

ADVANCED NEONATAL PROCEDURES

1. Performing Neonatal Resuscitation

Definition

Measures taken to receive newborns who have difficulty in establishing respiration at birth and includes suctioning, positive pressure ventilation, external cardiac massage, intubation and medications as necessitated by the neonate's condition at one minute of age.

Purposes

- ✚ To establish and maintain a clear airway.
- ✚ To ensure effective circulation.
- ✚ To correct any acidosis present.
- ✚ To prevent hypothermia, hypoglycemia and haemorrhage.

Articles

❖ Suctioning articles

- ✚ Bulb syringe
- ✚ De lee mucus trap with no. 10 Fr catheter or mechanical suction.
- ✚ Suction catheters no. 6,8,10.
- ✚ Feeding tube no. 8 Fr and 20ml syringe.

❖ Bag and mask articles.

- ✚ Infant resuscitation bag with pressure release valve or pressure gauge with reservoir, capable of delivering 90-100% oxygen.
- ✚ Face masks with cushioned rims (Newborn and premature sizes)
- ✚ Oral airways (Newborn and premature sizes)
- ✚ Oxygen with flowmeter and tubing.

❖ Intubation articles.

- ✚ Laryngoscope with straight blades No. "O" (premature), No "1" (Newborn)
- ✚ Extra bulbs and batteries for laryngoscope.
- ✚ Endotracheal tubes. Sizes- 2.5, 3.0, 3.5 and 4.0 mm internal diameter.
- ✚ Styilet
- ✚ Scissors

❖ Medications

- ✚ Epinephrine 1:10, 000 ampoules (1ml ampoule of 1:1,000 available in India)
- ✚ Nalaxone hydrochloride (Neonatal narkan 0.02mg/ml)
- ✚ Volume expander
 - 5% albumin solution.
 - Normal saline
 - Ringer's Lactate
- ✚ Sodium bicarbonate 4.2% (1mEq/2ml, 7.5% strength available in India approximately 0.9 mEq/ml)
- ✚ Dextrose 10% concentration 250ml.
- ✚ Sterile water 30ml
- ✚ Normaline saline 30ml.

