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The original version of the PTC manual was an annex to *Surgical Care at the District Hospital*, published by the World Health Organisation in 2003.

Introduction

These Additional Teaching Resources for Instructors provide help for areas not covered by the Instructor training day.

The materials also provide the learning objectives and key points for lectures, skill stations and workshops. Whenever an Instructor teaches any of these parts of a PTC course for the first time, these materials will give helpful advice on the main points for the PTC course participants to learn and understand.

The most important benefit of the section is that it gives you advice on using interactive teaching methods as much as possible. If you choose to follow the suggested outlines and questions, you will be able to teach PTC without slides or with minimal slides.

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Topics not covered in the PTC Manual

Welcome and Local Trauma Perspective  
(approx. 30 minutes)

Many countries have a strong culture of religion. It is quite common therefore for the 2-day PTC course to begin with prayers to bless the endeavours of the next two days. In some countries there may be a formal opening ceremony. In this situation, the Course Director should be prepared to make a short speech about the history and principles of the PTC course.

The visiting Course Director introduces himself or herself, followed by the other instructors. The course participants then introduce themselves briefly. This welcome session sets the scene for the rest of the course, so it is important to create a relaxed and positive atmosphere. Take note of who the participants are, so that you can include their experience or interest in course sessions.

Please remember to tell everyone to turn their mobile phones off, or at least put them on 'silent' mode.

The time allocated for the Welcome, Introductions, Local Trauma Perspective and MCQs is **45 minutes** in total. Within that time-frame, there is flexibility for how you structure the sessions, depending on the local context and resources. If a formal Opening Ceremony is planned, then extra time will be required for this.

The **Local Trauma Perspective** is a very successful way of starting a PTC course. An important hospital leader might speak about the local trauma situation as a way of ensuring high level support for the PTC programme. This gives an indication of the level of available facilities and the key needs for improving the trauma system.

Alternatively a local doctor or other health professional on the course, who has been invited in advance, might give a 10-minute presentation of a trauma case that was treated at the hospital where the course is taking place.

It is important for overseas instructors to attend and learn from this opening talk.
PTC Overview (15 minutes)

Slides 1-12 (12 slides)

The aims of this session are to

• Introduce the PTC concepts and mission statement
• Motivate the course participants by showing that PTC is relevant to their situation
• Outline what the participants will learn from the PTC course

Teaching tips

The Course Director normally delivers this session that introduces the PTC message. Try to make reference to the Local Trauma Perspective presentation to show the relevance of PTC. If you can access some local photographs, insert these into the talk.

If it is the very first course in a new environment, then additional information such as the history of PTC and where it is now taught in the world can be very useful. You are welcoming these participants into a global network!

Questions are used (slide 5) to encourage participant interaction and get them thinking about their local situation. A whiteboard can be used to note down the local challenges. This also sets the tone for interactive teaching and creates an environment where the participants feel comfortable to speak and participate.

Keep the overview concise and avoid detail - that will come later. The most important point in this session is to introduce the PTC concepts and create the right atmosphere for the rest of the course.

Disaster Management (50 minutes)

Major disaster session: PTC Programme Day 2, no slides

Learning Objectives

• Understand how PTC principles can be used to help prioritise emergency care for multiple trauma victims in a mass disaster situation
• Understand the roles for health workers and all components of effective management in a mass casualty disaster situation
• Be able to take a leadership role at the hospital or clinic in a mass casualty disaster situation

Key Points to cover include

• A mass casualty or disaster situation is any incident that overwhelms the normal capacity of the health clinic or hospital to cope
• The key to effective management in a disaster situation is good planning and preparation beforehand. This means having a disaster plan that everyone knows about, training staff and preparing back-up equipment
During a disaster, issues to consider include: care at the site, care at the hospital, transferring patients, staffing, equipment, lab and blood bank, communication, security, adequate use of limited space and public relations.

Health workers can take on a leadership role during a disaster.

The PTC system can be applied to multiple patients to help prioritise who to treat first. This is called Disaster or Mass Casualty trauma triage.

**Teaching Tips**

This session works best as an interactive workshop with the participants divided into groups of two or four.

It’s helpful to have an instructor with actual experience of a major disaster if at all possible. This person should know about any major disaster plans at their local hospital. You can begin the session with this instructor giving telling the brief story about the disaster that they were involved in.

Pick a topic that is imaginable in your local situation for example:

- an overcrowded bus comes off the road
- a refinery explosion
- a ferry sinking
- a major shooting incident
- mine injuries or bombing
- a fire in a school or factory
- an earthquake

Make up a brief description of your chosen local disaster and create a scenario for the participants. Each group can take on a major role; such as the site team, the hospital clinicians, the hospital managers etc. Get them to work out their priorities according to the role they are playing. Having plenty of large sheets of paper and pens can help the groups with their brainstorming.

Allow time for each group to report back.

You can also produce a list of 10-20 trauma patients from your local disaster scenario. One or two of the groups can work on prioritising these patients according to the PTC ABCDE principles. During the reporting back, you can get the groups to explain why they chose some patients ahead of others.

This may end up with a brief introduction to Disaster Triage, so it is a good idea to read up on this in order to have some background information available. There are also some notes in the PTC Manual 2015 Edition, Appendices 11 and 12.

In each approach course participants should be applying the PTC principles they have been learning.

Leave time at the end for the Instructor to sum up within the 50 minutes emphasising the key points.
Summary at the end of the Course

At the end of the second day, after the second round of Scenarios and a break, the participants come back together for the final components of the PTC course.

