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RESEARCH ARTICLE

NEW-BORN RESUSCITATION

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Abstract

These guidelines are planned for Health care workers who are dedicated to giving neonatal resuscitation in the health care facilities. These guidelines are designed to keep in mind the complete process from the intrauterine to the extrauterine life of a new-born. In Other words, we can say the transition from intrauterine to extrauterine life. Updated neonatal resuscitation guidelines Included the latest knowledge in neonatal resuscitation also important changes from older guidelines and sanctions by the government of India for practice in health care facilities.

Introduction:-

As Per Current Data, Neonatal Birth asphyxia is the cause of 20% of neonatal deaths. The majority (90%) of new-borns do not require respiratory intervention during the intrauterine-to-extrauterine transition, but approximately 10% of new-borns require some form of support to initiate breathing at birth and approximately 1 % require extensive care such as CPR.

Objective:-

Neonatal resuscitation aims to prevent morbidity and mortality caused by hypoxic-ischemic tissue damage (brain, heart and kidney) and restore adequate spontaneous breathing and cardiac output. Guidelines for neonatal resuscitation have been published by the **MoHFW,NHM, WHO, UNICEF, American Heart Association and the American Academy of Paediatrics.** Instructions are very useful for memorizing resuscitation sequences. Failure to follow instructions may lead to poor results.

A neonatal resuscitation area should be designated for each delivery room and all necessary equipment and medications should be kept nearby. With each birth, there should be at least one person who is primarily responsible for the new-born. This person should be able to initiate resuscitation, including positive pressure ventilation and chest compressions.

In high-risk deliveries, the majority of new-borns requiring resuscitation can be identified in the intranatal period. If the need for resuscitation is anticipated, additional specialists should be called for assistance and necessary equipment should be provided. Childbirth requires a team of specialists. One for Position, suction and drying the other for artificial respiration, endotracheal intubation, and medication. If premature, IUGR or very LBW delivery is expected, special preparation is required.

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Neonatal resuscitation supplies and equipment

1. **Suction equipment**
- Mucus Extractor (One time use)
- Bulb syringe
- Suction machine (Electric/Manual) and tubing
- Suction catheters, 5F, 6F, 8F, 10F, 12F or 14F
- 8F feeding tube
- 20 ml syringe

2. **Bag and Mask equipment**
- Device for delivering positive pressure ventilation around 90 to 100% O2
- 1 and 0 Size Face masks – new-born and premature sizes
- O2 source and tubing

3. **Intubation equipment**
- Laryngoscope with straight blades, No.0 (preterm) and No.1 (term)
- For the laryngoscope extra bulbs and batteries
- Endotracheal tubes 2.5,3.0,3.5,4.0-mm internal diameter (ID)
- Stylet
- Scissors
- Tape for securing the device for the ET tube
- Cotton sponges
- Antiseptic solution
- CO2 detector or capnograph
- Laryngeal mask airway (optional)

4. **Medication**
- Epinephrine 1:10,000(0.1 mg/ml) – 3 ml or 10 ml amp
- Normal saline or Ringer's lactatefor volume expansion – 100 or 250 ml
- Sodium bicarbonate 4.2% (5 mEq/10 ml) – 10 ml amp
- Naloxone hydrochloride (0.4 mg/ml) – 1 ml amp or (1 mg/ml) 2 ml amp
- Dextrose 10% – 250 ml, normal saline for flushes
- Umbilical vessel catheterization supplies: -
- Sterile gloves, scalpel or scissors, antiseptic solution, umbilical tape, umbilical catheters, 3.5F, 5F, three-way stopcock
- Syringes 1, 3, 5, 10, 20, 50 ml needles 25, 21, 18G or puncture device for a needleless system

5. **Other Necessary Equipment**
- A draught-free, warm room with a temperature of 26°C- 28°C.
- Gloves and appropriate personal protective equipment
- Radiant warmer
- Shoulder Roll (A folded piece of cloth, 1/2 to 1 inch thick to position the baby)
- Cord clamp/ sterile thread
- Identification Tag
- Identify the Helper to support in the New-born Resuscitation process
- Digital Clock or Clock with second's hand
- Prewarmed Towel/linens
- Paediatric Stethoscope
- Tape half or three-fourths inches
- Pulse oximeter or Cardiac monitor and electrodes
- Oropharyngeal airway (0, 00, and 000 sizes or 30, 40, 50 mm lengths)

