NURSING CARE OF HIGH RISK NEONATE-II

UNIT 1
Emergency Triage Assessment and Treatment (ETAT) 5

UNIT 2
Communication in Newborn Care 22

UNIT 3
Referral and Follow Up of Low Birth Weight and Sick Neonate 29
**CURRICULUM DESIGN COMMITTEE (Pre Revised)**

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prof. S. B. Arora</td>
<td>Director</td>
<td>School of Health Sciences, IGNOU, New Delhi</td>
</tr>
<tr>
<td>Prof. A.K. Agarwal</td>
<td>Ex-Director</td>
<td>School of Health Sciences, IGNOU, New Delhi</td>
</tr>
<tr>
<td>Dr. Pity Koul</td>
<td>Reader</td>
<td>School of Health Sciences, IGNOU, New Delhi</td>
</tr>
<tr>
<td>Dr. Naina Poddar</td>
<td>Principal</td>
<td>Bombay Hospital, Mumbai</td>
</tr>
<tr>
<td>Ms. Usha Ukande</td>
<td>Principal and Professor</td>
<td>College of Nursing</td>
</tr>
<tr>
<td>Dr. Dr. Jyoti Sareen</td>
<td>Ex-Faculty</td>
<td>RAK College of Nursing, New Delhi</td>
</tr>
<tr>
<td>Dr. Dr. N. B. Mathur</td>
<td>Professor of Pediatric</td>
<td>Maulana Azad Medical School, New Delhi</td>
</tr>
<tr>
<td>Ms. Geeta Razdan</td>
<td>Principal, MAM College of Nursing, Amabla</td>
<td></td>
</tr>
<tr>
<td>Dr. Dr. Jyoti Sareen</td>
<td>Senior Consultant</td>
<td>Centre of Neonatology</td>
</tr>
<tr>
<td>Dr. Dr. Jyoti Sareen</td>
<td>Reader in Nursing,</td>
<td>Dept. of Child Health</td>
</tr>
<tr>
<td>Dr. Dr. Jyoti Sareen</td>
<td>Professor &amp; Director</td>
<td>Dr. Sidharth Ramji</td>
</tr>
<tr>
<td>Dr. Dr. Jyoti Sareen</td>
<td>Professor &amp; Director</td>
<td>VM Medical College</td>
</tr>
<tr>
<td>Dr. Dr. Jyoti Sareen</td>
<td>Principal &amp; Director</td>
<td>Department of Health Research Centre, Indore</td>
</tr>
<tr>
<td>Ms. Ms. Jahanara, Tutor,</td>
<td></td>
<td>Ms K. Paul</td>
</tr>
<tr>
<td>Dr. Dr. Jyoti Sareen</td>
<td>Professor &amp; Director</td>
<td>MAM College of Nursing, Ambala</td>
</tr>
</tbody>
</table>

**COURSE REVISION COMMITTEE**

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Dr. Harish Chellani</td>
<td>Lecturer</td>
<td>College of Nursing, AIIMS, Delhi</td>
</tr>
<tr>
<td>Dr. Dr. Pooam Joshi</td>
<td>Director</td>
<td>School of Health Sciences, IGNOU, New Delhi</td>
</tr>
<tr>
<td>Dr. Dr. Pity Koul</td>
<td>Assistant Professor</td>
<td>School of Health Sciences, IGNOU, New Delhi</td>
</tr>
</tbody>
</table>

**BLOCK PREPARATION TEAM**

Written/Modified/Updated By: Dr. Jaipal (Pediatric), Kasturba Hospital, Delhi

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Dr. Jyoti Sareen</td>
<td>Reader in Nursing,</td>
<td>NIHFW, Delhi</td>
</tr>
</tbody>
</table>

**CO-ORDINATION**

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prof. Pity Koul</td>
<td>Director</td>
<td>School of Health Sciences, IGNOU, New Delhi</td>
</tr>
<tr>
<td>Prof. Pity Koul</td>
<td>Director</td>
<td>School of Health Sciences, IGNOU, New Delhi</td>
</tr>
<tr>
<td>Prof. Pity Koul</td>
<td>Programme Coordinator</td>
<td>School of Health Sciences, IGNOU, New Delhi</td>
</tr>
</tbody>
</table>

**PRODUCTION**

Mr. T.R. Manoj
Assistant Registrar (P)
SOHS, IGNOU, New Delhi

February, 2016
© Indira Gandhi National Open University, 2016
ISBN-81-266-

All rights reserved. No part of this work may be reproduced in any form, by mimeograph or any other means, without permission in writing from the Indira Gandhi National Open University.

Further information about the School of Health Sciences and the Indira Gandhi National Open University courses may be obtained from the University's office at Maidan Garhi, New Delhi-110 068.

Printed and published on behalf of the Indira Gandhi National Open University, New Delhi by Prof. Pity Koul, Director, School of Health Sciences.

We acknowledge the reference of material and figures from various sources like NNF, AIIMS, WHO, UNICEF, IGNOU, Govt. of India etc.


Printed at:
As you know that more than 60 per cent of deaths take place during 28 days of life. The main reasons for these deaths includes, hypothermia, infections hypoglycemia, asphyxia and so on. Therefore, you need to improve newborn care practices to reduce the risk of increased mortality in newborn babies. You need to improve your skills in emergency care, treatment and referrals so that the mortality and morbidity can be reduced. This block will review and enhance your skills in providing newborn and infant care during emergencies and their early referral.

This block consists of following 3 units:

Unit 1 Emergency Triage Assessment and Treatment (ETAT)
Unit 2 Communication in Newborn Care
Unit 3 Referral and Follow Up of Low Birth Weight and Sick Neonate
UNIT 1 EMERGENCY TRIAGE ASSESSMENT AND TREATMENT (ETAT)

Structure

1.1 Objectives
1.2 Introduction
1.3 Concept of Emergency Triage Assessment and Treatment
1.4 Process and Steps of Management of Sick Neonates
1.5 Assessing Emergency Signs and Triaging
1.6 Treatment
   1.6.1 Maintain Temperature
   1.6.2 Maintain the Airway
   1.6.3 Maintain Adequate Circulation
   1.6.4 Check and Treat Hypoglycemia
   1.6.5 Manage Coma and Convulsions
1.7 Let Us Sum Up
1.8 Answers to Check Your Progress

1.1 OBJECTIVES

After completing this unit, you should be able to:

- Describe an overview of ETAT;
- Describe the Process and steps of management of sick neonate;
- Discuss the Assessment of emergency signs and triaging; and
- Explain the treatment of triaged neonate.

1.2 INTRODUCTION

Deaths in hospital often occur within 24 hours of admission. Many of these deaths could be prevented if very sick children are identified soon after their arrival in the health facility, and treatment is started immediately. Therefore, a process of rapid triage for all children presenting to hospital needs to be put in place, to determine whether any emergency or priority signs are present. Triage may be done in 15-20 seconds by medical staff or by non-medical staff (after appropriate training) as soon as the child arrives, and no special equipment is needed for this. Once emergency signs are identified, prompt emergency treatment needs to be given to stabilize the condition of the child. The Emergency Triage Assessment and Treatment (ETAT) is designed to familiarize health workers with the ETAT guidelines and to provide them with the necessary knowledge and skills for applying the guidelines.

It teaches health workers to:

- Triage all sick children when they arrive at a health facility, into those with emergency signs, with priority signs, or non-urgent cases.
- Provide emergency treatment for life-threatening conditions.
1.3 CONCEPT OF EMERGENCY TRIAGE ASSESSMENT AND TREATMENT

Many neonatal deaths occur within 24 hours of admission due to treatable conditions when waiting in the queue for their turn. This can be prevented by “triaging” or rapid screening of the neonates who require immediate attention for life-threatening conditions. The word “triage” means sorting. It is a sequential process for managing sick neonates as soon as they arrive in the health facility (SNCU).

WHO has developed Emergency Triage Assessment and Treatment (ETAT) guidelines. These are adapted from the Advanced Paediatric Life Support guidelines used in western countries, and they identify children with immediately life-threatening conditions which are most frequently seen in developing countries, such as obstruction of the airway and other breathing problems caused by infections, shock, severely altered central nervous system function (coma or convulsions), and severe dehydration. These guidelines were developed in Malawi, and were field-tested in several other countries including Angola, Brazil, Cambodia, Indonesia, Kenya and Niger.

ETAT guidelines identify neonates with immediate life-threatening conditions such as significant hypothermia, obstruction of airway and breathing problems, shock, altered central nervous system function (coma or convulsions) and severe dehydration. ETAT is a tool to reduce facility mortality rates, particularly in first 24 hours in the hospital, where basic laboratory facilities and inexpensive essential drugs are available.

1.4 PROCESS AND STEPS OF MANAGEMENT OF SICK NEONATES

To start with the ETAT, one should first be able to understand the process and steps of management of sick neonate. Triaging should be the first step in assessing neonates referred to a hospital facility. This helps to ascertain the group a referred neonate belongs to. Sick newborns are triaged into the following categories:

<table>
<thead>
<tr>
<th>Triaging</th>
<th>Categories After Triaging</th>
</tr>
</thead>
<tbody>
<tr>
<td>E: Emergency</td>
<td>Need emergency treatment</td>
</tr>
<tr>
<td></td>
<td>Immediately:</td>
</tr>
<tr>
<td></td>
<td>- Start to give appropriate emergency treatment.</td>
</tr>
<tr>
<td></td>
<td>- Call a senior health worker and other health workers to help.</td>
</tr>
<tr>
<td></td>
<td>- Carry out emergency laboratory investigations.</td>
</tr>
<tr>
<td>P: Priority</td>
<td>Need assessment and rapid action</td>
</tr>
<tr>
<td></td>
<td>They should be given priority in the queue, so that they can rapidly be assessed and treated without delay.</td>
</tr>
<tr>
<td>N: Non-urgent</td>
<td>Need assessment and counseling</td>
</tr>
<tr>
<td></td>
<td>Those who have no emergency or priority signs and therefore are NONURGENT cases. These children can wait for their turn in the queue for assessment and treatment. The majority of sick children will be nonurgent and will not require emergency treatment.</td>
</tr>
</tbody>
</table>
Emergency

- Newborns classified as “Emergency” require urgent intervention and emergency measures. All such newborns will be admitted to SNCU after initial stabilization.

