SELF ASSESSMENT EXERCISES

Self-Assessment Exercises In Pre-Hospital Emergency Trauma Care

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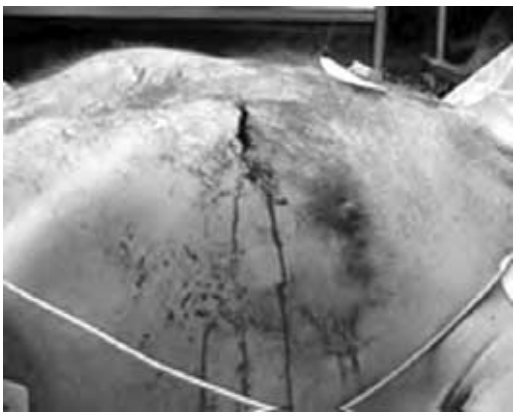
Questions

You are the Medical Officer to a unit where there are good links with the local BASICS scheme, and you volunteer to get involved with their on call duties. The following cases may be typical of those encountered in pre-hospital care.

1. You attend the scene of an accident where a motorcyclist has collided with a car, and been thrown from his bike. On arrival, you note he is lying on his back on the road, and is making a gurgling sound.

a. What should be your initial actions?
b. Should you remove his helmet?
c. Is intubation indicated?

2. You attend the scene of an incident where an articulated heavy goods vehicle has been involved in a collision with a school bus full of children. On your arrival you see that the lorry has overturned and spilled its load, and the coach is on its side on the edge of the road. The lorry driver appears unhurt, and runs to tell you that there appears to be a dozen seriously injured children in the coach.



a. What are your priorities?
b. What should be your initial actions?

3. You are called to your medical centre at midnight where a soldier is being assessed by a combat medical technician. There is a bloodstained shirt on the ground, and you notice that the soldier has sustained a 2cm incised wound to the epigastrium, and is alert but mildly short of breath. A kitchen knife has been retrieved from the scene, which has a line of blood on it to a depth of about 3cm. The medic has performed some observations and informs you that his heart rate is 105, with a blood pressure of 130/105. The medic suggests that he is haemodynamically stable, gains intravenous access and prepares to administer a litre of normal saline through a 14G cannula.

You are assured that scene safety has been secured, and that the assailant is in the custody of the military police.

a. What can you assume about the limit of the depth of the wound from this information?
b. Can you be reassured by these observations?
c. How much fluid should you give?
d. What interventions can you perform in the pre-hospital environment that will influence his survival?

4. You attend an incident involving a lorry that has overturned. Whilst approaching the vehicle you see the driver crawling away from the cab, screaming in pain and asking for help. Just before you reach him you notice an orange hazard board on the side of the lorry and see that the tanker is damaged and leaking.

a. What does the orange board mean?
b. What type of incident is this?
c. Where can further information be found?
d. What should your initial actions be?

5. You are escorting the patient in question 3 to hospital when you notice he is becoming increasingly breathless.

a. What symptoms and signs might you expect if he is developing a tension pneumothorax?
b. How should you treat it?

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6. You arrive at the scene of a motor vehicle collision to find the driver of a car involved in a high-speed frontal impact collision still trapped in his seat. He is still wearing his seatbelt, and there is no evidence that an airbag has deployed.

a. What injuries might you expect the driver to have sustained?

On closer inspection of the driver you find that he is alert, maintaining his own airway, spontaneously ventilating with a rate of 18 breaths per minute, has a palpable, good volume radial pulse of 90 per minute, a Glasgow Coma Score of 15, a clinically fractured right femur and trapped right and left legs.

b. How will you reassure yourself that this patient has no immediately life threatening chest injury?
c. Are you happy with his circulatory status?
d. What are the different types of entrapment?
e. How might you extract this patient, and what drugs and equipment will facilitate extrication?

7. You are providing medical cover to a sporting event where there is a crowd of 12,000 spectators. You hear on your VHF radio that a member of the crowd has collapsed and is not breathing.

a. What facilities would you expect to be present?
b. What should you do?

Answers to self-assessment exercises

1. a. Safety should be the first priority (of you, the casualty and the scene). Once it has been established that it is safe to intervene, the cervical spine should be immobilised by manual in-line stabilisation (MILS). Simple airway opening manoeuvres employed to try to clear the airway. If successful, this should be followed by an assessment of breathing, circulation and disability (neurological status).
   b. If good airway care is not possible without helmet removal, it should be removed while maintaining MILS. This is a two-person technique and must be performed with great care.
   c. It depends who is present – usually no in these circumstances. It should only be considered by a practitioner who has received appropriate training and experience in pre-hospital emergency anaesthesia and is current in this skill. Otherwise basic airway care should be optimised, greatly improving the morbidity and mortality of the patient.

