">Vital signs</th><th>Script</th><th>Details</th><th>Expected actions</th></tr>
<tr><td>ECG</td><td>ST</td><td rowspan="9">Mark
I have so much pain in my chest and it’s hard to breathe.</td><td rowspan="9">Primary survey results

A Maintaining own, cervical collar insitu, anterior neck normal, no cervical spine tenderness.

B Reduced air entry R) chest, shallow respirations, large bruise across chest wall consistent with seatbelt mark, tender sternum and anterior chest wall, crepitus and subcutaneous emphysema to R) chest wall.

C Well perfused peripherally.

D No neurological deficits.

E Nil abnormality</td><td rowspan="9">Commence primary survey
☐ Assess airway including cervical spine and anterior neck.
☐ Assess breathing.
• Identify bony chest wall and sternal tenderness.
• Examine for unequal chest wall movement.
• Feel for crepitus and subcutaneous emphysema.
• Auscultate breath sounds.
☐ Assess circulation.
• Consider blunt cardiac injury.
☐ Assess disability.
☐ Expose patient.
☐ Recognise hypoxaemia and respiratory distress and apply high concentration oxygen (e.g. 15L NRB).</td></tr>
<tr><td>HR</td><td>100</td></tr>
<tr><td>SpO_2</td><td>91% RA</td></tr>
<tr><td>BP/ART</td><td>120/80</td></tr>
<tr><td>RR</td><td>28</td></tr>
<tr><td>Temp</td><td>36.7</td></tr>
<tr><td>BGL</td><td>5.0</td></tr>
<tr><td>GCS</td><td>15</td></tr>
<tr><td></td><td></td></tr>
</table>

<table>
<tr><th colspan="4">STATE 2</th></tr>
<tr><th colspan="2">Vital signs</th><th>Script</th><th>Details</th><th>Expected actions</th></tr>
<tr><td>ECG</td><td>ST</td><td rowspan="9">Mark
Help me…my chest hurts.</td><td rowspan="9">• Improvement in saturations to 95% if oxygen is applied.

Secondary survey results

• Head – nil abnormalities.
• Chest – large bruise across chest wall consistent with seatbelt mark, tender sternum and anterior chest wall, crepitus and subcutaneous emphysema to R chest wall.
• Abdomen – soft, minor abrasions across lower abdomen from seatbelt.
• Pelvis – aligned, non-tender to palpation. Long bones and limbs – nil injury.
• Log roll – nil injury.

Results

• CXR – R Pneumothorax, pulmonary contusions bilaterally, multiple R sided rib fractures.
• Pelvic Xray – normal.
• EFAST – nil free fluid in abdomen, lack of lung sliding RHS.</td><td rowspan="9">Secondary survey
❑ Perform a secondary survey.
❑ Head to toe assessment.
❑ Arrange further analgesia.
❑ Ensure oxygenation adequate.

Investigations
❑ Perform ECG for blunt cardiac injury.
❑ Bloods: trauma panel- FBE, chem20, group and hold, lipase, coags.

○ Consider cardiac enzymes.
❑ EFAST.
❑ CXR and Pelvic Xray.
❑ Venous blood gas.

Management
❑ Recognition of R) chest wall trauma.
❑ Recognition of need for ICC.
❑ Analgesia plan.</td></tr>
<tr><td>HR</td><td>110</td></tr>
<tr><td>SpO_2</td><td>95%
15L
NRB</td></tr>
<tr><td>BP/ART</td><td>115/80</td></tr>
<tr><td>RR</td><td>28</td></tr>
<tr><td>Temp</td><td>36.4</td></tr>
<tr><td>BGL</td><td>5.0</td></tr>
<tr><td>GCS</td><td>15</td></tr>
<tr><td></td><td></td></tr>
</table>

<table>
<tr><th colspan="4">STATE 3</th></tr>
<tr><th colspan="2">Vital signs</th><th>Script</th><th>Details</th><th>Expected actions</th></tr>
<tr><td>ECG</td><td>ST</td><td rowspan="9">Mark
It's harder to breathe now (one-word responses, respiratory distress)</td><td rowspan="9">Increasing respiratory distress and tachycardia.

Manikin – Block R) lung.

Assessment results
• Maintaining own, anterior neck NAD.
• Increased work of breathing, auscultation – poor air entry R chest.
• Asymmetrical chest rise and fall.
• Increasing tachycardia</td><td rowspan="9">Assessment
❑ Repeat primary survey.
❑ Recognition of need for decompression R chest.