- Once emergency signs are identified; prompt emergency treatment needs to be given to stabilize the condition of the neonate.

- After the neonate with emergency signs is stabilized, a detailed history should be taken and relevant examination pertaining to the presenting problems should be performed.

- Relevant laboratory tests should be performed.

- A list of possible diagnosis should be made. A sick neonate often has more than one diagnosis or clinical problem requiring treatment.

- After deciding the main diagnosis or any secondary diagnoses or problems, treatment should be started (specific and supportive).

- Once the diagnosis is made and treatment given; the neonate should be closely monitored for response to treatment. When the neonate recovers and is fit to be discharged, he can be sent home with follow-up treatment & advice.

- At discharge, teach the mother all the treatments needed to be carried out at home, advise her when she should return to the health facility.

Example of a good triaging and emergency management

A nine-month old baby boy is carried into the children’s section of the outpatient department in his mother’s arms. He appears to be asleep. At the triage desk he is seen by a nurse and found to have lips and tongue that are grey/blue in color, and he is taken straight into the resuscitation room as an emergency. In the resuscitation room he is given oxygen from an oxygen concentrator. He is noted to be grunting and breathing very fast. His hands are cold to touch and the capillary refill time is prolonged to four seconds. An intravenous cannula is placed. A blood sample is taken at the same time for blood glucose, haematocrit and other investigations. An intravenous infusion of normal saline is commenced at 20ml/kg to run as fast as it can go. Other treatments are given, depending on the result of the investigations and the response to the treatment he receives. It is now 18 minutes since the baby came through the outpatient department’s door, and his situation is stable. It is now time to take a full history and carry out a full examination to make a definitive diagnosis. He is diagnosed as having severe pneumonia, and receives specific treatment for this. However, before coming to this diagnosis, no time was wasted, his status was stabilized, based on a few leading signs and symptoms, even when the medical staff did not know exactly what was wrong with him.

Priority

Newborns classified as “Priority” are sick and need rapid assessment and admission to SNCU.
Nursing Care of High Risk Neonate-II

Non-urgent
Newborns classified as non–urgent are not sick and need assessment and counseling.

- After these steps are completed, proceed with general assessment and further treatment according to the child’s priority.

1.5 ASSESSING EMERGENCY SIGNS AND TRIAGING

Assessing Emergency Signs

- First assess every neonate for emergency signs. Those with emergency signs require immediate emergency treatment.
- If emergency signs are not present, look for priority signs. Those with priority signs should alert you to neonate who is seriously ill and needs immediate assessment and treatment.
- Neonates with no emergency or priority signs are treated as non-urgent cases.

Triage is the sorting of patients into priority groups according to their need and the resources available.

To carry out the process of triaging, the reception or resuscitation area or the causality of the hospital managing the sick neonates should be earmarked as the triaging area. The site at the facility where a neonate is first brought should be the triaging area. All the staff involved with the initial management of the child should be trained in triaging process. The most experienced doctor present who is trained in neonatal care should undertake the responsibility of emergency treatment and management of the neonate keeping in mind TABCD steps: temperature, airway, breathing, circulation, coma, convulsion and dehydration. Make sure that the neonate is warm at all the times.

Several methods are available to facilitate the triaging process. One example is a stamp being used in Malawi consisting of the “ABCD” signs in which the health worker circles the correct step and initiates emergency treatment “E” or puts them in priority groups “P” or “Q” for children who can wait in the queue. Colors can also be used for differentiating the three groups, giving a red sticker to emergency cases, a yellow for priority and green for the queue (i.e. non urgent cases).

When and Where should Triaging Take Place?

Triage should be carried out as soon as a sick neonate arrives in the hospital, well before any administrative procedure such as registration. This may require reorganizing the flow of patients in some locations. Triage can be carried out in different locations – e.g. in the outpatient queue, in the emergency room, or in a ward if the child has been brought directly to the ward at night. In some settings, triage is done in all these places. Emergency treatment can be given wherever there is room for a bed or trolley for the sick neonate and enough space for the staff to work on the patient, and where appropriate drugs and supplies are easily accessible. If a neonate with emergency signs is identified in the outpatient queue, he/she must quickly be taken to a place where treatment can be provided immediately, e.g. the emergency room or ward.
Who Should Triage?

All clinical staff involved in the care of sick neonates/infants should be prepared to carry out rapid assessment in order to identify the few who are severely ill and require emergency treatment. If possible, all such staff should be able to give initial emergency treatment, as described in the flowchart and treatment charts. In addition, people such as gatekeepers, record clerks, cleaners, janitors who have early patient contact should be trained in triage for emergency signs and should know where to send people for immediate management.

The “ABCD” Concept

Triage of patients involves looking for signs of serious illness or injury. These emergency signs relate to the Airway-Breathing-Circulation/Consciousness-Dehydration and are easily remembered as “ABCD”. Each letter refers to an emergency sign which, when positive, should alert you to a patient who is seriously ill and needs immediate assessment and treatment.

How to Triage?

Keep in mind the ABCD steps: Airway, Breathing, Circulation, Coma, Convulsion, and Dehydration.

E.g. To assess if the neonate has airway or breathing problems you need to know:

- Is the neonate breathing?
- Is the airway obstructed?
- Is the neonate blue (centrally cyanosed)?

Look, listen and feel for air movement. Obstructed breathing can be due to blockage by the tongue, a foreign body, a swelling around the upper airway (retropharyngeal abscess) or severe croup which may present with abnormal sounds such as stridor.

- Does the neonate have severe respiratory distress?
- Is the neonate having trouble getting breath so that it is difficult to talk, eat or breastfeed? Is he breathing very fast and getting tired, does he have severe chest indrawing or is he using auxiliary respiratory muscles? (Refer Fig. 1.1)

Check Your Progress 1

Put the actions in the right chronological order: what will you do first, what next, what after that, and so on, and what last?

☐ Ask about head or neck trauma.
☐ Call a senior health worker to see any emergency.
☐ Have blood specimens taken for laboratory analysis.
☐ Look for any priority signs.
☐ Look for emergency signs.
☐ Move on to the next patient.
☐ Place priority patients at the front of the queue.
☐ Start treatment of any emergency signs you find.
Fig. 1.1 Triage of a sick or at risk newborn who presents at SNCU

**Emergency Signs**
- Hypothermia (<35.5 degree C)
- Apnea or gasping respiration
- Severe respiratory distress (rate>70, severe retractions, grunt)
- Central cyanosis
- Shock (cold periphery, CFT > 3 sec, weak & fast pulse)
- Coma, convulsions or encephalopathy

**Priority Signs**
- Tiny neonate (<1800gms)
- Temp 36.4- 35.5 degree C
- Respiratory distress (rate >60, no retractions)
- Irritable/restless/jittery
- Refusal to feed
- Abdominal distension
- Severe jaundice (appears<24hours/ stains palms and soles/lasts>2weeks)
- Severe pallor
- Bleeding from any site
- Major congenital malformations (tracheo esophageal fistula, meningocele, anorectal malformation)
- Large baby >3.8kg, or according to percentile charts

**Non-urgent Signs**
- Jaundice
- Transitional stools
- Developmental peculiarities
- Minor birth trauma
- Possetting
- Superficial infections
- Minor malformations
- All cases not categorized as emergency/priority

**Assess for emergency signs (in all cases)**
- Temperature
- Cold to touch (Abdomen)
- If positive

**Treat**
- Make sure the neonate is warm
- Give appropriate treatment for positive emergency signs
- Call for help
- Draw blood for Hct, glucose, calcium & sepsis screen

**Initiate emergency treatment**
- Needs urgent intervention and emergency measures
- Are to be stabilized in SNCU

**Assess and Act rapidly**
- Are sick and would need immediate assessment
- Attended on priority basis in SNCU

**Assess and Counsel**
- Precede with assessment and further treatment according to neonates requirements

**Temperatura**
- Cold to touch (Abdomen)
- If positive
Emergency Triage Assessment and Treatment (ETAT)

### Airway and Breathing

- Not Breathing or Gasping or
  - Central cyanosis or
  - Severe respiratory distress
    - Respiratory rate < 70/min
    - Severe lower chest in-drawing
    - Apnoeic spells
    - Grunting
    - Unable to feed

  Any sign positive
  - Manage airway
  - Provide tactile stimulation if apnoeic
  - If still apnoeic or gasping - Provide PPV
  - Give oxygen
  - Make sure neonate is warm.

### Circulation

- Cold extremities with
  - Capillary refill longer than 3 seconds, and
  - Weak and fast pulse (>160 bpm)

  If positive
  - Give oxygen
  - Insert IV line and give 20 ml/kg Normal Saline over 30 min
  - Proceed immediately to full assessment and treatment

### Coma Convulsion

- Coma
- Convulsions

  If coma/convulsion
  - Manage airway
  - Check & Correct hypoglycemia
  - If convulsions continue give IV calcium
  - If still convulsions continue, give anticonvulsants

### Severe Dehydration

- Diarrhoea plus any two of these
  - Lethargy
  - Sunset eyes
  - Very slow skin pinch

- Diarrhoea plus two signs positive

  Make sure neonate is warm
  - Insert IV line and begin giving fluids rapidly following PLAN C

  Check temperature if the baby is cold to touch, rewarm

### If There are No Emergency Signs, Look For Priority Signs

These neonates need prompt assessment and treatment

- Non urgent: proceed with assessment and further treatment according to neonate’s priority

### Note:
if the neonate has other surgical problems, get surgical help or follow guidelines
Plan C: For neonates with severe dehydration
Preferred treatment is rapid intravenous rehydration. Give 100 ml/kg RL or normal saline solution as follows:

<table>
<thead>
<tr>
<th>Age</th>
<th>First give 30 ml/kg in</th>
<th>Then give 70 ml/kg in</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infants</td>
<td>1 hour *</td>
<td>5 hours</td>
</tr>
</tbody>
</table>

* Repeat once if pulses are weak or not detectable.

Reassess neonate every 1-2 hours. If hydration is not improving, give the IV drip more rapidly. After completion of IV fluids, reassess the patient and choose the appropriate treatment Plan. If IV therapy is not available, then ORS by nasogastric tube or orally at 20 ml/kg/hour for 6 hours (total of 120/kg) should be given. If abdomen becomes swollen or the neonate vomits repeatedly, then ORS should be given slowly.

