



Queensland
Trauma Education

CHEST TRAUMA

Penetrating chest trauma

Immersive scenario

Facilitator resource kit

CSDS



Clinical Skills Development Service

Metro North
Health



Queensland
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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.

Developed by

Dr Frances Williamson, Emergency Staff Specialist - Metro North Hospital and Health Service

Reviewed by

Angelka Opie, Nurse Educator – CSDS, MNHHS

Kimberly Ballinger, Simulation Educator - Clinical Skills Development Service

Education Working Group, Statewide Trauma Clinical Network - Clinical Excellence Queensland

Queensland Trauma Education

**Chest Trauma – Penetrating 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 to assess and manage low velocity penetrating chest wall trauma.

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 penetrating chest injuries.
- Identify the need for escalation of decompression strategy in penetrating chest wall trauma.
- Recognise and effectively manage a patient with immediately life-threatening penetrating chest trauma.

Facilitation guide

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

Supporting resources (in Printable Resources)

1. Chest X-ray 1: Pre-ICC insertion: L Pneumothorax
2. Chest X-ray 2: Post-ICC insertion: L ICC insitu
3. EFAST: Subxiphoid/cardiac: negative
4. EFAST: Morrison's/RUQ: negative
5. EFAST: Splenorenal/LUQ: negative
6. EFAST: (lung US m-mode) L lung: negative pneumothorax
7. EFAST: (lung US m-mode) R lung: positive pneumothorax
8. EFAST: Pelvic: negative
9. Repeat EFAST: Parasternal long view/cardiac: positive pericardial free fluid
10. Lab result: Group and hold
11. Lab result: Coagulation
12. Lab result: Biochemistry
13. Lab result: Venous blood gas
14. Structured assessment
15. Pre-simulation briefing poster

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

Immersive scenario

Type	Immersive scenario
Target audience	Emergency department medical and nursing staff.
Overview	<p>32yr old male patient. Allegedly assaulted 1 hour ago. He has sustained a single stab wound to L posterior chest wall.</p> <p>The patient is brought to the emergency department by ambulance complaining of difficulty taking a deep breath. His vital signs with the ambulance are HR 100, BP 90/60, sats 88% RA,</p>

	and RR 28. He has a single stab wound to his left posterior chest wall. He is agitated and breathless despite 10mg IV morphine prehospital.
Learning objectives	<ul style="list-style-type: none"> • Demonstrate the assessment of a trauma patient with penetrating chest injuries. • Identify the need for escalation of decompression strategy in penetrating chest wall trauma. • Recognition and management of circulation life threats.
Duration	45 minutes, including debrief.

Resource requirements

Physical resources

Room setup	Resus bay in emergency.
Simulator/s	1 manikin – SimMan3G / ALS Simulator.
Simulator set up	<ul style="list-style-type: none"> • Street clothes, sitting up at 45 degrees. • Moulage: single stab wound to L posterior chest (no exit wound).
Clinical equipment	<ul style="list-style-type: none"> • Large bore ICCs (24-32F), sterile insertion pack, ICC drain set (Under Water Seal Drain/Dry Seal Drain), suture kit. • PPE – gown, sterile gloves, goggles, surgical mask. • Medications – local anaesthetic, +/-sedatives, analgesia.
Access	2 PIVC setups, with 1 '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 SimCo or Faculty for manikin set up and control.
Confederates	QAS officer for handover.
Other	Initially 1 nurse and 1 doctor in room. Additional staff to be called into room when further help requested to constitute full trauma team (as applicable to your area).

Handover card

Handover from ambulance officer

This is Joel. He is a normally well 32-year-old man who was involved in an altercation with another person one hour ago. He has sustained a stab wound to the L posterior chest wall with a knife - unsure of the length. We had to help him out of his location as he complained of feeling short of breath and light-headed with movement. His has become more breathless in the last 5 minutes and we have just noticed his sats have dropped from 95% to 88% RA as we were unloading.

His vital signs currently are: GCS 15, HR 100, BP 90/60mmHg, sats 88% RA and respiratory rate 28.

He has had 10mg IV morphine with minimal relief.

Joel has no past medical history, does not take medications and has no known allergies. Thanks for looking after him.