Discussion

From the information given this patient has an obstructed airway. Good basic airway care should be initiated with basic airway opening manoeuvres, suction, the use of simple adjuncts and high flow oxygen. Spinal immobilisation should be maintained throughout these procedures to safely perform rapid sequence induction of anaesthesia and intubation

(RSI) as an emergency at the scene of an accident, a triad of skills is essential, with each one being equally important (1-4).

- Emergency anaesthetic experience. This must be current and relevant to the procedure being performed.
- Resuscitation of sick patients. The doctor must have current experience of dealing with sick, unstable patients, recognising their problems and instituting appropriate resuscitation.
- Pre-hospital expertise. Familiarity with and experience of the pre-hospital environment is essential. Performing RSI with pre-hospital scene dangers, distractions, environmental challenges, unfamiliar assistants and different equipment is very different to the familiar and safe environment of a hospital.

It is important not to attempt to intubate a relatively unresponsive patient without the use of anaesthetic drugs, as this will potentially lead to raised intracranial pressure and worsening of a serious head injury (5). It is also worth noting that patients who can be easily intubated without the use of drugs have been shown to have a mortality rate of 100% (1).

2. a. Command and control, safety (of yourself, the scene and the casualties) and communication. Relay METHANE message to initiate major incident response.
   b. Initial actions should include: donning personal protective equipment including high visibility jacket, parking in a defensive position using warning triangle and hazard lights, and initiating major incident response by relaying METHANE message to the emergency services. Assume the duties of Medical Incident Officer and organise overall response to incident until further help arrives.

Discussion

This incident constitutes a major incident in that it has overwhelmed the resources immediately available. It could be

particularly emotive as it involves children (6). The temptation to start treating the injured must be resisted, as the aim is to do the most for the most. Safety should be a priority at any incident, and issues here may include traffic, the shed load, debris, fire and explosion. Oncoming traffic should be alerted to the situation to prevent further escalation of the incident. As soon as it is safe to do so a major incident message should be sent. The mnemonic METHANE summarises the information required (Box 1) (7).

Box 1. METHANE.

- M Major Incident declared *(record time)*
- E Exact location of incident
- T Type of incident *(description of what has occurred)*
- H Hazards present at the incident site
- A Access routes to the incident
- N Number of casualties *(estimated)*
- E Emergency services required *(usually all)*

Once this has been achieved, the priorities are CSCATTT - Command and control, Safety, Communications, Assessment of the scene, then Triage, Treatment and Transport of casualties (7). In practical terms for this incident it will involve taking overall command of the scene until other emergency services arrive, ensuring safety of the scene, directing walking wounded to a safe area, trying to establish communications, and making a judgement as to the best area to take the more seriously injured once help arrives. Only when help arrives can the process of triage, treatment and transport of the more seriously injured begin.

3. a. Nothing
   b. No, these observations probably indicate early shock.
   c. No fluid is required, as it may worsen outcome.
   d. Give high flow oxygen by mask, exclude a tension pneumothorax and transfer to hospital urgently. Do not delay transfer to establish intravenous access, and do not give large volumes of fluid.

Discussion

The 3cm level of blood on the knife is meaningless. Given the possible force of a punching type stab wound, the only safe assumption is that the knife could have penetrated at least twice the length of the knife in any direction from his epigastrium.

