Basic Life Support

November 2011

Health
Hunter New England
Local Health District

John Hunter Hospital and John Hunter Children's Hospital
Cardiac Arrest Education Sub Committee HAHS
Acknowledging Jenny Carter, Rhonda Winskill, Fiona Smith

Revised 2006
Current Revision September 2011

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INTRODUCTION

This is a comprehensive adult and paediatric package developed in accordance with the **Australian Resuscitation Council Guidelines 2010**.

It is essential that all health care professionals know how to recognise early signs and symptoms of an impending respiratory and/or cardiac arrest and be competent in performing basic life support skills. “Knowing what can happen and to whom, is the key to timely intervention and prevention of sequelae (Gilea, 1986:557)

There are 4 sections to this package and it is anticipated the learner completes the sections depending on the learners’ requirements and the patients or clients for whom they care. The sections cover Basic Life Support for Adults, Neonates, Children and Midwifery.

The aim of this BLS package is to equip the Emergency Responder with the knowledge necessary to be safe and competent practitioners of Basic Life Support and to be able to actively assist the Emergency Response Team, Medical Response Team or Rapid Response Team in their Advanced Life Support roles.

Your facility may or may not have an emergency response team. They may also be otherwise known as Medical Emergency Team, Medical Response Team or Rapid Response Team. Generally, a member of the emergency response team (possessing Advanced Life Support training) will be the Team Leader and ward staff should follow their directions. There will always be at least one medical officer and one emergency responder unless your facility utilizes the Ambulance service. If this is the case then be guided by local facility procedures. Generally this requires placing a “000” call directly or through the facility switch and then following direction.

When a paediatric Respiratory and/or Cardiac arrest occurs it must be clearly stated to the switchboard that it is a paediatric arrest so that appropriate personnel can be paged and appropriate Advanced Life support equipment carried to the scene.

AIM

The aim of this SDLP is to provide up-to-date information that forms the basis of Basic Life Support (BLS) competence in all staff who cares for adults, neonates, infants and children. Annual BLS competence also requires a skills assessment at a face-to-face BLS up-date by a recognised BLS trainer/facilitator.

LEARNING OBJECTIVES

By completion of this package a staff member should be able to:

- Discuss the signs & symptoms of an impending arrest in all age groups
- Describe the procedure for calling for an emergency response
- Understand and explain the importance of :-
    - Prompt delivery of oxygen to the tissues and vital organs, i.e. the heart and brain
    - Reinstituting ventilation
    - Reinstituting circulation
    - Correcting any metabolic and/or acid base disturbances that have occurred as a result of the cardio-pulmonary arrest (Rogers, 1992:5).

- Discuss the BLS algorithm ands its application in their practice environment
- Discuss the technique of delivering effective chest compressions and rescue breaths while maintaining safety for the patient and self
- Discuss the different equipment including AED used in CPR, troubleshooting and application to their practice environment
- Understand and explain the importance to support the family & significant others during an arrest
- Reflect on their own emotional preparation to be active in an emergency situation

PRE-REQUISITES

Target audience for this SDLP is all health professionals who provide care for adults, neonates, infants and children in a health setting.

LEARNING PACKAGE OUTLINE

The package is designed to be a self-directed learning experience that will guide you through the literature, policy and clinical issues related to resuscitation in maternity, neonates, infants and children in combination with the resuscitation in adults section.

This package is developed within an adult learning framework so not all activities need to be documented but it is expected that you will complete them in order to facilitate your learning.

On completion and submission of this learning package a record of your completion will be added to your professional development record in MYLINK and you will be credited with PD hours. PD hours are accredited before the package is issued and carries a non variable amount of hours.

After completing this package you need to attend a face-to-face BLS training and assessment for you skill competency to be completed as per HNE Health mandatory training requirements.

This package should be considered with the DETECT e-learning modules which describe the deteriorating patient and early intervention to prevent arrest.

PROBLEM BASED LEARNING

This program is based on a problem-based approach to learning. This approach has been chosen to enhance critical thinking, and to create a body of knowledge that staff can apply to practice. Problem based learning (PBL) is characterised by the use of patient specific problems or situations as a context for developing problem-solving skills and for acquiring clinical knowledge.

HOW TO USE THIS RESOURCE

- This package will take 30-60 minutes to complete and it is expected all staff complete this package as part of their orientation and review this package yearly as preparation for their yearly competencies.
- Completion of this package is equivalent to Continuing Professional Development (CPD) hours which is a requirement for National Registration. A certificate identifying CPD hours will be given on the successful completion of the package.
- At the completion of this learning package you are asked to complete several questions and a problem based scenario related to the topic, and should be completed prior to attending your practical viva.
- There is a suggested reference list and it is by no means complete. Please read widely to facilitate your learning.
- This resource has been written from a Hunter New England Local Health District perspective so it is not specific to any one health facility. Throughout the package procedures from the John Hunter Hospital have been mentioned as an example of practice only.
- When complete you can return the package to relevant nurse educator/ CNS/CNC who will discuss it with you.

RECOMMENDED READINGS

- All relevant HNE Health policy and guidelines for recognition of the deteriorating patient and resuscitation including your local facility procedures
- The Between the Flags awareness and DETECT e-learning programs and DETECT workshop manual: *Detecting Deterioration, Evaluation, Treatment, Escalation and Communicating in Teams* 2011
- Australian Resuscitation Council Guidelines. Australian Resuscitation Council, November 2010. http://www.resus.org.au/
- NSW Ministry of Health (2008) Fetal Welfare Maternity Emergency and Neonatal Training (FONT) project training package.
- RESUS4KIDS paediatric resuscitation program accessed at www.resus4kids.com.au

PREFACE

ISBAR

Introduction

ISBAR (an acronym for Introduction, Situation, Background, Assessment and Recommendation) is a framework for structured communication. It prompts us to introduce ourselves, state the current situation, give relevant background, state our assessment and our recommendation to and/or request of those with whom we are communicating.

Situation

The ISBAR acronym provides a tool to structure communication in a constant and reliable way. Poor communication can contribute to poor or adverse clinical outcomes. ISBAR helps to make communication a meaningful exchange where expectations are made explicit. Good effective communication is absolutely essential in critical situations.

Background

Evidence shows that when a standardised approach is implemented in a receptive environment the effectiveness of the approach increases. Standardised forms of communication have been adopted in many high risk areas including health. The listener knows what to expect and becomes more attuned, whilst the speaker can better meet the listeners' needs. Hunter New England Health expects that all health staff adopt ISBAR as standard in all forms of communication both verbal and written.

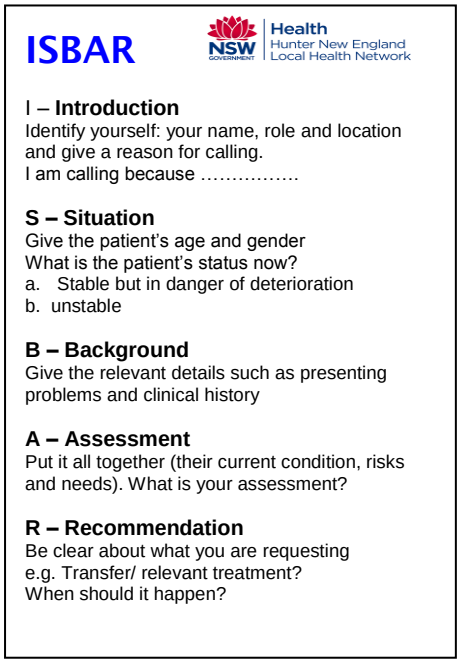
Assessment

ISBAR helps prioritise information for all parties. It decreases the chance of forgetting relevant information, helps decrease assumptions, misinterpretations and misunderstandings and encourages concise statements of fact.

Recommendation

It is recommended that the ISBAR standard form of communication is utilized during all stages of a critical event such as a cardiac or respiratory arrest. Alerting the medical or emergency response team, communicating to the medical or emergency response team on arrival and documenting treatment, outcomes and management plan in the patient notes are all stages where ISBAR should be utilised.

ISBAR Swing Tag Resource



ISBAR

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Local Health Network

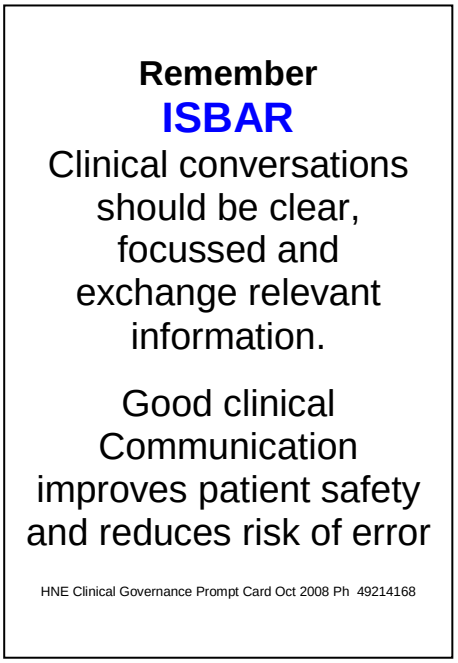
I – **Introduction**
Identify yourself: your name, role and location and give a reason for calling.
I am calling because …….

S – Situation
Give the patient's age and gender
What is the patient's status now?
a. Stable but in danger of deterioration
b. unstable

B – Background
Give the relevant details such as presenting problems and clinical history

A – Assessment
Put it all together (their current condition, risks and needs). What is your assessment?

R – Recommendation
Be clear about what you are requesting
e.g. Transfer/ relevant treatment?
When should it happen?



Remember
ISBAR
Clinical conversations should be clear, focussed and exchange relevant information.

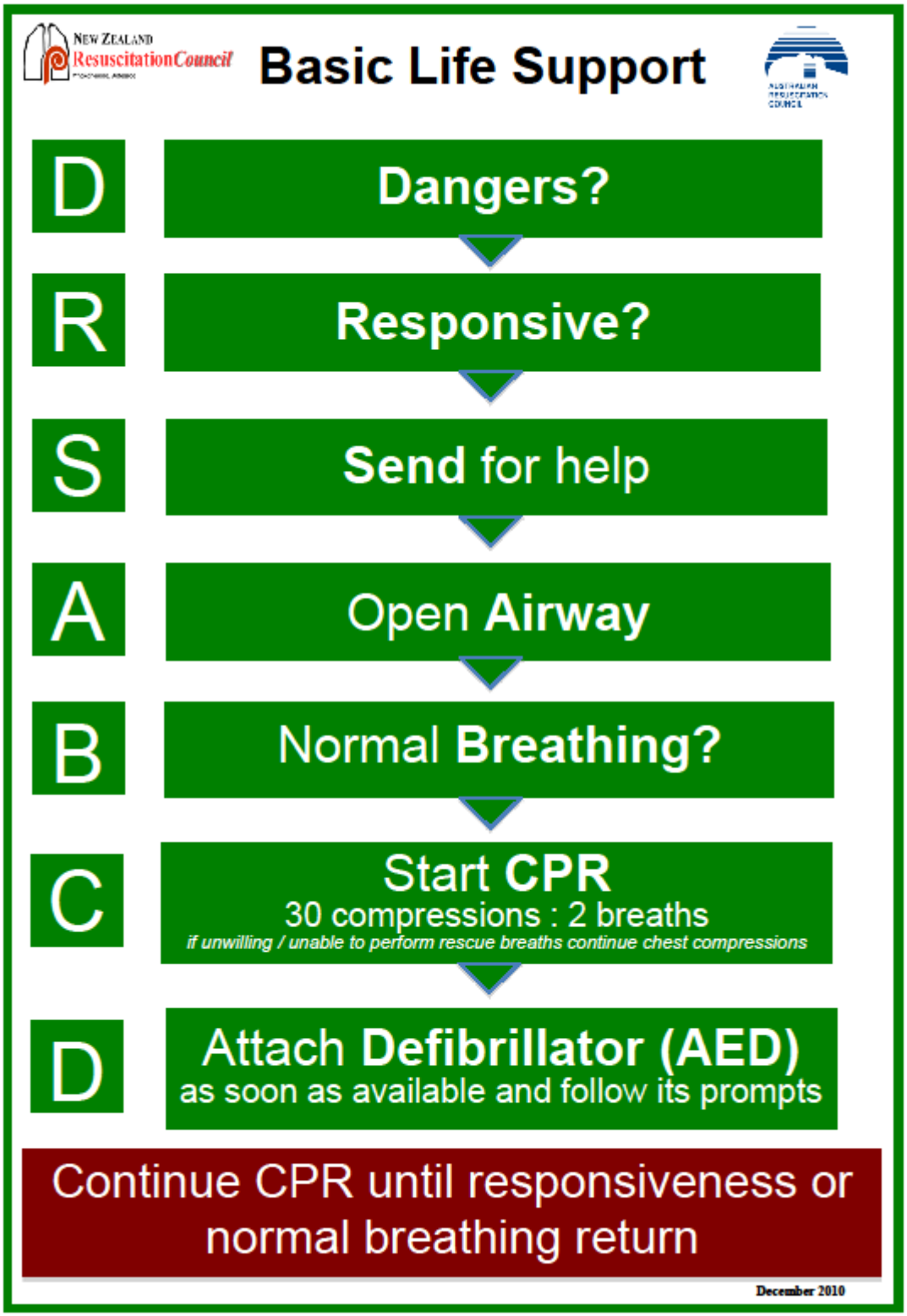
Good clinical Communication improves patient safety and reduces risk of error

HNE Clinical Governance Prompt Card Oct 2008 Ph 49214168

Please see your NUM or Educator in your area to obtain an ISBAR swing tag to assist in your clinical communication.

