Hospital Based Integrated Management of Neonatal and Childhood Illness (IMNCI)

3rd Edition October 2024

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MODULE 1

Emergency Triage, Assessment & Treatment ETAT

SECTION 1

1.1 Introduction

This module describes the initial assessment and management of sick children 1 month to 5 years of age as soon as they arrive in hospital. The module contains guidelines for triage, emergency treatment and inpatient care of all children including newborns in hospitals where basic laboratory facilities and essential drugs are available.

1.2 Learning objectives

At the end of the course the participants will be able to:

- carry out ETAT (Emergency Triage, Assessment and Treatment) of all sick young infants and children when they arrive at a health facility
- understand the management process of sick newborn and children referred to a hospital

1.3 Management Process of the sick child (Chart 1)

1.3.1 Triage and emergency treatment

The first step in assessing children referred to a hospital should be triaged: the process of rapid screening to categorize the sick child so that appropriate treatment is given promptly.

1. First assess every child for emergency signs. Those with emergency signs require immediate emergency treatment. Once emergency signs are identified, prompt emergency treatment needs to be given to stabilize the condition of the child.
2. If emergency signs are not present, look for priority signs. Those with priority signs should alert you to a patient who is seriously ill and needs immediate assessment and treatment.
3. Children with no emergency or priority signs are categorized as non-urgent cases

1.3.2 Taking history in children and clinical examination

A detailed history is taken and relevant examination should be performed to the presenting problems of the child.

1.3.3 Point-of-care/bedside investigations

Point-of-care tests are those tests which can be performed at the bedside quickly. These investigations for sick children include a complete blood count, blood sugar level, routine urine examination, peripheral blood smear, and rapid diagnostic tests for malaria.

1.3.4 Differential diagnosis

A list of possible diagnoses should be made. A sick child often has more than one diagnosis or clinical problem requiring treatment. After deciding the main diagnosis and any secondary diagnoses or problems, specific and supportive treatment should be started. Monitor and reassess the sick child.

1.3.5 Discharge from the hospital

Plan the discharge after improvement. At discharge, teach the mother home treatments at home and advise when to return immediately and arrange a follow-up.

1.4 Laboratory investigations needed at the 10 bedded hospitals:

Essential

- Hemoglobin (CBC)
- Blood smear for malaria
- Blood glucose
- Microscopy of urine, stool and CSF
- Blood grouping and cross-matching
- Liver function test, Renal function test
- X-rays and USG
- Culture of blood, urine and CSF

1.5 Basic Principles of child care

To provide good inpatient care, hospital policies and working practices should promote the basic principles of child care which includes:

- Communicating with the parents
- Arranging the pediatric ward so that the seriously ill children get the immediate attention
- Allowing the mother to stay with the child
- Keeping the child comfortable
- Preventing the spread of nosocomial infection by encouraging the staff and the family to practice hand washing and other IPC measures
- Maintaining warmth in the area in which young infants or children with severe malnutrition are being treatment in order to prevent hypothermia

1.6 Key aspects in the monitoring

The key aspects in monitoring the progress of the sick child are:

- Making a plan at the time the child gets admitted and to monitor the child regularly
- The frequency of monitoring will depend on the nature and severity of the child's clinical condition
- Using a standard chart to record essential information will facilitate the prompt identification of any problems
- These problems should be brought to the attention of the doctors or other senior staff who can then make necessary treatment changes

1.7 Discharge from the hospital

Careful monitoring of the child's overall response to treatment and correct planning of discharge from the hospital are just as important as making the diagnosis and initiating treatment. The discharge process for all sick children should include:

- Correct date and time of discharge from the hospital
- Counseling the mother on correct treatment and feeding of the child at home.
- Ensuring the child's immunization status and record card are up-to-date
- Communication with the health personnel who referred the child or who will be responsible for follow-up care (discharge summary)

» Instructions on when to return for follow-up care and signs indicating the need to return immediately
» Assisting the family with special support (e.g. providing equipment for a child with disability)

1.8 Providing follow-up care

1. Children who are discharged from the hospital should return for follow-up care to the nearest health facility.
2. Mother should be advised to return immediately if the child develops any of the following signs:

Young infant:

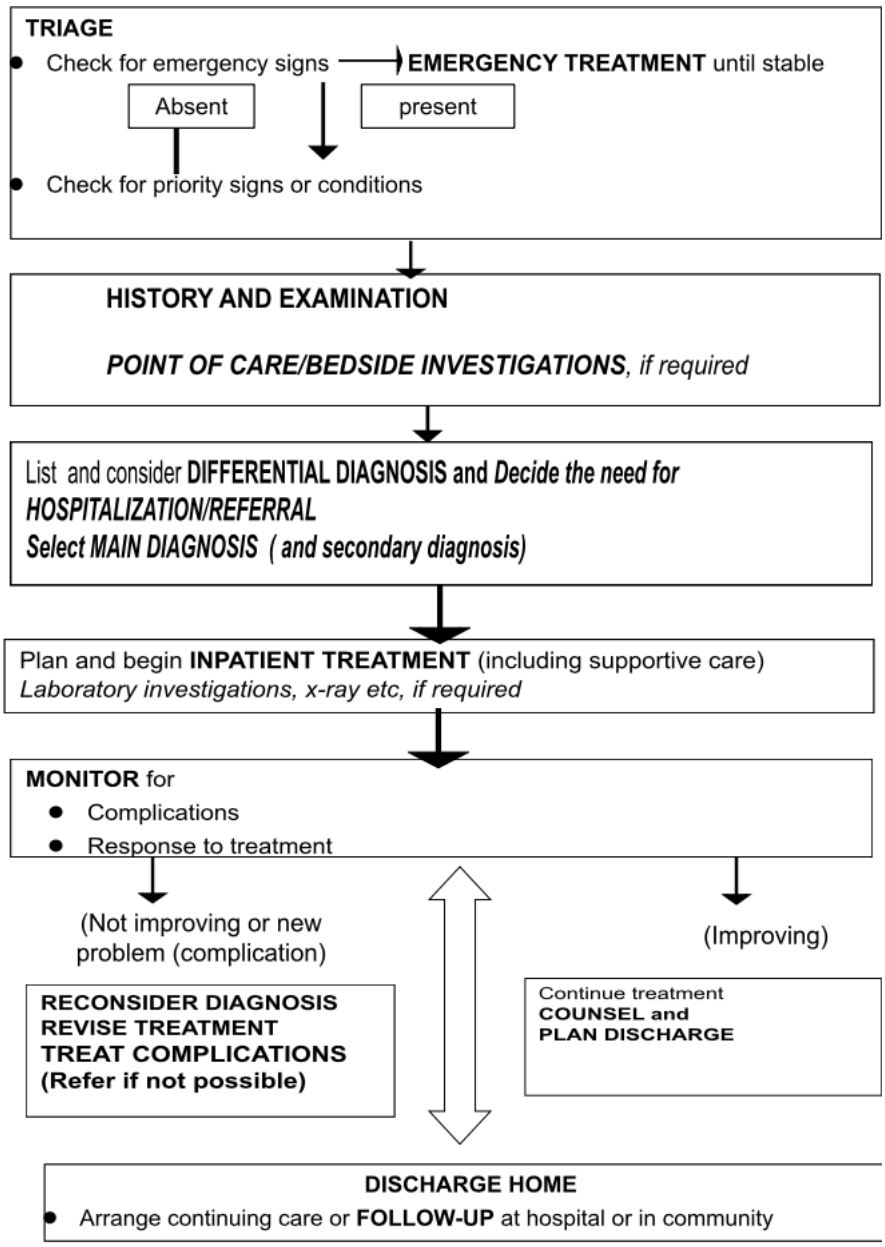
» breastfeeding or drinking poorly
» becomes sicker
» develops a fever or feels cold to touch
» fast breathing
» difficult breathing
» yellow palms and soles
» diarrhea with blood in stool
» repeated Vomiting
» abdominal distention

Sick child:

» not able to drink or drinking poorly
» develops convulsion
» excessive lethargy
» becomes sicker
» develops a fever
» fast or difficult breathing
» blood in stool

3. Remind the mother of the child's next immunization visit

Chart 1: Steps in the management of the sick young infants and children admitted to hospital:



SECTION 2:
EMERGENCY TRIAGE, ASSESSMENT AND TREATMENT (ETAT)

ETAT guidelines help in identifying children with life-threatening conditions which are most frequently seen in developing countries. While a dedicated team should continue to run the emergency department for twenty-four hours, it is very important that new doctors are taught the skills and are fully supervised. Nurses are the most important personnel in any emergency department since they are involved in the emergency care at all stages. Hence, it is equally important that they are well trained in important lifesaving procedures and their skills are renewed at frequent intervals. Besides the medical staff, other non-clinical staff can also be trained to recognize some of the life-threatening situations.

2.1 Learning objectives

After completion of this section the participants should be able to-

» Triage all sick young infants and children when they arrive at a health facility into the following categories:
  - Those with emergency signs
  - Those with priority sign
  - Those who are non-urgent cases