6. **For very pre-term babies**
- O2 blender to mix O2 and compressed air
- Pulse oximeter and probe
- Food-graded plastic bag
- Transport incubator to maintain baby's temperature during its move to the nursery

Procedure:-

1. A rapid Initial assessment at birth by checking four important parameters will help the health worker to identify the need for new-born resuscitation, which is given below-

- ❖ Is the New-born birth after Full-term gestation
- ❖ Is the amniotic fluid clear of meconium and evidence of infection
- ❖ Is the new-born breathing/crying
- ❖ Does the new-born have good muscle tone

i. If the answer to these four questions is "yes" the new-born does not require resuscitation and should not be separated from the mother. The new-born can be dried and go for delayed cord cutting (cut the cord within 1-3 minutes), placed directly on the mother's chest and make sure skin-to-skin care contact, and covered the new-born with a pre-warmed towel to maintain the temperature. The observation of respiration, activity, colour, temperature, Breastfeeding, the passing of stool/urine and condition of umbilical cord should be monitored every 30 minutes for the first 2 hr of birth (4th stage of labour monitoring).

ii. If the answer to any of these assessments is "no," it indicates that infants should receive immediate care. Health care providers need to**call for help** and cut the umbilical cord immediately and perform initial new-born resuscitation steps within 30 seconds of life.

2. Major Initial Steps are-**PSDSR**

i. **Position:** Place the baby on its back and **position** the head so that neck is slightly extended (to open the airway) by placing a shoulder roll under the baby's shoulder to help maintain this Position.

- Shoulder roll should not be too thick or thin, this may cause overextension or flexion which will close the airway.

ii. **Suction:**If there is thick meconium and the baby is unresponsive, **suction** should be carried out before drying the baby. If there is no meconium, there is no need to do suction.

- Suction first the mouth and then the nose (Remember 'M' comes before 'N')
- Do this by gently introducing a suction tube 5 cm into the baby's mouth until the '5 cm' mark is at the baby's lips. Use suction while withdrawing the tube
- Next introduce the suction tube up to 1-2 cm into each nostril Use suction while withdrawing the tube.
- Repeat suction if there is a lot of mucus, amniotic fluid or meconium but not more than two times or for a duration exceeding 20 seconds.

iii. **Dry:** Dry the baby thoroughly under the radiant warmer and remove the wet linen.

- Drying will stimulate the New-born and prevent hypothermia.

iv. **Stimulate:** Provide Tactile **Stimulation** to the New-born by Flanking on the Sole or Gently Rubbing the back, trunk and extremities of the baby by using Two fingers.

- Any form of stimulation will initiate breathing if the baby is in primary apnoea. Therefore 1 or 2 flicks on the sole or gently rubbing the back once or twice is sufficient.

v. **Reposition:** Reposition the New-born and Assess the Breathing and heart rate for 6 seconds.

- Make sure the shoulder roll is placed appropriately.

3. If the New-born is still not Breathing go for ventilation (next 30 seconds of life) Apply an appropriately sized mask (0 for preterm and 1 for term baby) correctly covering the mouth and nose up to the chin.
4. Start providing positive pressure ventilation (PPV) or bagging (calling out '2, 3, squeeze'). Start with 5 prolonged inflation breaths (lasting 2-3 seconds) make sure the chest raises bilaterally with each ventilation. When chest rise is seen, this indicates a good ventilation technique.
5. If the chest does not rise, check for the correct position, look for leaks from the face mask/seal, and give 5 inflation breaths. After 30 seconds of the bag and mask ventilation, Reassess the breathing and heart rate (Umbilical Pulse) for 6 seconds. Umbilical Pulsation felt in 6 seconds * 10 = Heart rate. If available, apply a pulse oximeter probe and connect it to the machine.
6. If the new-born is breathing well and HR >100/Minutes, Bean of the bag and mask Ventilation and refer for observational care, fill in the details of resuscitation.
7. If the new-born is not breathing well /or HR between 60-100/Minutes, continue PPV (bagging) for 30 seconds at a rate of 40–60 breaths/ min and connect Oxygen till the Heart Rate reaches > 100 bpm and the new-born becomes pink.
8. If the Heart Rate is < 60 / minute continue PPV (Bag and mask) with Oxygen and start Chest Compression along withadministering Medication for example- epinephrine (Only under the supervision of a paediatrician) After about 30 seconds, reassess the heart rate again.

