
UNIT 1 NEONATAL RESUSCITATION AND CARE AT BIRTH

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1.0 OBJECTIVES

After going through this unit, you should be able to:

- learn steps of resuscitation of an asphyxiated newborn;
- identify neonates who need routine care or special care to neonatal unit
- provide essential care to the newborn;
- provide cord care, eye and skin care; and
- assess for gestation; and record weight, length and head circumference

1.1 INTRODUCTION

This unit describes the practical skills which you need to learn for resuscitating an asphyxiated newborn and providing essential care to the newborn. You have already learnt some of these issues in Unit 1 of theory Block 1.

1.2 NEONATAL RESUSCITATION

Approximately 90% of newly born babies make the transition from intra uterine to extra uterine life without difficulty. It is important to remember that for better survival of new born the preparation starts well before delivery.

1.2.1 Preparation before Delivery

Following preparations should be made before delivery.

At Home

- Select clean, well lighted and ventilated room for delivery.
- Adequate washed, sun dried clean linen.

- Ensure clean/disposable delivery kit:
 - Soap for washing hands.
 - 2 to 3 sterilized cord-ties.
 - Clean and sterilized (or new) blade to cut cord.

At Hospital

- Prepare a resuscitation corner with radiant warmer (Fig. 1.1) or heating lamp (100-200 watt bulb) at 50 cm distance above the surface. Turn it on before delivery so that the resuscitation corner is warm enough to receive the baby.
- Minimum two clean dry sheets for each new born
- Contents of resuscitation kit:
 - 1) Suction machine, catheter (12, 14 F)
 - 2) Self inflating Resuscitation Bag (AMBU Bag) and Face Mask of two different sizes.
 - 3) Infant Laryngoscope with blades (sizes 0 & 1).
 - 4) Endotracheal Tubes (2.5, 3, 3.5, 4 mm)
 - 5) Medications, Weighing Scale, infantometer and measuring tape
 - 6) Appropriate sized gloves

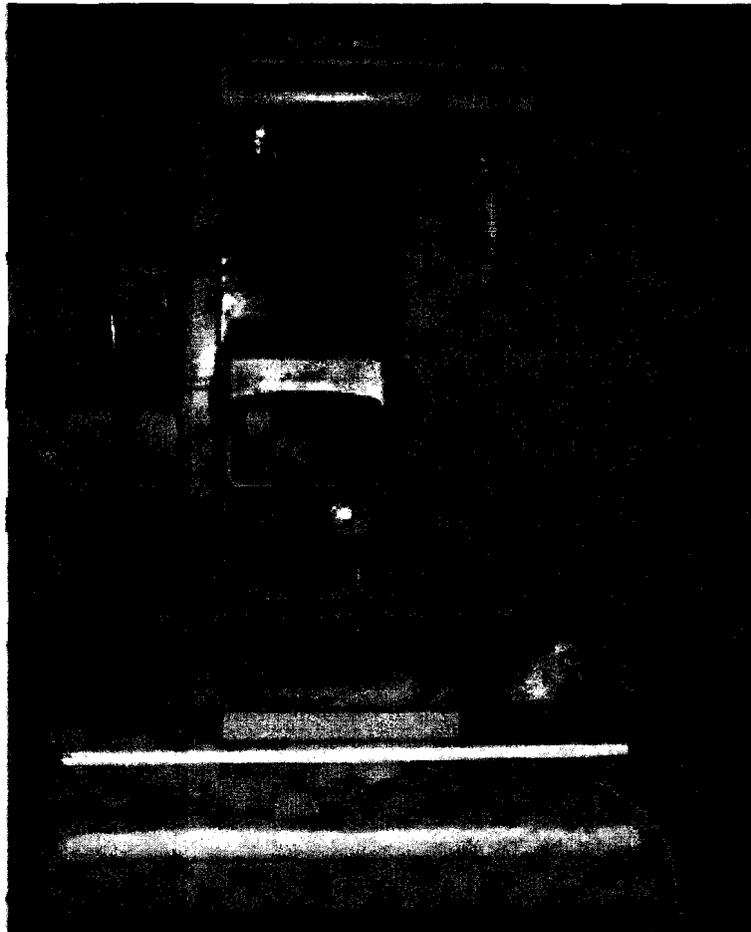


Fig. 1.1 : Radiant Warmer

Ensure the presence of personnel skilled to do resuscitation for every delivery. They must be present physically and not on call because problem can arise at the time of labour in low risk cases also.

1.2.2 Assessment at birth

Make a quick assessment of the following characteristics

- 1) Is the amniotic fluid clear of meconium?
- 2) Is the baby breathing or crying?
- 3) Does the infant have good muscle tone?
- 4) Is the baby born after full term gestation?

If answer to all above questions is YES, i.e. the infant baby is born at full term, liquor is clear of meconium, baby is crying well and breathing and has a good muscle tone, this qualifies for a care which is called ROUTINE CARE.