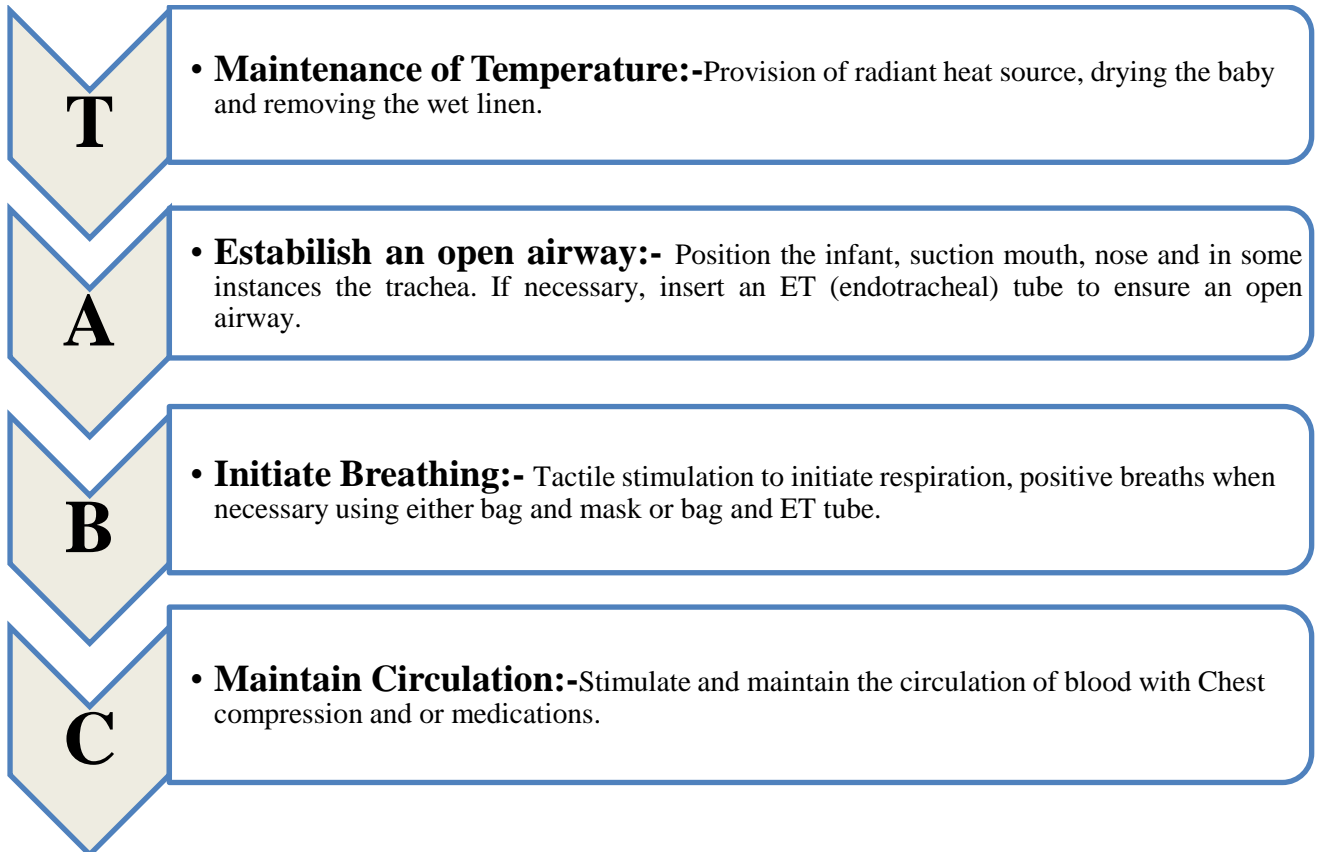
❖ Miscellaneous

- ✚ Radiant warmer
- ✚ Stethoscope.

- ✚ Adhesive tape and bandages scissors.
- ✚ Syringe 1ml, 2ml, 5ml and 20 ml sizes.
- ✚ Needles Nos 21,22 and 26 G
- ✚ Umbilical Cord clamp
- ✚ Warm dry towels.

TABC of Resuscitation

The components of the neonatal resuscitation procedure related to the TABC of resuscitation are shown here:

