CARDIOPULMONARY RESUSCITATION

PRACTICE GUIDELINE ©

DOCUMENT SUMMARY/KEY POINTS

The phone number for calling the Arrest Team is 444.

- If you are in a **ward area** - dial 444 and state "**Send the Arrest Team to** …" and state the ward, level and patient location
- **Exceptions** to this are:
  - Grace Neonatal Nurseries. In the event of a non-neonatal arrest the assistant should summon a mobile arrest team - dial 444 and state "**Send the Mobile Arrest Team to Grace Neonatal Nurseries, level 3, bed x**"
  - Hall ward. For all arrest calls - dial 444 and state "**Send the Mobile Arrest Team to Hall ward, level 1, bed x**"
- If you are in a **non-ward area** - dial 444 and state "**Send the Mobile Arrest Team to** " and state the patient location and level.
- The ward and mobile arrest trolley have the necessary equipment and drugs for advanced life support management of an arrested patient from a newborn through to an adult. In the event of an arrest occurring in a location where there is no fully stocked resuscitation trolley available a mobile arrest is activated to obtain the mobile arrest pack, patient trolley, oxygen and security support. It is the same primary arrest team that responds to mobile and arrest calls.
- On discovering a collapsed person, approach them cautiously in order to ensure your own safety and the safety of the patient. Lay the person flat, shake the shoulder gently, say patient's name (if known) or ask if the person is 'all right' and observe for response.

Airway

- Open and clear the airway with simple airway manoeuvres (head tilt and chin lift or jaw thrust) and suction the oropharynx as necessary.

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Breathing

- Check the breathing by looking for chest movement and listening and feeling for breaths from the patient's mouth and nose for 10 seconds.
- If the patient is not breathing, provide up to 5 rescue breaths, ensuring that at least 2 breaths are effective with visible chest movement.

Note: The Hospital recommends that a self-inflating resuscitation bag be used to ventilate the patient. Mouth-to-mouth / mouth and nose is not recommended.

Circulation

- Check the pulse over a period of 10 seconds.
- Start chest compressions if there is:
  - no palpable pulse
  - an inadequate pulse rate (<60 beats per minute)
  - an absence of other signs of circulation i.e. no breaths or cough in response to rescue breaths and no spontaneous movement.

Ventilation to Compression Ratio

- **Single Rescuer**
  All ages = 30 compressions to every 2 ventilations.
- **Two or more health care rescuers**
  Infant = 15 compressions to every 2 ventilations
  Child = 15 compressions to every 2 ventilations
  Adult = 30 compressions to every 2 ventilations

Defibrillator

- The defibrillator should be collected from the nearest defibrillator location and brought to the site of the arrest with the resuscitation trolley.

The Deteriorating Child

- A child who is deteriorating clinically must be notified immediately to the medical or surgical team responsible for that patient, or the after hours medical or surgical cover.
- If a medical or surgical review is not possible within a timely fashion or if nursing concerns remain despite medical or surgical review, a PICU consultation can be obtained by direct referral from the ward nurse in-charge to the PICU registrar on page 6664.

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Universal Precautions should always be instigated

Rationale

- To restore and maintain oxygenation, perfusion, circulation and consciousness after a period of cardiopulmonary collapse.

Cardiopulmonary Resuscitation in a Ward Area

In the event of a presumed "cardiac arrest", resuscitative measures must be commenced immediately by members of the nursing staff and any of the medical staff present. The only exception to this is when the patient's medical records clearly state '**not** for resuscitation' (See CHW policy "Limiting the Use of Life-Sustaining Treatment".

On discovering a collapsed person, approach them cautiously in order to ensure your own safety and the safety of the patient. Lay the person flat, shake the shoulder gently, say patient's name (if known) or ask if the person is 'all right' and observe for response.

If patient is unresponsive, press the **Nurse Assist button**.

- The "Nurse Assist" call button remains activated until sufficient appropriate personnel have responded to an "arrest" call. Where no nurse assist button exists three rings on the "nurse call" button should be considered a call for urgent assistance.
- If assistance is slow in arriving, leave the patient briefly to collect the resuscitation trolley and return to the patient to commence basic CPR as for single rescuer until assistance arrives.
- On hearing the emergency "Nurse Assist" call, all ward nursing staff should respond.
- The first person to pass the resuscitation trolley should collect it and deliver the trolley to the room. (see Appendix 2)
- Assign an assistant to dial 444 to summon the hospital arrest team. (See Appendix 1)
- If you are in a **ward area** - dial 444 and state "**Send the Arrest Team to** …" and state the ward, level and patient location. Eg: "*Send the arrest team to Clancy ward, level 3, bed 19*". This arrest page should be put out for all arrests, adult or paediatric, which occur in the ward area.
- **Exceptions** to this are:
  - Grace Neonatal Nurseries. In the event of a non-neonatal arrest the assistant should summon a mobile arrest team - dial 444 and state "**Send the Mobile Arrest Team to Grace Neonatal Nurseries, level 3, bed x**"
  - Hall ward. For all arrest calls - dial 444 and state "**Send the Mobile Arrest Team to Hall ward, level 1, bed x**" (see Cardiopulmonary Arrests in non-ward areas - Mobile Arrests)

Nursing roles

- First nurse on scene - assess patient responsiveness, press nurse assist button, assess airway and breathing and commence bag-valve-mask ventilation if required
- Second nurse on scene – Call, or assign an assistant to call, '444' to activate the arrest team. Then assess circulation and commence external cardiac massage if required
- Third nurse on scene -Collects defibrillator from nearest defibrillator location (as indicated on chart behind resuscitation trolley). Ensures all monitoring is connected (ECG, SaO_2 and BP). Ensures adequate documentation is completed and forwarded appropriately.

Airway

Clear the airway with simple airway manoeuvres (head tilt and chin lift or jaw thrust) and suction the oropharynx as necessary. Consider insertion of an appropriately sized oropharyngeal (Guedel) airway.

Breathing

Check the breathing by looking for chest movement and listening and feeling for breaths from the patient's mouth and nose for 10 seconds.

If the person is breathing spontaneously and effectively, but remains unresponsive, continue to maintain an open airway, apply oxygen and await the arrival of the arrest team.

If the patient is not breathing, provide up to 5 rescue breaths, ensuring that at least 2 breaths are effective with visible chest movement. These breaths should be delivered slowly over 1-1.5 seconds each in order to reduce gastric distension.

Note: The Hospital recommends that a self-inflating resuscitation bag be used to ventilate the patient. Mouth-to-mouth / mouth and nose is **not** recommended.

Circulation

Check the pulse over a period of 10 seconds. (The second nurse on the scene should perform this duty). The pulse is best assessed in the following places:

- Infants (<12 months) - femoral or brachial pulse.
- Child/Adult (>12 months) – carotid, femoral or brachial pulse.

If there is an adequate pulse, recheck the breathing, and if spontaneous breathing has not resumed, continue bag-valve-mask ventilation with a self-inflating resuscitation bag connected to high flow oxygen (greater than 14 litres per minute) , at a rate of 12 -20 breaths per minute (1 breath every 3 to 5 seconds)

Start chest compressions if there is:

- No palpable central pulse.
- An inadequate pulse rate (< 60 beats per minute).
- An absence of other signs of circulation i.e. no breaths or cough in response to rescue breaths and no spontaneous movement.

Technique for External Cardiac Compressions

1. Place a cardiac arrest board under the patient. Cardiac compressions should be performed by the second nurse on the scene initially, but this role can be reassigned as required.
2. To assist with resuscitation procedures the bed/cot needs to be pulled out from the wall and the head of the bed/cot removed or lowered. The height of the bed/cot may also need to be adjusted to facilitate correct technique.
3. Method of Chest Compression.
    - For **all age groups** compress over the lower half of the sternum.
    - For **all age groups** compress approximately one third the depth of the chest.
    - **Infants and Neonates** (0 to 12 months): Chest compressions for an infant can be performed with the two-finger or with the two thumb technique. In the latter, the rescuers hands encircle the chest and the thumbs compress the sternum. The two-thumb technique is the preferred technique for two health care rescuers. The two finger technique remains acceptable and may be used by a single rescuer in order to minimize the transition time between chest compression and ventilation.
    - **Child** (defined as all paediatric patients from 1 year to 18 years of age) Chest compressions can be performed with the heel of one hand or the two handed technique, whatever is required to compress the chest to one third the depth of the chest.
    - **Adult**: Use the two handed technique i.e. the heel of one hand on the compression site over the lower half of the sternum, with the other hand on top.
4. Compression Rate
    - For **all age groups, except newborns**, the compression rate is 100 compressions per minute (i.e. 1 compression every 0.6 secs or nearly 2 compressions per second)
5. Ventilation to Compression Ratio
    - **Single Rescuer**
      All ages = 30 compressions to every 2 ventilations.
    - **Two or more health care rescuers**
      Infant = 15 compressions to every 2 ventilations
      Child = 15 compressions to every 2 ventilations
      Adult = 30 compressions to every 2 ventilations
    - The compressions should pause while the ventilation is delivered for a non-intubated patient. Compressions should restart during the second expiration.
      (**Please note** that with pauses for ventilation, the actual number of compressions will be less than 100 per minute.)
      Once the airway is secured with an endotracheal tube there is no need to pause for ventilations. Care should be taken to avoid hyperventilation which causes cerebral vasoconstriction. Appropriateness of ventilation rate can be assessed with end – tidal CO_2 monitoring or arterial blood gases.

6. To achieve **effective CPR**:
    - Push hard
    - Push fast
    - Allow complete chest recoil between compressions.
    - Minimise interruptions to compressions.

If compressions are effective they should generate enough blood flow to enable a central pulse to be palpated during compression.