Steps in ROUTINE CARE are:

- 1) Provide warmth by skin to skin contact
- 2) Position the baby with head turned to one side
- 3) Wipe the mouth with clean cloth or gauze piece
- 4) Dry the baby
- 5) Assess the color

However, if skin to skin care is not feasible on mother's abdomen as in Caesarean section perform these steps under overhead servo control warmer

If the answer to any of the above asked question is 'NO' i.e. the baby

- is born pre-term
- is not breathing or has gasping respiration
- has poor muscle tone or
- the liquor is meconium stained, proceed to next step in resuscitation called INITIAL STEPS

1.2.3 Initial Steps of Resuscitation

- Provide warmth
- Position and clear airway (as necessary)
- Dry, stimulate, reposition

Initial steps of resuscitation (perform within 30 seconds)

- **Provision of warmth** by placing the baby under servo-control overhead radiant warmer

Position: Universal position of baby during whole resuscitation is with neck in slight extension which is called "Sniffing Position". This can be achieved either manually or by placing a roll of sheet beneath the shoulders Fig 1.2



Fig 1.2: Sniffing Position

- **Clearing of the airway.** Depends on whether the liquor is clear or is meconium stained. If the liquor is clear, do the oropharyngeal suction

Procedure of oropharyngeal suctioning

- Secretion may be removed from the airway by wiping the nose and clearing the oropharynx by applying suction through a suction catheter (size 12-14 F).
- The negative pressure for suction should be between 80-100 mm Hg, not exceeding 100 mm Hg in any case.
- The mouth is suctioned before the nose to ensure that there is nothing to aspirate if the baby takes gasp while the nose is being suctioned. You can remember mouth before nose because "M" comes before "N".
- Suction should be gentle and avoid stimulating posterior pharyngeal wall.

Caution: Vigorous suctioning may cause bradycardia and apnoea due to vagus nerve stimulation. If bradycardia occurs, stop suctioning and re-evaluate the heart rate.

- **Dry** the baby and **discard** wet linen

Provide **tactile stimulation** if not breathing after above steps. It should only be provided twice by tapping or flicking the soles or gently rubbing the back Fig 1.3

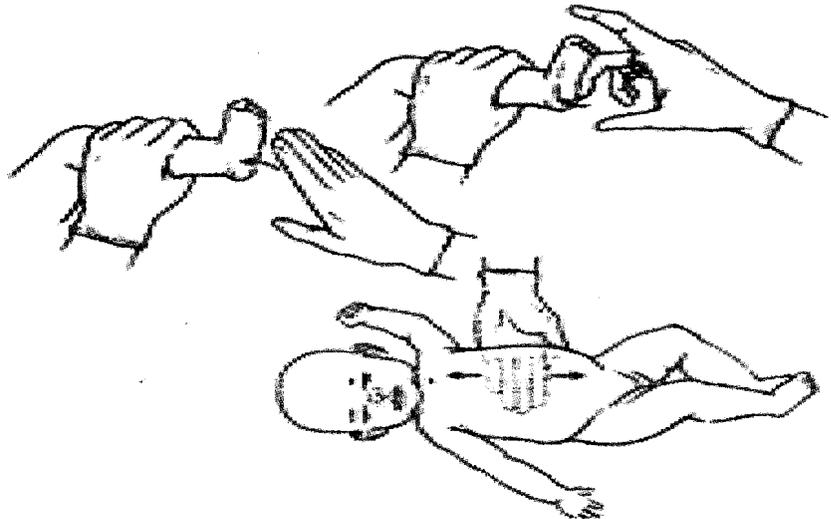


Fig. 1.3: Method of tactile stimulation

- Reposition the baby
- Make next assessment

Management of meconium stained amniotic fluid (MSAF)

Facts:

- 1) The management of babies born through MSAF does not depend on consistency of meconium i.e thick or thin, or color of meconium i.e yellow or green
- 2) Routine intrapartum suctioning of mouth and nose is not recommended in these babies.
- 3) The management of these babies is decided by the condition of the baby i.e. whether the baby is **VIGOROUS** or not

VIGOROUS BABY is defined as the one who has:

- 1) Strong respiratory efforts
- 2) Heart Rate > 100 bpm
- 3) Good muscle tone

Babies who are born through MSAF and are vigorous, perform usual resuscitation as described in initial steps.

Those babies who are NOT VIGOROUS i.e either have poor respiratory efforts or Heart rate is less than 100 bpm or has a poor muscle tone, need endotracheal suctioning after oropharyngeal suction.