Example

The following example describes how to treat a infant with SEVERE DEHYDRATION according to Plan C.

A six-month old (9 kg) girl, Ellen, had diarrhoea with SEVERE DEHYDRATION. She was not in shock and did not have severe malnutrition. She was not able to drink. The health worker decided to treat the infant with IV fluid according to Plan C. The health worker gave Ellen 270 ml (30 ml x 9 kg) of Ringer’s lactate by IV during the first hour. Over the following five hours, he gave her 630 ml of IV fluid (70 ml x 9 kg), approximately 125 ml per hour. The health worker assessed the infant’s hydration status every 1-2 hours (that is, he assessed for dehydration). Her hydration status was improving, so the health worker continued giving Ellen the fluid at a steady rate.

After 4 hours of IV treatment, Ellen was able to drink. The health worker continued giving her IV fluid and began giving her approximately 45 ml of ORS solution to drink per hour. After Ellen had been on IV fluid for 6 hours, the health worker reassessed her dehydration. She had improved and was reclassified as SOME DEHYDRATION. The health worker chose Plan B to continue treatment. The health worker stopped the IV fluid. He began giving Ellen ORS solution as indicated in Plan B.

1.6 TREATMENT

1.6.1 Maintain Temperature

1) Hypothermia

Newborn babies are often not able to keep themselves warm in low environmental temperature resulting in hypothermia. Hypothermia continues to be a very important cause of neonatal morbidity and mortality due to lack of attention by health care providers.

2) Handicaps of Newborn in Temperature Regulation

A newborn is more prone to develop hypothermia because of a large surface area per unit of body weight. A low birth weight baby has decreased thermal insulation due to less subcutaneous fat and reduced amount of brown fat.
Brown fat is the site of heat production. It is localized around the adrenal glands, kidneys, nape of neck, inter scapular and axillary region. Metabolism of brown fat results in heat production. Blood flowing through the brown fat becomes warm and through circulation transfers heat to other parts of the body. This mechanism of heat production is called as non-shivering thermo genesis. LBW babies lack this effective mechanism of heat production.

3) Mechanism of Heat Loss and Heat Gain

Newborn loses heat by evaporation (particularly soon after birth due to evaporation of amniotic fluid from skin surface), conduction (by coming in contact with cold objects-cloth, tray, etc.), convection (by air currents in which cold air from open windows replaces warm air around baby) and radiation (to colder solid objects in vicinity-walls). The process of heat gain is by conduction, convection and radiation in addition to non-shivering thermogenesis. (Refer Fig. 1.2)

4) Temperature Recording

Normal temperature in a newborn is 36.5-37.5°C.

Preferably low reading thermometer recording temperature as low as 30°C should be used in the newborn to record temperature (records between 30°C to 40°C).

a) Axillary temperature is as good as rectal and safer (less risk of injury or infection). It is recorded by placing the bulb of thermometer against the roof of dry axilla, free from moisture. Baby’s arm is held close to the body to keep thermometer in place. The temperature is read after three minutes.

b) Rectal temperature: Do not use this method for routine monitoring. However, it can be used as a guide for core temperature in cold (hypothermic) sick neonates. It is recorded by inserting the greased bulb of the rectal thermometer backwards and upwards to a depth of 3 cm in a term baby (2 cm in a preterm baby). Keep thermometer in place at least for 2 minutes.

The difference in rectal and axillary temperature is not clinically significant.

c) Skin temperature: Skin temperature is recorded by a thermister. The probe of the thermister is attached to the skin over upper abdomen. The thermister senses the skin temperature and displays it on the panel.
5) **Assessment of Temperature by Touch**

Baby’s temperature can be assessed with reasonable precision by touching with dorsum of hand over abdomen, hands and feet. In newborn, abdominal temperature is representative of the core temperature. When feet are cold and abdomen is warm, it indicates that the baby is in cold stress. In hypothermia, both feet and abdomen are cold to touch.

6) **Warm Chain**

The “warm chain” is a set of interlinked procedures carried out at birth and later, which will minimize the likelihood of hypothermia in all newborns. Baby must be kept warm at the place of birth (home or hospital), during transportation for special care from home to hospital or within the hospital. Satisfactory control of baby’s temperature demands both prevention of heat loss and providing extra heat using an appropriate source.

a) **Common situations where cold stress can occur**
   i) At birth.
   ii) After giving bath.
   iii) During changing of nappy/clothes.
   iv) Malfunctioning heat source or removing the baby from heat source.
   v) While transporting a sick baby.

b) **Steps to prevent heat loss in labor room**
   i) Warm delivery room (25°C).
   ii) Newborn care corner temperature 30°C.
   iii) Drying immediately. Dry with one towel. Remove the wet towel and cover with another pre-warmed towel.
   iv) Skin-to-skin contact between mother and baby.

c) **Steps to prevent heat loss in postnatal ward**
   i) Breast feeding.
   ii) Appropriate clothing, cover head and extremities.
   iii) Keep mother and baby together.
   iv) Keep room warm.
   v) Postpone bathing and weighing.

d) **How to keep baby warm?**
   i) Use dry, warm towel to hold baby at birth. Remove wet towel after cleaning.
   ii) Adequate and appropriate clothing.
   iii) Skin-to-skin contact or next to mother (Rooming in).
   iv) Radiant warmer in nursery (works best if room temperature >20°C).
   v) Keep the room temperature of baby care area 25°C.

* Using a 200 watt bulb may not be sufficient to keep the baby warm. There is a risk of breakage of bulb.
e) How to keep room warm?
   i) Avoid too cool air conditioner in summer.
   ii) Keep windows and doors closed in winter.
   iii) Don’t use ceiling fan, specially high speed.
   iv) Warm the room by convector/heater.

<table>
<thead>
<tr>
<th>Prevent Hypothermia: Warm chain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baby must be kept warm at all times right from birth. The warm chain is a set of ten interlinked procedures carried out at birth and later which are as follows:</td>
</tr>
<tr>
<td>1) Warm delivery room (&gt;25°C)</td>
</tr>
<tr>
<td>2) Warm resuscitation</td>
</tr>
<tr>
<td>3) Immediate drying</td>
</tr>
<tr>
<td>4) Skin-to-skin contact between baby and the mother</td>
</tr>
<tr>
<td>5) Breastfeeding</td>
</tr>
<tr>
<td>6) Bathing and weighing postponed</td>
</tr>
<tr>
<td>7) Appropriate clothing and bedding</td>
</tr>
<tr>
<td>8) Mother and baby together</td>
</tr>
<tr>
<td>9) Warm transportation</td>
</tr>
<tr>
<td>10) Training/awareness-raising of healthcare provider</td>
</tr>
</tbody>
</table>

1.6.2 Maintain the Airway

Airway can be maintained by following means:
- Keep the neck of the baby in slight extension
- Do not cover the baby’s mouth and nose
- Suction mouth and nose if required

Maintain oxygenation/ ventilation

To maintain adequate oxygenation is of immense importance in the sick neonates during transport as quiet often the indication for transfer is respiratory distress. This can be ensured by:
- Free flow oxygen
- Oxygen by hood/nasal prong
- Bag and mask ventilation
- Endotracheal tube and manual ventilation
- Transport ventilator

Check breathing

Watch baby’s breathing. If the baby stops breathing, provide tactile stimulation to the soles to restore breathing.

Management of the Choking Neonate/Infant

A neonate with a history of aspiration of a foreign body who shows increasing respiratory distress is in immediate danger of choking. Attempts to remove the
foreign body should be made instantly. Do not hesitate. Apply back slaps or **Heimlich manoeuvre** (Fig. 1.3). The treatment differs depending on whether there is a foreign body causing respiratory obstruction or some other cause for the obstruction or respiratory distress.

![Heimlich manoeuvre in infant](image)

**Fig. 1.3: Heimlich manoeuvre in infant**

**Management of young infant**

- Lay the infant on your arm or thigh in a head down position
- Give 5 blows to the infant’s back with heel of hand
- If obstruction persists, turn infant over and give 5 chest thrusts with 2 fingers, one finger breadth below nipple level in midline
- If obstruction persists, check infant’s mouth for any obstruction which can be removed
- If necessary, repeat sequence with back slaps again

After you have performed this procedure you should check inside the mouth for any foreign body. Obvious foreign bodies should be removed. Secretions should be cleared from the throat of all children. The breathing should be checked again.

**Positioning to Improve the Airway**

An airway or breathing problem is life-threatening. This infant needs immediate treatment to improve or restore the breathing, even before you continue with the assessment of emergency signs. To treat an airway or breathing problem you should first open the airway and then begin giving the neonate oxygen. The chin lift is a way of opening the airway in neonates who have not been subjected to trauma. The position for infant, is the nose pointing upwards. In this case, place your hand on the infant’s forehead and apply a little pressure to achieve the tilt. The fingers of the other hand are used to gently lift the chin (Fig. 1.4).
To do this safely you must know if the neonate/infant has been subjected to any trauma. In such a case, it is important not to tilt the head or move the neck.

**Is Trauma of the Neck a Possibility?**

Any neonate with an emergency sign needs emergency treatment. However, always ask and check for head or neck trauma before treating, as this will determine how much a child can be moved. If a child has trauma you must avoid further injury during assessment or treatment. To check for head or neck trauma:

- Ask if the neonate has had trauma to the head or neck, or a fall which could have damaged the spine
- Look for bruises or other signs of head or neck trauma
- Stabilize the neck if trauma is suspected.

If you suspect trauma which might have affected the neck or spine, do not move the head or neck as you treat the neonate and continue the assessment. This child may have a spinal injury, which could be made worse by moving him. To open and manage the airway when trauma is suspected a jaw thrust is used (Fig. 1.5). This is a way of opening the airway without moving the head. It is safe to use in cases of trauma for neonates of all ages. The jaw thrust is achieved by placing two or three fingers under the angle of the jaw on both sides, and lifting the jaw upwards.
If neck trauma is suspected, stabilize the neck:

- Stabilize the neonate’s neck and keep the neonate lying on the back
- Tape the neonate’s forehead to the sides of a firm board to secure this position
- Prevent the neck from moving by supporting the neonate’s head (e.g., using litre bags of IV fluid on each side)
- Place a strap over the chin

If vomiting, turn on the side, keeping the head in line with the body. If the neonate is restless, ask an attendant to stabilize the neck without upsetting the neonate more.