Resuscitation of the Newborn (only applies in Grace Centre for Newborn Care)

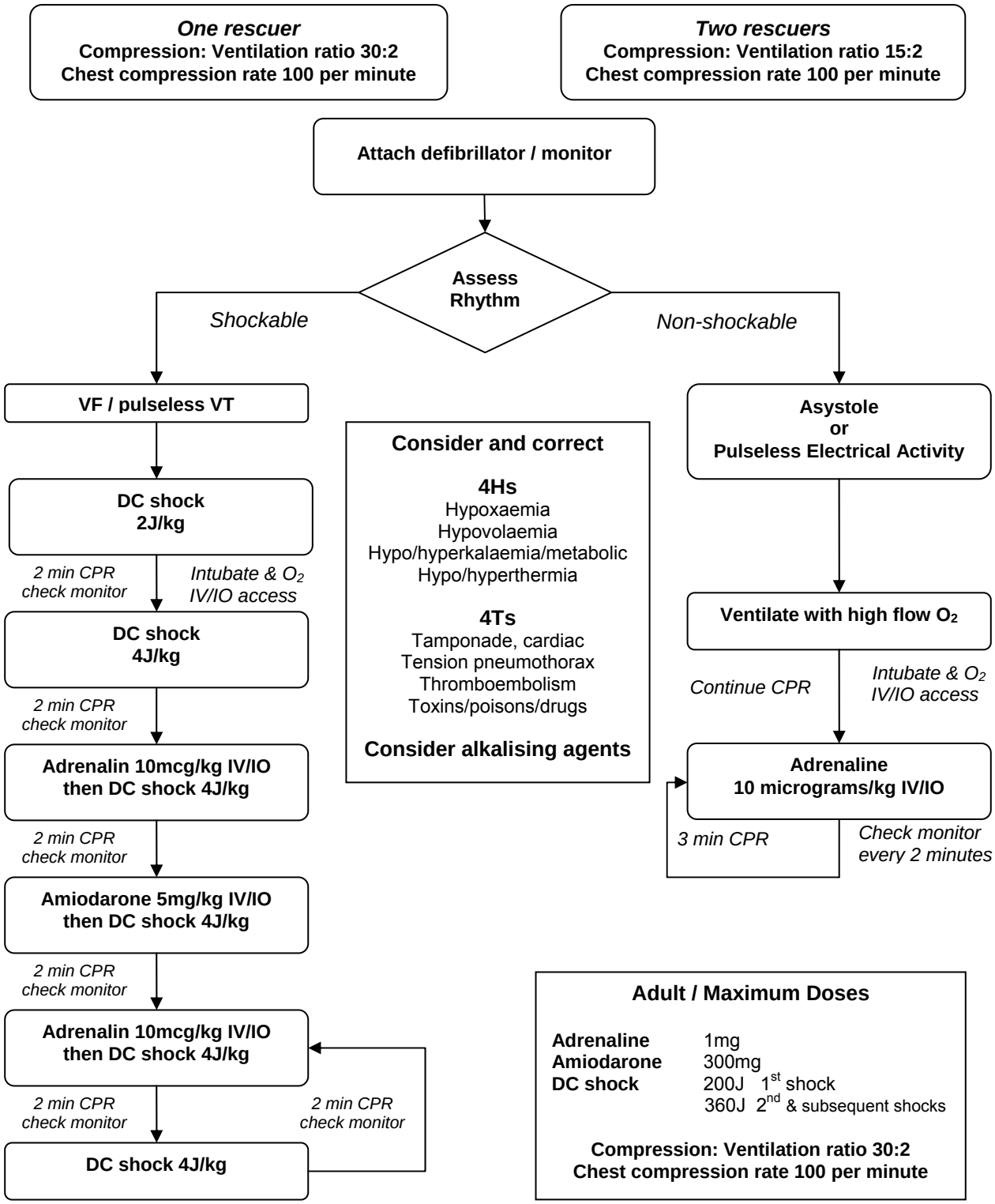
In newborns there should be **3 compressions to every 1 ventilation at a compression rate of 120 per minute**.

All other neonates in CHW please use infant guidelines mentioned within this guideline.

Assess Rhythm

Attach the monitor or LIFEPAK 20 as soon as available and advanced life support treatment is guided by the cardiac rhythm. The choice and sequence of drugs, defibrillation and other therapy is indicated in the Paediatric Cardiac Arrest algorithm.

Paediatric Cardiac Arrest Algorithm



Modified from APLS Cardiac arrest algorithm Jan 2007(ammended 03/09)

Defibrillator

Introduction

Defibrillation is a recommended means of terminating certain potentially fatal arrhythmias, Defibrillation is only one aspect of the medical care required to resuscitate a patient with a shockable ECG rhythm. Other supportive measures include:

- Cardiopulmonary resuscitation
- Administration of oxygen (O_2)
- Drug therapy

At CHW the defibrillators in use are The LIFEPAK 20 which delivers a biphasic defibrillation waveform. It is suggested that biphasic shocks are at least as effective as monophasic shocks and produce less post shock myocardial damage

The defibrillator/monitor should be collected from the nearest defibrillator location and brought to the site of the arrest. Defibrillators will not be located on all wards. For a list of defibrillator locations (see Appendix 3)

In an emergency situation the LIFEPAK 20 has 4 major functions:

1. continuous cardiac monitoring
2. direct current defibrillation using biphasic technology
3. synchronized cardioversion
4. non invasive transthoracic pacing on defibrillators located in specialised areas. (See Appendix 3)

Note: the dedicated mobile arrest LIFEPAK 20 will also feature Oxygen Saturation monitoring.

State of readiness

The LIFEPAK 20 should always be ready for use. This includes:

- Defibrillator/monitor to be plugged into AC (Alternating Current) mains at all times.
- Defibrillator/monitor to be maintained in satisfactory working condition at all times.
- Only staff with a satisfactory working knowledge of defibrillation to use this equipment.

The LIFEPAK 20 defibrillator uses QUIK-COMBO™ pacing/defibrillation /ECG electrodes in adult or paediatric sizes. The adult QUIK-COMBO™ electrodes must be connected to the therapy cable in a state of readiness at all times (except GNN), Paediatric QUIK-COMBO™ electrodes must be available with the machine for patients under approximately 15kg.

Use of Monitor on the LIFEPAK 20

Continuous cardiac monitoring and printout: Patients are monitored by using the patient monitor cable. The LIFEPAK 20 at CHW default lead setting is:

- Channel 1- Lead 11
- Channel 2 -Paddles.

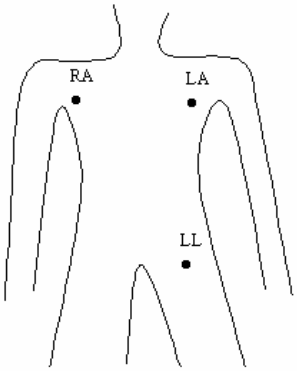
In an emergency situation the QUIK-COMBO™ electrodes can be used to monitor the patient until the cable has been attached. The ECG trace will only appear on Channel 2, to obtain trace on Channel 1 change lead select button to 'Paddles'.

Monitoring with the Patient ECG cable

The patient can be monitored on leads I, II or III. Lead II will automatically be selected.

1. Press power on.
2. Patient cable should be attached to monitor at all times
3. Attach electrodes to ECG dots and place on patient's skin see Figure 1
4. Attach electrodes according to nominated codes.
5. There should be 3 electrodes placed in the positions of LA, RA, LL.
6. To print, simply press print. Press again to stop.
7. There is an 8 seconds delay until trace appears.

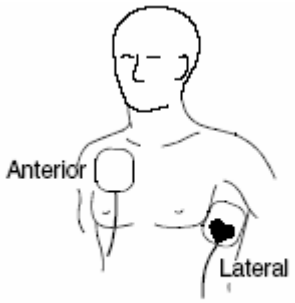
Figure 1



Monitoring ECG with QUIK-COMBO™ electrodes on LIFEPAK 20

Anterior –Lateral placement is the only placement that should be used for ECG monitoring with electrodes see Figure 2. Confirm package is sealed and the use by date has not passed.

1. Place the ♥ therapy electrode lateral to the patient's left nipple in the mid-axillary line,
2. Place the other therapy electrode on the patient's upper right torso, lateral to the sternum and below the clavicle.
3. Connect the disposable therapy electrode to the therapy cable.
4. Select paddle lead



QUIK- COMBO Electrodes

Figure 2: Anterior-Lateral Placement

Selecting ECG Lead and Size

There are two methods for selecting or changing the ECG lead.

1. To change the ECG lead using the **LEAD** button:
    - **i.** Press the **LEAD** button
    - **ii.** When the lead menu appears, press the **LEAD** button again or rotate the Speed Dial to select another lead. The highlighted section shows the ECG lead.
2. To select or change the ECG lead using the Speed Dial.
    - **i.** Highlight and select Channel 1 and then Lead to obtain the primary ECG lead choices.
    - **ii.** Change ECG lead by rotating the Speed Dial. The highlighted selection shows the ECG lead.
    - **iii.** Press the Speed Dial to activate the highlighted menu item.
    - **iv.** Repeat steps **i** and **ii** to select or change displayed waveforms for Channel 2.

Adjusting the Systole Tone Volume

To adjust the systole tone volume, highlight and select heart rate (HR) in the monitoring area of the screen using the Speed Dial.

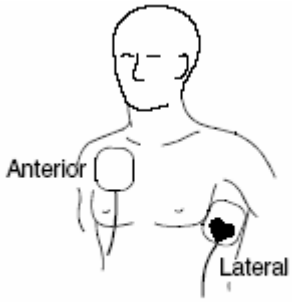
1. Rotate the Speed Dial to the desired volume.
2. Press the home screen to exit.

Manual Defibrillation

Defibrillation is required in the emergency situation to terminate certain potentially fatal arrhythmias. The decision to deliver a shock is made by a medical officer; in this case only experienced and appropriately trained staff are to prepare the LIFEPAK 20 for defibrillation, and to deliver the prepared shock. Documentation must include the rhythm prior to shock, number of joules delivered, any response to the delivered shock and the name of the prescribing medical officer.

Therapy electrode placement

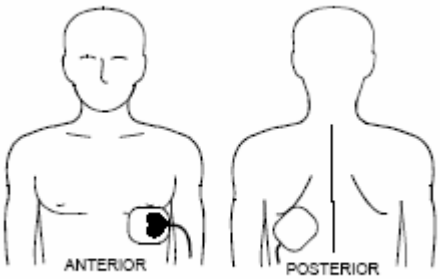
1. The anterior –lateral placement allows for ECG monitoring, synchronised cardioversion, and non-invasive pacing.
2. Place the ♥ therapy electrode lateral to the patients left nipple in the mid axillary line.
3. Place the other therapy electrode on the patients upper right torso, lateral to the sternum, and below the clavicle as shown in Figure 3



QUIK- COMBO Electrodes

Figure 3: Anterior-Lateral Placement

4. The anterior-posterior placement is an alternative position for non-invasive pacing, manual defibrillation, and synchronised cardioversion, but not for ECG monitoring. The ECG lead signal obtained through electrodes in this position is not a standard lead.
    i. Place the ♥ therapy electrode over the precordium as shown in Figure 4. The upper edge of the electrode should be below the nipple. Avoid placement over the nipple, the diaphragm, or the bony prominence of the sternum if possible.
    ii. Place the other electrode behind the heart in the infrascapular area as shown in figure 4. Do not place the electrode over the bony prominences.



QUIK-COMBO Electrodes

Figure 4: Anterior-Posterior Placement

Defibrillation Procedure

At CHW DO NOT use AED mode of LIFEPAK 20

The **ANALYZE** button should not be pressed as this will activate the AED mode. If the ANALYZE button is pressed inadvertently please press **ENERGY SELECT**, **CHARGE** or **PACER** buttons to return to MANUAL mode.

The power on default energy setting in manual mode is 5 joules at CHW.

1. Press **ON**
2. Ensure appropriate size QUIK-COMBO™ electrodes are connected to the therapy cable; confirm cable connected to the device, position electrodes on patient.
3. Conductive gel is not required when using QUIK-COMBO™ electrodes.
4. Press **ENERGY SELECT** adjust up or down as needed. (See Table 1 for recommended Joules).
5. Press **CHARGE**, when fully charged a message will appear on screen and loud alarm will sound.
6. Operator to call loudly "**Stand Clear**" and make certain all personnel, including the operator, stand clear of the patient, bed, and any equipment connected to the patient.
7. Confirm ECG rhythms and available energy.
8. Press the **SHOCK** button to discharge energy to the patient.

Note If the charged electrodes are no longer required, the energy can be dumped by:

- Pressing the Speed Dial button.
- Pressing **ENERGY SELECT** button.
- If the button is not pressed within 60 seconds, stored energy is internally removed.
- Press the **ON** button which will turn the machine off.