While performing Endotracheal Suctioning:

- Administer free flow oxygen throughout procedure
- Clear mouth and posterior pharynx
- Perform endotracheal suctioning with the endotracheal tube or suction catheter and not through endotracheal tube
- Insert endotracheal tube or suction catheter into the trachea
- Attach the ET or suction catheter to suction source
- Apply suction as ET or suction catheter is slowly withdrawn
- Repeat as necessary until no meconium or heart rate indicates further resuscitation

After performing Initial Steps make assessment of:

- Respiration
- Heart rate – Count the heart beat or palpate the umbilical pulsations for only six seconds and multiply by ten to obtain the heart rate per minute (e.g. a count of 12 in 6 seconds is a HR of 120/minute).
- Color: Look for cyanosis at lips/tongue.

Remember assessment during neonatal resuscitation is always done in this sequence of Respiration, Heart Rate and Color

Some babies have spontaneous respiration, but have central cyanosis. Ensure that they are warm and the sheet is dry. At this stage provide them with free flowing oxygen with face mask or loosely cupped hand with a oxygen source at a flow rate of 5 liters/minute Fig 1.4.

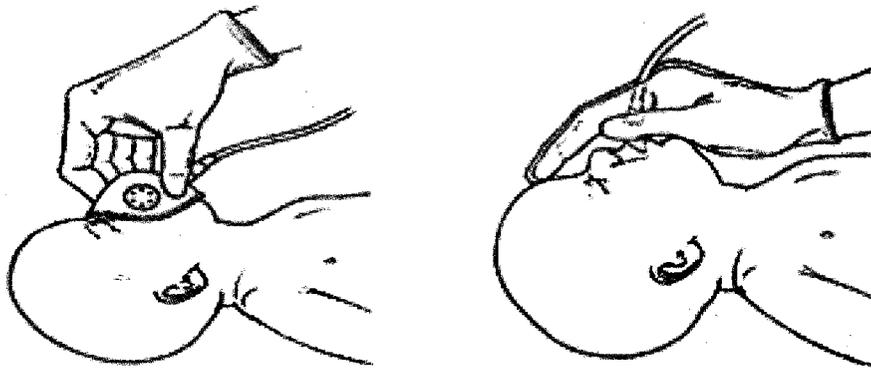


Fig. 1.4: Technique of free flow Oxygen

Remember administering free flow oxygen or continuing to provide tactile stimulation to a non-breathing new born or to a new born whose heart rate is less than 100 beats per min is of no value and only delays appropriate treatment.

If the baby is still apneic or gasping, immediately initiate positive pressure ventilation with a bag and mask.

1.2.4 Positive Pressure Ventilation

Indications

- Apnea/gasping respiration after 30 sec of initial steps.
- Heart rate below 100 after initial steps and positive pressure ventilation for 30 sec.
- Persistent cyanosis.

Bag and Mask

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. It has the following parts: Air inlet, oxygen inlet, patient outlet, valve assembly, oxygen reservoir and pressure release valve. Fig 1.5.

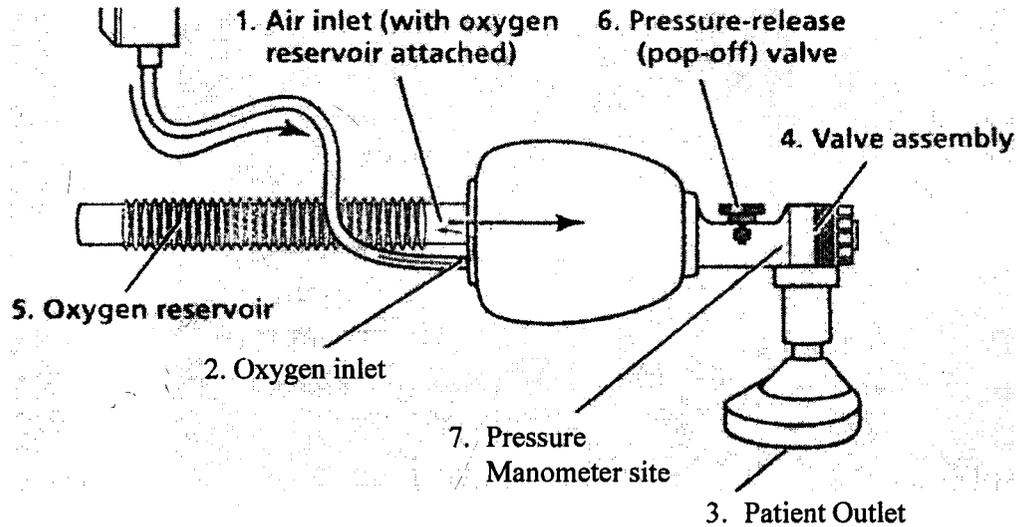


Fig. 1.5: Self Inflating Bag

- An oxygen reservoir is an appliance that can be placed over the bag's air inlet.
- The advantage of reservoir is to get 90-100% oxygen at the patient outlet as compared to only 60 % without reservoir with oxygen connected to oxygen inlet.
- If no oxygen is attached to the bag, it provides only 21% i.e. Room air
- A pressure release valve is also called a pop-off valve. If pressures greater than 30 to 40 cm H₂O are generated as the bag is compressed the valve opens, limiting the pressure being transmitted to the lungs of the infant.
- The ideal size of the bag for neonates is 240 to 500 ml capacity.
- Select the appropriate sized mask. Mask should cover the mouth, nose and tip of the chin but not the eyes Fig 1.6. It should be cushioned and round.