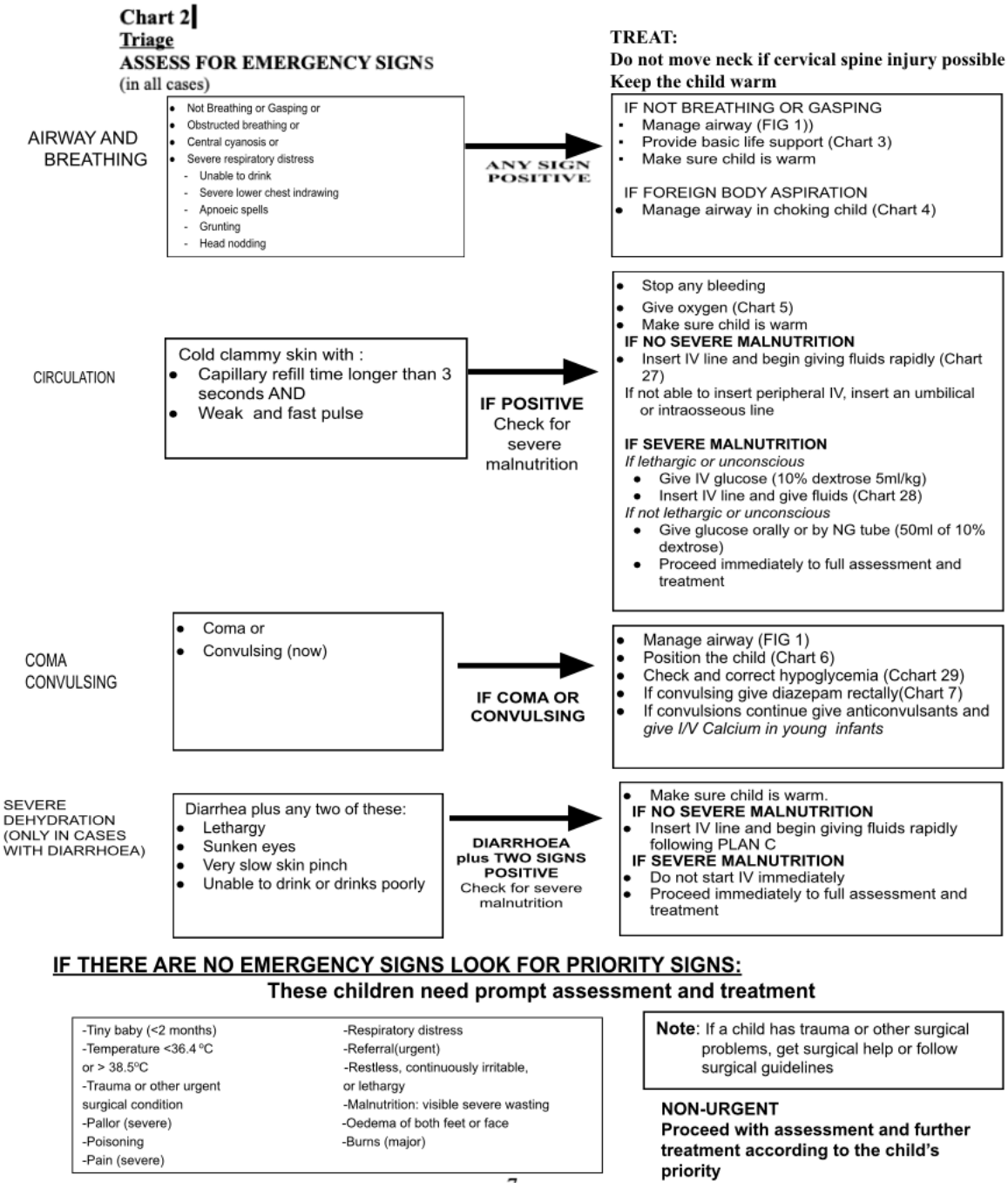
Categories after triage	Action
Emergency cases (E)	Emergency treatment
Priority cases (P)	Rapid assessment and action
Non-urgent cases (N)	Can wait

» Assess airway and breathing and give emergency treatments.

» Assess the status of circulation and level of consciousness.

» Manage shock, hypothermia, coma, and convulsions.

» Assess and manage severe dehydration in a child with diarrhea.



2.2 How to Triage?

Triaging should be swift, with the ability to assess multiple signs simultaneously. On arrival of sick children in the hospital, rapidly screen and place them in one of the following categories:

Emergency
Priority
Non-Urgent

2.2.1 EMERGENCY SIGNS:

Keep in mind the ABCD steps: Airway, Breathing, Circulation, Coma, Convulsion, and DFollowing are the emergency signs:

- Not breathing at all or gasping
- Obstructed breathing
- Central cyanosis
- Severe respiratory distress
- Shock : Capillary refill >3 seconds and Weak and fast pulse
- Coma
- Convulsions
- Diarrhea with severe dehydration (any two signs):
  - Lethargy
  - Sunken eyes
  - Very slow skin pinch
  - Unable to drink or drinks poorly

To assess **if the child has airway or breathing problems** you need to know:

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

Look, listen and feel for breathing. The child may not be breathing at all or gasping or may have obstructed breathing due to a foreign body or blockage by the tongue or epiglottitis or severe croup.

- Does the child have severe respiratory distress?

Is he/she breathing very fast and getting tired?
Does he have severe chest indrawing or is he using accessory respiratory muscles?
Is the child having difficulty in breathing while talking, eating or breastfeeding?

To **assess if the child has circulation problems** you need to know:

- Does the child have warm skin?
- If not, is the capillary refill time longer than 3 seconds?
- And is the pulse weak and fast?

To **assess for coma,** you need to know:

A child who is not alert but responds to voice is lethargic.
If the assessment shows that the child is not alert and does not respond to voice but is unresponsive or may respond to pain (“P” or “U”), then the child is in coma and needs to be treated accordingly.

A ALERT
V RESPONDS TO VOICE
P RESPONDS TO PAIN
U UNRESPONSIVE

To **assess for severe dehydration,** you need to know:

- If the child is lethargic or unconscious
- If the child has sunken eyes
- If the skin pinch goes back very slowly (>2 seconds)
- If the child is unable to drink or drinks poorly

When a child with emergency signs is identified, take to the emergency room or treatment area and start the appropriate emergency treatments immediately. Do not proceed to the next step before treatment is begun for a positive sign. It is very important to ask for head or neck trauma and look for signs of severe malnutrition as they affect the treatment protocol. The emergency team should work together efficiently.

Triage Steps	Treat when any sign is positive
Assess A	If positive, treat. If negative, proceed to B
Assess B	If positive, treat. If negative, proceed to C
Assess C	If positive, treat. If negative, proceed to D
Assess D	If positive, treat. If negative, proceed to priority signs

When ABCD has been completed and there are no emergency signs, continue to assess for priority signs.

2.2.2 PRIORITY SIGNS

Alert you that this child needs prompt treatment but not emergency assessment. These signs can be remembered as 3 TPR - MOB:

» Tiny baby (< 2 months)
» Temperature (very high)
» Trauma or other urgent surgical condition
» Pallor (severe)
» Poisoning
» Pain (severe)
» Respiratory distress
» Restless, continuously irritable, or lethargic
» Referral (urgent)
» Malnutrition: visible severe wasting
» Oedema of both feet or face
» Burns (major)

Tiny baby (<2 months)
If the patient appears very young, confirm the age from the mother and assess them as a priority as they are more likely to deteriorate further if sick.

Temperature: Fever
A child that feels very hot has high fever and needs immediate care like antipyretics and investigations. High fever (≥ 38.5°C) can have harmful effects such as:

- reducing the appetite
- making the child irritable
- precipitating convulsions in some children aged between 6 months to 5 years
- increasing oxygen consumption

Treatment with oral paracetamol should be given to children aged ≥ 2 months who have a fever of ≥ 38.5 ° C and are uncomfortable or distressed because of the high fever . The dose of paracetamol is 15 mg/kg/dose 6-hourly. Children with fever should be lightly clothed, kept in a warm but well-ventilated room, and encouraged to increase their oral fluid intake. Tepid sponging with lukewarm water lowers the temperature during the period of sponging only.

Severe Trauma (or other urgent surgical condition)
Usually this is an obvious case, but one needs to think of acute abdomen, fractures and head injuries in this category.

Severe Pallor
It can be detected by comparing the child's palms with your own. If the palms are very pale (almost paper-white), the child is severely anaemic. This child needs admission and may need blood transfusion.

Poisoning
A child with a history of swallowing drugs or other dangerous substances needs to be assessed immediately, as he can deteriorate rapidly and might need specific treatments depending on the substance taken. The mother will tell you if she has brought the child because of possible intoxication.

Severe Pain
If a child has severe pain and is in agony, she/he should be prioritized to receive early full assessment and pain relief. Severe pain may be due to severe conditions such as acute abdomen, meningitis, etc.

Respiratory distress
If there is mild respiratory distress like fast breathing or mild chest in-drawing, this child needs urgent assessment.

Restless, continuously irritable, or lethargic.
The child who cries constantly and will not settle is irritable or restless. A lethargic child is drowsy and uninterested.

Referral (Urgent)
Any patient referred urgently from another health facility needs urgent assessment.

Malnutrition: Visible severe wasting
A severely wasted child appears to be all skin and bones. Examine the child from the back and you see the buttocks are flat and there are loose folds of skin (baggy pant sign). The arms and legs are thin and you can see the outline of ribs. This is a form of malnutrition called marasmus.

Oedema of both feet or face
If you press the dorsum of the foot gently with your thumb and a definite pit is formed, the child has oedema. Oedema of both feet is an important diagnostic feature of kwashiorkor, another form of severe malnutrition.

Major Burn
Any child with a major burn, trauma or other surgical condition needs to be seen quickly. Get surgical help or follow surgical guidelines.

Summary
Triage is the sorting of patients into three categories according to the initial quick assessment. All children should undergo triage. The main steps in triage are:

- Look for emergency signs.
- Check for head/neck trauma
- Treat any emergency signs if present.
- Call your senior doctor for additional help
- Do point of care laboratory tests (like CBC, RBS, RDT)
- Look for any priority signs.
- Place patients with priority signs at the front of the queue.
- Move on to the next patient.

EXERCISE 1

1. Write the following actions in the right chronological order.

- ☐ Check about head or neck trauma
- ☐ Call your senior doctor for additional help
- ☐ Draw blood for point of care laboratory tests
- ☐ Look for any priority signs
- ☐ Look for emergency signs
- ☐ Move on to the next patient
- ☐ Place priority patients at the front of the queue
- ☐ Treat any emergency signs you find

2. Karma, 3 weeks old is brought to you with complaints of 4 days of diarrhea and vomiting. His temperature is 36.2oC and he is lethargic, breathing normally, his hands are cold and capillary refill is < 3 seconds. The eyes are normal and skin pinch takes more than 3 seconds and has a weak and fast pulse.

How do you triage this child?

3. An 8 day old baby fed on formula milk, is brought to a health facility with complaints of diarrhea. The eyes and skin pinch are normal and the baby is alert. How do you triage this infant?

4. Rinchen, a one-year old, had a seizure outside the hospital. He became unconscious. His breathing sounds very wet and noisy and there is drooling from his mouth. He has cyanosis. How do you triage this child?

SECTION 3:
ASSESSMENT AND TREATMENT OF EMERGENCY SIGNS

3.1 Assessing Airway and Breathing

The letters **A** and **B** in **"ABCD"** represent **"airway and breathing".** If there is no problem with the airway or breathing, you should look for signs in the circulation **(C).**

To assess **if the child has an airway or breathing problem** you need to know:

- Is the child breathing?
- Is the airway obstructed?
- Is the child blue (centrally cyanosed)?
- Does the child have severe respiratory distress?

If the child is not breathing you must first open the airway.

