

COMMON PROCEDURES

This module is designed to complement your skills for management of sick newborn in hospital.

LEARNING OBJECTIVES

The objectives of this module are to learn about:

- **The proper technique of intramuscular injection**
- **Preparation of common medications**
- **Recording the weight and temperature of newborn babies**
- **Initiating oxygen therapy and establishing intravenous access**
- **Insertion of feeding tube and checking its position**
- **Development supportive care - pain**
- **Care of baby on CPAP**
- **Oxygen monitoring**
- **Screening for ROP**
- **How to organize emergency triaging and safe transport of sick neonates**

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:** The facilitator will demonstrate the procedures described.
- **Video Film:** Learn steps while performing common nursing procedures.

I. INTRAMUSCULAR INJECTION

PURPOSE

For administration of vitamin K, vaccines, and IM antibiotics.

POINTS TO REMEMBER

- Intramuscular injections are always given in the **antero-lateral aspect of thigh** in newborns
- **DO NOT USE GLUTEAL REGION** for intramuscular injections in newborns because unlike older children the risk of inadvertent injury to sciatic nerve resulting in paralysis of the limb is high in newborn babies. Moreover gluteal muscles are under developed leading to poor absorption of medications in them

DO NOT give IM injection in the gluteal region in newborns

EQUIPMENT

1. Disposable syringe with needle size 26 G
2. Cotton swabs
3. Alcohol/spirit
4. Sterile gloves

PROCEDURE

The steps are given in the box below:

Intramuscular injection

FOLLOW ASEPSIS ROUTINE AND STANDARD PRACTICE

1. While observing the three checks -check the drug while taking out from shelf , before loading and before replacement. Load the required dose in a syringe attached with needle.
2. Attach a fresh needle use 1 ml syringe with 26 or 27 gauge needle for vitamin K.
3. Ask the mother to breastfeed or use oral sucrose to decrease pain.
4. restrain the baby.
5. Expose the thigh and identify injection site (lateral side of the thigh) and extend the leg to make muscle prominent.
6. Cleanse the site with isopropyl alcohol; let it dry.
7. Grasp the muscle between thumb and finger of your hand and introduce the needle of the loaded syringe at right angles into the middle of vastus lateralis muscle
8. Aspirate the syringe to rule out that the needle is not in a blood vessel (if blood is aspirated take out the needle and prick again at another site).
9. Inject the required amount of medication.
10. Withdraw the needle.
11. Press with dry cotton, don't rub.
12. Dispose needle and syringe as per biomedical waste disposal policy
13. Document the medication administered



DEMONSTRATION

The facilitator would demonstrate the procedure of **IM injection of vitamin K 1 mg** on a mannequin. After demonstration, one of the **participants** would be asked to **demonstrate** the same procedure.



VIDEO

There will be a video demonstration on the procedure of intramuscular injection in newborns. This will be followed by discussion.

II. ADMINISTRATION OF COMMONLY USED MEDICATIONS

PURPOSE

To learn the proper procedure of preparation and administration of the common medications used in the newborn nursery.

POINTS TO REMEMBER

- Administer only those medications which you have prepared or verified.
- Give medications from legibly labeled containers.
- Check all medications for expiry date and discard all expired drugs.
- Be careful to ensure correct dose.
- Always get the calculation counter-checked by another person and initial it.
- Document the procedure immediately after administering the medication.
- Protocols of the commonly used drugs with doses, side effects, contraindications, and routes of administration should be available in the nursery.

EQUIPMENT

1. Disposable syringe with needle size 24 or 26 G
2. Cotton swabs
3. Alcohol / spirit
4. Syringe Pump
5. Pressure monitoring line
6. Sterile Gloves

PROCEDURE

The steps are given in the box below:

Administering common medications

FOLLOW ASEPSIS ROUTINE AND STANDARD PRACTICE

1. Check for the written instruction of the physician.
2. Observe the six rights for administering medications:
 - Right patient
 - Right drug
 - Right dose
 - Right route
 - Right time
 - Right documentation
3. Read the label of the medication carefully before loading the drug and confirm once again.
4. Use disposable syringe and needles for administering drugs.
5. Give intramuscular injection as described above (section I of this module). Attach needle and load syringe with the required dose.
6. For giving intravenous (IV) injection*, clean the port of IV cannula with squeezed spirit swab let it dry. Follow it up with betadine and again with spirit in a similar manner.
7. Slowly administer the drug, once drug is administered,
8. Document in the chart once drug is administered, push 0.5 ml of 0.9% saline and replace the cap.
9. Discard the waste as per the policy
10. Wash hands, document in the record.

**preferably as an infusion over 30 minutes (duration differs more for some drugs for each drug).*

The commonly used drugs in the nursery are presented here in alphabetical order based on their generic names. Simple formula for calculation of drug amount is given below:

$$\frac{\text{Desired strength of the drug}}{\text{Actual strength of drug}} \times \text{quantity} = \text{amount}$$

I. Adrenaline (Epinephrine)	
Presentation	1 mg/ml (1:1000 concentration)
Dosage	0.1-0.3 ml/kg/dose of 1:10,000 concentration, repeat every 3-5 minutes, if necessary May be given via endotracheal route using higher doses; upto 0.1 mg/kg (100 microgram/ kg) followed immediately by normal saline.
Route	Intravenous or endotracheal route
Directions for use	Take 0.1 ml in tuberculin syringe. Dilute it with 0.9 ml of sterile water for injection to make it 1 ml or 1ml to be diluted in 9 ml. (10 times dilution). The resultant concentration is 1:10,000 solution.

II. Aminophylline	
Presentation	Injection 250 mg in 10ml ampoules or 1ml to be diluted in 9ml
Uses	Apnea of prematurity
Dosage	Loading dose: 5.0-8.0 mg/kg IV Maintenance: 1-2.5 mg/kg/dose q 8 hourly IV, PO
Route	Intravenous or oral route
Directions for use	Take 0.1 ml of solution in 1 ml syringe. Dilute with 0.9 ml to make 1 ml with water for injection. Resultant concentration is 2.5 mg/ml. Administer required dose IV over 20 minutes.
Compatible	With 5% dextrose, normal saline, ringer lactate
Incompatible	Sodium bicarbonate
Caution	Never give by intramuscular route

III. Ampicillin	
Presentation	Injection 100, 250 & 500mg vials; oral amoxicillin syrup 25mg /ml
Uses	Sepsis, pneumonia, meningitis etc.
Dosage	Sepsis/pneumonia: 50-100 mg/kg/day divided q 8-12 hourly IV, IM Meningitis: 100-200 mg/kg/day divided q 6-8 hourly IV
Directions for use	250 mg vial : Add 5.0 ml water for injection Resultant concentration 50 mg/ml. Administer the required quantity IV slowly
Compatible	Normal saline, ringer lactate
Incompatible	Dextrose solution, sodium bicarbonate
Stability	Use prepared solutions within 4 hours

IV. Calcium gluconate	
Presentation	9 mg/ml ampoules
Uses	Treatment of low blood calcium level
Dosage	1-2 ml/kg/dose every 6-8 hourly
Route	Intravenous route only
Directions for use	To be diluted in equal amount of sterile water for injection. Inject very slowly while MONITORING HEART RATE. If there is bradycardia, discontinue the injection.
Incompatible	Sodium bicarbonate
Caution	Take care to avoid extravasation, if being given as in infusion - as it may cause sloughing of skin.