BLS Algorithm

The following flow chart clearly defines principle points of BLS in all age groups other than newborns and their sequence of order



BASIC LIFE SUPPORT SEQUENCE

D Danger

Check for Danger.

Don PPE.

Ensure Moving Safely principles adhered to at all times. Always consider your safety and then the safety of the patient, as the aim is to prevent any further injury or harm.

R Response

Check for a response from the person.

Use talk and touch techniques. Grasp and squeeze the person's shoulders firmly to elicit a response. Use simple commands: "Open your eyes squeeze my hand".

Assess the infant or child response to verbal and tactile stimulation, always supporting the head when gently squeezing the shoulders. An infant or child who does not respond is considered unconscious. "Cardiorespiratory arrest should be suspected when the infant or child is unresponsive and not breathing normally" (ARC guideline 12.2, 2010).

S Send for Help

Send for help.

Dial the emergency number in your facility.

Clearly state your name, location, the nature of the emergency and whether adult or paediatric victim. Ensure you are familiar with the process for gaining assistance in your current workplace/s.

A Airway

Open airway using head tilt / chin lift.

Clear the airway, turning head to the side.

B Breathing

Check for breathing by Look, Listen & Feel

If patient is unresponsive and not breathing normally, immediately commence compressions.

C Circulation

Begin 30 compressions followed by 2 breaths

D Attach the AED

Attach AED as soon as possible and follow the prompts.

Section One: Adult

Initially developed by:

John Hunter Hospital and John Hunter Children's Hospital

Cardiac Arrest Education Sub Committee HAHS

Acknowledging Jenny Carter, Rhonda Winskill, Fiona Smith

&

Revised 2006

Current Revision:

September 2011

Cath Kirkman NE Division of Surgery, John Hunter Hospital

Peer reviewed by Joanne West (CNE ICU and Rapid Response Team Co-Ordinator, JHH)

Next review date:

2015 in line with Australian Resuscitation Council Guidelines

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Basic Life Support is also covered in Detect programs therefore your attendance covers Basic Life Support mandatory requirements.

BASIC LIFE SUPPORT

This is the initial stage of resuscitation. Although mortality remains high for those patients post cardiac arrest, immediate commencement of BLS +/- early defibrillation with an AED (Automatic External Defibrillator) and gaining assistance of the Emergency response team remain key factors in improving the outcome for the patient.

BLS must be commenced **immediately** if the person is
Unresponsive and Not Breathing Normally

Even if the person is gasping occasionally, BLS should be commenced immediately.

BLS consists of seven principle points to remember:

D	Danger
R	Response
S	Send for Help
A	Airway
B	Breathing
C	Circulation
D	Attach the AED

AED = Automatic External Defibrillator

Remember, Moving Safely principles MUST be adhered to at all times.

AIRWAY

1. Clear the airway using finger sweep turning head to the side or suction with Yankeur Sucker.

2. Open the airway using the head tilt / chin lift manoeuvre. One hand is placed on the forehead or the top of the head. The other hand is used to provide the chin lift. The head (not the neck) is tilted back.

Chin lift can also be performed by placing the thumb over the chin below the lip and supporting the tip of the jaw with the middle finger and index finger lying along the jaw line (See Figure 1).

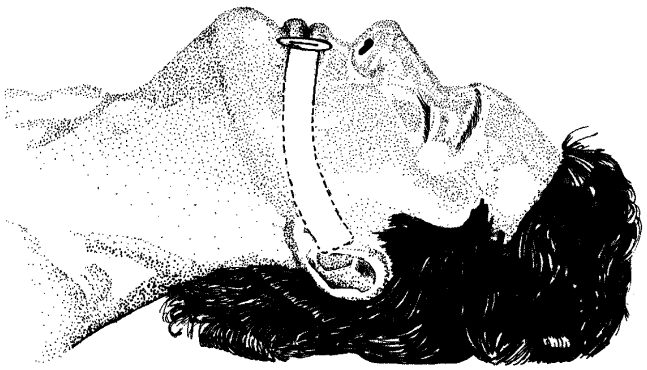
Figure 1

Loose fitting dentures should be removed. Well fitting dentures can remain in place.

If the airway still cannot be established a Guedel airway may be necessary

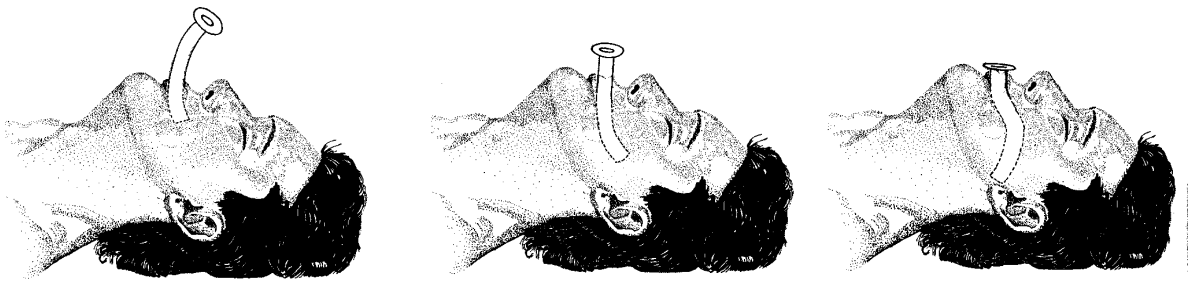
GUEDEL AIRWAY (ADULTS ONLY)

Select the size of the airway by measuring the approximate distance from the corner of the mouth to tragus (earlobe). It can also be measured from the centre of the mouth to the angle of the jaw.



(National Adult ALS program manual 2010 Resuscitation Guidelines)

Insertion is achieved by migrating the Guedel upside-down into the mouth. As soon as the distal end reaches the hard palate the airway is rotated 180 degrees and slipped behind the tongue into the posterior pharynx. The flange of the tube should sit comfortably on the lips <u>if</u> the device has been inserted correctly.



Remember a Guedel airway should only be used on an unconscious patient. Suctioning should be performed beside the Guedel and not through its lumen.

BREATHING

Look for movement of upper abdomen or lower chest
Listen for air escaping from the nose and mouth
Feel for movement of the chest and upper abdomen.

If the patient is not breathing normally, then commence 30 compressions immediately followed by 2 rescue breaths.

Pocket masks must be available and utilised in the hospital setting.

MOUTH TO MASK

Using the Laerdal Pocket Mask with one way valve and O2 outlet. Apply oxygen using the oxygen outlet on the mask.

Position yourself at the person's head and use both hands to maintain an open airway and hold the mask in place to maximise seal. Maintain head tilt and chin lift. Place the narrow end of the mask on the bridge of the nose and apply the mask firmly on the face. Inflate the lungs by blowing through the mouthpiece of the mask with sufficient volume and force to achieve chest movement. Remove your mouth to allow for exhalation. Look at the chest and watch for movement of chest and upper abdomen (See Figure 2).

Figure 2

BAG – VALVE – MASK (AMBUBAG OR LAERDAL)

Using this method an oxygen concentration of up to 98% can be achieved. The bag-valve-mask is attached to a mask and the recoil bag is compressed to deliver the breaths to the patient. Oxygen is applied via the oxygen outlet.

The Australian Resuscitation Council states that 2 trained people are required to manage Bag – Valve – Mask (Ambubag or Laerdal). One person manages the airway, mask and seal whilst the second person operates the bag. Therefore if external Cardiac Compression is needed a minimum of 3 trained people are required (See Figure 3).

Figure 3

If there is no chest movement?

1. Recheck head tilt and correct if needed.
2. Recheck chin lift and correct if needed.
3. Check for any airway obstruction by foreign material and clear if needed.
4. Check adequate seal of mask to the face and that the mask is applied correctly.
5. Recheck all equipment connections and check if the ambubag has a leak.
6. If using mouth to mask, blow more firmly.

Watch for gastric distention and regurgitation and aspiration caused by excessive ventilation volumes. Turn person's head to the side and quickly suction as required. Use enough ventilation volume only to the point where the chest rises.

CIRCULATION

Palpation of a pulse is unreliable and should not be used to assess the need for resuscitation. If patient is unresponsive and not breathing normally, immediately commence compressions.

Place your hands on the lower half of the sternum (Figure 4 shows where to place heel of palm).The heel of one hand is placed over the centre of the sternum with the other hand placed on top. Avoid compressing beyond the lower half of the sternum. Hand placement too high will be ineffective. Hand placement too low can cause regurgitation or damage to organs (See Figure 5).

Figure 4

Figure 5

Interruptions to compressions must be minimised. They should be rhythmic and allow equal time for compression and relaxation. Allow complete recoil of the chest after compression.

Remember if an air mattress is in place, it must be deflated in order for effective compressions to be performed. Ensure you know the correct procedures to deflate all air mattresses in your facility.

DEPTH OF COMPRESSION

The depth of compressions should be equal to one third of the chest wall with each compression, or at least 5cm for adults.

RATE OF COMPRESSION

Rescuers should perform compressions at a rate 100 compressions a minute.

QUALITY OF COMPRESSION

When performing compressions it is essential to change rescuers at least every 2 minutes so that rescuer fatigue is prevented. 5 cycles of CPR: 30 compressions + 2 breaths = 2 mins and is referred to as 1 loop of CPR. Rescuer fatigue will cause deterioration in compression quality particularly the depth of compression. Changing

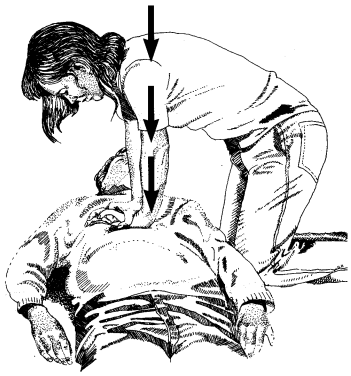
rescuers should be attended with the minimum of compression interruption. Rib fractures and other injuries are common to CPR but an acceptable consequence given the alternative of death

Proper Compression Technique

Effective compressions are accomplished by attention to the following guidelines:

1. Elbows are locked into position, the arms are straightened and the shoulders of the rescuer are positioned directly over the hands.
2. To achieve the best compression with the least effort, the rescuer leans forward until the shoulders are directed over the outstretched hands. The natural body weight of the rescuer falling forward provides the necessary pressure to depress the sternum.
3. The pressure must then be released to allow the heart to allow blood flow into the heart.

Remember that artificial circulation is not as effective as normal circulation and generates approximately 20 – 30% of normal cardiac output. It is therefore essential that CPR is performed correctly.



DURATION OF CPR

Rescuers should minimise interruptions to chest compressions and CPR should not be interrupted to check for response, breathing or pulses. Interruptions to CPR are associated with lower survival rates. CPR should continue until the person responds or begins to breathe normally or the leader of the Emergency response team directs CPR should cease.