**Log roll**

Move the neonate/infant with a suspected cervical spine injury carefully. Avoid rotation and extremes of flexion and extension. One person, usually the most senior attendant, should assume responsibility for the neck. He should stand at the top end of the patient, hold the neonate’s head, and place the fingers under the angle of the mandible with the palm over the ears and parietal region and maintain gentle traction to keep the neck straight and in line with the body. When the neonate is not being moved, a sandbag placed on each side or a cervical collar can splint the neck.

### 1.6.3 Maintain Adequate Circulation

Sick neonates are prone to develop peripheral circulatory failure and myocardial dysfunction. Ensuring adequate perfusion prior to transport and on arrival at referral hospital is critical to survival of sick newborn babies. Inadequate perfusion will result in tissue hypoxemia and acidosis. If perfusion is not reversed in time, it will eventually result in organ dysfunction and/or cell death. Early recognition of poor perfusion is essential to initiate appropriate treatment.

Clinical recognition of poor perfusion is easy. It is possible at all levels of human care.

The simplest indicator of poor perfusion is a prolonged capillary refill time. Normally it should be less than 3 seconds. Other useful indicators include mottling of the skin, cool peripheral extremities, pallor and tachycardia (heart rate >180bpm). Decreased urine output recorded by history or by measurements of urine output (such as at the district level or higher facility) would also indicate impaired perfusion. It is important to remember that blood pressure measurement and demonstrating hypothermia is not essential to the diagnosis of shock or poor perfusion.

Attention to additional clinical findings can provide clues to the etiology. Some of these include: distant heart sounds (as in pneumothorax or pneumomediastinum), heart sounds better heard on the right hemithorax (as in diaphragmatic hernia), absent femoral pulses (as in coarctation of aorta) and asymmetrical decrease in breath sounds (as in pneumothorax or pleural effusion).

At home look for cool extremities, pallor and decreased urine output. At health facility look for prolonged capillary refill time, mottling of the skin, cool extremities, pallor, tachycardia, decreased urine output, heart sounds, peripheral pulses and breath sounds.
Maintenance of adequate circulation can be achieved by:
- Securing an IV access
- IV infusion with a syringe

### 1.6.4 Check and Treat Hypoglycemia

Hypoglycemia in newborns is defined as blood glucose level less than 45 mg/dl

**Management of Hypoglycemia**

- Establish an IV line. Infuse a bolus of 2 ml/kg body weight of 10% glucose slowly over 5 minutes.
- If baby has convulsions, give bolus of 4 – 5 ml/kg of 10% glucose.
- If IV line is not present, administer 2 ml/kg body weight of 10% glucose by gastric tube.
- Start infusion of dextrose at the daily maintenance volume to provide at the rate of 6 mg/kg/min.
- Measure blood glucose after 30 minutes and then every four to six hours.
- If blood glucose <25 mg/dl:
  - Repeat bolus of glucose as above.
  - Increase to infusion rate of 8 mg/kg/ min.
- If the blood glucose > 25 mg/dl but <45 mg/dl:
  - Increase infusion rate by 2 mg/kg/min.
  - Measure blood glucose after 30 mts.
  - Continue the infusion at this rate until 2 consecutive values 6 hrs apart are above 45 mg/dl.
- Begin breastfeeding as soon as baby is able to breastfeed.
- If cannot be breastfed, give EBM by Spoon or paladai.
- As feeding improves, slowly decrease IV glucose (over 1-2 days) and increase oral feeds.
- Do not discontinue the glucose infusion abruptly to prevent rebound hypoglycemia.

### 1.6.5 Manage Coma and Convulsions

- Identify and characterize the seizure.
- Secure airway and optimize breathing, circulation and temperature.
- Start O$_2$ if seizures are continuous.
- Secure IV access and take samples for baseline investigations including sugar, hematocrit, sepsis screen and calcium, magnesium, electrolytes where feasible.
- If blood sugar < 45 mg/dl, give 2 – 4 ml/kg 10% dextrose.
- If seizures continue
  - IV phenobarbitone 20 mg/kg over 20 min.
• If no control
  o Repeat phenobarbitone 10 mg/kg till a total of 40 mg/kg.
• If seizures continue
  o Give phenytoin 20 mg/kg over 20 min.
  o After control of seizures initiate maintenance doses.

To help you assess the consciousness level of a neonate a simple scale AVPU is used
A: Alert
V: Responding to voice
P: Responding to pain
U: Unresponsive

A neonate who is not alert, but responding to voice is lethargic. An unconscious neonate may or may not respond to pain. A neonate with a coma scale of “P” or “U” will receive emergency treatment for coma. Ensure TABC.

Once the baby is triaged and stabilized, the next step is to decide whether the baby requires admission to SNCU or referral.

Check Your Progress 2
1) List down categories of Triaging

2) Expand TABCD

3) Jot down the important points to remember while managing neonate with seizures
1.7 LET US SUM UP

Many neonatal deaths can be prevented by triaging neonates who require immediate attention. All hospital health personnels should be trained in the triaging process and should take up the responsibility of emergency treatment and management of neonate.

1.8 ANSWERS TO CHECK YOUR PROGRESS

Check Your Progress 1

1) Look for Emergency Signs
2) Start treatment of any emergency signs you find
3) Call a senior health worker to see any emergency
4) Have blood specimens taken for laboratory analysis
5) Ask about Head or Neck Trauma
6) Look for any priority signs
7) Place priority patients at the front of the queue
8) Move on to the next patient.

Check Your Progress 2

1) E: Emergency
   P: Priority
   N: Non-Urgent
2) TABCD: temperature, airway, breathing, circulation, coma, convulsion and dehydration.
3) • Identify and characterize the seizure
   • Secure airway and optimize breathing, circulation and temperature
   • Start O₂ if seizures are continuous
   • Secure IV access and take samples for baseline investigations including sugar, hematocrit, sepsis screen and calcium, magnesium, electrolytes where feasible
   • If blood sugar < 45 mg/dl, give 2 – 4 ml/kg 10% dextrose
   • If seizures continue
     o IV phenobarbitone 20 mg/kg over 20 min
   • If no control
     o Repeat phenobarbitone 10 mg/kg till a total of 40 mg/kg
   • If seizures continue
     o Give phenytoin 20 mg/kg over 20 min
     o After control of seizures initiate maintenance doses
UNIT 2 COMMUNICATION IN NEWBORN CARE

Structure
2.1 Objectives
2.2 Introduction
2.3 Need for Effective Communication
2.4 Forms of Communication
2.5 Types of Communication in Neonatal Unit
2.6 Levels of Communication in Neonatal Care
2.7 Let Us Sum Up
2.8 Answers to Check Your Progress

2.1 OBJECTIVES

After completing this unit, you should be able to:
• Describe an overview of communication in neonatal care;
• Describe the need of effective communication in neonatal care;
• Discuss forms and types of communication in neonatal unit; and
• Explain levels of communication in neonatal care.

2.2 INTRODUCTION

Good communication is an integral part of comprehensive patient care. It assumes special importance in neonatal care because of technical and physical complexities involved, rapid changes in the clinical course and associated stress of the parents. In this unit, we shall study about the need, types and levels of communication in Newborn Care. Also, you will recognize the importance of communication in Newborn Care Unit.

2.3 NEED FOR EFFECTIVE COMMUNICATION

• Making informed decisions on behalf of the neonate, by the parent
• Medico legal issues
• Maintain a healthy association between the health care provider and parents.

2.4 FORMS OF COMMUNICATION

Information can be provided through two types of communication:
1) Verbal: involves the exchange of information using words including spoken and written.
2) Non verbal or body language: involves transmission of information without words. It may be in the form of eye contact, touch, facial expression, posture, gesture etc.
2.5 TYPES OF COMMUNICATION IN NEONATAL UNIT

Communication begins right at the time of admission of the neonate to the unit till the time the newborn is discharged or referred to higher centre and during follow up visits. Parents need to be informed at each step of the neonatal care which includes the following:

- The reason for admission to SNCU
- Initial diagnosis of the neonate at the time of admission
- Medical management
- Initial/current prognosis
- Changing clinical course/adverse events
- Information and consent regarding any intervention/procedure
- Reason for referral and care during transport in case of referral to higher centre
- Finally, follow up information in case of discharge.

Remember information provided should be as follows:

- Practical and in simple language, easily understood by the parents/relatives
- Should be of immediate relevance
- Do not flood the parents with too much information at a single contact
- Avoid use of technical jargon
- Information provided may require repetition and reiteration for the parents to understand it
- Timing of providing the information is crucial: fix up a specific time daily for parent – doctor interaction e.g. 12 noon after the morning rounds are over and the neonate is stabilized and as and when required
- Discussion should be unhurried and relaxed preferably provided bedside so that the parents are oriented to the current situation of the newborn
- Any bad news/adverse event should be disclosed in a quiet and private setting
- Documentation of the information provided to the parents is important
- Procurements (medicines, reports), if any, to be provided by the parents should preferably be at single visit on a day to avoid inconvenience and repeated calls to the parents, unless urgent
2.6 LEVELS OF COMMUNICATION IN NEONATAL CARE

A health personnel (Nursing staff/Doctors) needs to communicate at various stages or levels while working in a neonatal unit, as personnel trained specifically for this task are generally not available. The levels are:

1) Communication on admission to the neonatal unit
2) Communication during the course of the stay
3) Communication in case of death of baby admitted in the unit
4) Communication at discharge of neonate from neonatal unit
5) Communication at the time of referral to a higher centre

1) Communication on Admission to the Neonatal Unit:

It is crucial to talk to the parents and relatives at the time of admission of the neonate to SNCU. This discussion should be done once the baby has been stabilized and a reasonable clinical diagnosis has been made. The discussion should be relaxed and unhurried as per the following:

- The first contact should be preferably made by the senior most person of the unit available at the time. He/she should also introduce the staff (junior doctors and staff nurses) who would be available round the clock during this contact.

- Honest opinion should be given and all aspects of illness should be explained in detail. Parental anxiety regarding finance should be allayed by providing information about “Janani Shishu Suraksha Karyakram (JSSK)” under which free medical services are provided to both mother and baby during the first month of life.