V. Gentamicin	
Presentation	Injection 80 mg, 40 mg and 20 mg/2 ml
Uses	Sepsis, pneumonia, meningitis etc.
Dosage	Conventional: <7 days: 2.5 mg/kg/dose q 12 hourly IV, IM >7 days: 2.5 mg/kg/dose q 8 hourly IV, IM Single dose: Preterm: 4 mg/kg/dose 24 hourly IV, IM Term: 5 mg/kg/dose 24 hourly IV, IM
Route	Intravenous, intramuscular routes
Directions for use	20 mg/1 ml (40 mg/2ml) ampoule: Take 0.1 ml and dilute with 0.9 ml with water for injection to make 1 ml. Resultant concentration is 2 mg/ml
Compatible	With 5% dextrose, normal saline
Incompatible	Sodium bicarbonate, heparin, chloramphenicol

VI. Phenobarbitone	
Presentation	Injection 200 mg/ml 1 ml ampoules :syrup 5 mg/ml
Uses	Neonatal seizures
Dosage	Loading dose: 15-20 mg/kg IV Maintenance: 3-5 mg/kg/day IV, PO in 1-2 divided doses
Route	Intravenous or oral route compatibility Normal saline only
Directions for use	Take 0.1 ml of solution and dilute with 0.9 ml of water for injection to make 1 ml. Resultant concentration is 20 mg/ml. Give required amount slowly over 15-20 minutes.
Caution	May cause respiratory arrest

VII. Phenytoin	
Presentation	Injection 100 mg/2 ml; syrup dilantin 25mg/ml; eptoin 6mg/ml
Uses	Neonatal seizures
Dosage	Loading dose 15-20 mg/kg IV
Route	Intravenous route only
Directions for use	Dilute in normal saline Give slowly at a rate 1 mg/kg/min infusion over 15-20 minutes.
Compatible	Normal saline only; incompatible with all other solutions.
Caution	After giving, flush the cannula with saline to prevent phlebitis. Do not use cloudy solutions.



DEMONSTRATION

The facilitator would demonstrate how to prepare the required concentration of one of the discussed medications. Show how to infuse using a syringe pump.

After demonstration, one of the **participants** would be asked to **demonstrate** the procedure for some other medication while other participants would observe.

III. INTRAVENOUS CANNULATION

PURPOSE

For

- Administration of fluid therapy
- Stabilization of sick newborn
- Administering intravenous medications
- Infusion of blood products

EQUIPMENTS

- Scalp vein set / cannula 24G
- Syringe
- Normal saline
- Cotton
- Alcohol, betadine/ povidone iodine
- Splint
- Tape, scissors
- Sterile gloves

POINTS TO REMEMBER

- Intravenous access may be initiated by physician or a neonatal nurse practitioner. The nurse is also expected to
 - Prepare all materials.
 - Help in identification of suitable vein.
 - Assist in immobilization i.e., taping and splinting.
 - Connect intravenous fluid and monitor infusion rate.
 - Administer IV medications.

PROCEDURE

The steps are given in the box below:

Insertion and Fixation of intravenous (IV) cannula / Scalp vein set

FOLLOW ASEPSIS ROUTINE AND STANDARD PRACTICE

1. Wash hands and assist by physician by holding the extremity and making the vein prominently visible and easy to cannulate.
2. Identify the appropriate site, clean the site as per the unit policy. Once the skin is prepared, no tapping/ or touching over the site.
3. Secure cannula after insertion with tapes/ transparent tape. Keep visibility of cannula tip area above skin insertion. This allows early detection of extravasation.
4. Use splint to immobilize joint.
5. Attach intravenous infusion line.
6. Document timing of intravenous access and medications given.
7. **Monitoring**
 - Infusion flow rate
 - Leaking from cannula site / connection
 - Extravasation (swelling, redness)

- Blockage (non-passage of fluid / medication)

8. Saline locking

(To keep the patency of the canula)

- Wipe the canula cap with spirit/70% iso propyl alcohol. Remove the cap
- Keep it on sterile area
- Flush 0.5 ml normal saline to ensure patency
- Replace cap
- Discard the used article as per biomedical waste management policy .Wash hands.



DEMONSTRATION

The facilitator would demonstrate how to fix an intravenous cannula using a model.



VIDEO

These will be a video demonstration on how to do insertion and fixation of intra venous cannula and provide oxygen therapy by hood. This will be followed by discussion.

IV. OXYGEN THERAPY

Oxygen is one of the most commonly administered drugs in the neonatal intensive care unit. While administering oxygen the main goal should be to deliver adequate amount of oxygen to the tissues without causing oxygen toxicity. Use a pulse oximeter to document saturation.

INDICATION:

1. Hypoxemia (O₂ saturation <90 % in room air)
2. Respiratory distress
 - Respiratory rate >60/min
 - Intercostal retractions
 - Grunt
 - Cyanosis in room air

SOURCE OF OXYGEN

- Oxygen concentrators
- Compressed gas cylinders
- Centralized piped gas supply

DEVICES FOR OXYGEN ADMINISTRATION

- Oxygen hoods
- Nasal cannulas / prongs
- Closed incubators

PROCEDURE

• Oxygen therapy by head box/oxygen hood

Equipments needed

- Flow meter
- Tubing
- Oxygen hood
- Humidification device (desired)

Procedure

- Initiate minimum oxygen flow based on severity of distress
- Place the neonate's head inside the hood /head box
- Monitor the baby for signs of improvement (respiratory rate, distress i.e. intercostalrecession, grunt, colour)
- Observe all infection control strategies.

• Oxygen therapy by nasal prongs

Equipments needed

- Flow meter
- Tubing
- Nasal prongs

- Humidification device (desired)

Procedure

- Initiate minimum oxygen flow as per need
- Secure the nasal prongs
- Monitor the baby for signs of improvement (respiratory rate, distress i.e. intercostal recession, grunt, colour)
- Observe all infection control strategies.

WHO Classification of respiratory distress

Classification	Respiratory Rate (bpm)	Grunting or Chest indrawing	Requirement of oxygen		
			By hood	Nasal catheter	Nasal prongs
Severe	More than 90 Less than 30	Present	>5L/min	>1 L/min	3-5 L/min
Moderate	More than 90	Absent	3-5 L/min	0.5-1.0 L/min	0.5-1.0 L/min
Moderate	60 – 90	Present	3-5 L/min	0.5-1.0 L/min	0.5-1.0 L/min
Mild	60 – 90	Absent	<3 L/min	<0.5 L/min	<0.5 L/min

POINTS TO REMEMBER

- Avoid using nasopharyngeal catheters, partial-rebreathing masks and non-rebreathing masks in neonates.
- To reduce the incidence of retinopathy of prematurity and other complications we need to titrate the oxygen flow to maintain the saturation between 90-95% with continuous pulse oximetry (for details refer to pulse oximeter in common equipment module)



Video

These will be a video demonstration on how to provide oxygen therapy by using cannula, oxygen hood. This will be followed by discussion.