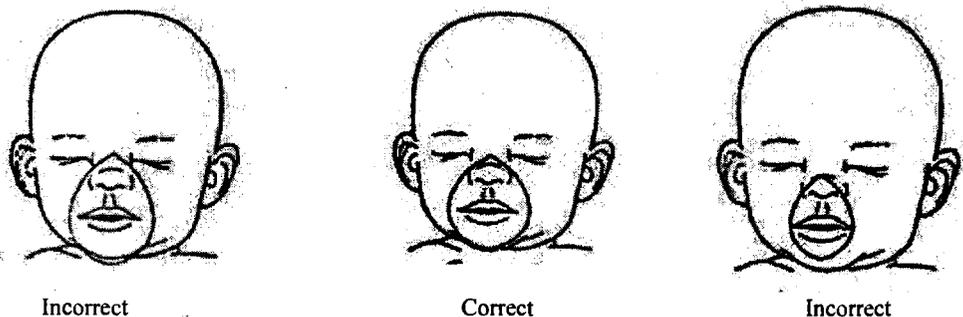


Fig. 1.6: Face Mask Position

Procedure of PPV

Position yourself at the side or head of the baby to use the bag effectively and to view the baby's chest for the rise or fall. Fig 1.7

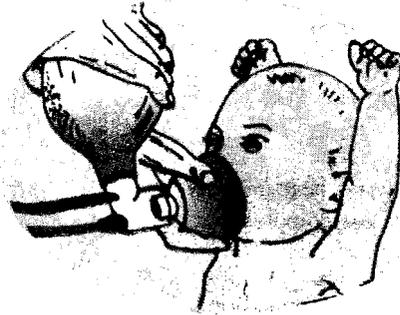
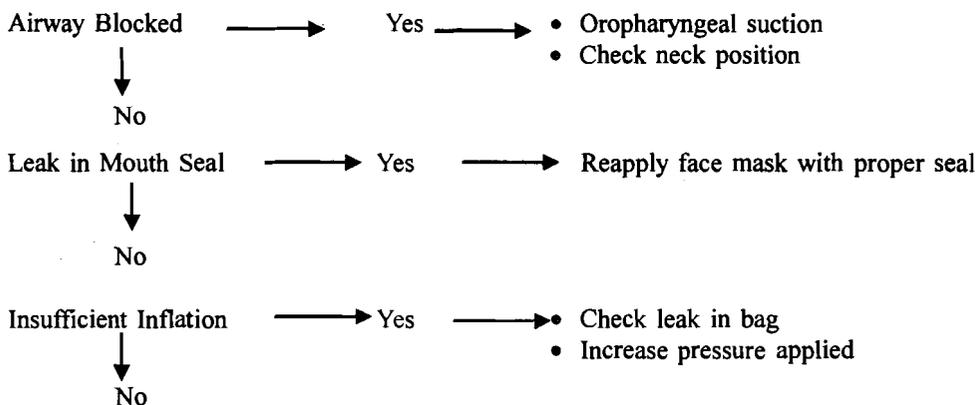


Fig. 1.7: Bag and Mask ventilation

- **Application:** The mask should be applied with slight pressure to avoid the leakage and should be held with the thumb, index and the middle finger of the left hand; while supporting the chin with the ring and the little finger.
- **Technique:** The bag is squeezed to cause a visible chest expansion. The best guide to adequate pressure during bag & mask ventilation is an easy rise and fall of the chest with each breath.
- **Rate of PPV** should be 40-60 per min and while applying pressure say “squeeze, two, three ... squeeze, two, three ... squeeze, two, three”. Release the pressure while counting “...two, three”. This sequence will give a rate of 40 to 60 breaths/minute.
- **Effect:** If there is no improvement in color, heart rate or breathing, it is possible that the chest is not expanding adequately.

Check list in case of non expansion of chest



Lung Pathology (Consider the need to intubate the patient)

The primary measure of improvement is increasing heart rate. If heart rate is not improving, assess chest movements and check breath sounds.

After 30 seconds of adequate PPV assess the child for heart rate and there would be three situations that you may come across.

- Respiration adequate, heart rate above 100 per min. Wean this child off PPV by providing free flow oxygen and look for color. Soon the child will become pink.
- Heart rate between 60-100 per min: Continue positive pressure ventilation and recheck for chest movements.

Heart rate below 60 per min: Continue positive pressure ventilation and start chest compression.

Bag and mask ventilation may cause abdominal distention and may compromise ventilation. Therefore if bag and mask ventilation is required for more than 2 minutes, an orogastric tube (Feeding Tube size 6-8 Fr) should be inserted and left open to decompress the abdomen.