- In case, baby is with congenital malformations, provide information regarding consequences of the disorder/ malformation and ways to prevent and treat the disorder. This involves assessing the family in comprehending medical facts, including the diagnosis and the available management.

- Words should be carefully chosen and tactlessly uttered as opinions may cause tremendous conflict resulting in providing poor or no care to the baby. If the baby’s father is not available, a responsible member of the immediate family should be identified and all the relevant information should be given to that person.

2) Communication During the Course of the Stay:

It is given as per the following:

- If the baby is admitted to the unit, it is the responsibility of the health professional to communicate with the parents about the condition everyday and more frequently if required. The treatment plan should be communicated appropriately to the family and changes informed timely.

- Health care providers must be available when the mother visits her baby for the first time in the neonatal unit. She should be encouraged to get
involved totally in the care of her baby provided that her baby should be stable. Even if the baby is very sick, mother should be encouraged to visit often, express breast milk, clean and touch the baby.

- Nursing staff should be very considerate and compassionate as mothers at this point are often sick themselves and also worried about their babies.

- The doctors and nursing staff should be able to explain the equipments surrounding the babies and should give right amount of information so that the family members can make informed choices about any procedure that is to be performed.

- In case of critically ill babies, family should be informed and prepared in advance for poor outcome.

3) **Communication in Case of Death of baby admitted in the Unit:**

The death of an infant is a major loss for the entire family. The mother's separation from her newborn sick infant leaves her emotionally and physically helpless. Events may occur too fast for the parents to comprehend. Dealing with the death of a newborn is traumatic for both families and caregivers. The most important goal is to be compassionate and humane.

If the baby is critically ill, as explained earlier the family members should have been prepared for any eventuality. The exact cause of death should be informed to the parents in a simple language. Communicate as per following:

- As soon as possible, sit down with the parents (or another support person) to tell them about the condition of the baby. The role of the health personnel should be to support the parents by giving clear and honest information in a supportive and caring manner. Avoid using phrases and sentences that may make the family members feel uncomfortable like “it was for the best” or “it was meant to be”.

- Avoid negative comments regarding the parents, referring doctor or the obstetrician (such as, you came too late, baby was sent when very sick, delivery was not conducted well). Offer to bring the baby to the mother and father to hold. Baby should be cleaned and wrapped well soon after being declared dead and should not be lying dead with intravenous lines and other monitoring equipment. All queries should be answered with utmost sincerity and genuine concern for the bereaved parents.

- If an autopsy is required, the parents consent and the formalities should be completed as soon as possible, so that the parents are free to take care of other things. All the formalities with the other departments should be completed quickly and the body handed over to relatives as early as possible. Parents can be called a month later to explain the findings of the autopsy and if required discuss the possibility of the problem occurring in the next baby and also be offered support.

4) **Communication at Discharge of Neonate from Neonatal Unit:**

The families should be informed well in advance regarding discharge. They may require a lot of information related to home care of the neonate e.g.
about breastfeeding, keeping babies warm, how to prevent infection, danger signs for which the parents need to come to the health facility immediately. Communicate the following:

- Standardized information should be provided to ensure that every family member receives uniform information.

- The family may be counseled regarding care, nutrition, immunization and follow up.

- Parents should be encouraged to contact unit for any queries. Write the contact number of SNCU on the discharge sheet.

- Information should address well baby clinics, high risk clinics, developmental issues, information regarding ROP and hearing, other screening tests etc. and infection prevention.

5) Communication at the Time of Referral to A Higher Centre:

Some of the critically ill neonates may require referral to a higher centre for tertiary care. One of the most important and often very difficult aspect of transport is the need for emotional support of the parents and family. The need for transport of a newborn can precipitate a crisis for the entire family. Address the concerns of the family. Accepting emotional outburst calmly and reassuring the parent that their newborn is being cared for can reduce parental anxiety. Also do the following:

- Allow parents to see and touch their child prior to transport and encourage them to accompany the baby.

- Explain thoroughly the clinical problems and anticipated care during transport.

- Explain where to go and indicate whom to contact.

- Ensure communication with the referral facility and request for feedback.

- Consider maternal transfer with her medical records whenever possible.

Check Your Progress 1

1) What are the forms of communication?

...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
...............................................................................................................
..................................................................................
2.7 LET US SUM UP

Each neonate in SNCU requires individualized assessment and nursing care. A family centered approach in SNCU can make a tremendous difference to parents, providing the basis of systematic support. Ensuring that the parents have good information on which to base their decisions requires intense efforts from staff using innovative communication strategies. Equipping staff to undertake this communication should be a mandatory component of their training and assessment and its practice should be a compulsory component of care. Good communication with family brings confidence and faith in health care providers and avoids emotional harassment and unnecessary litigations.

2.8 ANSWERS TO CHECK YOUR PROGRESS

Check Your Progress 1

1) Information can be provided through two types of communication:
   1) Verbal: involves the exchange of information using words including spoken and written.
   2) Non verbal or body language: involves transmission of information without words. It may be in the form of eye contact, touch, facial expression, posture, gesture etc.
2) 1) Communication on admission to the neonatal unit
   2) Communication during the course of the stay
   3) Communication in case of death of baby admitted in the unit
   4) Communication at discharge of neonate from neonatal unit
   5) Communication at the time of referral

3) 1) Refer section 2.6
UNIT 3  REFERRAL AND FOLLOW UP OF LOW BIRTH WEIGHT AND SICK NEONATE

Structure

3.1 Objectives
3.2 Introduction
3.3 Referral of a Neonate
3.4 Transportation of Low Birth Weight and Sick Neonate
  3.4.1 Indications for Neonatal Transport
  3.4.2 Requirements for Neonatal Transport
  3.4.3 Preparation before Transport
  3.4.4 Care during Transportation/Enroute Management of Sick Neonate
  3.4.5 Return Transport
3.5 Follow Up
3.6 Let Us Sum Up
3.7 Answers to Check Your Progress

3.1 OBJECTIVES

After completing this unit, you should be able to:

• Describe an overview of the referral of low birth weight and sick neonate;
• Describe the transport of a low birth weight and sick neonate;
• Outline management procedure for low birth weight and sick neonate by referral unit;
• List the common clinical indications and requirements for neonatal transport;
• Discuss the management of low birth weight and sick neonates before and during transport.

3.2 INTRODUCTION

The neonatal period encompasses the highest incidence of mortality, if compared with any other period of individual’s life span. The high risk infant once identified needs to be transported safely to next facility.

A great number of newborns at risk can be recognized before birth and can be delivered at institution with level II and tertiary level neonatal intensive care units but for various reasons this doesn’t happen often. Perinatal period is the most hazardous one in which the neonate is vulnerable to rapid deterioration that can lead to irreversible damage. Transportation of the sick neonate from delivery room to NICU is of paramount importance because even the slightest delay in the required expert care would lead to permanent irreversible neurological deficit or death.
In India, 75% of the total deliveries are conducted at home or small community hospitals or private nursing homes which do not have the personnel, expertise, space or facilities for adequate newborn critical care. About 30% to 40% of all births in India are low birth weight.

Out of this 8-10% are preterm and 20-30% are small for date. Therefore, transfer of these low birth weight and sick neonates to the regional health centre is frequently necessary. Satisfactory transport facilities are needed whether the neonate is being transferred from home or health facility to tertiary hospital or simply within the hospital from delivery room to NICU and from NICU to Operation Theater and X-ray department.

In this unit you will learn about the referral and management of transportation of low birth weight and sick neonates.

### 3.3 REFERRAL OF A NEONATE

Identify the babies who need referral

**a) From community to SNCU**

Any neonate who has

- Lethargy
- Refusal to feed
- Hypothermia
- Tachypnea, grunt, gasping, apnea
- Seizures
- Abdominal distension
- Bleeding
- Deep jaundice over palms and soles
- VLBW or premature should be transferred from community to the SNCU

**b) From SNCU to tertiary centre**

- Need of mechanical ventilation
- Unresponsive shock
- Jaundice needing exchange transfusion if facilities not available
- Refractory seizures
- Refractory hypoglycemia
- Need for surgical intervention

### 3.4 TRANSPORTATION OF LOW BIRTH WEIGHT AND SICK NEONATE

The ability to identify a neonate at risk in home or health facility and to provide effective transitional care will determine neonatal outcome. The referral hospital health facility stabilizes the neonate and then transports neonate to a level II or Level III hospital. The success of the transportation depends on the initial care given by the health personnel at referral centre.
Ensuring safe transport of the sick neonates is one of the important responsibilities of neonatal nurse. If transportation is anticipated, it is much better to transport the baby as a fetus along with the mother before delivery. This in-utero transport is far easier than the transport of sick neonate after birth.

**Constraints to the Safe Transport of Neonate are as following:**

- Newborn beds are scarce and not easily available
- Families have poor resources and are not able to afford newborn care
- Organized transport services are not available. At times the baby may have to be transported on foot or on bullock cart
- No health provider is available to accompany the baby during transport
- Facilities are not fully geared up to manage sick neonates
- Communication systems are nonexistent or inefficient

Thus, transporting neonates in developing countries is a formidable challenge. In spite of the best planning, babies will develop serious problems requiring transport to a higher level of care. Care providers should, therefore, be ready and confident to handle this responsibility.

**3.4.1 Indications for Neonatal Transport**

Indications for transportation range from subtle signs of sepsis, temperature instability and occasional apnea to life threatening surgical emergencies e.g. tracheo esophageal fistula.

The success of transportation of a sick neonate depends on earlier identification, stabilization, referral and care during transport. The danger signs which should prompt the caregiver to refer the neonate to a health facility are lethargy, refusal to feed, hypothermia, tachypnea, grunt, gasping, apnea, seizures, abdominal distension, bleeding, deep icterus over palms and soles and VLBW and premature infants.

**3.4.2 Requirements for Neonatal Transport**

A well-organized transport system with basic life support equipments and a trained, skilled and dedicated team is utmost essential for having effective transitional care and optimal neonatal outcome.

Availability of an ambulance equipped with transport incubator and facilities for suction, bag and mask ventilation, equipments required to stabilize sick neonates along with physician and nurse are essential for safe transportation of an infant.