DEFIBRILLATION

BACKGROUND

Automated External Defibrillators (AED'S) were initially introduced for use in 1979 in America for use by community personnel. The diagnostic feature of the AED, is achieved by measuring and analysing the impedance (resistance to electrical flow) across the heart muscle and the heart rate (if any). The accuracy of the diagnosis can be impaired by many factors such as: patient movement, muscle tremors, poor skin preparation before applying the pads, use of old or damaged pads, radio interference (portable radios transmissions in close proximity to the patient), digital mobile phone signal, contact with another person (including CPR).

The importance of defibrillation has been well established as an important part of resuscitation along with effective CPR. The development of **automated** defibrillators means that defibrillation is now considered part of BLS and should not be restricted to trained personnel.

Manual and Semi-Automated Defibrillators are in use in some areas, however only ALS trained staff should operate these.

REASON FOR USE

AED's are small, portable and lightweight making them easy to carry. This devise is able to accurately determine if the victim has a shockable rhythm, and can instruct the rescuer to deliver the necessary shocks quickly and safely. The AED must only be used on the unresponsive person who is not breathing normally.

Ensure that you know the location of and understand the model / type of AED used at your facility.

PREPARATION

- Remove clothing from the person's chest
- Remove excessive chest hair as much as possible. **AVOID** nicking or cutting the skin if using a shaver or razor. If possible, **AVOID** placing the electrodes over broken skin.
- Briskly wipe the skin dry with a towel or gauze. This mildly abrades the skin and removes oils, dirt, and other debris for better electrode adhesion to the skin.
- **DO NOT** use alcohol or antiperspirant to prepare the skin.

PAD PLACEMENT

Prior to placement

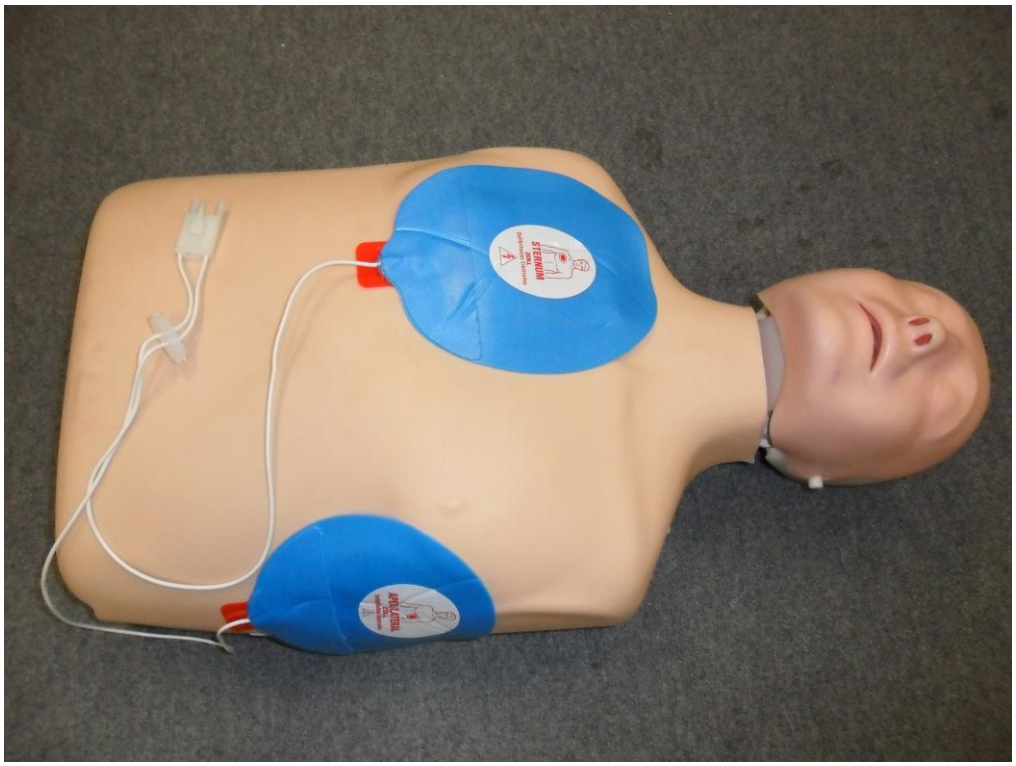
- Before applying the pads unpack them and make sure that they are within the used by period and that they are dry and in good order (See Figure 6)
- Remove any protective backing.
- Do not touch the contact surface of the electrode prior to placement

Placement

- All defibrillator pads will have a diagram on the outside of the packet demonstrating pad placement.
- Place the defibrillator pads in an anterior – lateral position.
- One pad is placed on the midaxillary line over the 6th LEFT intercostal space.
- The second pad is placed on the RIGHT parasternal area over the 2nd intercostal space (See Figure 7)
- Starting from one edge, firmly press the electrode on the patient's chest to eliminate air pockets between the gel surface and the skin (rolling technique). Firmly press all adhesive edges to the skin.

Figure 6

Figure 7



STEPS FOR USE

1. Confirm that the patient is unresponsive and not breathing normally.
2. CPR must be continued while the AED is turned on and the defibrillation pads are in place.
3. Only stop CPR when the AED voice prompts to do so
4. Stand clear of the patient. Some devices will begin to analyse the heart rhythm automatically and others require the operator to press an "ANALYSE" button. An audible voice prompt instructs the operator through this process. Once the rhythm has been analysed, the device tells the operator whether a shock is advised.
5. If a shock is advised, remain clear of the patient and press the "SHOCK" button.
6. Then continue CPR for 2 minutes and repeat steps 1-6.

SAFETY CONSIDERATIONS

AVOID placing the defibrillator pads over ECG electrodes (risk of burns or sparks), ECG leads (may melt), medication patches such as Nitrobid or Fentanyl, and implanted devices such as a pacemaker, or a central line insertion site

AVOID allowing oxygen from a resuscitator to flow onto the patient's chest during delivery of the shock (risk of fire)

NEVER use the machine on a wet patient or when the patient is lying in water

NEVER use the machine on a conscious patient

NEVER allow anyone to be in contact with the patient while the machine is diagnosing or defibrillating. Look to all staff and speak clearly stating "stand clear" prior to pushing the shock button.

AVOID defibrillating if the patient, operator and/or close bystander are situated in an explosive/flammable environment

AVOID having the patient in contact with metal fixtures such as the bed rails.

OTHER CONSIDERATIONS

ARREST TROLLEYS

Most areas within healthcare facilities have Arrest or Emergency Trolleys which hold emergency equipment and drugs. These trolleys must be checked and restocked as required regularly and after an arrest. Ensure that:

- All equipment is correct and working and not out of date
- All emergency drugs (or the drug box) are on the trolley and not out of date Portable oxygen cylinder is full
- Bag – Valve – Mask device is correctly connected and functional.
- Portable suction unit is available and in order.
- Defibrillator is plugged in, has power and is functioning and the correct defibrillator pads are available and are not out of date

Ensure you are familiar with the contents and layout of your unit's emergency trolley and your facility processes for restocking & replacement after emergency use.

DOCUMENTATION

It is important during an arrest situation that someone initiates and continues a documentation record. Most arrest trolleys have a standard arrest form which can be used. Information which should be documented includes time of arrest; defibrillation times; drugs and their dose, route and time delivered; intubation and ET size.

OXYGEN

Always use high flow oxygen. Never withhold oxygen in an arrest situation regardless of respiratory status (for example COAD or Chronic Obstructive Airways Disorder). When using Laerdal Pocket Mask or Bag – Valve – Mask (Ambubag), always connect oxygen to outlet.

SUCTION

Suction is used to remove oropharyngeal secretions. Units should generate at least 200mmHg of negative pressure. Ensure bedside suction (preferably High suction) is working and tubing and Yankeur sucker is available at the beginning of shift for all patients. If your bedside suction is not high flow, ensure there are high suction outlets available on the Arrest Trolley.

Ensure you know where and how the portable HIGH suction unit in your area works.

INTRAVENOUS DRUG ADMINISTRATION

The Emergency Responder should avoid using cannulas in lower limb veins (if another site available) as impairment of blood flow below the diaphragm does occur in cardiac arrest. IV drug administration should be followed by a flush of at least 20mls - 30mls and CPR continues to ensure the drug is circulated adequately.

Always remember to check the order with another Emergency Responder or medical officer prior to administration. State again the drug, dose and route aloud for all team to hear just prior to administration and ensure documentation is occurring. After administration state that the drug has been given.

DRUGS

Adrenaline is the primary drug commonly used during a cardiac arrest. It produces peripheral vasoconstriction and redirects available cardiac output to the myocardium and brain. The initial dose is 1mg (1ml of 1:1000 or 10mls of 1:10000). It is generally given regularly (usually every second loop of CPR = every 4 minutes).

Amiodorone is the second most common drug used in a cardiac arrest. It has effects on sodium, potassium and calcium channels as well as alpha & beta-adrenergic blocking properties. It is used when adrenaline and DC shocks have failed to revert pulseless VT or VF. The initial dose is 300mg with consideration of an additional dose of 150mg. NB: it is not compatible with normal saline and must be mixed with 5% Dextrose.

INTUBATION

Intubation is primarily undertaken in arrest situations to:

1. Secure the airway
2. Prevent aspiration of gastric contents into the lungs
3. Provide a means of delivering high oxygen concentrations
4. Provide alternate route for drug administration

Some emergency or rapid response teams will bring their own intubation equipment otherwise it will be on the arrest trolley.

Essential equipment for Intubation:

- Laryngoscope (ensure light working / not loose) and appropriate blades
- Endotracheal tube (Females size 8, Males size 9)
- Yankeur Sucker and suction
- 10ml syringe to inflate ETT cuff
- Trache tape to secure ETT tube
- Bag valve mask device / resuscitation mask connected to O_2
- Guedels airway
- Lubricant
- Easi cap CO2 detector

If not already occurred:

- Remove head of bed, pull out from the wall to allow space for doctor to intubate.
- Remove patient dentures if required.
- Connect Yankeur sucker to high suction and ensure it is working
- Ensure Bag/valve/mask with reservoir bag attached and O2 at 15L/min connected is ready for use

MANUAL HANDLING

No patient is to be lifted even in an emergency arrest situation. Leave them on the floor until person is stable and then use appropriate lifter to move person to bed.

If patient is out of bed, use moving safely techniques to lay the patient flat. This might mean straightening the patients legs, then pulling on the patient's legs with 2 people, whilst a 3rd person supports the patient's head to protect them from harm.

IN SUMMARY

ROLE OF INITIAL EMERGENCY RESPONDER:

Initiate **D R S A B C D** and stay with person. The prime responsibility of the initial emergency responder is then A. B. C.

ROLE OF SECONDARY EMERGENCY RESPONDER:

- Call the Emergency response team (for example 7700 at the John Hunter Hospital) State nature of emergency, exact location and whether Paediatric or Adult
- Take Arrest Trolley to patient's bedside
- Clear immediate area / screen patient
- Set up suction
- Connect patient to defibrillator monitor and turn on
- Commence record of arrest
- Set up for IV access (if none present)

The number of ward staff present at an arrest (i.e. time of day) will determine what can be achieved prior to the arrival of the team.

Upon arrival of the team the Emergency Responder's role will expand to support aspects of Advanced Life Support.

- Continue CPR
- Provide a history of patient and event
- Administer drugs as ordered by the team leader
- Record administration of drugs, defibrillation and other interventions.

Note: the emergency responder is a vital member of the resuscitation team and accordingly the emergency responder's level of knowledge must enable them to initiate and perform BLS and provide assistance to the ALS team in their role.

REVIEW QUESTIONS: BLS PACKAGE

Name: Pay Roll Number: Date:

Q1. What is the emergency number in your facility?

Q2. What information do you need to give when you make an emergency or rapid response call?

Q3. What do you need to consider when you perform cardiac compressions?

Q4. When would you use a Guedels airway and how would you select the correct size?

Q5. What are the primary safety considerations if the patient is to be defibrillated?