They do the Multiple Choice Questions again, either using individual question sheets, or by putting the questions on an overhead projector or power-point slides and going through the questions as a group. They also repeat the Confidence Matrix.

It is important after this, to provide a final overview and summary of the whole PTC course. There is no new information here, and no slide set. It is an opportunity to re-enforce the powerful PTC message. At the end of this session, the participants should
- Understand the PTC structured approach to any trauma patient
- Feel confident with their knowledge and skills to treat a trauma patient in their own environment, using whatever resources they have
- Feel motivated to share the PTC message with colleagues on a daily basis and learn how to teach on future PTC courses

It can be helpful in this final overview to simply review all of the components and teaching sessions of the PTC course, summarising all of the topics covered. The focus for Day 1 has been on the Primary Survey and ABCDE, whilst on Day 2 we have covered Secondary Survey and tried to put the PTC principles into more complex situations.

Asking the participants to reflect on the change between what they knew about PTC at the start of the course, to what they know now can be a helpful technique to increasing confidence in treating trauma patients.

You want the participants to leave the PTC course feeling positive, confident and motivated in their clinical practice and also to share the PTC message that they have learnt. Stay positive and motivated throughout this final summary!

Finally, the participants are required to complete the evaluation forms. You can use this time too, to sort out any final arrangements for the next day, if you are going on to run an Instructor Training Day.

** Don’t forget the group photo after all the certificates have been presented! **
Extra notes for the Teaching Topics

The ABCDE of Trauma and Primary Survey (30 minutes)

Slides 13 – 37

PTC Course Manual pages 7 – 8

Learning objectives

• Understand the concept of Primary Survey
• Understand the structured approach and sequence of the Primary Survey
• Know when to perform the Primary Survey

Teaching tips

If you are teaching Primary survey to a group whose first language is not English and who do not understand enough English to follow ABCDE, then you must find another way of reinforcing this crucial sequence.

This session is the clinical introduction to the PTC Course. The ABCDE of Trauma is a difficult lecture to give well.
It is important not to try to cover all aspects of ABCDE in this lecture – there are specific lectures on Airway and Breathing, Circulation and Head and Spinal injuries.

Referring to real-life situations and using questions can be an effective technique to highlight the key points. Here is a suggested outline:

1. In real life, history, examination, investigation and treatment all happen at once.
2. How do you assess it?
3. What are you worried about?
4. What might you miss?
5. If you know what you are looking for, you are much more likely to find it.
6. PTC teaches an organised approach to trauma management.
7. There is a Primary Survey and a Secondary Survey.
8. The ABCDE approach is a system of priorities in patient management so that during the Primary Survey:
   • problems relating to the Airway are managed first,
   • then Breathing,
   • then Circulation,
   • then neurological Disability and
   • lastly the patient is Exposed to ensure that no other life or limb threatening injuries are present.
9. The PTC approach is to manage the patient with regard to the available staff number, expertise and equipment. PTC teaches good principles of patient management in the absence of high technology.
Airway and Breathing  
(40 minutes)

Slides 39 – 62  
PTC Course Manual pages 7 – 11

Learning objectives

• Understand the structured approach to Airway and Breathing, as part of the PTC system
• Know how to recognise and immediately treat airway and breathing problems

The key points to cover include

• An open and clear airway is the first priority of trauma management
• How to assess an airway clinically
• Signs of airway obstruction
• Basic airway management
• Tracheal intubation - indications
• Tracheal intubation - risks to the cervical spine
• The surgical airway
• Clinical signs of respiratory failure
  o On inspection - rate, accessory muscles, cyanosis
  o On palpation - tracheal shift, rib fractures, subcutaneous air
  o On auscultation - breath sounds, heart sounds, bowel sounds
• Management of a tension pneumothorax

Teaching tips

This session can be run partly as a discussion, using questions and then writing the answers and explaining concepts on a board or sheets of paper. You can use the slides as a reference to reinforce the key points.

Refer to the PTC Manual (pages 7-11, Appendices 2,3,4) as you ask the questions

1. Has anyone managed a difficult airway recently?

2. What makes airway management difficult?
   • Patient injuries
     o Blood in the airway
     o The burnt airway
     o Cervical spine injury (known or suspected)
     o Facial injury
     o Airway injury (laryngeal fracture, tracheobronchial injury)
   • Patient status prior to injury
     o Body shape and obesity
     o Arthritis with reduced movement of the occiput on C1 vertebra
     o Poor mouth opening
     o Congenital abnormality
     o Respiratory disease e.g. Asthma
     o Children and neonates
   • Non-patient factors
     o Personal skill level of the doctor or health worker
     o Quality of assistance
3. What makes airway management urgent? (Airway management not necessarily intubation)
   - Cyanosis
   - Apnoea
   - Partial or complete airway obstruction

4. What are high-risk situations for airway and breathing?
   - Coma
   - Maxillo facial trauma
   - Neck trauma
   - Chest injury
   - Full stomach

5. How do you determine an inadequate airway?
   - Ask ‘What happened’
   - Look, feel and listen
     - Normal speech/Noisy breathing
     - Maxillofacial crepitus
     - Tracheal deviation
     - Haematoma

6. What would be a bad outcome?
   - Hypoxic brain injury
   - Aspiration
   - Cervical cord injury
   - Airway rupture

7. What can you do to treat an inadequate airway? (Increasing levels of complexity of intervention)
   - Chin lift, Jaw thrust
   - Suction, oral airway, other airways
   - Tracheal intubation
   - Surgical airway