V. INSERTION OF OROGASTRIC TUBE & ORO-GASTRIC TUBE FEEDING

PURPOSE

1. Insertion of feeding tube: For infants who
 - Require gastric decompression
 - Require gastric lavage
2. Oro-Gastric tube feeding: For infants who
 - Are unable to feed orally and need continuous or intermittent gavage feeding

INDICATIONS

1. Neonates who cannot feed orally e.g. preterm LBW infants, neurologically depressed.
2. Neonates with surgical conditions
3. Neonate on CPAP

EQUIPMENT

1. Feeding tube
 - a. 6 FG for babies >2000g
 - b. 5 FG for babies <2000g
2. Appropriate size syringe
3. Stethoscope
4. Scissors, tape

PROCEDURE

The procedure of insertion of feeding tube and oro-gastric tube feeding are given below:

Insertion of feeding tube

1. Wash hands thoroughly.
2. Position baby on right side or in supine position with head elevated. Baby may also be held in a sitting position in mother's or nurse's arms.
3. Measure the length required for insertion:
 - Open the feeding tube package and starting at the tip of the tube, measure from the bridge of the nose to the tip of the ear lobe down to tip of xiphoid process
 - Mark the tube with tape or maintain measurement with thumb and finger
4. To insert an oro gastric tube:
 - Hold the feeding tube 1" - 2" from the tip
 - Use the natural bend of the tube to follow the natural curves of the mouth and throat
 - Insert the tube in the mouth and towards the back of the throat, gently pushing it down the esophagus until it reaches the pre-measured mark on the tube

Note: Use expressed breast milk (EBM) to lubricate the tube before insertion. Do not use oil or paraffin to lubricate the tube.
5. Establish correct placement of the feeding tube by either of the following methods:
 - Connect the syringe to other end of feeding tube and gently aspirate the contents. The aspiration would look like curdled milk, if the tube is in stomach

- Disconnect syringe from the feeding tube and draw up 1-2 cc air. Reconnect the syringe to the tube. Inject the air into the stomach while auscultating. You should hear the air enter the stomach. Gently aspirate air before commencing feed
- 6. Observe baby for choking, gasping or cyanosis during insertion of tube. Withdraw tube immediately if baby appears to be in any distress.
- 7. Tape the tube in place at angle of mouth.

Procedure for giving oro-gastric tube feeding

1. Wash hand remove the plunger of a 10, 20 or 50 ml sterile syringe.
2. Connect the barrel of the syringe to the end of the gastric tube.
3. Fill the barrel with the required volume of milk.
4. Let the milk run from the syringe through the gastric tube by gravity.
DO NOT force milk through the gastric tube by using the plunger.
5. Hold the syringe 5-10 cm above the infant until the syringe is empty.
6. It should take about 10-15 minutes for the milk to flow into the infant's stomach. Changing the height of the syringe will also affect the speed of milk flow. Lowering the syringe slows the milk flow, raising the syringe makes the milk flow faster.
7. Observe the infant during the entire gastric tube feed. Do not leave the infant unattended. Stop the tube feed if the infant shows any of the following signs:
 - a. Breathing difficulty
 - b. Changes colour, looks blue
 - c. Becomes floppy
 - d. Vomits
8. Cap the end of the gastric tube between feeds. Keep open the tube end after 30 minutes of feed if baby on CPAP.
9. Document the feed amount on the clinical monitoring chart.

POINTS TO EMPHASIZE

- Pass the gastric tube gently so as to avoid trauma
- Passage of the gastric tube may lead to stimulation of vagal nerve resulting in apnea or bradycardia. If this occurs, tactile stimulation will assist the infant to breathe
- Let milk flow under gravity
- Pinch tube while filling the syringe
- Feed slowly
- Pinch the tube during removal



DEMONSTRATION

The facilitator would demonstrate how to insert a feeding tube using a mannequin.

After demonstration, one of the **participants** would be asked to **demonstrate** the procedure while other participants would observe.

VI. EXPRESSION OF BREASTMILK

PURPOSE

To teach, demonstrate and help mothers in expression of breast milk.

INDICATIONS FOR EXPRESSION OF BREASTMILK

For women whose infants cannot breastfeed effectively but are able to accept oral feeds by spoon/paladai or by oro-gastric tube.

METHODS OF EXPRESSION OF BREASTMILK

- By using hands - **preferred method**
- By using pumps:
 - Manually operated
 - Electrical pumps

POINTS TO EMPHASIZE

- **Hand expression is the most useful method** to express milk. It needs no appliance, so a woman can do it anywhere at any time
- It is easy to express milk when the breasts are soft. It becomes more difficult when the breasts are engorged and tender. **So teach a mother how to express her milk in the first or second day after delivery.** Do not wait until the third day, when her breasts are full
- **A mother should express her own breast milk.** The breasts are easily hurt if another person tries to do so
- If you are showing a mother how to express, show it on a breast model. If you need to touch her to show her exactly where to press breasts, get consent and **be very gentle**

EQUIPMENT

1. Clean, wide-mouthed container.
2. Mechanical or electrically operated pumps (if expression is done using pumps).

HOW OFTEN A MOTHER SHOULD EXPRESS MILK?

It depends on the reason for expressing the milk, but usually as often as the baby would breastfeed (at least 8 to 10 times / day)

- To establish lactation, to feed a low-birth-weight (LBW) or sick newborn
 - She should start to express milk on the first day, within six hours of delivery if possible. She may only express a few drops of colostrum at first, but it helps breastmilk production to begin
 - She should express as often as her baby would breastfeed. Hence it should be done at least **every 3 hours**, including the night hours. If she expresses only a few times or if there are long intervals between expressions, she may not be able to produce enough milk
- To sustain her milk supply to feed a sick baby:
 - She should express at least every 3 hours
- To build up her milk supply (if it seems to be decreasing after a few weeks)
 - Express very often for a few days (every ½ - 1 hours) and at least every 3 hours during the night

- To leave milk for the baby while she is out at work:
 - Express as much as possible before she goes to work. It is also important to express while at work to help keep up her supply
- To relieve symptoms such as engorgement, of breasts:
 - Express only as much as is necessary

PROCEDURE

The steps are given in the box below:

Expression of breastmilk

Step 1: Preparation of container

1. Choose a cup, glass, or jar with a wide mouth.
2. Wash the cup with soap and water.
3. Pour boiling water into the cup, and leave it for a few minutes. Boiling water will kill most of the germs.
4. When ready to express milk, pour the water out of the cup.

Step 2: Massaging the breast before expression

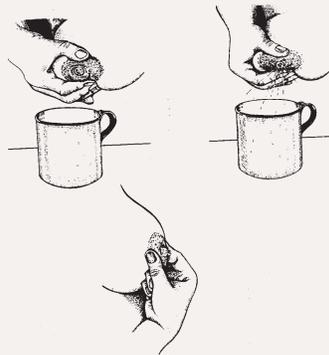
It is helpful to do simple massage before expression of milk.

1. Take a wet warm towel and wrap it around the breast. Let it be there for 5 min.
2. With two fingers, massage the breast using circular motion of fingers. Use pulp of fingers only with modest pressure. Alternately she can use knuckles of a fist. Massage the breast towards nipple as if kneading dough. Massage should not hurt her.
3. Provide massage for 5-10 minutes on each breast before expression of milk.

Step 3: Expression of breast milk

1. The mother should wash her hands thoroughly.
2. She shall sit or stand comfortably and hold the container near her breast.
3. She should think lovingly of the baby or look at a picture of her baby.
4. Ask her to put her thumb ABOVE the nipple and areola, and her first finger BELOW the nipple and areola opposite the thumb. She supports the breast with her other fingers.
5. Ask her to press her thumb and first finger slightly inward towards the chest wall. She should avoid pressing too far or she may block the milk ducts.
6. Press her breast behind the nipple and areola between her fingers and thumb. She must press on the lactiferous sinuses beneath the areola. Sometimes in a lactating breast it is possible to feel the sinuses. They are like pods, or peanuts. If she can feel them, she can press on them.

7. Press and release, press and release. This should not hurt-if it hurts, the technique is wrong.



8. At first no milk may come, but after pressing a few times, milk starts to drip out. It may flow in streams if the oxytocin reflex is active.
9. Press the areola in the same way from the SIDES, to make sure that milk is expressed from all segments of the breast.
10. Avoid rubbing or sliding her fingers along the skin. The movement of the fingers should be more like rolling.
11. Avoid squeezing the nipple itself. Pressing or pulling the nipple cannot express the milk. It is the same as the baby sucking only the nipple.
12. Express one breast for at least 3-5 minutes until the flow slows; then express the other side; and then repeat both sides. She can use either hand for either breast and change when they tire.
13. Explain that adequate expression of breast milk takes 20-30 minutes, especially in the first few days when only a little milk is produced. It is important not to try to express in a shorter time.

