Course Pre-reading for Resuscitation Techniques

2014

Levels 2, 4, 5, 6, 7

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Morning or afternoon tea is provided for our four hour courses, with morning tea, afternoon tea and lunch provided for our full day courses. If you have any special dietary requirements, please let us know prior to attending your course.

In preparation for your course, please revise:

• **The Emcare supplementary pre-reading.** This guide covers supplementary pre reading for all of our courses. If you are doing a NZRC Level 5, 6 or 7 course, this will direct your study for the exam.

• **The ECG Rhythm Study Guide**
  If you are doing a Principles of Advanced Cardiac Life Support (PACLS) course, there is a discussion on manual defibrillation – including shockable rhythms. Please go to [www.skillstat.com](http://www.skillstat.com) and practice on the ECG simulator.
  If you are doing NZRC Level 5, 6 or 7 course, this guide covers the 15 rhythms that will be examined. Please go to [www.skillstat.com](http://www.skillstat.com) and practice on the ECG simulator. During the course you will be shown moving rhythms. You will need to be able to recognise and name these rhythms for Levels 6 and 7 and correctly identify which rhythms will be defibrillated for Level 5.

• **The Level 7 Advanced Resuscitation for Health Professionals (2012) manual,** as this is your key resource for the Level 5, 6 and 7 Core courses. This manual can be purchased or hired from Emcare.

• During the NZRC Level 5, 6 or 7 course there will be an exam comprised of true/false questions and short answers. The recommended pre-reading time is 6 weeks, as the instructors will not be able to cover all of the exam content during the course. The questions are taken from the Level 7 Advanced Resuscitation for Health Professionals (2012) manual.

If you have any queries, please email [yvette@emcare.co.nz](mailto:yvette@emcare.co.nz)
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What sections do I need to read?

**Basic Life Support (Level 2)**
Read pages 4 – 22

**Basic Life Support for Health Professionals (Level 4)**
Read pages 4 – 56 and Appendix 5 (p. 88)

**Modular Core Certificate Level 4**
Read pages 4 – 56 and Appendix 5 (p. 88)

**Principles of Advanced Cardiac Life Support (PACLS)**
Read pages 4 – 56, and Appendix 1 and 5 (p. 69 & 88)

**New Zealand Resuscitation Council CORE Level 5/6/7**
Read pages 4 – 67, and Appendix 1 and 5 (appendices 2, 3 and 4 are level specific)

The Teamwork section is optional, however, an effective team leads to effective management of emergency situations and we believe that this section is worth a quick read.
CPR Guidelines – Main Points

Basic Life Support
- Follow the DRS-ABCD approach
- The need for CPR is determined by unresponsiveness and the absence of normal breathing
- The initial check for normal breathing should be no more than ten seconds

Chest Compressions
- Compression/ventilation ratio for unintubated patients 30:2 for adults and children in Basic Life Support, 15:2 for children/infants in Advanced Life Support
- Minimise all interruptions to chest compressions
- Hard and Fast and Fresh. Allow the chest to recoil fully
  - Hard (i.e. depress the chest by 1/3 of its anterior/posterior diameter)
  - Fast (i.e. chest compressions are at 100 compressions per minute)
  - Fresh (i.e. Change compression person every 2 minutes)
- Once intubated, compressions are continuous and ventilations are 10 breaths per minute for adults and 15 breaths per minute for children and infants

Rescue Breaths
- These breaths are attempted. If unsuccessful, do not delay the resumption of chest compressions
- Each breath is given over one second, and with enough volume to produce chest rise
- In adults the focus is on early defibrillation – send for help first, and compressions as a priority over rescue breathing
- In children and infants 2 attempted initial breaths are given, enough to produce chest rise. In child/infant collapse – send for help fast (1 minute of CPR before going for help)

Pulse Checks
- The pulse is no longer checked during the initial assessment and then only if there are signs of life or it is noted that there is a rhythm present that could be associated with cardiac output

Precordial Thump
- The precordial thump has largely been omitted
- A single precordial thump is administered to the centre of the chest during a witnessed adult collapse, AND the patient is cardiac monitored, AND you see they are in Ventricular Tachycardia, AND there is no defibrillator immediately available
**Manual Defibrillation**
- All manual defibrillation shocks are given at maximum output of the defibrillator in adults and at 4 J/kg in children.
- Defibrillations are given as a single shock followed by two (2) minutes of CPR
- Reanalyse every 2 minutes

**AEDs**
- AEDs are pre-programmed to deliver a certain amount of energy
- Turn the AED on and follow the voice prompts

**Drug Management**
- Adrenaline
  - Shockable
    - 1 mg is given after the second shock/defibrillation and then every second loop (shock : CPR 2 minutes = 1 loop)
  - Non-shockable
    - 1 mg given as soon as possible
  - Children/Infants
    - 10 mcg/kg (0.1 ml/kg 1:10000)
- Amiodarone is given in persistent VF and pulseless VT after the third (3rd) shock/defibrillation. In adults amiodarone 300 mg is given. In children and infants 5 mg/kg amiodarone is given.
Basic Life Support

D
Dangers?

R
Responsive?

S
Send for help

A
Open Airway

B
Normal Breathing?

C
Start CPR
30 compressions : 2 breaths
if unwilling/unable to perform rescue breaths continue chest compressions

D
Attach Defibrillator (AED)
as soon as available and follow its prompts

Continue CPR until responsiveness or normal breathing return
D DANGER  Approach the victim while ensuring your own safety from electrocution, fire, poison, traffic or other physical hazards. If necessary, while bearing in mind the possibility of spinal injury, the victim should be moved in order to ensure the safety of both the victim and the rescuer.

R RESPONSE  Gently shake the victim and shout “are you okay?” but do not aggravate any injuries. Other ways to check for responsiveness include a tap on the clavicle, sternal rub or squeezing the trapezius muscle.

In adult collapse, the most likely rhythm is VF or VT. It is therefore important that the medical emergency team/ambulance should be always be called to decrease the time from collapse to defibrillation and optimise further management.

S SEND FOR HELP  In the in-hospital setting activate the emergency call bell system and ask one of your colleagues to call the emergency number. This is a Code Blue.

In the out of hospital setting ensure that a specific individual has the responsibility for calling 111 for an ambulance and ensure that they return and confirm that the ambulance is on its way.

The rescuer should go for help if they are alone and help is not on the way. If it is going to take longer than 3 minutes to go for help or if it is a drowning victim or a child, CPR should be performed prior to going for help.

A OPEN AIRWAY  Open the airway by applying the head tilt and chin lift manoeuvre. If the casualty shows signs, or the history is suggestive of injury, open the airway using a jaw thrust. Remove obvious causes of upper airway obstruction, such as vomit, with 2 fingers covered in cloth.

B CHECK BREATHING  Within 10 seconds, determine if the victim is breathing by placing your ear over the victim’s mouth and nose while maintaining an open airway. Look and feel for movement of the chest and listen and feel for air escaping during exhalation. Remember that slow gasping respirations (agonal breathing), may persist for several minutes after a cardiac arrest. These agonal breaths are generally ineffectual and rescue breaths are required

** If breathing is present and there is airflow at the mouth, place the victim in the recovery position if they are unconscious.

C CPR  Chest compressions are delivered over the lower half of the sternum. Run the dominant hand to the top of the victim’s axilla and place this hand in the centre of the chest directly opposite the top of the axilla.

Now place the second hand on top of the first. The fingers are lifted from the chest wall and only the heel of the hand should be in contact with the sternum Keep the arms straight with the elbows locked in position. The shoulders should be positioned directly above the hands so that the thrust for each compression is straight down onto the sternum.

Push
Hard (depress the chest by 1/3 of its anterior/posterior diameter) and
Fast (compress at a rate of 100 compressions per minute) and
Fresh (Change the compression person every 2 minutes)

D Defibrillate  ATTACH AN EXTERNAL DEFIBRILLATOR AS SOON AS POSSIBLE

The goal is to defibrillate the victim as soon as possible after cardiac arrest.
Airway

Airway Occlusion
During unconsciousness the greatest cause of airway occlusion is the tongue. As unconsciousness deepens the loss of muscle tone causes the tongue to fall to the back of the pharynx thus occluding the airway. Any noises such as snoring, grunting, wheezing, stridor or gurgling indicate that some form of airway management is required.

Outlined below are some common basic moves to open the airway:

**Head Tilt Chin Lift**

**Jaw Thrust**
This method of opening the airway is for those patients with suspected neck injuries.

Breathing

After establishing that the airway is clear and open, the next step is to establish the presence (or absence) of breathing.

The 'look, listen, feel' technique quickly confirms whether or not breathing is present.

**Look, listen feel:**
- LOOK for the rising or falling of the chest
- LISTEN for breathing by placing your ear close to the patient’s mouth.
- FEEL for chest movement by placing your hand on the patient’s chest.

If normal or adequate breathing that moves air is absent, proceed with 30 chest compressions and 2 breaths/ventilations for the adult patient.

Breathing is done by pinching the patient’s nose while maintaining head tilt and chin lift. The rescuer takes a deep breath and makes a tight seal around the patient’s mouth. The rescuer then blows sufficient air into the patient’s mouth to make the chest rise. The rescuer then turns their head and looks down the patient’s chest to watch it fall before giving the next breath. Each breath should be given over 1 second. Quick breaths can cause gastric inflation that increases the risk of regurgitation.

![Breathing Instructions](image)

If using a bag mask resuscitator never simply push the mask onto the patient’s face. Position it over the mouth and nose and hold it in place by the thumb and index finger placed around the collar of the face mask. The other three fingers grasp the lower jaw, and lift it into the mask to obtain an airtight seal with the face.
**Bag Valve Mask**

The bag valve mask (BVM) is used to ventilate the patient. In conjunction with high flow oxygen and an oxygen reservoir it delivers approximately 90% oxygen. Each ventilation is delivered over one second. The 10/10 rule is useful to bear in mind when ventilating the patient.

10 – Run O2 at **10 litres per min** plus or alternatively until the reservoir bag fills.

10 – For the pt in respiratory arrest with a pulse, ventilate them **10 x per min**.

For the pt that is intubated and in cardiac arrest, ventilation rate is **10 x per min**.

Excessive ventilation in terms of rate or volume leads to:
- Risk of aspiration
- Gas trapping & decreased tidal volume
- Increasing intrathoracic pressure → ↓ coronary perfusion

If you have problems achieving a seal with the BVM, use two hands to hold the mask, and have another person squeeze the bag.


**Compressions**

The need for resuscitation is identified by unresponsiveness and the absence of normal breathing.

Hands should be placed on the lower third of the sternum. Use either a one or two hand technique for children. In babies, use the ‘two finger’ or the ‘two thumb’ technique. Compression rate for all ages is 100/min.

Compression depth should be approximately 1/3 of the depth of the chest.

Defibrillation

The combination of early CPR, early defibrillation and early Advanced Cardiac Life Support has been termed the ‘Chain of Survival’ The table above reprinted from the AHA Textbook of ACLS clearly represents how early access to all of the steps of the chain of survival reflects better patient outcomes.

Rationale for Early Defibrillation
- The most frequent initial rhythm in sudden cardiac arrest is VF
- The only effective treatment for VF is electrical defibrillation
- The probability of successful defibrillation diminishes rapidly over time
- VF tends to convert to asystole within a few minutes
Safety when Defibrillating

- Use with care around water – dry the patient’s chest
- Always ensure that charged paddles remain in contact with the patient
- There are two places for defibrillator paddles, on the patient or in the machine. DO NOT wander around with the paddles

- Always shout for people to stand clear when you are about to defibrillate
- Visually check nobody is touching the patient before you discharge the shock
- Use a contact medium to prevent burning the patient (e.g. 3M™ Gel Pads)
- Never touch the patient who is receiving the DC shock
- Do not use in the presence of flammable gases. If using a BVM & 02 remove the mask prior to defibrillation. If your patient is intubated and you therefore have closed circuit from which the 02 cannot escape, nothing different needs to be done
- Do not defibrillate over GTN patches
- If a permanent pacemaker is placed under the right clavicle the pad/paddle should be placed at least 8 cm away, or the anterolateral configuration should be adopted (NZRC – Advanced Resuscitation for Health Professionals, 2012, p.50)

Paddle and electrode placement

1. Keep away from jewellery
2. If patient’s chest is so hairy electrodes do not contact the skin then the use of a razor is indicated.