ASSESS AIRWAY AND BREATHING	Not breathing or gasping or Obstructed breathing or Central cyanosis or Severe respiratory distress Unable to drink Severe lower chest indrawing Grunting Head nodding Apnoeic spells	**ANY SIGN POSITIVE** →	IF NOT BREATHING OR GASPING Manage airway Provide basic life support Make sure child is warm IF FOREIGN BODY ASPIRATION Manage airway in choking child IF NO FOREIGN BODY ASPIRATION Manage airway Give oxygen Make sure child is warm

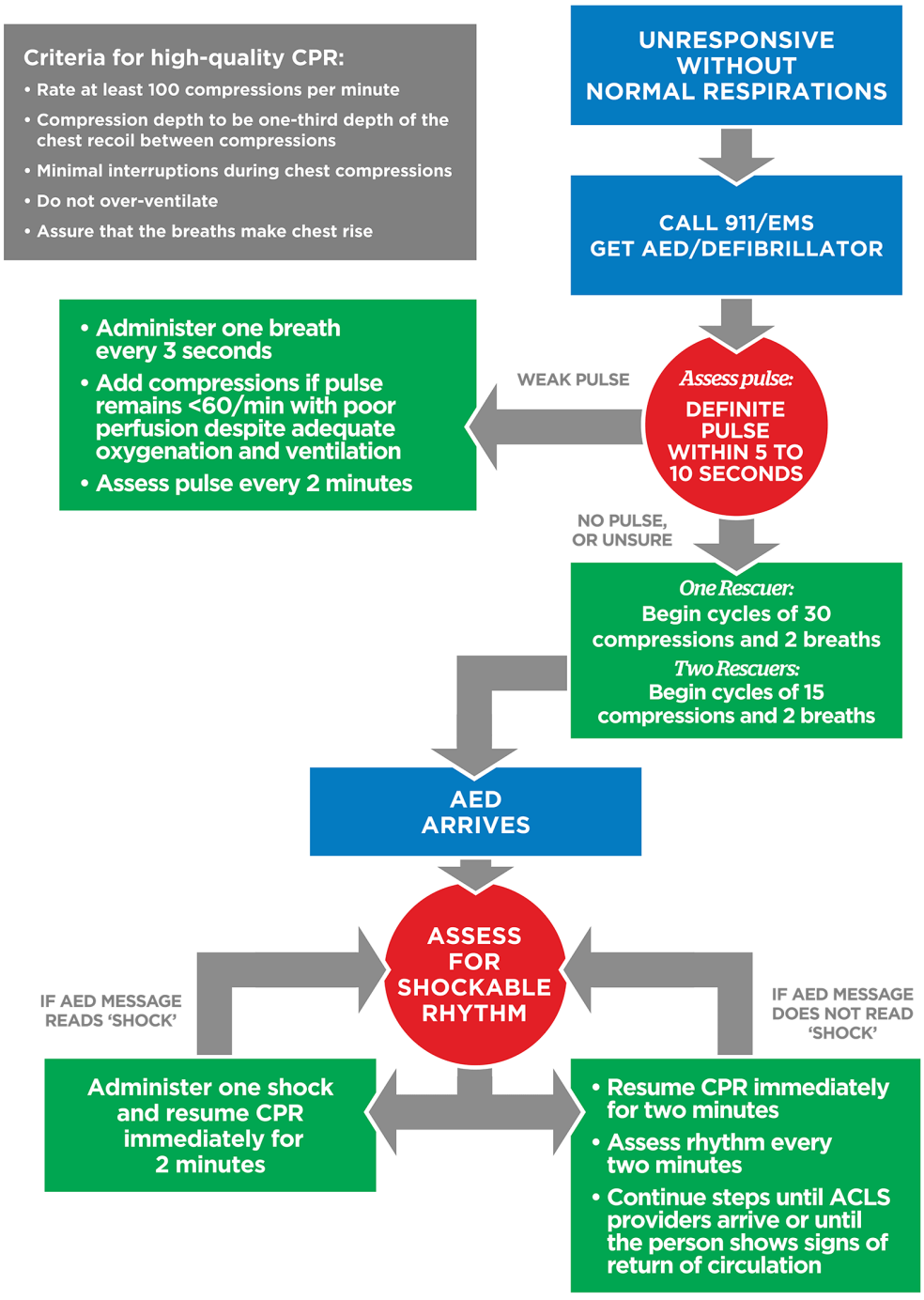
Is the child breathing?

To assess breathing, there are three things you must do:

- **Look:** If active, talking, or crying, the child is obviously breathing. If none of these, look again to see whether the chest is moving.
- **Listen:** Listen for any breath sounds. Are they normal?
- **Feel:** Can you feel the breath at the nose or mouth of the child?

If the child is not breathing, gasping or unresponsive, call for help and initiate basic life support as shown in chart 3.

Chart 3: Pediatric Basic Life Support



(Courtesy: PALS - Provider Handbook 2020-2025)

Rescue breathing in unresponsive infants and children with definite pulse:

- » Give 1 breath every 3 to 5 second (about|12 to 20 breaths /min)
- » Give each breath in 1 second.
- » Each breath should result in visible chest rise.
- » Check the pulse about every 2 minutes

Is the Airway Obstructed?

Obstruction can occur at several levels. The tongue can fall back and obstruct the pharynx, or a foreign body (such as a piece of fruit) can lodge in the upper airway. Croup and epiglottitis can also cause upper airway obstruction.

Coins and peanuts are notorious causes of aspiration and subsequent choking. Ask the child's caretaker explicitly for a history of choking. Foreign body should be suspected in cases of sudden respiratory distress associated with coughing, gagging, stridor, cyanosis, or wheezing. Do not try to remove the foreign bodies in the upper airway blindly because it may result in pushing the back of foreign body into the airway or may cause serious trauma. Techniques to remove foreign bodies are based on support of forced expiration rather than a blind finger sweep of the mouth. Attempts to force the foreign body out of the airway should be done immediately, because airflow may be halted completely and sudden death could be imminent.

Does the Child Show Central Cyanosis?

Cyanosis occurs when there is an abnormally low level of oxygen in the blood. This sign may be absent in a child who has severe anemia.

To assess for central cyanosis, look at the mouth and base of the tongue. A bluish or purplish discoloration of the tongue and the inside of the mouth indicates central cyanosis.

Does the Child have Severe Respiratory Distress?

Observe whether the child has significant discomfort from not getting enough air into the lungs. Is there difficulty in breathing while talking, eating or breastfeeding? Is the child breathing very fast, have severe lower chest wall indrawing, or using the accessory muscles for breathing which cause the head to nod or bob with every inspiration? The latter is particularly seen in young infants.

Signs of severe respiratory distress
» Unable to drink
» Severe lower chest in-drawing
» Grunting
» Head nodding
» Apneic spells
» Stridor
» Labored or very fast breathing (RR >70/min)
» SpO 2 (oxygen saturation) <90%

If the child is breathing adequately, go to the next step to quickly continue the assessment for emergency signs. If the child has an airway or breathing problem, you should initiate appropriate treatment and then quickly resume the assessment.

3.2 Management of Airway and Breathing

Positioning to Improve the airway

To do this safely, you must find out if the child has been subjected to any trauma. In such a case, it is important not to tilt the head or move the neck. It is also important to know the child's age because you will position an infant (under 12 months of age) differently from a child.

Is trauma of the neck a possibility?

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. If you suspect trauma, to limit the risk of aggravating a potential cervical spine injury, open the airway with a jaw thrust while you immobilize the cervical spine. Jaw thrust is safe and can be used in cases of trauma for children of all ages.

3.2.1 No neck trauma is suspected

Triage Steps	Treat when any sign is positive
» Inspect mouth and remove foreign body, if present » Clear secretions from throat » Let child assume position of maximum comfort	» Tilt the head as shown (Head tilt-chin lift maneuver:Figure1) » Inspect mouth and remove foreign body, if present » Clear secretions from throat » Check the airway by looking for chest movements, listening for breath sounds and feeling for breath

Head tilt-chin lift maneuver

The neck is slightly extended and the head is tilted by placing one hand on the child's forehead. Lift the mandible up and outward by placing the fingertips of the other hand under the chin. A neutral position, nose up in an infant and a sniffing position in a child should be maintained.

Figure 1: Look listen & feel for breathing

3.2.2 Neck trauma suspected (possible cervical spine injury)

» Stabilize the neck,
» Inspect mouth and remove foreign body, if present
» Clear secretions from throat
» Check the airway by looking for chest movements, listening for breath sounds, and feeling for breath

Jaw thrust maneuver

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 and outward. The jaw thrust maneuver is also used to open the airway when bag-mask ventilation is performed.

Figure: 2: Using Jaw thrust without head tilt

Ventilate with Bag and Mask

If the child is not breathing or spontaneous ventilation is inadequate after management of the airway (as judged by insufficient chest movements and inadequate breath sounds), ventilate with a self-inflating bag and mask. The bag is used together with a facemask.

Bags and masks should be available in sizes for all age group (size 0, 1 and 2).

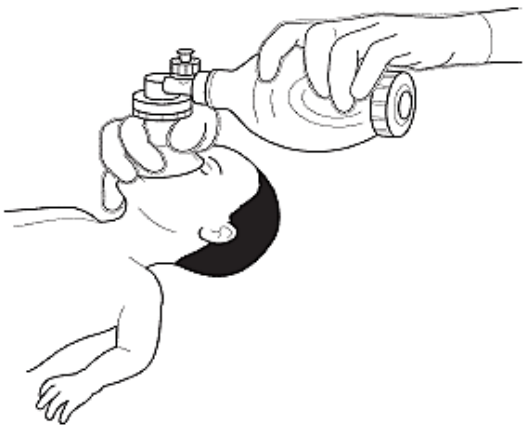


Figure 3: Bag and mask ventilation

It is important for the mask to be of the correct size for the child. It must cover the mouth and nose completely without covering the eyes or overlapping the chin. The correct size and position are shown in Figure4.

Self-inflating bags of minimum volume 450-500ml should be available. Use adequate force and tidal volume necessary to cause the chest to rise visibly.

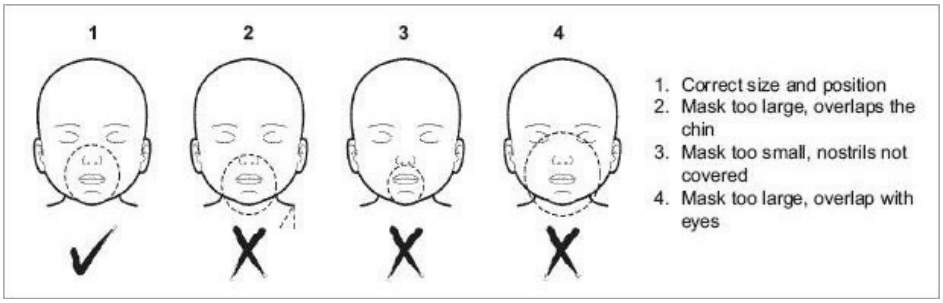


Figure 4: Masks and Positioning

Call for help for any child who needs a Bag and Mask since some of these children may need chest compression.
After two effective ventilations, check the pulse (femoral, brachial or carotid) for ten seconds. If the pulse is absent, the second person should start chest compression.

Chest compressions
If you are unable to confidently detect a pulse or other signs of circulation, or if the heart rate is below 60 beats per minute in an infant or child with signs of poor perfusion despite adequate oxygenation and ventilation, begin chest compressions coordinated with ventilations. Reassess the pulse after 2 minutes. Ensure the child is lying supine on a firm, flat surface.