It is imperative that an inventory of all equipments and supplies should be maintained and inspected and replenished after each transport.

**Equipments and supplies**

Transport incubators, clothing, suction apparatus, resuscitation kit, oxygen source, pulse oximeter, infusion pump, blood glucose meter, I/V infusion set, syringes and needles (various sizes), adhesive tapes, gloves, torch, extra batteries, Endotracheal tube, nasal prongs.
Transport Isolette/ Portable Incubator / Transport Incubator

Transport incubator is ideal but is not affordable in developing countries. The transport incubator should be a completely self contained unit that provides clear visibility of the neonate, has adequate internal lighting, is easy to clean and provides the necessary heat to keep the infant warm.

The portable incubator provides an ideal micro-environment during transport. It is battery operated and has build in system for oxygen supply.

The transport incubator should be light in weight but sturdy and should allow sufficient access to manage a sick neonate.

Transport vehicles

The morbidity in the neonatal period requiring transport is related to the distance traveled and the duration of the time between the onset of illness and the transfer of the baby. These neonates deserve an appropriate transport facility for a safe transfer from place of birth to NICU.

The baby should be transported to the nearest facilities by fastest mode of transport by the shortest route, such as

- Cars
- Open jeeps
- Buses
- Rickshaws
- Ambulances

The ideal transport vehicle should provide adequate space, power sources and safety equipment to back life support system. Sufficient oxygen should be stored in each vehicle along with air tanks or compressors. Appropriate controls are essential especially when transporting small neonates.

Take the neonate to the nearest referral facilities by the shortest route using the fastest possible mode of transport

Personnel

- Resident doctor, nursing staff

Neonatal transport team

Registered nurse involved in primary health care services with basic knowledge of neonatal intensive care is a significant member of neonatal transport team. Other than this respiratory therapist with experience in neonatal ventilation and in rural areas, trained paramedics, local birth attendants, health care providers should be ready, competent and confident to handle the responsibility of neonatal transport.

Drugs and fluids

- Epinephrine
- Nalaxone
• Sodium bi carbonate
• Vitamin K
• Glucose (10% dextrose)
• Calcium gluconate

Scarce and inaccessible facilities, lack of organized transport system, non existent and poor road links and lack of organized communication system, ill equipped health facilities, poor resources of family, no care possible enroute are main constraints and pose a challenge to health care providers regarding neonatal transport in developing countries.

3.4.3 Preparation before Transport

You need to do following before transport of baby:

a) Assess:
   Make careful assessment of the baby. Make sure that there is a genuine indication for referral.

b) Stabilize the neonate:
   Stabilize with respect to temperature, airway, breathing, circulation and blood sugar.

c) Write a note:
   Write a precise note for the providers at the referral facility with details of the baby’s condition, reasons for referral and treatment given to the baby.

<table>
<thead>
<tr>
<th>Referral note</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Name of the neonate</td>
</tr>
<tr>
<td>• Sex</td>
</tr>
<tr>
<td>• Gestational age</td>
</tr>
<tr>
<td>• Date and time of birth</td>
</tr>
<tr>
<td>• Birth weight</td>
</tr>
<tr>
<td>• Referral diagnosis</td>
</tr>
<tr>
<td>• Temperature, pulse, respiration</td>
</tr>
<tr>
<td>• Antibiotics</td>
</tr>
<tr>
<td>• Injection: Vitamin K</td>
</tr>
<tr>
<td>• Maternal Age</td>
</tr>
<tr>
<td>LMP</td>
</tr>
<tr>
<td>EDD</td>
</tr>
<tr>
<td>Gravida and Para</td>
</tr>
<tr>
<td>• Prenatal care: Booked/Unbooked</td>
</tr>
<tr>
<td>• Maternal Diagnosis/ Risk factors</td>
</tr>
</tbody>
</table>
**d) Encourage mother to accompany**

Mother should accompany the baby for breast feeding and for providing supportive care to the baby on the way and in the hospital. In case she cannot accompany the baby immediately, she should be encouraged to reach the facility at the earliest.

Arrange a provider to accompany.

A doctor/nurse/health worker should accompany the baby, if feasible, to provide care to the baby en route and to facilitate transfer to the referral facility.

Explain the condition of the baby, the prognosis and the reasons for transfer to the family. Explain where to go and whom to contact. This allays the anxiety of the parents and other family members. Prior information to the referral facility helps to build the confidence and removes the fears of unknown, thus positively motivating the family for transport. The referral facility should be given time to receive the baby and can be intimated for bed and time of referral.

**Let us explain how you can stabilize the neonate before transportation:**

1) **Maintain temperature**

For baby who is cold to touch both centrally and peripherally or temperature is less than 35.5 deg C, temperature to be maintained as the infant is hypothermic.

**Grading of hypothermia**

- Normal temperature: 36.5 to 37.5°C
- Cold stress: 36.4 to 36.0°C
- Moderate hypothermia: 35.9 to 32°C
- Severe hypothermia: < 32°C

**Management of hypothermia**

- Record the actual body temperature
- Re-warm a hypothermic baby as quickly as possible
  - Severe hypothermia – Radiant warmer
  - Mild to Moderate hypothermia – Kangaroo Mother Care or Radiant Warmer

Infection should be suspected, if despite taking above measures hypothermia still persists.

**Management of Severe Hypothermia**

1) Keep under radiant warmer
2) Reduce further heat loss
3) Infuse IV 10% Dextrose @ 60ml/Kg/Day
4) Inject Vitamin K 1.0 mg Intramuscular
5) Provide Oxygen
6) Consider and assess for sepsis

Use one of the following approaches to keep the baby warm during transportation:

- **Skin to skin care**
  
  This is probably the most effective, safe and convenient method. Make baby wear cap and napkin. Baby is placed facing the mother in skin to skin contact between breasts. Baby’s back is covered by tying the blouse or with a fold of gown/ chunari. The skin to skin contact can also be provided by another woman/man/father.

- **Cover the baby**
  
  Cover the baby fully with clothes including the head and the limbs. Nurse the baby next to the mother or another adult during transport.

- **Improvised containers**
  
  Thermocol box, basket, padded pouch, polythene covering can be used for ensuring temperature stability during transport. If available, you may use one of these methods.

- **Transport incubator**
  
  This is ideal mode of transport, but is often not available.

  The use of rubber hot water bottle is fraught with considerable danger due to accidental burns to the baby i.e., if the bottle is not wrapped properly or remains in contact with the baby’s body. It is therefore best avoided. If no other means of providing warmth is available, method may be employed but with utmost caution. The accompanying members of the team should be explained about the care of the bottle.

Whatever method of keeping the baby warm is employed, make sure that the baby’s feet are warm to touch. Warm feet means that the baby is not in cold stress. If the baby passes urine or stool, dry promptly. He should not remain wet, otherwise he will lose heat.

**Prevent Hypothermia**

- **Warm chain**
  
  Baby must be kept warm at all times right from birth. The warm chain is a set of ten interlinked procedures carried out at birth and later as per the following:

  1) Warm delivery room (>25ºC)
  2) Warm resuscitation
  3) Immediate drying
4) Skin-to-skin contact between baby and the mother  
5) Breastfeeding  
6) Bathing and weighing postponed  
7) Appropriate clothing and bedding  
8) Mother and baby together  
9) Warm transportation  
10) Training/awareness-raising of healthcare provider  

• **Check breathing**  
Watch baby’s breathing. If the baby stops breathing, provide tactile stimulation to the soles to restore breathing.

• **Provide feeds**  
Breast-feed if baby is active.

---

**Provider not accompanying the baby**  
In the event of health care provider not accompanying the transported neonate, it is in the best interest of the baby that there are not running intravenous fluids on the way, orogastric and nasogastric feeds are avoided and hot water bags are not used. These need supervision by a health care provider.

• **Family support**  
One of the most important and often very difficult aspect of transport is the need for emotional support of the parents and family. Hospitalization and the need for transport of a newborn can precipitate a crisis of the entire family. Accepting emotional outbursts calmly and reassuring the parent that their child is being cared for can reduce parental anxiety. The common influencing factor is socio-economic status/poor education/traditions and lack of support system.

Interventions to reduce stress and support the grief response must be incorporated into the transport process by the following:

- Allow parents to see and touch their child prior to transport  
- Thorough explanation ought to be given of the clinical problems and anticipated transport care  
- Information about the receiving hospital including location, visiting policies and general NICU facts must be given  
- Consider maternal transport whenever possible  
- Consider a phone call to the parents shortly after the admission of the child  
- Neonatal stabilization before transportation of sick neonate  

• **Optimal neonatal stabilization** requires skills in airway management including laryngoscopy, tracheal intubation and suctioning of the airway, oxygen administration and monitoring, assisted ventilation, chest compression, emergency administration of drugs and fluid and maintenance of thermal stability. **Efficient pre transport stabilization** is associated with decreased transport related mortality and improved outcome of transported neonates. Pre-transport stabilization includes the following:
Assessment of neonate’s condition before transport for hypothermia, apnea and hypoglycemia. Hypothermia, hypovolemia, hypoglycemia, acidosis and seizures should be treated before referring.

The neonate should be as stable as possible before leaving the referral hospital.

Intubate the neonate with the history of frequent apneic spells or severe RDS before referring.

A mnemonic **STABLE** expresses the principle of safe transport of sick neonate as follows:

- **S**ugar
- **T**emperature
- **A**irway
- **B**lood Pressure
- **L**ab work
- **E**motional Support

**Temperature stabilization and regulation**

Hypothermia has emerged as a major cause of morbidity and mortality especially in preterm babies during the transit. The most basic intervention that will reduce the transported neonate’s mortality and morbidity is to prevent cold stress. A neonate that has cold stress has increased oxygen consumption and increased rate of glucose consumption, leading to metabolic acidosis. Providing a neutral thermal environment during transportation is one of the biggest challenge.

Maintenance of adequate temperature during transportation to prevent further morbidity can be achieved by the following measures:

- Adequate clothing with special attention to head, feet and palms
- Air tight transport vehicle
- Skin to skin touch during transport
- Transport incubator
- Use of radiant warmer at referral hospital if it is available

The short distance transport within the hospital can be accomplished in a pre-warmed incubator.