ECG Rhythm Recognition

For assistance in ECG interpretation and recognition, the following website may be of assistance:
http://www.skillstat.com/learn.htm - click on ECG Simulator
**Automated External Defibrillators**

**WHAT IS AN AED?**
The Automated External Defibrillator (AED) is a small compact device that
Interprets heart rhythms
Delivers an electrical shock to treat sudden cardiac arrest

**WHAT ARE THE INDICATIONS FOR USING AN AED?**
Unconsciousness
Abnormal breathing

**VOICE PROMPTS FROM AED**
1. Each AED manufacturer has different instructions
2. Turn the AED on, listen and follow the instructions
3. **DO NOT** stop CPR until the AED advises you to

**BEFORE YOU PRESS THE SHOCK BUTTON**
Check that no one is touching the patient/victim – including yourself
State clearly – “stand back”
Push the shock button

Follow machine prompts which will tell you when to analyse again
- Note – Portable self contained units count down automatically –
  hospital combination manual and AED machines need the “Pause”
  button pressed to start an automatic count down
- Note: CPR should continue until the AED begins analysis and
  immediately after the delivery of the defibrillation shock

**AED BATTERY**
- Will last a minimum of 300 shocks or 12 ‘on’ hours
- Has a shelf life of 5 years, even if it is not used
- Must not be turned on to practice
  1. **Daily Check** – Check the status indicator window should display
     an hour glass and not a cross
  2. **Monthly Check** – Check the AED pads for expiry dates and signs
     of damage

**Note**
- AED pads ALSO plug into the manual defibrillator pads connector
  Once pads are on, there is NO reason to remove and change to paddles

**Choking**

**Recognition**

Because recognition is the key to successful outcome, it is important to ask the conscious victim “Are you choking?” This at least gives the victim who is unable to speak the opportunity to respond by nodding!

Consider the diagnosis of choking particularly if:

- Episode occurs whilst eating, and onset was very sudden
- Adult victim - may clutch his or her neck, or points to throat
- Child victim - there may be clues, e.g. seen eating or playing with small items just before onset of symptoms

**Assess severity**

- Effective Cough (Mild Airway Obstruction):
  - The patient is able to breathe, cough effectively and speak
  - Children are fully responsive, crying or verbally respond to questions, may have loud cough (and able to take a breath before coughing)

- Ineffective Cough (Severe Airway Obstruction):
  - Victim unable to breathe or speak/vocalise
  - Attempts at coughing are quiet or silent
  - Cyanosis and diminishing conscious level (particularly in children)
  - Victim unconscious

**Management**

**Adults**

- With an effective cough, encourage the patient to continue coughing, but do nothing else except monitor for deterioration. If the obstruction is not relieved – call 111
- Ineffective cough in a conscious patient:
  - Stand to the side and slightly behind the victim, support the chest with one hand and lean the victim well forwards (so that the obstructing object comes out of the mouth rather than going further down the airway)
Give up to five sharp back blows between the shoulder blades with the heel of your other hand (checking after each if the obstruction has been relieved)

If unsuccessful, give up to five chest thrusts. Stand behind the victim put both arms around the chest, identify the same compression point as for chest compressions, clench one fist, grasp it with the other hand and pull sharply inwards

Continue alternating five back blows and five chest thrusts until successful or the patient becomes unconscious

In an unconscious patient:

- Lower the patient to the floor
- Call an ambulance immediately
- Begin CPR

**Children**

- If coughing effectively, just encourage the child to cough, and monitor continuously
- If coughing is, or is becoming ineffective, shout for help and assess the child’s conscious level
- If the child is conscious, give up to five back blows, followed by five chest thrusts in infants and children (repeat the sequence until the obstruction is relieved or the patient becomes unconscious)
  - For infants (<1 year old): back blows and chest thrusts:
    - In a seated position, support the infant in a head-downwards, prone position to let gravity aid removal of the foreign body.
    - Support the head by placing the thumb of one hand at the angle of the lower jaw, and one or two fingers from the same hand at the same point on the other side of the jaw. Do not compress the soft tissues under the jaw, as this will aggravate the airway obstruction.
    - Deliver up to five sharp blows with the heel of your hand to the middle of the back (between the shoulder blades).
    - After each blow, assess to see if the foreign body has been dislodged and, if not; repeat the manoeuvre up to five times.
    - After five unsuccessful back blows, use chest thrusts: turn the infant into a head-downwards supine position by placing your free arm along the infant’s back and encircling the occiput with your hand. Support the infant down your arm, which is placed down (or across) your thigh. Identify the landmark for chest compression.
This is the lower sternum. Deliver five chest thrusts. These are similar to chest compressions for CPR, but sharper in nature and delivered at a slower rate.

- For children (1 year old to puberty): treatment is the same as in Adults:
  - Blows to the back are more effective if the child is positioned head down. A small child can be placed across the lap as with an infant. If this is not possible, support the child in a forward-leaning position.
  - Deliver up to five sharp back blows with the heel of one hand in the middle of the back between the shoulder blades.
  - After five unsuccessful back blows, chest thrusts are used
    - Repeat chest thrusts up to 5 times.
  - If the child becomes unconscious, place him or her on a flat, firm surface, shouting for help if none has arrived. Open the mouth and look for any obvious object. If one is seen, make an attempt to remove it with a single finger sweep (don't do blind finger sweeps).
  - If unsuccessful, begin CPR as for paediatric basic life support.

Assess Severity

Ineffective Cough
Severe airway obstruction

- Unconscious
  - Call ambulance
  - Commence CPR

- Conscious
  - Call ambulance
  - Give up to 5 back blows
  - *If not effective*
  - Give up to 5 chest thrusts

Effective Cough
Mild airway obstruction

- Encourage coughing
  - Continue to check casualty until recovery or deterioration
  - Call ambulance
Further information around Adult Advanced Life Support is located on the New Zealand resuscitation Council website at http://www.nzrc.org.nz/policies-and-guidelines/
How are children different?

- An infant is less than 1 year of age
- A young child is 1 – 8 years of age
- An older child is 9 – 14 years of age
- Older children may be treated as per adult protocols
- VF may be the cause of approximately 10% of paediatric arrests
- It is rare for a child to have a primary cardiac arrest. Most cardiac arrests are secondary to hypoxia
- Therefore the paediatric arrest algorithm places rescue breaths not compressions as first priority - **2 attempted breaths** may be given first in Advanced Life Support
- Other causes of cardiac arrest include trauma, dehydration and sepsis
- **Cardiac compressions are 100 compressions per minute**
- Once intubated, give breaths at a rate of 15 min for an infant or child during uninterrupted chest compressions
- If a manual defibrillator is not available infants ≤ 1 year and children 1-8 yrs may be treated with an AED if it has a dose attenuator. If neither is available, use the preset AED energy levels
- Manual defibrillation is given at 4 Joules/kg

**Adrenaline:** 10mcg/kg (0.1ml/kg of 1:10,000) intravenous or intra-osseous dose

- Give 1st dose after second shock for patients with a VT/VF arrest
- Give 1st dose as soon as possible for patients in PEA or asystolic arrest
- Adrenaline is given immediately post defibrillation and followed with 2 minutes of CPR
- Give every alternate loop or every 4 minutes thereafter

**Amiodarone:** 5mg/kg in 10mls of 5% Dextrose

- Give Amiodarone for VT/VF arrests after the 3rd defibrillation


Further information about the management of Medical Emergencies in Dental Practice can be found on the Dental Council website: [www.dentalcouncil.org.nz](http://www.dentalcouncil.org.nz) – search for Medical Emergencies
Advanced Life Support for Infants and Children

Start CPR
15 compressions : 2 breaths
Minimise Interruptions

Attach
Defibrillator / Monitor

Assess Rhythm

Shockable

Shock (4 J/kg)

CPR for 2 minutes

Non Shockable

Adrenaline 10 mcg/kg
(immediately then every 2nd cycle)

CPR for 2 minutes

Return of Spontaneous Circulation?

Post Resuscitation Care

During CPR
Airway adjuncts (LMA / ETT)
Oxygen
Waveform capnography
IV / IO access
Plan actions before interrupting compressions
(e.g. change manual defibrillator to 4 J/kg)
Drugs
Shockable
* Adrenaline 10 mcg/kg after 2nd shock
  (then every 2nd cycle)
* Amiodarone 5mg/kg after 3rd shock
Non Shockable
* Adrenaline 10 mcg/kg immediately
  (then every 2nd cycle)

Consider and Correct
Hypoxia
Hypovolaemia
Hyper / hypokalaemia / metabolic disorders
Hypothermia / hyperthermia
Tension pneumothorax
Tachypnoea
Toxins
Thrombosis (pulmonary / coronary)

Post Resuscitation Care
Re-evaluate ABCDE
12 lead ECG
Treat precipitating causes
Re-evaluate oxygenation and ventilation
Temperature control (cool)

December 2010
The ‘Drowning Chain of Survival’ comprises five life-saving steps for untrained and professional rescuers to help saves lives. The steps of the chain are:

1. Prevent drowning
2. Recognise distress
3. Provide flotation
4. Remove from water
5. Provide care as needed.

To find out more visit www.nzrc.org.nz/news
Medical Emergencies

The following information has been adapted or taken from the following website http://www.resus.org.uk/pages/MEdental.pdf

The ‘ABCD MOVE’ approach to the sick patient

This section provides guidance on the initial approach and management of common medical emergencies which may arise.

In all circumstances it is advisable to call for medical assistance as soon as possible by dialing 111 and summoning an ambulance.

Early recognition of the ‘sick’ patient is to be encouraged. Pre-empting any medical emergency by recognising an abnormal breathing pattern, an abnormal patient colour or abnormal pulse rate, allows appropriate help to be summoned e.g., ambulance, prior to any patient collapse occurring.

A systematic approach to recognising the acutely ill patient based on the ‘ABCD MOVE’ principle.

General principles

1. Follow the Airway, Breathing, Circulation, Disability, Monitoring, Oxygenation, Venous access and Exposure/ECG approach (ABCD MOVE) to assess and treat the patient.
2. Treat life-threatening problems as they are identified before moving to the next part of the assessment.
3. Continually re-assess starting with Airway if there is further deterioration.
4. Assess the effects of any treatment given.
5. Recognise when you need extra help and call for help early. This may mean dialing 111 for an ambulance.
6. Use all members of your team. This will allow you to do several things at once, e.g., collect emergency drugs and equipment, dial 11.
7. Organise your team and communicate effectively.
8. The aims of initial treatment are to keep the patient alive, achieve some clinical improvement and buy time for further treatment whilst waiting for help.
9. Remember - it can take a few minutes for treatment to work.
10. The ABCD MOVE approach can be used irrespective of your training and experience in clinical assessment or treatment. Individual experience and training will determine which treatments you can give. Often only simple measures such as laying the patient down or giving oxygen are needed.
First steps

- In an emergency, stay calm. Ensure that you and your staff are safe.
- Look at the patient generally to see if they ‘look unwell’.
- In an awake patient ask, “How are you?” If the patient is unresponsive, gently shake them and ask, “Are you all right?” If they respond normally, they have a clear airway, are breathing and have brain perfusion. If they speak only in short sentences, they may have breathing problems. Failure of the patient to respond suggests that they are unwell. If they are not breathing and have no pulse or signs of life, start CPR according to current resuscitation guidelines.

Airway (A)

Airway obstruction is an emergency.

1. Look for the signs of airway obstruction:
   - Airway obstruction causes ‘paradoxical’ chest and abdominal movements (‘see-saw’ respirations) and the use of the accessory muscles of respiration e.g., neck muscles. Central cyanosis (blue lips and tongue) is a late sign of airway obstruction. In complete airway obstruction, there are no breath sounds at the mouth or nose.
   - In partial airway obstruction, air entry is diminished and usually noisy
     - Inspiratory ‘stridor’ is caused by obstruction at the laryngeal level or above.
     - Expiratory ‘wheeze’ suggests obstruction of the lower airways, which tend to collapse and obstruct during expiration. This is most commonly seen in patients with asthma or chronic obstructive pulmonary disease.
     - Gurgling suggests there is liquid or semi-solid foreign material in the upper airway.
     - Snoring arises when the pharynx is partially occluded by the tongue or palate.

2. Airway obstruction is an emergency:
   - In most cases, only simple methods of airway clearance are needed
     - Airway opening manoeuvres – head tilt/ chin lift or jaw thrust.
     - Remove visible foreign bodies, debris or blood from the airway (use suction or forceps as necessary).
     - Consider simple airway adjuncts e.g., oropharyngeal airway.

3. Give oxygen initially at a high inspired concentration:
   - Use a mask with an oxygen reservoir. Ensure that the oxygen flow is sufficient (15 litres per minute) to prevent collapse of the reservoir during inspiration.
If you have a pulse oximeter, titrate the oxygen delivery aiming for normal oxygen saturation levels (94-98%). In very sick patients this may not be possible and a lower oxygen saturation (more than 90%) is acceptable for a short period of time.

**Breathing (B)**

During the immediate assessment of breathing, it is vital to diagnose and treat immediately life-threatening breathing problems, e.g., acute severe asthma.