The techniques for chest compression vary for a child under 1 month and those between 1 month to 8 years as detailed below:

Chest compression in Newborn up to 1 month of age (Figure 5)
There are two techniques for performing chest compression. These techniques are

- Thumb technique, where the 2 thumbs are used to depress the sternum, while the hands encircle the torso and the fingers support the spine
- 2-finger technique, where the tips of the middle finger and either the index finger or ring finger of one hand are used to compress the sternum, while the other hand is used to support the baby's back (unless the baby is on a very firm surface)

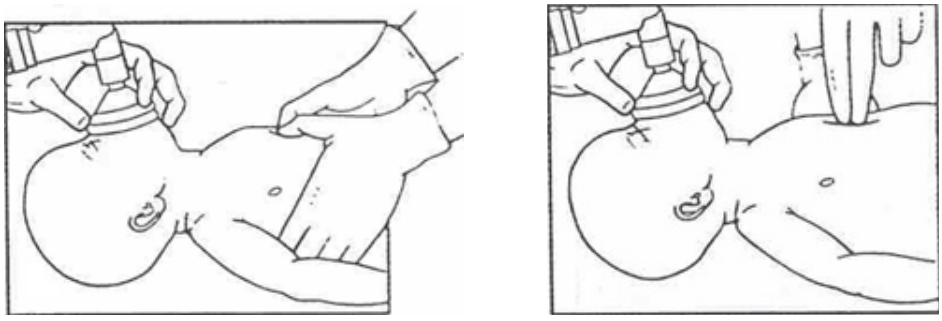


Figure 5: Chest Compression

During cardiopulmonary resuscitation, chest compressions must always be accompanied by positive-pressure ventilation. Avoid giving a compression and ventilation simultaneously, because one will decrease the efficacy of the other. Therefore, the 2 activities must be coordinated, with one ventilation interposed after every third compression, for a total of 30 breaths and 90 compressions per minute. The ratio of chest compressions and ventilation should be 3:1. If the heart rate is 60 bpm or greater, discontinue compressions and resume PPV at 40 to 60 breaths per minute.
Chest compressions for the child more than 1 month of age.

- Place the heel of one hand over the lower half of the sternum. Lift your fingers to avoid pressing on the ribs.
- Depress the sternum 1/3 to 1/2 of the depth of the chest. This corresponds to 4-5 cm.
- Compress at the rate of approximately 100-120 times per minute.

The ratio of chest compressions and ventilation should be 15:2 for double rescuers and 30:2 for a single rescuer. Two effective breaths should be given after every 15 chest compressions in case of double rescuer and after every 30 chest compressions in case of single rescuer. Bag and mask

ventilation is a very effective way of ventilation if done correctly. If the health care provider has the necessary skills and equipment, the airway can be secured by endotracheal intubation. You should call for help or more trained hands by this time. Secure an intravenous or an intraosseous line for use of any drugs, where needed.

High quality CPR

- Rate 100-120/min
- Compression depth to at least 1/3 of the AP diameter of the chest (4- 5 cm)
- Allow complete chest recoil after each compression
- Minimize interruptions in chest compressions
- Do not over ventilate
- Change compressor every 2 minutes, or sooner if fatigued

 # If you see someone suddenly collapse with no pulse, use an AED as soon as it's available.

Securing IV access and use of drugs:

If the patient does not have an intravenous line in place, secure an intravenous access preferably using a large peripheral vein. Some children may require intraosseous access in case IV access is not possible.
Intravenous adrenaline 0.1 ml /kg (1:10,000) is used in a child who does not respond to initial ventilation and chest compressions and his pulses are absent. Two doses can be administered 3 to 5 minutes apart. The outcome of babies who do not respond to 2 doses of adrenaline is generally poor but continue administering adrenaline in potentially reversible situations like poisoning, hypothermia, Pneumothorax, etc.

If the child improves, he can be given oxygen and fluid according to the assessment and the underlying condition should be managed. An unconscious patient should be placed in recovery position (Chart 6). An airway may be placed if the child is unable to maintain the airway.

3.3 Foreign body aspiration with increasing respiratory distress

A child 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.
If a foreign body is causing the obstruction, different methods are used for clearing up the foreign body in infants (up to 1 year) and children (chart 4).

3.3.1 Management of choking infant

- Lay the infant on your arm or thigh in a head down position and support the head by firmly holding the jaw.
- Give 5 blows to the infant's back with the heel of hand between the shoulder blades.
- 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 the sequence until the object is expelled or the patient becomes unconscious. If he becomes unconscious, start CPR.

3.3.2 Management of choking child (1 year and above): Abdominal thrusts (Heimlich Maneuver)

- The child may be sitting or standing
- Stand or kneel behind the child and encircle his torso by putting both arms directly under axillae
- Place the thumb side of one fist against the victim's abdomen in the midline slightly above the navel and below the tip of the xiphoid process
- Place the other hand over the fist and pull upwards into the abdomen, repeat this Heimlich maneuver 5 times
- If the obstruction persists, check the child's mouth for any obstruction which can be removed
- If necessary, repeat this sequence

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.

3.4 Oxygen therapy to a child with respiratory distress

Provide oxygen therapy to all sick children with signs of severe respiratory distress

Give oxygen by nasal prongs or by head box to maintain SpO2 > 90%

Method	Nasal prongs	Head box
Flow & Concentration	Low = 0.5 L per minute	Low = 3 L per minute
	Moderate = 0.5 to 1 L per min	Moderate = 3 to 5 L per min
	High = 1 - 2 L per min	High = 5 - 6 L per min

3.4.1 Sources of oxygen to treat hypoxemia

There are two possible sources of oxygen: Oxygen concentrators and Oxygen-filled cylinders.

3.4.2 Methods of Oxygen delivery

Give oxygen to a child in a non-threatening manner as anxiety increases oxygen consumption and possibly respiratory distress. If a child is upset by one method of oxygen support, you should attempt to deliver the oxygen by an alternative technique. It is important to have the proper equipment to control oxygen flow rates.

Headbox:

- Place a head box over the baby's head.
- Ensure that the baby's head stays within the head box, even when the baby moves.
- Adjust the flow of oxygen to achieve the desired concentration.

If the baby's breathing difficulty worsens or the baby has central cyanosis, give oxygen at a high flow rate.

If breathing difficulty is so severe that the baby has central cyanosis even with high flow oxygen, organize transfer and urgently refer the baby to a tertiary hospital or specialized centre capable of assisted ventilation.

Nasal Prongs:
These are short tubes inserted into the nostrils. Prongs come in different sizes for adults and children. It is the preferred method for delivering oxygen to pre-terms and low birth weight infants, with a flow rate of 0.5- 1 L/min, increased to 2L/min in severe respiratory distress.

Place them just inside the nostrils and secure with a piece of tape on the cheeks near the nose and take care that the nostrils are kept clear of mucus, which could block the flow of oxygen.

If you have only adult-size prongs, and the outlet tubes are too far apart to fit into the child's nostrils, cut the outlet tubes off and direct the jet of the oxygen into the nostrils.

3.4.3 Duration of oxygen therapy

Continue giving oxygen until the child is able to maintain SpO2 >90% in room air. When the child is stable and improving, take the child off oxygen for a few minutes. If the SpO2 remains above 90%, discontinue oxygen, but check again half an hour later on the first day off-oxygen to ensure the child is stable.

Where pulse oximetry is not available, the duration of oxygen therapy is guided by clinical signs, which are less reliable.

Any child who has been successfully resuscitated or any unconscious child who is breathing and keeping the airway open should be placed in the recovery position. This position helps to reduce the risk of vomitus entering the child's lungs. It should only be used in children who have not been subjected to trauma. A child with cyanosis or severe respiratory distress should be allowed to take a comfortable position of his choice.

3.5 Circulation

The letter C in **"ABCD"** stands for

- Circulation
- Coma and Convulsions

ASSESS CIRCULATION	**Cold clammy skin with:** - Capillary refill time longer than 3 seconds AND - Weak and fast pulse	**If POSITIVE Check for malnutrition** →	If the child has any bleeding, apply pressure to stop the bleeding. Do not use a tourniquet Give oxygen Make sure child is warm Insert IV and begin giving fluids rapidly If not able to insert peripheral IV, insert an umbilical or intraosseous line **IF SEVERE MALNUTRITION** (Age ≥2 months) **If lethargic or unconscious** Give glucose orally or by NG tube (50 ml of 10% Dextrose) Proceed immediately to full assessment and treatment

3.5.1 Assessment of circulation

After the airway has been opened, to assess if a child has a circulation problem, you need to know:

- Does the child have warm skin?
- If not, is the capillary refill time longer than 3 seconds?
- And is the pulse weak and fast?

Is the child's skin warm?

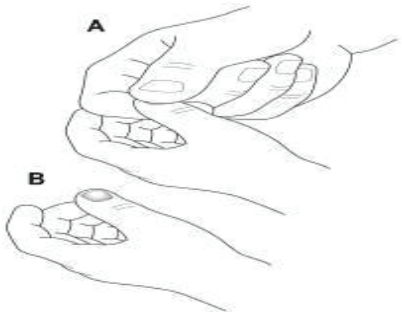
To assess the circulation, take the child's hand on your own. If it feels warm, you do not need to assess capillary refill time or pulse. If the child's hands feel cold, you need to assess the capillary refill time.

Is the capillary refill time longer than 3 Seconds?

Capillary refill time is a simple test that assesses how quickly blood returns to the skin after pressure is applied. It is carried out by applying pressure to the pink part of the nail bed of the thumb or big toe in a child and over the sternum or forehead in a young infant for 3 seconds.

The capillary refill time is the time from release of pressure to complete return of the pink color. It should be less than 3 seconds. If it is more than 3 seconds the child is in shock.

Lift the limb slightly above heart level to assess arteriolar capillary refill and not venous stasis. This sign is reliable except when the room temperature is low, as cold environment can cause a delayed capillary refill. In such a situation check the pulses and decide about shock.



A. Applying pressure to the nail bed for 3 seconds
B. Check the time to the return of the pink colour after releasing the pressure

Figure 6: Checking capillary refill time

Is the pulse weak and fast?

The radial pulse should be felt. If the pulse is strong and not fast, the pulse is adequate; no further assessment is needed.

If the radial pulse is difficult to find, you need to look for central pulses such as brachial, femoral and carotid in the older children. The pulse should be strong.

Tachycardia is defined as a pulse > 180/min in infants/toddlers and > 160/min in children above 2 years.

Note that we do not recommend blood pressure to assess for shock because of two reasons:

1) Low blood pressure is a late sign in children and may not help identify treatable cases and
2) The BP cuff necessary in children of different age groups is mostly unavailable in many district hospitals.
3) Normal BP readings will not exclude compensated type of shock.

3.5.2 Shock and treatment of shock

If the child has cold clammy skin, a capillary refill time more than 3 seconds, and a fast weak pulse, then the child is in shock. The shock can be Compensated Shock or Hypotensive Shock. The most common cause of shock in children is due to loss of fluid from circulation, either through loss from the body as in severe diarrhea or when the child is bleeding, or through capillary leak in a disease such as severe dengue fever. In all cases, it is important to replace this fluid quickly. An intravenous line must be inserted and give fluids RAPIDLY in shocked children without severe malnutrition.