1.2.5 Chest Compression

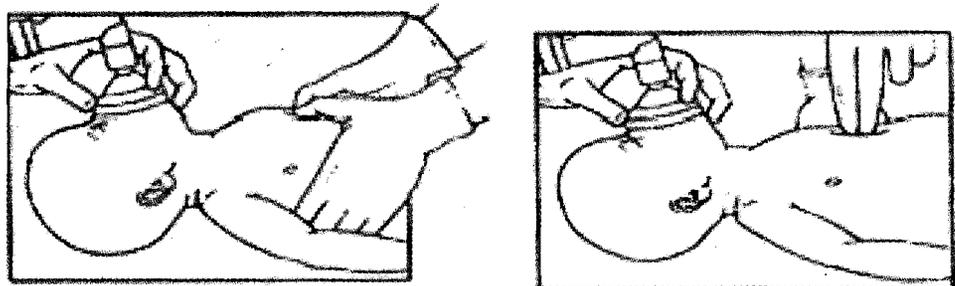
If the heart is below 60 despite adequate PPV for 30 seconds, chest compression should be initiated to improve circulation and must always be accompanied by ventilation with 100% oxygen.

Indication: Heart rate below 60 beats/minute after 30 sec of PPV. Once the heart rate is above 60 beats per minute, chest compressions should be discontinued.

Technique: For chest compressions two trained personnel are needed– one for assisted ventilation and other for cardiac compression.

There are two ways of chest compression– Thumb and finger technique. Thumb technique is preferred than finger technique.

Thumbs of both hands are placed either side by side or one over the other with fingers encircling the rib cage Fig 1.8.



Thumb technique (preferred)

Two finger technique

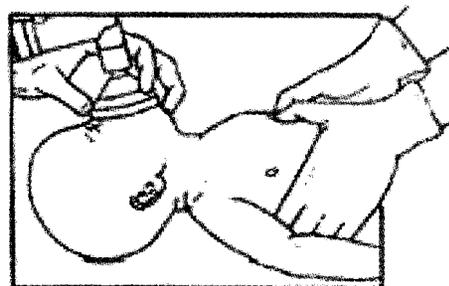


Fig. 1.8: Technique of Chest Compression

Rate:

- Ventilation interposed between compressions
- 90 compressions and 30 ventilations per minute
- 3:1 ratio

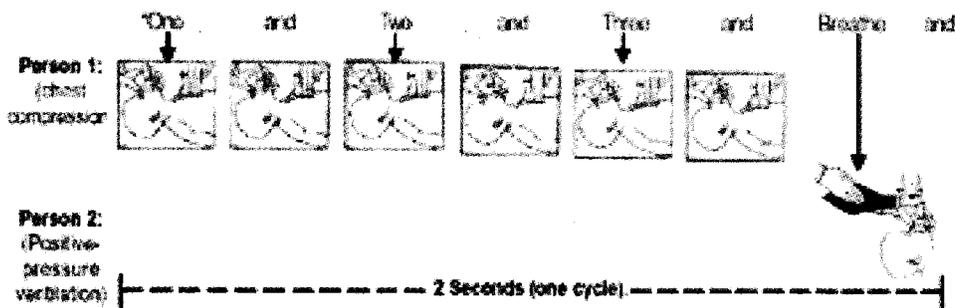


Fig. 1.9: Frequency of Chest Compression and PPV

- **Site.** Lower one third of sternum (the area just below the inter nipple line and above the xiphisternum).
- The **depth of compression** should be one third of the antero-posterior diameter of the chest.
- **Rate** of chest compression should be coordinated with ventilatory support i.e. three chest compressions and one breath
- "1 and 2 and 3 and BREATHE", should be the sequence of Chest compression and PPV.

Evaluate again after 30 sec of chest compression and PPV. Make your decision on the basis of the heart rate.

- Chest compression is discontinued once the heart rate is above 60 per min whereas PPV should be continued till the heart rate is above 100 per min. and infant is breathing spontaneously.

Chest compression can cause trauma to the underlying vital organs. Avoid pressure over the ribs and xiphoid.

1.4.6 Endotracheal Intubation.

Most of the babies are managed by initial Steps and PPV. Only less than 1% of births need chest compression or endotracheal Intubation. Intubation is a relatively difficult skill to master and it requires frequent practice to master this skill.

Indications

- Meconium stained liquor and child is limp and/or apneic.
- Suspected congenital diaphragmatic hernia.
- Non-response to bag and mask ventilation.
- Prolonged positive pressure ventilation is required.

Equipment: Correct sized endotracheal tube and straight blade-laryngoscope of size "0" for Preterm and "1" for term neonate. The appropriate size of the tubes for different babies is given in the chart.