1. Look, listen and feel for the general signs of respiratory distress: sweating, central cyanosis (blue lips and tongue), use of the accessory muscles of respiration (muscles of the neck) and abdominal breathing.
2. Count the respiratory rate. The normal adult rate is 12 to 20 breaths per minute and a child’s rate is between 20 and 30 breaths per minute. A high, or increasing, respiratory rate is a marker of illness and a warning that the patient may deteriorate and further medical help is needed.
3. Assess the depth of each breath, the pattern (rhythm) of respiration and whether chest expansion is equal and normal on both sides.
4. Listen to the patient’s breath sounds a short distance from their face. Gurgling airway noises indicate airway secretions, usually because the patient cannot cough or take a deep breath. Stridor or wheeze suggests partial, but important, airway obstruction.
5. If the patient’s depth or rate of breathing is inadequate, or you cannot detect any breathing, use bag and mask (if trained) or pocket mask ventilation with supplemental oxygen while calling urgently for an ambulance.
6. Hyperventilation and panic attacks are relatively common in stressful situations. In most patients these will resolve with simple reassurance.

**Circulation (C)**

Simple faints or vasovagal episodes are the most likely cause of circulation problems. These will usually respond to lying the patient flat and if necessary raising the legs. The systematic ABCD MOVE approach to all patients will ensure that other causes are not missed.

1. Look at the colour of the hands and fingers: are they blue, pink, pale or mottled?
2. Assess the limb temperature by feeling the patient’s hands: are they cool or warm?
3. Measure the capillary refill time. Apply cutaneous pressure for five seconds on a fingertip held at heart level (or just above), or on the patient’s shoulder with enough pressure to cause blanching. Time how long it takes for the skin to return to the colour of the surrounding skin after releasing the pressure. The normal refill time is less than three seconds. A prolonged time suggests poor peripheral perfusion.
Other factors (e.g., cold surroundings, old age) can also prolong the capillary refill time.
4. Count the patient’s pulse rate. It may be easier to feel a central pulse (i.e. carotid pulse) than the radial pulse.
5. Weak pulses in a patient with a decreased conscious level and slow capillary refill time suggest a low blood pressure. Laying the patient down and raising the legs may be helpful. In patients who do not respond to simple measures urgent help is needed and an ambulance should be summoned.
6. Cardiac chest pain typically presents as a heaviness, tightness or indigestion like discomfort in the chest. The pain or discomfort often radiates into the neck or throat, into one or both arms (more commonly the left) and into the back or stomach area. Some patients experience the discomfort in one of these areas more than in the chest. Sometimes pain may be accompanied by belching, which can be misinterpreted as evidence of indigestion as the cause. The patient may have known stable angina and carry their own glyceryl trinitrate (GTN) spray. If they take these, the episode may resolve. Give a single dose of aspirin and consider the use of oxygen.

Disability (D)

Common causes of unconsciousness include profound hypoxia, hypercapnia (raised carbon dioxide levels), cerebral hypoperfusion (low blood pressure), hypoglycaemia (low blood glucose levels) or the recent administration of sedatives or analgesic drugs.
1. Review and treat the ABCs: exclude hypoxia and low blood pressure.
2. Check the patient’s drug record for reversible drug-induced causes of depressed consciousness.
3. Examine the pupils (size, equality and reaction to light).
4. Make a rapid initial assessment of the patient’s conscious level using the AVPU method: Alert, responds to Vocal stimuli, responds to Painful stimuli or Unresponsive to all stimuli.
5. Measure the blood glucose to exclude hypoglycaemia, using a glucose meter. If below 3.0 mmol per litre give the patient a glucose containing drink to raise the blood sugar or glucose by other means.
6. Nurse unconscious patients in the recovery position if their airway is not protected.

Monitoring

Attach monitoring to the patient.

You may not have all of the monitoring equipment mentioned below. The aim is to gather as much information about your patient as possible.
1. Pulse – is it present? Is it strong or weak? Is it regular or irregular
2. Respirations – count the patient’s respiratory rate for a full minute. Ensure that the patient is not talking while you are doing this. If the patient appears short of breath, ask them to count to ten out loud. Whatever number they reach equals the number of words that they can speak per breath.

3. Blood Pressure – more useful as a trend over time, but this can easily answer if your patient’s blood pressure is too high or too low.

4. Pulse Oximetry – useful in assessing the patient’s oxygen levels. Remember that pulse oximetry is perfusion dependant, so you will not get accurate readings on the patient’s finger if their blood pressure is low.
   a. Normal oxygen levels are 94% or above
   b. If the patient has COPD, normal oxygen levels will be 88% - 92%

5. Temperature – an increased temperature may indicate sepsis, a low temperature may indicate advanced sepsis.

6. 3-lead ECG – this will very quickly highlight any rhythm abnormalities that the patient may have.

**Oxygenation**

Oxygen is a drug, and like all drugs is given when there is a need. The aim of oxygen is to raise the patient’s oxygen levels to normal or near normal. Give the least amount of oxygen required to bring oxygen levels to 94% or above if you suspect your patient is having a heart attack. For seizures, stroke and trauma, giving oxygen at 6 Litres per minute via a simple face mask (Hudson Mask) is a safe starting point.

**Venous Access**

Depending on your skill level, consider gaining intravenous (IV) access if you are significantly concerned about your patient, or if you have called for an ambulance. Gaining IV access will enable the administration of IV fluids or medication if indicated.

**Exposure/ECG (E)**

To assess and treat the patient properly loosening or removal of some of the patient’s clothes may be necessary. Respect the patient’s dignity and minimise heat loss. This will allow you to see any rashes (e.g., anaphylaxis) or perform procedures (e.g., defibrillation). Perform a 12-lead ECG if there is an indication (you suspect a heart attack or you notice abnormalities on the patients 3-lead ECG).
Common medical emergencies

Asthma

Patients with asthma (both adults and children) may have an attack anywhere at any time. Most attacks will respond to a few ‘activations’ of the patient’s own short-acting beta2-adrenoceptor stimulant inhaler such as salbutamol. Repeat doses may be necessary. If the patient does not respond rapidly, or any features of severe asthma are present, an ambulance should be summoned. Patients requiring additional doses of bronchodilator should be referred for medical assessment after emergency treatment. If the patient is unable to use the inhaler effectively, additional doses should be given through a large-volume spacer device. If the response remains unsatisfactory or if the patient develops tachycardia, becomes distressed or cyanosed (blueness around the lips or extremities), arrangements must be made to transfer them urgently to hospital.

Symptoms and Signs

Clinical features of acute severe asthma in adults include:
- Inability to complete sentences in one breath.
- Respiratory rate > 25 per minute.
- Tachycardia (heart rate > 110 per minute).

Clinical features of life threatening asthma in adults include:
- Cyanosis or respiratory rate < 8 per minute.
- Bradycardia (heart rate < 50 per minute).
- Exhaustion, confusion, decreased conscious level.

Treatment

Whilst awaiting ambulance transfer, oxygen should be given. Assuming the patient’s nebuliser is unavailable, up to 10 activations from the salbutamol inhaler should be given using a large-volume spacer device and repeated every 10 minutes if necessary until an ambulance arrives. All emergency ambulances in New Zealand carry nebulisers, oxygen and appropriate drugs. If bronchospasm is part of a more generalised anaphylactic reaction and there are ‘life-threatening’ signs, an intramuscular injection of adrenaline should be given. The perceived risk of giving patients with chronic obstructive pulmonary disease too much oxygen is often quoted but this should not distract from the reality that ALL sick, cyanosed patients with respiratory difficulty should
be given high flow oxygen until the arrival of the ambulance. This short term measure is far more likely to be of benefit to the patient than any risks of causing respiratory depression. If any patient becomes unresponsive always check for ‘signs of life’ (breathing and circulation) and start CPR in the absence of signs of life or normal breathing (ignore occasional ‘gasps’). For further information about the management of the the patient with asthma see: http://www.nzrc.org.nz/assets/Uploads/Guidelines/Guideline-9.2.5---First-Aid-for-Asthma-March-2014.pdf

Anaphylaxis

Anaphylaxis is a severe, life-threatening, generalised or systemic hypersensitivity reaction. It is characterised by rapidly developing life-threatening airway and/or breathing and/or circulation problems usually associated with skin and mucosal changes. Anaphylactic reactions may follow the administration of a drug or contact with substances such as latex in surgical gloves. In general, the more rapid the onset of the reaction, the more serious it will be. Symptoms can develop within minutes and early, effective treatment may be life saving. Anaphylactic reactions may also be associated with additives and excipients in medicines. It is wise therefore to check the full formulation of preparations which may contain allergenic fats or oils (including those for topical application, particularly if they are intended for use in the mouth).

Symptoms and signs

The lack of any consistent clinical manifestation and a wide range of possible presentations can cause diagnostic difficulty. Clinical assessment helps make the diagnosis.

Signs and symptoms may include:

- Urticaria, erythema, rhinitis, conjunctivitis.
- Abdominal pain, vomiting, diarrhoea and a sense of impending doom.
- Flushing is common, but pallor may also occur.
- Marked upper airway (laryngeal) oedema and bronchospasm may develop, causing stridor, wheezing and/or a hoarse voice.
- Vasodilation causes relative hypovolaemia leading to low blood pressure and collapse. This can cause cardiac arrest (although very rarely).
- Respiratory arrest leading to cardiac arrest.
Clinical Criteria for Diagnosing Anaphylaxis

Anaphylaxis is highly likely when any one of the following three criteria is fulfilled (taken from the World Allergy Organization Guidelines for the Assessment and Management of Anaphylaxis http://www.waojournal.org/content/4/2/13)

1. Acute onset of an illness (minutes to several hours) with involvement of the skin, mucosal tissue, or both (eg, generalised urticaria, itching or flushing, swollen lips-tongue-uvula)

AND AT LEAST ONE OF THE FOLLOWING:

A) Respiratory compromise (eg, dyspnœa, wheeze-bronchospasm, stridor, reduced PEF, hypoxaemia)

B) Reduced blood pressure or associated symptoms of end-organ dysfunction (eg, hypotonia [collapse], syncope, incontinence)

OR

2. Two or more of the following that occur rapidly after exposure to a likely allergen for that patient (minutes to several hours)

A) Involvement of the skin-mucosal tissue (eg, generalized urticaria, itch-flush, swollen lips-tongue-uvula)

B) Respiratory compromise (eg, dyspnea, wheeze-bronchospasm, stridor, reduced PEF, hypoxemia)

C) Reduced blood pressure or associated symptoms (eg, hypotonia [collapse], syncope, incontinence)

D) Persistent gastrointestinal symptoms (eg, crampy abdominal pain, vomiting)

OR

3. Reduced blood pressure after exposure to known allergen for that patient (minutes to several hours)

A) Infants and children: low systolic blood pressure (age-specific) or greater than 30% decrease in systolic blood pressure

B) Adults: systolic blood pressure of less than 90 mm Hg or greater than 30% decrease from that person's baseline
Treatment

Use an ABCD MOVE approach to recognise and treat any suspected anaphylactic reaction. First-line treatment includes managing the airway and breathing and restoration of blood pressure (laying the patient flat, raising the feet) and the administration of oxygen.

If two or more body systems are involved
- Initial treatment), adrenaline should be given intramuscularly (anterolateral aspect of the middle third of the thigh) in a dose of 500 micrograms (0.5 mL adrenaline injection of 1:1000); an autoinjector preparation delivering a dose of 300 micrograms (0.3 mL adrenaline injection 1:1000) is available for immediate self-administration by those patients known to have severe reactions. This is an acceptable alternative if immediately available. The dose is repeated if necessary at 5-10 minute intervals according to patient response

The paediatric dose for adrenaline is based on the child’s approximate age or weight:
1 year (10kg) = 0.1 ml (1:1000 adrenaline)
5 years (20kg) = 0.2 ml (1:1000 adrenaline)
10 years (30kg) = 0.3 ml (1:1000 adrenaline)
12 years (40kg) = 0.4 ml (1:1000 adrenaline)

In any unconscious patient always check for ‘signs of life’ (breathing and circulation) and start CPR in the absence of signs of life or normal breathing (ignore occasional ‘gasps’).

In less severe cases any wheeze or difficulty breathing can be treated with a salbutamol inhaler as detailed above in the section on Asthma.

All patients treated for an anaphylactic reaction should be sent to hospital by ambulance for further assessment, irrespective of any initial recovery.

Antihistamine drugs and steroids, whilst useful in the treatment of anaphylaxis, are not first line drugs. Once the emergency phase is over, all patients should receive corticosteroids and given antihistamines for any residual itch.
Adult Anaphylaxis

Anaphylaxis suspected?