Scenario 1
An elderly patient has collapsed in the bathroom on the toilet. What are your immediate actions? Include in your answer how to move this patient safely

Scenario 2
You find a patient collapsed beside his bed. You are the only Emergency Responder in the ward at the present time. What are your immediate priorities?

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Section Two: Infants and Children

Kaleidoscope
HUNTER CHILDREN'S HEALTH NETWORK
HUNTER NEW ENGLAND
NSW HEALTH

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Date: September 2011

Date Due: October 2015

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This package is based on work by Margo Nancarrow (NE, JHCH) and Fiona Smith (CNE ICU, JHH)

Pre-requisites

Target audience for this section of the SDLP is all health professionals who provide care for infants and children in a health setting.

The guidelines followed in paediatrics are different from newborn/neonatal guidelines which are covered in the following section, and all are based from the Australian Resuscitation Council guidelines and the International Liaison Committee on Resuscitation (ILCOR) guidelines

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INTRODUCTION

The care of sick children is a challenging practice that requires specific skills, knowledge and understanding of children and their families. **Cardio-Pulmonary arrest is rarely a sudden event in the paediatric patient,** therefore it is essential that all health care professionals employed to care for sick infants and children know how to recognise early signs and symptoms of an impending respiratory and/or cardiac arrest and be competent in performing basic life support skills (Hazinski, 1992:75).**Respiratory dysfunction is the most frequent cause of arrest in the paediatric patient.** Hence the emphasis in paediatric resuscitation is always on airway patency and adequate ventilation (Curley and Ead, 1996). Remember, *"The survival rate and long-term neurological outcome rate for children who suffer pure respiratory arrest with timely intervention are dramatically better than those of secondary cardiac arrest, even when intervention is rapidly initiated."* (Curley, Smith and Moloney-Harmon, 1996: 965)

AGE DEFINITIONS

An infant is < 1 year of age

A child is 1 - 8 Years

An older child is > 9 years of age is managed as per the adult ARC algorithms

> *"The exact age at which paediatric techniques…should replace those used for newborns is not certain…Infants aged more than a few hours beyond birth, i.e., newborns, should be managed according to paediatric guidelines" (ARC guideline 12.1, 2010, pg 1)*

CAUSES

Majority of cardio-respiratory collapse in infants and children are caused by:

- Hypoxaemia
- Hypotension
- Or both

Respiratory causes include:

a) Obstruction e.g. foreign body, Croup, Epiglottis
b) Disease e.g. Pneumonia, Asthma, Bronchiolitis,
c) Apnoea e.g. prematurity
d) Drug overdose e.g. Narcotic toxicity, Sedation

Shock can be caused by:

a) Hypovolemic e.g. gastroenteritis, blood loss, burn injuries
b) Septic e.g. CVAD infection, pneumonia
c) Cardiogenic e.g. congenital defects
d) Distributive e.g. neurogenic injury, anaphylaxis

Cardiac arrhythmias are rare but can be caused by:

a) electrolyte abnormalities
b) Toxic drug ingestion
c) Congenital cardiac defects
d) Arrhythmias e.g. prolonged GT syndrome
e) Cardiomyopathy
f) Traumatic injuries

If not corrected promptly the resultant hypoxia and hypercapnia can precipitate severe bradycardia or asystole, the most common arrhythmia seen in paediatric patients.

Paediatric respiratory arrest is infrequently a sudden event. The hallmarks or 'red flags' of impending respiratory arrest are

- A change in the child's level of consciousness. The child's level of consciousness moves from restlessness to agitation, irritability, lethargy and finally obtundation if hypoxia and hypercapnia is permitted to persist.

- At the same time a change in the child's respiratory rate and effort is observed. Initially the respiratory rate is increased, with or without increased effort. However if hypoxia and hypercapnia persist the respiratory rate increases further and becomes shallow, with retractions nasal flaring and expiratory grunt

- Tachycardia is evident with pale or mottled skin; cool extremities and poor capillary refill time indicate cardiovascular compromise (Hazinski, 1992:75).

- It is important to remember that some routine medical or nursing procedures can cause stress in the child, and if performed on a stressed infant or child they can trigger an arrest

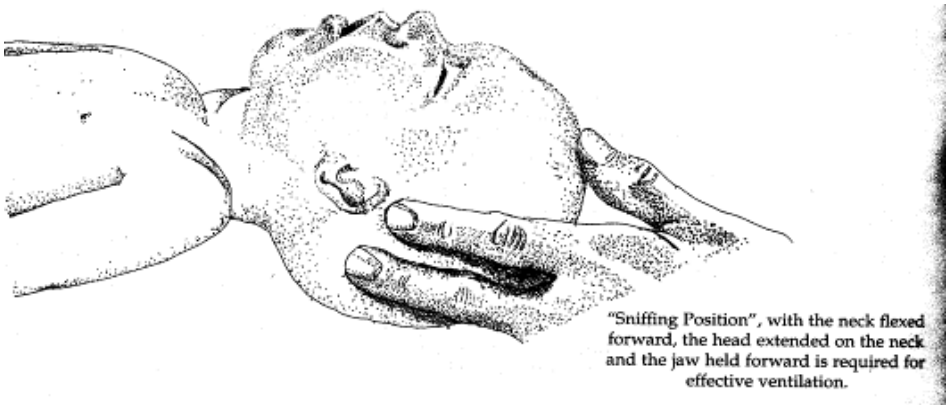
BASIC LIFE SUPPORT

Please refer to the Basic Life Support algorithm in the preface of this package as the basis for this section

AIRWAY

Open and clear the airway by correct positioning and removal of fluid or a visible object, with airway taking precedence over any injury (ARC guideline 4, 2010). Do not routinely roll the patient to their side unless there is fluid obstructing the airway and no access to pharyngeal suction (e.g. Yankauer's). Finger sweep should only be considered >1 year of age and if an object can be seen, and caution must be used as an injury from biting can occur (ARC guideline 4, 2010).

An INFANT's head should be placed in the neutral position (see diagram below) as the trachea is soft and can be easily distorted by excessive backward head tilt or jaw thrust.



"Sniffing Position", with the neck flexed forward, the head extended on the neck and the jaw held forward is required for effective ventilation.

The lower jaw should be supported at the point of the chin with the mouth kept open, but avoid placing fingers or pressure on the soft tissue of the neck, if necessary adjust the position by tilting the head back very slightly to provide an open airway (see below).

Head-tilt / chin-lift

An orophayngeal airway can be used to maintain an open airway. The approximate size is the equivalent distance from the centre of the lips to the angle of the mandible (concave side up). An inappropriate size can cause laryngospasm, mucosal trauma or obstruction, and the airway is placed in an infant concave down using a tongue depressor (see below)

A CHILD's airway should be managed using the same technique as an adult using the head tilt-chin manoeuvre, avoiding excessive force (see section 1 of this package).

For management of foreign body airway obstruction (choking) please refer to the ARC Guideline 4, 2010. http://www.resus.org.au

BREATHING

Opening an airway may often stimulate an infant or child to breath, so it is necessary look, listen and feel for respirations.
If spontaneous breathing is not immediately resumed rescue breathing should be commenced utilising the correct sized equipment.

Initially 2 breaths are given; if the infant or child does not spontaneously commence breathing then subsequent ventilations are given at the normal respiratory rate and depth for the age group, allowing 1 second for each inspiration. Adequate ventilation is assessed by looking & feeling for the rise & fall of the chest.

EQUIPMENT

Please note that a pocket mask or an appropriate sized self-inflating bag must be available and utilised within the work setting

POCKET MASKS

Ensure a tight seal and follow the instructions described in the adult section. Pocket masks are often a 'one-size-fits-all' size, although a paediatric pocket mask is available.

If using a standard pocket mask on an INFANT, the mask needs to be turned up-side down to prevent pressure on the eye socket to prevent the Vagus nerve being stimulated which can cause a fall in blood pressure (see photo below).

SELF-INFLATING BAG-VALVE-MASK

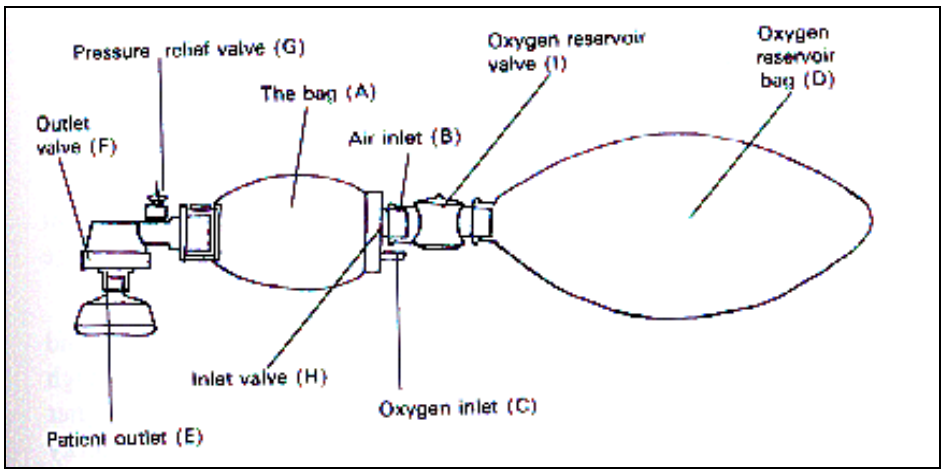
These devices can be either non-disposable or disposable, it is important to familiarise yourself with the equipment that is available in your area.

There are 3 sizes to choose from (listed from the top in the picture below):

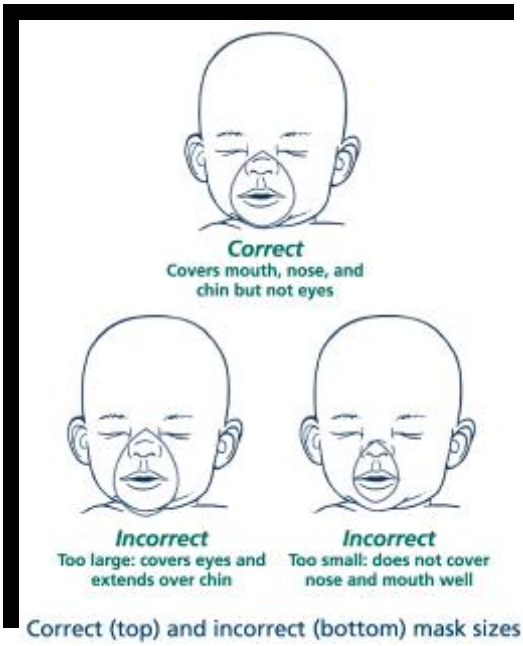
- Adult bag - for anyone >25kgs (1600ml)
- Paediatric bag - for infants/children >2.5kgs to < 25kgs (500ml)
- Preterm bag - for newborns & neonates < 2.5kgs (240ml)

The significant difference for the paediatric and preterm bag is the additional pressure release valve which releases at 40mmH_20, which potentially reduces the risk of barotrauma to the lungs. It is important that when checking the function of these bags this valve is checked as well. This valve can be over-ridden by holding it down if the infant or child has high resistance or low compliance lungs.

It is recommended that 2 persons are used to operate the adult-sized bag, this is not necessary for the smaller sized bags.



FACE MASKS



Correct (top) and incorrect (bottom) mask sizes

The correct size face mask for infants and children "extends from the bridge of the nose to the space between the lower lip and point of the chin" (ARC guideline 12.6, 2010).

OXYGEN

In both cases (Pocket mask & self-inflating bag-valve-mask) it is important to connect to high flow oxygen as soon as possible. When using a Self-inflating bag-mask-valve the reservoir bag needs to be filled as soon as possible as this enables an inspired oxygen concentration of 98% to be achieved, without the reservoir bag being filled oxygen concentration may only reach 50%.