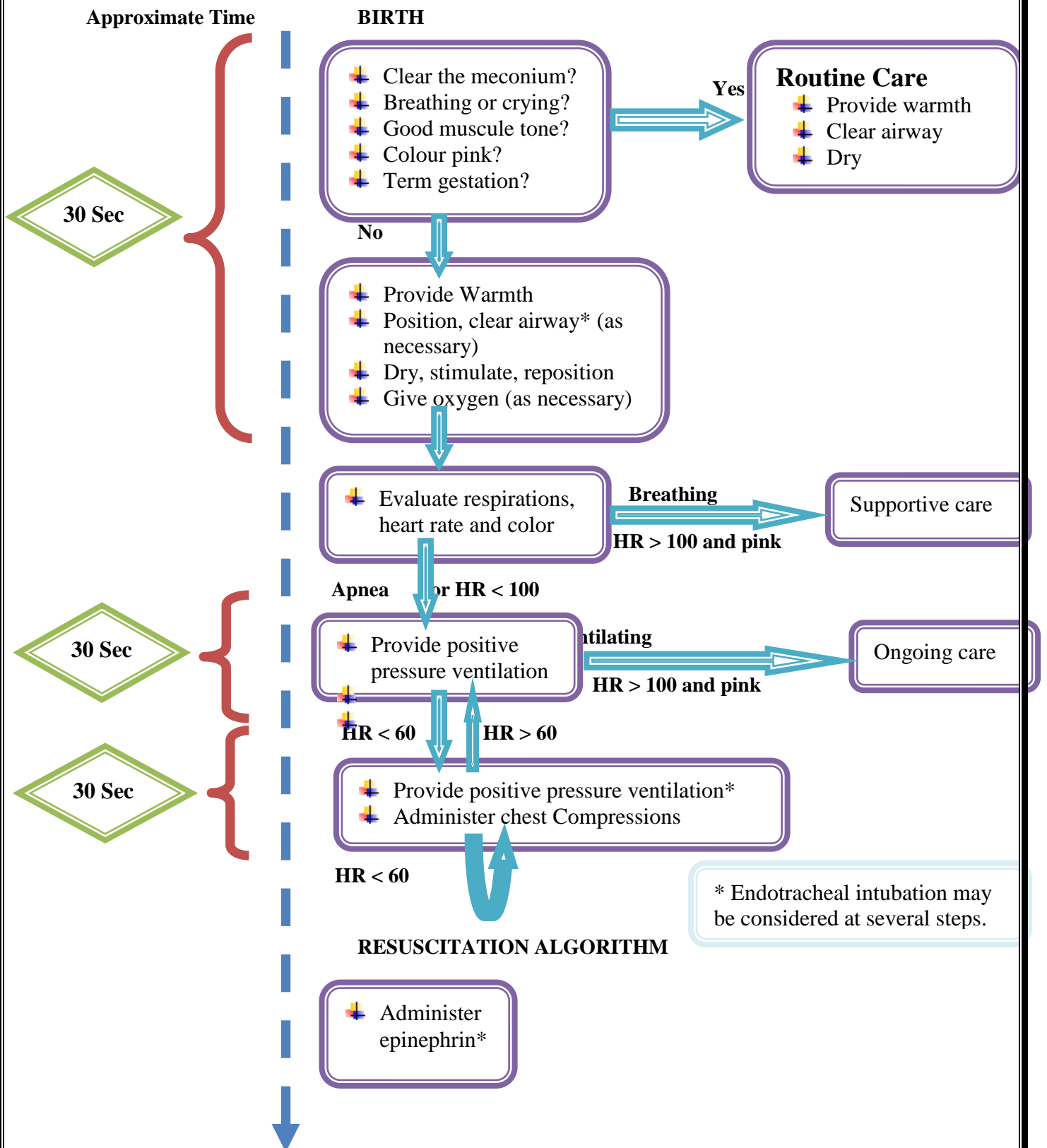


Resuscitation Algorithm

As soon as baby is delivered, assess for five signs while cord is being cut.

- a. Clear the meconium
- b. Breathing or crying
- c. Good muscle tone (Flexed posture and active movement of baby denotes good tone).
- d. Colour pink (Look at tongue and lips).
- e. Term gestation

If answers to all the five questions are 'Yes' then baby does not require any active resuscitation and routine care should be provided. The baby can be placed on mother's abdomen after drying and cleaning. If required, secretions can be wiped off using a clean cloth. Providing skin- to- skin contact and allowing breastfeeding will help in easy transition to extra uterine life.



Procedure

S.N.	Nursing action	Rationale
1.	Assess the Apgar score.	Helps to know if resuscitation measures are to be instituted.
2.	Place infant under warmer, quickly dry off amniotic fluid, replace wet sheets with a dry one.	Prevents heat loss.
3.	Place the baby on his back with slightly head down 15 degree tilt, neck slightly extended.	Straightens the trachea and opens the airway. Hyperextension may cause airway obstruction.
4.	Suction the mouth first and then nose.	Clears the airway passage. Infants often gasp when the nose is suctioned and may aspirate secretion from the mouth into lungs.
5.	Give tactile stimulation if infant does not breathe. (Flick or tap the sole of foot twice or rub the back). Do not slap.	Tactile stimulation of drying may bring spontaneous respiration.
6.	Check the vital signs, and the colour of the newborn.	Helps in determining further need for resuscitation.

Note: Evaluation should be done on respiration, heart rate and colour. If the baby is apnoeic, heart rate is less than 100bpm and central cyanosis is present, proceed for bag mask ventilation or positive pressure ventilation.