8. How do I know that a tracheal tube is correctly placed?

9. Should patients be given drugs to assist in airway management in trauma?

10. How do you protect the cervical spine during airway management?

11. Controversy in airway management in trauma
    - Laryngeal masks
    - Drugs
    - Nasotracheal tubes
    - Cervical collar off or on
Circulation and Shock

(35 minutes)

Slides 63 – 85

PTC Course Manual pages 12 – 16

Learning objectives

• Understand the structured approach to circulation problems as part of the PTC system
• Know how to recognise and treat shock

The key points to cover include

• Shock in trauma should be assumed to be hypovolemic until proven otherwise.
• Other rarer types of shock are cardiogenic, neurogenic, septic and anaphylactic.
• Concepts relating to the preservation of tissue oxygen delivery
• Revealed and concealed haemorrhage
• Clinical signs of shock
• Management
• First priority – stop the bleeding
• Second priority – volume replacement, warming and analgesia

Issues
  o Vascular access and intraosseous needles
  o When to use blood
  o Response to fluid therapy
  o Controversial areas if time allows
  o Colloid or crystalloid, does it matter?
  o Immediate and delayed resuscitation
  o Setting resuscitation end points in different patient groups

Teaching tips

This is a long lecture with important points to explain about blood volume, blood loss and early shock.

Refer to PTC Course Manual (pages 12-16, Appendices 5 and 6):

• How much blood have you got?
• How much blood can you lose?
• How much intravenous fluid should I give?  Good, transient and nil responses to treatment
• What type of fluid should I use?
• What other types of shock are there?
• How do I evaluate adequate fluid resuscitation and organ perfusion?
Chest Injuries

(35 minutes)

Slides 86 – 104

PTC Course Manual pages 17 – 20

Learning objectives

- The principles of management of chest injuries in trauma patients
- How to treat common life-threatening chest injuries
- 25% of trauma deaths are attributable to chest trauma
- Chest trauma can result in a number of life threatening conditions
  - Airway obstruction or disruption
  - Tension pneumothorax
  - Massive haemothorax
  - Pericardial tamponade
  - Open pneumothorax
  - Flail chest
- Early appropriate treatment, often with minimal equipment, can be life saving

Teaching tips

This topic is very well suited to interactive teaching.

Note that Chest Trauma is the last topic before lunch on Day 1 and people will be tired. It is your job as the instructor to make sure they are interested and engaged. Because you are not going into the detail of pathophysiology (as you have done in Circulation), you need only to give them a clear outline that will help them remember the facts, most of which they already know. Here is a sample interactive presentation.

You can do this by asking straightforward questions:
1. Which structures of the thorax can get damaged
2. What are the mechanisms of injury.
3. What are the consequences of such damage.

How to prepare

Your aim is to get everyone to work things out for themselves.

1. Remind yourself of the key points: read through the topic in the PTC manual and then the slides.
2. Plan a framework
   - Introduction
   - What information you want them to give you
   - How you will record the answers: in lists or diagrammatic form
   - Practise the diagram
   - What needs to be straightforward teaching from you
   - The summary
   - The timing – you need to be at Question 7 by 15 minutes into the session and allow 5 minutes for the summary.
   - Resources: board/flipchart/pens and slides for summary
How the session might run

Introduction

• Explain the importance of treating chest injuries and that there are only a few life-saving manoeuvres: oxygen, ventilation, open wounds and chest drain (refer to previous skill station).
• On flipchart make a simple line diagram of the thorax (looking like a chest X-ray).

As participants answer your questions
  o illustrate these on the diagram (e.g. by showing a pneumothorax, rib fracture, mediastinal shift etc.)
  o write the words below the diagram

Questions

1. Which structures can get injured?
Expect answers: clavicle, ribs, spine, diaphragm
Draw or write the responses on diagram/flipchart
Follow-up question: What are potential consequences of those injuries?
  o pneumothorax (simple, tension & open)
  o haemothorax.
Use your diagram to illustrate these consequences.

2. Possible Consequences?
• pain / respiratory difficulty / flail segment / pneumothorax / haemothorax

Having done this process for chest wall structures, move on to chest contents.

3. What are the contents? How can they get injured?
Expect answers: heart, lungs, vessels, oesophagus etc
Add the structures to diagram
Follow-up question: What are potential consequences of those injuries?

Now move on to thinking about means of injury

4. What are the most important means of injury for us to consider?
Write up responses:
  • Deceleration
  • Penetration
  • Crush

Now ask the participants to define and differentiate these

5. What sort of injuries are caused by deceleration, penetration, crush?
Expect:
  • deceleration in an RTA, lung & heart contusions
  • penetration in stab & missile wounds, pericardial tamponade in stab wounds, shock wave in high velocity missile wounds
  • crush in flail chest.
Use your diagram and emphasise the key points and give further information.

Summarize and give them a list of life threatening emergencies that can be picked up from Primary Survey:
  • Tension pneumothorax
  • Simple pneumothorax
  • Open pneumothorax
- Flail chest
- Haemothorax
- Penetrating wounds

6. Now ask two questions about each of these:
   How are we going to make the diagnosis?
   What are we going to do about it?

Summary
One suggestion: show the slides at the end in complete silence.
Give everyone time to read and revise the information they gave you in their answers.