Storage of expressed breast milk

After expression, breast milk can be stored either at room temperature or in the refrigerator.

Storage of expressed breast milk

Stored at	Can be stored for
At room temperature	6 hours
In refrigerator	24 hours
In freezer	
at -4°C	2 weeks
at -20°C	3 months



DEMONSTRATION

Facilitator will demonstrate expression of breast milk using a breast model.



VIDEO

There will be a video demonstration on 'Expression of breast milk'.

VII. TEMPERATURE RECORDING

PURPOSE

To accurately record the temperature in newborn babies. Neonates are more prone for low body temperature (hypothermia); they grow better if their core body temperature stays in normal range (36.5 - 37.5° C).

INDICATIONS

- All new admissions to nursery
- Sick newborn and LBW babies
- To diagnose hypothermia / hyperthermia

METHODS OF TEMPERATURE RECORDING

- **Skin temperature**
 - Axillary: using ordinary clinical thermometer - **preferred method**
 - Abdominal: using skin probes of the incubator / radiant warmer
- **Rectal temperature**
 - Using rectal thermometer

EQUIPMENTS

1. Clinical thermometer - ordinary or rectal
2. Skin probe of the incubator / radiant warmer

POINTS TO EMPHASIZE

- Axillary temperature should be checked at least **once in every 6-8 hours** to see that it coincides with the temperature shown on the panel of the warmer or incubator
- Babies under the warmer require more frequent monitoring of temperature
- Ordinary clinical thermometer is different from rectal thermometer - rectal thermometer has a short and thick bulb
- Each baby should have a separate thermometer
- Disinfect thermometer with alcohol after use; keep thermometer dry and not in any disinfectant solution

PROCEDURE

The steps of recording skin temperature in the axilla are covered in the module on "Thermal protection."

The steps of temperature recording using the skin probes of radiant warmer and rectal thermometer are described below:

Recording abdominal skin temperature using skin probes

1. Clean the probe with spirit.
2. Attach the probe to the skin preferably over the upper part of abdomen in supine and the flank in prone position. This site is chosen as variation of temperature is minimal and the surface is hot.
3. Record the temperature shown in the display panel of the radiant warmer/ incubator.
4. Continuously monitor the temperature while the baby is under warmer or incubator. Make sure the probe is properly stucked to the site(not loose).

Recording rectal temperature using rectal thermometer *

1. Take clean rectal thermometer. Lubricate it with saline or xylocaine jelly.
2. Hold the lower limbs of the baby off the couch.
3. Insert the thermometer backwards and upwards for 2 cm in a preterm and 3 cm in a term baby.
4. Hold both the buttocks together for 2 min.
5. Take out the thermometer and clean it with dry cotton (from stem to bulb) and take the reading.
6. Clean thermometer again thoroughly first using soap swab then dry and clean again using spirit swab.

* *Use only for sick hypothermic babies*



VIDEO

These will be a video demonstration on temperature recording in newborns. This will be followed by discussion.

VIII. WEIGHT RECORDING ON A DIGITAL MACHINE

PURPOSE

- Recording of weight at birth helps in identifying the level of care required for the baby
- Recording weight daily is also essential to monitor the adequacy of nutrition as well as fluid balance. This is important for the management of VLBW babies

OBJECTIVE

- To demonstrate how to weigh the baby
- To understand the significance of the weight recording of a baby

EQUIPMENTS

1. Weighing scale with accuracy of ± 5 g
2. Clean, warm linen

POINTS OF EMPHASIS

- Record weight prior to feeding
- Resume skin-to-skin care or ask the mother to dress the baby promptly after weighing.
- Accurate daily weighing would be helpful in avoiding complications due to under or over hydration. Excessive weight gain would raise suspicion of fluid overload or of heart failure/renal failure. If baby loses or gains 3% or more of body weight in a day, it should be brought to the notice of the physician
- For monitoring of weight, one should use the same weighing scale

PROCEDURE

The steps of weight recording are described below:

Weight recording

1. Put the weighing scale on a flat, stable surface preferably bring the scale near the baby.
2. Put a clean warm towel/cloth on the scale pan. Zero the scale if the machine has the facility. If zero facility is not available, record the weight of the towel.
3. Detach as many tubes/equipment as possible.
4. Keep the naked baby on the towel and record the weight (subtract the weight of the towel if the scale has not been zeroed with the towel on the scale) up to the least count of the machine.
5. Keep baby in middle of scale pan. Record weight while the baby is not moving.
6. Use separate sterile towel for each baby.
7. If using pre-weighed splint, reduce the weight of splint from the baby's weight.
8. Document the weight in case record for quality assurance, check accuracy of weighing scale with standard known weights every 2 weeks.

Note

1. A weighing scale can also be employed to measure the urine output of the babies. Pre-weighed nappies should be used for nursing babies. Weighing the nappies post urination would be helpful in assessing the urine output of sick babies.
2. Weighing a baby pre-and post-feed is helpful in assessing adequacy of breast feeding.



DEMONSTRATION

Facilitator will demonstrate weight recording using a mannequin and an electronic weighing scale.



VIDEO

There will be a video demonstration on 'Weight recording'.

IX. OROPHARYNGEAL SUCTION

PURPOSE

Suctioning is used to remove secretions from the oral and nasopharyngeal area to ensure airway patency.

OBJECTIVES

The learner will be able to:

- Enlist the indications for suctioning of a non-intubated neonate
- State the important points one need to keep in mind while undertaking suctioning

INDICATIONS

- Presence of oral and/or nasal secretions in an infant unable to clear them on his own
- Prior to bag and mask ventilation and endotracheal intubation
- Presence of milk in airways
- After chest physiotherapy

EQUIPMENTS

1. Suction catheter with thumb control or Y connector:
 - FG 5 or 6 for preterm
 - FG 8 for term babies
2. Portable suction machine or wall suctioning with tubing.
3. Gloves.
4. Distilled/boiled cool water.

POINTS TO EMPHASIZE

- Avoid suctioning for 30 minutes to 1 hour after feeding, unless it is necessary to establish a patent airway
- Suction only when necessary. Vigorous suctioning increases risk of vaso-vagal response which can lead to bradycardia and apnea. Routine suction to be avoided
- Do not exceed suction pressure of 100 mm of Hg (130 cm of water)
- Oxygen source and bag and mask should be available at beside during suctioning
- Change the suction bottle and tubing every day to minimize bacterial colonization with pathogenic organisms

PROCEDURE

The steps of oropharyngeal suction are described below:

Oropharyngeal suctioning

1. Wash hands and wear clean gloves. (standard practice)
2. Attach appropriate size catheter to suction tubing and insert catheter into sterile water.
3. Occlude catheter completely and set pressure on suction machine at 100 mm of Hg (130 cm of water).
4. Estimate length of the catheter to be inserted by measuring from the tip of the nose to the tip of the ear lobe.
5. Gently insert catheter to the measured distance from the mouth. During insertion keep catheter pinched or keep suction off.
6. Apply suction only upon withdrawal of catheter. Limit attempts to 3-5 seconds or less.
7. Rinse catheter in sterile water before applying suction and between suction attempts.
8. Gently insert catheter into one nare and apply suction. Then repeat on other side.
9. Insert suction catheter gently upwards and back into the nares. If the catheter is difficult to pass, try with a smaller catheter. It is not necessary to pass a catheter completely through the nares to clear secretions (this may cause trauma). Applying suction to the external nares is often sufficient.
10. After suctioning, reposition the infant.
11. Discard catheter after single use as per policy.