Since electronic incubators are expensive and require constant maintenance, various other indigenous ways for transportation in rural setting/community setting can be carried out by using a plastic basket with perforated sides and careful placement of hot water bottles. Other methods include the following:

- **Skin to skin contact (KMC)**
  Neonate covered with **several layers of cotton** and carried next to skin.

- **Thermocol box**
  Thermocol box is an improvised method of ensuring warmth to a newborn.

- **Silver swaddle**
  Prewarm the transport incubator to the infant’s thermal environment. Very low birth weight infant should be covered with bubble paper in the transport.
Caution must be observed when using hot water bottle for providing warmth since this source of heat can cause burns. The hot water bottle should be well covered to control the degree of heat to which the neonate’s skin is exposed.

At present Indian scenario reveals that neonates are usually brought to the emergency wrapped in cotton, blanket and quilt or just in towel without any external source to provide warmth. Very rarely kangaroo care is provided to keep the neonate warm during transportation.

- Encourage mother to accompany.
- If possible, let care provider accompany the baby.
- Ensure warmth on the way.
- Explain care on the way to the family (keep baby’s trunk and palms/sole warm to touch, keep airway open, provide physical stimulation if apenic).

2) Maintaining Airway
Maintaining patent airway is vital to ensure adequate oxygenation and ventilation. This can be achieved by proper positioning, oropharyngeal and nasal suction.

3) Maintain oxygenation/ ventilation
To maintain adequate oxygenation is of immense importance in the sick neonates during transport as quiet often the indication for transfer is respiratory distress. This can be ensured by:
- Free flow oxygen
- Oxygen by hood/nasal prong
- Bag and mask ventilation
- Endotracheal tube and manual ventilation
- Transport ventilator
- Ensure an open airway
  - Keep the neck of the baby in slight extension.
  - Do not cover the baby’s mouth and nose.
  - Suction mouth and nose if necessary.
- Check breathing
  Watch baby’s breathing. If the baby stops breathing, provide tactile stimulation to the soles to restore breathing.

4) Provide feeds and fluids
Breast feed if baby is active.

Expression of Breast Milk
Breast milk expression is required for optimal feeding of newborns for preterm, LBW and sick newborns that cannot breastfeed but can tolerate assisted feeding.
Teach the mother the following:

- Wash hands with soap and water before expression. Hold, handle or cuddle the baby.
- Sit comfortably and hold the clean container near the breast.
- Put thumb and index finger on the breast at the rim of the areola opposite each other. Support the breast with other three fingers.
- Press thumb and index finger slightly inwards towards the chest wall.
- Press the breast between the fore-finger and thumb. Press and release, press and release. This should not hurt.
- Press the areola in the same way from the sides, this ensures that milk is expressed from all segments of the breast.
- Avoid rubbing or sliding fingers along the skin.
- Express one breast for at least 3-5 minutes until the flow slows; then express the other side; and then repeat on both sides.
- To express breast milk adequately, it may take 20-30 minutes.

Refer Fig. 3.1 for expression of breast milk.

**Storing expressed breast milk (EBM) can be done as per following:**

- Cover the container of EBM with a clean cloth or a lid.
- EBM can be kept at room temperature for 8 hours and in the refrigerator for 24 hours.
- EBM stays in good condition longer than animal milk. Do not boil the EBM. For warming, place the container in a bowl of warm water.
- Before feeding, gently shake the container or use a stirrer to recombine the separated fat globules with the rest of the milk.
- Feed with cup or spoon or paladai, never feed with bottle.

**Assisted Feeding of Low Birth Weight Neonates**

**Newborns that require assisted feeding are as follows:**

- Preterm < 34 weeks or birth weight < 1.8 kg
- Babies having mild respiratory distress
- Babies with inability to feed at breast or by Katori spoon / Paladai
- Oro-facial defects/malformation (Cleft lip or palate)
Table 3.1: Guidelines for the modes of providing fluids and feeding

<table>
<thead>
<tr>
<th>Birth weight (gm)</th>
<th>&lt;1200</th>
<th>1200-1800</th>
<th>&gt;1800</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gestation (wks)</td>
<td>&lt;30</td>
<td>30-34</td>
<td>&gt;34</td>
</tr>
<tr>
<td>Initial feeding</td>
<td>Intravenous fluids and try gavage feeds if not sick</td>
<td>Gavage, try katori-spoon if not sick</td>
<td>Breast feeding, if Unsatisfactory, try katori-spoon feeds</td>
</tr>
<tr>
<td>After 1-3 days</td>
<td>Gavage</td>
<td>Katori-spoon</td>
<td>Breastfeeding</td>
</tr>
<tr>
<td>Later (1-3 wks)</td>
<td>Katori-spoon</td>
<td>Breastfeeding</td>
<td>Breastfeeding</td>
</tr>
<tr>
<td>After some more time (4-6 wks)</td>
<td>Breastfeeding</td>
<td>Breastfeeding</td>
<td>Breastfeeding</td>
</tr>
</tbody>
</table>
Referral and Follow Up of Low Birth Weight and Sick Neonate

Mode for providing fluids and feeds (Table 3.1)

Breast milk is the ideal feed for low birth weight babies. Those unable to feed directly on the breast can be fed expressed breast milk (EBM) by Gavage or Katori-spoon or Paladai.

Techniques of assisted feeding

**Gavage feeds**

- Place an oro-gastric feeding catheter of size 5-6 Fr after measuring the correct insertion length from ala of nose to tragus and from tragus to midway between xiphisternum and umbilicus.
- Check correct placement by pushing in air with 10 ml syringe and listening with stethoscope over upper abdomen.
- Attach 10 ml syringe (without plunger) at the outer end of the tube, pour measured amount of milk and allow milk to trickle by gravity. Close outer end of tube after feeding.
- Place baby in left lateral position for 15 to 20 minutes to avoid regurgitation.
- Leave oro-gastric tube in situ.
- Pinch the oro-gastric tube during withdrawal.
- Measure pre-feed abdominal girth just above the umbilical stump. Do not attempt pre-feed aspirates.
- Evaluate baby for the cause of ileus, if abdominal girth increases by > 2 cm from baseline, it represents ileus.

**Katori-spoon feeds**

- Place the baby in a semi-upright posture.
- Take the pre-measured amount of milk in katori.
- Place the layer of cloth around the neck covering the chest.
- Place the milk filled spoon at the corner of mouth.
- Allow milk to flow into baby’s mouth slowly, allowing him to actively swallow, avoiding the spill.
- Repeat process till required amount has been fed.
- Try gentle stimulation if baby does not actively accept and swallow the feed.
- Estimate the amount of spillage of milk.
- Record the exact amount of milk given to baby after subtracting the spillage.
- If unsuccessful, switch back to gavage feeds.

**Intravenous Fluid Therapy for Newborns**

**Criteria for starting Intravenous fluids among newborns**

- Neonates with lethargy and refusal to feed
- Moderate to severe breathing difficulty
- Babies with shock
- Babies with severe asphyxia
- Abdominal distension with bilious or blood stained vomiting
**Choice of Intravenous fluids**

- Determine required volume of fluid as per birth weight and age. *(Table 3.2).*
- Use 10% Dextrose for initial 48 hours of life.
- After 48 hrs, if baby is passing urine, use commercially available IV fluid, such as Isolyte P.
- If the premixed solution is not available or baby requires higher GIR (Glucose infusion rate):
  - Take normal saline (NS) 20 ml/kg body weight.
  - Add remaining fluid volume as 10% Dextrose.
  - Add 1ml KCl/100ml of prepared fluid.

**Administration of IV fluid**

- Use micro-drip infusion set (where 1 ml = 60 microdrops)
- In this device, mL of fluid per hour is equal to number of micro-drops per minute e.g. 6mL/hr = 6 micro-drops/minute
- Calculate rate of administration, monitor to ensure that micro-dropper delivers required rate.
- Change the IV infusion set and fluid bag every 24 hours.
- Before infusing IV fluid, carefully Check:
  1) Expiry date of the fluid
  2) Seal of the infusion bottle or bag
  3) Fluid is clear and free from any visible particles

**Monitoring of babies receiving IV fluid**

- Inspect infusion site every hour for redness and swelling.
- If present, stop infusion, remove cannula, and establish a new IV line in a different vein.
- Check the volume of fluid infused, compare to the prescribed volume and record all findings.
- Measure blood glucose every nursing shift i.e. 6 – 8 hours.
- If the **blood glucose is less than 45 mg/dl**, treat for low blood glucose.
- If the **blood glucose is more than 150 mg/dl** on two consecutive readings:
  - Change to 5% Dextrose solution - measure blood glucose again in three hours.
- Weigh the baby daily. If the **daily weight loss is more than 5%**, increase the total volume of fluid by 10 ml/kg body weight for one day.
- If there is no weight loss in the initial 3 days of life, do not give the daily increment.
- If there is excessive weight gain (3-5%) decrease the fluid intake by 15-20 ml/kg/day.
- Check urine output: Normally a baby passes urine 5 – 6 times everyday.
**Table 3.2: Fluid requirements of newborns**

<table>
<thead>
<tr>
<th>Day of life</th>
<th>Amount of fluids required (ml/kg/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Birth weight &gt; 1500 g</td>
</tr>
<tr>
<td>1</td>
<td>60</td>
</tr>
<tr>
<td>2</td>
<td>75</td>
</tr>
<tr>
<td>3</td>
<td>90</td>
</tr>
<tr>
<td>4</td>
<td>105</td>
</tr>
<tr>
<td>5</td>
<td>120</td>
</tr>
<tr>
<td>6</td>
<td>135</td>
</tr>
<tr>
<td>Day- 7 onwards</td>
<td>150</td>
</tr>
</tbody>
</table>

5) **Maintain adequate circulation**

Sick neonates are prone to develop peripheral circulatory failure and myocardial dysfunction.

Ensuring adequate perfusion prior to transport and on arrival at referral hospital is critical to survival of sick newborn babies. Inadequate perfusion will result in tissue hypoxemia and acidosis. If perfusion is not reversed in time, it will eventually result in organ dysfunction and/or cell death. Early recognition of poor perfusion is essential to initiate appropriate treatment.

Clinical recognition of poor perfusion is easy. It is possible at all levels of human care.