Abdominal, Pelvic and Limb Injuries
(50 minutes)

Abdominal, Pelvic Slides 105 - 124
Limb trauma Slides 125 - 141
PTC Course Manual pages 21 – 24
PTC Course Manual pages 25 – 26

Learning Objectives

- Understand the principles of management of abdominal, pelvic and limb injuries in the trauma patient
- Recognise and know how to treat life-threatening abdominal and pelvic injuries
- Recognise and know how to treat limb and peripheral injuries, and how to prevent further injury

The key points to cover Abdominal and Pelvic injuries

- The surgeon stops the bleeding
- Do airway, breathing and circulation first
- The abdomen extends from the dome of the diaphragm to the floor of the pelvis
- Much of the abdomen is difficult to examine
- A rectal examination is an important part of the physical examination
- Seek early surgical advice
- Pelvic fractures are usually associated with massive haemorrhage
- Blood at the urethral meatus is a contra-indication to urethral catheterisation

Key points to cover in Limb injuries

- Peripheral haemorrhage is a preventable cause of early death
- Direct pressure with a finger on a bleeding artery or vein is a much better way to control haemorrhage than the use of a tourniquet
- Open limb wounds are very prone to infection
- Compartment syndrome should be anticipated and treated early
- Aligning fractures and stabilising limbs reduces pain and bleeding.
Head and Spinal Trauma (45 minutes)

Head trauma slides 142 – 170  
PTC Course Manual pages 27 – 30

Spinal trauma slides 171 – 182  
PTC Course Manual pages 31 – 32

Learning objectives

- Understand the structured approach to head and spinal injuries
- Recognise and know how to manage serious and life-threatening head and spinal injuries, and to prevent further disability

The key points to cover include

- The most important aspect of the immediate management of a head injured person is the maintenance of airway, breathing and circulation.
- Early surgical/neurosurgical referral is important to manage intracranial haemorrhage.
- Little can be done to directly affect the outcome of a primary brain injury.
- Secondary brain injury should be identified and treated.
- Careful and repeated neurological observations of pupils and Glasgow Coma Scale are vital for good head injury management.
- Cervical spinal injury should be suspected in any unconscious head injured patient.
- Any patient who cannot be cleared of injury to the cervical spine should have their cervical spine immobilised.

Teaching tips

This is a long session that covers some complex concepts. Use your interactive teaching skills to keep the attention of the participants.

Be aware of the local context, as the availability of medical imaging and CT scans may be very limited. This is not a barrier to the effective management of head injury patients, as prevention of secondary injury (and therefore prevention of further disability) can be done with good Airway, Breathing and Circulation management.

Questions are very helpful to guide participants through the important learning points and ensure everyone understands. Use a white or blackboard to explain key concepts, such as the Cerebral Perfusion Pressure equation.

Some possible questions

1. Why do patients go unconscious quickly?
   - Discuss brain physiology and cerebral blood flow

2. Why do patients recover badly?
   - Cerebral neurons are very susceptible to ischaemic damage leading to Ischaemic/Reperfusion injury

3. How can we assess the severity of head injury?
   - Pupils
   - AVPU
   - Glasgow Coma Score
   - CT scan
4. What types of head injury are there?
   • Primary brain injury and secondary brain injury
   • Extradural haemorrhage, subdural haemorrhage, intracerebral and intraventricular haemorrhage and diffuse axonal injury

5. How do we treat these patients?
   • ABC + Neurosurgery

6. When should we suspect a cervical spine injury?
   • Whenever there is significant injury to the head or upper body

7. How do you treat a patient with a suspected cervical spine injury?
   • With immobilisation.

8. How effective is a hard cervical collar alone?

<table>
<thead>
<tr>
<th></th>
<th>No immobilisation</th>
<th>Hard collar alone</th>
<th>Spine board + hard collar + Sand bags + tape</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neck flexion</td>
<td>30°</td>
<td>20°</td>
<td>1°</td>
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<tr>
<td>Neck extension</td>
<td>40°</td>
<td>15°</td>
<td>7°</td>
</tr>
<tr>
<td>Neck rotation</td>
<td>70°</td>
<td>35°</td>
<td>1°</td>
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Trauma in Children and Pregnancy

(30 minutes total)

Slides 183 – 214

PTC Course Manual pages 33 – 37

Learning Objectives

- Understand the structured approach to the injured child using the PTC system
- Recognise physiological, anatomical and psychological differences between children and adults that influence management of an injured child
- Understand the structured approach to the injured pregnant woman
- Recognise the physiological and anatomical changes in pregnancy that influence management of the pregnant trauma patient.

The key points to cover in Trauma in Children include

- Trauma management principles stay the same, the primary survey is still ABCDE
- The airway anatomy of a small child is different to that of an adult
- Hypotension is a very late sign of haemorrhage in children
- Give fluid boluses of 20mls/kg
- Intraosseous access is safe and effective in children
- Most drugs can be given by the intraosseous route
- It is easy for an injured child to become hypothermic.

Key points to cover in Trauma in Pregnancy include

- Trauma management principles remain the same. Pregnant women with trauma require ABCDE
- Resuscitation of the mother resuscitates the foetus
- The mother comes first
- Uterine rupture, placental separation and pelvic fracture can all cause massive haemorrhage
- Remember aorta-caval compression and left lateral tilt
- A mother at term may require the baby to be delivered as part of her resuscitation.
Burns  
(30 minutes)

Slides 215 – 235  
PTC Course Manual pages 38 – 40

Learning objectives

- Understand the structured approach to the patient with burns using the PTC system
- Recognise and know how to treat the trauma patient with burns, including the consequences and complications of severe burns.

The key points to cover include

- Burns can affect Airway, Breathing, Circulation and Disability. Exposure is important to assess the extent of a burn
- Patients with burns may have other injuries eg. a blast injury may cause a tension pneumothorax
- Burns patients deteriorate during the first few hours after injury
- Consider early intubation for an airway burn

Teaching tips

This session is well suited to interactive teaching. Use the pictures in the slide set to ask questions. Encourage the participants to reflect on their own experience.