If ventilation attempts are unsuccessful:

a) Reposition the child's head and attempt to ventilate again
b) Check for obstruction and remove it
c) Check ventilation depth
d) Insert Guedels airway

In the post-recovery phase after a successful resuscitation it is important to replace the Self-inflating bag-valve-mask with appropriate continuous oxygen mask/nasal prongs as "minimal and unreliable amounts of oxygen are released passively from the patient exit valve despite introduction of high flow oxygen into the resuscitation bag" (ARC guideline 12.6, 2010)

CIRCULATION

> "Cardiorespiratory arrest should be suspected when the infant or child is unresponsive and not breathing normally. Additional signs are pallor, cyanosis and absence of pulse. Healthcare personnel may use pulse palpation in their assessment but valuable time should not be wasted. If a pulse cannot be confidently identified within 10 seconds, or there is uncertainty, cardiopulmonary resuscitation (CPR) should be commenced. In two studies of paediatric cardiac arrest, healthcare personnel could not reliably determine the presence or absence of a pulse when other information about the presence or absence circulation was unknown to them. (ARC guideline 12.2, 2010, pg 1)

If a pulse is easily identifiable chest compressions should be commenced:

In an infant or child if < 60 beats/min

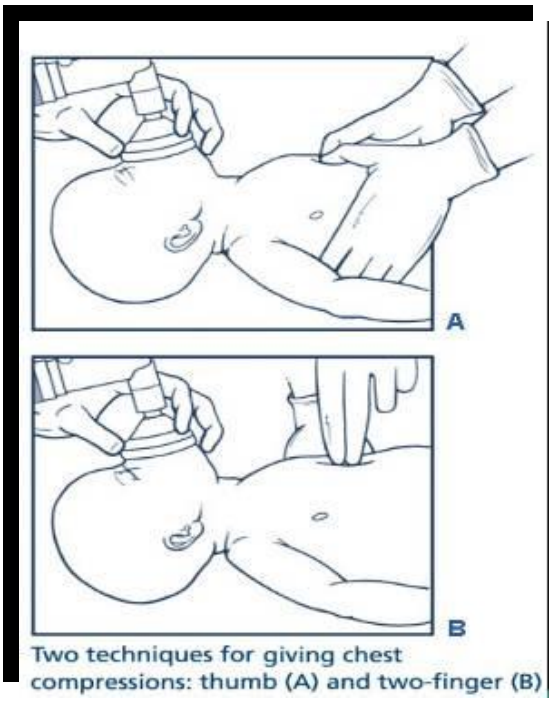
DEPTH OF COMPRESSIONS

At least one third of the dimension of the chest which is approximately:

- 5cm for Children
- 4cm for Infants

METHOD OF COMPRESSIONS

For an Infant the two-thumb technique is the preferred method, ensuring that chest expansion isn't restricted during inspiration. The two-finger method can be used especially for 1 rescuer situations. Visualise the centre of the infant chest as this equates with the lower half of the sternum



Two techniques for giving chest compressions: thumb (A) and two-finger (B)

For a child chest compression can be either with the heel of one hand or with two hands as for adults, ensuring that pressure on the ribs and abdomen is avoided.

Once chest compressions have been commenced the key principles to maximise efficiency are:

- Minimise interruptions
- Have the patient on a firm surface
- Compression is the be directed to the lower half of the sternum
- Avoid the lower end of the sternum as it can cause regurgitation and damage to organs
- Avoid the upper end of the sternum as this reduces efficiency
- Aim for a rhythmic motion with equal compression and recoil time
- Compression should be a 'jabbing' motion
- Avoid leaning on the chest during recoil

COMPRESSION RATIOS, SEQUENCES AND RATES

For all healthcare providers the ratio for infants and children is 15:2 with pauses for ventilation when using bag-valve-mask.

(Note: If you are teaching resuscitation to lay persons the ratio is 30:2)

Pausing compressions for ventilation needs to be minimised so chest compression should be recommenced during the expiratory phase of the second inflation (ARC guideline 12.2, 2010, pg 4).

The rate of compressions is approximately 100 per minute, i.e. 2 compressions per second with pauses for ventilation. Faster compressions have not been shown to be more effective. Fatigue is likely therefore it is recommended that the person doing the compressions is changed every 2 minutes, while minimising interruptions to compressions while assessing for spontaneous return of circulation.

5 cycles should be achieved in 2 minutes = 75 compressions & 5 breaths per min. Assess the effectiveness of cardio-pulmonary resuscitation methods by assessing skin colour, skin temperature, ECG monitoring and the presence of pulses.

Once a patient has been intubated chest compressions should not be interrupted and ventilations should be 12-14 per minute

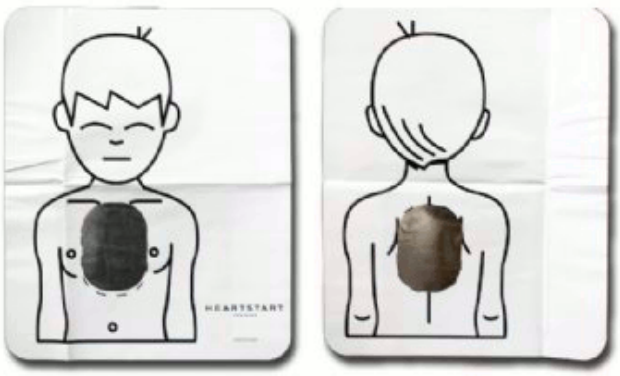
ATTACH DEFIBRILLATOR

Display of the electrocardiogram (ECG) should be attempted simultaneously with commencement of resuscitation. This can be achieved by using chest leads, defibrillator paddles or pads.

Considerations for placement of defibrillation pads/paddles for 1-8 years of age include:

- Preferable to use paediatric sized pads/paddles and use the adult positions if possible
- If paediatric sizes not available you can use the adult pad/paddles
- Do not allow the pads/paddles to touch

- If they are too large you risk arcing and you should use the front-back position (anterior-posterior) when 1 pad is placed on the upper back between the shoulder blades and 1 pad is on the front slightly to the left
- All standard precautions used when defibrillating adults apply



In infant and child resuscitation a variable dose defibrillator is preferred, but a semi-automated external defibrillator (AED) may be used for 1-8 years of age, note that defibrillation is rarely used for infants (<1year). If a shockable rhythm is detected the dose is 4J/kg for infants and children or 50 joules can be used if only an adult dose attenuated AED is available. If an AED is available the cue provided by the device should be followed. After defibrillation CPR needs to be recommenced and return of spontaneous circulation assessed after 2 minutes.

ADVANCED LIFE SUPPORT

Techniques included in advanced life support include:

- Providing airway adjuncts including endotracheal intubation or laryngeal mask airway (LMA)
- Waveform capnography
- IV/IO access
- Assessing rhythm, determining if it is shockable or not, and administrating defibrillation
- Drugs, including adrenalin 10mcg/kg and amiodarone 5mg/kg
- Considering and correcting the cause of the arrest

FAMILY & POST- RESUSCITATION CARE

Parents/carer's should always be kept closely informed during resuscitation. Research studies have shown that most families would prefer to be offered the opportunity to be present during the resuscitation of their infant or child (Kleinman et al, 2010, pgS467). Some studies have also shown it is beneficial for family members to be present if subsequently the patient dies (Kleinman et al, 2010, pgS467). The key issues associated with family presence include:

- Family members may experience emotional trauma from being present
- Healthcare personnel performance may be affected
- If resuscitation is unsuccessful or treatment is being withdrawn the family need to be informed before this occurs
- Follow-up discussion and support should be routinely offered to family

The sudden deterioration of an infant or child also tests the abilities of staff who respond and the psychological impact can be significant. Regular education and sensitive debriefing sessions should be part of the follow-up care after resuscitation (ARC guideline 12.7, 2010, p3).

Post-resuscitation care of a patient may include:

- Oxygen therapy +/- mechanical ventilation
- Inotropic infusion
- Renal support
- Seeking and treating the cause
- Assessing for CPR complications involves:
    - Temperature
    - X-ray for rib fractures & position of ETT
    - Blood sample for haemoglobin, pH, gas tensions, electrolytes and glucose
    - Cardiac monitoring and possibly echocardiogram

Infants and children who are less likely to recover successfully have suffered prolonged global hypoxia, hyperthermia, hyperglycaemia or hypoglycaemia. The prediction of outcome is not reliable, but tends to be better if it is a respiratory arrest alone or occurs in a hospital (ARCG guideline 12.7, 2010). In the absence of reversible causes, and no return of spontaneous circulation (ROSC) prolonged resuscitation is unlikely to be

successful in paediatrics and the decision to cease resuscitation should be considered using the following factors:

- Pre-arrest status
- Duration of arrest
- Response to resuscitation
- Remedial factors
- Duration & quality of resuscitation
- Likely outcome
- Opinions of experienced personnel
- Desires of parents/guardians
- Availability of extracorporeal life support

REFERENCES

Australian Resuscitation Council. (Dec 2010) *Australian Resuscitation Council Guidelines*

Hazinski M.F. (1992) Advances and controversies in Cardio-pulmonary resuscitation in the Young. *Journal of Cardiovascular Nursing*, Volume 6, (3), pages 74-85.

Kleinman ME, et al (2010). Part 10: Pediatric basic and advanced life Support: 2010 International consensus on cardiopulmonary resuscitation and emergency cardiovascular care science with treatment recommendations. Circulation 2010, 122: Suppl 2, S466- S515. Available at http://circ.ahajournals.org

SCENARIO 1 & QUESTIONS

A 3 month old infant Donald in your care was admitted with bronchiolitis this shift and is currently receiving oxygen 1.0L/min via nasal prongs and has signs of moderate respiratory distress. You have just left the room while his mother is attempting to give him a short breast feed when suddenly his mother calls out for help. Donald is unresponsive and doesn't appear to be breathing normally, he is also mottled looking.

What whould be your first three actions in this situation?

1)

2)

3)

Despite your efforts to stimulate Donald he is not responding and you have made the decision to begin breathing for Donald using a self-inflating bag-mask-valve.
Describe which bag you will choose from the arrest trolley, how you will check it is working and how you will use it to support Donald's breathing?

1)

2)

3)

Donald responds to your bagging and spontaneously starts breathing after 30 seconds. Describe your nursing considerations for post-resuscitation care for Donald and his mother and the signs of an impending arrest that you will monitor for?

1)

2)

SCENARIO 2 & QUESTIONS:

You are working in the ED department when a 5 year old girl Millie is brought in by ambulance after drowning at a swimming pool. When Millie arrives she is being ventillated using a bag-valve-mask via an ETT by the ambulance team and her mother is beside her. As Millie is moved to the trauma trolley Millie's colour becomes pale and her heart-rate falls to 40b/min.

Describe how you would commence compressions?

How would you support the mother at this time?

Describe how you would attach the defbrillator that is in your clinical area to Millie?

Describe how you would apply the BLS algorithym to your own clinical environment?

D)

R)

S)

A)

B)

C)

D)

Section Three: Newborns and Neonates

Kaleidoscope
HUNTER CHILDREN'S HEALTH NETWORK
HUNTER NEW ENGLAND
NSW HEALTH

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Date Due: December 2013

Acknowledgements:

This package is based on work by Margo Nancarrow (NE) and Fiona Smith (CNE)

Pre-requisites

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INTRODUCTION

The document outlines the basic principles for neonatal resuscitation. While it is focused on what is done following birth of a newborn the principles are the same while the baby is being cared for in the Neonatal Intensive Care Unit at the John Hunter Children's Hospital. Once the newborn leaves the NICU or the post-natal ward paediatric principles of resuscitation should be followed.

RESUSCITATION

Being prepared for resuscitation is fundamental to good resuscitation. At the beginning of every shift you are responsible for checking the resuscitation equipment next to the infant's bed. In Delivery Suite the equipment is checked by midwives but if you are asked to attend a delivery it is your responsibility (with the medical/NNP support) to check the resuscitation trolley and equipment. If you are working in the NICU you need to become familiar with the resuscitation trolley in level 2 and 3.