Stop administration / Remove trigger
Call for help - Position supine
High flow oxygen - Attach monitoring

Cardiac Arrest

Start CPR

IV/IO access
Intravenous adrenaline 1mg every 3-5mins

2L saline rapidly

Consider increased doses/frequency of IV adrenaline if still in cardiac arrest > 5mins

Shock / Bronchospasm

Diagnosis:
Look for acute onset of illness
Life-threatening airway and/or breathing and/or circulation problems
And usually skin changes

Intramuscular adrenaline
0.3-0.5mg

Attempt IV cannulation
Intravenous fluids

If hypotension, bronchospasm or airway swelling persists 5-10mins after first dose of IM adrenaline

Administer second dose of IM adrenaline

1. Life-threatening problems
   Airway (swelling, hoarseness, stridor)
   Breathing (rapid breathing, wheeze, fatigue, cyanosis, SpO2<92%)
   Circulation (pale, clammy, low blood pressure, faintness)

2. Intramuscular adrenaline
   Use 1:1,000 adrenaline / 0.3-0.5mg (0.3-0.5mL). Preferred injection site: upper outer thigh
   Check route and dose before administration (to ensure adrenaline is given IM)

3. Intravenous fluids
   0.9% Sodium Chloride: 1000mL. Rapid infusion then titrate according to requirements

August 2011
Cardiac emergencies

The signs and symptoms of cardiac emergencies include chest pain, shortness of breath, fast and slow heart rates, increased respiratory rate, low blood pressure, poor peripheral perfusion (indicated by prolonged capillary refill time) and altered mental state.

If there is a history of angina the patient will probably carry glyceryl trinitrate spray and they should be allowed to use them.

Where symptoms are mild and resolve rapidly with the patient’s own medication, hospital admission is not normally necessary.

Sudden alterations in the patient’s heart rate (very fast or very slow) may lead to a sudden reduction in cardiac output with loss of consciousness. Medical assistance should be summoned by dialing 111.

Myocardial infarction

The pain of myocardial infarction is similar to that of angina but generally more severe and prolonged.

Symptoms and signs of myocardial infarction
- Progressive onset of severe, crushing pain in the centre and across the front of chest. The pain may radiate to the shoulders and down the arms (more commonly the left), into the neck and jaw or through to the back.
- Skin becomes pale and clammy.
- Nausea and vomiting are common.
- Pulse may be weak and blood pressure may fall.
- Shortness of breath.

Initial management of myocardial infarction

Call 111 immediately for an ambulance. Allow the patient to rest in the position that feels most comfortable; in the presence of breathlessness this is likely to be the sitting position. Patients who faint or feel faint should be laid flat; often an intermediate position (dictated by the patient) will be most appropriate. Reassure the patient as far as possible to relieve further anxiety. Give aspirin in a single dose of 300 mg orally, crushed or chewed. Ambulance staff should be made aware that aspirin has already been given as should the hospital. St John Paramedics or Intensive Care Paramedics will administer thrombolytic therapy before hospital admission. Any treatment (including dental) carried out that might
contraindicate this must be brought to the attention of the ambulance crew.

Oxygen may be administered if the patient has oxygen levels less than 94%, is cyanosed (blue lips) or conscious level deteriorates. If the patient becomes unresponsive always check for ‘signs of life’ (breathing and circulation) and start CPR in the absence of signs of life or normal breathing (ignore occasional ‘gasp’).
Epileptic seizures

Symptoms and signs

- There may be a brief warning or ‘aura’.
- Sudden loss of consciousness, the patient becomes rigid, falls, may give a cry, and becomes cyanosed (tonic phase).
- After a few seconds, there are jerking movements of the limbs; the tongue may be bitten (clonic phase).
- There may be frothing from the mouth and urinary incontinence.
- The seizure typically lasts a few minutes; the patient may then become floppy but remain unconscious.
- After a variable time the patient regains consciousness but may remain confused.
- Fitting may be a presenting sign of Hypoglycaemia and should be considered in all patients, especially known diabetics and children. An early blood glucose measurement is essential in all actively fitting patients (including known epileptics).
- Check for the presence of a very slow heart rate (<40 per minute) which may drop the blood pressure. This is usually caused by a vasovagal episode. The drop in blood pressure may cause transient cerebral hypoxia and give rise to a brief seizure.

Treatment

During a seizure try to ensure that the patient is not at risk from injury but make no attempt to put anything in the mouth or between the teeth (in the mistaken belief that this will protect the tongue). Do not attempt to insert an oropharyngeal airway or other airway adjunct while the patient is actively fitting.

Give oxygen.

Do not attempt to restrain convulsive movements.

After convulsive movements have subsided place the patient in the recovery position and reassess.

If the patient remains unresponsive always check for ‘signs of life’ (breathing and circulation) and start CPR in the absence of signs of life or normal breathing (ignore occasional ‘gasp’).

Check blood glucose level to exclude hypoglycaemia. If blood glucose <3.0 mmol per litre or hypoglycaemia is clinically suspected, give oral/buccal/IV glucose, or glucagon.

After the seizure the patient may be confused (‘post-ictal confusion’) and may need reassurance and sympathy.

The patient should not be sent home until fully recovered and they should be accompanied. It may not always be necessary to seek medical attention or transfer to hospital unless the convulsion was the patient’s first seizure, atypical, prolonged (or repeated), or if injury occurred.
The National Institute for Clinical Excellence (NICE) guidelines suggest the indications for sending to hospital are:

- Status epilepticus.
- High risk of recurrence.
- First episode.
- Difficulty monitoring the individual's condition.

Medication should only be given if seizures are prolonged (convulsive movements lasting 5 minutes or longer) or recur in quick succession. In this situation an ambulance should be summoned urgently. With prolonged or recurrent seizures, ambulance personnel will often administer IM or IV Midazolam which is usually rapidly effective in stopping any seizure.

**Hypoglycaemia**

If food is omitted after having insulin, the blood glucose will fall to a low level (hypoglycaemia). This is usually defined as a blood glucose <3.0 mmol per litre, but some patients may show symptoms at higher blood sugar levels. Patients may recognise the symptoms themselves and will usually respond quickly to glucose. Children may not have such obvious features but may appear lethargic.

**Symptoms and signs**

- Shaking and trembling.
- Sweating.
- Headache.
- Difficulty in concentration / vagueness.
- Slurring of speech.
- Aggression and confusion.
- Fitting / seizures.
- Unconsciousness.

**Treatment**

The following staged treatment protocol is a suggested depending on the status of the patient. If any difficulty is experienced or the patient does not respond, the ambulance service should be summoned immediately; ambulance personnel will also follow this protocol. Confirm the diagnosis by measuring the blood glucose. Early stages - where the patient is co-operative and conscious with an intact gag reflex, give oral glucose (sugar (sucrose), milk with added
sugar, glucose tablets or gel). If necessary this may be repeated in 10-15 minutes.

In more severe cases - where the patient has impaired consciousness, is uncooperative or is unable to swallow safely, give buccal glucose gel, or administer IM glucagon, or administer 100ml of 10% Glucose IV.

- Glucagon should be given via the IM route (1mg in adults and children >5 years old or >20 kg, 0.5mg if <5 years old or <20 kg). Remember it may take 5-10 minutes for glucagon to work and it requires the patient to have adequate glucose stores. Thus, it may be ineffective in anorexic patients, alcoholics or some non-diabetic patients.
- Re-check blood glucose every 10 minutes to ensure that it has risen to a level consistently greater than 3.5 mmol per litre or more, in conjunction with an improvement in the patient’s mental status.
- If any patient becomes unconscious, always check for ‘signs of life’ (breathing and circulation) and start CPR in the absence of signs of life or normal breathing (ignore occasional ‘gasper’).

It is important, especially in patients who have been given glucagon, that once they are alert and able to swallow, they are given a drink containing glucose and if possible some food high in carbohydrate. The patient may go home if fully recovered and they are accompanied by an adult. Their General Practitioner should be informed and they should not drive. If you are unsure, phone 111.
Syncope

Inadequate cerebral perfusion (and oxygenation) results in loss of consciousness. This most commonly occurs with low blood pressure caused by vagal overactivity (a vasovagal attack, simple faint, or syncope). This in turn may follow emotional stress or pain. Some patients are more prone to this and have a history of repeated fainted.

Symptoms and signs

- Patient feels faint / dizzy / light headed.
- Slow pulse rate.
- Low blood pressure.
- Pallor and sweating.
- Nausea and vomiting.
- Loss of consciousness.

Treatment

Lay the patient flat as soon as possible and raise the legs to improve venous return. Loosen any tight clothing, especially around the neck and give oxygen. If any patient becomes unresponsive, always check for ‘signs of life’ (breathing, circulation) and start CPR in the absence of signs of life or normal breathing (ignore occasional ‘gasses’).

Other possible causes

- Postural hypotension can be a consequence of rising abruptly or of standing upright for too long. Several medical conditions predispose patients to hypotension with the risk of syncope. The most common culprits are drugs used in the treatment of high blood pressure, especially the ACE inhibitors and angiotensin antagonists. When rising, patients should take their time. Treatment is the same as for a vasovagal attack.
- Under stressful circumstances, many anxious patients hyperventilate. This may give rise to feelings of light headedness or faintness but does not usually result in syncope. It may result in spasm of muscles around the face and of the hands. In most cases reassurance is all that is necessary.
Stroke

The following information is taken from the NZRC Stroke guideline
Stroke-March-2014.pdf

Stroke (previously known as cerebrovascular accident) is the second most
common cause of death after heart disease.

A stroke occurs when the supply of blood to part of the brain is suddenly
disrupted or when bleeding from a blood vessel within the skull occurs.
Approximately 80% of strokes are caused by an acute blockage of a
blood vessel supplying part of the brain.

Stroke is a medical emergency.

When stroke is caused by an interruption to the blood supply to a part of
the brain, that area of the brain is damaged and may die. The
surrounding brain tissue is also affected and is at risk of dying. However, if
the blockage can be rapidly cleared and blood supply restored, the
amount of damage to brain tissue can be significantly reduced.

Rapid recognition, protection and support of the airway, breathing and
circulation, and rapid access to definitive stroke care can all contribute
to reducing deaths and long term damage from stroke.

Symptoms may seem to improve but should still be considered as a stroke.

FAST is a simple way for remembering the signs of stroke.

**Facial weakness** - can the person smile? Has their mouth or eye drooped?
**Arm weakness** - can the person raise both arms?
**Speech difficulty** - can the person speak clearly and understand what you
say?
**Time to act fast** – seek medical attention immediately – Call for an
ambulance.

Other common symptoms of strokes include:

- weakness, numbness or paralysis of the face, arm or leg on either or
  both sides of the body
- difficulty speaking or understanding
- difficulty swallowing
- dizziness, loss of balance or an unexplained fall
- loss of vision, sudden blurred or decreased vision in one or both eyes
• headache, usually severe and of abrupt onset or unexplained change in the pattern of headaches
• drowsiness
• confusion

Symptoms of stroke may also be caused by other conditions such as epilepsy or diabetes with low blood sugar, however the victim should be treated as suffering a stroke until proven otherwise.

Treatment

• Call an ambulance and stay with the person: call an ambulance for any person who has shown signs of stroke, no matter how brief or if symptoms have resolved.
• If the person is conscious, provide reassurance, and do not give anything to eat or drink.
• Administer oxygen if available and trained to do so.
• If the victim becomes unconscious place them in the recovery position.
• If any patient becomes unresponsive, always check for ‘signs of life’ (breathing, circulation) and start CPR in the absence of signs of life or normal breathing (ignore occasional ‘gasps’).
Is it a Stroke?
Check it out the F.A.S.T way

Face
Smile - is one side drooping?

Arms
Raise both arms - is one side weak?

Speech
Speak - unable to? Words jumbled, slurred?

Time
Act fast and call 111! Time lost may mean brain lost.

CALL 111 IMMEDIATELY IF YOU THINK IT’S A STROKE!
Teamwork and Leadership

The following reading material has been produced largely from the text:


Part 1: Introduction

Why is teamwork important?

Teamwork is an inherent feature of healthcare. Many tasks impose mental and physical demands that are too strenuous for even the most experienced individual to perform in isolation. The relationship between teamwork and performance in high stakes environments has been unequivocally demonstrated. In turn, poor teamwork and communication between members of healthcare teams have emerged as key factors in poor care and for the occurrence of medical errors.

A Team

- Consist of two or more individuals
- Has a common goal or outcome
- Has members who rely on task inter-dependency
- Has member specific roles
- Has members who perform specific tasks
- Makes decisions.
- Often functions under conditions of high workload
- Makes fewer mistakes than individuals
- Possesses specialised knowledge and skills

Teamwork is the co-operative effort by members of a group to achieve a common goal. Teamwork, however, is not an automatic consequence of co-locating people together.

A team of experts does not make an expert team.
Part 2: Getting the most out of a team

What Makes a Successful Team Player?