Suggested questions

1. Has anyone in the audience been burnt?  
   - Invite them to give an account of their experience

2. What will a person who has received 100% full thickness burns and an airway burn be like 5 minutes after the event?  
   - Answer – Probably not too bad
   - Message – Burns patients deteriorate

3. What makes a burnt patient unconscious?  
   - Trauma
   - Drugs
   - Alcohol
   - Carbon monoxide

4. How can a burn affect the airway and breathing?  
   - See slides on inhalational injury

5. Can hypovolemic shock be due to the burn in the first hour?  
   - Probably not, look for evidence of concealed haemorrhage

6. How much fluid should a burnt person get?  
   - Discuss rule of 9’s and fluid regimes

7. What is an escharotomy? Is it painful?  
   - Yes, a general anaesthetic is required
Secondary Survey (30 minutes)

Slides 236 – 248 PTC Course Manual pages 41 – 42

Learning Objectives

• Understand how the secondary survey fits into the PTC system
• Know how and when to perform the Secondary Survey

The key points to cover include

• The secondary survey is undertaken when the primary survey is complete and airway, breathing and circulation have been stabilised
• The secondary survey is a thorough head to toe examination looking for life and limb threatening injuries
• If there is any significant deterioration in Airway, Breathing or Circulation, discontinue the secondary survey and attend to the more urgent problems.

Teaching tips

This session is more meaningful for the participants if they see an example of a secondary survey. There are many ways to incorporate a “hands-on” demonstration during this session for example:

1. Use another instructor as the “patient” lying on a trolley or table in front of you. Go through the components of the Secondary Survey showing what this looks like.

   This technique is helpful because it emphasises the “hands-on” approach and the “Look, Listen and Feel” message of a thorough clinical assessment. Ask for volunteers from the audience to help you with the log roll.

2. The session may be covered as a demonstration scenario, using all of the instructors in a rehearsed scenario involving injuries in multiple areas that are ‘discovered’ during a comprehensive Secondary Survey.

   As an alternative, one instructor is sent out of the room, and the participants discuss and agree upon 3-4 injuries that another instructor has as the ‘patient’. The ‘doctor’ instructor comes back to the room to perform a thorough Secondary Survey, with a commentary from the instructor running the session.

The slides can be used (or not) to reinforce the key points of the session.
Skill Stations

The core teaching material must be part of your PTC course, but there is room for some flexibility. You can choose those topics most relevant for your participants. Therefore we have included more than four topics. Remember: first decide on your learning objectives and key points, then teach interactively.

Core teaching material

1. Basic Airway Management (20 minutes)

Equipment
It is important to use the same equipment that is available at the hospital where the course is taking place. If available use:

- An adult intubation mannequin, if available.
- Self-inflating bag and mask
- Guedel oral airways (different sizes if possible)
- Nasopharyngeal airway
- Sucker
- Oxygen tubing
- Hudson mask or oxygen reservoir mask.
- Cervical collar
- 2 Bags of intravenous fluid
- Tape

Learning Objectives
- Be able to demonstrate how to open the airway while protecting the cervical spine, using chin lift and jaw thrust manoeuvres and airway adjuncts.
- Understand the importance of giving oxygen by mask.
- Be able to ventilate a patient using a self-inflating bag and mask.

Technique
Emphasise to the participants the importance of maintenance of cervical immobilisation by an assistant during airway manoeuvres. Do not put on a collar until the airway is opened since it will make manoeuvres more difficult and will prevent safe intubation.

Start with simple airway manoeuvres – chin lift (lifting the jaw forward) and jaw thrust (lifting the jaw further forward, pressing behind the angles of the jaw, to slide the temporomandibular joint forward and push the lower teeth in front of the upper teeth). If these manoeuvres do not work well then consider insertion of a Guedel oral or nasopharyngeal airway. The Guedel airway is sized from the front teeth to the angle of the jaw and inserted behind the tongue either with a tongue depressor or laryngoscope blade, or by inserting it upside down and turning it gently round to lie behind the tongue (be careful of delicate teeth and tissues in children. Nasopharyngeal airways may be helpful but should be avoided if there is a possibility of base of skull fracture.

Ventilation using a self-inflating bag and mask uses a similar manoeuvre to the jaw thrust. The participants should think about lifting the jaw into the mask rather than pushing the mask onto the face. Encourage them to use two hands on the mask and get someone else to squeeze the bag unless they are expert.
Potential Complications
- Worsening of injury to the cervical spine.
- Failure to open the airway or ventilate the patient.

Teaching tips
- To introduce the concepts of the chin lift and jaw thrust to lift the tongue off the back of the pharynx, and how to maintain the airway when using a self-inflating bag and mask you might ask participants to demonstrate how they would snore (letting the chin fall backwards) and then to put their lower teeth outside their upper ones and to see how much more difficult it is to snore.
- Ask them to shut their mouths and hold their nose shut and breathe hard, and watch how each others’ chests and necks move when breathing is obstructed.
- Discuss how pulse oximetry, if available, can be very helpful during airway management but emphasise that it does not monitor the adequacy of ventilation.

2. Advanced Airway Management (20 minutes)

Equipment
- Adult / paediatric intubating mannequin
- Laryngoscope with different sized blades
- Endotracheal tubes
- Suction
- Self-inflating bag and mask
- Stylet / introducer
- Bougie

Learning Objectives
- Understand the indication for advanced airway management
- Understand that tubes do not save lives – opening the airway and mask ventilation are most important.
- Understand the technique of intubation
- Know what to do if they cannot intubate or ventilate a patient

Technique
- Tracheal intubation technique
- Rapid sequence intubation with in line immobilisation of the cervical spine

Teaching tips
This station is easier to teach with an intubation mannequin; if not you can still talk about the techniques and use pictures or your own downloaded video. Stress that basic airway skills are more important than intubation.