Tube Size Inner diameter (mm)	Weight (g)
2.5	<1000
3.0	1000-2000
3.5	2000-3000
4.0	>3000

Technique: With the help of laryngoscope, introduce the ET Tube to a level so that the vocal cord guide is placed at the level of the vocal cords. This usually positions the tip of the tube above the bifurcation of the trachea.

Confirm the tube placement by ventilating the infant and checking for heart sounds on both sides of chest and stomach. After confirmation of correct tube position.

1.4.7 Drugs

The role of drugs is very limited. In few infants who fail to improve with ventilation and chest compression, medications becomes necessary. Only the following drugs are required for neonatal resuscitation:

- Adrenaline
- Naloxone
- Volume expanders (Normal Saline)

Remember atropine, dexamethasone, calcium, dextrose etc. are not indicated for resuscitation in the delivery room.

- **Adrenaline**
 - **Indication:** Heart rate is below 60 beats per min despite chest compression and PPV for 30 sec.
 - **Dose and route:** Through intravenous route in a dose of 0.1 to 0.3 ml per kg of 1:10,000 dilution.
 - If no I/V access, it may be given through endotracheal route.
 - Dose can be repeated after 3-5 minutes if no response
- **Naloxone hydrochloride**
 - **Indication:** A baby with poor respiratory effort but good heart rate (>100/minute) and is pink despite adequate PPV and there is history of administration of morphine or pethidine to the mother within past 4 hours
 - **Dose** of 0.1 mg/kg. Naloxone can be given IM or IV.
- **Volume Expanders** are indicated if there is evidence of acute blood loss with signs of hypovolemia. Give 10 ml/kg of Normal Saline over 10 minutes intravenously.

Do not use sodium bicarbonate empirically.

1.2.8 Role of Apgar Score

The Apgar score (Table 1.1) is the measure of the status of the new born immediately after delivery. As scoring does not begin until one minute of age, it is not used to determine the need for resuscitation. The Apgar when properly applied it can be used for ongoing standardized assessment of resuscitative efforts.

Table 1.1: Scoring of Apgar Score

Parameters	0	1	2
Respiratory effort	Absent	Gasping	Good cry
Heart rate	Zero	<100/min	>100/min
Color (Cyanosis)	Central Cyanosis	Peripheral cyanosis	Pink
Tone	Flaccid extremities	Partial Flexion of extremities	Complete
Reflex response to nasal catheter	None	Grimace	Sneeze

A low Apgar score by itself is not indicative of intrapartum hypoxia, nor does it predict mortality or long term neurological abnormality. The factors that depress Apgar scores include low gestational age, maternal medications, infection, neonatal respiratory disease, and congenital neurologic/neuromuscular disease.