Treatment of shock requires teamwork. The following actions need to be started simultaneously:

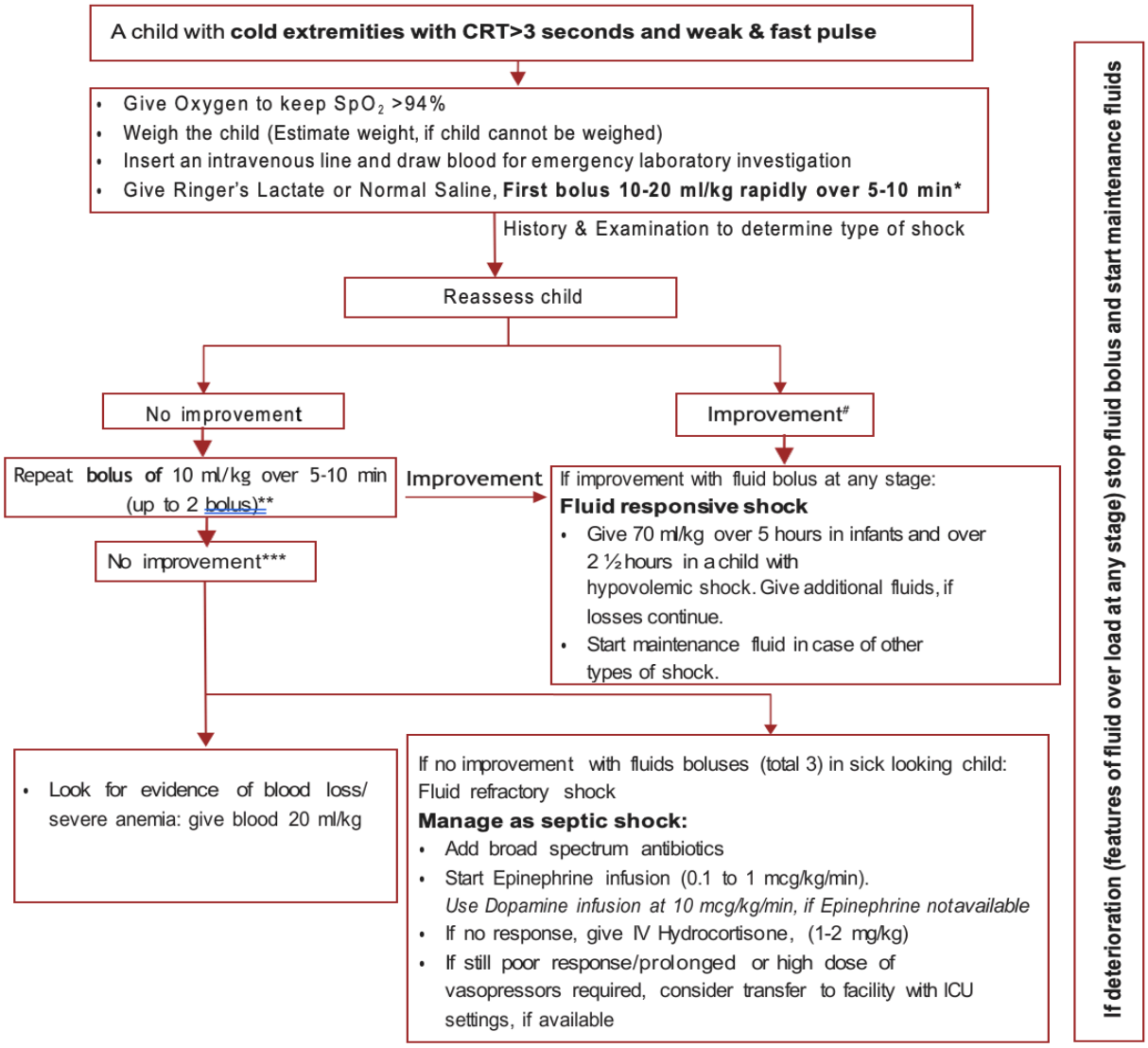
- If the child has any bleeding, apply pressure to stop the bleeding. Do not use a tourniquet
- Give oxygen (>94%)
- Make sure the child is warm
- Select an appropriate site for administration of fluids
- Establish IV or intraosseous access
- Take blood samples for emergency laboratory tests
- Begin giving fluids for shock.

3.5.2.1 Administering IV fluid therapy rapidly in a shocked child without severe acute malnutrition

When shock is classified by the cause, the terms hypovolemic, cardiogenic, distributive, and obstructive are used. Hypovolemia is the primary cause in children. Early fluid replacement is crucial to prevent refractory shock and organ dysfunction.

Quickly establish vascular access in all patients with shock. Administer intravenous fluids, preferably isotonic crystalloids (Ringer's lactate or normal saline) during initial resuscitation. Monitor cardiogenic shock patients carefully, as rapid boluses can cause complications.

Chart 6: How to Give IV Fluids dor Shock in a Child without severe Acute Malnutrition



**Give 20 ml/kg IV fluids fast over 5-10 minutes in hypovolemic shock, slow over 60 min if the child has moderate malnutrition or severe pallor or fever*

***Give 20 ml /kg IV fluid bolus in case of hypovolemic shock*

#Signs of improvement: Good volume and slowing pulse rate and faster capillary refill.

****If deterioration (increase in RR > 5 and HR > 15) stop fluid, consider cardiogenic or septic shock.*

(Courtsy: F-IMNCI(2023), Minitry of Health and family welfare, GOI)

Initial fluid therapy in a child with shock

- When signs of shock are detected, rapidly administer a fluid bolus of 10-20 ml/kg of isotonic crystalloid solution (RL/NS over 5-10 minutes in hypotensive shock and 5-20 minutes in compensated shock.
- Fluid administration rate should be individualized for each patient based on frequent clinical assessment (pulse rate, capillary refill, breathing rate) before, during and after fluid therapy is given.
- Placement of a 3-way stopcock in the IV tubing system can facilitate rapid fluid delivery as fluids can be pushed by syringe.
- Slower rate (over 60 min) is recommended for children who have febrile illnesses, are malnourished and children with moderate to severe anemia.
- Once you have started fluid, assess for type of shock (hypovolemic, distributive, cardiogenic and obstructive) which is critical to decide further management.

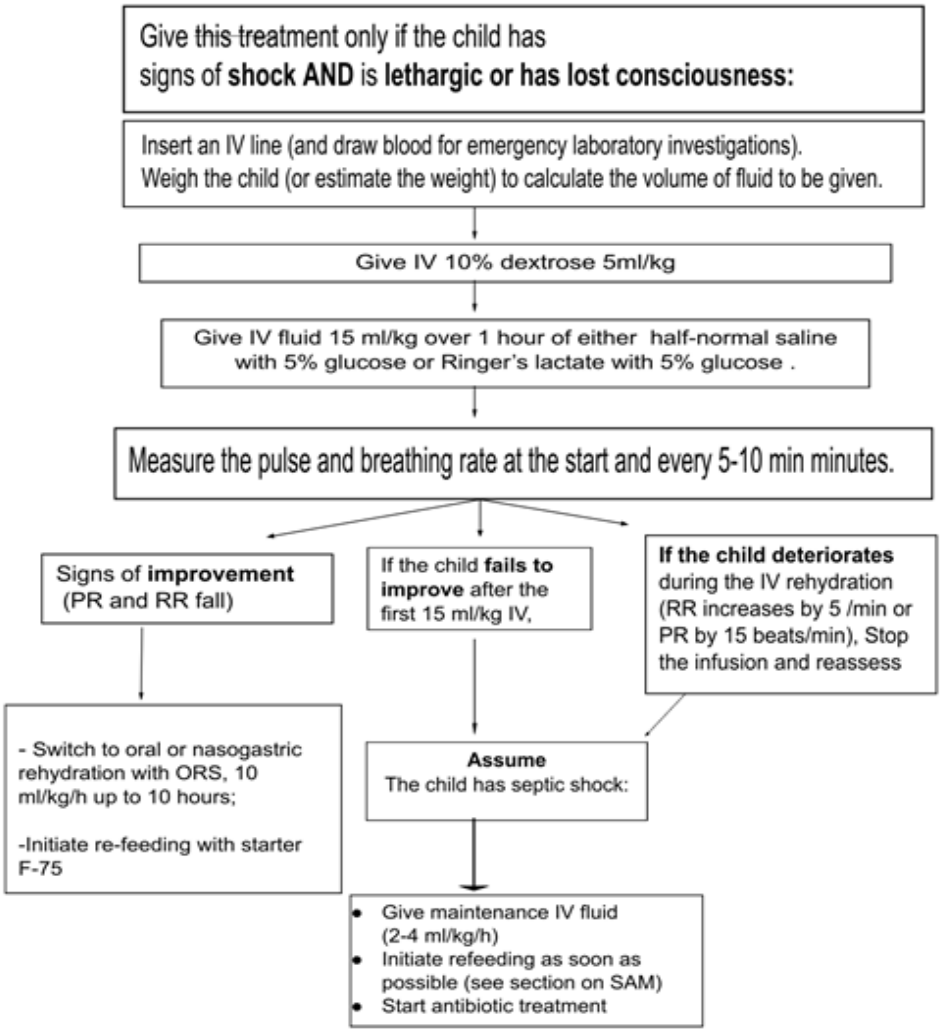
3.5.3.2 Administering IV fluids for shock in a child with severe acute malnutrition (visible severe wasting or oedema)

In children with severe acute malnutrition, shock is challenging to assess and manage. Malnutrition weakens not just the muscles but also internal organs, including the heart. The heart may fail if it has to pump large amounts of fluid, leading to fluid buildup in the lungs (pulmonary edema), which will worsen breathing and can become life-threatening. Therefore, rapid IV fluid infusion should be avoided in severely malnourished children.

Children with severe acute malnutrition require special fluids and slower rates of administration, along with close monitoring. If possible, avoid IV fluids and use a nasogastric (NG) tube or oral fluids instead. Otherwise, administer IV fluids such as half-strength Normal Saline (N/2) with 5% glucose or Ringer's Lactate in 5% glucose at a rate of 15 ml/kg over 1 hour. If these fluids are unavailable, use Ringer's Lactate.

In children with severe acute malnutrition, shock may indicate septic shock rather than hypovolemia. Monitor pulse, respiratory rate, temperature, and capillary refill time every 10 minutes to detect septic shock. Stop IV fluids if pulse increases by 15 bpm or respiratory rate by 5 breaths per minute. If no improvement occurs after a 15 ml/kg IV bolus, manage for septic shock. Administer another 15 ml/kg if there is partial improvement and a history of diarrhea or suspected cholera. Transition to oral or nasogastric rehydration if the child improves.