Scenario progression

STATE 1: INITIAL ASSESSMENT				
Vital signs		Script	Details	Expected actions
ECG	ST	Joel I'm having trouble breathing (labored respirations).	Primary survey results A Maintaining own, anterior neck normal, no wounds/lacerations, trachea midline. B Single stab wound to L posterior chest over 4/5th ICS, no subcutaneous emphysema, laboured breathing. Reduced air entry L lung. C Cool peripherally, cap refill 3 secs. D GCS 15, no neurological deficits. E Nil abnormality. Manikin: 50% blocked left lung.	Commence primary survey <input type="checkbox"/> Assess airway including anterior neck. <input type="checkbox"/> Assess breathing. <ul style="list-style-type: none"> Identify stab wound to L posterior chest. Examine for unequal chest wall movement and tracheal position. Feel for subcutaneous emphysema. Auscultate breath sounds. <input type="checkbox"/> Assess circulation. <ul style="list-style-type: none"> Feel peripheral pulses. Assess for JVP. Auscultate for heart sounds. <input type="checkbox"/> Assess disability. <input type="checkbox"/> Expose patient. <input type="checkbox"/> Recognise hypoxaemia and respiratory distress and apply high concentration oxygen (via NRB mask).
HR	100			
SpO₂	88%RA			
BP/ART	90/60			
RR	28			
Temp	36.7			
BGL	5			
GCS	15			

STATE 2: ONGOING MANAGEMENT / SECONDARY ASSESSMENT				
Vital signs		Script	Details	Expected actions
ECG	ST	<p>Joel</p> <p>Can someone please help me?</p> <p>My chest hurts so bad and it's hard to breathe (laboured breathing, short sentences).</p>	<p>Improvement in saturations to 93% if oxygen is applied.</p> <p>Continue to reduce saturations if failure to apply O₂.</p> <p>Secondary survey results</p> <p>Head – nil abnormalities. Abdomen – soft, no other wounds. Pelvis – aligned, non-tender to palpation. Long bones and limbs – nil injury. Back – single stab wound, no exit wound, not actively bleeding.</p> <p>Results</p> <p>CXR – L Pneumothorax. EFAST scan – nil free fluid in abdomen or pericardium, L pleural fluid and lack of lung sliding LHS.</p> <p>Manikin: 100% blocked left lung.</p>	<p>Secondary survey</p> <ul style="list-style-type: none"> <input type="checkbox"/> Top to toe assessment. <input type="checkbox"/> Arrange further analgesia. <input type="checkbox"/> Ensure adequate oxygenation. <input type="checkbox"/> Provide IV fluid bolus. <p>Investigations (as applicable)</p> <ul style="list-style-type: none"> <input type="checkbox"/> Bloods: Trauma panel - FBE, chem20, Group and hold, lipase, coags. <input type="checkbox"/> EFAST. <input type="checkbox"/> CXR. <input type="checkbox"/> Venous bloods gas. <p>Management</p> <ul style="list-style-type: none"> <input type="checkbox"/> Recognition of penetrating L chest wall trauma. <input type="checkbox"/> Recognition of need for decompression of pleural space (perform needle decompression if applicable to your area and team composition). <input type="checkbox"/> Recognise possibility of cardiac involvement. <input type="checkbox"/> Analgesia plan.
HR	120			
SpO ₂	93% NRB			
BP/ART	80/60			
RR	28			
Temp	36.7			
BGL	5.0			
GCS	15			

STATE 3: IDENTIFICATION OF NEED FROM ICC INSERTION				
Vital signs		Script	Details	Expected actions
ECG	ST	Joel It is even harder to breathe now... (gaspings, one-word responses).	Increasing respiratory distress and haemodynamic instability. Assessment results <ul style="list-style-type: none"> • Decreased BS L hemithorax. • Respiratory distress with single word responses. Manikin: 50% blocked left lung (if ICC inserted or finger thoracostomy performed).	Assessment <ul style="list-style-type: none"> <input type="checkbox"/> Repeat primary survey. <input type="checkbox"/> Escalate management to decompression L chest. <input type="checkbox"/> Prepare for ICC insertion: <ul style="list-style-type: none"> • Equipment. • Sedation plan. • Team roles. • Pre-brief. Management <ul style="list-style-type: none"> <input type="checkbox"/> Insertion of ICC - as per procedural skills station.
HR	120			
SpO ₂	93% NRB			
BP/ART	80/60			
RR	28			
Temp	36.7			
BGL	5			
GCS	15			