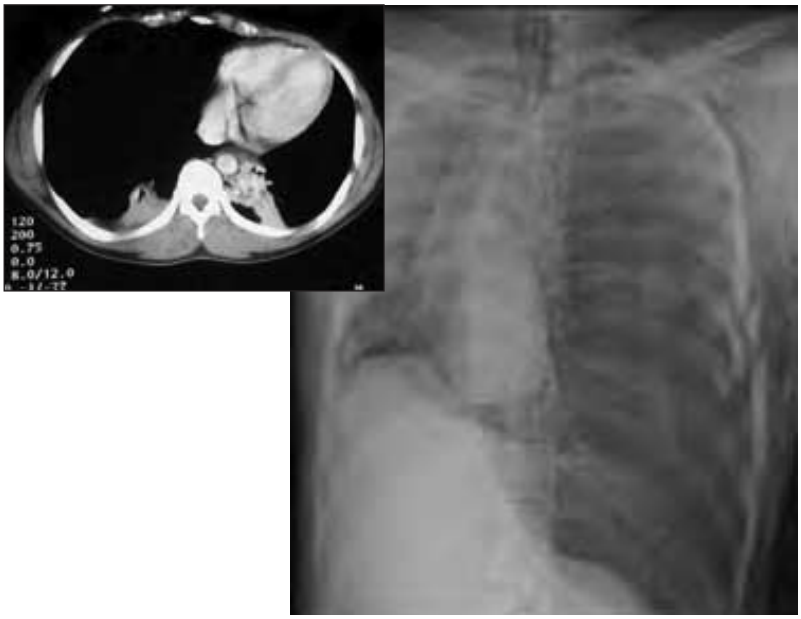
These observations show a mild tachycardia and a decreased pulse pressure, both of which are early signs of shock. Other early signs to look for would be cool peripheries and mild anxiety or agitation. The wisdom of administering two litres of crystalloid to all victims of trauma has been the matter of some debate over the last few years. It has led to new guidelines being issued for the fluid management of trauma in the pre-hospital environment (8). Bleeding can be either controlled or uncontrolled. Bleeding from blunt trauma often has a degree of tamponade surrounding the origin of the bleeding and is therefore controlled to a certain degree. In penetrating trauma this is rarely the case and it is therefore uncontrolled. Intravenous fluid administration for blunt trauma may replace some of the volume that has been lost into the compartment under tamponade. In penetrating trauma however, aggressive fluid replacement may simply cause more bleeding by a combination of increased arterial and venous pressure, dilution of clotting factors, and decrease in blood viscosity (9-12). Clearly some fluid will need to be given if shock continues to worsen before surgery, but when to administer fluid, how much, and what type is still a matter of debate (13). Current evidence would suggest best practice is controlled fluid therapy to maintain a systolic blood pressure of 80mmHg or the presence of a radial pulse (8,14).

In summary, the critical intervention in penetrating trauma is likely to be surgery, and anything that delays this will be detrimental to the outcome. Transfer should not be delayed by gaining intravenous access, and fluid should only be given to maintain critical organ perfusion.

4. a. This is a UKHIS (UK hazard information system) sign.
   b. By definition this is now a chemical incident.
   c. The UKHIS card contains coded information used by the fire service. If there is an "E" on the card the scene should be evacuated. There may be a telephone number of the manufacturer on the card. A TREM (transport emergency) card is carried in the cab with further information but it would not be safe to retrieve it in this situation.
   d. DESIGNATE the contaminated area, CALL OUT the fire service GET OUT of the immediate vicinity, and STAY OUT of the contaminated area until it is safe

Discussion

The classical mistake people attending chemical incidents make is not recognising them, contaminating themselves then continuing to contaminate others until someone eventually realises the danger. If it is suspected, a contaminated (hot) area must be established and the call out “get out, stay out” policy adopted. You are useless to the driver in this incident if you suffer adverse effects from chemical exposure. The fire service will assume control of the hazards when they arrive, with the ambulance service



assuming responsibility for decontamination.

5. a. Increasing respiratory distress, abnormal chest movements
   b. The options for treatment of a tension pneumothorax (Box 2), on the side of the pathology are:
   - Wide bore needle into the second intercostal space, mid-clavicular line.
   - Wide bore needle into the fifth intercostal space, mid-axillary line.
   - Chest drain into the fifth intercostal space, mid-axillary line.

Box 2. "Reliable" signs of a tension pneumothorax.

• Respiratory distress	–	increasing severity
• Tachycardia	–	increasing severity
• Hyper-expansion	–	ipsilateral
• Hypomobility	–	ipsilateral

The classical signs of a tension pneumothorax (see Box 3) are not always seen in a spontaneously ventilating patient (15). The doctor must always be alert to the possibility of this pathology when the earliest sign is likely to be increasing respiratory distress. This may manifest with worsening pleuritic pain or simply increasing respiratory rate, shortness of breath, inability to talk and shallow breathing. Lateralisation of the side with the pathology is simple if the classical signs are present, but if absent it can prove difficult. Close observation of chest movement and respiratory pattern is required to detect the side with hypomobility and possibly hyperexpansion. The spontaneously ventilating patient will physiologically compensate for significant periods of time, and hypotension is a late or preterminal sign (16). Drainage in the second intercostal space, mid-clavicular line is not always successful due to a number of reasons (17,18). If this does not give the expected hiss of air it is worth trying a needle in the position of routine chest drain placement (fifth intercostal space, mid-axillary line). Even this may be unsuccessful and formal chest drainage will then be required (19). Needle thoracocentesis is not always successful and the lack of a hiss does not rule out the diagnosis.