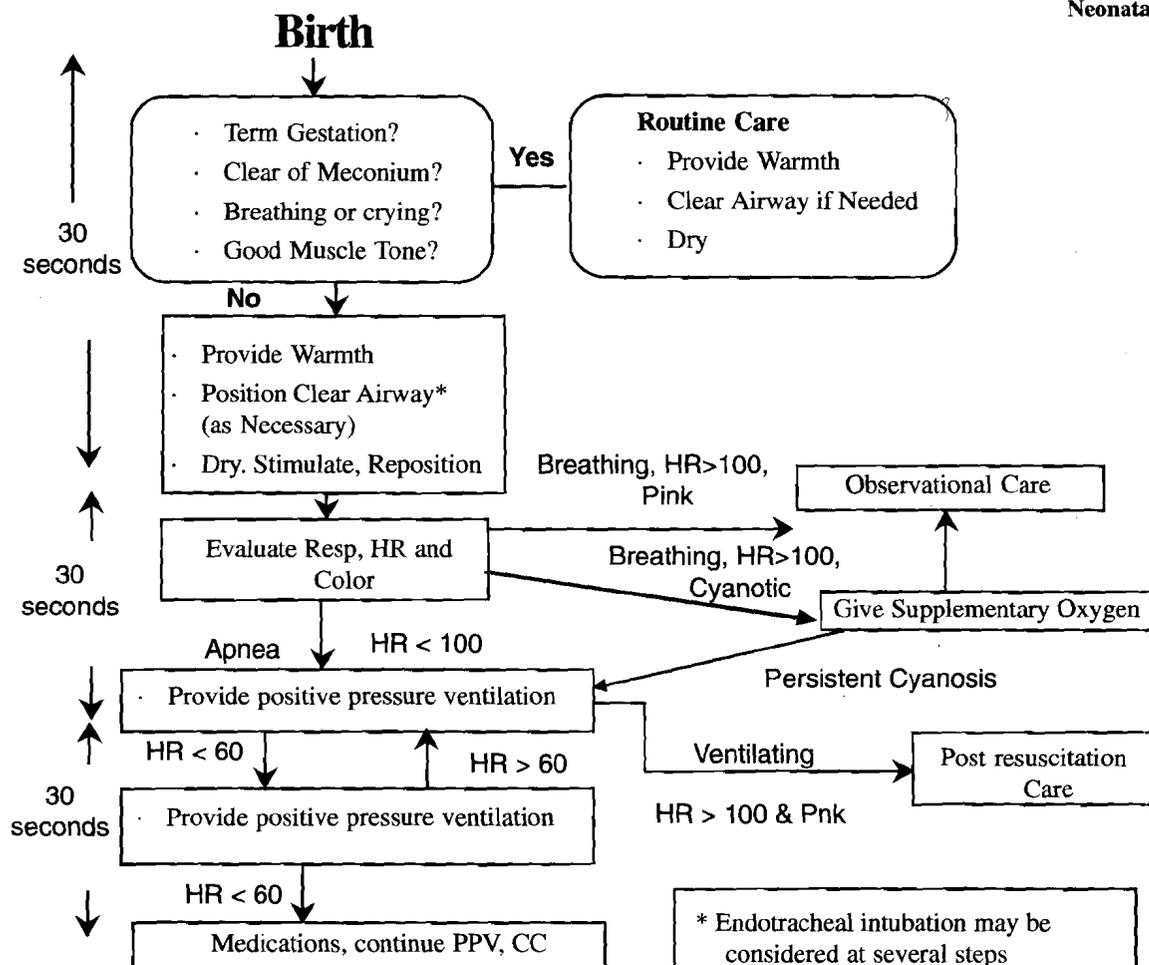


Fig. 1.10: Neonatal Resuscitation Algorithm

When to terminate resuscitation

Babies who show no sign of life (i.e. no heart rate or respiratory effort) after 10 minutes of resuscitation (i.e. Apgar score of 0 at 1, 5, 10 minutes) have a high rate of mortality or severe neuro development impairment. If after 10 minutes of continuous and adequate resuscitation, no sign of life remains it may be justifiable to stop resuscitative efforts.

1.3 CARE AT BIRTH

Appropriate care immediately at birth is crucial for favorable outcome and prevention of any serious sequelae. Babies who are well at birth i.e. born at term gestation, with clear amniotic fluid, crying and breathing well and having good muscle tone qualify for routine care, preferably provided by skin – skin contact on mother’s abdomen. Other components of care at birth in these babies are:

- **Initiating breast feeding** soon after birth; preferably within the first hour and let the baby breast feed on demand.
- **Giving Vitamin K 1 mg intra muscular once**

1.3.1 Care of Umbilical Cord

- The umbilical cord should be clamped and cut soon after the infant is completely delivered.
- Put ties tightly around cord at 2cm and 5cm from baby’s abdomen, cut between ties with a sterile blade, OR
- Use commercially available Cord Clamp at 2 cm from baby’s abdomen

- Observe for oozing blood. If blood oozes, place a second tie between the skin and first tie.
- **DO NOT** apply any substance or medication to stump.
- **DO NOT** bind or bandage stump.
- Leave stump uncovered

Care of the Eyes

- Routine cleaning of eyes is not recommended.
- Do not applying kajal or surma in the eyes

Skin Care

- Clean the baby off blood, mucus and meconium with clean water and dry it adequately.
- Bathing of babies soon after birth is not recommended. Postpone bath to preferably next day and ensure that baby's temperature is normal before giving bath.

1.3.2 Recognition of Preterm and SFD Newborns

Preterm babies have distinct physical features which help in their recognition:

- Preterm baby is diagnosed on the basis of period of gestation calculated from the date of last menstrual cycle of the mother. If it is less than 37 completed weeks, the baby is Preterm.
- The deep skin creases on their soles are absent or present only on the anterior one third (Fig. 1.11).



Fig .1.11: Sole Creases (left-preterm, right-term)

- The external ear or the pinna is soft and devoid of cartilage. Hence, it does not recoil back promptly on being folded (Fig. 1.4).



Fig. 1.12: Ear Cartilage

- In males, the scrotum does not have rugae and testes are not descended into the scrotum. In female infants, the labia are widely separated, not covering the labia minora, resulting in the prominent appearance of the clitoris. (Fig 1.3) & (Fig 1.4)



Fig. 1.13: Male Genitalia (Left-preterm, right-term)

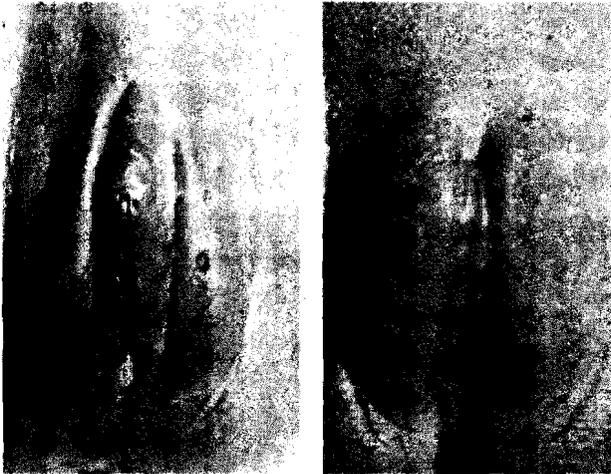


Fig. 1.14: Female Genitalia (left-preterm, right-term)

- The back of the preterm babies has abundant growth of fine hair called lanugo.