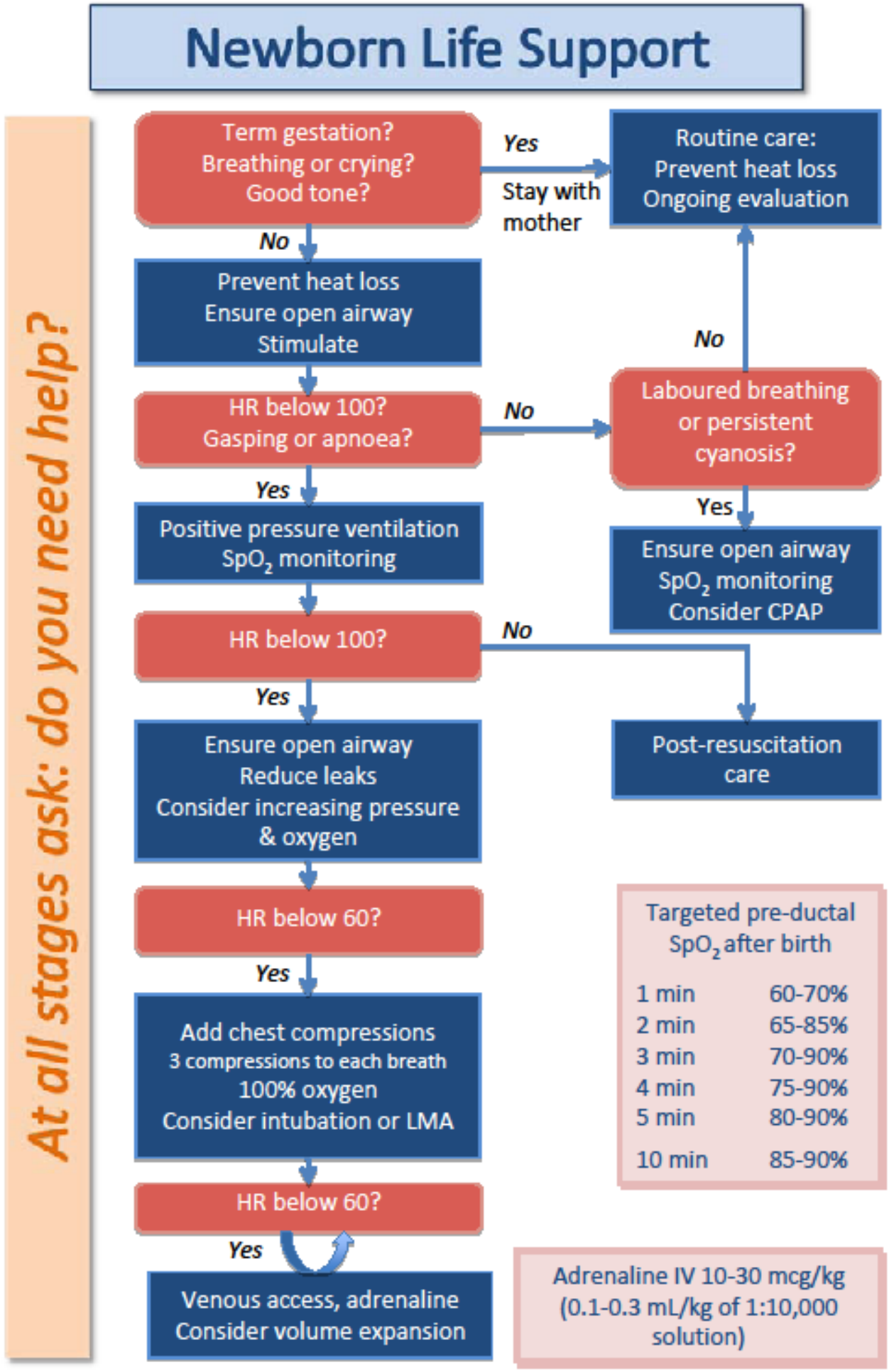
PACE OF RESUSCITATION

Each set of actions in the algorithm should be applied for about 30 seconds, and then response should be assessed. If the heart rate, breathing, tone and oxygenation do not improve or the infant is deteriorating, progress to the next step in the algorithm

REMEMBER

Resuscitation of a newborn is broken down to 30 second intervals. AFTER 30 seconds REVIEW and then continue as necessary. Continually repeat your evaluation after each 30 seconds.

While it is not documented on the algorithm maintaining the newborn's temperature is also fundamental towards a successful resuscitation and should be reviewed every few minutes.



(Australian Resuscitation Council Guidelines 2011)

TERMINOLOGY

Newborn

Refers to babies in their first few minutes to first few hours following birth

Neonate

Refers to babies less than 28 days of life

Infant

Refers to the babies first year of life including the neonatal period

These guidelines relate specifically to babies who are either newborn or in their neonatal period. Babies who are term and are beyond their newborn period may be resuscitated following the Paediatric Advanced Life Support guidelines.

Approximately 10% of newborns require some form of assistance in breathing at time of birth. However, only 1% required extensive resuscitation.

PERSONNEL

All personnel who attend births or work in a Special Care or Neonatal Intensive Care Unit should be trained in basic newborn resuscitation skills.

EQUIPMENT

The need for resuscitation at birth cannot be anticipated. However, resuscitation equipment and drugs need to available for all births and in the nurseries. This equipment should be regularly checked for completion and operational.

ENVIRONMENT

TEMPERATURE

Newborn and neonates are at risk of hypothermia so it is imperative that precautions are taken to ensure that the newborn/neonate is in a warm, draft free area. For every 1C fall in temperature there is a 28% increased odds of dying and 11% increased odds of late onset sepsis. It is imperative that heat loss is minimised and this can be done by:

At Delivery

Very low birth weight preterm – ambient temperature at least 26^0C do not dry and place polyethylene sheet around the baby (pic 1), and place a hat on the head. You can also place a polyethylene sheet across the baby (pic 2)

Picture 1

Picture 2

Term or near to term – dry and remove wet towels and linen immediately ensuring that the new linen is warm

After Birth – Neonate

Neonates nursed in incubators or open care systems – ensure the crib temperature is adjusted to ensure heat loss does not occur when doors are opened or lids lift.
Neonates nursed in cots – place on a warm resuscitation trolley as quickly as possible

Identification of at Risk

There is a significant list of risk factors that increases the risk of a newborn/neonate requiring resuscitation and they maybe considered under the following headings:-

- Maternal risk factors
- Fetal risk factors
- Intrapartum risk factors
- Neonatal risk factors

In most cases newborn/neonates have a respiratory arrest followed by a cardiac arrest.

ASSESSMENT OF THE NEWBORN/NEONATE:

- Tone
- Heart Rate
- Respiratory Assessment

Further assessment throughout the resuscitation is based on the infant's heart rate, breathing, tone and oxygenation (with pulse oximetry). Prompt heart rate increase is the best indicator of resuscitation efficacy.

TONE

Tone is subjective and dependant on gestational age. If the newborn/neonate has good tone (is moving limbs with a flexed posture) it is unlikely to be severely compromised whereas a very floppy infant (not moving and extended posture) is very likely to need active resuscitation.

STIMULATION

- Brisk but gentle rubbing to dry and stimulate the newborn at time of birth
- Brisk but gentle rubbing while unwrapping and or undressing

NB. You should not stimulate a non vigorous newborn exposed to Meconium. The newborn should be intubated immediately and suction applied. Stimulation should only occur once suction is complete.

HEART RATE

The most appropriate way to determine the heart rate in a neonate is to listen with a stethoscope. The pulse may be felt at the base of the umbilical cord but is only reliable in the first minutes of life and if there is not felt it does not mean the heart rate is absent. All other central and peripheral pulse are unreliable sign of heart rate. Heart rate should be 110 – 160/min. If heart rate less than 100/min assisted ventilation should be instigated.

RESPIRATORY ASSESSMENT

At Birth

Breathing rates are often difficult to assess immediately after birth as the newborn will often pause its breathing efforts for a few seconds. It then should establish a normal breathing pattern. To assist in this position of the head, jaw and neck should be correct (see below) to maximise the airway.

After Birth

Breathing rate of a neonate should be between 40-60 breaths per minute. Breathing is often difficult to assess immediately after birth as it takes time to establish a good breathing pattern. Recession, retraction or indrawing of the lower ribs and sternum, or onset of persistent expiratory grunting are signs that the baby is having difficulty expanding the lungs. Persistent apnoea, particularly associated with hypotonia and heart rate ≤100min is a very serious sign and the baby requires positive pressure ventilation

Colour

Colour is a poor sign of oxygenation as it is difficult to assess accurately. It is normal for babies to initially be blue at birth and while they will start to look pink after the onset of breathing, hands and feet may remain bluish. It is important to place a pulse oximeter on as soon as possible to check oxygenation.

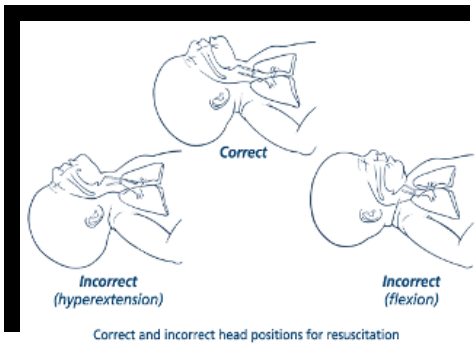
Extreme pallor can indicate severe acidosis, hypotension due to poor cardiac output with or without hypovolaemia, or sometimes severe anaemia.

Pulse oximetry

It is recommended that all babies requiring resuscitation and/or respiratory support a pulse oximeter should be attached.

Positioning the infant to open the airway

Place the infant supine on the resuscitaire with the head in a neutral position. It may be appropriate to place a rolled towel under the shoulders if the newborn has extensive caput to bring the head into a neutral position. Extend the head slightly to the "sniffing" position if the infant is breathing (but ineffectively) as the airway may be obstructed.



Correct and incorrect head positions for resuscitation

Mouth and Pharyngeal suction

Most newborns do not require suctioning of the nose, mouth or pharynx after birth. They clear their airways very effectively and suctioning can delay the normal rise in oxygenation.

If there is Meconium, blood clots, tenacious mucous or vernix it may need to be cleared. However, suctioning can cause laryngeal spasm, trauma to the soft tissue and bradycardia may occur. It can also delay onset of spontaneous breathing. Therefore, any pharyngeal suction should be done briefly and with care.

Suction should not be used except when newborns show obvious signs of obstruction.

Pharyngeal suction maybe required to visualise the vocal cords during intubation.

Use a large bore suction catheter e.g. Fg 10 or Fg 12, pass it no more than 5cm from the lips in a term infant and should be limited to only a few seconds.

The negative suction pressure used should not exceed 100 mmHg (13 kPa, 133 cmH2O, 1.9 Psi)

Management of the infant born through meconium stained amniotic fluid

Aspiration of meconium before or during birth or during resuscitation can cause meconium aspiration syndrome and any baby born through Meconium are at risk.

Intrapartum Pharyngeal Suction

It is NOT recommended to suction the infant's mouth and pharynx before delivery of the shoulders.

Endotracheal suction

Routine endotracheal suction of babies who have Meconium stained liquor, and who are vigorous is also discouraged.

In babies who are non-vigorous, endotracheal suction maybe preformed as it may remove Meconium from the trachea. It must be noted that if tracheal suction is performed it MUST be BEFORE spontaneous or assisted respirations have commenced.

Tactile Stimulation

Drying and stimulation are both assessment and resuscitative interventions. If, in response, the infant fails to establish spontaneous, effective respirations and heart rate does not increase to more than 100/min, positive pressure ventilation is required.

If a newborn has meconium stained liquor, stimulation is not recommended until it is ascertained whether or not the infant may require endotracheal suctioning. If the newborn is vigorous then drying may occur.

POSITIVE PRESSURE VENTILATION

After stimulation, positive pressure ventilation should be started if the heart rate is below 100/min and either the newborn remains apnoeic or the breathing is inadequate.

Positive prompt improvement in heart rate that is sustained is the primary objective of positive ventilation.

KEY POINTS OF POSITIVE PRESSURE VENTILATION

Poor visible chest wall movement indicates poor ventilation/technique e.g.