If devices such as Laryngeal Mask Airways or I-gel airways are available, discuss them. They may be useful if intubation is not possible, but they do not protect against aspiration.
3. Spinal Immobilisation

(20 minutes)

Equipment
- 2 x 1 litre intravenous fluid bags, sand bags or rolls of padding.
- Adhesive tape
- 1 variable size adult cervical collar or locally available equivalent.
- 1 trolley or table for a patient to lie on
- Spine board (optional)

Learning Objectives
- Be able to safely control the spine to prevent further damage after trauma.
- Assess the patient for immobilisation with collar, sandbags and tape.
- Log-roll the patient to examine the back.

Technique

*Immobilisation of the cervical spine*

Should either be from the top of the table with forearms to either side of the head and hands anchored to the clavicles and trapezium muscle on either side of the neck, or can be from one side of the shoulders from below, with forearms against the shoulders and hands holding the head (this can be better during intubation).

Alternatively, immobilisation should be using a hard cervical collar or locally available substitute, which is appropriately sized for the patient, with padding, intravenous fluid bags or sandbags to either side of the head (sometimes taped on if the patient is very still). A collar alone will still allow head movement, but additional supports on either side improve immobilisation. If the patient is confused and struggling then it may be better to put on a collar and use manual immobilisation.

*Log Roll*

This needs three people to move the body and legs, one person to control the head and neck and one person to examine the back. The person controlling the head and neck is the most important.

Three people should stand next to the patient’s trolley or bed on the side to which the patient will be rolled. The tallest person should support the shoulders. This person should place hands over the patient’s shoulder and hip (supporting the arm), the next person should place one hand over the hip and one under the top of the thigh, and the third person should place both hands under the patient’s lower leg (stress to the participants that this is “three hands over and three hands under”. The person controlling the head and neck should give clear commands to the team to start the roll and when lying the patient flat again.

Potential Complications
- Worsening of spinal injury
- Further injury to the neck if three point immobilisation is used while the patient is struggling.
- Difficulty with intubation if the collar is not released and manual immobilisation reapplied

Teaching tips
Check local availability of collars. The collar needs to be the correct size for the patient. Follow instructions to get the fit right.
If you have no collars, teach immobilisation using sandbags and tape.
4. Tension Pneumothorax decompression and Chest Drain Insertion

(20 minutes)

Equipment

- Oxygen mask
- 14 or 16g IV Cannula
- Chest tubes of various sizes 20 FG (Child) and 36 FG (Adult)
- Scalpel handle and blade, tissue forceps, artery clamp, needle holder, suture,
- Local anaesthetic, syringe and needle, dressing tray, iodine or other antiseptic.
- Underwater seal drain bottle/Heimlich valve

Learning Objectives

- Revise understanding of importance and pathophysiology of tension pneumothorax and other chest trauma, and indications for needle decompression and chest drain insertion.
- Be aware of the surface markings and techniques for needle decompression of tension pneumothorax and insertion of chest drain.
- Describe the complications of needle decompression and chest tube insertion.

Technique

Needle decompression
This is the immediate management for a tension pneumothorax. Administer high flow oxygen and ventilate as necessary. Identify the site of insertion: feel down the sternum to the lump of the Angle of Louis, then feel out into the second intercostal space in the mid clavicular line on the side of the tension pneumothorax. Clean the skin and insert local anaesthetic if time permits. Insert a 14–16 gauge IV cannula through the skin just above the 3rd rib into the pleural space. You can attach a syringe to the hub of the needle and advance the needle aspirating for air or if a syringe is not available listen for an escape of air. Advance the plastic cannula in position and remove the stylet and leave the cannula in place. Prepare for insertion of a chest tube.

Chest drain insertion
The indications for this are a tension pneumothorax after needle decompression or a haemothorax, and a simple pneumothorax or significant chest injuries in a patient who might develop a tension pneumothorax, such as those undergoing a general anaesthetic for other injuries or being transferred, particularly if by air.

Position the patient – preferably slightly sitting up, monitor ECG and pulse oximetry. Identify the insertion site – usually 5th intercostal space (approx. nipple level) just anterior to the midaxillary line on the affected side or above this point. Remember that the abdomen extends up to the level of the nipple.

Prepare equipment – choose a large bore chest tube and remove the stylet. Put a clamp on the end that will go into the chest, to guide the tube. Clean and drape the skin and infiltrate the skin and deeper tissues including pleura with local anaesthetic. Make a 2-3 cm incision in the line of the intercostal space through skin and subcutaneous tissues, and then bluntly dissect through the intercostal muscles just over the top of the rib. Inject local anaesthetic directly onto the pleura. Puncture the parietal pleura with the tip of a clamp and spread it slightly to enlarge a hole.

Insert your gloved little finger to confirm that you are into the chest cavity and to avoid injury to other organs, pleural adhesions etc. Insert the chest tube, supporting it with the clamp, and direct it into the chest to the desired length (around 15cms. in an adult). Connect the end of the tube to an underwater seal bottle.
Confirm correct placement by observing bubbling in the drain bottle as well as swinging of fluid in the tubing with inspiration. Suture the tube in place, apply dressing and tape the tube to the chest wall. Obtain a chest x-ray to ensure correct placement of the tube and improvement of the haemothorax or pneumothorax.