Bag and Mask Ventilation/ Positive Pressure Ventilation

Indications

- ✚ Apnea
- ✚ Heart rate less than 100 bpm.

Procedure

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S.N.	Nursing action	Rationale
1.	Place back with head slightly extended. The newborn on his	Helps in opening airway. Hyperextension may cause airway obstruction.
2.	A tight seal is to be formed over the infant's mouth and nose with the face mask.	Prevents leakage of air from the sides of the mask.
3.	Ventilate at a rate of 40-50 per minute.	
4.	Ventilate for 15-30 seconds and evaluate	Spontaneous respiration may be initiated with initial attempts to ventilate.
5.	Have an assistant to evaluate, listen to the heart rate for 6 seconds and multiply by 10.	

Evaluation

- ✚ If heart rate is above 100bpm and spontaneous respirations are present, discontinue bagging.
- ✚ If heart rate is 60-100bpm and increasing, continue ventilation, check whether chest is moving adequately.
- ✚ If heart rate is below 80bpm, start chest compression.
- ✚ If heart rate is below 60 bpm, in addition to bagging and chest compressions, consider intubation and initiate medications.
- ✚ Signs of improvement.
- ✚ Increasing heart rate.
- ✚ Spontaneous respirations.

Improving colour

Continue to provide free flow oxygen by face mask after respirations are established. If the baby deteriorates, check the following:-

-  Placement of face mask for tight seal.
-  Head position and presence of secretions.
-  Pressure being used.
-  Presence of air in the stomach preventing chest expansion.
-  Oxygen being delivered (100% or not).



For bagging lasting for more than two minutes insert an orogastric tube to vent the stomach.

Chest Compressions

Chest compressions consist of rhythmic compressions of the sternum that compresses the heart against the spine, increase the intrathoracic pressure and circulates blood to the vital organs.

Chest compressions must always be accompanied by ventilation with 100% oxygen to assure that the circulating blood is well oxygenated.

Indications

-  Heart rate less than 60bpm after bagging with 100% oxygen for 15-30 seconds.
-  Heart rate 60-80bpm and not increasing after bagging with 100% oxygen for 15-30 seconds.

Procedure

S.N.	Nursing action	Rationale
1.	Compress the chest by placing the hands around the newborn's chest with the fingers under the back to provide support and the thumbs over the lower third of the sternum (just above the xiphoid process) Or Use two fingers of one hand to compress the chest and place the other hand under the back to provide support.	Correct hand position compresses the heart and avoids injury to the liver, spleen, fracture of the ribs and pneumothorax.
2.	Compress the sternum to a depth of approximately one third of the anteroposterior diameter of the chest and with sufficient force to cause a palpable pulse. The fingers should remain in contact with the chest between compressions.	The size of the newborn determine the depth of compressions to avoid injury.
3.	Use three compressions followed by one ventilation for a combined rate of compressions and ventilation for a combined rate of compressions and ventilations of 120 each minute. Pause for ½ second after every third compression for ventilation.	Simultaneous compression and ventilation may interfere with adequate ventilation. The short pause allows air to enter the lungs.
4.	Check the heart rate after 30 seconds. If it is 60 bpm or more, discontinue compressions but continue ventilation until the heart rate is more than 100bpm and spontaneous breathing begins.	Periodic evaluation is necessary to ensure that treatment is appropriate to the infant's status.

Note: If cardiac compression fails, endotracheal intubation should be initiated.

Endotracheal Intubation

Indications

Heart rate below 60 per minute inspite of begging and chest compressions. Presence of meconium in the amniotic fluid.