VIDEO

There will be a video demonstration on how to do oral and oropharyngeal suctioning in newborn babbies. This will be followed by discussion.

X. GLUCOSE MONITORING BY HEEL-PRICK

PURPOSE

To monitor blood sugar and to detect hypoglycemia (defined as blood glucose level of less than 45 mg/dL with or without any symptoms)

OBJECTIVES

The learner will be able to:

- Identify the appropriate site for heel-prick and
- Perform the procedure correctly

INDICATIONS

- Premature and term LBW neonates especially those weighing less than 2.0 kg
- Infants born to diabetic mothers
- Sick neonate (asphyxia, hypothermia, poor &/or delayed feeding, sepsis, shock, respiratory distress)

EQUIPMENTS

1. Alcohol for skin preparation , cotton swabs
2. 26 gauge needle or lancets
3. Glucometer and test strips (Dextrostix)

POINTS TO EMPHASIZE

- DO NOT use povidone / betadine as specimen contamination may elevate blood sugar results
- Avoid the middle portion of heel and avoid making deep punctures
- Symptoms of hypoglycemia are very nonspecific and can mimic any illness (usual features include lethargy, weak cry and poor suck, temperature instability, jitteriness, apnea and rarely convulsions). Hence it is important to monitor blood sugar in babies who are at risk

PROCEDURE

The steps of dextrostix estimation of blood sugar are described below:

Estimation of blood sugar by heel-prick method

1. Giving breast feeding or 2 ml expressed breast milk will reduce pain. Warm by using water at 42° -43° C or warm steamed towel, if required. Follow the aseptic technique and standard precautions.
2. Prepare the site with 70% isopropyl alcohol/spirit, using a scrubbing/circular motion.
3. Do NOT use povidone/betadine, as specimen contamination may elevate some results.
4. Allow spirit to dry. Failure to allow spirit to dry may contaminate the specimen and give fallacious results.
5. Make a needle stick puncture on the **postero-lateral aspect of heel**. AVOID the MIDDLE PORTION of heel and avoid making deep punctures.
6. Allow a drop of blood to form and to fall on the strip.
7. Do not rub the strip against the skin.
8. Follow the instruction on the dextrostix bottle or glucometer.
9. If blood sugar / dextrostix value is less than 45 mg/dl, inform physician; the baby may require boluses of dextrose and/or IV dextrose infusion.
10. Discard the needle and swabs as per policy.
11. Do the documentation.



VIDEO

There will be a video demonstration on the heel-prick method for estimation of blood sugar.

XI. DEVELOPMENTAL SUPPORTIVE CARE AND PAIN MANAGEMENT IN NEWBORNS

Developmental care refers to interventions that support the behavioural organisation of the individual infant, enhance physiological stability, protect sleep rhythms and promote growth and maturation.

PURPOSE

- To reduce harmful environment stimuli in the NICU to the lowest possible level.
- To provide opportunity for optimal physical and neuro-behavioural development of neonate.
- To create a baby friendly womb like ambience and ecology in the NICU to stimulate in utero environment.

Procedure

Nursery Environment

Environment

- Baby should be nursed in thermo-neutral environment
- The number of visitors should be restricted, parents may be allowed
- The stressed infants should be kept away from areas with high unit traffic.

Noise

- Noise level should not exceed 40-45 decibels.
- Avoid unnecessary talking at bedside; teaching rounds should be away from bedside.
- Close incubators portholes/cabinet doors gently
- Remove water bubbling in oxygen and ventilator tubing
- Avoid putting bottles and equipment directly on the incubator
- Avoid writing on top of the incubator
- Reduce the volume of monitor noises (syringe pump, pulse oximeter)
- Keep telephone volume at a minimum
- Excess noise such as music should be avoided
- Reduce use of metal trash cans and running water near incubator
- Avoid tapping fingers on the incubator.

Light

- Turn off unnecessary light and dim the other lights at night to promote development of diurnal cycles (day and night).
- Lighting should be adjustable - the range of 100-600 lux is recommended.
- Blankets may be used to avoid direct light exposure to infants.
- Spot lights for examination should be directed away from baby's head and eyes should be covered when using such lights and phototherapy.

Parenteral involvement

- Parents should be involved in decisions about interventions where possible. This promotes their understanding of their infant's behaviour and allows them also to practice cue based care. This allows them to experience positive interactions with their baby and empowers them to recognize behavioural cues and become more confident in caring for their baby.

Nursery practices**Boundaries**

- Use covering, swaddling or cloth rolls around the infant to provide containment/ boundaries
- Place 2cm thick shoulder roll below the shoulder to provide slightly extended posture to facilitate breathing.
- Infants should be provided with neutral alignment to facilitate hand to mouth activities which are self soothing. The hands of the baby should be left free so that he can set them on his face to suck in or just touch his face
- Avoid sudden changes in the infants' position; rough handling may lead to hypoxemia and sudden elevation of blood pressure with risk of development of intraventricular hemorrhage.

Touch

- The baby should be positioned in such a way so that he is able to suck his fingers or hand or is able to touch his face.
- Gentle maternal touch should be promoted.
- Adopt minimal handling protocols for babies <1500g and fragile infants.
- Before touching, talk to infants so as to awaken the baby gently.
- For stable babies, monitoring of vital signs should be left for when the baby is awake and be coordinated with other care activities for the baby.

Stimulation

- The gauze pad or cotton ball soaked in mother's milk can be kept inside the incubator to stimulate olfactory system.
- Provide skin to skin contact.
- Lack of stimulation and overstimulation are equally bad for preterm babies.
- Stable babies should be picked up and encouraged to develop an eye to eye contact.

Cue based care and clustering of cares

- This involves caring for the infant while recognising the behavioural cues or stress responses and providing an appropriate strategy such as timeout or modification of care as appropriate.
- Clustering of cares encourages a minimum handling approach and protects periods of deep sleep by minimising the number of times an infant needs to be woken up or disturbed.

- The health provider should follow the infant's cues and pace the feeds, according to the infant's capacity to organize sucking, swallowing and breathing.

Stressful or painful procedures

- Minimize painful procedures and provide appropriate pain relief measures. During these procedures the use of some comforting techniques can reduce stress responses.
- Comforting techniques include:
 - Non-nutritive sucking (dummy, cotton bud with breast milk or sucrose)
 - Containment of infant's arms and or legs (swaddle or gently holding hands together on chest and/or hold legs tucked up)
 - Grasping a finger
 - Pain reduction
 - Breastfeed the infant at time of injection if appropriate.
 - Oral sucrose may be given for relief of distress with parental consent.
- Introduce touch slowly and allow time for the infant to respond and adjust to a change in position.

Kangaroo care

- Provide opportunities for kangaroo care when possible.
- Kangaroo care is early, prolonged and continuous skin to skin contact between a parent and a low birth weight infant. (Refer to module 3)

Noxious stimuli

- Minimize the infant's exposure to noxious stimuli such as strong fragrances, open alcohol swabs outside the incubator, clinical procedures and adhere to lighting and noise guidelines.

XII. NURSING CARE OF BABY ON CPAP

PURPOSE

To provide continuous positive airway pressure so that alveoli remain open at the end of expiration.