A successful team player can:

- Listen and participate actively
- Ask the right questions
- Hold an opinion and then change it when necessary
- Assess and value the capabilities of other team members
- Assess their own capabilities and where others have more experience
- Keep to an agreement and identify with a task
- Be self-critical
- Solve conflicts in a constructive way

Shared Mental Models

Good communication in critical situations is aimed at creating a shared mental model. That is “getting everyone on the same page”. Such shared knowledge allows each person to carry out their role in a timely coordinated fashion. The greater the degree of accuracy and overlap among team-member mental models the greater the likelihood that team members will predict, adapt, and coordinate with one another successfully, even under stressful and novel conditions.

Developing a shared mental model is the most important responsibility of a leader. In order to do this they need to establish a clear situational assessment (see below).

Good Communication

Characteristics of good communication in critical situations are:

Communicate Congruently

Congruent communication can be delivered by every speaker matching body language, nonverbal signals and the words spoken. If, for example, somebody asks if you need help, do not say “I’m fine” with a desperate tone indicating helplessness.

Speak unambiguously

Explicitly identify the receiver of information by using eye contact and using the name of the person addressed. Information should be exchanged concisely with as few items as possible. Sentences should not consist of several verbs or objects. Difficulties, negative trends, or unexpected problems should be expressed clearly (e.g. I cannot get a view of his vocal cords).
Close the Communication Loop
Communication should follow the following sequence:
1) The “sender” concisely states information to the “receiver"
2) The receiver is then required to read-back or say in their own words (paraphrase) what they have just heard
3) The sender then acknowledges that the read-back was correct, by giving a hear-back, or if necessary makes a correction
4) The read-back/hear-back process continues until a shared understanding is verified by both
5) The instruction is then carried out and the task execution is announced

“Specific, directed, acknowledged.”

Brief team members
Brief the team in advance on the planned course of action. This is especially true for any critical situation with multiple possible alternatives.

Communicate critical information in a succinct manner e.g. ISOBAR
I – Identify (yourself)
S – Situation (the current situation)
O – Observations (your own or patients physiological)
B – Background (the history leading to the situation)
A – Assessment (your assessment of the situation)
R – Response (the response you require from team members)

Briefings help to focus individual plans and intentions on the “big picture” and to line up mental models, thereby allowing an opening for enquiry, concerns and suggestions.

If a critical situation has a phase with low workload, this time should be used for a situational update and a forecast on possible developments of the situation.

Search actively for information
At the beginning of critical situations initial diagnoses or decisions will commonly be based on incomplete information. In addition, the information available is filtered by the biased search for those pieces of information which fit into and confirm the current mental model of the situation. This is known as confirmation bias. In light of this, it should become a habit to actually search for information which actually contradicts current assumptions. This is best done by continuing to ask questions until you are sure that you have all the information you need.

Sometimes people are reluctant to ask questions because they feel it is a sign of weakness or demonstrates inadequacy. This is especially the case for the inexperienced. Their fear is that the person questioned will start to send
devaluing messages on a relational level. As a result they settle for limited information, keeping quiet for the sake of ongoing harmony. The price for not having asked though, or for not challenging a faulty assumption or erroneous action, may be high. Providers should thus continue to press for the information they need, no matter how awkward they feel.

**Voice concerns and advocate your position**

Most people are not assertive for fear of displeasing others and being disliked. They keep their opinions to themselves, especially if their opinions conflict with those of older and more experienced colleagues; however it is indispensable for effective teamwork that their position or viewpoint be understood by team-mates and that intentions and actions be questioned if necessary.

Barriers to Assertiveness

- Steep authority gradient
- Steep experience gradient
- Rank
- Lack of Confidence
- Fear of Reprisal
- Personal Agenda

The goal of assertiveness is to prompt other team members to carefully reconsider their point of view before making a decision. In a situation of conflict, people want to be convinced by facts, not just the authority of the other, that a plan is appropriate.

Assertiveness is not aggressiveness; instead assertiveness involves communicating one’s feelings, concerns, ideas, and needs to others in a clear and direct manner, but without being demeaning or infringing on the rights of others.

The acronym **PACER** describes graded levels of assertiveness.

- Probe
- Alert
- Challenge
- Emergency
- React

Most people struggle to make the step from alert to challenge however, and instead will make repeated alerting or probing statements in a “hint and hope” fashion.

The following strategy can be considered to overcome this barrier and broach the issue in a constructive way.

**Opening**: Use the other person’s name.

**State your concern** : Make the issue yours (e.g, I am worried…) as opposed to theirs (e.g, Doctor, you are wrong!).

45
**State the problem**: describe the situation but make it clear you are addressing what is wrong not who is wrong.

**Offer a solution(s)**.

**State consequences**: In terms of team goals.

**Obtain feedback**: Get acknowledgement that your concerns have been heard.

It is crucial to avoid getting into personal issues or setting up a power game. Focus on “what’s right”, not “who’s right”. Assertive people state their opinions while still being respectful of others. Aggressive people attack or ignore others’ opinions in favour of their own.

Senior team members can facilitate advocacy in critical situations by actively encouraging team members to share their thoughts and voice concerns during everyday situations e.g “any suggestions?”

**“Authority with participation, assertiveness with respect”**

**Listen actively**

In critical situations mind drift is hazardous. By listening actively, you do not make assumptions about a team-mates’ intentions or expect others to be good at relaying what they really mean; instead, by listening actively, you proactively take up the point until doubtful issues are resolved.

Active listeners use feedback as a means to ensure mutual understanding. The following behaviours and habits indicate an active listener.

- **Be Patient**: Wait until the other person has finished speaking before responding.
- **Ask questions**: Once the other person has finished speaking, seek clarification, details, or explanations.
- **Observe and hold eye contact**
- **Paraphrase and Mirror**: Repeat important details literally; or repeat in your own words what you understood (paraphrase).
- **Be supportive**: show respect and say “thank you”. This will help to create a supportive team climate.

**Address communication issues at the right time**

Negative relationship messages have no place in critical situations; however if they do occur they should be addressed after the event. The time of crisis is a work phase which is completely inappropriate for the clarification of relationship issues.

**Co-ordinating Task Execution**

Co-ordination of actions is necessary because of time pressure, differing technical skills and roles, and parallel task actions by team members. Shared mental models
allow teams to anticipate, without much talking, each other's' resource needs and actions (implicit co-ordination). However, if teams rely too heavily on implicit co-ordination, they may find themselves suddenly overwhelmed. Instead, good team processes are characterized by team members defining the problem much more explicitly, volunteering relevant information, communicating plans and strategies, discussing contingencies, explaining rationales for decisions, and allocating and coordinating task responsibilities within the team (explicit co-ordination).

**Use all available resources**

Utilise all available resources. This may be personnel, equipment or algorithms. Do not be afraid to ask for additional help or resources to ensure that your team can function effectively.

**Active Followership, Cross-monitoring, and Sharing the Workload**

**Active Followership**

For teams to work effectively, not only is leadership essential, but so too is effective follower-ship.

Effective Followers:
- Unload tasks
- Deflect distractions
- Anticipate decisions
- Prepare equipment/logistics
- Mentally double check progress
- Provide emotional support.

**Cross-Monitoring**

Uncertainty, complexity, and dynamism increase the likelihood of errors when managing crises. Thus, monitoring of team-mates thus should be encouraged. Effective team members ask questions and voice concerns if they feel actions or omissions may harm the patient.

Cross monitoring implies a working climate of open communication and a willingness to accept help from others, irrespective of their status or experience.

**Sharing the Workload**

Mutual performance monitoring is not limited to the detection of errors, but includes monitoring the workload status and performance limitations of other team members. High workloads degrade the performance of the individual, and impact negatively on team performance. Critical situations can quickly escalate to a point where one can feel overwhelmed by the
task load and the stress. Monitoring the workload of other team members should therefore be a habit and help should be offered early and readily.

**Being True to Your Own Performance Limitations**

On the other hand, when a team member feels that their personal limit has been reached, they should communicate this to the team e.g. “Hang on a moment, I’m not ready yet, I’ll tell you when.” Don’t hesitate to ask for help.

**Part 3: Leadership**

Leadership tasks in a critical situation include:

**Generate a Comprehensive Mental Model of the Situation**

The most important role of a leader is that of developing and sharing a mental model. In order to do this they need to establish a clear situational assessment.

Situational awareness has three elements:

1) **Information Gathering** (parameters, events, observations etc)
2) **Interpretation** (what the events actually mean)
3) **Projection** (Understanding in which directions the situation could evolve).

Failures of situational awareness may thus result from failure to adequately gain information, incorrect interpretation of that information, or incorrect projection of future events.

In order to keep the image up to date and maintain a high degree of situational awareness, two processes have to be in operation

1) The situational image has to be updated regularly. This has to be done by consciously allocating attention. 
   This is best done by standing back, taking an overview, and where possible trying to avoid taking a task load. Develop a “scan” pattern & integrate data from every possible source.
   - Patient
   - Monitoring devices
   - Therapeutic devices
   - Overall environment
   - Actions of other personnel

2) The perceived elements have to be assessed with respect to their relevance. This demands that you have to be clear about goals.
Thus, situational awareness depends in part on the lay-out and design of the working place, monitors, alarms etc. However another valuable source of situational information are team mates. One of the main tasks in team formation is the creation of a shared situational awareness, a shared mental model of the situation. Developing shared mental models for a problem will create a context within which decisions can be made and the resources of the entire team can be exploited.

**Fixation Errors**

Failures of Situational Awareness may lead to the development of fixation errors. The defining feature of fixation errors is that they persist over time. There are three main types of fixation error:

<table>
<thead>
<tr>
<th>Fixation Error</th>
<th>Defining Features</th>
<th>Antidote</th>
</tr>
</thead>
<tbody>
<tr>
<td>This and only this</td>
<td>The persistent failure to revise a diagnosis or plan, despite plentiful evidence to the contrary</td>
<td>Stand back, take an overview, and search actively for information that contradicts your assumptions.</td>
</tr>
<tr>
<td>Everything's OK</td>
<td>The persistent belief that no problem is occurring in spite of plentiful evidence that it is.</td>
<td>It is up to you to prove it is OK. Scan and search for evidence that it is. Return to algorithm approaches e.g. DRS ABC.</td>
</tr>
<tr>
<td>Everything but this</td>
<td>The persistent failure to commit to the definitive treatment of a major problem</td>
<td>Sometimes difficult to overcome. An extended search for information may need to be curtailed in preference to definitive action.</td>
</tr>
</tbody>
</table>

In time critical situations where there is no room for discussions, it is an important leadership task to define a model the group can share (“our situation is this, the assessment is this, our response needs to be ...”).
Co-ordinate tasks to achieve goals
Priorities should be set according to the demands of the situation. The plan for task execution must be relayed to the team, and individual tasks allocated to team members according to skills and knowledge. It is important to ensure that the person allocated the task is capable of completing it.

Centralize communication and flow of information
Relevant information should be communicated to the leader. This ensures that all relevant information can be integrated into the situational assessment.

Establish a Structure
Stabilize Emotions
Represent the Team
As the flow of information converges on the leader, she/he represents the team to external groups. Team members thus have a right to also expect from their representative behavioural patterns such as integrity, and adherence to appropriate moral standards, reflective of the entire group.

Part 4: How Team-work goes Wrong
If basic principles of a successful team processes are neglected, team dynamics may develop which lead to a performance of the whole team that is below that which could have been expected from the sum of its parts.

Communication Deficits
Unspecified Receiver
In critical situations every message should be addressed to a specific person. Commands should never be made to the ‘atmosphere’. If none of the team members can tell to whom an instruction was addressed, then no-one will take responsibility. Poor communication with an unspecified receiver can be seen in phrases such as “can somebody...”, “does anyone...”

The four most useless people in a crisis:

- Somebody
- Anybody
- Someone
- Anyone
Problems with Speech: Articulation and Terms
Mumbling, talking in a low voice, too hastily, in unfinished sentences, or with faulty grammar can lead to confusion and misunderstanding. Ambiguous, colloquial, or non-technical terminology can create an “insider language” leading to misunderstanding.

Information Overload
There is an ever present danger in critical situations for a sender to overload a message with information. The receiver then has to separate the important from the unimportant, and often their decision may not reflect the sender’s intentions. The following signs may indicate an information overload.

- Rapid sequence of unrelated instructions for actions
- Minimal pause between sentences (<2 sec)
- Two or more objects and verbs within sentences
- Long lists with numbers or dosage instructions
- Aggressive and pressing tone
- Long and detailed instructions
- Several questions within one question

Becoming Tight-Lipped
If team leaders become tight lipped, the entire team can lose its shared mental model. Typical indicators are:

- Abandonment of explanations
- No reply to questions of team members
- No active communication of background information
- Closed questions
- Answers in monosyllables
- Long periods of silence

Resolving Conflicts through Passivity or Aggression
Passivity: Passive responses send a diluted expression of the sender’s true intentions. Critiques are sugar coated and statements beat around the bush.