9. **The rate of oxygen for new-borns is 0.5-1 litre / Minute.** For new-borns, give the amount of oxygen which is needed to reach an oxygen saturation of between 90 to 95 %. Administering too much oxygen to a new-born, particularly a preterm, can cause serious damage to the retina and blindness.
10. If the heart rate remains < 60 b/m, chest compression, positive pressure ventilation, and epinephrine can be repeated every three to five minutes.
11. At any point, if the New-born start breathing spontaneously and is seen chest raising bilaterally bean off the bag and mask ventilation and give post-resuscitation care, stabilize the New-born and refer a higher centre for further observation and care.
12. If no improvement, continue bag and mask ventilation Maximum for 20 Minutes and prepare to refer to the appropriate centre. The Referral unit will be nearest to NBSU, SNCU or other Public/private healthcare facilities.

Note-
In cases of placental abruption, placental previaor umbilical cord blood loss, the baby's condition may not improve with effective ventilation, chest compressionsand medication (epinephrine). The baby looks pale in colour, with slow refilling of capillaries, a weak pulse, and a slow heart rate. May the baby is in hypovolemic shock and may need volume support.

Special Situation
Conditions like -
1. Choanal atresia
2. Pharyngeal airway malformations
3. Laryngeal web
4. Pneumothorax
5. Plural effusion and
6. Diaphragmatic hernia

All these should be looked for and require immediate interventions like inserting an airway in the mouth for patency of new-borns' airway, by nasopharyngeal airway, tracheotomy or by insertion of intercostal drains must be done.

Guideline for withholding and discontinuing resuscitation
Morbidity and mortality for new-borns vary according to the region and availability of resources.

1. Withholding resuscitation
In cases of high mortality and poor outcome, withholding resuscitation attempts may be considered, especially if parental consent is obtained. Not initiating resuscitation is ethically equivalent to discontinuing life support during or after resuscitation, and the care provider should not hesitate to discontinue support without functional survival.The following guidelines must be understood-

Resuscitation is not indicated when gestational age, birth weight or congenital anomalies are associated with certain premature deaths and unacceptably high morbidity. For example-
1. Extreme prematurity (gestational age < 23 weeks)
2. LBW (birth weight < 400 g)
3. Anencephaly
4. chromosomal abnormalities, such as trisomy 13.

In conditions with a high rate of survival and acceptable morbidity, resuscitation is always indicated, for example,
1. New-born with a gestational age of 25 weeks
2. New-born with congenital malformations.

2. Discontinuing resuscitative efforts
Infants with no signs of life have a high mortality rate or cause severe neurodevelopmental impairment after 20 minutes of resuscitation. Therefore, resuscitation should be discontinued after he/she has received 20 minutes of sustained and adequate resuscitation efforts.

Chest compressions

1. Chest Compression is rhythmic compression of the sternum that-

- Compress the heart between the sternum and spine
- Increase the intrathoracic pressure
- Pump the blood into the circulatory system

2. In new-born chest compression must be initiated if the heart rate **is <60 b/m after 30 seconds of PPV**, Chest compression is required to ensure that the heart is able to pump the blood being oxygenated in the lungs by mechanical ventilation. Oxygen level drops to cause acidosis and significant myocardial dysfunction.
3. Chest compression is performed to supplement the mechanical ability of the heart to maintain circulation till the time myocardium is oxygenated to perform an adequate function and deliver oxygen to the brain. A bag and mask can be used to provide PPV but to make it more effective during chest compression endotracheal intubation should be performed.
4. Compressions should be delivered on the **lower third of the sternum**to a depth of approximately **one-third of the anterior-posterior diameter of the chest**.
5. The duration of a downward stroke is shorter than the duration of release to permit the heart to fill.
6. On Complete release, the fingers/thumbs should maintain contact with the chest to avoid relocating the compression site and loss of control over compression.
7. For Every 3 compression, 1 Breath is delivered hence in a minute 90 compression and 30 breath is to be given. Here the **ratio is 3:1** compression and ventilation.
8. The person performing compression should call out loudly counting sequences "**One and two and three and Breath" The person who is ventilating squeeze the Ambu bag during Breath and release during one and.**
9. Health professionals need to practice this several time so that you can do 5 cycles in 10 seconds.