The simplest indicator of poor perfusion is a prolonged capillary refill time. Normally it should be less than 3 seconds. Other useful indicators include mottling of the skin, cool peripheral extremities, pallor and tachycardia (heart rate >180bpm). Decreased urine output, recorded by history or by measurements of urine output (such as at the district level or higher facility) would also indicate impaired perfusion. It is important to remember that blood pressure measurement and demonstrating hypothermia is not essential to the diagnosis of shock or poor perfusion.

Attention to additional clinical findings can provide clues to the etiology. Some of these include: distant heart sounds (as in pneumothorax or pneumomediastinum), heart sounds better heard on the right hemithorax (as in diaphragmatic hernia), absent femoral pulses (as in coarctation of aorta) and asymmetrical decrease in breath sounds (as in pneumothorax or pleural effusion).

At home look for cool extremities, pallor and decreased urine output. At health facility look for prolonged capillary refill time, mottling of the skin, cool extremities, pallor, tachycardia, decreased urine output, heart sounds, peripheral pulses and breath sounds.

Maintenance of adequate circulation can be achieved by securing an IV access and IV infusion with a syringe.
6) **Management of Hypoglycemia:**

Hypoglycemia in newborns is defined as blood glucose levels less than 45 mg/dl.

- Establish an IV line. Infuse a bolus of 2 ml/kg body weight of 10% glucose slowly over 5 minutes.
- If baby has convulsions, give bolus of 4 – 5 ml/kg of 10% glucose.
- If IV line is not present, administer 2 ml/kg body weight of 10% glucose by gastric tube.
- Start infusion of dextrose at the daily maintenance volume to provide at the rate of 6 mg/kg/min.
- Measure blood glucose after 30 minutes and then every four to six hours.
- If blood glucose <25 mg/dl:
  - Repeat bolus of glucose as above.
  - Increase to infusion rate of 8 mg/kg/min.
- If the blood glucose > 25 mg/dl but <45 mg/dl:
  - Increase infusion rate by 2 mg/kg/min.
  - Measure blood glucose after 30 mts.
  - Continue the infusion at this rate until 2 consecutive values 6 hrs apart are above 45 mg/dl.
  - Begin breastfeeding as soon as baby is able to breastfeed.
  - If cannot be breastfed, give EBM by Spoon or paladai.
  - As feeding improves, slowly decrease (over 1-2 days) IV glucose and increase oral feeds.
- Do not discontinue the glucose infusion abruptly to prevent rebound hypoglycemia.

Refer **Table 3.3** for glucose infusion rates of D10 & D25.

**Table 3.3: Achieving Appropriate glucose infusion rates using a mixture of D10 and D25**

<table>
<thead>
<tr>
<th>Volume of fluids(ml/kg/d)</th>
<th>Glucose Infusion Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6 mg/kg/min</td>
</tr>
<tr>
<td></td>
<td>D10</td>
</tr>
<tr>
<td>60</td>
<td>42</td>
</tr>
<tr>
<td>75</td>
<td>68</td>
</tr>
<tr>
<td>90</td>
<td>60</td>
</tr>
<tr>
<td>105</td>
<td>85</td>
</tr>
<tr>
<td>120</td>
<td>86</td>
</tr>
<tr>
<td>135</td>
<td>86</td>
</tr>
<tr>
<td>150</td>
<td>86</td>
</tr>
</tbody>
</table>
Preventing a neonate with surgical defects for neonatal transport

Surgical defects may be classified into open defects and closed defects/obstructions. Open defects are easily diagnosed and are quickly apparent where in the neonate will be transferred to another institution for further care. The principles of stabilizing open defects include:

- Covering the defects to protect it from trauma, heat loss and insensible fluid loss
- Providing orogastric suctioning for decompression
- Securing IV access

Suspicion of a closed defect or obstruction requires closed physical examination and observation.

Recognition of gastrointestinal pathology is the first step in preparing a neonate for transfer. For example, the newborns that are diagnosed with tracheoesophageal fistula are at risk of aspiration of gastric content into the trachea. They require placement of suction catheter in the proximal pouch and use of continuous suction. Suction by hand from time to time. Immediate intubation is not necessary unless the newborn is in significant respiratory distress.

Documenting/communication

Reliable communication is the key to effective transport system. It is essential that the referring physician provides the referral institution with relevant information about the condition/health status of the neonate and the indication for transfer so that unit can be prepared to receive and provide immediate care without delay.

3.4.4 Care during Transportation/Enroute Management of Sick Neonate

The basic needs for the sick neonate during transportation are mentioned as follow:

- Thermoregulation
- Maintaining patent airway and respiration
- Maintaining adequate circulation
- Maintaining adequate metabolic homeostasis and adequate nutrition
- Medication

En route management requires close monitoring of the baby to prevent or treat complications as they may arise. Heart rate, respiration and temperature are continuously monitored. The respiratory status of a neonate is evaluated by observing his color, the quality of his respiration and the presence of retractions/chest indrawing because it is nearly impossible to evaluate breath sounds with a stethoscope in a moving ambulance. Oxygen, whether given by hood or mask is continuously analyzed and adjusted as the neonate’s condition dictates. The IV line is attached to the infusion pump to keep the line patent and to prevent accidental fluid overload. The baby is transported in the plastic swaddler; the port holes are opened as little as necessary during the trip in order to maintain the infant’s temperature. Accurate recording of vital parameters, medications, treatment given, procedures performed and observations made during the transport
is necessary for the legal chart and is invaluable to those who will have ultimate responsibility for the newborn care.

Any problem that has occurred during the transport should be noted before it is forbidden. This includes any breakdown in communication between the hospitals, malfunctions of the transporter or inadequate emergency care given at the referring hospital.

**Arrival at referral centre**

Upon arrival at the NICU, the baby is attached to another set of monitoring devices, vital signs are checked, laboratory investigations are carried out and if necessary, treatment is given. When the neonatologist/nurse is satisfied, that the infant is stabilized, she calls the mother to allay her fear about the transfer and to give a progress report on the baby's condition. The transport incubator is cleaned and kept ready for the next call and the medical and respiratory resuscitation kits are immediately restocked.

### 3.4.5 Return Transport

The return transport i.e. transfer of the convalescing neonate from hospital to the referring unit after resolution of the acute illness and before home discharge has been shown to improve the efficiency of neonatal bed in NICU. Other potential advantages of return transport includes a greater opportunity for parental visits with its beneficial effects on parent-infant attachment, an early involvement of the continuing care, health care personnel and substantial cost savings. The follow-up evaluation of the neonates includes neuro developmental assessment, ophthalmic examination, speech and hearing evaluation and pulmonary function testing at designated times throughout childhood.

Care during transport includes ensuring warmth by skin to skin care, adequately well wrapped baby, improvised transport containers, carriers, an open airway, checking breathing and stimulating the baby if apneic and providing feeds if baby is active.

### 3.5 FOLLOW UP

In case of these babies, when they are discharged from the hospital, responsibility of their care lies on to mother and family members. Health care personnel should inform them that extra care is required to maintain their body temperature. Baby should be provided with skin to skin contact (KMC). If this is not possible, the baby should be nursed next to the mother, as mother herself is a good source of heat to the baby. Further the room where the baby is kept should be warm. The baby should be clothed well. Two to three layers of clothes are generally required. Feet should be covered with socks, hands with mittens and head with a cap. Besides, a blanket should be used to cover the baby.

In addition, mother and family must be provided counseling for care at home. They should be informed about:

- Exclusive breast milk to the baby for 6 months
- How to keep the baby warm at home
- Identifying ‘Danger Signs’ for seeking medical help.
### Check Your Progress 1

1) List down types of hypothermia

-.................................................................
-.................................................................
-.................................................................
-.................................................................
-.................................................................

2) Describe the management of neonate with hypoglycemia

-.................................................................
-.................................................................
-.................................................................
-.................................................................
-.................................................................

3) Enlist the important points while transferring newborn with tracheoesophageal fistula

-.................................................................
-.................................................................
-.................................................................
-.................................................................
-.................................................................

### 3.6 LET US SUM UP

Neonate needs to be referred to a right place in right time with right management. The effectiveness of neonatal transport in lowering infant mortality depends on the efficiency of care by health team before and during transport. Communication and teamwork are the keynotes to a successful transport system. This requires a team not only trained in transport details but also to give emergency care to stabilize the infant prior to transport.

Transportation of neonates is a specialized task. Establishing an efficient and cost effective transport system is essential. A safe and effective means of transportation must be established.

Follow up of the neonate is as important as its management in the hospital. So adequate and clear discharge advices needs to be given to the mother and family to follow.
Check Your Progress 1

1) Cold Stress: 36.4 to 36.0°C, Moderate Hypothermia: 35.9 to 32.0°C, Severe Hypothermia: < 32.0°C.

2) Management of Hypoglycemia:
   - Establish an IV line. Infuse a bolus of 2 ml/kg body weight of 10% glucose slowly over 5 minutes.
   - If baby has convulsions, give bolus of 4 – 5 ml/kg of 10% glucose.
   - If IV line is not present, administer 2 ml/kg body weight of 10% glucose by gastric tube.
   - Start infusion of dextrose at the daily maintenance volume to provide at the rate of 6 mg/kg/min.
   - Measure blood glucose after 30 minutes and then every four to six hours.
   - If blood glucose <25 mg/dl:
     o Repeat bolus of glucose as above
     o Increase to infusion rate of 8 mg/kg/min.
   - If the blood glucose > 25 mg/dl but <45 mg/dl:
     o Increase infusion rate by 2 mg/kg/min
     o Measure blood glucose after 30 mts.
     o Continue the infusion at this rate until 2 consecutive values 6 hrs apart are above 45 mg/dl.
     o Begin breastfeeding as soon as baby is able to breastfeed.
     o If cannot be breastfed, give EBM by Spoon or paladai.
     o As feeding improves, slowly decrease (over 1-2 days) IV glucose and increase oral feeds.
   - Do not discontinue the glucose infusion abruptly to prevent rebound hypoglycemia.

3) Recognition of gastrointestinal pathology is the first step in preparing a neonate for transfer. For example, the newborns that are diagnosed with tracheo-esophageal fistula are at risk of aspiration of gastric content into the trachea. They require placement of suction catheter in the proximal pouch and use of continuous suction. Suction by hand from time to time. Immediate intubation is not necessary unless the newborn is in significant respiratory distress.