Aggressiveness: Aggressive statements are unambiguous. Unfortunately, they generally take the form of accusations, or disrespectful, even rude remarks. It is difficult then for team members to accept or consider input in this form, even when true.

Assertiveness: Assertiveness (discussed above) represents the appropriate middle ground between these two extremes of conflict resolution.

Poor Listening
Indicators of poor listening include:

Interrupting: The interrupting person usually has a higher regard to their own opinion than to what the other person is saying.
Diverting: Changing the direction of the conversation by picking up irrelevant issues. Since the listener has not perceived the core problem, they pay undue attention to surface details.

Debating: There is a fine line between challenging and debating. When challenging, the intent is to gain clarification, insight or more information. The debater, on the other hand, is more interested in winning an argument than in hearing the other person’s position.

Quarrelling: Quarrelling occurs when the conflict moves from the content level to the relationship level. Solving the problem is abandoned in preference for offending the other party.

Becoming Reactant: Because one feels pressured to accept another’s view, they reject both; the person, and their opinion.

Tuning Out: Implies the person does not think the individual is worth listening to.

Mingling Relationship and Content Components

Sometimes team members allow content and relationship components of a message to mingle. Reasons include:

- Antipathy between team members
- A working climate of disrespect
- Enforcement of personal preferences and habits
- Inability to tolerate error
- Power struggle for social status

Subtle relationship messages can emerge within a discourse which on the surface is concerned with facts and goals. Typical examples include:

- **Flying solo**: If someone acts without involving team members in the decision their signal may be interpreted as: “I consider your contribution unimportant.”
- **Enforcing decisions through loudness**: the loudest argument wins approach from leaders implies: “I don’t respect you, the only thing that matters is me and my opinion.”
- **Appeal with a subtle dispraise** e.g. “John, do something useful for once and find a laryngoscope.”
- **Open Insult**

Clarifying Relationships at the Wrong Time

Negative relationship messages have no place in critical situations; however if they do occur they should be settled after the event. The time of crisis is a work phase which is absolutely inappropriate for the clarification of relationship issues.

Unclear specification of responsibility

If teams fail to agree on responsibilities in critical situations, ownership of responsibilities will be lost. The easiest tasks will be attended to by several team members, although one person would have been enough, while
other tasks will remain undone because everybody expects some-one else to address them. Time limits for critical tasks will be exceeded because no team member was aware of being responsible for their execution. If several healthcare providers are in charge of an emergency without having appointed a leader, then the tendency for risky decisions will increase because nobody will be accountable for the action. This is called risk shift.

Shared misconceptions
Teams can easily tend to follow a majority vote in their decision making instead of rational arguments. They may succumb to the illusion of unanimity meaning invulnerability. “If every member agrees it cannot be wrong.”. Because all team members are in agreement they see no further need to discuss other options; thus the search for solutions is abandoned early. Expert opinion from outside the team is not requested and the team suspends its rational judgement. This is known as group-think.

Peer Pressure
If group cohesiveness is very important to the team, discussions are easily seen as a threat. Once a majority of team members have formed an opinion they will maintain it even when presented with contradicting information. Criticism by dissenting members is suppressed, and disagreements are seen as disruption. Team members are voted down instead of convinced. Only items of information that confirm a pre-existing biased opinion are used in decision making.

Failures of Leadership

“Without” a leader
An indecisive leader will cause a loss of co-ordination, failure to execute necessary tasks, and time delay.

Misled into action
The main task of leadership in a crisis is to generate a comprehensive mental model, to set priorities and goals, and to co-ordinate the actions of all team members. Unfortunately leaders are not immune to a stress-related urge to “do something now”. Once leaders have been misled into assuming tasks themselves however, the danger is great that they will lose situational awareness. If it should become necessary that the leader, as the clinically most skilled individual, must perform a task, this should only be a temporary exception followed immediately by a “strategic” phase again.

Tasks Executed? Failure to Monitor
If leaders fail to close the loop, consecutive decisions will be based on assumptions, not on reality.

Strain: Leadership and Emotional Pressure
The leader is often confronted with an overwhelming number of challenging parallel task demands. If they are not able to cope with the
strain of these demands, they may well fall into the trap of the cognitive emergency reaction - **cognition and behaviour will no longer be directed at leading the team, but instead at regaining the feeling of competence.** Alternatively they may fly solo, and as such team-members can no longer share the leader’s mental model of the situation; they have no idea what the leader thinks, plans, or expects for support.

**Change in Leadership – Change in Function**

Healthcare providers in an acute medical care setting are sometimes forced to switch functions (e.g. when a senior doctor takes over from a more junior one). It is not uncommon however that team members **continue to assume the leadership role despite being assigned to a task subject to direction.**

**“I’m in the Driver’s Seat!” – Leadership and Power**

An autocratic leadership style can cause problems with teamwork. If the function of a team is continually derided to receiving orders, this **can lead to hidden resistance, and wayward behaviour.** This in turn can lead to a complete breakdown of teamwork.

**Conflicts among co-equals**

When several leaders with a comparable position in hierarchy meet in an emergency the leadership position can become a matter of dispute. The respective ‘leaders’ should **agree on an appropriate leadership model.**

**Handing over responsibility: The revolving door effect.**

This occurs when leaders assume responsibility too abruptly thereby displacing team members with situational knowledge. As a consequence, information that could be shared is lost and negative consequences may ensue.

The advantage the new leader had with an unbiased approach to the situation is undone by the fact that team members stop participating in problem-solving as they are lead to believe their input is unwanted.

**Immunity from Criticism**

Leaders make mistakes. The interaction between team members and their leader should be characterised by a sound balance of respect and assertive behaviour.
Hazardous Attitudes
One of the patterns that repeatedly can be found when accidents are analysed is the coupling of a potentially dangerous initial situation with an inadequate attitude towards safety and risk.

Attitudes are a blend of situation assessment (cognition), emotional response (emotion), and an impulse for action (motivation). Attitudes are not spontaneous, but fit to our motives.

Five typical hazardous attitudes can be distinguished which account for response patterns not guided by patient safety.

<table>
<thead>
<tr>
<th>Attitude</th>
<th>Thoughts in emergent situation</th>
<th>Antidote</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macho</td>
<td>Courageous actions are supposed to strengthen ones' own feelings of competence (especially if other team members watch).</td>
<td>I can do it I'll show you! Showing off is foolish</td>
</tr>
<tr>
<td>Anti-authority</td>
<td>The person wants to defy regulations as they cannot stand the feeling of being controlled by others.</td>
<td>Don't tell me what I'm supposed to do! Stick to the rules, they are meant for everybody</td>
</tr>
<tr>
<td>Impulsivity</td>
<td>Is grounded in the inability to generate several options before taking action. To impulsive persons, “just do something, quick&quot; seems superior to moments of inactivity and reflection.</td>
<td>I have to act now – there’s no time. Not so fast – think first</td>
</tr>
<tr>
<td>Invulnerability</td>
<td>If somebody has never experienced an accident they may regard themselves as invulnerable. This in turn leads to a tendency for risky decisions.</td>
<td>Nothing will ever happen to me. It can happen to me</td>
</tr>
<tr>
<td>Resignation</td>
<td>This person gives up quickly when faced with difficulty. The feeling of competence is so low that no action is taken. Help is expected from others only.</td>
<td>What’s the use of even trying? I can always make a difference so I’m not helpless.</td>
</tr>
</tbody>
</table>
Trauma Management

The initial assessment and management of seriously injured patients is a challenging task and requires a rapid and systematic approach.

The aim of good trauma care is to prevent early trauma mortality. Early trauma deaths occur because of failure of oxygenation of vital organs or central nervous system injury, or both.

Injuries causing this mortality occur in predictable patterns and recognition of these patterns led to the development of advanced trauma life support (ATLS) by the American College of Surgeons. A standardised protocol for trauma patient evaluation has been developed.

Aims of the initial evaluation of trauma patients

• Stabilise the patient
• Identify life-threatening conditions in order of risk and initiate supportive treatment
• Organise definitive treatments or organise transfer for definitive treatments

Preparation and co-ordination of care

Assessment and management will begin out of hospital at the scene of injury and good communication with the receiving hospital is important. The preparatory measures are outlined below to ‘set the scene’:

Theprehospitalphase

• Co-ordination and communication with the receiving hospital so that the trauma team can be alerted and mobilised.
• Airway maintenance.
• Control of external bleeding shock.
• Keeping the patient immobilised.
• Information gathering: time of injury; related events; patient history. Key elements are the mechanism of injury to alert the trauma team to the degree and type of injury.

• Keeping time at the scene to a minimum.

The hospital phase

• Preparation of a resuscitation area.
• Airway equipment - laryngoscopes, etc. (accessible, tested).
• Intravenous (IV) fluids (warming equipment, etc.).
• Immediately available monitoring equipment.
• Methods of summoning extra medical help.
• Prompt laboratory and radiology backup.
• Transfer arrangements with trauma centre.

Initial assessment

This comprises:

• Resuscitation and primary survey.
• Secondary survey.
• Definitive treatment or transfer for definitive care.

Resuscitation and primary survey

For speed and efficacy a logical sequence of assessment to establish treatment priorities must be gone through sequentially although, with good teamwork, some things will be done simultaneously (resuscitation procedures will begin simultaneously with the assessment involved in the primary survey, i.e. lifesaving measures are initiated when the problem is identified). Special account should be taken of children, pregnant women and the elderly as their response to injury is modified. The primary survey is:
A = Airway maintenance with cervical spine protection:

- Are there signs of airway obstruction, foreign bodies, facial, mandibular or laryngeal fractures? Management may involve secretion control or intubation.

- Establish a clear airway (chin lift or jaw thrust) but protect the cervical spine at all times. If the patient can talk, the airway is likely to be safe; however, remain vigilant and recheck. A nasopharyngeal airway should be used in a conscious patient; or, as a temporary measure, an oropharyngeal airway in an unconscious patient with no gag reflex. Definitive airway should be established if the patient is unable to maintain integrity of airway; mandatory if Glasgow Coma Scale (GCS) less than 8.

- Cervical spine protection is critical throughout the airway management process. Movement of the cervical spine could cause spinal injury so movement of the cervical spine should be avoided unless absolutely necessary for maintaining an airway. The trauma mechanism or history may suggest the likelihood of a cervical spine injury, but always assume there is a spinal injury until proven otherwise, especially in any multisystem trauma or if there is an altered level of consciousness. Inline immobilisation and protection of the spine should be maintained and X-rays can be taken once immediately life-threatening conditions have been dealt with.

B = Breathing and ventilation:

- Provide high flow oxygen through rebreather mask if not intubated and ventilated. Evaluate breathing: lungs, chest wall, and diaphragm. Chest examination with adequate exposure: watch chest movement, auscultate, and percuss to detect lesions acutely impairing ventilation:
  - Tension pneumothorax - requires needle thoracostomy followed by drainage.
  - Flail chest - management involves ventilation.
  - Haemothorax - will usually require intercostal drain insertion.
  - Pneumothorax - may require intercostal drain insertion.
Note: it can be difficult to tell whether the problem is an airway or ventilation problem. What appears to be an airway problem, leading to intubation and ventilation, may turn out to be a pneumothorax or tension pneumothorax which will be exacerbated by intubation and ventilation.

C = Circulation with haemorrhage control:

Blood loss is the main preventable cause of death after trauma. To assess the amount of blood loss rapidly observe:

- Level of consciousness.
- Skin colour.
- Pulse.

- Bleeding should be assessed and controlled:
- IV access should be achieved with 2 large cannula (size and length of cannula is determinant of flow not vein size) in an upper limb.
- IV fluids will need to be given rapidly usually as 500 ml to 1 L boluses (10-20 ml/kg in children). 0.9% Normal Saline is the preferred initial crystalloid solution.
- Direct manual pressure should be used to stem visible bleeding.
- Occult bleeding into the abdominal cavity and around long-bone or pelvic fractures is problematic but should be suspected in a patient not responding to fluid resuscitation.
- Splinting may be necessary to slow down bleeding.
- The five main places that trauma victims bleed from can be remembered by using the acronym PLACE.
  - Pelvis
  - Long Bones
  - Abdomen
  - Chest
  - Extremities
Note: response to blood loss differs in:

- Elderly - limited ability to increase heart rate; poor correlation between blood loss and blood pressure.
- Children - tolerate proportionately large volume loss but then rapidly deteriorate.
- Athletes - do not show the same heart rate response to blood loss.
- Chronic conditions and medication may affect response and early on in trauma management will not be known about.

D = Disability: neurological status:

After A, B and C above, rapid neurological assessment is made to establish:

- Level of consciousness, using AVPU.
- Pupils: size, symmetry and reaction.
- Any lateralising signs.
- Level of any spinal cord injury (limb movements, spontaneous respiratory effort).