Box 3. Other "Classical" signs of a tension pneumothorax – often absent.

• Reduced air entry and breath	–	ipsilateral
• Hyper-resonance to percussion	–	ipsilateral
• Distended neck veins	–	unless hypovolaemic
• Hypotension	–	late sign
• Tracheal deviation	–	often absent

6. a. Possible injuries may typically include:
   - Head – frontal head injury, possibly left frontal laceration from rear view mirror, any intracranial injury.
   - Neck – flexion extension injury, possible fractured /dislocation.
   - Chest – fractured ribs, simple pneumothorax, tension pneumothorax, flail chest, tracheal disruption, oesophageal rupture, myocardial contusion, haemo-thorax, aortic dissection, diaphrag-matic rupture, fractured R clavicle, fractured sternum (seatbelt injury).
   - Abdomen – possible seatbelt injury to spleen or L kidney.
   - Pelvis – posterior dislocation of the hip.
   - Femur – fractured shaft of femur
   - Knee – fractured patella, fractured tibial plateau, knee dislocation, major ligamentous injury.
   - Lower leg and ankle – possible fractured from injury caused by pedals.

   b. The normal respiratory rate is reassuring. Other good prognostic factors are:
   - Breathing feels normal to the patient.
   - No pleuritic pain with deep inspiration or coughing.
   - Normal respiratory pattern.

   c. For the moment. Heart rate and pulse volume are part of the assessment of haemodynamic status, and a palpable radial pulse probably infers a systolic blood pressure of 80-90mmHg (8).
   Other useful indices are capillary refill time and level of consciousness.

   d. Physical (can't move because physically trapped) or clinical (can't move because of pain or need for spinal immobilisation).

   e. Extrication can be either immediate or controlled. In this case it should be controlled. Strong analgesic drugs will aid extriction. Fire brigade cutting equipment, cervical collars, spinal boards and extrication devices may be used.

Discussion

The pattern of injury in motor vehicle collisions can sometimes be predicted from knowledge of mechanism of injury and injury patterns (21). In a frontal impact, a driver will suffer predictable injuries as detailed above. Some are seatbelt related, but the severity of these tends to be much less than the severity of injury had the same driver been unrestrained. However, in the initial resuscitation of any major trauma victim the doctor must assume that any and all possible injuries have occurred.

The aim of most extrications is to get the patient out of their predicament as soon as their condition allows while delivering the best spinal care possible within the timeframe. True physical entrapment is quite rare, and many so-called entrapments are clinical. The patient cannot be moved due to extreme pain, but with the administration of adequate analgesia they can usually be released (21). Possible analgesic agents include; Entonox (contraindicated with chest trauma), intravenous Morphine or Ketamine. If the environment is unstable, such as when there is a high risk of explosion or fire, it may be necessary to perform an immediate (snatch) rescue. The advantages of spinal immobilisation must be measured against the risk of the environment, and the risk to the rescuer should be taken into account. Otherwise the decision as to whether the patient requires controlled or immediate extrication is a clinical one. Most extrications can be performed within 20 minutes by a competent fire brigade with all the necessary cutting equipment. It may take longer in an operational military environment where crowbars and other makeshift tools may have to be used. Removing the roof from a car, inserting a spinal board and winding the seat back followed by controlled extrication of the already collared patient on the board is the preferred and most controlled way of extrication.

A rapid clinical assessment is required to establish whether or not a patient can wait 20 minutes or whether an immediate extrication is required. Monitoring equipment slows down and complicates extrication and is not always necessary. The clinical signs described above are very reassuring and often all that is required. A full formal clinical examination is certainly inappropriate in this circumstance.

7. a. Facilities should include a defibrillator, one trained first aider per 1000 public, one doctor (you), and one fully equipped ambulance when there are more than 5000 in the crowd.
   b. Ensure it is safe to approach the scene, then delegate first aiders to institute basic life support while you institute advanced life support and defibrillate as necessary.

Discussion

As a result of the Taylor report (22) following the Hillsborough disaster in 1989, the above facilities are now mandatory for these events. Facilities at stadia vary greatly, from the minimum requirement to a fully equipped resuscitation facility, and you would be wise to research the facilities available before committing to such a task. In the case given, you will have first aid trained personnel to help you, so it would be appropriate for them to institute basic life support while you perform more advanced procedures such as defibrillation.

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