STATE 4: POST ICC INSERTION				
Vital signs		Script	Details	Expected actions
ECG	ST	Joel The tube is painful, but I can breathe better now.	Respiratory status improved post ICC insertion. Remains tachycardic.	Assessment <input type="checkbox"/> Repeat primary survey. <input type="checkbox"/> Check ICC function: <ul style="list-style-type: none"> • Swing, bubble, drain. • CXR position. • Improvement in clinical symptoms. Management <input type="checkbox"/> Disposition and ongoing analgesia. <input type="checkbox"/> Documentation. <input type="checkbox"/> Notification to surgeons/RSQ for <input type="checkbox"/> consultation.
HR	104			
SpO₂	100% NRB			
BP/ART	100/70			
RR	22			
Temp	36.1			
BGL	5			
GCS	15			

STATE 5: DETERIORATION POST ICC (For senior participants only)				
Vital signs		Script	Details	Expected actions
ECG	ST	Joel Moaning.	<p>Deterioration of GCS and haemodynamic state.</p> <p>Increasing respiratory distress.</p> <p>Primary survey results</p> <p>A Maintaining own, midline trachea.</p> <p>B Tachypnoea, increasing respiratory distress, ICC swinging, bubbling – drained 1000ml blood.</p> <p>C Pale, diaphoretic, thready brachial pulse.</p> <p>D Reduced consciousness. E3V3M6.</p> <p>Imaging results</p> <ul style="list-style-type: none"> EFAST – Positive subxiphoid/cardiac. 	<p>For senior participants</p> <ul style="list-style-type: none"> <input type="checkbox"/> Recognition of deterioration. <input type="checkbox"/> Reassess primary survey. <input type="checkbox"/> Recognise circulatory compromise and initiate treatment and investigations. <input type="checkbox"/> Initiate repeat EFAST. <p>Management</p> <ul style="list-style-type: none"> <input type="checkbox"/> Progress to OT or ED thoracotomy as per participant level/environment and location. <input type="checkbox"/> Failure to recognise abnormal vital signs results in further deterioration in observations necessitating +/- thoracotomy (can be discussion or part task trainer if available). <input type="checkbox"/> If team recognise the requirement for operative management scenario ends with summary by facilitator of surgical management.
HR	120			
SpO₂	90% NRB			
BP/ART	70/40			
RR	32			
Temp	35.8			
BGL	5			
GCS	12			

Debriefing guide

Scenario objectives

- Understand the injury pattern from low velocity penetrating trauma.
- Perform a primary and secondary survey assessment.
- Recognise major penetrating chest trauma.
- Understand management principles of penetrating 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?

Discussing management

- What are your strategies to manage this patient's pain?
- What are your options to manage his hypoxaemia?
- What is the role a Chest Xray in penetrating trauma? Can the EFAST help in diagnosis?
- 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/location of stab wound)?
- What criteria indicate the need for an emergency thoracotomy?
- Where is this best performed?
- Describe the steps in performing an ED thoracotomy.

Discussing teamwork / crisis resource management

- How do you prioritise the team to manage the penetrating 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?
- How do you encourage all team members to voice their concerns/recognition of the deteriorating patient?

Key moments

- Systematic assessment of trauma presentation.
- Recognition of differences in management of penetrating chest wall injury.
- Decision making for ICC insertion timing and procedure.
- Analgesia/sedation or intubation strategy to facilitate ICC placement.

Acronyms and abbreviations

Term	Definition
EFAST	Extended Focussed Assessment with Sonography in Trauma
FBE	full blood examination
ICC	intercostal catheter
ICS	intercostal space
JVP	jugular venous pressure
LHS	left hand side
NRB	non-rebreather mask
PCO2	partial pressure of carbon dioxide
PO2	partial pressure of oxygen
CXR	Chest xray
GCS	Glasgow coma scale
QAS	Queensland ambulance service
PPE	Personal protective equipment
ED	Emergency department
PIVC	Peripheral intravenous catheter
RSQ	Retrieval services Queensland

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Visit csds.qld.edu.au/qte

Email CSDS-Admin@health.qld.gov.au

Phone [+61 7 3646 6500](tel:+61736466500)