Procedure

S.N.	Nursing action	Rationale
1.	Place infant with head slightly extended with a rolled towel under the shoulder.	Position makes the airway open.
2.	Introduce laryngoscope over the baby's tongue at the right corner of the mouth.	To guide the endotracheal tube
3.	Advance 2-3 cm while rotating it to midline, until the epiglottis is seen. Elevation of the epiglottis with the tip of the laryngoscope reveals the vocal cords.	To find right route
4.	Suction secretions if needed.	Clears the airway.
5.	Pass the endotracheal tube a distance of 1.5-2cm into the trachea, hold it firmly but gently in place and withdraw the laryngoscope slowly.	Ensures adequate air entry into both lungs.
6.	Attach the endotracheal tube to the adapter on the bag.	To facilitate ventilation
7.	Ventilate with oxygen by bag. An assistant should check for adequate ventilation of both lungs with stethoscope.	To know the improvement.

Medications

Medications should be administered if despite adequate ventilation with 100% oxygen and chest compressions the heart rate remains at 80 bpm.

Recording

Record the procedure in nurses' record. Document the baby's condition before and after procedure.

2. Care of baby undergoing Phototherapy

Definition

Caring for a baby being exposed to light source for prescribed of time.

Purpose

- To bring down serum bilirubin level to normal.

Articles

- Fluorescent lamps and fiberoptic pads (if available).
- Eye pads or eye shields.
- Napkin to cover the genitalia of male babies.
- Baby blankets, sheets – 2 nos.

Indications

- Elevated serum bilirubin levels
- Healthy term babies > 17mg/dl.
- Pre-term babies (weighing more than 1500 gm>8mg/dl).

- Preterm babies (weighing less than 1500mg > 5mg/dl).
- **Phototherapy can be delivered in several ways. The most common methods are:-**
- Fluorescent lamps or “bililights” placed over the infant who is usually in an incubator or under a radiant warmer.
- Halogen lamps.
- Fiberoptic phototherapy blankets or pads.

Procedure

S.N.	Nursing action	Rationale
1.	Provide explanation to mother that her baby will be kept in an isolate and exposed to a blue – green light for bringing down the bilirubin levels.	Allays anxiety and convinces her about the need for phototherapy.
2.	Instruct the mother to feed the baby.	Prevents dehydration when exposed to phototherapy.
3.	Check machine for electrical safety and proper insulation of wires.	Prevents electrical hazards.
4.	Check whether all bulbs are burning in machine.	
5.	Transfer the baby to nursery where phototherapy equipment is present and place the baby in the isolate over which phototherapy lights are placed.	Heat loss is minimized and temperature is controlled when an incubator is used.
6.	Adjust height between baby and lamp to 45cm.	Lights that are too close increases the risk of burning the skin. Lights too far away from the infant will not be effective.
7.	Place the baby naked under light in the isolette.	Exposes the skin as much as possible for maximum exposure to light.
8.	Cover the baby’s eyes with eyepads.	Protects eyes from the effect of high intensity lights on retina and avoids abrasions to cornea.
9.	Cover the genitals of male babies with the napkin.	Protects testicles from the high intensity lights.
10.	a. If fiberoptic pad is used, place it under the baby in contact with the baby’s skin. b. Keep the baby on his side with a rolled baby sheet on the side.	Maintains the position.
11.	Switch on bili lights and/or machine for the fiberoptic pad.	
12.	Change position every 2 hours.	Ensures that light reaches all areas of the body.
13.	Record in baby’s chart, all details about starting the procedure, observations made and precautions taken.	Acts as a communication between staff members.

Care and Observation during Phototherapy

- ✚ Provide feeding at regular intervals to maintain adequate hydration. If breastfeeding, mother should be encouraged to give demand feeding.
- ✚ If baby is hyperthermic, discontinue phototherapy and keep baby exposed under fan. When temperature reaches normal, restart phototherapy.
- ✚ Monitor bilirubin level and other hematologic assessments at regular intervals.
- ✚ Check baby at least every hour and see that the eyeshields remain in place. The eyeshields should not press against the eyes.
- ✚ The infant may be removed from the lights for feeding, diaper changes and other general care but should receive phototherapy for 18 hours every day.