9. Immediately recommence CPR for 2 minutes then pause chest compressions to recheck the patient's ECG rhythm and pulse and if an additional shock is necessary, repeat the procedure beginning at step 4.

Paediatric Defibrillation

Paediatric QUIK-COMBO™ electrodes are to be connected for patients less than 15kg. For neonates with very small chests, paediatric electrodes may be too large to place in the anterior-lateral position. In this situation place, place QUIK-COMBO™ electrodes in the anterior – posterior position.

Defibrillation Doses

Defibrillation for children

Table 1

Rhythm	Mode	1st dose	2nd dose	3rd dose
VF, Pulseless VT	non-synchronised	2 J/kg	4 J/kg	4 J/kg
VT with pulse	synchronised	0.5 J/kg	1 J/kg	2 J/kg
SVT	synchronised	0.5 J/kg	1 J/kg	2 J/kg

Note: Maximum Paediatric Dose is the same as Adults 200J, 360J, 360J

Defibrillation for adults

Rhythm	Mode	1st dose	2nd Dose	3rd Dose
VF, Pulseless VT	non-synchronised	200J	360J	360J
VT with pulse	synchronised	100	200J	300J (4^{th} and all subsequent doses up to maximum of 360J)
SVT	synchronised	50J	100J	200J

Synchronised Cardioversion

Synchronised Cardioversion Procedure

1. Press **ON**.
2. Prepare the patient for therapy electrode application. Remove clothing and any moisture; DO NOT apply alcohol or other. If possible place the patient on a firm surface.
3. Attach patient ECG cable and ECG electrodes.
4. Select lead II or the lead with greatest QRS complex amplitude (positive or negative).
   Note: To monitor the ECG through QUIK-COMBO™ electrodes, place the electrodes in the anterior-lateral position and select paddles lead on channel 1.
5. Press **SYNC** and Confirm the SYNC LED blinks with each detected QRS complex.
   Note: Press **SYNC** again to deactivate synchronous mode.
6. Observe the ECG rhythm. Confirm that a triangular sense marker appears near the middle of each QRS complex. If the sense markers do not appear or are displayed in the wrong locations (for example, on the T-wave), select another lead. (It is normal for the sense marker location to vary slightly on each QRS complex.)

7. Connect the therapy electrodes to the therapy cable, and confirm cable connection to the device.
8. Apply therapy electrodes to the patient in the anterior-lateral or anterior-posterior position. (Theatres only - If using standard paddles, apply conductive gel to the paddles and place paddles on the patient's chest).
9. Press **ENERGY SELECT** (Theatres only - rotate the energy select dial on the standard paddles).
10. Press **CHARGE**.
11. Operator to call loudly "Stand Clear" and make certain all personnel, including operator, stand clear of the patient, bed, and any equipment connected to the patient.
12. Confirm ECG rhythm. Confirm available energy.
13. Press *and hold* **SHOCK** button until discharge occurs with next detected QRS complex and then release **SHOCK** button. If **SHOCK** button is not pressed within 60 seconds, stored energy is internally removed.
    Note: If you change the energy selection after charging has started, the energy is removed internally. Press **CHARGE** to restart charging.
14. Observe patient recheck their pulse and ECG rhythm. Repeat procedure from Step 4, if necessary

Synchronised cardioversion may not function if the R wave is not recognised. If this is the case, use the 'asynchronous' mode.

Temporary transthoracic cardiac pacing

Rationale for Cardiac Pacing

To provide an artificial electrical stimulus to the heart muscle when there is an abnormal rhythm that is not maintaining an adequate cardiac output. There are 10 LIFEPAK 20 that have transthoracic pacing capacity located at CHW see Appendix 3 for locations. Please refer to CHW Cardiac Pacing Practice Guideline for full details on methods of pacing: http://intranet.kids/o/documents/policies/guidelines/2005-0004.pdf

Indications for Temporary Pacing

- The most common indication for temporary pacing is transient heart block associated with congenital cardiac surgery
- Temporary pacing is indicated to support infants with congenital complete heart block (CHB)
- It is also indicated to support infants or children with temporary heart block associated with myocarditis or infection and certain drug overdoses.
- Some paediatric patients may require temporary pacing in the presence of symptomatic bradycardia

Transthoracic Pacing

Transthoracic (non-invasive) pacing is accomplished via QUIK-COMBO™ electrode pads delivering a stimulus through the chest wall. Self adherent pads are placed either anterior lateral OR anterior posterior, see below Fig 5.1, 5.2. Non-invasive pacing is not as reliable as other temporary pacing modes, and can be uncomfortable. It may be used as temporary supportive therapy until another method of pacing can be established.

Figure 5.1: Anterior-lateral Placement

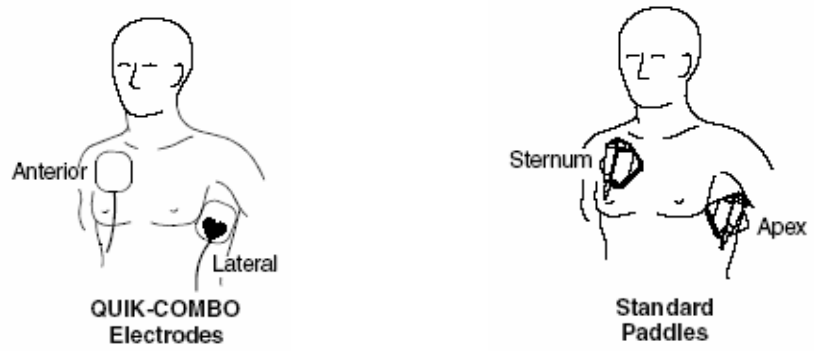
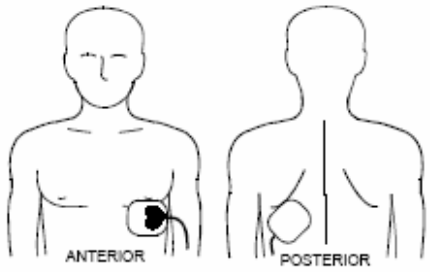


Figure 5.2: Anterior-posterior Placement



General Principles for Non-Invasive Transthoracic Pacing

- Temporary non-invasive transthoracic pacing (NTP) is used primarily during emergency situations for the treatment of haemo-dynamically significant dysrhythmia that is unresponsive to resuscitative measures and pharmacology
- NTP is available on the LIFEPAK 20 located in specialised areas see Appendix 3.
- NTP pacing is implemented using the QUIK-COMBO™ electrodes. For placement of QUIK-COMBO™ electrodes see Figure 5.1, 5.2.ECG monitoring via the LIFEPAK 20 must be in place in order to synchronously pace.
- NTP maybe carried out as either synchronous (demand) or asynchronous (non-demand) mode. CHW LIFEPAK 20 is defaulted to asynchronous (non-demand) so that pacing occurs regardless of the patient's own QRS being detected.
- Should you require synchronous (demand) pacing, this can be set by pressing OPTIONS and then using the speed dial to select PACING, MODE, DEMAND – the LIFEPAK 20 ECG cable must be attached for demand pacing to occur, this is not the hospital default mode.

Procedure for asynchronous (non-demand) Transthoracic Pacing (default)

To pace, perform the following – assuming arrest team summoned and basic and advanced life support (ABC's) being attended to as required – i.e. inadequate pulse requires chest compressions whilst pacing being set up.

1. Using the LIFEPAK 20, press **ON**.
2. Apply ECG electrodes to patient and connect ECG cable, select lead I, II or III; for optimal signal ensure ECG electrodes and therapy electrodes are adequately separated. Note you can pace a patient without the LIFEPAK 20 ECG leads attached, but it will be asynchronous and you will not be able to view the ECG via the paddles whilst the current is increased to capture. If the ECG leads become dislodged asynchronous pacing can continue, monitored via the paddles ECG on the lower half of the screen only.
3. Prepare QUIK-COMBO™ electrode sites (anterior-lateral OR anterior-posterior) remove clothing and moisture – DO NOT apply alcohol or other.
4. Connect QUIK-COMBO™ electrodes to cable if not already connected. Apply QUIK-COMBO™ electrodes to patient.
5. Press **PACER**– LED illuminates.
6. Press **RATE** (increments of 10bpm) or rotate Speed Dial (5bpm increments) to select desired pacing rate.
7. Press **CURRENT** (10mA increments) or rotate Speed Dial (5mA increments) to increase current until electrical capture occurs: The **PACER** indicator flashes for each delivered paced beat and the desired rate appears on the ECG monitor.
8. Use the minimal current to achieve this. Current and rate can continue to be adjusted as above.
9. To interrupt and view patient's native rhythm press and hold **PAUSE** – this delivers pacing at 25% of the set rate.
10. To stop pacing reduce current to zero or press **PACER**. If the pacing electrodes are dislodged, pacing ceases and delivered current resets to 0mA.
11. If defibrillation is required during pacing, press **ENERGY SELECT** and then **CHARGE** and pacing will automatically stops. Then proceed for defibrillation.
12. This is an uncomfortable and temporary method of pacing. Patient analgesia/ sedation should be considered.
13. Monitor the patient continuously and closely and arrange definitive pacing urgently.

Procedure for synchronous (demand) Transthoracic Pacing

This is not the default setting; it requires some knowledge about pacing and may be interfered with by CPR etc. However it may be undertaken following discussion with cardiology/ PICU.

To pace, perform the following – assuming arrest team summoned and basic and advanced life support (ABC's) being attended to as required – i.e. inadequate pulse requires chest compressions whilst pacing being set up.

1. Using the LIFEPAK 20, press **ON**.
2. Apply ECG electrodes to patient and connect ECG cable, select lead I, II or III; for optimal signal ensure ECG electrodes and therapy electrodes are adequately separated. Note you can pace a patient without the LIFEPAK 20 ECG leads attached, but it will be asynchronous and you will not be able to view the ECG via the paddles whilst the current is increased to capture. If the ECG leads become dislodged asynchronous pacing can continue, monitored via the paddles ECG on the lower half of the screen only.
3. For synchronous (demand) pacing, this can be set by pressing **OPTIONS** and then using the speed dial to select PACING, MODE, DEMAND – the LIFEPAK 20 ECG cable must be attached for demand pacing to occur.
4. Prepare QUIK-COMBO™ electrode sites (anterior-lateral OR anterior-posterior) remove clothing and moisture – DO NOT apply alcohol or other.
5. Connect QUIK-COMBO™ electrodes to cable if not already connected. Apply QUIK-COMBO™ electrodes to patient.
6. Press **PACER**– LED illuminates. Observe ECG – confirm triangular sense marker is near middle of each QRS complex. Select another lead if marker position is not mid QRS. These are the sensed QRS complexes. Demand pacing will only occur if a rate greater than this is selected and if adequate current is selected to capture.
7. Press **RATE** (increments of 10bpm) or rotate Speed Dial (5bpm increments) to select desired pacing rate.
8. Press **CURRENT** (10mA increments) or rotate Speed Dial (5mA increments) to increase current until electrical capture occurs: The **PACER** indicator flashes for each delivered paced beat and the desired rate appears on the ECG monitor.
9. Use the minimal current to achieve this. Current and rate can continue to be adjusted as above.
10. To interrupt and view patient's native rhythm press and hold **PAUSE** – this delivers pacing at 25% of the set rate.
11. To stop pacing reduce current to zero or press **PACER**. If the pacing electrodes are dislodged, pacing ceases and delivered current resets to 0mA.
12. If defibrillation is required during pacing, press **ENERGY SELECT** and then **CHARGE** and pacing will automatically stops. Then proceed for defibrillation.
13. This is an uncomfortable and temporary method of pacing. Patient analgesia/ sedation should be considered.
14. Monitor the patient continuously and closely and arrange definitive pacing urgently.