Small-for-dates neonates

- They have an emaciated look and loose folds of skin because of lack of subcutaneous tissue. These are particularly prominent over the buttocks and the thighs.
- They look alert and often plethoric Fig 1.15.



Fig. 1.15: SFD & AGA Baby

- If you compare the head circumference with chest circumference, it is easy to identify a small-for-dates baby. Normally, the head is bigger than the chest by about 2 cm. In small-for-date babies, the head circumference exceeds the chest circumference by more than 3 cm.
- When their birth weight is plotted on the intrauterine growth chart, it falls below the 10th centile.

Any baby at birth may be classified based on gestation into Preterm, term or post term and on the birth weight into small-for-dates (SFD), appropriate-for-dates (AFD), and large-for-dates (LED).

1.3.3 Examination for Congenital Malformations

- The neonate should be examined quickly but thoroughly for birth defects, birth injuries or any breathing difficulty.
- The patency of esophagus should be checked by passing a stiff rubber catheter into the stomach.
- Also check for anal opening
- Record weight and length

1.3.4 Weight, Length and Head Circumference Measurement

Weighing of the baby should be done in all cases. It can be done as and when baby is stable and is able to maintain the body temperature. Any of the following weighing scale is used to measure the weight:

- 1) Beam Balance Scale
- 2) Portable Spring Balance
- 3) Dial Type Weighing Scale
- 4) Electronic Weighing Scale (Fig. 1.16).

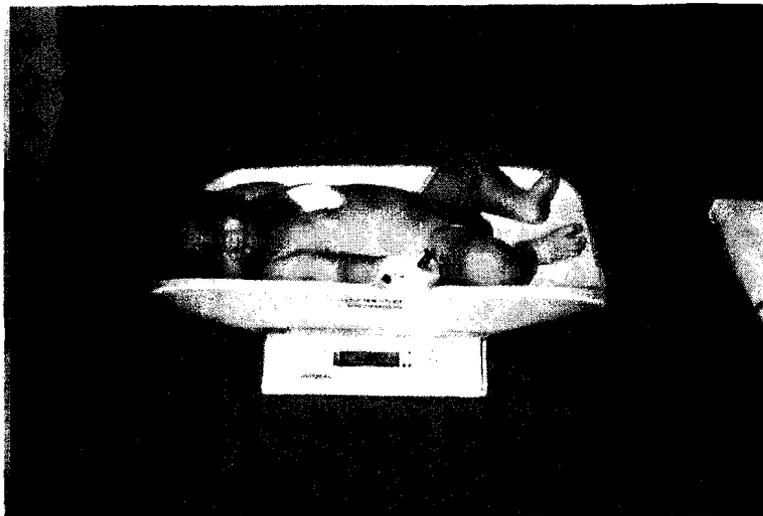


Fig. 1.16: Weighing Scale

Whatever type of scale is used,

- 1) Ensure that the weighing scale is accurate and the zero error corrected.
- 2) Fix the weight scale at eye level for correct reading.
- 3) Weigh the child with minimal clothing.
- 4) If the child is crying, look at the reading when it becomes steady between the attacks of crying.

Length – Measured on an infantometer taking care that knees are fully extended and the feet are perpendicular to the horizontal Fig 1.17. Term neonate at birth is about 50 cm long.



Fig. 1.17: Length Measurement

Head circumference – Measured at the level of the supraorbital ridges and maximal parietal prominences. The head circumference of term newborn is about 33 to 36 cm.

1.3.4 Babies Needing NICU Care

- Low birth weight babies: Birth weight less than 1.8 kg requiring assisted feeding
- Babies with breathing difficulty
- Babies with moderate to severe asphyxia or who required PPV at birth for more than 3 min.
- Babies with major congenital malformations e.g. tracheo esophageal fistula, Cleft palate etc

1.4 LET US SUM UP

In this unit you have learnt about the practical issues related to providing care to a newborn at birth. Immediate care at birth includes helping the baby clear its airway, preventing heat loss and providing warmth, initiate breast feeding, care of the cord, skin and eyes.

Birth asphyxia is an important emergency in the delivery room. The asphyxiated newborn has no or poor respiratory effort at birth. The assessment of these babies for resuscitation need is based on observation of respiratory effort, heart rate and color. Assisted ventilation with a bag and mask is provided for babies who have no spontaneous breathing or those with spontaneous breathing effort with a heart rate below 100/min and persistent cyanosis. Babies with heart rate below 60/min require chest compressions along with PPV. This unit also provides information on the use of drugs—adrenaline, naloxone, normal saline in the delivery room.