Techniques of Chest compression

Two techniques have been described

1. **Thumb Technique**Compression with two thumbs with fingers encircling the chest and supporting the back. The two-thumbs-encircling hand technique may generate higher peak systolic and coronary perfusion pressure than the two-finger technique. The two-thumb-encircling hand technique is recommended in newly born babies. Healthcare providers need to note a few points-

- New-borns back is firmly supported
- Neck is slightly extended
- Compression should be at appropriate location depth and rate.

2. **Two Finger techniques**Compression with the fingertip of the middle finger along with the index/ring finger with the second hand supporting the back. The two-finger technique may be preferable when access to the umbilicus is required during the insertion of an umbilical catheter. Healthcare providers need to note a few points-

- Two Fingertips should rest on the sternum
- Pressure is to be applied vertically
- This technique is quite tough than the thumb technique

When to stop Chest Compression

Stop chest compression if the heart rate is >60 but PPV (40-60 b/m) is to be continued. Ventilation is later stopped only if the heart rate is >100 b/m and the baby start breathing spontaneously. Now refer the new-born to the SNCU/NBSU for post resuscitation care.

If the new-born is still not revived:

1. Check if PPV is effective
2. If not intubated yet do it in the supervision of paediatricians/ Specialists.
3. Administered oxygen at 100%.
4. The Check depth of compression.
5. Ensure Coordination of Compression and breath is appropriate.

If the new-borns heart rate remains <60 b/m then should insert umbilical catheter and give epinephrine.

Note- Chest compression may lead to trauma to the baby if it is not done properly.

1. Damage to Xiphoid
2. Injury to internal organs such as the Lungs, Liver and Spleen.
3. Ribs Fracture

Post Resuscitations Care

New-borns who require resuscitation are at risk of deterioration after their vital signs have returned to normal. Once adequate ventilation and circulation have been established, the new-born should be maintained in or transferred to an environment in which close monitoring and anticipatory care can be provided.

Monitoring of a baby after successful resuscitation includes:

Observational Care: -

1. Place the baby in a prone position between the mother's breasts making sure skin-to-skin care contact.
2. Cover baby and mother together to prevent hypothermia.
3. Initiate breastfeeding as soon as possible it will prevent the new-born from hypoglycaemia (low blood sugar).
4. Assess the baby's attachment at the breast, can you hear him swallow, if needed Assist the motherin breastfeeding.
5. Good suckling reflex is a positive sign of recovery.
6. If new-born is unable to feed assist the mother to express colostrum by EBM Technique.
7. Monitor neonate (temperature, heart rate, breathing and colour, every 15 minutes in the first hour and then every 30 minutes in the next hour).
8. NEVER leave the mother and new-born alone. Monitor the duo every 15 minutes during the first hour.
9. Check breathing, temperature and colour. Watch for complications & refer immediately, if present.
10. Encourage the mother to breastfeed her baby as soon as she is ready. This will help prevent hypoglycaemia (low blood sugar).
11. Assess the baby's attachment at the breast, and help the mother breastfeed if needed. Good suckling is a sign of recovery. If the baby cannot suck effectively, help the mother express colostrum.
12. Record the sequence of events in baby note and Labour room record during resuscitation and explain them to the mother and family. Keeping records of events that occur at the time of delivery and in the immediate period can be vital. The information is important if a baby needs to be referred or becomes sick in the next few days.

Conclusion:-

Neonatal resuscitation contributes to better care of new-borns. Many important questions about neonatal resuscitation need to be answered in the future. Effects of endotracheal suctioning in meconium-contaminated non-viable neonates, outcomes in preterm neonates treated with occlusive plastic wraps, and effects of a ventilator with positive end-expiratory pressure on neonatal postnatal adaptations, percentage and timing of initially unresponsive neonates treated with supplemental oxygen, use of continuous positive airway pressure during neonatal resuscitation, most effective intravenous epinephrine in neonates with cardiac arrest, and hypothermia. In addition, the implementation of new guidelines and training in neonatal life support programs will further improve neonatal care.

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