Indications

Common indications

1. Respiratory Distress Syndrome
2. Apnoea of prematurity
3. Post extubation in preterm VLBW infants
4. Transient tachypnea of newborn/delayed adaptation

Other indications

1. Pneumonia
2. Meconium aspiration/other aspiration syndrome
3. Pulmonary edema/Pulmonary hemorrhage
4. Laryngomalacia/tracheomalacia/bronchomalacia

Requirements of CPAP

- CPAP circuit, bubble chamber (for bubble CPAP only) and machine
- Nasal prongs and appropriate size CPAP cap
- Orogastric tube
- Tegaderm
- Setting of pressure, FiO and Flow flowmeter

Points to remember

- Ensure correct position and fixation of the nasal prongs
- Clean the nostrils with saline drops, suction the secretions when required and ensure patency of prongs
- Prevent injury to the nasal septum by applying a small tegaderm over the columella and keep a distance of 2mm between columella and interface
- Ensure that nasal skin is not blanched and there is no columella/septal redness or excoriation
- Always keep orogastric tube in situ and end open
- There should be no condensation in the Inspiratory circuit; this can be ensured by appropriate heating of the gases.
- Fill the humidification chamber up to the mark and ensure that the gas reaching baby should be at 37°C celcius and at 100% relative humidity
- Fill the bubble chamber with distilled water and it is always bubbling
- Remember to keep the tubing below the patient level
- Record the depth of immersion of the expiratory limb in the bubble chamber
- Initiate with a flow of 5 litre/min; titrate the flow in bubble CPAP to ensure visible bubbling in inspiration and expiration

PROCEDURE

- Warm and humidify the gases to 37°C celcius
- Use appropriate sized prongs. Size of the CPAP cannula is decided based on the type of nasal interface (Weight of the baby for Argyle prongs/Hudson's/ Respicare prongs and size of nostril/ columella for Fisher and Paykel prongs)
- Connect cannula to the circuit of the CPAP machine or ventilator. If ventilator is used switch to CPAP mode.
- Stabilize the head of the baby by suitable padding, ensure that there is no undue pressure on the soft tissues. Pass cotton tapes through the holes in the CPAP cannula and fix the cotton tapes in the sticky ends of the leucoplast.
- Adjust CPAP to desired level, usually 4-5 cm of water at start.
- Ensure that there is no blockage in prongs by periodic observation
- Suction the oral cavity, if there are secretions.
- In order to decompress the swallowed air, pass orogastric catheter and keep the proximal end open
- Look for blockage of the nares, gentle suction may be required. Instill a drop of normal saline into the nares every 1-3 hours as necessary.
- Change CPAP prongs/circuit every 3 days.

MONITORING

Baby

- Continuous monitoring of respiratory rate, heart rate, SpO₂
- Serial monitoring of severity of respiratory distress by using Silverman score
- Perfusion-CFT, BP, Peripheral pulses, urine output.
- Abdominal girth
- Observe the baby is comfortable
- Keep the oro-gastric tube in situ with proximal end kept open .

Interface

- Ensure an appropriate size cap, prongs and interface length
- Do regular but gentle nasal suction to clear the mucous 4 hourly or as and when required.
- Clean the nasal cannula and check the patency atleast once per shift
- Change the infant's position & check the skin condition of the nose 24 Hourly
- Ensure correct position and fixation of nasal prongs
- Prevent injury to the nasal septum by ensuring a gap between nasal prongs and columella

Machine

- Remove condensed water in the inspiratory circuit
- Ensure the gas delivered should be at 37°C and at 100% relative humidity
- Observe for the bubbles throughout the respiratory cycle (bubble CPAP)
- Fill the bubble chamber with distilled water
- Record the depth of immersion of the expiratory limb in the bubble chamber
- Monitor pressure and FiO₂

XIII. SCREENING FOR RETINOPATHY OF PREMATURITY

Retinopathy of prematurity (ROP) is a vaso-proliferative disorder of the retina among preterm infants. Normally, neonates born at less than 32 weeks of gestation are at risk of developing ROP. However preterm infants born at 32 weeks or later can also develop severe ROP if they had turbulent NICU course or required prolonged oxygen therapy. Timely screening and treatment of ROP can prevent blindness and minimize vision abnormalities.

PURPOSE

- The aim of the screening program is to detect ROP early.
- Follow it up closely during its evolution
- Treat if it assumes potentially serious severity level

INDICATIONS

- Babies with birth weight <1500gms
- Babies born at <32 wks of gestation

- Selected preterm infant with a birth weight between 1500-2000gms or gestation more than 32 wks with sickness like cardio respiratory instability, prolonged oxygen therapy, repeated episodes of apnea of prematurity, anaemia needing blood transfusion, neonatal sepsis, poor weight gain, hypotension or infants believed by their attending pediatrician or neonatologist to be at high risk.

When to screen

- First screening examination should be carried out at 32 weeks of post menstrual age (PMA) or 4 weeks of postnatal age, whichever is earlier.

Points to remember

- Practice hand hygiene.
- Keep the examination as brief as possible as it has effect on heart rate, BP, respiratory function of the premature baby
- Minimizes the discomfort by administering oral sucrose just before the examination and proper swaddling
- Should not have fed just before the examination
- Neonates are best examined in the neonatal unit itself under the supervision of attending pediatrician
- For prevention use antenatal steroids, monitor oxygen therapy, avoid unnecessary blood transfusion.
- For quality improvement, units caring for babies at risk should have written protocol.

Equipment required for eye examination

Tray containing

- 2 Bowls
 - 1st bowl-normal saline
 - 2nd bowl-savlon
- Eye speculum
- Retractor
- Tropicamide 1%
- Phenylephrine 2.5%
- Proparacaine just before examination

PROCEDURE

- Pupils are dilated with phenylephrine 2.5% and tropicamide 1%.
- One drop of tropicamide is instilled every 10-15 minutes up to four times starting one hour before the schedule time for examination.
- This is followed by phenylephrine 2.5% just one drop before the examination.
- Phenylephrine is available in 10% concentration. It should be diluted 4 times before use in neonate.
- Avoid repeated instillation of phenylephrine to prevent hypertension.
- Support the baby throughout the procedure.
- Use sucrose soaked swabs to soothen the baby.

- Ensure baby is not fed one hour prior before and after the procedure
- Record zone, stage and extent in terms of clock hours, presence of any plus or preplus disease.
- ROP examination should be followed by instillation of antibiotic eye drops 6 hourly for 3 days.
- Monitor baby for apnea.
- Advice follow up examination as necessary.

XIV. EMERGENCY TRIAGE ASSESSMENT AND TREATMENT

Triage is the process of rapidly screening sick neonates when they arrive at the hospital and categorizing them in one of the following groups:

1. Emergency Cases

- Severe hypothermia (temp < 32°C)
- Apnea or gasping respiration
- Severe respiratory distress (rate > 60/min, severe retractions, grunt)
- Bleeding
- Shock (cold periphery, Capillary Filling Time > 3secs, weak & fast pulse)
- Seizures, Coma or encephalopathy

These neonates with emergency signs are at high risk and require urgent intervention and emergency measures

2. Priority signs

- Small neonate (< 2000gms)
- Cold stress/moderate hypothermia
- Respiratory distress (rate > 60/min, no retractions)
- Irritable/restless/Jittery
- Refusal to feed
- Abdominal distension
- Severe jaundice (yellow palms & soles)
- Severe pallor
- Major congenital malformations

The neonates with priority signs are sick and would need urgent assessment. They should be attended to on a priority basis

3. Non urgent cases

- Jaundice
- Developmental peculiarities
- Superficial infections
- All cases not categorized as Emergency/Priority
- Transitional stools
- Minor birth trauma
- Minor malformations

Triaging Neonates: Where and How?