Nursing Management of Temporarily Paced Children

- Refer to CHW Cardiac Pacing Practice Guidelines: http://intranet.kids/o/documents/policies/guidelines/2005-0004.pdf

Resuscitation Drugs

- The third nurse should assist in the drawing up of appropriate resuscitation drugs. (See Appendix 4 for a list of resuscitation drugs and their indications)
- When drawing up resuscitation drugs the ampoule will be fixed to the barrel of the syringe with clear tape and the dilution on the drug should be clearly recorded on the syringe. The dilution and volume in the syringe must be on the resuscitation flow chart.

PICU Resuscitation Management

Cardiac Tamponade

Cardiac tamponade is a rare cause of cardiac arrest but may occur particularly in the setting of post-operative cardiac surgery. Tamponade may follow the recent removal of transthoracic lines and may be preceded by a sudden change in chest drainage, either an increase or sudden cessation of flow. If an arrest has occurred secondary to tamponade then it needs to be immediately relieved either by emergency reopening of the chest in the post-operative cardiac surgical patient or needle pericardiocentesis in other patients. Discussion with the intensivist and surgeon is mandatory.

Internal Cardiac Compression

Internal cardiac compression (open heart massage) may rarely be necessary in postoperative cardiac patients who have had an emergency sternotomy before or during cardiac arrest to diagnose and manage acute tamponade, cardiac perforation or haemorrhage. It is more effective than ECC and may deliver near normal perfusion to the brain and heart. Internal cardiac compression should only be performed by a cardiac surgeon.

The electrocardiograph (ECG) is obtained using chest leads or defibrillator paddles. Pharmacotherapy or immediate direct electrical current is applied depending on the existing arrhythmia while cardiac compression and mechanical ventilation with oxygen are maintained.

Internal Cardiac Defibrillation

If internal cardiac defibrillation is indicated the internal therapy cable for internal defibrillation is stored in the PICU Chest Opening Trolley and contains the four defibrillator paddle sizes. Internal defibrillation procedures guidelines are located at: http://intranet.kids/o/documents/policies/guidelines/2007-0087.pdf

Pulseless Electrical Activity (Electromechanical Dissociation)

Pulseless Electrical Activity (PEA) is a state of pulselessness associated with normal coordinated electrical activity. Causes include the classic “4Hs and 4Ts” noted above, but specifically: tension pneumothorax, severe hypovolaemia, severe acidosis, massive pulmonary embolus, pericardial tamponade and poor intrinsic myocardial function. Management of PEA

involves resuscitation and if possible, reversing the causative factor(s). Adrenaline is given in an initial dose of 10 micrograms/kg IV or IO (0.1mL/kg of 1:10,000) or 100 micrograms/kg ETT (1mL/kg of 1:10,000), followed by further doses of 10 micrograms/kg IV/IO or 100 micrograms via ETT. Intravascular volume expansion with colloid (most commonly, 4% albumin) 10-20 mL/kg should also be given. A chest X-ray, 12 lead ECG and echocardiogram should be obtained as soon as possible. **These principles apply to the management of PEA anywhere in the hospital.**

Magnesium

Magnesium may be used for ventricular fibrillation and pulseless ventricular tachycardia of any cause. Magnesium sulphate in a rapid IV/IO infusion is recommended in "torsades de pointes" VT.

Special Circumstances

If a cardiac arrest occurs while a child is on continuous veno-venous haemofiltration (CVVH), this therapy should be continued except if hypovolaemia is suspected or confirmed to be responsible for the cardiac arrest. For further details, consult the CVVHDF Practice Guideline.

Cessation of Resuscitation

Cardiac arrest in children has a particularly poor outcome. In the ICU, because of the rapidity of intervention, some children who in other settings may have died, may be successfully resuscitated. The decision to stop resuscitation is based on a number of variables including the pre-arrest state, response to resuscitation, reversible factors, patient and parental wishes, likely outcome and opinions of experienced staff. The attending intensivist is responsible for the decision to terminate resuscitation and should always be consulted before resuscitative attempts are abandoned.

Documentation during a PICU Resuscitation

- Documenting nurse enters the Resuscitation field of the CCIS record.
- A hard copy is printed for each child (at central station and issued if child requires resuscitation during intra-hospital transport.
- 'Chart Now' and document commencement of cardiac massage (External Cardiac Compressions, in cell attached to rhythm), rhythm and validate or enter other observations. Rhythm should be documented at regular intervals.
- Minutely observations are recorded during the resuscitation.
- Drugs administered are recorded in appropriate cells (on the Medication Sheet field after selecting the cardiac arrest button).
- Information about change in respiratory support (i.e. intubation) is recorded.
- Following a resuscitation, nurse or medical officer verifies, at least, 5 minutely observations for the half-hour prior to the cardiac arrest. Temperature and end-tidal CO_2 prior to the cardiac arrest are useful parameters to include.
- If deterioration is thought to have commenced prior to this half-hour, 15 minutely observations are verified by nurse or medical officer.

Note: Non-invasive blood pressure monitoring will automatically carry over as it is on the monitor. Initial record should be maintained and remainder deleted.

NICU Resuscitation Management

Neonates in the Grace Centre for Newborn Care are managed according to the guidelines of the Australian Resuscitation Council. www.resus.org.au (These guidelines are applicable to neonates in GCNC: all other neonates at CHW are managed according to the infant guidelines outlined in this document)

The Neonatologist or senior fellow must be called to attend all resuscitations. At CHW 100% oxygen is routinely used for all neonatal resuscitations.

Circulation

External cardiac massage is commenced if there is persistent bradycardia (heart rate <60–80 bpm) despite adequate ventilation with 100% oxygen. The first and second fingers (or the thumbs with the hands encircling the chest) are placed over the lower one-half of the infant's sternum and the chest compressed to a distance equal to one-third of the anteroposterior depth of the chest. The ventilation and compression are coordinated and a ratio of 3:1 is used to provide approximately 90 cardiac compressions and 30 breaths per minute.

Be aware that infants in the Grace Centre for Newborn Care are often post cardiac surgery and may be at risk of pericardial effusion and cardiac tamponade. This is a rare cause of cardiac arrest and if considered requires urgent ultrasound assessment. If an arrest has occurred secondary to tamponade then it needs to be immediately relieved by emergency needle pericardiocentesis by the most experienced operator available.

Drugs

If the infant's colour, oxygen tension or saturation, heart rate and circulation do not improve with ventilation and external cardiac massage, intravenous or endotracheal adrenaline is administered for its alpha-adrenergic effect and to facilitate coronary perfusion. In general, a low dose of adrenaline is recommended (0.01–0.03 mg/kg (0.1–0.3 ml/kg) of a 1:10,000 solution), though doses ten times this amount have been used. The efficacy of other drugs such as atropine, sodium bicarbonate and calcium chloride has been questioned and these drugs are no longer recommended.

In view of the risk of undiagnosed ductal dependant congenital heart disease, newborn resuscitation in the emergency department is not complete until a prostaglandin E1 infusion has been commenced at 50nanograms/kg/hour.

Blood volume expansion

Blood volume expansion with blood, normal saline or normal serum albumin is not recommended in the acute phase of resuscitation, unless the cardiocirculatory collapse is clearly the result of hypovolaemic shock.

Thermoregulation

The infant's body temperature should be monitored and the abdominal skin temperature maintained at 36.0–36.5°C.

Cessation of resuscitation attempts

Newborns can tolerate asphyxia remarkably well and quick/efficient resuscitation often results in a good outcome. Ongoing resuscitation after complete cessation of heartbeat for 10 minutes at birth is associated with very poor outcomes. The decision to stop resuscitation is based on a number of variables including the pre-arrest state, response to resuscitation, reversible factors, parental wishes, likely outcome and opinions of experienced staff. Resuscitative efforts in the Grace Centre for Newborn Care are not stopped until consultation with Neonatologist on call has been attended.

Documentation

A scribe is allocated to document events during the resuscitation. Following the arrest the event is documented in the CCIS by the scribe and also Neonatologist/Fellow.

Investigations

The following investigations should be carried out following successful resuscitation:

- Chest x-ray.
- Arterial blood gases, pH and lactate.
- Blood glucose.
- Plasma electrolytes, urea and creatinine.
- Full blood count and coagulation studies.
- Cranial ultrasound or CT examination.

Continuing care

The infant's continuing care includes mechanical ventilation, maintenance of blood volume and red cell mass with judicious use of normal serum albumin or blood, support of myocardial function with dopamine or dobutamine, correction of metabolic acidaemia with sodium bicarbonate and precise control of fluid, electrolyte and glucose balance.

Refer to: Newborn Intensive Care Handbook:
http://intranet.kids/ou/grace_neonatal_nursery/resources/medical_resources/handbook.pdf

CHW related Emergency Management

Refer to CHW policies:

- Emergency Seizure Management: Appendix 2 (CHW Practice Guideline "Seizure Management")
- Bedside Emergency Equipment policy:
http://intranet.kids/o/documents/policies/policies/2006-8195.pdf
- Limiting the use of Life-Sustaining Treatment policy:
http://intranet.kids/o/documents/policies/policies/2006-8331.pdf

Documentation

A Resuscitation Flow Chart is to be completed to enable accurate documentation.

- This flow chart is to be filled in by a member of the nursing staff during resuscitation, and documents the timing of events and treatment measures during the "arrest". The chart is then completed by the leader of the Arrest Team at the end of the emergency.
- The resuscitation flow chart forms a part of the medical records and should accompany the patient to their final destination. Ward nursing staff must also ensure that a photocopy of the flow chart is made and forwarded to the resuscitation committee secretary for auditing purposes.

Disposition Following Ward Arrest

Children

- Inpatient - may be appropriate to remain on the ward after discussion with PICU. If transfer to PICU is required the PICU nurse will organise suitable monitoring for transport.
- Outpatient - should be assessed by the arrest team and have emergency management commenced and then be transferred to the Emergency Department for ongoing care/investigation. The arrest team leader must notify the admitting officer on extension 52454

Adults

- Patient requiring ambulance transfer to Westmead Hospital (WMH) should be assessed and managed on the scene by the arrest team and have urgent ambulance retrieval from the scene to Westmead Hospital.
- Senior Nurse Manager to arrange urgent ambulance retrieval to WMH.
- Patient requiring non ambulance transfer to WMH – should be assessed by the arrest team and have their initial treatment at the scene and then be transferred to Westmead in a wheelchair with hospital porter and/ or nurse escort if appropriate, or by their own transport if well enough.
- Patient not requiring further hospital assessment – Patient should be assessed by the arrest team and then arrange own follow up with LMO.