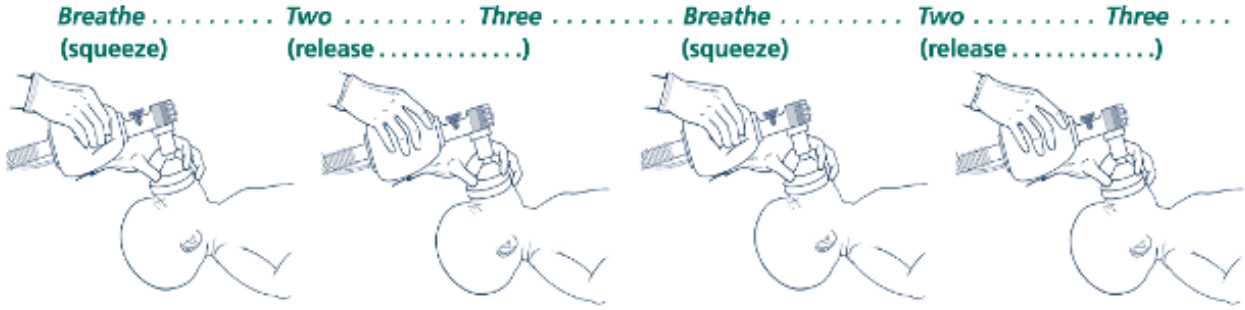
- Large leak around face mask
- Head position inappropriate
- Jaw position incorrect

Two people may be able to provide mask ventilation more effectively than one

If chest wall movement remains poor increase inflating pressure to increase chest movement.

The amount of pressure required is the amount that moves the chest affectively.

If providing positive pressure ventilation by bag and mask the rate should be 40 – 60 breaths per minute



Counting out loud to maintain a rate of 40 to 60 breaths per minute

MANUAL VENTILATION DEVISES

Before any resuscitation – CHECK THE EQUIPMENT to ensure it is appropriately working

Self-Inflating bag

- Following compression, a self-inflating bag re-expands due to its elastic recoil.
- Does not depend on a gas source for inflation
- Difficult to deliver consistent inflating pressures
- Easy to generate unnecessarily high pressures
- Maximum pressure is limited by the pressure-release valve – approximately 40cm
- Maximum pressure-release valve can be over-ridden if necessary
- Does not provide PEEP
- Cannot provide CPAP as cannot sustain inflation for more than one second
- Flow of oxygen delivered to the infant is unreliable and should not be used to deliver free flow oxygen
- 240mL self-inflating bag is the most appropriate size for ventilating newborn infants of all sizes
- A newborn's tidal volume is between 5-10mL/kg

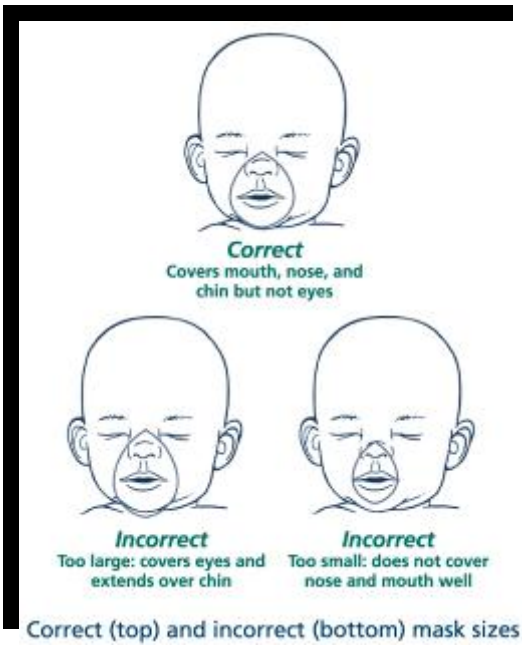
T- Piece Device

- T-piece devices must have gas supply. Ensure it is connected to the gas supply and adjust gas flow to 10L/min
- Test maximum pressure relief valve – set between 40-50cm H_20.
- Set desired peak pressure (PIP) – 30cm H_20 for term infants and 20-25cm H_20 for preterm infants
- Set desired PEEP 5-8cm H_20
- Fit an appropriate sized face mask
- To provide ventilation place finger over the outlet aperture and remove. This is done about 40-60 times per minute with an inspiratory time of about 0.3-0.5 sec.

Face masks

- The appropriate size of face mask must seal around the mouth and nose but not cover the eyes or overlap the chin.
- Masks with a cushioned rim are preferable to masks without.
- Ensure airway is open – adjust head/neck position to open the airway
- Open mouth slightly
- Clear airway if necessary
- Place mask at the tip of the chin and roll over mouth and nose and use a two-point top hold with thumb and first finger and second finger to left jaw (Wood F.E 2008)

Two point hold with thumb and first finger



Correct (top) and incorrect (bottom) mask sizes

INITIATING VENTILATION

- The aim of ventilation is to establish functional residual capacity
- To establish initial lung inflation in apnoeic newborns, initiation of intermittent positive pressure ventilation can be accomplished with or without several initial prolonged inflation breaths.
- Higher inflation pressure may be required to open the lungs during the first few inflations than for subsequent inflations
- Peak inflating pressures necessary to achieve an increase in heart rate or movement of the chest are variable and unpredictable and should be individualised.
- Term babies, an initial inflation pressure of 30cm H_20 should achieve chest expansion
- In premature infants avoid excessive lung expansion during ventilation immediately after birth.
- If possible provide PEEP 5cm H_20 to assist in lung expansion, help establish a functional residual capacity and improve oxygenation.

For most infants, ventilation can be accomplished with progressively lower pressure and rates as resuscitation proceeds.

SUPPLEMENTAL OXYGEN

Blood oxygen levels of normal newborns can take up to 10 minutes to rise above 90%. Pulse oximetry is recommended when the need for resuscitation is anticipated, when positive pressure is administered, when persistent cyanosis is suspected, or when supplemental oxygen is used.

Term Newborns

Start in air if IPPV

Use 100% if asystolic or requires chest compressions

If good response in HR use blender to target saturations to

Time from Birth	Target saturations for Term infants during resuscitation
1 min	60-70
3 min	70-90
5 min	80-90
10 min	85-90

Wean oxygen when saturations reach 95%. Keep at 90-94%

Preterm baby 31-37 weeks

Start 50% FiO2 if IPPV

Use 100% if Asystolic or needs Chest compressions

If good response in HR use blender to target saturations to

Time from Birth	Target saturations for Preterm baby 31-37 wks
1 min	60-70
3 min	70-90
5 min	80-90
10 min	85-90

Wean oxygen when saturations reach 95%. Keep at 90-94%

Preterm baby <31weeks

Use 100% and wean appropriately

Preterm newborns

If less than 32 weeks gestation will not achieve target saturations in air then appropriately blended air and oxygen may need to be implemented.

In all cases, the first priority is to ensure adequate inflation of the lungs, followed by increasing the concentration of inspired oxygen if needed.

REMEMBER IF YOU ARE UNABLE TO INFLATE THE LUNGS YOU PROBABLY DO NOT HAVE AN ADEQUATE AIRWAY AND OTHER STEPS OF RESUSCITATION MAY BE FRUITLESS.

CHEST COMPRESSIONS

Chest compression is indicated when the heart rate is <60/min despite adequate assisted ventilation provided for 30 seconds.

Chest compression should be centred over the lower third of the sternum and should compress one third of the chest anterior-posterior diameter

The recommended technique is two thumbs on the sternum, superimposed or adjacent to each other according to the size of the infant, with fingers surrounding the thorax to support the back.

If access is needed to the newborn's abdomen, the two-finger technique can be used as an interim measure. It is important that the two-fingers are kept straight to ensure maximum thrust.

Chest compression should be performed each half second with a half second pause after each 3rd compressions to deliver a breath, resulting in a 3:1 ratio with a total of 90 compressions and 30 breaths in each minute. Compressions and inflations should be coordinated to avoid simultaneous delivery of a compression and a breath.

The chest should be fully expanded between compressions, but the rescuer's hands should not leave the chest

Chest compressions should continue until it is obvious that the heart rate is >60/min.

When providing positive pressure ventilation for the newborn and neonate the resuscitator should pause external cardiac compressions for a breath - as in the following diagram.

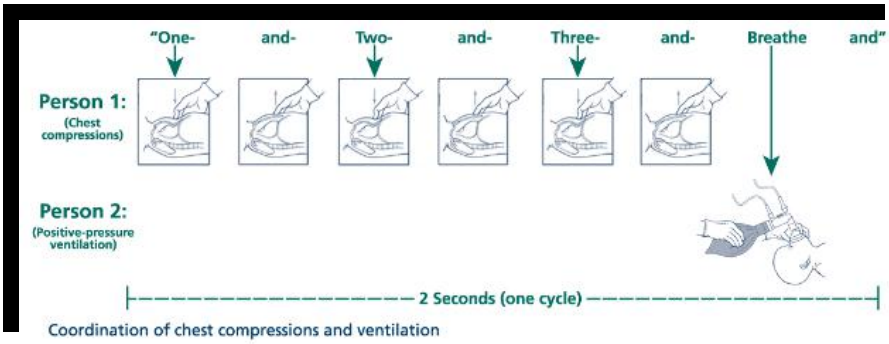


Diagram from American Academy of Pediatrics 2000

FACTS FOR CPR IN THE NEONATAL UNIT

APNOEA

Apnoea is defined as the cessation of breathing for >20 seconds, or less if accompanied by cyanosis and/or bradycardia. Apnoea may be central, obstructive or a combination of both – "mixed" apnoea.

Apnoea is most commonly secondary to prematurity. The frequency and severity of apnoea is inversely related to the degree of prematurity. Apnoea of prematurity usually abates by 37 weeks post-gestational age. Mild anaemia or a small persistent ductus arteriosus does not usually aggravate apnoea of prematurity.

Apnoea may be a nonspecific manifestation of an underlying disease. Infection, neurological disorder and metabolic imbalance should be excluded in all infants with apnoea, including preterm infants. (Reference: Westmead Hospital intranet site)

The causes of neonatal apnoea

Infection	Septicaemia, meningitis, necrotizing enterocolitis, RSV, pertussis
Hypo- or hyperthermia	Environmental or secondary to sepsis
Neurological	Asphyxia, intraventricular haemorrhage, hydrocephalus, seizures, congenital anomaly of brain
Metabolic	Electrolyte abnormality, hypoglycaemia, hyperammonaemia
Hypoxia	Respiratory distress, pneumothorax, shock
Upper airway obstruction	Choanal atresia, Pierre-Robin sequence, macroglossia, gastro-oesophageal reflux
Drugs	Pre and postnatal exposure to opiates

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Australian Resuscitation Guidelines.2011 Section 13. Downloaded November 2011 from www.resus.org.au/

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NICU Guideline 5.1.16a (2012) resuscitation of the newborn infant.

QUESTIONS

You are working a night shift in Special Care Nursery when a woman arrives in Delivery Suite who is about to have an imminent delivery of a 33 week gestation infant.

1. What do you need to prepare?

You are asked to go to the Delivery Suite to assist with the resuscitation.

2. Please identify what you would do when you arrive in the Delivery Room.

Following a normal vertex birth a male infant is born. The infant has gasping respirations and a heart rate of 72.

3. Describe your actions to manage this situation.

Following your actions the infant's respiratory effort and heart rate improves to 120. The infant is wrapped and given to their mother.

4. On completion of the resuscitation what else do you need to do?

Section Four: Pregnancy

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Date Due:

Acknowledgements:

This supplement has been prepared using information provided in the NSW Health Fetal Welfare Obstetric Emergency Neonatal Resuscitation Training Project (FONT) 2008.

Pre-Requisites:

Target audience for this section of the SDLP is all health professionals who provide care in maternity services.

TABLE OF CONTENTS

INTRODUCTION

There are various reasons why a pregnant or postpartum woman my require cardiopulmonary resuscitation. Similar to the general population, pregnant women can be exposed to trauma for example, through motor vehicle accidents, domestic violence or mental illness. Population trends such as increasing BMI[1], advancements in IVF technology and the social trend of increasing maternal age (the median age for birthing woman in 2010 was 30.7yrs)[2], can also affect health risk in pregnancy. Also, continuing advances in medicine and health care have meant that women with significant underlying disease, such as heart disease, kidney disease or diabetes, are more likely to become pregnant.

Fortunately cardiac arrest is a rare occurrence in the pregnant population with an incidence of about 1/30,000[3]. It is usually associated with other maternity emergencies, for example hypertension or embolism. The table below outlines numbers of maternal death in Australia related to different causes. Many maternity related deaths occur from potentially treatable causes, it is therefore important to look for and treat the condition that may have led to the arrest for example severe haemorrhage.