The reception and resuscitation area or the emergency room of the hospital managing sick neonates should be the triaging area. In other places, the site at the facility where a neonate is first brought should be the triaging area.

The staff involved in the initial management of a child should all be trained in the triaging process. The most experienced doctor who is trained in neonatal care should undertake the responsibility of emergency treatment and management of the neonate.

After emergency treatment the neonate is assessed to establish a diagnosis and appropriate management done.

Process of triaging

Assess for emergency signs

- Assess for severe hypothermia. If present, arrange for rapid re-warming of the baby
- Check for severe respiratory problem and if present arrange to oxygenate the baby
- Determine if the baby is in shock or has encephalopathy or convulsions and if so initiate urgent steps to manage

Assessment of emergency and priority signs

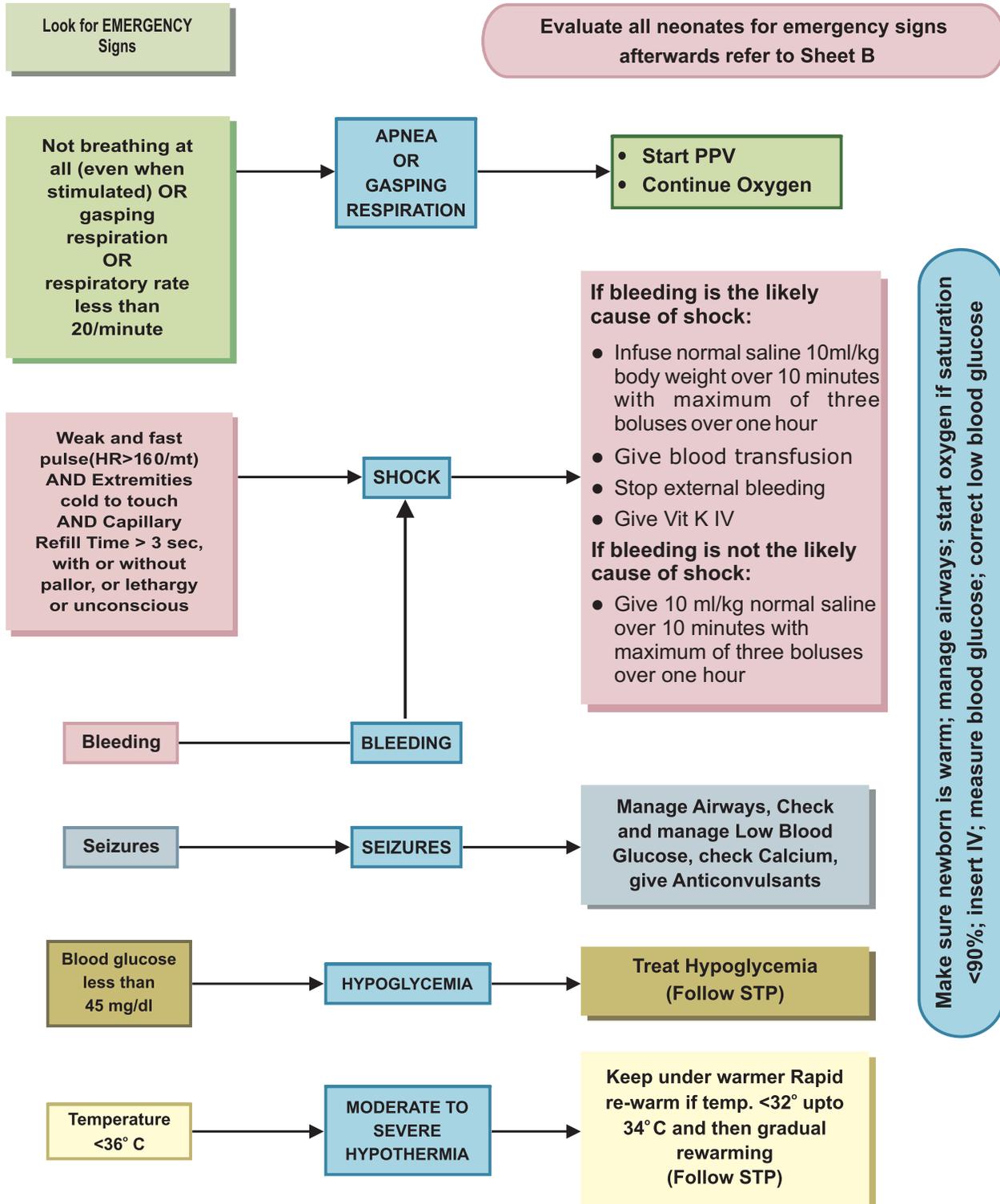
- Temperature assessment
 - Assess temperature and look for hypothermia
 - If the temperature is $<32^{\circ}\text{C}$, the baby has severe hypothermia and is seriously sick. If this temperature is above 38°C , the baby has hyperthermia and is suggestive of sepsis if environmental condition has been ruled out
- Assess airway and breathing
 - Is the baby apneic or has gasping respiration? It could be due to apneic spells or aspiration or blockage of airway
 - Does the baby have severe respiratory distress? (RR more than 60/min, retractions or grunting)
- Assess circulation
 - Look for evidence of shock
 - ❖ The hands and feet are cold
 - ❖ Look for CFT by pressing the front of chest or forehead and blanching the skin. If the area becomes pink again in more than 3 secs, it is suggestive of prolonged CFT
 - ❖ Check for the pulse. If the baby has tachycardia ($\text{HR} > 160/\text{mt}$) and the pulse is weak and rapid, it is suggestive of shock
- Assess for convulsions, encephalopathy and coma.
 - Is the baby in coma or encephalopathy? Assess on the APU scale. A. Awake, P. response to pain and U. unresponsive

After assessment, give emergency treatment:

- Manage temperature
- Maintain the airway
- Support circulation
- After initiating emergency measures proceed to investigate the neonate with emergency investigations (blood glucose, oxygen saturation, sepsis screen, chest X-ray, Hb etc)
- Based on the clinical exam and the investigations, proceed to treat the baby for underlying disorder

Rapid Assessment and immediate management of emergencies

SHEET-A



Assessment for specific conditions

SHEET-B

(AFTER EMERGENCY MANAGEMENT OR IF EMERGENCY SIGNS ARE ABSENT)

ASK

NEONATAL HISTORY

- Age of the neonate and the birth weight if available.
- Was the baby born term? If not, then at what gestation?
- Delayed Cry/ not breathing at birth/ requirement of BMV at birth
- Is the baby having any other problem in feeding/ choking/ vomiting?
- When did the problem start?
- Has the baby worsened?