**Potential Complications**
- Laceration of lung or other intrathoracic or abdominal organs – minimised by using the blunt dissection technique described above.
- Incorrect position or kinking, clogging or disconnection of the tube
- Persistent pneumothorax due to persistent leak
- Injury to intercostal nerves or vessels causing paraesthesia or haemothorax
- Introduction of infection

**Teaching tips**
- Try introducing this session with discussion of a scenario to help the participants remember the information they heard in the lectures.
- Discuss the symptoms and signs of the various chest trauma types, especially tension and simple pneumothorax and massive haemothorax.
- Encourage the participants to feel the insertion landmarks on each other.

**Optional Extras**

### 1. Surgical Airway  
*(20 minutes)*

**Equipment**
- Larynx specimen from sheep, or model. If this is not available, corrugated anaesthetic gas tubing can be used to improvise, with a cut out for the cricothyroid membrane. Using Chamois leather to act as overlying skin, and surgical glove material for the membrane, works well.
- 14 or 16 gauge cannula
- 2ml and 10ml Syringes
- Oxygen tubing
- Scalpel
- Mosquito forceps
- Endotracheal tube – 5 or 6mm internal diameter
- Bougie if available

In Muslim countries Halal slaughtering often injures the larynx. It may be helpful to liaise with those slaughtering animals used for teaching to ask them to make the cut avoiding the larynx.

**Learning Objectives**
- Be aware of the indications for performing a surgical airway
- Identify the surface markings and structures relevant to performing surgical and needle cricothyroidotomies
- Be able and have confidence to perform surgical or needle cricothyroidotomy.
Technique

Stress to the participants that these techniques are for a “can’t intubate can’t ventilate” situation.

Needle cricothyroidotomy

Stress to the participants that this technique requires the availability of pressurised oxygen.

Prepare Oxygen tubing to deliver the oxygen to the airway. The end of this is inserted into a 1 or 2 ml syringe barrel, with a small hole cut in the wall of the tubing.

Attach a 10ml syringe to the hub of a 16 or 14G catheter over needle cannula. From the head of the patient, insert the catheter through the cricothyroid membrane, aspirating for air while advancing. Once air is aspirated, advance the cannula off the metal needle. Aspirate again from the hub of the cannula to ensure that the cannula is sited within the trachea and has not created a false passage. Attach the oxygen tubing inserted into a 2 ml syringe barrel to the hub of the cannula and connected to high-flow pressurised oxygen, and blow oxygen into the trachea by intermittently occluding the side hole in the tubing. This will provide oxygenation to the patient but will not give adequate ventilation to control carbon dioxide.

Surgical cricothyroidotomy.

Identify the cricothyroid membrane, and stabilise the skin overlying it using the finger and thumb of the non-dominant hand. With a scalpel, make a vertical incision through the skin overlying the membrane (do not cut deep enough to damage the cricoid or thyroid cartilages). Use a mosquito forceps, if available, to bluntly dissect down to the cricothyroid membrane. Incise horizontally through the membrane with the scalpel blade. Insert the forceps into the trachea and open and rotate to open the hole into the airway. If forceps are not available, then this can be done with the blade or the handle of the scalpel. Use the forceps or scalpel to hold the hole open and insert a tracheal tube downwards into the trachea. A bougie may make this easier. Begin ventilation using a self-inflating bag with oxygen. Listen over both lungs to ensure that the tube is correctly positioned. Tie the tube securely in place.

Potential Complications

- Bleeding and aspiration of blood
- Creation of a false passage into the tissues
- Air in tissues outside trachea
- Local damage to cartilages, vocal cords or oesophagus

Teaching Tips

- To demonstrate the anatomy of the cricothyroid membrane, ask the participants to feel their own throats from the chin to the laryngeal cartilage, then drop down over the front of this to the dip over the membrane and the cricoid cartilage below. Discuss the importance of using the cricothyroid membrane rather than going further down the trachea where the structures are deeper with blood vessels, thyroid etc.
2. Intraosseous Needle Insertion

(20 minutes)

Equipment
- Intraosseous needle or large bore spinal needle with stylet
- Syringe containing saline
- Chicken or turkey bones, or other bones
- Gloves

Learning Objectives
- Understand the indications for intraosseous needle insertion
- Be confident in the landmarks for intraosseous needle insertion
- Able to insert an intraosseous needle

Technique

This is most suitable for children under the age of 6-8, though it can be done for older patients. It should be used if attempts at venous cannulation have not been successful. Select the appropriate site for intraosseous needle insertion. This is most often the about 1cm below the tibial tuberosity on the upper front surface of the tibia, where the bone surface is flat. This is below the bone growth plate. Clean the area of insertion and use local anaesthetic if the child is awake.

Insert the intraosseous needle until it contacts the bone. Once it is embedded in the bone surface, advance the needle facing slightly down towards the foot with a gentle screwing movement until it is felt advancing through the bone cortex and into the marrow. Remove the stylet from the needle and use a syringe to aspirate a small quantity of bone marrow to confirm position. Check that saline can easily be injected with no swelling of the tissues. Ensure that the needle is kept in position. Use a syringe to infuse fluid.