Management
❑ Prepare for ICC insertion:
• Equipment.
• Sedation plan.
• Team roles.
• Pre-brief.
❑ Insertion of ICC:
• Sterile technique.
• LA/sedation.
• Identification of landmarks for the triangle of safety.
• Scalpel, blunt dissect to pleura, insertion of ICC to correct depth, secure with sutures/ dressing, connect to ICC drainage system.
❑ Confirm correct placement of ICC:
○ Initial rush of air/fluid.
○ Misting of tube.
○ Swinging, bubbling, drainage.
❑ Improvement in clinical symptoms.
❑ Monitor ICC drainage output:
○ Fluid type (frank blood vs haemoserous).
❑ Volume.</td></tr>
<tr><td>HR</td><td>120</td></tr>
<tr><td>SpO₂</td><td>93% NRB</td></tr>
<tr><td>BP/ART</td><td>105/70</td></tr>
<tr><td>RR</td><td>30</td></tr>
<tr><td>Temp</td><td>36.1</td></tr>
<tr><td>BGL</td><td>5.2</td></tr>
<tr><td>GCS</td><td>15</td></tr>
<tr><td></td><td></td></tr>
</table>

<table>
<tr><th colspan="4">STATE 4</th></tr>
<tr><th colspan="2">Vital signs</th><th>Script</th><th>Details</th><th>Expected actions</th></tr>
<tr><td>ECG</td><td>ST</td><td rowspan="9">Mark
It still hurts but I can breathe better now.</td><td rowspan="9">Respiratory status and tachycardia improve post-ICC insertion.

Primary survey results - repeated

A Maintaining own, soft C-collar insitu. Anterior neck NAD.

B Chest remains tender anteriorly, bilateral chest rise/fall, R) ICC swinging/bubbling drained 250mls bloodstained fluid. Crepitus and subcutaneous emphysema unchanged.

C Peripherally warm, well perfused.

D GCS 15/15.

E Nil further abnormalities.</td><td rowspan="9">Assessment
❑ Repeat primary survey.
❑ Check ICC function/position:
• Swing, bubble, drain.
• CXR position (CXR included).
• Improvement in clinical symptoms.

Management
❑ Disposition and ongoing analgesia.
❑ Documentation.
❑ Notification to surgeons/RSQ for consultation of disposition.</td></tr>
<tr><td>HR</td><td>105</td></tr>
<tr><td>SpO_2</td><td>99% NRB</td></tr>
<tr><td>BP/ART</td><td>110/75</td></tr>
<tr><td>RR</td><td>22</td></tr>
<tr><td>Temp</td><td>36.1</td></tr>
<tr><td>BGL</td><td>5.1</td></tr>
<tr><td>GCS</td><td>15</td></tr>
<tr><td></td><td></td></tr>
</table>

Debriefing guide

Scenario objectives

- Understand the injury pattern from high-speed frontal impact vehicle trauma.
- Perform a primary and secondary survey assessment.
- Recognise major chest trauma.
- Understand management principles of blunt chest trauma.

Example questions

Exploring diagnosis

- Explain your thought process in assessing a trauma patient for life threatening injuries.
- Do you have a system for rapid assessment following trauma?
- How does blunt chest wall trauma lead to oxygenation and ventilation issues?
- What other injuries need to be considered with blunt chest trauma and rib fractures?
- How do you exclude blunt cardiac, aortic or diaphragmatic injury?

Discussing management

- What are your strategies to manage this patient's pain?
- What are your options to manage his hypoxaemia?
- What is the role of a Chest and Pelvic X-ray in major trauma?
- How do you decide the timing of intercostal catheter insertion?
- Are there any factors that would make you change your approach to the ICC insertion (consideration of diaphragmatic injury)?

Discussing teamwork / crisis resource management

- How do you prioritise the team to manage the chest wall injury?
- What would you do with your team to provide optimal conditions to place the ICC?
- Where would that ideally occur in your department?
- What strategies can you use to ensure the team have a shared mental model for the ongoing care of this patient?

Key moments

- Systematic assessment of trauma presentation.
- Recognition of severe chest wall injury.
- Decision making for ICC insertion timing and procedure.

Acronyms and abbreviations

Term	Definition
ICC	Intercostal catheter
UWSD	Underwater seal drain
RSQ	Retrieval Services Queensland
QAS	Queensland Ambulance Service
RHS	Right hand side
RTC	Road traffic collision
NRB	Nonrebreather
EFAST	Extended focused assessment sonography in trauma
LA	Local anaesthetic
NAD	Nil abnormalities detected
CXR	Chest xray

References

1. Ludwig, C., & Koryllos, A. (2017). Management of chest trauma. *Journal of thoracic disease*, 9(Suppl 3), S172–S177. https://doi.org/10.21037/jtd.2017.03.52
2. Mumtaz, U., Zahur, Z., Raza, M. A., & Mumtaz, M. (2017). Ultrasound And Supine Chest Radiograph In Road Traffic Accident Patients: A Reliable And Convenient Way To Diagnose Pleural Effusion. *Journal of Ayub Medical College, Abbottabad. JAMC*, *29*(4), 587–590. https://pubmed.ncbi.nlm.nih.gov/29330983/

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