Chart 7: How to give IV fluids for shock in a child with Severe Acute Malnutrition (SAM)



EXERCISE 2

1. Wangmo, a four-month old baby is brought to the hospital with fever, rapid breathing and refusing to breastfeed. She has had 2 episodes of vomiting and watery stool. She weighs 5 kg. Her hands are cold and the capillary refill time is more than 3 seconds. The femoral pulse is palpable but fast and weak. There is no chest indrawing and there are no abnormal respiratory noises. How will you triage the baby? How will you manage the baby?

2. Tashi, 12 months old, is brought to you with loose stools and vomiting. He weighs 5 kg and has visible severe wasting. The child is very lethargic and extremities are cold with capillary refill time of more than 3 seconds. The pulses are weak and fast and have mild respiratory distress. How do you triage this child? How will you manage the child?

3.6 Coma and Convulsion

Now we shall look at the second and third components in which **C** represents **"coma and convulsion"**.

The following signs indicate impaired neurological status: coma, lethargy, and convulsions.

3.6.1 Assessment of coma and convulsion

To assess the child's neurological status, you need to know:

- Is the child in a coma?
- Is the child convulsing?

COMA CONVULSING	**Coma or Convulsing (now)**	**IF COMA OR CONVULSING** →	Manage airway Position the unconscious child (if head or neck trauma is suspected, stabilize the neck first) Give oxygen Check and correct hypoglycemia* Give IV calcium if infant <3 months If convulsion continue, give anticonvulsant

Is the Child in Coma?

A child who is awake is obviously conscious and you can move to the next component of the assessment. If the child is asleep, ask the mother if the child is just sleeping. If there is any doubt, you need to assess the level of consciousness:

Try to wake the child by talking to him/her, e.g. call his/her name loudly. A child who does not respond to this should be gently shaken. A little shake to the arm or leg should be enough to wake a sleeping child. Do not move the child's neck. If this is unsuccessful, apply a firm squeeze to the nail bed, enough to cause some pain.

A child who does not wake to voice or being shaken or to pain is unconscious.

To help you assess the conscious level of a child is, a simple scale (AVPU) is used:

- **A** Is the child **A**lert? If not,
- **V** Is the child responding to **V**oice? If not,
- **P** Is the child responding to **P**ain?
- **U** The child who is **U**nresponsive to voice (or being shaken) AND to pain is Unconscious.

A child who is not alert, but responds to voice, is lethargic. An unconscious child may or may not respond to pain. **A child with a coma scale of "P" or "U" will receive emergency treatment for coma as described below.**

Is the Child Convulsing Now?

This assessment depends on your observation of the child and not on the history from the parent. Children who have a history of convulsion, but are alert during triage, need a complete clinical history and investigation, but no emergency treatment for convulsions.

Convulsion can be recognized by the sudden loss of consciousness associated with uncontrolled jerky movements of the limbs and/or the face. There is stiffening of the child's arms and legs. The child may lose control of the bladder, and is unconscious during and after the convulsion. Sometimes, in infants, the jerky movements may be absent, but there may be twitching (abnormal facial movements) and abnormal movements of the eyes, hands or feet. You have to observe the infant carefully.

3.6.2 Treatment of coma and convulsion

Treatment of coma and convulsions are similar and will be described together.

3.6.2.1 Manage the Airway

Managing the airway is done in the same way as treating a child with an airway or breathing problem which has been discussed earlier.

In a convulsing child, do not try to insert anything in the mouth to keep it open. Administer oxygen.

3.6.2.2 Positioning the child

Any unconscious child who is breathing should be placed in the recovery position. This position helps to reduce the risk of aspiration. It should only be used in children who have not been subjected to trauma.

If neck trauma is not suspected:

- Turn the child on the side to reduce risk of aspiration
- Keep the neck slightly extended and stabilize by placing the cheek on one hand
- Bend one leg to stabilize the body position

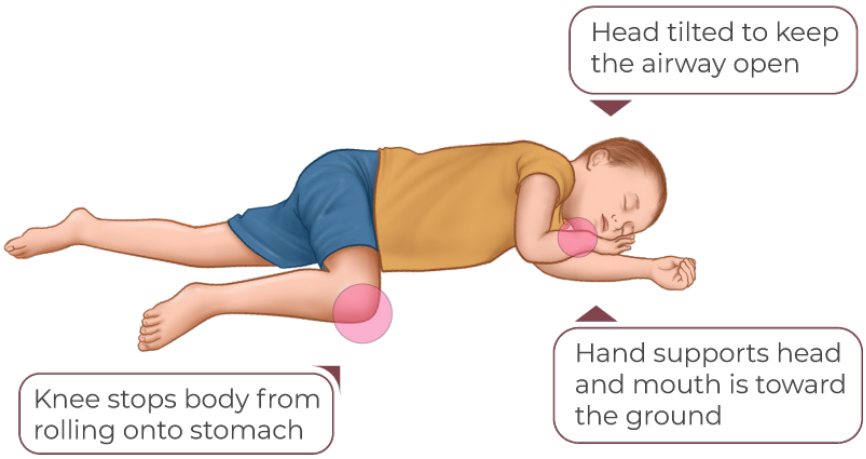


Figure 7: Recovery Position of unconscious child

If neck trauma is suspected:

Cervical spine immobilization:

Cervical spine immobilization is essential to prevent further spinal cord injury after head or neck trauma. In a child with neck trauma, a rigid, appropriately sized cervical collar is applied, and the child is placed on a spine board, secured with straps. The collar should not obstruct airway management. Proper positioning on the backboard is crucial, avoiding neck flexion or extension, and the child should be kept in a neutral position to ensure optimal cervical spine protection.

The neutral position is defined as the normal anatomic alignment of the head and body when standing and looking straight ahead. In children, due to their larger head and prominent occiput, special precautions are needed when they are lying supine, as these features can force the cervical spine into flexion. To prevent this, padding should be placed under the shoulders to elevate the back. Cervical spine stabilization depends on the patient's initial position. If the patient is found prone, they must be log-rolled to the supine position for evaluation, with a rigid cervical collar applied beforehand.

If cervical collar is not available, stabilize the neck child while lying on the back with a sandbag placed on each side. Bottles or rolled towels as shown in theFigurebelow are also some other options.

Figure 8: Stabilizing the neck of trauma patient with sandbags/rolled towels

Log roll:

Use the “log roll” technique to turn the child on the side if the child is vomiting

Move a patient 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 patient’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. Patient then can be rolled to one side with the help of two more persons simultaneously moving the torso and lower limbs on instructions from the senior attendant.

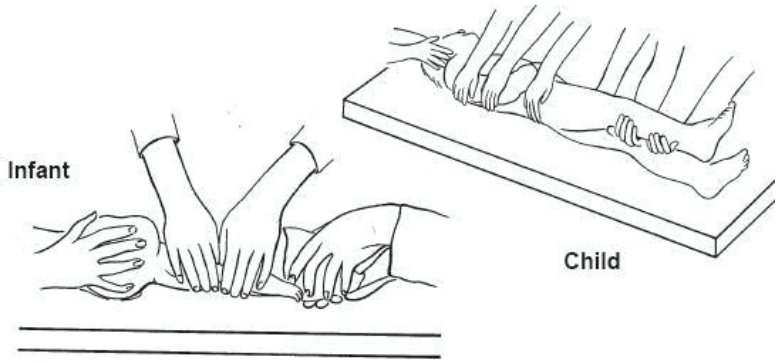


Figure 9: Log roll for stabilizing the neck of the patient while moving the body

3.6.2.3 Insertion of an Oropharyngeal (Guedel) Airway:

The oropharyngeal or Guedel airway can be used in an unconscious patient to improve airway opening. It may not be tolerated in a patient who is awake and may induce choking or vomiting. Guedel airways come in different sizes (Guedel size 000 to 4).

An appropriately sized airway goes from the centre of the teeth (incisors) to the angle of the jaw when laid on the face with the raised curved side (concave) up ("the right side up").

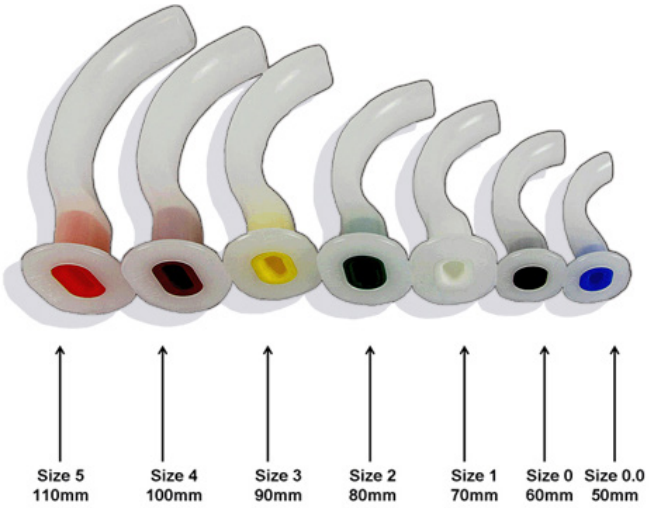


Figure 10: Guedel Airway of Different Sizes

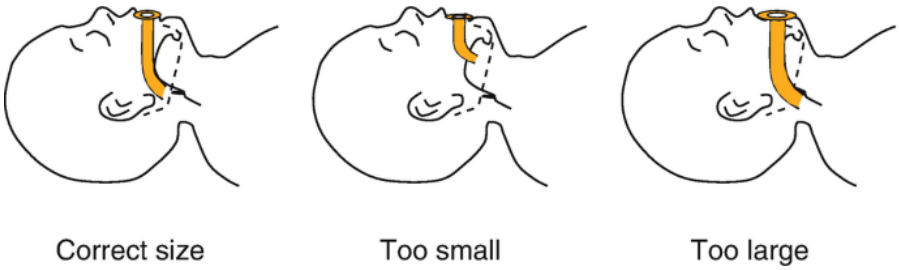
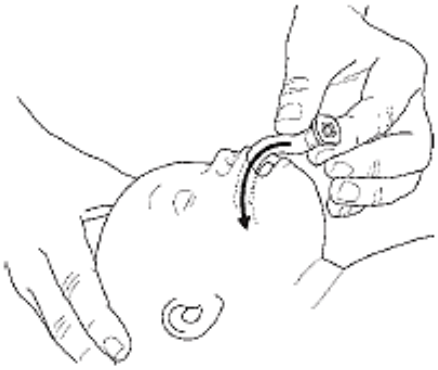


Figure11: Selecting Right Size of an Airway

Infant:



Inserting an oropharyngeal airways in an infant: convex side up

Figure 12: Inserting an oropharyngeal airway in an infant (convex side up)

» Select an appropriate sized airway
» Position the child to open the airway as described above, taking care not to move the neck if trauma suspected
» Using a tongue depressor, insert the oropharyngeal airway the convex side up.
» Re-check airway opening.
» Use a different sized airway or reposition if necessary.
» Give oxygen

Older Child:

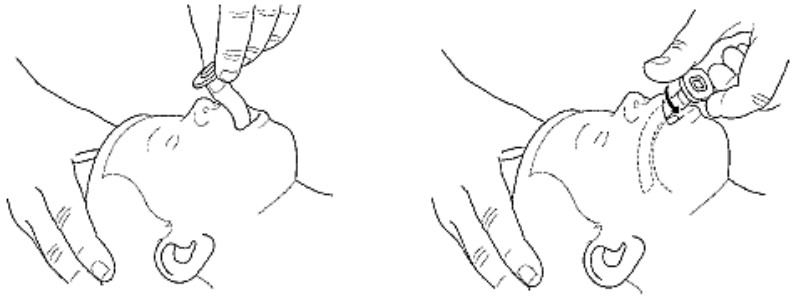


Figure 13: Inserting an oropharyngeal airway in an older child

» Select an appropriate sized oropharyngeal airway.
» Open the child's airway, taking care not to move the neck if trauma is suspected.
» Using a tongue depressor, insert the airway "upside down" (concave side up) until the tip reaches the soft palate.
» Rotate through 180° and slide back over the tongue.
» Re-check airway opening.
» Use a different sized airway or reposition if necessary.
» Give oxygen

To maintain a clear airway, suctioning of secretions, blood, or vomit may be required. Suction can be performed using a foot-operated device, electric machine, or mucous extractor. Suction pressure should not exceed 100 cm of water, and no negative pressure should be applied during catheter insertion—only once the catheter is properly positioned.