- Oxygenation, ventilation, perfusion, drugs, alcohol and hypoglycaemia may all also affect the level of consciousness.

Patients should be re-evaluated frequently at regular intervals as deterioration can occur rapidly and often patients can be lucid following a significant head injury before worsening. Signs such as pupil asymmetry or dilation, impaired or absent light reflexes, hemiplegia/weakness all suggest an expanding intracranial mass or diffuse oedema.

E = Exposure/ environmental control: undress the patient, but prevent hypothermia. Clothes may need to be cut off but, after examination, attention to prevention of heat loss should be considered. Also check blood glucose levels.
Additional considerations to primary survey and resuscitation

ECG monitoring: this can guide resuscitation by diagnosing dysrhythmias, ischemia, cardiac injury, pulseless electrical activity (PEA) - which may indicate cardiac tamponade - hypovolaemia, tension pneumothorax, and extreme hypovolaemia. Hypoxia or hypoperfusion should be suspected if there is bradycardia, aberrant conduction, and premature beats. Hypothermia produces dysrhythmias.

Urinary/gastric catheters:

• Output of urine can guide fluid replacement (reflects renal perfusion). Adequate output is 0.5-1 ml/kg/hour. Note: prior to catheter insertion urethral injury should be excluded - suspect if there is blood at meatus, pelvic fracture, scrotal blood, perineal bruising. Per rectum (PR) and genital examination are mandatory prior to catheter insertion.

• Gastric catheters are inserted to reduce aspiration risk. Suction should be applied. Note: care should be taken not to provoke aspiration by triggering gagging.

Other monitoring: monitoring of resuscitation by measuring various important parameters measures adequacy of resuscitation efforts. Values for various parameters should be obtained soon after the primary survey and reviewed regularly. Important parameters are:

• Pulse rate, blood pressure, ventilatory rate, body temperature and urinary output.

• Carbon dioxide detectors may identify dislodged endotracheal tubes.

• Pulse oximetry measures oxygenation of haemoglobin colorimetrically (sensor on finger, ear lobe, etc.).

Remember: blood pressure is a poor measure of perfusion.

Secondary survey

This begins after the ‘ABCDE’ of the primary survey, once resuscitation is underway and the patient is responding with normalisation of vital signs. The secondary survey is essentially a head-to-toe examination with completion of the history and reassessment of progress, vital signs, etc. It comprises:
• History:
  • A = Allergies
  • M = Medication currently used
  • P = Past illnesses/Pregnancy
  • L = Last meal
  • E = Events/Environment related to injury

• Physical examination: this will repeat some examinations already undertaken in the primary survey and will be further informed by the progress of the resuscitation. It aims to identify serious injuries, occult bleeding, etc. A review of neurological status including GCS score is also undertaken. Back and spinal injuries are commonly missed and pelvic fractures cause large blood loss which is often underestimated.

Beware: burns (fluid requirements, inhalation injury); cold injury (continue resuscitation until rewarmed); high voltage electricity injuries (extensive muscle injury likely to be concealed).
Paediatrics

Infants and children are not small adults. They are different anatomically and physiologically, this then means you'll need to have a different approach for dealing with them.

Special Considerations

An ill or injured child will be frightened. This will be caused by the injury/illness and the feeling and discomfort associated with it. You too, even as a Health Professional, will frighten that child due to being a stranger.

The sick or injured child will only be able to communicate with you up to their understanding of vocabulary. This throws in some challenges from the word 'GO'. You may not be able to get any conversation due to a young child unable to speak or a child that is howling in pain, this also adds anxiety and confusion to the child.

Parents and relations might be acting in a manner which may be driven by a feeling of helplessness. These parents or relations may also become frustrated and almost 'aggressive' towards you by what may seem a relaxed manner by you while dealing with their child. A parent wants you to take control straight away and to be seen doing something constructive with their child. It may seem like a big task.

Guidelines for Dealing with a Sick Child

Very little time is spent learning and dealing with paediatrics so even experienced staff can become less confident when dealing with a child.

Following these guidelines will make you job of dealing with a sick child a little easier.

- Stay calm
- Come down to the child's level
- Who are you? Explain to the child who you are (Name) and that you are their to help
- Ask mum or dad to hold child.
- Has the child got a favourite toy you could give them?
- Be patient and gentle. Take your time if no life threatening injuries are present
- If possible keep the patient with the parent/carer
- If you have to carry out any procedures explain them to the child and parents
- **Do Not Lie** - If something will hurt tell the child it will hurt or their trust in you will be lost
• Remember to constantly reassess the ill or injured child

**Paediatric Assessment Triangle (PAT)**

The paediatric assessment triangle is a good tool to assist you in the early recognition of the ill child. The triangle is split into three sections. These are:

- Appearance
- Work of Breathing
- Circulation to skin

**PAT benefits**

Allows the development of a general impression of the child from across the room, and assists in determining the level of severity, urgency for life support, and the key physiologic problems.

PAT can be completed in 30 to 60 seconds; the three components can be assessed in any order.

**Components of the PAT**

**Appearance**

Reflects the adequacy of ventilation, oxygenation, brain perfusion, body homeostasis, and central nervous system function.

Assess from across the room; allow child to remain on the parents/caregivers lap.

Use bright lights or toys to assess alertness.

Have parent assist with assessment if appropriate.
The mnemonic ‘TICLS’ is used to remember the key characteristics of appearance

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Features to look for:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tone</strong></td>
<td>Extremities should move spontaneously, with good muscle tone; should not be flaccid or move only to stimuli</td>
</tr>
<tr>
<td><strong>Interaction</strong></td>
<td>Should respond to environmental stimuli or presence of a stranger; should not be listless or lethargic</td>
</tr>
<tr>
<td><strong>Consolable</strong></td>
<td>Easily comforted or calmed by caretaker (i.e., speaking softly, holding child, or offering a pacifier)</td>
</tr>
<tr>
<td><strong>Look/Gaze</strong></td>
<td>Should maintain eye contact with objects or people; should not have a “nobody home” or glassy-eyed stare</td>
</tr>
<tr>
<td><strong>Speech/Cry</strong></td>
<td>Should be present, strong and spontaneous; should not be weak, muffled, or hoarse</td>
</tr>
</tbody>
</table>

**GOLDEN RULE:** The child’s general appearance is the most important thing to consider when determining how severe the illness or injury is, the need for treatment, and the response to therapy.

**Work of Breathing**

Is a more accurate, quick indicator of oxygenation and ventilation than respiratory rate or chest sounds on auscultation.

Reflects the child’s attempt to make up for difficulties in oxygenation and ventilation.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Features to look for:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abnormal airway sounds</td>
<td>Gasping, hoarse speech, stridor, grunting, wheezing</td>
</tr>
<tr>
<td>Abnormal positioning</td>
<td>Sniffing position, tripodding, refusing to lie down</td>
</tr>
<tr>
<td>Retractions</td>
<td>Supraclavicular, intercostal, or substernal retractions of the chest wall head bobbing in infants</td>
</tr>
<tr>
<td>Flaring</td>
<td>Nasal flaring - Seen in infants with respiratory distress</td>
</tr>
<tr>
<td>Respiratory Rate</td>
<td>Outside of normal range for age group (see below)</td>
</tr>
</tbody>
</table>
Normal Respiratory Rates

<table>
<thead>
<tr>
<th>Age</th>
<th>Respiratory Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1 Year</td>
<td>30 - 40 bpm</td>
</tr>
<tr>
<td>1 - 2 Years</td>
<td>25 - 35 bpm</td>
</tr>
<tr>
<td>2 - 5 Years</td>
<td>25 - 30 bpm</td>
</tr>
<tr>
<td>5 - 12 Years</td>
<td>20 - 25 bpm</td>
</tr>
<tr>
<td>&gt; 12 Years</td>
<td>15 - 20 bpm</td>
</tr>
</tbody>
</table>

Circulation to Skin

Reflects the adequacy of cardiac output and core perfusion, or perfusion of vital organs.

Cold room temperatures may cause false skin signs, i.e., the cold child may have normal core perfusion but abnormal circulation to the skin.

Inspect the skin (i.e., face, chest, abdomen) and mucous membranes (lips, mouth) for colour in central areas.

Capillary Refill - Applying gentle pressure to the forehead or sternum for 5 seconds and then release and see the time taken for capillary refill. If the time is >3 seconds then this indicates poor perfusion. Although this can be influenced by factors such as the cold.

In dark skinned children, the lips and mucous membranes are the best places to assess circulation.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Features to look for:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pallor</td>
<td>White or pale skin or mucous membrane coloration</td>
</tr>
<tr>
<td>Mottling</td>
<td>Patchy skin discoloration due to vasoconstriction</td>
</tr>
<tr>
<td>Cyanosis</td>
<td>Bluish discoloration of skin and mucous membranes</td>
</tr>
</tbody>
</table>

Normal Heart Rates

<table>
<thead>
<tr>
<th>Age</th>
<th>Heart Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1 Year</td>
<td>110 - 160 bpm</td>
</tr>
<tr>
<td>1 - 2 Years</td>
<td>100 - 150 bpm</td>
</tr>
<tr>
<td>2 - 5 Years</td>
<td>95 - 140 bpm</td>
</tr>
<tr>
<td>5 - 12 Years</td>
<td>80 - 120 bpm</td>
</tr>
<tr>
<td>&gt; 12 Years</td>
<td>60 - 100 bpm</td>
</tr>
</tbody>
</table>
Apgar Score

The Apgar score was devised in 1952 by Virginia Apgar as a simple and repeatable method to quickly and summarily assess the health of newborn children immediately after childbirth. The Apgar score is determined by evaluating the newborn baby on five simple criteria on a scale from zero to two and summing up the five values thus obtained. The resulting Apgar score ranges from zero to 10.

The five criteria of the Apgar score:

<table>
<thead>
<tr>
<th></th>
<th>Score 0</th>
<th>Score 1</th>
<th>Score 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart rate</td>
<td>absent</td>
<td>&lt;100</td>
<td>&gt;100</td>
</tr>
<tr>
<td>Respiration</td>
<td>absent</td>
<td>weak or irregular</td>
<td>strong</td>
</tr>
<tr>
<td>Muscle tone</td>
<td>none</td>
<td>some flexion</td>
<td>active movement</td>
</tr>
<tr>
<td>Reflex irritability</td>
<td>no response to stimulation</td>
<td>grimace/feeble cry when stimulated</td>
<td>sneeze/cough/pulls away when stimulated</td>
</tr>
<tr>
<td>Skin colour</td>
<td>blue all over</td>
<td>blue at extremities</td>
<td>normal</td>
</tr>
</tbody>
</table>

The test is generally done at 1 and 5 minutes after birth, and may be repeated later if the score is, and remains, low. Scores below 3 are generally regarded as critically low, with 4 – 7 fairly low and over 7 generally normal.

WETFLAG

W  Weight 1-12months (0.5 x age in months) + 4 1-5yrs (2 x age in yrs) + 8 6-12yrs (3 x age in yrs) + 7

E  Electricity 4 Joules / Kg/ biphasic

T  Tube ETT Internal Diameter (age/4 + 4) = --- mm Length Oropharangeal Tube (age /2 +12) = -- cm Nasopharyngeal tube (age /2+ 15) = --- cm

F  Fluids Medical / cardiac arrest – 20 ml/ kg Trauma cases initial Bolus 10 ml/ kg, then 2nd 10 ml /kg

L  Lorazepam 0.1 mg / Kg IV/ IO

A  Adrenaline 0.1 ml/kg of 1:10, 000 = 10mcg/kg

G  Glucose 2ml / kg of 10% dextrose
Appendices

Appendix 1 – ECG Rhythm Study Guide (p. 69-76)
Appendix 2 – Suggested pre reading for CORE Level 5 (p. 77-80)
Appendix 3 – Suggested pre reading for CORE Level 6 (p. 81-85)
Appendix 4 – Suggested pre reading for CORE Level 7 (p. 86-87)
Appendix 5 – Medical Emergency Management (p. 88)
Appendix 1 – ECG Rhythm Study Guide

**Normal Sinus Rhythm – Non shockable**

Looking at the ECG you'll see that:

- Rhythm - Regular
- Rate - 60 to 100 bpm
- QRS Duration - Normal
- P Wave - Visible before each QRS complex
- P-R Interval - Normal (<5 small Squares. Anything above and this would be 1st degree block)
- Indicates that the electrical signal is generated by the sinus node and travelling in a normal fashion in the heart.

**Sinus Bradycardia – Non shockable**

A heart rate less than 60 beats per minute (BPM). This in a healthy athletic person may be 'normal', but other causes may be due to increased vagal tone from, hypoglycaemia and brain injury with increased intracranial pressure (ICP) as examples.