- ✚ If fiberoptic blanket is used, it should kept next to baby's skin at all times. Be sure that the baby does not roll off the blanket. It is not necessary to cover the eyes if blanket alone is used.
- ✚ Monitor the body temperature at regular intervals.
- ✚ Observe the skin for rashes, dryness and excoriation.
- ✚ Feed the baby every 2-3 hours because phototherapy causes the baby to loose fluid from the skin and have loose stools. This may cause dehydration.
- ✚ Count your baby's wet diapers and stools. Increase feeding if the baby has less than six wet diapers a day or if urine appears dark.
- ✚ Do not apply oil to the skin of the baby.
- ✚ Observe for side effects like:-
- ✚ Loose green stool resulting from increased bile flow and peristalsis. Stool may damage the skin and cause fluid loss.
- ✚ Tanning effect from the light.
- ✚ Bronze baby syndrome- a grayish brown discoloration of skin and urine.
- ✚ Skin rash.
- ✚ Temporary lactose intolerance.

3. Care of Newborn in Incubator

Definition

Providing care to prematurely born or sick infants in a device called incubator which keep them warm.

Purposes

- ✚ To maintain a baby's core temperature stable at 37 degree Celsius.
- ✚ To provide humidified air.
- ✚ To administer oxygen.
- ✚ To observe the baby without disturbing him.
- ✚ To conserve the energy of premature canopy.

Parts of Incubator

- ❖ Deck
- ❖ Mattress which is enclosed by a clear plastic canopy.
- ❖ Air intake pipe.
- ❖ Microfilter assembly.
- ❖ Oxygen inlet.
- ❖ Thermostat.
- ❖ Caliberated dial.
- ❖ Arm ports.
- ❖ Hood: Single walled rectangular hood. The hood has a large door to aid in placing or removing baby from incubator. There are four elbow operated parts for better access during small procedures, inlet for IV tubes, probes, endotracheal tubes etc. Canopy can be lifted for cleaning and access.
- ❖ Control panel: Heater, blower and electronics.
- ❖ Lower unit: This consists of control box, touch sensor, front panel with display, humidifier, airducts and filter. The following are displayed on the front of the panel.
 - ✚ Air temperature
 - ✚ Patient temperature
 - ✚ Control temperature
- ❖ Cabinet: This provides support for hood, canopy and lower unit. It houses main switch, fuse and power cord connector. The cabinet has three drawers for storage space.

- ❖ Humidity percentage: Air is circulated by configural blower. Fresh air enters through air filters located at the end of incubator. Fresh air is mixed with circulating air from incubator canopy and passed over heater and humidifier. Temperature inside incubator is maintained by sensor placed on hood. Thus, heated air flow maintains surroundings of infant at desired temperature.

Procedure

S.N.	Nursing action	Rationale
1.	Identify the premature, weak or ill baby who needs to be nursed in an isolette.	Promotes chances of survival for premature baby who needs thermoregulation.
2.	Verify physician's orders for management of baby in the incubator.	Facilitates adequacy of required unit assembly for care.
3.	Explain procedure to mother/parents.	Promotes understanding and acceptance of parents.
4.	Prepare the incubator for placing the baby by cleaning it with soap and water and disinfecting.	Use of clean disinfected incubator prevents growth of microorganisms.
5.	Switch on the incubator and adjust the temperature at 36 degree centigrade on "servo control mode"	36 degrees centigrade set on servo-control mode maintains the baby's skin temperature at 36 degree centigrade.
6.	Prewarm the incubator for 15 minutes.	Prewarming facilitates flow of warm air on body surface.
7.	Transfer the baby to the prepared isolette.	Facilitates provision of required care to baby without causing stress.
8.	Undress the baby except for diapers.	Facilitates observation of the baby through the clear plastic canopy.
9.	Check temperature of newborn and the incubator every hour until the temperature of the baby is stabilized.	Prevents over exposure to heat.
10.	Maintain flow chart to record, temperature, heart rate, respiration and oxygen saturation.	
11.	Change humidifier water every day.	
12.	Give care for baby by introducing hand through arm ports.	
13.	Permit mothers/ parents to see and bond with the baby according to hospital policy.	Reduces the chances of sensory deprivation.
14.	Weaning a baby is important and has to be taken care of. This is done by gradually decreasing the temperature of incubator and monitoring the infant's body temperature. Keep port holes open for some time. Then take baby out and keep warm by dressing and wrapping.	
15.	Do not tap incubator.	Avoids disturbance to the baby.