Potential Complications
- Misplacement of the needle with infusion into the tissues, not the bone marrow cavity
- Tissue swelling or compartment syndrome
- Infection
- Bone growth plate injury

Teaching Tips

Encourage the participants to find the landmarks on their own legs. If chicken bones are not available, insertion through the sides of vertebral bodies also feels realistic.
Workshops

Pain Management in Trauma (20 minutes)

Learning Objectives

- Understand the importance of good pain management for trauma patients
- Know what analgesia options are available locally for effective pain relief

Key Discussion Points

- Trauma can be extremely painful; be ready to offer analgesia
- Good analgesia for thoracic and abdominal trauma can result in more effective breathing
- There are many types of analgesia – opiates, non-steroidal anti-inflammatory drugs, paracetamol (acetaminophen), nitrous oxide, ketamine, local anaesthetic nerve blocks and epidural analgesia.
- Using opiates for analgesia in trauma will not cause drug addiction
- Intramuscular or subcutaneous injections are often poorly absorbed in the hypovolemic trauma patient

Teaching Tips

- Try to do some local research before this session, so that you know what is available and what the barriers to effective pain relief are.
- Use the expertise within your participant group for this session.
- Case studies from the local context get participants thinking about what they can use in different situations with the available resources.

Additional information in the PTC Course Manual, Appendix 7, pages 55 – 56

Transportation (20 minutes)

Learning Objectives

- Understand when and how to decide on the need to transport a trauma patient
- Understand the issues involved in transporting a trauma patient and how these relate to local conditions

Key Discussion Points

- Preparation, planning and communication are the key to successful patient transport
- The decision to transport a patient rests on an evaluation that the benefits of transport exceed its risks.
- Each type of patient transport has its own specific advantages and disadvantages — carrying the patient manually, road ambulance, boat, fixed or rotary wing aircraft.
- Quality of care should not deteriorate during transport.
- Do not unnecessarily endanger the lives of the people who will transport the patient.
Teaching Tips

- Every PTC course location will have unique issues around transporting critically injured patients. Delays to expert medical care due to remote locations and poor communication and retrieval systems are common.
- Brainstorm with the group all the issues and barriers to safe and timely transport, then use this information to help the group come up with some possible solutions.
- Take the opportunity to discuss implementation of a local patient transport and retrieval system.

Additional information in the *PTC Course Manual* section ‘Transport of Critically Ill patients’ page 43

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**Paediatrics**

(20 minutes)

**Learning Objectives**

- Understand the main anatomical, physiological and psychological differences between children and adults and how this affects trauma care for children
- Understand the challenges of trauma care in children and how these can be met.

**Key Discussion Points**

- The PTC principles of resuscitating children are the same, but some details differ because children are not “mini-adults”
- A system or some techniques for remembering some important facts and calculations are very important
- Psychological differences can be a challenge to trauma care in children; family involvement can be helpful
- Issues around injuries in children are also important to follow-up (such as prevention, non-accidental injury etc.)

**Teaching Tips**

Remember: this is a discussion group workshop, not a mini-lecture! Make sure the group are all involved in discussing the issues, rather than you or someone else dominating the talking. Use questions to get everyone involved.

Use this session to reinforce the key points of the *Trauma in Children* lecture

Examples: how to calculate weight, how to choose the right sized equipment, how much fluid to give and how to calculate percentage of body burnt in a child.

- Brainstorm at the start of this session to identify the most important issues for your participants.
- Ask what is easy and what is difficult about resuscitating children in trauma.
Use this information to help the group discuss the challenges and suggest appropriate solutions for your local context.
- Use clinical scenarios to help the group to share knowledge and insights based on past experience, and reinforce the key learning points.

Neurological Assessment (20 minutes)

Learning Objectives

- Understand and know how to assess a patient for any head or spinal injury
- Understand the issues when caring for the patient with head and spinal injuries

Key Discussion Points

- A good understanding of the AVPU and GCS
- GCS can provide an initial assessment of head injury severity, but repeating it regularly demonstrates deterioration or progress.
- Cervical spine injury should be suspected in all patients with head injury
- Knowledge of dermatome anatomy is helpful when assessing spinal injuries
- Using the PTC system for resuscitation minimises secondary head and spinal injury

Teaching Tips

- The level of participants' training and experience determines the complexity of your teaching
- Present some clinical findings and ask them to work out the GCS or level of spinal injury
- Discuss management of head injured patients when access to some resources (such as CT scan and neurosurgery) and not easily available and come up with a treatment plan

Information in the *PTC Course Manual* pages 27-32 and Appendix 9, page 58
**Alternative Workshop suggestions**

We encourage you to adapt the workshop topics according to local needs. Prepare some actual and relevant situations; decide the main learning objectives and the key points: prepare discussion questions. Here are two suggestions:

**Drowning**

(20 minutes)

Drowning is not covered at all in the current PTC format, however for some communities it can be the most common cause of traumatic injury and death. The workshop session is where you can discuss the key issues.

**Learning Objectives**

- Understand the structured approach to the drowned patient using the PTC system

**Key Discussion Points**

- The ABC approach to a drowned patient is the same as any other trauma patient
- Particular issues in drowning include airway foreign bodies, water in the lungs, secondary brain injury and hypothermia
- Always suspect other injuries in drowned patients and especially beware of head and cervical spine injury in shallow water, children or recreational swimming

**Burns and Blasts**

(20 minutes)

Burn and blast injuries are more common where there has been armed conflict. Use a Workshop session to develop the lecture on *Burns* and talk more about how to manage these injuries.

**Learning Objectives**

- Understand the issues in the assessment and management of patients with severe burns and blast injuries

**Key Discussion Points**

- The PTC approach is the same in burn and blast patients, but there are some specific injuries to look for
- Blasts affect particular parts of the body; ear, lungs, abdominal viscera
- Be careful to look for penetrating injuries in blast patients
- Exposure and secondary survey is very important to assess depth and size of burn as well as look for particular blast injuries
- Wounds are often contaminated, so good wound care and consideration of antibiotics is very important