Arrest team Responsibilities for Adult Arrests in ward areas

- The arrest team will continue care for the patient until transfer to Westmead.
- The senior nurse manager will arrange urgent ambulance transfer to Westmead if required.
- The arrest team leader will alert the admitting officer at Westmead Emergency Department (Patient Flow 55548) and provide appropriate documentation.

- In the event that Westmead hospital is only accepting life threatening cases (LTO), this can be overridden if the case is discussed with and directly accepted by one of the emergency physicians at Westmead, phone admitting Officer 58222.
- If team require patient trolley and / or scoop the Senior Nurse Manager to page the porter (pager number 6788) to collect them from the Emergency Department and bring to scene.

Resuscitation in a Non-Ward Area: 'Mobile Arrests'

On discovering a collapsed person, approach them cautiously in order to ensure your own safety and the safety of the patient. Initially, lay the person flat, shake the shoulder gently, say name (if known) or ask if the person is 'alright' and observe if the person responds. If there is any suggestion of recent trauma (eg: fall from a height), stabilise the cervical spine by placing one hand on the forehead before gently shaking the person's hand or arm.

If patient is unresponsive, call for assistance by asking staff bystanders to dial 444.

If you are in a **non-ward area** - dial 444 and state "**Send the Mobile Arrest Team to** …" and state the patient location and level. Eg: "*Send the mobile arrest team to the Bear Brasserie on level 2*". This arrest page should be put out for all arrests, adult or paediatric, which occur in a non-ward area.

If there is no immediate assistance available, leave the patient briefly to summon help and then proceed as per points above (Airway, Breathing, Circulation and apply Technique for External Cardiac Compressions).

Mobile Arrest Pack

The mobile arrest pack contains the same equipment as the ward resuscitation trolley, in addition to a Lifepak 20 defibrillator (see Appendix 5).

- The ED nurse will bring the mobile arrest pack to the scene. The nurse will attach the ECG dots and connect the patient to the ECG monitor. A paper recording of the patient's rhythm should be obtained.
- The defibrillator should be readied for use if requested. (Defibrillator Procedure)

Documentation

- A Mobile Arrest Form is to be filled in by the nursing staff during the resuscitation. The form will then be completed by the leader of the Arrest Team at the end of the emergency.
- The mobile arrest form has 3 carbon copies:
  - The original should accompany the patient to their final destination.
  - Blue copy to Resuscitation Training Coordinator,
  - Green copy to OH&S coordinator.
  - Yellow copy to medical records.

Disposition following Mobile Arrest

Children

- Inpatient - should be assessed by mobile arrest team and have emergency management commenced and then should be transferred back to their ward of origin or PICU for ongoing care/investigation as soon as possible.
- Outpatient / visitor - should be assessed by the mobile arrest team and have emergency management commenced and then be transferred to the Emergency Department for ongoing care/investigation. The arrest team leader must notify the admitting officer on extension 52454.

Adults

- Patient requiring ambulance transfer to Westmead Hospital (WMH) should be assessed and managed on the scene by the mobile arrest team and have urgent ambulance retrieval from the scene to Westmead hospital.
- Senior Nurse Manager to arrange urgent ambulance retrieval to WMH.
- If arrest location is unsuitable for team to manage patient while awaiting ambulance eg patient privacy etc, transfer patient to the Emergency Department (ext 52454) The patient's movement to ED should be discussed with the Admitting Officer prior to moving to ensure that a bed space is available.
- Patient requiring non ambulance transfer to WMH – should be assessed by the mobile arrest team and have their initial treatment at the scene and then be transferred to Westmead in a wheelchair with hospital porter and/or nurse escort if appropriate, or by their own transport if well enough.
- Patient not requiring further hospital assessment- Patient should be assessed by the mobile arrest team and then arrange own follow up with LMO.

Mobile Arrest team Responsibilities in an Adult Arrest in non-ward areas

- As outlined in ward arrest responsibilities.
- The Mobile arrest team will continue care for the patient until transfer to definitive care.
- Mobile Arrest Pack Maintenance (see Appendix 5).
- At the completion of a mobile arrest, it is the responsibility of the ED nurse to restock the mobile arrest pack.

Arrest Team Attendance

There is a two tiered response for both mobile and ward arrests.

- If arrest team members are unavailable, it is their responsibility to ensure they have arranged appropriate cover should an arrest be called.
- All team members must report to the arrest team leader when arriving at the arrest.
- Only arrest team members and appropriate ward staff should attend arrest calls, unless otherwise requested by the attending arrest team.

Ward Arrests

- Primary team
- ICU Registrar – Arrest Team Leader (in the event of an arrest in the Emergency department this role will be taken on by the ED registrar)
- Medical Registrar of day – Co-arrest team leader / Circulation
- Anaesthetic Registrar – Airway/Breathing
- Medical Resident of day – History/vascular access
- ICU nurse with ICU drug pack
- Senior nurse manager
- Social Worker
- Secondary team
- ICU consultant / ICU fellow (in hours when available) – overseeing
- In the event of an arrest in the ED the Emergency Consultant / Fellow when available will be the Team Leader.

Mobile Arrests

- Primary Team
- ICU Registrar – Arrest Team Leader
- Registrar of day – Co-arrest team leader / circulation
- Anaesthetic Registrar – Airway/Breathing
- Medical Resident of day – History/vascular access
- Emergency nurse with mobile arrest pack and emergency drug pack (from ED fridge).
- Security
- Porter
- Social Worker
- Senior nurse manager
- Secondary Team
- Emergency consultant / Emergency fellow (in hours when available) - overseeing
- Emergency Nurse Practitioner (when available)

Arrest Team Roles

- Arrest Team Leader = ICU registrar or ED registrar in ED arrests
- Assume primary responsibility for resuscitation and direction of all individual personnel
- Co-ordinate resuscitation efforts
  - Airway
  - Breathing
  - Circulation
  - Disability (CNS)
- Liaise with attending medical officer and team
- Co-ordinates disposition of patient
- Ensure completion of full documentation

Co-arrest Team Leader = Medical registrar of day

- Work in co-operation with the ICU registrar or as arrest team leader in absence of ICU registrar
- Obtain IV access
- Obtain blood specimens
- Responsible for fluid administration
- Monitor ECG and cardiac output
- Push bolus medications during arrest sequence
- Liaise with ICU to organise disposition of patient

Airway/ Breathing Doctor = Anaesthetic Registrar

- Airway management
- Ventilation
- Monitor CNS status
- Accompany patient to final disposition if ventilated

Medical Resident

- Obtain history and other information from clinical notes and attending staff and family members
- Assist with vascular access, blood sampling and documentation as designated
- ICU Nurse (ward arrests)
- Responsible for co-ordinating and overseeing nursing management of the resuscitation
- Bring arrest drug pack from ICU
- Accompany patient during transport to final disposition

ED Nurse (mobile arrests)

- Responsible for co-ordinating and overseeing nursing management of the resuscitation
- Bring mobile arrest trolley and ED drug pack from ED
- Accompany patient during transport to final disposition
- Restock mobile arrest pack

Senior Nurse Manager

- Readjust nurse staffing to ensure nursing care of patient throughout resuscitation and relocation
- Provide communication link between resuscitation scene and rest of hospital
- Maintain resuscitation nursing team to established number and roles.
- Arranges ambulance transfer to Westmead hospital for adult arrests as required.
- Designate nursing staff to accompany patient to receiving unit
- In absence of Social Work staff (especially after hours) performs functions described for Social Worker below.
- Ensures documentation is completed and forwarded appropriately.
- Ensures maintenance of patient privacy.

Social Work

- Assist family to a designated area
- Talk to the family regarding events
- Support family members and attempt to ascertain their perceptions
- Counsel and support family throughout resuscitation
- Ensure follow-up dependent on outcome of resuscitation

Porter (Mobile arrests only)

- Brings oxygen cylinder, extraction equipment and patient trolley from ED to arrest scene
- Assists with movement of patient
- Assists with transfer of patient to appropriate unit for further management

Security staff (Mobile arrests only - when available)

- Assists with movement of patient
- Be available to assist ambulance paramedics to scene
- Assists with bystander crowd control

The Deteriorating Child

- The "deteriorating child" refers to any child whose clinical condition is felt to be worsening; such "deterioration" will often be accompanied by alterations in one or several of their clinical observations outside of the normal range for their age.
- Any member of the health care team may refer a child that is felt to be clinically deteriorating on the ward to the PICU by paging 6664. A criterion for the deteriorating child has been developed and is available in all clinical areas (Refer to Appendix 6). Remember 6664 does not replace the arrest team. Call an arrest **(Phone 444)** for children who are deteriorating acutely and who require immediate attention.
- The referral service is coordinated by the PICU Nurse Practitioner service and all patients will be seen within 10 minutes. The CHW policy for Urgent Ward/ED Request for PICU Review outlines the service provided by the PICU team. The "Referral form" (provided by PICU) includes a brief history, patient assessment and suggested treatment plan, and will be completed by the PICU team and included in the patient's medical notes (PowerChart documentation). The service also provides ongoing follow-up for children that require close observation on the ward.

Resuscitation Trolley Maintenance

Daily Checks

The resuscitation trolley must be checked on a daily basis and this check should be signed for on the resuscitation checklist attached to the trolley. The following must be ensured:

- The trolley should be sealed with the chain linked security tag (Seal) system this ensures that the correct equipment is in place in the trolley.
- To check the trolley contents break the security tag (Seal) by pulling the tag or by opening a drawer using the checklist (http://intranet.kids/o/forms/resuscitation_committee/ward_resuscitation_trolley_checklist.pdf) and check to ensure that all stock is present and has not expired.
- The drug drawer (bottom white drawer) contains a resuscitation drug kit which is sealed and has not exceeded its expiry date. If the seal is broken or the kit is past its expiry date it must be replaced through biomedical engineering store room or through pharmacy (See "After an Arrest")
- The drug drawer (bottom white drawer) also contains the following: two clear plastic bags; two 500mL bags of Normal Saline; two 500mL bags of Hartmann's Solution; one 500mL bag of 10% Glucose. If any of these is missing or past their expiry date they should be replaced from ward stock.
- Once the trolley contents have been checked and are correct re-seal the security tag by feeding the chain link through the trolley handles and clip the new security tag in place. Then add the security tag number and sign on the appropriate space on the daily checklist. This helps to identify if the trolley is sealed and when it was last sealed or if it has been tampered with.

Also check the presence of the following:

- A functioning and full oxygen cylinder, flow meter and tap
- Adult 1600mL and Child 500mL orange disposable self-inflating resuscitation bags. These resuscitation bags are stored in plastic bags which are sealed with a white tamper evident seal – if this seal is broken the resuscitation bag must be replaced with a new one.
- *Chained to the trolley rail*: breathing circuit picture, drug dose chart, and trolley contents sheet and scissors
- *On trolley bottom shelf*: clipboard with resuscitation flowcharts and daily check sheet.
- *At back of trolley*: an arrest board
- *On top of trolley*: glucometer.
- Areas that have an allocated defibrillator must complete a daily check.
- A monthly check of the emergency alarm bell must be performed and signed for on the resuscitation checklist attached to the trolley

After an Arrest

See Appendix 7 to guide trolley restocking.