Looking at the ECG you'll see that:

- Rhythm - Regular
- Rate - less than 60 beats per minute
- QRS Duration - Normal
- P Wave - Visible before each QRS complex
- P-R Interval - Normal
- Usually benign and often caused by patients on beta blockers
Premature Atrial Complex (PAC) – Non shockable

A premature beat arising from an ectopic focus within the atria. These arise from ectopic pacemaking tissue within the atria. There is an abnormal P wave, usually followed by a normal QRS complex. PACs are a normal electrophysiological phenomenon not usually requiring investigation or treatment.

Looking at the ECG you’ll see that:

- Rhythm - Irregular
- Rate - 60 to 100bpm
- QRS Duration - Normal
- P Wave - Visible before each QRS complex. Ectopic P Wave is often abnormal looking
- P-R Interval - Normal
- Seen with anxiety, sympathomimetics, beta-agonists, excess caffeine, hypokalaemia, hypomagnesaemia, digoxin toxicity, myocardial ischaemia

Asystole – Non shockable

Looking at the ECG you’ll see that:

- Rhythm - Flat
- Rate - 0 Beats per minute
- QRS Duration - None
- P Wave - None
- Carry out CPR!!
Premature Ventricular Complexes – Non shockable

Due to a part of the heart depolarizing earlier than it should

Looking at the ECG you’ll see that:

- Rhythm - Regular
- Rate - Normal
- QRS Duration - Normal
- P Wave - Ratio 1:1
- P Wave rate - Normal and same as QRS rate
- P-R Interval - Normal
- Also you'll see 2 odd waveforms, these are the ventricles depolarizing prematurely in response to a signal within the ventricles. (Above - unifocal PVC's as they look alike if they differed in appearance they would be called multifocal PVC's, as below)
Supraventricular Tachycardia (SVT) – Non shockable

A narrow complex tachycardia or atrial tachycardia which originates in the 'atria' but is not under direct control from the SA node. SVT can occur in all age groups

Looking at the ECG you'll see that:

- Rhythm - Regular
- Rate - 140-220 beats per minute
- QRS Duration - Usually normal
- P Wave - Often buried in preceding T wave
- P-R Interval - Depends on site of supraventricular pacemaker
- Impulses stimulating the heart are not being generated by the sinus node, but instead are coming from a collection of tissue around and involving the atrioventricular (AV) node

Atrial Fibrillation – Non shockable

Many sites within the atria are generating their own electrical impulses, leading to irregular conduction of impulses to the ventricles that generate the heartbeat. This irregular rhythm can be felt when palpating a pulse

Looking at the ECG you'll see that:

- Rhythm - Irregularly irregular
- Rate - usually 100-160 beats per minute but slower if on medication
- QRS Duration - Usually normal
- P Wave - Not distinguishable as the atria are firing off all over
- P-R Interval - Not measurable

The atria fire electrical impulses in an irregular fashion causing irregular heart rhythm
Atrial Flutter – Non shockable

Looking at the ECG you’ll see that:

- Rhythm - Regular
- Rate - Around 110 beats per minute
- QRS Duration - Usually normal
- P Wave - Replaced with multiple F (flutter) waves, usually at a ratio of 2:1 (2F - 1QRS) but sometimes 3:1
- P Wave rate - 300 beats per minute
- P-R Interval - Not measurable
- As with SVT the abnormal tissue generating the rapid heart rate is also in the atria, however, the atrioventricular node is not involved in this case

1st Degree Heart Block – Non shockable

1st Degree AV block is caused by a conduction delay through the AV node but all electrical signals reach the ventricles. This rarely causes any problems by itself and often trained athletes can be seen to have it. The normal P-R interval is between 0.12s to 0.20s in length, or 3-5 small squares on the ECG.

Looking at the ECG you’ll see that:

- Rhythm - Regular
- Rate - Normal
- QRS Duration - Normal
- P Wave - Ratio 1:1
- P Wave rate - Normal
- P-R Interval - Prolonged (>5 small squares)
2nd Degree Heart Block Type 1 (Mobitz 1) – Non shockable

Another condition where there is a conduction block of some, but not all atrial beats getting through to the ventricles. There is progressive lengthening of the PR interval and then failure of conduction of an atrial beat; this is seen by a dropped QRS complex.

Looking at the ECG you’ll see that:

- Rhythm - Regularly irregular
- Rate - Normal or Slow
- QRS Duration - Normal
- P Wave - Ratio 1:1 for 2, 3 or 4 cycles then 1:0.
- P Wave rate - Normal but faster than QRS rate
- P-R Interval - Progressive lengthening of P-R interval until a QRS complex is dropped

2nd Degree Heart Block Type 2 (Mobitz 2) – Non shockable

When electrical excitation sometimes fails to pass through the A-V node or bundle of His, this intermittent occurrence is said to be called second degree heart block. Electrical conduction usually has a constant P-R interval, in the case of type 2 block atrial contractions are not regularly followed by ventricular contraction.

Looking at the ECG you’ll see that:

- Rhythm - Regular
- Rate - Normal or Slow
- QRS Duration - Prolonged
- P Wave - Ratio 2:1, 3:1
- P Wave rate - Normal but faster than QRS rate
- P-R Interval - Normal or prolonged but constant
Junctional Rhythms – Non shockable

Looking at the ECG you’ll see that:

- Rhythm - Regular
- Rate - 40-60 Beats per minute
- QRS Duration - Normal
- P Wave - Ratio 1:1 if visible. Inverted in lead II
- P Wave rate - Same as QRS rate
- P-R Interval - Variable

3rd Degree Heart Block (Complete Heart Block) – Non shockable

3rd degree block or complete heart block occurs when atrial contractions are 'normal' but no electrical conduction is conveyed to the ventricles. The ventricles then generate their own signal through an 'escape mechanism' from a focus somewhere within the ventricle. The ventricular escape beats are usually 'slow'

Looking at the ECG you’ll see that:

- Rhythm - Regular
- Rate - Slow
- QRS Duration - Prolonged
- P Wave - Unrelated
- P Wave rate - Normal but faster than QRS rate
- P-R Interval - Variation
- Complete AV block. No atrial impulses pass through the atrioventricular node and the ventricles generate their own rhythm
Ventricular Tachycardia (VT) – Shockable

Looking at the ECG you'll see that:

- Rhythm - Regular
- Rate - 180-190 Beats per minute
- QRS Duration - Prolonged
- P Wave - Not seen
- Results from abnormal tissues in the ventricles generating a rapid and irregular heart rhythm. Poor cardiac output is usually associated with this rhythm thus causing the pt to go into cardiac arrest. Shock this rhythm if the patient is unconscious and without a pulse

Ventricular Fibrillation (VF) – Shockable

Disorganized electrical signals cause the ventricles to quiver instead of contract in a rhythmic fashion. A patient will be unconscious as blood is not pumped to the brain. Immediate treatment by defibrillation is indicated. This condition may occur during or after a myocardial infarct.

Looking at the ECG you'll see that:

- Rhythm - Irregular
- Rate - 300+, disorganized
- QRS Duration - Not recognizable
- P Wave - Not seen
- This patient needs to be defibrillated!! QUICKLY
Appendix 2

Suggested pre reading for L5 Paper
Algorithms.

- Be able to, from memory, write out the DRSABCD algorithm.
- Be able to, from memory, write out the advanced cardiac life support algorithm for adults.
- Know the chain of survival and when it is utilised.
- Understand when to go for help (if alone) in adult and child collapse and how these differ.
- Be able to explain the management of choking in adults, children and infants.

Chest Compressions and Ventilation.

- Know the correct anatomical location for chest compressions in adults, children and infants.
- Be familiar with the correct position of the rescuer's hands, arms and shoulders to provide adequate chest compressions.
- Know the correct ratios of chest compressions to breaths for adult and paediatrics.
- Know how mouth to mouth differs for adults, children and infants.
- Be familiar with what constitutes an adequate ventilation and what may constitute under and over ventilation and how this may also relate to gastric distension.
- Understand the use of a bag-valve mask device and the benefits of a two user versus single user approach.
• Explain why chest compressions should not be stopped for the insertion of advanced airways.

• Comprehend the pros and cons of mouth to mouth ventilation

• Understand how oro-pharyngeal, laryngeal and endotracheal airways differ and how they assist with airway maintenance.

**Primary and Secondary Surveys**

• Be familiar with what is required for a primary and secondary survey and how they differ from each other

**Medications**

• Understand the difference between a 1:1000 solution and a 1:10000 solution

• Know the dose of adrenaline and amiodarone for adults and paediatrics (mcg/kg for adrenaline and mg/kg for amiodarone) and when it is given.

**Causes and Management of Cardiac Arrest.**

• Understand the basic physiological changes in heart rate, blood pressure, volume loss and respirations in anaphylaxis.

• Be aware of how resuscitation varies in conditions such as pregnancy, drug overdose and electrocution

• Know how a delay in defibrillation affects outcomes.
• Be able to discuss methods for reducing peri-shock pauses such as charging a defibrillator during CPR.

• Understand which patient groups a defibrillator can be used on and how this may change the energy selected.

• Understand the main causes of cardiac arrest in adults versus paediatrics.

• Understand the initial recognition and management of myocardial infarction and asthma.
Appendix 3

Suggested pre reading for L6 Paper
Algorithms.

- Be able to, from memory, write out the DRSABCD algorithm.
- Be able to, from memory, write out the advanced cardiac life support algorithm for adults.
- Know the chain of survival and when it is utilised.
- Understand when to go for help (if alone) in adult and child collapse and how these differ.
- Be able to explain the management of choking in adults, children and infants.

Primary and Secondary Surveys

- Be familiar with what is required for a primary and secondary survey and how they differ from each other.
- Understand the pros and cons of various anatomical sites for the measurement of a pulse in paediatrics.
- Comprehend the concept of permissive hypotension in trauma.
- Identify common locations for catastrophic blood loss.
Chest Compressions and Ventilation.

- Know the correct anatomical location for chest compressions in adults, children and infants
- Be familiar with the correct position of the rescuers hands, arms and shoulders to provide adequate chest compressions
- Know the correct ratios of chest compressions to breaths for adult and paediatrics
- Know how mouth to mouth differs for adults, children and infants
- Be familiar with what constitutes an adequate ventilation and what may constitute under and over ventilation and how this may also relate to gastric distension.
- Understand the use of a bag-valve mask device and the benefits of a two user versus single user approach.
- Explain why chest compressions should not be stopped for the insertion of advanced airways.
- Comprehend the pros and cons of mouth to mouth ventilation
- Understand how oro-pharyngeal, laryngeal and endotracheal airways differ and how they assist with airway maintenance.
- Appreciate the sizing of oro-pharyngeal, laryngeal mask and endotracheal airways in adults and paediatrics.
• Comprehend the role of end tidal CO2 measurement in cardiac arrest.

Medications
• Understand the difference between a 1:1000 solution and a 1:10000 solution
• Know the dose of adrenaline and amiodarone for adults and paediatrics (mcg/kg for paediatric doses of adrenaline and mg/kg for the paediatric dose amiodarone) and when it is given.

Causes and Management of Cardiac Arrest.
• Understand the basic physiological changes in heart rate, blood pressure, volume loss and respirations in anaphylaxis and its management.
• Be aware of how resuscitation varies in conditions such as pregnancy, drug overdose, poisoning and electrocution
• Know how a delay in defibrillation affects outcomes.
• Be able to discuss methods for reducing peri-shock pauses such as charging a defibrillator during CPR.
• Understand which patient groups a defibrillator can be used on and how this may change the energy selected.
• Understand the main causes of cardiac arrest in adults versus paediatrics.
• Understand the initial recognition and management of myocardial infarction, seizures and asthma.
• Be able to discuss alternatives to intra-venous access in the setting of cardiac arrest.

• Discuss the difference between ventricular tachycardia and ventricular fibrillation and the precursors to these.

• Identify the correct positioning of defibrillation pads including when an implanted device is encountered.
Appendix 4

Suggested pre reading for L7 Paper
Please read the following Chapters as a **MINIMUM** from Advanced Resuscitation for Health Professionals Level 7 by the New Zealand Resuscitation Council

This will assist you in passing the exam at the end of the course

**Required Reading**

Chapter 3  
Chapter 6  
Chapter 8  
Chapter 10  
Chapter 11  
Chapter 12  
Chapter 13  
Chapter 14  
Chapter 16  
Chapter 19  
Chapter 20  
Chapter 21  
Chapter 23  
Chapter 27  
Chapter 28  
Chapter 31  
Chapter 33  
Chapter 34  
Chapter 36  
Chapter 40  
Chapter 41  
Chapter 42  
Chapter 48  
Chapter 49
Appendix 5

Medical Emergency Management

This document can be downloaded from our website

www.emcare.co.nz/resources/course-resources

Our recommendation is that you print this off and attach to your emergency equipment as a quick reference guide