4. Assisting in Exchange Transfusion

Definition

Assisting in withdrawing a baby's blood which has high bilirubin content and replacing with fresh blood through umbilical vein.

Aims

- To correct anaemia by replacing the Rh positive sensitized red cells.
- To remove the circulatory antibodies.
- To eliminate circulatory bilirubin.

Indications

- ❖ Non- obstructive jaundice with serum bilirubin level of 20mg/dl or more in fullterm and 15mg/dl in preterm infants, e.g. Rh or ABO incompatibility.
- ❖ Kernicterus irrespective of serum bilirubin level.
- ❖ Haemolytic disease of the newborn under following situations:-
 - ✚ Cord Hb 10% or less.
 - ✚ Cord bilirubin 5mg/dl or more.
 - ✚ Rise of serum bilirubin of more than 1mg/dl/hour.
 - ✚ Maternal antibody titer of 1:64 or more, positive direct Coombs' test and previous history of a severely affected baby.

Articles

- a. Exchange transfusion set containing:-
 - Kidney tray-1
 - Bowl-2
 - Metal scale-1
 - Suture scissors-1 fine scissors-1
 - Vein dilator-1
 - Fine toothed forceps-1
 - Fine non-toothed forceps-1
 - Fine non-toothed forceps-1
 - Curved mosquito forceps-1
 - Straight mosquito forceps-1
 - Dressing forceps -1
 - Surgical towel-2
 - 20cc syringe 2, 10 cc syringe 2
 - Cross splint, pads and bandages
- b. Injection tray with antiseptic.
- c. Small dressing pack.
- d. Sterile scalpel blade 3/11.
- e. Sterile feeding tray with pacifier.
- f. I.V. stand
- g. Injection normal saline 500ml.
- h. Injection heparin.
- i. 3-way stopcock.
- j. Resuscitation equipment and oxygen source.
- k. Heat source.
- l. Suction apparatus with mucus sucker.
- m. Umbilical vein catheter.
- n. NG tube no 5,6,8.
- o. Sterile linen bundle with 2 sheets and 1 biopsy towel.
- p. Mask and gloves.
- q. Cord tie.
- r. Specimen containers.
- s. Specimen tubes.
- t. Adhesive plaster, scissors and extra syringes.
- u. Emergency drugs like:-
 - Injection Adrenalin.
 - Inj. Calcium gluconate.
 - Injection Soda bicarbonate.
 - Inj. Amniophylline
- v. Blood giving set.
- w. Cross splint.

Choice of Donor Blood

- ✚ The donor blood should be fresh (less than 3 days old).
- ✚ The amount needed for an adequate exchange is about 160ml/kg (double the blood volume of baby).
- ✚ The blood should be crossmatched against mother's blood.
- ✚ It should be made sure that the blood is slowly warmed to infant's temperature.
- ✚ Fresh heparinized blood or blood preserved with acid citrate dextrose is used.
- ✚ In Rh incompatibility the transfusions are performed with group O, Rh negative blood whereas in case of ABO incompatibility and G-6 PD deficiency the procedure has to be performed with the same ABO and RH groups of the baby.
- ✚ 20-30 ml of blood is withdrawn and about 10-20 ml are replaced each time.