3.6.2.4 Administration of Diazepam and antiepileptic agents for convulsions

In a child with acute seizures or status epilepticus, if blood sugar is normal or seizures persist despite hypoglycemia treatment, an anticonvulsant is required. Intravenous diazepam or Midazolam should be used if IV access is available. Diazepam can also be administered rectally. If IV access is in place, administer the drug slowly over at least one minute, and reassess the child after 10 minutes.

Dose should be based on the child's weight if known. For diazepam, the rectal dose is 0.5 mg/kg and the IV dose is 0.25 mg/kg with a maximum dose of 5 mg for children under 5 years and 10 mg for those over 5 years.

	Intravenous diazepam 10mg/2ml	Diazepam given rectally 10mg/2ml solution
Age / weight	**0.05ml/kg**	**Dose 0.1 ml/kg**
1 to 2 months (<4 kg)	0.15ml	0.3 ml
2 to <4 months (4 to <6 kg)	0.25ml	0.5 ml
4 to <12 months (6 to <10 kg)	0.5ml	1.0 ml
1 to <3 years (10 to <14 kg)	0.6ml	1.25 ml
3 to <5 years (14 to 19 kg)	0.75ml	1.5 ml

Administer Diazepam injection solution rectally using a tuberculin syringe, preferably with a catheter. After administration, hold the buttocks together for a few minutes. Flush the catheter with 2 ml of normal saline.

If convulsions persist beyond 10 minutes, administer a second dose of diazepam at 0.25 mg/kg if IV access is available, with a maximum dose of 10 mg. Since diazepam can depress the child's breathing, it is crucial to reassess airway and respiratory status frequently. Do not exceed two doses of diazepam. Alternatively, midazolam (0.1-0.2 mg/kg IV/IM or 0.2 mg/kg intranasal; Max 5 mg) can be used instead of diazepam.

In children with established status epilepticus (seizures that continue for more than 30 minutes or recurrent seizures for more than 30 minutes without recovery of consciousness in between the attacks),where seizures persist despite two doses of benzodiazepines, other antiepileptic agents such as phenobarbital, or phenytoin should be administered, with appropriate monitoring.

IV phenytoin should be administered at a dose of 15-20 mg/kg diluted in approximately 20 ml of saline (avoiding dextrose-containing solutions), infused slowly over 20 minutes. If IV access is not possible IO route can be used. Alternatively, phenobarbital can be given at a dose of 15-20 mg/kg IV, diluted in 20 ml of 5% dextrose or saline, infused over 20 minutes. Maintenance dose of phenobarbitone in infants is 5 to 6 mg/ kg in 1-2 divided doses and in older Children (1 to 5 years): 6 to 8 mg/kg in 1 to 2 divided doses.

For Infant up to 4 weeks of age with seizures:

- Secure IV access
- If blood sugar < 45 mg/dl, give 2 ml/kg 10% dextrose
- If seizures continue: IV phenobarbitone 15 to 20 mg/kg over 20 min
- If no control: Repeat phenobarbitone 5 to 10 mg/kg till a total of 40 mg/kg for a day.
- Maintenance dose of phenobarbitone (oral/ IV) is 3 to 5 mg /kg/day in 1-2 divided doses
- If seizures continue, give phenytoin 20 mg/kg over 20 min
- If hypocalcaemic, administer 2 ml/kg of 10 % calcium gluconate as slow IV infusion and continue with oral supplementation.

Caution

Do not use Diazepam for control of convulsions in the first 4 weeks of age.

If there is high fever:

» Sponge the child with room-temperature water to reduce the fever.

» Do not give oral medication until the convulsion has been controlled (danger of aspiration)

EXERCISE 3

1. Dorjee, a two-year old boy is carried in by his grandmother. He weighs 12 kg. He is febrile and having a seizure. How will you manage the child?

2. Sonam, an 18-month old boy has fever for two days. His mother has noticed that he has fast breathing. He weighs 11 kg. His airway is fine, and he has no chest indrawing. There is no history of diarrhoea. However, the boy started to convulse while being examined. What are the most appropriate measures?

3.7 Dehydration

The letter **"D"** in the **ABCD** mnemonic represents **Dehydration.** In emergency situations, severe dehydration is assessed by evaluating the child's general condition, sunken eyes, and skin turgor. Severe dehydration is classified if the child exhibits **two or more** of the following signs: lethargy, sunken eyes, and a very slow skin pinch.

3.7.1 Assessment for severe dehydration

To assess if the child is severely dehydrated you need to know:

- Is the child lethargic?
- Does the child have sunken eyes?
- Does a skin pinch take longer than 2 seconds to go back?
- Not able to drink or drinking poorly?

SEVERE DEHYDRATION (ONLY IN CASES WITH DIARRHOEA)	Diarrhea plus any two of these: Lethargy Sunken eyes Very slow skin pinch Unable to drink or drinks poorly	**DIARHOEA PLUS TWO SIGNS POSITIVE** Check for severe malnutrition	Make sure child is warm. Insert IV line and begin giving fluids rapidly following PLAN C **IF SEVERE MALNUTRITION** (Age ≥2 months) Do not start IV immediately Proceed immediately to full assessment and treatment

3.7.2 Treatment of severe dehydration in an emergency setting

Severe dehydration (without shock or severe acute malnutrition)

- Start IV fluid immediately. If the child can drink, give ORS by mouth while the drip is set up. Give 100 ml/kg Ringer's lactate solution (or normal saline), divided as follows:

AGE	First give 30 ml/kg in	Then give 70 ml/kg in
Infants (under 12 months)	1 hour*	5 hours
Children (12 mo- 5 years)	30 minutes*	21/2 hours

- Reassess the child every 15-30 minutes. If hydration status is not improving, give the IV drip more rapidly.
- Give ORS (about 5 ml/kg/hour) as soon as the child can drink: usually after 3-4 hours (infants) or 1-2 hours (children).

If IV treatment not possible, give ORS 20 ml/kg/hour for 6 hours (120 ml/kg) by NG tube

- Reassess an infant after 6 hours and a child after 3 hours. Reclassify dehydration status and choose the appropriate plan (A, B, or C) to continue treatment
- Give oral antibiotics for cholera if suspected in a child 2 years or older.
- If possible, observe the child for at least 6 hours after rehydration to be sure that the mother can maintain hydration by giving the child ORS solution by mouth.

Annexure 1: Diagnostic considerations of children presenting with Emergency signs (differential diagnosis)

Table 1: Differential diagnosis of the child presenting with shock

Diagnosis or underlying cause	In favour
Hypovolemic shock	History of profuse diarrhea Known cholera outbreak
Hemorrhagic shock	History of trauma Bleeding site
Dengue shock syndrome	Known dengue outbreak or season History of high break bone fever, headache and rashes (petechiae/ purpura)
Cardiogenic shock	History of heart disease or murmur Enlarged liver Respiratory distress
Septicaemic shock	History of febrile illness Very ill child Known outbreak of meningococcal infection

Table 2: Differential diagnosis of a child or a young infant with lethargy,unconsciousness and convulsions

Differential diagnosis of the child presenting with lethargy, unconsciousness or convulsions		Differential diagnosis of the young infant (less than 2 months) presenting with lethargy, unconsciousness or convulsions	
Diagnosis or underlying cause	**In favor**	**Diagnosis or underlying cause**	**In favor**
Meningitis	» Very irritable » Stiff neck or bulging fontanelle » Petechial rash (meningococcal)	Meningitis	» noeic episodes » Convulsions » High-pitched cry » Tense/bulging fontanelle
Cerebral malaria (Often seasonal)	» Blood smear positive for malaria parasites » Jaundice » Anemia » Convulsions » Hypoglycaemia	Birth asphyxia Hypoxic ischaemic encephalopathy Birth trauma	» History of difficult delivery » Onset in first 3 days of life
Febrile convulsions	» Prior episodes of short convulsions when febrile » Associated with fever » Age 6 months to 5 years » CSF normal	Sepsis	» Fever or hypothermia » Shock » Seriously ill with no apparent cause
Metabolic (Hypoglycemia/ Hypocalcemia)	Confirm by blood sugar/serum calcium level (Always seek and treat the cause to prevent a recurrence).		
Head injury	» Signs or history of head trauma	Neonatal tetanus	» Onset (age 3–14 days) » Irritability » Difficulty in breastfeeding » Trismus » Muscle spasms » Convulsions

Differential diagnosis of the child presenting with lethargy, unconsciousness or convulsions		Differential diagnosis of the young infant (less than 2 months) presenting with lethargy, unconsciousness or convulsions	
Diagnosis or underlying cause	**In favor**	**Diagnosis or underlying cause**	**In favor**
Poisoning	» History of poison ingestion or drug overdose	Haemolytic disease of the newborn, kernicterus	» Onset of jaundice with 24 hours of life. » Lethargy » Jaundice » Pallor » Rh/ABO incompatibility
Acute glomerulonephritis with encephalopathy	» Raised blood pressure » Peripheral or facial oedema » Blood in urine » Decreased or no urine		
Diabetic ketoacidosis	» High blood sugar » History of polydipsia and polyuria » Acidotic (deep, labored) breathing		