NSW HEALTH

Pregnancy-Related (Direct) Maternal Death 2002- 2005

Cause of Death	Australia	United Kingdom
Embolism	5	30
Hypertension	5	14
AFE	8	5
Haemorrhage	4	17
Ectopic		11
Anaethesia	1	11
Sepsis	1	
Other	5	12
Total	**29**	**106**

2006 Australian Institute of Health and Welfare, Canberra

3

[1] Australian Bureau of statistics
[2] Australian Institute of Health and welfare, Australian Mothers and Babies report 2009
[3] NSW Health Fetal welfare Obstetric emergency Neonatal resuscitation Training project (FONT) 2008

Pregnancy leads to many physiological changes some of which extend into the immediate postpartum period. These changes can have significant impact on the outcomes of cardiopulmonary resuscitation. It is therefore important for all staff to be aware of the maternal physiology that can influence resuscitation. In pregnancy fetal outcome is directly related to the wellbeing of the mother so resuscitation measures must be directed towards her.

PHYSIOLOGICAL CONSIDERATIONS IN PREGNANCY

The primary pregnancy changes that may influence basic cardiopulmonary resuscitation include but are not limited to the following:[4]

GENERAL BODY CHANGES INCLUDING

- Enlargement of the breasts in preparation for feeding the infant can affect the ability to perform successful cardiac compressions and affect placement of paddles for defibrillation
- Enlargement of the uterus displaces other internal organs and will cause a rise in the level of the diaphragm (of approximately 7 cm) as the fetus grows. This displacement can make cardiac compression difficult due to an decrease in chest wall compliance
- Hormonal influences of pregnancy cause a slowing of peristalsis and gastric motility so resuscitation is more likely to become complicated with increased risk for aspiration
- Respiratory rate increases (due to the effects of progesterone) in response to increase in oxygen requirements and a decrease in lung volume .The hyperventilation causes a decrease in carbon dioxide (CO2) and a compensatory respiratory alkalosis. If there is hypoxia there is a rapid fall in PaO2.
- There is an increase in clotting factors in pregnancy leading to an increase in susceptibility to thromboembolism

[4] NSW Health Fetal welfare Obstetric emergency Neonatal resuscitation Training project (FONT) 2008

CIRCULATION CHANGES

By 32- 34 weeks gestation, the circulating blood volume increases on average by 40-45% compared to the non-pregnant woman. This increase usually starts in the first few weeks of pregnancy and varies among women. Much of the volume increase occurs in the plasma and erythrocytes. The change in circulation results in a dilutional anaemia effect decreasing oxygen carrying capacity of the blood. The significance for resuscitation in pregnancy is that there is a decrease in oxygen carrying capacity in the blood so it is essential to provide oxygenation in resuscitation and maintain adequate circulation.

In pregnancy the uterus receives 20-30% of the maternal blood flow. Approximately 1litre of blood flows to the uterus each minute. There is a high flow of blood to the placenta with low resistance or pressure. This ensures adequate nutrients and oxygen flow to the fetus. In pregnancy the uterine vessels do not control their own blood pressure (are not auto-regulated) so any systemic fall in BP will mean an automatic decrease in uterine perfusion and compromise to the fetus.

PREGNANCY SUPINE HYPOTENSIVE SYNDROME

Pregnancy supine hypotensive syndrome occurs when the pregnant woman lies supine and the heavy uterus presses on the major blood vessels including the descending aorta and the inferior vena cava. This compression can decrease cardiac output by up to 30% so therefore it must be considered in any pregnancy over approximately 20 weeks.

It is essential that pregnancy supine hypotension be corrected by careful positioning of the woman and/or early delivery of the fetus; otherwise any attempts at CPR will be severely limited or futile, even when exceptional efforts are made in all areas of basic life support.[5]

[5] Banks A., 2009 Maternal resuscitation: plenty of room for improvement, *International Journal of Obstetric Anesthesia* 17, pp289-291

During resuscitation, the uterus must be repositioned so that it is not occluding the main vessels by laying the woman in a left lateral tilt. The tilt can be achieved by placing a wedge under the woman's right hip so she is tilted at a 25-30 degree angle towards the left. If no foam wedge is available than a rolled towel (see picture below), pillow, or even an IV bag can be used. The uterus may also need to be manually tilted by an additional person to help reduce the effect of compression.[6]

(Figure 1) Courtesy John Hunter hospital, Newcastle NSW

If nothing else is available then a second resuscitator may be required to use their own knees to act as a human wedge**.** This tilt is essential but can make the resuscitation extremely difficult. If possible the operator performing cardiac massage needs to have the woman tilted towards them so they achieve effective cardiac compression. [7]

[6] Kundra P, Khanna S, Habeebullah S, Ravishankar M (2007)Manual Displacement of the uterus during caesarean section. *Anaesthesia* **62** (5) 460-5
[7] Madams M, Maternal(2008) Resuscitation: how to resuscitate mothers who die, *British Journal of Midwifery* **16**(6)372-7

BASIC LIFE SUPPORT

Please refer to Basic Life Support algorithm in the preface of this package as the basis for this section[8]

DANGER

Always consider your own safety first as described in section one of this package. If attending resuscitation in a birthing suite additional hazards could include water, such as baths and showers, and possibly monitoring equipment cords.

RESPONSE

This is assessed as described in section 1 of this package

Position the woman with a 27 degree lateral tilt for resuscitation

SEND FOR HELP

Ensure you are familiar with the emergency numbers for the emergency response teams in your area as recommended in section one of this package

When a woman is estimated to be 20 weeks gestation or more, obstetric/midwifery staff as well as the neonatal resuscitation team, must be included in the emergency call. Obstetric/midwifery staff are usually contacted through the delivery suite or birthing areas. When calling for help in an emergency it is important that staff identify a pregnancy and contact the appropriate team in the facility in which they are working.

[8] Australian Resuscitation Council (Dec 2010) *Australian Resuscitation Council Guidelines*

AIRWAY

Assess the airway per Adult CPR guidelines in section 1 of this package

In pregnancy:

- Vascular engorgement leads to oedema in the tissues of the nasal and oral larynx, pharynx and trachea. This can affect the airway. It may be necessary to use a pillow or rolled towel between the shoulder blades to achieve effective head tilt to open airway[9] [10]
- The risk of aspiration in pregnancy is increased due to the hormonal effects of pregnancy causing delayed gastric motility and decreased gastroesophageal tone.

Advanced CPR

- Intubation always needs to be considered early in the resuscitation process in pregnancy due to increased oxygen needs and possible difficulty of intubation due to pregnancy oedema
- Clear visualisation of the vocal cords and intubation will most likely need a combination of head tilt and chin lift as well as jaw thrust[11]
- Cricoid pressure should be used to protect from aspiration

BREATHING

Assess breathing according to ARC guidelines in section 1 of this package

In pregnancy it can be difficult to assess chest rise in the very pregnant woman due to breast enlargement as well as the splinting effect of the diaphragm elevated by the growing fetus. It may be necessary to look for a rise of the breast tissue or movement in the lateral chest wall [11]

[9] Madams M, Maternal(2008) Resuscitation: how to resuscitate mothers who die, *British Journal of Midwifery* **16**(6)372-7
[10] FONT 2008
[11] Madams M, Maternal(2008) Resuscitation: how to resuscitate mothers who die, *British Journal of Midwifery* **16**(6)372-7

CIRCULATION

In pregnancy there is

- increase in breast tissue
- increased circulation demands and cardiac output
- dilution anaemia decreasing oxygen carrying capacity of the blood and
- higher diaphragm

All these factors can make cardiac compression more difficult **but also mean cardiac compressions need a stronger force** to achieve compression of the a third of the chest wall and achieve the required cardiac output [11] [12] [13]

DEFIBRILLATION

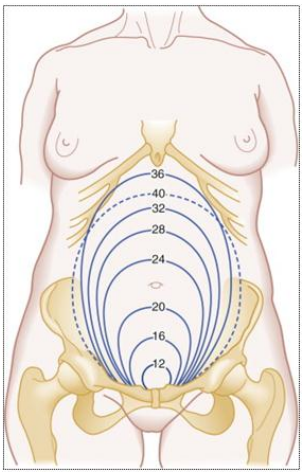
In pregnancy there is an urgent need for return of effective maternal circulation, so early defibrillation to correct any arrhythmia is as recommended in Section one.

Adhesive defibrillating electrode pads should not be positioned on top of breast tissue so larger breasts may need to be displaced or defibrillating pads may need to be placed slightly more laterally.[14]

OTHER CONSIDERATIONS

It is important to have some idea of the gestation of pregnancy as it can influence resuscitation procedures. Pregnancy can be quickly assessed by looking at the height of the fundus. For a singleton pregnancy 23-24 weeks gestation the fundus of the uterus is usually palpated a few centimetres above the umbilicus. See picture below for a guide to gestational estimation for a singleton pregnancy.

[12] ILCOR guidelines
[13] FONT 2008
[14] Madams M, Maternal(2008) Resuscitation: how to resuscitate mothers who die, *British Journal of Midwifery* **16**(6)372-7



Marx J et al, (2009) Rosen's Emergency Medicine, 7th ed. Elsevier Inc

PERI MORTEM CAESAREAN SECTION

Outcomes for both mother and fetus are very poor in the event of cardiac arrest in pregnancy unless resuscitation measures are initiated very rapidly and there is early delivery of the fetus[15]. Therefore peri mortem caesarean is a real consideration when responding to cardiac arrest in the pregnant woman over approximately 20-24 weeks gestation. Maternal apnoea results in a rapid decline in arterial ph and PaO2[16]. While it has not been definitively proven, recommended best practice is that peri mortem caesarean section is performed within **four minutes** of a witnessed maternal cardiac arrest to have an impact on the outcome.[17] As a result there is very little time for decision-making and execution of the procedure. So it important that all members of the resuscitation team are aware of the likelihood of this resuscitation procedure and preparation of the necessary equipment and appropriate after care is made.

The criteria for a peri mortem caesarean section as described in the FONT[18] training package is as follows:

- the pregnancy should have reached an estimated gestation of 23-24 weeks
- the arrest needs to be witnessed with accurate time assessment
- there must have been four minutes without spontaneous maternal circulation

[15] Banks A., 2009 Maternal resuscitation: plenty of room for improvement, *International Journal of Obstetric Anesthesia* 17, pp289-291
[16] FONT 2008
[17] Banks 2009, FONT 2008
[18] NSW Health Fetal welfare Obstetric emergency Neonatal resuscitation Training project (FONT) 2008

- there should be the appropriately skilled personnel (usually members of the Obstetric team) with equipment to perform the procedure
- there needs to be facilities and personnel to care for the mother and the baby post procedure

POST RESUSCITATION CARE

Cardiac resuscitation is an emotion charged and traumatic event and is especially so when it involves a pregnant woman and her fetus. As stated in previous sections of this package the family must be kept informed and supported during and after attempts at resuscitation.

Consideration must also be given to those staff involved in resuscitation. It is not uncommon for professionals to display feelings of inadequacy and be critical of how events were handled[19]. Decisions must be made within very limited time frames and people can respond differently in these situations. It is important that, along with investigation, sensitive debriefing of staff and follow up support takes place.

[19] Madams Madams M, Maternal(2008) Resuscitation: how to resuscitate mothers who die, *British Journal of Midwifery* **16**(6)372-7

QUESTION:

You are working in Accident and Emergency when a woman who is 28 weeks pregnant presents with an acute asthma attack. She deteriorates quickly and goes into respiratory arrest.

a) How should you position this woman for resuscitation?

b) Who will you call for help?

c) What equipment might you need to prepare?

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LEARNING PACKAGE EVALUATION FORM

Please circle your response to the following questions:

1. The aims and objectives of the learning package were clear and appropriate to your learning needs and goals? Yes No

2. I have achieved my learning goals?

   Yes No

3. As a result of completing this package I now have a better understanding of …….

   Yes No

4. The activities and case scenarios were helpful?

   Yes No

5. The package was easy to follow?

   Yes No

6. The workload was reasonable?

   Yes No

7. The information and skills I can use from the package are:

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8. Some suggestions I would like to make to improve the package are:

9. Further comments I would like to make are: