

## RESUSCITATION OF THE NEWBORN BABY

This module is designed for in-service/pre-service education of nursing personnel in resuscitation of newborns in the delivery room. The same principles apply for resuscitation of sick newborns and infants up to age of three months in the wards and nursery.

### LEARNING OBJECTIVES

At the end of this session, participants will be able to:

- **Assess a newborn baby at birth**
- **Perform resuscitation of a newborn baby using standard equipment if needed**
- **Provide aftercare if a baby requires help with its breathing at the time of birth**

### MODULE CONTENTS

The module includes following elements:

- **Text material:** Easy to read format for quick reproduction and essential reference material for the participants. Key messages are highlighted in the boxes.
- **Demonstration:** You will learn steps of resuscitation this in the participating hospital.
- **Webinar :** You will learn through a virtual classroom lecture.
- **Self-evaluation:** At the end of lesson you will be evaluated by MCQ examination.
- **Video Film:** Steps of basic resuscitation upto bag & mask ventilation will be shown.

### 1. INTRODUCTION

Spontaneous breathing after birth is not a problem for most babies. However, one in twenty babies might require help with breathing at birth. It is not always possible to know in advance which babies will need this help since up to half of them (who require resuscitation) have no identifiable risk factors before birth. Hence resuscitation must be anticipated at each birth.

### 2. IMPORTANCE OF RESUSCITATION

Oxygen is important for every part of the human body. Without it, the cells that make up our organs - brain and other body parts- will die. Before birth, the fetus receives oxygen from the placenta. After birth, the umbilical cord is clamped and cut which stops the delivery of oxygen from the placenta. If the baby does not start breathing immediately after birth, s(he) may even die due to lack of oxygen. A proper resuscitation helps the baby to attain normal breathing. Therefore, all health care providers should develop basic resuscitation skills.

An increased risk of breathing problems may occur in babies who are:

- preterm
- born after long traumatic labor
- born to mothers who received sedation during the late stages of labor

However, it should be kept in mind that any baby may have breathing difficulty at birth. Therefore, it is important to be prepared for resuscitation in all deliveries.

**Any baby can have breathing difficulty at birth. It is important to anticipate and be prepared for this eventuality in all deliveries**

### 3. KEY TO SUCCESSFUL RESUSCITATION

All health professionals who attend the mother at birth must be skilled at resuscitation and know how to recognise babies at risk. They must:

- anticipate
- be prepared
- know what to do (be gentle & fast)
- in what order
- be able to work quickly in coordination
- document/record
- maintain hygiene
- remember mother

### 4. PREPARATION IN THE DELIVERY ROOM

When a baby has asphyxia, resuscitation must be started right away. If things are not prepared, much time can be lost before starting resuscitation. With this lost time a baby can become worse.

Preparations should include having warmth, place to do the resuscitation, equipment and supplies. These are summarized in the box below:

#### PREPARING FOR BIRTH

##### **Essential**

1. A draught free, warm room with temperature >25°C
2. A clean, dry and warm delivery surface
3. A radiant heater
4. Two clean, warm towels/clothes
5. A folded piece of cloth (1/2 to 1 inch thick)
6. A newborn size self inflating bag
7. Infant masks in two sizes: size '1' for normal weight baby and '0' for small baby
8. A suction device
9. Oxygen (if available)
10. A clock (with seconds hand)

#### **Important points about the equipment used for resuscitation**

- Equipment must be cleaned and checked after each delivery and checked again before the next delivery to ensure it is ready for use.
- Broken equipment is dangerous and should be replaced.
- Equipment must be of the appropriate size. Pediatric and adult bag and masks cannot be used on newborn babies who have small and fragile lungs.
- The volume of the bag should not be more than 240-500mL; it should be able to generate a pressure of at least 35 cm of water.
- If a mucus extractor is used the trap should be big enough (20 mL) to prevent aspirated fluid going into the resuscitator's mouth.
- A mucus extractor with a bulb is NOT recommended because they are difficult to clean and might act as a source of cross infection.
- Suction should not exceed a negative pressure of 100 mmHg or 130cm water.
- Resuscitation can be done without having piped oxygen available.
- If oxygen is available, it should be used; but avoid using 100% oxygen in premature babies.

## 5. INITIAL STEPS AND ASSESSMENT AT BIRTH

The steps to be taken at the time of birth are given below:

### 5.1 Deliver the baby on to mother's abdomen

A newborn baby should be delivered onto his mother's chest. If the baby is not delivered onto his mother's abdomen, make sure there is a warm towel or cloth on the bed to put the baby on.

### 5.2 Note the time of birth and dry the baby

Keeping a baby warm at birth is a priority. The baby has to be dried with a warm towel. After drying, the wet towels or clothes should be replaced and the baby loosely wrapped in clean, dry and warm towels.

Drying the baby and wiping its eyes will take about 30 seconds; discarding the wet cloth and replacing it with a warm cloth will take about 10 seconds.

Breathing and warmth go together and breathing should be assessed whilst drying the baby. Drying itself often provides sufficient stimulation for breathing to start in mildly depressed newborn babies.

### 5.3 Assess the baby's breathing

The baby's breathing should be assessed while drying:

- Watch the way the baby's chest rises and falls.
- The chest should move equally on both sides with no difficulty between 30 to 60 times in a minute.

When a baby's breathing is assessed one of four main behaviours may be seen. These are:

1. The baby is crying at birth, like the baby in the picture.



*Does this baby need help with its breathing?*

**No**, this baby can be given straight away to his mother to start skin-to-skin contact and breastfeeding.

*Is suction needed for this baby?*

**No**, suctioning is not necessary if the baby is crying.

2. The baby is not crying, but his chest is rising regularly between 30 to 60 times in a minute

*Does this baby need help with his breathing at birth?*

**No**, this baby needs no help with his breathing as long as his chest is rising about 30 - 60 times a minute and his colour is good. This baby can be given straight to his mother for skin-to-skin contact.

*No suctioning is necessary for this baby.*

3. The baby is gasping, does not breathe regularly and there are long pauses between each breath.

*Does this baby need help at birth to breathe?*

**Yes**, this baby needs immediate help to breathe.

You **MUST** start resuscitation within 1 minute of birth.

4. The baby is NOT breathing.

*Does this baby need help at birth to breathe?*

**Yes**, this baby needs immediate help with his breathing.

You **MUST** start resuscitation within 1 minute of birth if the baby is not breathing or is only gasping.

In the last 2 situations, resuscitation should be carried out immediately.

Assessment	Decision
Baby is crying	No need for resuscitation or suctioning. Start skin-to-skin contact and breastfeeding.
Baby is not crying but his chest is rising regularly between 30 to 60 times in a minute	No need for resuscitation or suctioning. Start skin-to-skin contact and breastfeeding.
Baby is gasping	Start resuscitation immediately.
Baby is not breathing	Start resuscitation immediately.

## 6. STEPS OF RESUSCITATION

- Tell the mother that her baby is having difficulty beginning to breathe and that you are going to help him. Tell her quickly but calmly
- Call for help
- Remove the wet cloth or towel
- Lightly wrap the baby in a warm, dry towel or cloth
- Leave the face and upper chest free
- Transfer the baby to a warm, clean and dry surface, preferably under a radiant warmer

### 6.1 Open the baby's airway: position the head

- Place the baby on its back
- Position the head so that it is slightly extended (to open the airway)
- Place a folded piece of cloth under the baby's shoulders to help maintain this position (the folded cloth should not be too thick or thin - this may cause overextension or flexion which will close the airway)

### 6.2 Open the baby's airway: suction the mouth and the nose

- Suction first the mouth and then the nose (Remember 'M' comes before 'N')
- Do this by gently introducing a suction tube 5 cms into the baby's mouth until the '5 cms' mark is at the baby's lips
- Use suction while withdrawing the tube
- Next introduce the suction tube upto 3 cms into each nostril
- Use suction while withdrawing the tube
- Repeat suction if there is lot of mucus, amniotic fluid or meconium but not more than two times or for a duration exceeding 20 seconds

### 6.3 Reassess the baby's breathing

Suctioning alone may stimulate the baby to start breathing. If this happens (i.e. the baby is breathing), place the baby in skin-to-skin contact on the mother's chest. Encourage the baby to breast feed to avoid a low blood sugar. Monitor the baby every 15 minutes for breathing and warmth.

### 6.4 If the baby is still not breathing: VENTILATE

#### 6.4.1. Equipment

It is important that you become completely familiar with the specific equipment used where you work.

#### Self-inflating bag

The self-inflating bag is designed to inflate automatically as you release your grip on the bag. It does not require a compressed gas source to fill. You should be able to identify various parts of a self-inflating bag.

As the bag re-expands following compression, gas is drawn into the bag through a one-way valve that may be located at either end of the bag depending on the design. This valve is called the air inlet.

Every self-inflating bag has an oxygen inlet which is usually located near the air inlet. It is a small nipple or projection to which oxygen tubing can be attached when oxygen is needed.

The patient outlet is where gas exits from the bag to the infant and where the mask or ET tube attaches.

In many self-inflating bags, the valve assembly allows gas to flow from the bag through the patient outlet only while bag is being compressed. Since oxygen flow is not continuous, these bags cannot be used to provide free-flow oxygen.

An oxygen reservoir is an appliance that can be placed over the bag's air inlet. It helps in delivering a high concentration of oxygen to the baby and allows oxygen to be administered in a concentration as high as 90% to 100%.

Most resuscitation bags used in neonatal resuscitation have a safety mechanism in the form of a pressure release valve to guard against inadvertent transmission of excess pressure to the baby's lungs. Pressure release valves are generally set to release at 30 to 40 cm H<sub>2</sub>O. If pressures greater than this are generated, the valve opens, limiting the pressure being transmitted to the lungs of infant. The ideal size of the bag for neonates is 240 to 500 mL capacity.

### **Resuscitation masks**

Masks come in a variety of shapes, sizes and materials. Resuscitation masks should have cushioned rim to prevent injury to the face. The rim conforms more easily to the shape of the infant's face, making it easier to form a seal. There is less chance of damaging the infant's eyes if the mask is correctly positioned. Masks come in several sizes. Masks suitable for both small, premature infants as well as for larger term infants should be available for use. An appropriate size mask will cover the tip of chin, mouth, and the nose but not the eyes.

#### **6.4.2. Assembling equipment**

The bag should be assembled and connected to oxygen so that it provides 90% to 100% oxygen. If a self-inflating bag is used, be sure that the oxygen reservoir is attached. Connect the mask to the bag.

#### **6.4.3. Testing equipment**

To check a self-inflating bag, block the mask or patient outlet by making an airtight seal with the palm of your hand. Then squeeze the bag:

- Do you feel pressure against your hand?
- Can you force the pressure-release valve open?
- Is the valve assembly present and moving well?

If not check

- Is there a crack or leak in the bag?
- Is the pressure-release valve missing or stuck or closed?
- Is the patient outlet completely blocked?

If your bag generates adequate pressure and the safety features are working, while the mask-patient outlet is blocked, check to see:

- Does the bag re-inflate quickly when you release your grip?

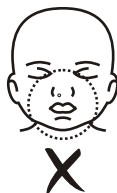
#### **6.4.4. How to ventilate the baby:**

1. Re-check the baby's position.
2. Slightly re-position the baby so that its neck is extended.
3. Put the folded piece of cloth under the baby's shoulders at this time.
4. Place the correct sized mask on the baby's face so that it covers the baby's chin, mouth and the nose.



**Size 1 for a normal weight baby and size 0 for a small baby**

- o A mask that is **too large** covers the eyes, and extends over the tip of the chin:



- o A mask that is **too small** does not cover the nose and does not cover the mouth effectively:



5. Make a seal between the mask and the baby's face.
6. Hold the mask in place gently but firmly. Keep the head in position.
7. Squeeze the bag attached to the mask with the **thumb and two fingers so as to cause adequate chest rise.**
8. Squeeze and release the bag two or three times.
9. Watch the baby's chest as the bag is squeezed. Does it rise as the bag is squeezed?



10. If the baby's chest **IS** rising, the ventilation pressure is probably adequate.
11. If the baby's chest is **NOT** rising, do the following steps:

Possible cause	Action
Blocked airway	Re-position the baby's head Do suction (if secretions are present)
Leakage of air around the mask	Check the seal around the mask; if it is not good, re-position the mask.
Inadequate pressure	Squeeze the bag harder (using more pressure)

12. Use oxygen if available, if not use room air.
13. Ventilate at a rate of 40 breaths per minute. Squeeze the bag (ventilate) at **40 times a minute** until the baby starts crying or breathing.

Count out loud. **An easy way to count is to:**

SQUEEZE - count aloud 'one hundred and one, SQUEEZE one hundred and two, SQUEEZE one hundred and three, SQUEEZE .....' and continue until you reach 'one hundred and twenty' (i.e. for 30 seconds).

14. After 30 seconds of bag and mask ventilation, reassess the baby and look for the following signs of improvement:
  - i. Is the baby crying? - If yes, STOP ventilation
  - ii. Is the baby breathing regularly at >30 breaths per minute? - If yes, STOP ventilation
  - iii. Does the baby have 'in-drawing' of the chest wall (skin between the ribs 'sucked' inwards making the ribs very prominent)? - if NO, then STOP ventilation (chest in-drawing indicates that the baby is still having difficulty in breathing and hence need support for breathing)

The other signs of improvement are increasing heart rate and improving color.

**When to stop ventilation?**

1. **Baby is breathing or crying**
2. **Baby is breathing more than 30 times in a minute**
3. **NO chest in-drawing during breathing**

15. What is to be done if there is no improvement after 30 seconds?
  - i. If **NO** facilities/manpower are available: **continue to do bag and mask ventilation**; reassess after every 30 seconds until the baby is breathing spontaneously. In the mean time, shout for help and also arrange for referral to a higher centre.  
 During transport, ensure that the baby's temperature is maintained and breathing is supported by bag and mask ventilation (with or without oxygen).  
 The procedure of bag and mask ventilation should be continued until the baby establishes spontaneous breathing; however, if there are no signs of life (breathing/heart rate) even after 20 minutes of birth, ventilation may be stopped.
  - ii. If facilities and/or man-power are available: **continue to do bag and mask ventilation and assess the need for chest compressions**. The need for chest compressions is decided on the basis of the baby's heart rate as shown below:

Heart Rate (per minute)	Action
Above 100	STOP ventilation if spontaneous respirations are present; If gasping or not breathing, continue ventilation
60 to 100	Continue bag and mask ventilation
Below 60	Begin chest compressions; Continue to ventilate

**Remember:** Ventilation is more important during resuscitation than any other step - hence it **SHOULD BE** continued even while administering chest compressions. This might require at least two persons with the necessary skills.

### 6.5 Chest Compressions

The heart circulates blood throughout the body delivering oxygen to vital organs. When an infant becomes hypoxic, the heart rate slows and myocardial contractility decreases. As a result, there is a diminished flow of blood and oxygen to the vital organs. The decreased supply of oxygen can lead to irreversible damage to the brain, heart, kidneys and bowel. Chest compressions are used to temporarily increase circulation and oxygen delivery.

Chest compressions must always be accompanied by ventilation. Ventilation must be performed to ensure that the blood being circulated during chest compressions gets oxygenated.

After 30 seconds of chest compressions, the baby's heart rate should be re-assessed. If heart rate is still less than 60 per minute, chest compressions should be continued (after administering Inj. adrenaline); if heart rate is > 60/min, stop chest compressions.

### 6.6 Medications

If the baby's heart rate is less than 60 per minute after 30 seconds of chest compressions and ventilation, adrenaline injection has to be administered (see module on 'Common procedures').

**Babies requiring chest compressions, intubation and medications often need presence of a skilled healthcare provider (Doctor).**

## 7. FOLLOW ON CARE AFTER SUCCESSFUL RESUSCITATION

After stopping ventilation, place the infant gently between the mother's breasts with skin-to-skin contact so that he stays warm.

**DO NOT** leave this baby alone; make sure there is someone with him for at least the first hour. Monitor him every 15 minutes. Check if he is breathing normally and whether he is warm. Reassure the mother that her baby will probably be well.

Continuing care and monitoring of a baby after successful resuscitation include:

### For the baby

- The mother and baby should be kept together with the baby in skin-to-skin contact
- Encourage the mother to breastfeed her baby as soon as they are ready. This will help to prevent hypoglycaemia (low blood sugar)
- Assess the baby's attachment at the breast; help the mother to breastfeed her baby if needed
- Good suckling is a sign of recovery. If the baby is unable to suck effectively, ask the mother to express colostrum; help her in expression of milk
- Record what has happened in the baby's notes and in the labour record:
  - the date
  - the time of the resuscitation
  - what has been done
  - what was the outcome

### For the mother and family

- After resuscitation, explain to the mother and family what has happened and how the baby is now
- Keep the mother and baby in the delivery room and **DO NOT** separate them
- **NEVER** leave the woman and newborn alone. Monitor them every 15 minutes during the first hour

## 8. RECORD THE EVENTS

Record what has happened as soon as possible after the baby is stable. Keeping records of events which occur at the time of delivery and in the immediate period afterwards can be vital. The information is important if a baby needs to be referred or becomes sick in the next few days.

## 9. EXAMINE THE BABY BEFORE DISCHARGE

The baby should be thoroughly examined before s(he) is discharged from the delivery room. Tell parents that although the possibility of complications is low, there is still a small probability that the baby may have problems such as feeding difficulty or convulsions in the first few days.

Instruct them to take the baby to the nearest hospital if these problems occur. Encourage the mother to maintain skin-to-skin contact as much as possible in the next few days.

## Recommended reading

- Basic Newborn Resuscitation: A practical guide. WHO/RHT/ MSM/98.1
- WHO essential newborn care course based on pregnancy, postpartum and newborn case a guide for essential practice [www.who.int/making\\_pregnancy\\_safer/publications/en](http://www.who.int/making_pregnancy_safer/publications/en)