- If an arrest occurs on a ward while the resuscitation trolley is unstocked, a mobile arrest call should be made.
- The resuscitation trolley should be wiped down with chlorhexidine in alcohol 70% to remove any obvious contaminants
- All used disposable equipment should be discarded appropriately. This includes the orange disposable self inflating resuscitation bag, its disposable mask and the breathing circuits, the laryngoscope blades and the laryngoscope handle if worn or non-functioning.
- The used non-disposable face masks should be placed in a clear plastic bag and sent to Inhalation Therapy.
- The used, Magill forceps and metal Yankauer suckers should be placed in a separate clear plastic bag and labelled and sent to CSSD
- The used laryngoscope handles as long as the disposable handle continues to function should be wiped down with chlorhexidine in alcohol 70% and placed back in the red airway drawer insert. If the handle does not work or is worn it needs to be replaced.
- The used/unsealed or expired pharmacy box can be returned to pharmacy during normal working hours

In normal working hours

- If an arrest occurs on a ward while the resuscitation trolley is unstocked, a mobile arrest call should be made.
- During normal working hours stock that is available from the biomedical stock room including the pharmacy box can be picked up from Biomedical / Inhalation therapy department (Level 3) All stock collected needs to be documented and signed for on the equipment list in the restocking room
- Equipment that is available on the wards can be restocked from the areas appropriate storage cupboards. Hospital managers have the checklist and can ensure they have this stock in supply. If stock not available in your ward area try hospitals stores, other ward areas, Emergency department or PICU.

Outside of normal working hours

- If an arrest occurs on a ward while the resuscitation trolley is unstocked, a mobile arrest call should be made.
- The same procedure applies except that to gain access to the after hours biomedical store room , you will need to get keys to unlock the store room these are available from PICU staff – please ring 51181/51171 to collect keys on the way to the biomedical after hours store room.
- After Hours Nurse Manager should be paged (pager 6056) if there is not any pharmacy boxes left in supply in the biomedical stock room so that more can be retrieved from the out of hours pharmacy.
- On weekends and public holidays, the resuscitation equipment, is kept in the biomedical engineering stock room which is routinely stocked and is the responsibility of the biomedical engineering department. Should the existing stock be depleted to only 1 pharmacy box available, the After Hours Nurse Manager should contact the on-call Pharmacist. Inhalation therapy/biomedical engineering staff to organise restocking out of hours once contacted by the After Hours Nurse Manager. If restocking is not possible, the ward areas affected will need to utilise a mobile arrest call as a temporary solution.

Defibrillator Maintenance and Warnings

Testing the LIFEPAK 20

The LIFEPAK 20 requires 2 different types of testing:

- a daily auto test
- a daily user test

The tests should be performed as follows in accordance with Medtronic LIFEPAK 20 Operating Instructions (2004).

Daily Auto Test

Each day at approximately 0300 hrs, the LIFEPAK 20 defibrillator/monitor automatically completes the following tasks:

- Turns itself on
- Performs self-tests
- Charges to a low energy level (approx 1-3J) and then discharges through a test load
- Tests the pacing circuitry (if non-invasive pacing installed)
- Stores the results in the test log
- Prints the results.
- Turns itself off

The daily auto test is not performed if the LIFEPAK 20 defibrillator/monitor is already turned on at 0300. If you must use the device while the daily auto test is in progress, press ON. The test is halted and the LIFEPAK 20 defibrillator/monitor resumes normal operation.

If the defibrillator detects a problem during the auto test, it will remain on if connected to AC power. The service LED will illuminate and the printed report will indicate a test failure.

Note: As the QUIK-COMBO™ electrodes will be connected and ready for use, the LIFEPAK 20 will recognize this and the integrity of the therapy cables will not be tested.

The automatic print out will then state “Self test did not complete connect to test plug” The defibrillator or pacer test will have to be performed manually using the user test provided in the Options menu.

Report all Faults to Biomedical Engineering

User Test

This test must be preformed at least daily and signed for on the arrest trolley daily checklist.

The LIFEPAK 20 defibrillator/monitor user test is a functional test and should not be performed while using the defibrillator during patient care.

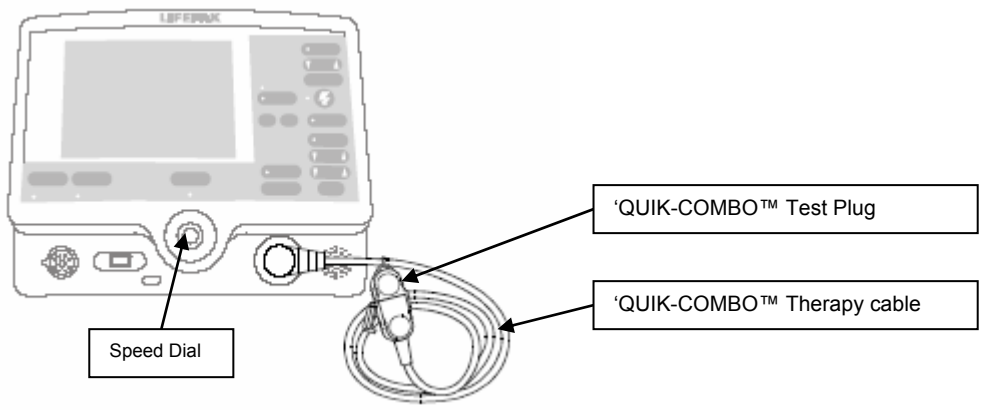


Figure 6

1. Press **ON**; LIFEPAK 20 will perform Self Test.
2. Prior to performing the user test you need to ensure the therapy cable is connected to the 'QUIK-COMBO™ test plug see Figure 6.
3. Press **OPTIONS** then turn Speed Dial to select **USER TEST**. Push the Speed Dial button when USER TEST selected.
4. Message will be displayed:
   Start user test? (This will end monitoring and close patient records)
   Select **YES** and push Speed Dial button to confirm.
5. When selected the user test automatically performs the following tasks:
   - **i.** Performs self-test
   - **ii.** Charges to a low energy level (approximately 1-3J) and then discharges through a test load
   - **iii.** Tests the pacing circuitry (if non-invasive pacing installed)
   - **iv.** Automatic print out of the result states "user test succeeded"
   - **v.** Turns itself off
6. If the LIFEPAK 20 defibrillator/monitor detects a problem during the user test, the service LED lights and a printed report indicates that the test failed. Turn off the defibrillator and then repeat the user test. If the Service LED remains lit, contact Biomedical Engineering Department on extension 52594.
7. Once test is completed please ensure that the 'Quick combo' test plug is disconnected and the adult QUIK-COMBO™ electrodes are reconnected.

Note: If it is necessary to interrupt the user test, turn the power off and then on again. The test will stop and the defibrillator will operate normally. A Pass/Fail report will not print.

Note: During the user test, all front panel controls (except ON) and standard paddle controls are disabled.

Note: Routinely testing the defibrillator consumes power; perform the user test with the device plugged into ac power.

Defibrillator Checks After an Arrest

The LIFEPAK 20 must be returned to it's location by the RN and left in a State of Readiness. Replacement QUIK-COMBO™ electrodes are obtained from Biomedical Engineering during normal working hours and from the after hours pharmacy storeroom outside of normal working hours.

In the event of a second arrest occurring in a ward area whilst the LIFEPAK 20 is in use elsewhere a mobile arrest call should be activated.

Loading Paper into the Recorder

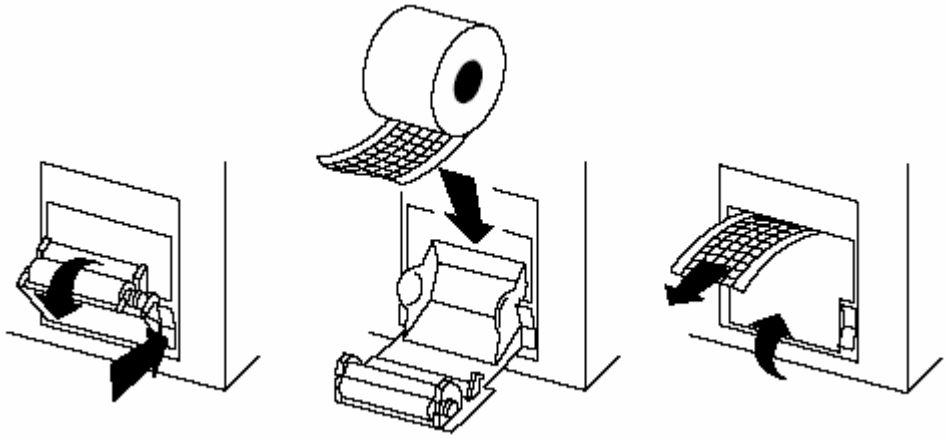
Loading 50 mm Paper (PN 804700)

The printer is equipped with an out-of-paper sensor to protect the print-head. The sensor automatically turns off the printer if paper runs out or if the printer door is open.

To load the paper:

1. Pull the slotted edge of the front printer door to open the printer.
2. Remove the empty paper roll.
3. Insert the new paper roll, grid facing upwards.
4. Pull out a short length of paper.
5. Push the rear printer door in and push down on the front printer door to close.

Figure 7 illustrates the steps for loading 50 mm paper.



CAUTION! Possible printer malfunction:

Using other manufacturers' printer paper may cause the printer to function improperly and/or damage the print head. Use only the printer paper specified in these operating instructions.

Defibrillator WARNINGS!

- Only experienced and trained staff are to use the LIFEPAK 20.
- Report all faults to the Biomedical Engineering Department Ex 52594.
- You must ensure all staff are not in contact with the patient, the bed or any connections to the patient or bed when cardioversion or defibrillation is being attended.

The following are general warning and caution statements:

Shock hazard

The defibrillator delivers up to 360 J of electrical energy. Unless properly used as described in these Operating Instructions, this electrical energy may cause serious injury or death. Do not attempt to operate this device unless thoroughly familiar with these operating instructions and the function of all controls, indicators, connectors, and accessories.

Possible fire or explosion

Do not use this device in the presence of flammable gases or anaesthetics. Use care when operating this device close to oxygen sources (such as bag-valve-mask devices or ventilator tubing). Turn off gas source or move source away from patient during defibrillation.

Possible defibrillator shutdown

When operating on battery power, the large current draw required for defibrillator charging may cause the defibrillator to reach shutdown voltage levels with no low battery warning. If the defibrillator shuts down without warning, or if a LOW BATTERY: CONNECT TO AC POWER message appears on the monitor screen, immediately connect the AC power cord to an outlet.

Possible failure to detect an out of range condition

Reselecting QUICK SET will reset the alarm limits around the patient's current vital sign values. This may be outside the safe range for the patient.

Note: Medtronic devices, electrodes, and cables are latex-free.

External Cleaning Procedures

WARNING! Shock or fire hazard

Do not immerse or soak any portion of this device in water or any other fluid. Avoid spilling any fluid on the device or accessories.

CAUTION! Possible case damage

Do not clean any part of this device or accessories with bleach, bleach dilution, or phenolic compounds. Do not use abrasive or flammable cleaning agents. Do not attempt to sterilize this device or any accessories unless otherwise specified in accessory operating instructions.