Procedure

S.N.	Nursing action	Rationale
1.	Explain the procedures to the patients.	Helps in reassuring the parents.
2.	Get informed consent from the parent.	Prevents legalities.
3.	The procedure is best carried out in an air conditioned room.	
4.	Collect the blood from blood bank and place in tepid water and check the blood type and group against the neonate's blood before administering.	Prevents hemolytic reaction caused by mismatched donor blood.
5.	Procedure should be carried out in an incubator maintaining the temperature at 27-30 degree centigrade.	
6.	NPO should be maintained for 4 hours before procedure.	Minimizes the risk of vomiting and aspiration into lungs.
7.	Expose and immobilize baby on cross splint.	Prevents movements during procedure.
8.	Open dressing pack and assist in cleaning of umbilical stump.	Removes microorganisms.
9.	Assist in cleaning umbilical cord and draping with sterile linen.	
10.	Pour 500ml of I.V. normal saline into a sterile bowl and add 1ml inj. Heparin in it.	Before beginning the exchange the whole apparatus should be primed with the saline as it prevents syringes becoming sticky.
11.	Umbilical cord is cut to less than 2.5 cm from the skin surface.	Helps in location of vein.
12.	Attach ligature loosely round the base of the cord. Insert umbilical catheter into the vein.	
13.	The catheter should be filled with a flushing solution, or donor blood before insertion.	Minimises the risk of air embolism.
14.	When free flow of blood is obtained, ligature is tightened and the catheter should be deep enough to reach the inferior venacava.	
15.	Make sure that heat source is available throughout the procedure.	Hypothermia may lead to metabolic acidosis.
16.	Measure CVP after insertion of catheter into the umbilical vein.	
17.	Take sample of pre-exchanged blood as well as after exchange for investigation.	Helps in estimation of bilirubin and haemoglobin.
18.	Monitor heart rate, respiratory rate and condition of baby hourly during procedure.	
19.	The physician removes 10ml of umbilical blood and replaces with 10ml of fresh blood immediately, until calculated volume has been exchanged.	
20.	Apply cord tie at umbilicus, seal umbilicus with tincture benzoin	Prevents risk haemorrhage

	apply small gauze and secure with adhesive.	and infection.
21.	Replace equipments and start phototherapy.	
22.	Document time of starting, duration, completion time, amount and type of blood exchanged, condition of baby during and after procedure, drugs given during procedure and samples sent to lab.	Gives information to the staff members.

Post Transfusion Care

- ✚ Place the baby in a radiant warmer.
- ✚ Inspect umbilicus for evidence of bleeding.
- ✚ Repeat serum bilirubin as required.
- ✚ Check infant's blood glucose level hourly.

Complications

- ✚ Bacterial sepsis.
- ✚ Thrombocytopenia.
- ✚ Portal vein thrombosis.
- ✚ Umbilical vein perforation
- ✚ Dysrhythmia
- ✚ Cardiac arrest.
- ✚ Hypocalcemia
- ✚ Hypoglycemia
- ✚ Hypomagnesemia
- ✚ Metabolic acidosis
- ✚ Alkalosis
- ✚ HIV, Hepatitis B infections.
- ✚ Graft versus host disease.

Special considerations

- ✚ If citrated or heparinized donor blood is used, one should be prepared for hypocalcemia, hypoglycemia, hyperkalemia and metabolic acidosis. Further, citrated blood leaves the infant with low Hb level. So as, a precaution calcium gluconate at regular intervals should be given when using citrated blood for exchange.
- ✚ For every 100ml of blood transfused one milli equivalent of sodium bicarbonate is given to combat metabolic acidosis.

CONCLUSION

Intensive care nurses endure intensive didactic and clinical orientation, in addition to their general nursing knowledge, to provide highly specialized care for critical patients. Their competencies include the administration of high-risk medications, management of high-acuity patients requiring ventilator support, surgical care, resuscitation, advanced interventions such as extracorporeal membrane oxygenation or hypothermia therapy for neonatal encephalopathy procedures, as well as chronic-care management or lower acuity cares associated with premature infants such as feeding intolerance, phototherapy, or administering antibiotics. NICU RNs undergo annual skills tests and are subject to additional training to maintain contemporary practice.

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