MATERNAL HISTORY

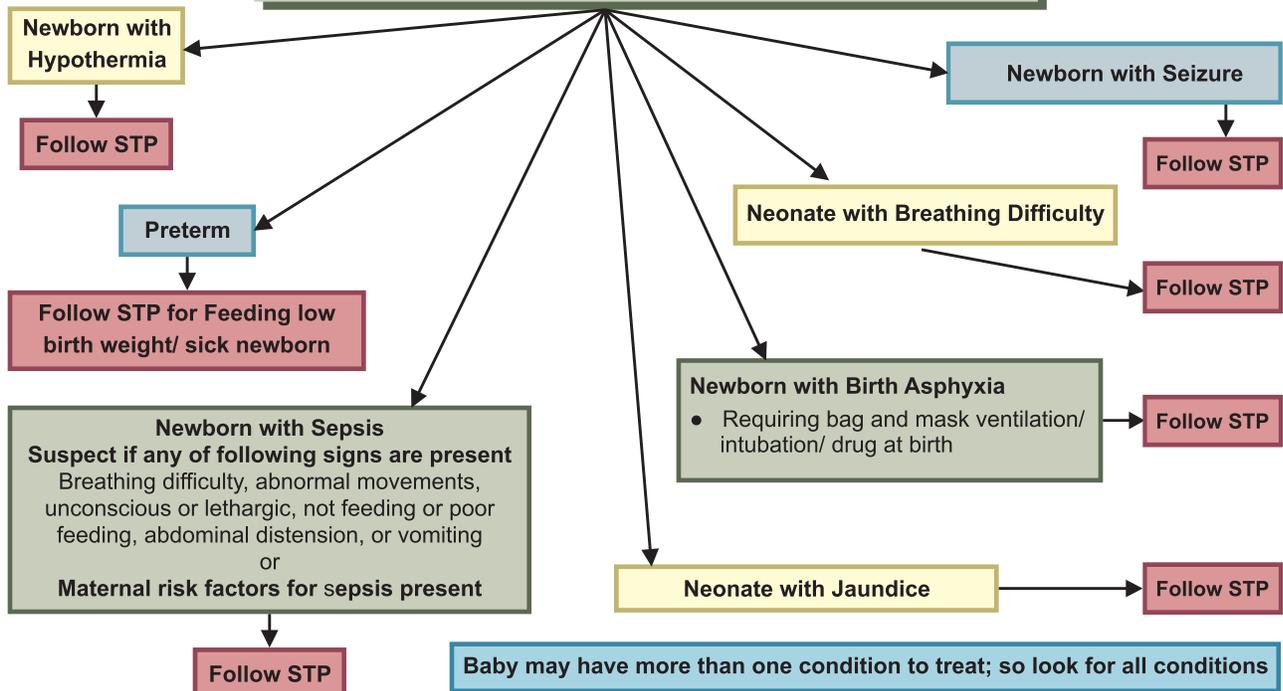
- Medical, obstetric, social history,
- **Pregnancy:** Duration, chronic diseases, HIV, any complications, history of maternal fever
- **Labour:** Any complications, duration of rupture of membranes, any complication-fetal distress, prolonged labor, caesarean section, color and smell of amniotic fluid, instrumental delivery, vaginal delivery, malposition, malpresentation, any other complications

LOOK

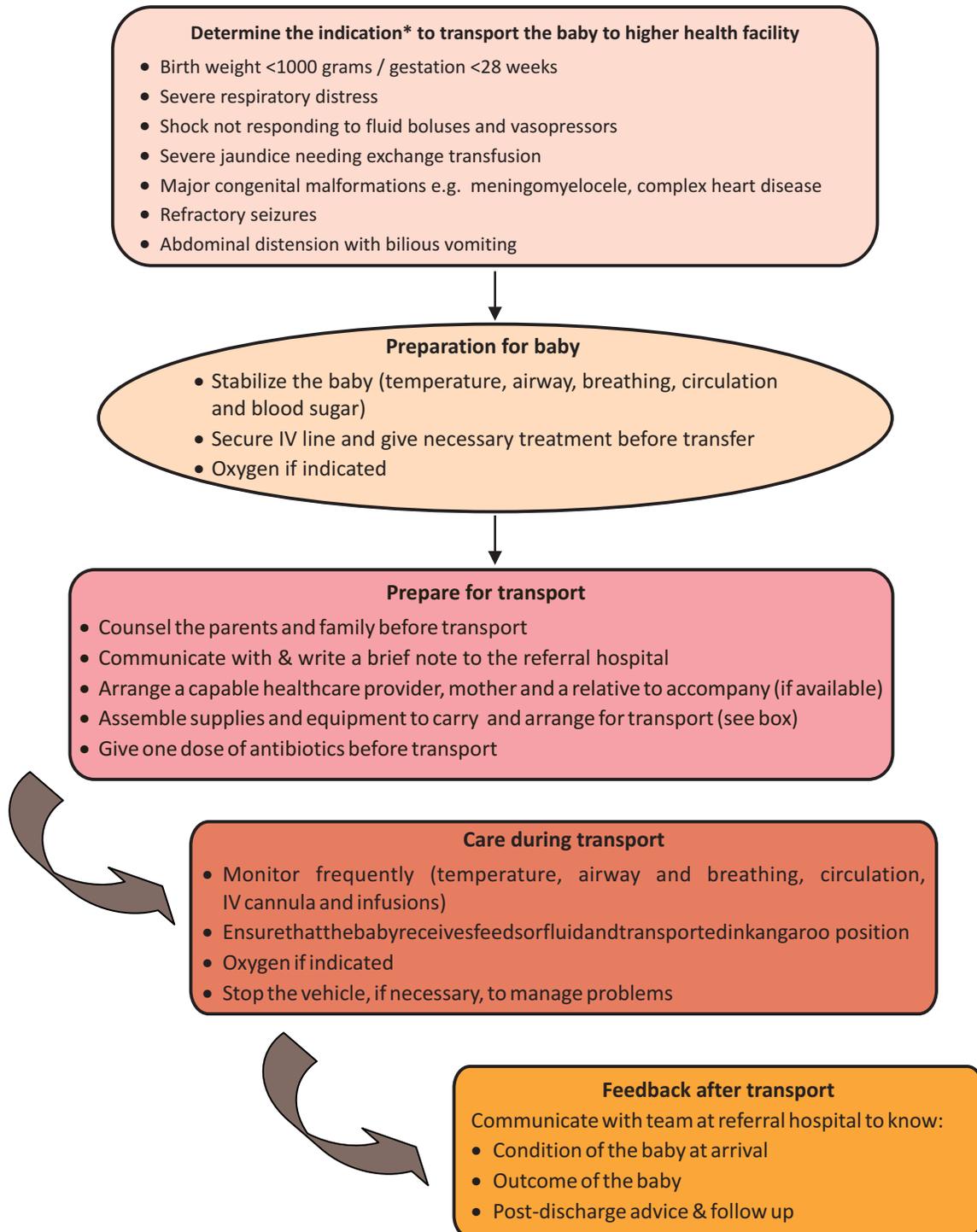
EXAMINATION

- Recheck Temperature*
- Recheck Heart rate*
- Recheck Respiratory rate*
- Severe chest indrawing, grunting, central cyanosis.
- Abdominal distention and/or vomiting
- Seizure
- Lethargy
- Jaundice
- Any other obvious abnormality/malpresentation, any other complications

*If taken more than 30 minutes before



XIV. TRANSPORT OF A SICK BABY



****Indications have to be individualized for each facility depending upon capabilities and infrastructure of referring and referral facilities***

Annexure: Supplies and equipment to carry

Equipment and supplies		Drugs & fluids
<ul style="list-style-type: none"> • Cover adequately-socks, cap • Source of warmth, blanket • Resuscitation equipment: <ul style="list-style-type: none"> o bag o appropriate sized mask o suction apparatus o oxygen cylinder with flow meter o nasal catheter, or head box • Stethoscope, thermometer 	<ul style="list-style-type: none"> • Fluids & feeds: <ul style="list-style-type: none"> o Expressed breast milk o Oro gastric tube to feed o IV infusion set o Butterfly set or IV set • Syringes and needles (various sizes and types) • Adhesive tape • Sterile gloves • Antiseptic solution and cotton-wool balls • Extra napkins (diapers) • A source of illumination: Torch 	<ul style="list-style-type: none"> • Any drug (e.g. antibiotics) the baby is receiving if a dose is anticipated during the trip • IV fluid (Normal Saline, Ringer lactate , 10% dextrose)

If the baby is able to feed and the mother is not accompanying the baby, carry expressed breast milk and send mothers blood sample.