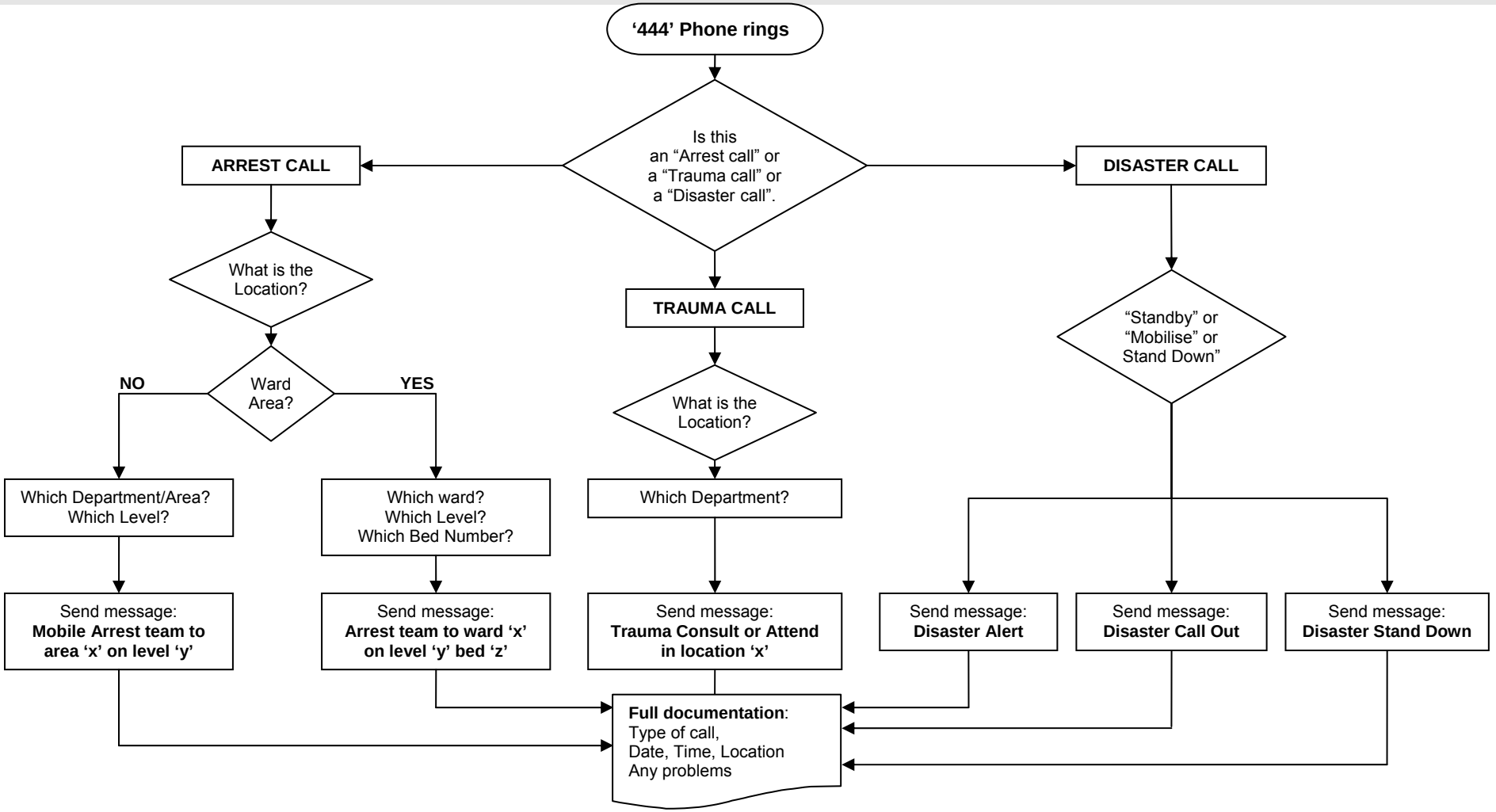
Clean the exterior of the LIFEPAK 20defibrillator/monitor by wiping the surface with any of the following solutions:

- Soap and water
- Isopropyl alcohol

References

1. International Liaison Committee on Resuscitation (ILCOR) Resuscitation 2005, Vol. 67, pp 157-303
2. Advanced Life Support Group. Advanced Paediatric Life Support - The Practical Approach, 4th edition. BMJ Publishing, 2005.
3. Australian Resuscitation Council (ARC) Guidelines February 2006
4. Medtronic Lifepak 20 Defibrillator/ Monitor with ADAPTIV Biphasic technology – Operating Instructions, 2004.
5. Perspectives on ADAPTIV Biphasic Technology, Medtronic 2004.
6. An Update on Biphasic external Defibrillation: Published Evidence from Clinical Research – April 2004, Medtronic.
7. Is There a Need for Biphasic Energy Greater than 200 Joules? An Evidence – Based Approach, Medtronic 2005.
8. New 2005 guidelines for emergency Cardiovascular Care: What is the Role of escalating Energy in Treating VF? Medtronic 2005.
9. 2005 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency cardiovascular care, Circulation.2005: 112 (suppl IV): IV-67-IV-77.

Appendix 1: Switchboard Flowchart for '444' calls



Appendix 2: Contents of Resuscitation Trolleys

On Top or Attached to Rails		
Description	**Size**	**Number**
Portable oxygen cylinder, flow meter and tap		One each
Mayo orange coloured disposable self inflating bags	Adult 1600mL & Child 500mL	One each
Clipboard with documentation		One each
Scissors - chained		One each
Arrest board		One each
Glucometer		One each

Airway Drawer		
Description	**Size**	**Number**
Yankauer suction head	Small Large	One each
Suction catheters	6,8,10,12 (long)	Two each
Guedel airways	Sizes 00-4	One each
Magill forceps	Adult Child Infant	One each
Spare batteries	C	Two each
Laryngoscope handles		Two each
Laryngoscope Straight blade	0 1 2	One each
Laryngoscope Curved blade	2 3	One each
Stethoscope		One each

Breathing Drawer		
Description	**Size**	**Number**
Face masks -Non-latex; Laerdal type	Sizes 0-4	One each
Endotracheal introducer	Small Medium Large	One each
Endotracheal tubes uncuffed	size 2.5	Two each
Endotracheal tubes uncuffed	size 3.0, 3.5, 4.0, 4.5,	One each
Endotracheal tubes uncuffed	size 5.0, 5.5, 6.0	One each
Endotracheal tubes cuffed	size 6.0, 6.5, 7.0, 8.0	One each
Intragastric tubes	FG 8 & 10	Two each
Paedi – caps (Co2 detectors)	Adult & child	One each
Lubricant		5 sachets
Leucoplast tape 2.5		One roll
Tincture Benz Co. swabs		2 sachets
Rebreathing bags with corrugated tubing, T piece connector and O_2 tubing attached	500mL and 1000mL	One each

Circulation Drawer		
Description	**Size**	**Number**
Syringes	2mL, 5mL,	Five each
Syringes	10mL	Ten each
Syringes	20mL, 50mL	Two each
Needles	Blunt 18 gauge drawing up needles	Ten each
Needles	Standard 23 gauge	Five each
Needles	25 gauge needles	Five each
Butterflies	23g and 25g	Two each
Needle less IV caps with extension		Five each
Wide bore tubing (20-25cm long) with attached 3-way tap		Two each
Minibore extension set with side clamp	152cm	3 each
Intraosseous needles 18g		Two each
Cannulae	18, 20, 22, 24 gauge	Five each
Blood gas syringes		Five each
Tourniquets		Two each
Medi Swabs		Twenty each
Additive labels		Ten each
Three way connectors		Two each
Blood tubes	X-match, FBC, EUC	Two each
Armboards neonatal, small & large		One each
Blood pump sets		One each
Burrette with IV Luer lock		One each
Leucoplast 2.5cm		One each
Clear tape		One each
Medication additive labels		ten

Drug Drawer		
Description	**Size**	**Number**
Drug Case		One each
Fluids	Normal saline 500ml	Two bags
Fluids	Hartmann's Solution 500mL	Two bags
Fluids	10% Glucose 500mL	One each
Decontamination plastic bag		Two

Appendix 3: Location and Features of Lifepak 20 Defibrillators

Level 1

- Hunter Baillie Ward - 1 standard unit

Level 2

- Camperdown Ward - 1 standard Unit
- Emergency Department
  - 1 standard unit with transthoracic pacing capacity
  - 1 standard unit on mobile arrest pack with transthoracic pacing capacity, SaO_2 and BP monitoring.
- Cardiac Cath Lab (radiology) 1 standard unit with transthoracic pacing capacity.
- CHISM – 1 standard unit

Level 3

- Edgar Stevens Ward – 1 standard unit with transthoracic pacing capacity.
- Cardiac Theatre – 1standard unit with transthoracic pacing capacity and internal defibrillation paddles.
- General Theatre – 1standard unit with transthoracic pacing capacity and internal defibrillation paddles.
- Recovery - 1 standard unit.
- Middleton Day Stay – 1 standard unit.
- Cardiology (Stress Lab) – 1standard unit with transthoracic pacing capacity.
- GCNC – 1 standard unit.
- PICU – 2 standard units with transthoracic pacing capacity and internal defibrillation paddles.
- Biomedical engineering – 1standard unit.

Appendix 4: Resuscitation Drugs

Adenosine (Adenocor®)

- PREPARATION ON TROLLEY: 3 x 6mg / 2mL ampoules
- INDICATIONS: Antiarrhythmic agent - to treat supraventricular tachycardia.
- DOSE:
  - 0.05mg/kg (50 micrograms/kg) up to 0.25mg/kg (250 micrograms/kg) increasing in increments until control achieved.
  - **Dose 1:** 0.05mg/kg
  - **Dose 2:** 0.1mg/kg
  - **Dose 3:** 0.25mg/kg
  - Given as rapid IV bolus followed by rapid saline flush.
  - Maximum single dose - 12mg
  - Maximum cumulative dose – 30mg
- ROUTE: IV rapid bolus

Adrenaline / Epinephrine

- PREPARATIONS ON TROLLEY:
  - 5 x 10mL ampoule of 1:10,000 solution (1mg/10mL)
  - 5 x 1mL ampoule of 1:1000 solution (1mg/1mL)
- INDICATIONS:
  - To treat asystole and slow idioventricular rhythms.
  - To convert fine to coarse fibrillation before defibrillation. (see VF/pulseless VT algorithm)
  - To raise the blood pressure and improve myocardial contractility.
  - To treat anaphylactic shock.
  - To treat electromechanical dissociation
- ARREST DOSES:
  - All doses in arrests - 0.1mL/kg of 1:10,000 solution (10 micrograms/kg) IV or Intraosseous
  - Note all doses via ETT are 100 micrograms/kg. (1mL/kg 1:10,000 or 0.1mL/kg of 1:1,000)
- ANAPHYLAXIS DOSE: 10 micrograms/kg IMI - this can be given as 0.1mL/kg of 1:10,000 solution or 0.01mL/kg of 1:1,000 solution

- ROUTE:
  - Arrests: IV, Intraosseous or via endotracheal tube (if IV or IO unavailable)
  - Anaphylaxis: IMI only

Anginine® - refer to Glyceryl Trinitrate

Amiodarone (Cordarone®)

- PREPARATION ON TROLLEY:
  - 2 x 150mg / 3mL ampoule
- INDICATIONS:
  - Antiarrhythmic agent - to treat ventricular and supraventricular tachyarrhythmias.
- DOSE:
  - 5mg/kg
  - Use only with advice
  - Usually given over 120 minutes (negative inotrope), but in an arrest situation, rapid bolus is appropriate.
  - Maximum single dose - 300mg
- ROUTE: IV or Intraosseous
  - May cause thrombophlebitis

Aspirin (Aspro Clear®)

- PREPARATION ON TROLLEY: 4 x 300mg dispersible tablets
- INDICATIONS: Suspected Myocardial Ischaemia in adults
- DOSE: 150mg (adult dose).
- ROUTE: Oral

Atropine Sulphate:

- PREPARATION ON TROLLEY:
  - 5 x 500 micrograms / 1mL ampoule
- INDICATIONS:
  - Sinus bradycardia which is vagally mediated.
- DOSE:
  - 20 micrograms/kg.
  - Maximum dose = 1000 micrograms
- ROUTE:
  - IV, Intraosseous or ETT (if I.V or I.O unavailable)

Calcium Chloride

- PREPARATION ON TROLLEY: 2 x 10mL ampoule of 10% solution
- INDICATIONS: Only hyperkalaemia, hypocalcaemia, hypermagnesaemia and calcium channel blocker overdose.
- DOSE: 0.1 - 0.2mL/kg of 10% solution of calcium chloride (10 to 20mg/kg)
- ROUTE: IV or Intraosseous

Note: Flush IV lines with NaCl before and after administration.

Diazepam

- PREPARATION ON TROLLEY: 2 x 10mg / 2mL ampoule
- INDICATIONS: Seizures
- DOSE:
  - 0.2mg/kg of body weight IV
  - 0.5mg/kg of body weight PR
  - Maximum dose 10mg
- ROUTE: IV, Intraosseous, PR

Glucose

- PREPARATION ON TROLLEY:
  - 1 x 50mL ampoule of 50% glucose
  - 1 x 500mL bag of 10% glucose (in drug drawer)
- INDICATIONS: Hypoglycaemia.
- DOSE:
  - Older children/adults: 1mL/kg of 50% glucose (0.5gm/kg)
  - Younger children and infants: 5mL/kg of 10% glucose (0.5gm/kg)
- ROUTE: IV, Intraosseous

Glyceryl Trinitrate (Anginine®)

- PREPARATION ON TROLLEY: 600 microgram sublingual tablets Glyceryl trinitrate (30 tabs/bottle)
- INDICATIONS: Ischaemic chest pain in adults
- DOSE:
  - 0.5 -1 tablet sublingually, repeat in 5 minutes (adult dose).
  - ANNOTATE DATE OF OPENING, discard 90 days after opening
- ROUTE: Sublingual

Lignocaine

- PREPARATION ON TROLLEY: 2 x 50mg/5mL ampoule (1% solution)
- INDICATIONS: To treat ventricular arrhythmias.
- DOSE: 1mg/kg (0.1mL/kg of 1% solution).
  - Maximum dose = 100mg
- ROUTE: IV, Intraosseous or ETT (if I.V or I.O unavailable)

Note: Flush IV lines with NaCl before and after administration.

Midazolam

- **Midazolam is not stored on the resuscitation trolleys it is brought to the arrest in the PICU / ED drug box.**
  - 2 x 15mg/3mL ampoule
- INDICATIONS: sedation / seizures
- DOSE:
- 0.1 - 0.2 mg/kg/dose
- Maximum dose 10mg
- ROUTE:I.V or Intraosseous

Note: Respiratory depression can occur with I.V use.

Flumazenil is not routinely brought to the arrest scene. It is readily available in PICU and should be obtained without delay for instances of midazolam overdose.

Naloxone (Narcan®)

- PREPARATION ON TROLLEY: 2 x 400 micrograms / 1mL ampoule
- INDICATIONS:
  - Narcotic overdose (post surgery).
  - Unconsciousness of undetermined origin.
  - Neonatal resuscitation (if mother has been given narcotics;
    NB: beware of using this in neonates where the mother is a chronic opiate user).
- DOSE: 10 micrograms/kg of body weight. maximum dose = 2mg)
- ROUTE: IV, Intraosseous or ETT

Sodium Bicarbonate

- PREPARATION ON TROLLEY: 1 x 100mL vial of 8.4% solution (1mEq/1mL)
- INDICATION:
  - To treat severe metabolic acidosis of hypoxia or ischaemia. (pH < 7.1)
  - May be considered in prolonged arrest after adequate ventilation with 100% 0_2 and external cardiac compressions have been established. (Poor evidence for efficacy)

- DOSE: 1mL/kg/dose (maximum dose 50mL)
- ROUTE: IV or Intraosseous

Note: Flush IV lines with NaCl before and after administration.

Sodium Chloride 0.9% (Normal Saline)

- PREPARATION ON TROLLEY: 5 x 10mL ampoule
- ROUTE: IV, Intraosseous or ETT

Water for Injection

- PREPARATION ON TROLLEY: 5 x 10mL ampoule
- ROUTE: IV, or Intraosseous

ICU/ED Drug Pack

These packs will be brought to the arrest scene by the ICU/ED nurse attending.

- Adrenaline 1:10,000 10mL – one ampoule
- Adrenaline 1:1000 1mL - four ampoules
- Midazolam 15mg / 3mL – two ampoules
- Pancuronium 4mg – one ampoule
- Propofol 200mg – one ampoule
- Suxamethonium 100mg/2mL – one ampoule
- Thiopentone 500mg – one ampoule
- Vecuronium 10mg – one ampoule
- Vecuronium 4mg – one ampoule

Appendix 5: Contents of Mobile Arrest Pack

Equipment

- Oxygen cylinder porter to bring to mobile arrest
- Scoop device porter to bring to mobile arrest
- ED drug pack from fridge (two vials of each drug):
  - Suxamethonium 100mg/2mL – two ampoules
  - Pancuronium 4mg/2mL – two ampoules

Equipment Trolley

Defibrillator (Lifepak 20) with ECG dots and gel pads

Mobile arrest pack

- **Outside of Pack**
  - Res-Q-Vac suction device, disposable suction catheter and container
  - Self-inflating resuscitation bags – child and adult
  - Laerdal masks – 00-4 - one each
- **Intubation Roll inside top of pack**
  - Two laryngoscope handles
  - Straight blade 0, 1, 2 one each
  - Curved 3, 4, 5 one each
  - Spare battery and globes (small and large)
  - Endotracheal tubes:
    - size 2.5 (two)
    - size 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0 uncuffed one each
    - size 6.0, 7.0, 8.0 cuffed one each.
  - Endotracheal introducer – small, medium and large
  - Magill forceps – adult, child and infant sizes
  - KY jelly – three
  - White tape for ETT
  - Brown elastoplast
  - Tinc Benz Co
  - Disposable CO_2 detector – small (1-15kg) and large (>15kg)

- **Airway (blue pack with green strip)**:
  - Guedel airways 0-4 one each
  - Nebuliser kit (1 x small)
  - Oxygen tubing
  - Intragastric tubes 8, 10 one each
- **Circulation (Orange Pack x 2)**
  - Pack 1 - Cannulation
    - Needles
    - Blunt 19 gauge drawing up needles - five
    - 25 gauge needles - five
    - Butterflies 23g, 21g, 19g – three each
    - T-piece connectors with needle less injection caps – two; arm-boards (top inside pocket above fluids)
    - Cannulae sizes 16,18, 20, 22, 24 gauge – three each
    - Tourniquets – one
    - Alco wipes – twenty
    - Blood gas syringes – two
    - Blood tubes – X-match, FBC, EUC – one each
    - Sodium chloride 10mL – five
    - Steristrip packet – two
    - Tegaderm – two
    - Brown elastoplast
    - Bandaids – five
    - Cannula caps - two
  - Pack 2 - syringes
    - Syringes – 2mL, 5mL, 10mL - 3 each
    - Drugs (yellow pack)
    - Adenosine 6mg / 2mL - 3 ampoules
    - Adrenaline/epinephrine 1:10,000 and 1:1000 – five each
    - Amiodarone 150 mg– two
    - Anginine 600 micrograms - 1 bottle of 100 tablets
    - Aspirin – 4 tablets
    - Atropine 500microg – two
    - Calcium chloride 10mL – one
    - Diazepam 10mg – two
    - Diazepam Rectal 5mg/5mL - two
    - GlucaGen Hypokit (1mg) - one
    - Glucose 50% 50mL – one
    - Hydrocortisone 100mg vials- two
    - Naloxone 400microg – two
    - Lignocaine 1% - two
    - Midazolam 5mg/5mL –two

- Promethasine Hydrochloride 50mg/2mL -two
- Salbutamol 0.5% solution – one 30mL bottle
- Sodium bicarbonate 840mg – one
- Thiopentone 500mg one.
- Water for injection 10mL – five
- Syringes – 50mL – two each
- Three way connector and minimal volume extension tubing – one each
- Additive labels – five
- Red drawing up needles - ten
- BSL kit
- scissors

- (**inside pocket**) Gloves – non-latex in a variety of sizes
- (**left outside pocket**)Sphygmomanometer, Stethoscope, Neuro torch, spare ECG dots
- **Inside pocket**
  - 500mL Normal Saline – one
  - 1000mL Normal Saline -one
  - 500mL Glucose 10% - one
  - Blood pump set – one
  - Giving set - one
  - Sharps container-attached to top of pack
- **Right side pocket**
  - pads 9x20 and 20x20 – five each
  - gauze swabs – five
  - steristrips
  - tegaderm
  - Documentation leaf (sleeve under defibrillator)
  - Resuscitation Drug List
  - Mobile Arrest Sheet – two
  - Pen and torch (check working)
  - Envelope – two
  - Mobile Arrest Equipment List

Appendix 6: Recognition of the Deteriorating Child

θ Any Health Care Team Member Worried About Clinical State can Page 6664 for PICU review

A. Airway Difficulties

- Onset of increased secretions
- Requires suction more than hourly
- Difficulties with tracheostomy
- Early signs of airway obstruction
- Stridor

Patient NOT ABLE to protect own airway – CALL 444

B. Breathing

- Tachypnoea with any of the following:
  - Recession
  - Grunt
  - Accessory muscle use
  - Cyanosis
  - Head bobbing
- Increase in oxygen requirements
  - Desaturation continues despite increased oxygen
  - Saturation's <92% in oxygen

Patient NOT Breathing – CALL 444

C. Circulation

- Tachycardic / Bradycardic with any of the following:
  - Pale
  - Cool/cold
  - Sweaty
  - Fever
  - Poor peripheral perfusion capillary refill > 3 seconds
  - Weak pulses
  - Blood pressure outside age-adjusted range

No Palpable pulse – CALL 444

D. Neurological

- Altered level of consciousness
  - Confusion
  - Agitation
  - Irritability
  - Difficult to rouse
  - Seizures
  - Increasing headache

Seizure – CALL 444 if unresponsive to treatment

Normal Ranges for Age

Age (yrs)	Resp rate	Heart rate	Systolic blood pressure
<1	30-40	110-160	70-90
1-2	25-35	100-150	80-95
2-5	25-30	95-140	80-100
5-12	20-25	80-120	90-110
>12	15-20	60-100	100-120

Appendix 7: Resuscitation Trolley action after an Arrest (Ward)