Annexure 2: Case Recording Form

<table>
<tr><td colspan="2">Case Recording Form Date
Name---------- Age---------- Sex---------- Wt------- Temp ----------
ASK: What are the infant's problems?</td></tr>
<tr><td>ASSESS (Circle all signs present)</td><td>Emergency treatments
» Check for head/neck trauma before treating child – do not move neck if cervical spine injury possible
» EMERGENCY SIGNS: (If any sign positive: give treatment(s), call for help, draw blood for emergency laboratory investigations (glucose, malaria smear, Hb)</td></tr>
<tr><td>AIRWAY AND BREATHING
» Not breathing at all or gasping or
» Obstructed breathing or • Central cyanosis or
» Severe respiratory distress
(Unable to drink, Respiratory rate ≥ 70 / minute, Severe lower chest indrawing, Grunting, Head nodding, Apnoeic spells)</td><td></td></tr>
<tr><td>CIRCULATION
Cold hands with:
» Capillary refill longer than 3 seconds, and
» Weak and fast pulse
IF POSITIVE Check for severe malnutrition</td><td></td></tr>
<tr><td>COMA CONVULSING
» Coma (AVPU) or
» Convulsing (now)</td><td></td></tr>
<tr><td>SEVERE DEHYDRATION (ONLY IN CHILD WITH DIARRHEA)
Diarrhoea plus any two of these:
» Lethargy
» Sunken eyes
» Very slow skin pinch
» Check for severe malnutrition</td><td></td></tr>
<tr><td>PRIORITY SIGNS
» Tiny baby (<2 months)
» Temperature very high
» Trauma or other urgent surgical condition
» Pallor (severe)
» Poisoning
» Pain (severe)</td><td>» Respiratory distress
» Restless, Continuously irritable, or lethargy
» Referral (urgent)
» Malnutrition: Visible severe wasting
» Oedema of both feet
» Burns (major)</td></tr>
</table>

» History and Examination
» Differential diagnosis
» Laboratory Investigations
» Treatment

MODULE 2

CARE OF SICK YOUNG INFANT

INTRODUCTION

Neonatal mortality contributes to over 70 % of infant deaths in Bhutan and more than two thirds of these deaths occur during the first week of life. It is well known that the majority of neonatal deaths can be prevented with low technology and low cost interventions delivered across two continua of care: the first from pregnancy, birth, through neonatal period and young infanthood, and the second from home, through primary health facilities to hospitals. It has been estimated that optimal treatment of neonatal illness can avert up to half of all preventable neonatal deaths.

In addition to providing care to newborns at birth, a health facility also receives sick young infants with diverse clinical presentations. Some of them are serious and need emergency and lifesaving treatments.

This module discusses care of newborns at birth, during the first few days of life and sick young infants with common important conditions which are likely to be encountered in a health facility.

Learning Objectives

After completion of this module, the participant should be able to:

- Provide care at birth for all newborns
- Manage sick young infants in a health facility
- Understand principles of transporting sick young infants needing referral
- Use essential equipment for providing care to young infants

SECTION 4:
EARLY ESSENTIAL CARE AT BIRTH

This section gives guidelines for routine newborn care at birth. Immediate Routine newborn care is important as:

- A baby's survival is totally dependent on the health worker, caregivers and the mother.
- It is important to provide the essential care at birth to reduce the risk of complications.

4.1 Learning Objectives

After completion of this section the participant should be able to:

- Provide routine immediate newborn care for all newborns
- Identify and manage newborns who may need special care

4.2 Basic needs of all newborn at birth

The four basic needs of **ALL** newborns at the time of birth and for the first few weeks of life are:

1. **To be warm**
2. **To breathe normally**
3. **To be protected (prevent infection)**
4. **To be fed**

Prepare equipment and supplies for care at birth:

- 2 or more clean baby sheets/towels
- Sterile Gloves
- Sterile scissor
- Sterile ties/cord clamp
- Suction catheter
- Oxygen supply and SpO2 monitor
- Bag and mask of various sizes
- Laryngoscope of various sizes
- ET –tube of various sizes
- Stethoscope
- Wall clock
- Baby clothes and cap
- Emergency tray

4.3 Steps of routine newborn care at birth

1. Assess by checking whether - Term gestation? - Breathing or crying? - Good muscle tone? If yes to all of above, provide routine care as given in step 2 onwards If not breathing or crying, proceed for neonatal resuscitation Note the time of birth and sex of baby
2. Baby should be placed on the mother's chest/abdomen. If this is not possible, keep the baby next to the mother on a clean surface.
3. Immediately dry the baby with a warm clean towel or piece of cloth. Wipe the mouth and nose with a clean cloth. Do not wipe off the white greasy substance covering the baby's body (vernix). This helps to protect the baby's skin and gets reabsorbed very quickly.
4. Delayed cord clamping: Clamp and cut the umbilical cord with a sterile instrument after the pulsation stops (1- 3 minutes)
5. Examine the baby quickly for malformations/birth injury. - If there is a major malformation/severe birth injury refer the baby to a health facility with a newborn unit. - Ensure warmth during examination and transportation.
6. Leave the baby between the mother's breasts/ abdomen to start skin-to-skin care. Do not separate the mother and baby for ≥ 90 minutes unless respiratory distress or maternal emergency.
7. Cover the baby's head with a cloth. Cover the mother and baby with a warm cloth.
8. Place an identity label on twins (multiple) delivery
9. Give Injection Vitamin K 1mg IM and Hepatitis B vaccine
10. Give eye care within one hour
11. Encourage the initiation of breastfeeding within one hour
12. Take weight, length and head circumference (After 90 minutes)
13. Monitor baby every 15 minutes for the first 2 hours and then every 30 minutes for next 4 hours
14. Document records of newborn and routine immediate newborn care
15. Explain findings to mother and family (normal and abnormal)
16. Reexamine the baby before discharge (For danger signs, jaundice, malformations)

4.4 Respiration

To ensure adequate oxygenation in a newborn, establishing effective breathing immediately after birth is critical. Failure to do so can lead to hypoxia, which may result in rapid deterioration (hypoxic injury) or death if not addressed promptly.

Oxygen is essential to maintain perfusion to the brain and vital organs. Once the umbilical cord is clamped, the placenta no longer provides oxygen, and the infant must rely on spontaneous respiratory effort. Therefore, respiratory support through the lungs is crucial.

After birth, as the infant is dried, a thorough assessment of respiratory function should be performed. Normal neonatal breathing is characterized by equal bilateral air entry with a respiratory rate of 40-60 breaths per minute. Any deviations from these parameters may require immediate intervention.

Majority of babies do not have any problem in initiating breathing after birth. However, 5-10 % may require assistance to establish adequate breathing requiring resuscitation. Therefore, it is vital to recognize those babies who may need immediate help to support respiration.

4.5 Providing warmth

The temperature of the newborn falls within seconds of being born. If the temperature continues to fall the baby will become sick and may even die.

There are 4 ways by which a baby may lose heat. (Figure: 14)

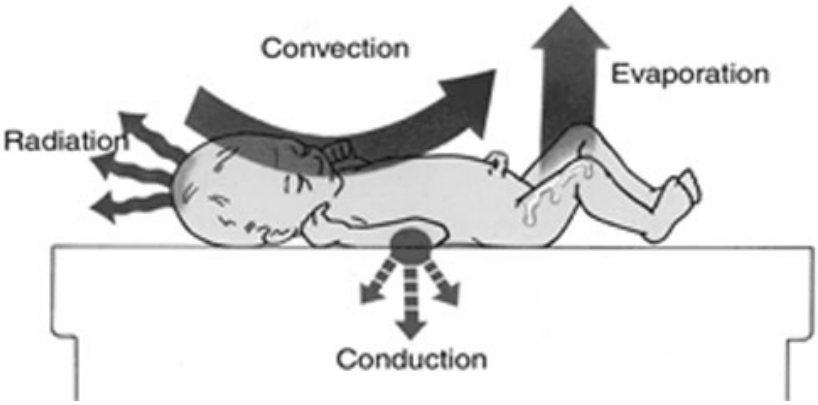


Figure 14: Four ways a newborn may lose heat to the environment

Method of heat loss	Prevention
Evaporation: Wet baby	Immediately after birth dry baby with a clean, warm, dry cloth
Conduction: Cold surface e.g. weighing scale etc.	Put the baby on the mother's abdomen or on a warm surface
Convection: Cold draught	Provide a warm, draught free room for delivery at ≥ 25oC
Radiation: Cold metallic surroundings	Keep the room warm

Keeping a newborn warm after delivery

Provide a warm (25 – 28 ºC), draught free room for delivery.
Immediately after birth dry baby with a clean, warm, dry cloth.
Put the baby on the mother's abdomen/ between the mother's breasts
Cover the baby's head with a cloth/ cap
Cover the mother and baby with a warm and dry cloth
Initiate breastfeeding when the baby show feeding cues and at least within one hour.

If mother and baby's separation is necessary, do the following.

Wrap the baby in a clean dry warm cloth and place under a radiant warmer. If warmer is not available ensure warmth by wrapping the baby in a clean dry warm cloth and cover with a blanket. Ensure baby's head, hands and feet are covered.
Delay the first bath till the baby is beyond 24 hours of birth.
Skin-to-skin contact can re-start as soon as mother and baby do not need any medical care

4.6 To prevent infection:

4.6.1 Immediate Cord Care:

» Remove the outer pair of gloves
» Apply cord clamp at 2- 3 cm from the base of umbilicus after the pulsation stops (1- 3 minutes) on the baby's side and clamp the cord on mother's side with an artery forceps and cut the cord with a sterile scissor
» Observe for oozing of blood. If blood oozes, place a tie between the skin and umbilical clamp.
» Do not apply any substance to the stump.
» Leave the stump uncovered and dry.
» The umbilical cord is an important portal of entry for pathogenic organisms.
» Umbilical stump must be inspected after 2 to 4 hours of clamping. Bleeding may occur at this time due to shrinkage of cord and loosening of the ligature.

4.6.2 Care of the eyes

» The eyes should be cleaned with sterile normal saline soaked swabs, using one swab for each eye. Clean from medial to lateral side.
» Apply 1% tetracycline eye ointment to both the eyes at birth.

4.6.3 Examine the baby quickly for malformations/birth injury

Quick but thorough clinical screening is essential to identify birth injuries and any life-threatening congenital anomalies at birth and also before discharge. The infant should be examined for location and patency of all the orifices e.g. imperforate anus.

4.7 Initiate breastfeeding within 1 hour

» Tell the mother to breast feed the baby within the first hour.

» Check for correct positioning and attachment at the first feed. Offer to help the mother at any time.

» The baby's first feed of colostrum is very important because it helps to protect against infections.

» The baby can feed from the mother whether she is lying down or sitting; both the baby and mother must be comfortable

» Do not give artificial teats or prelacteal feeds to the newborn e.g. sugar water, honey, butter and even water.

» There is no need to routinely separate babies born by caesarean section or instrumental delivery from mother.

Measure the weight, length and head circumference of all babies before transfer from the delivery room (after 90 minutes of birth)

4.8 Neonatal resuscitation

Approximately 85% of babies born at term will initiate spontaneous respiration within 10-30 seconds of birth, an additional 10% will respond during drying and stimulation, approximately 3% will initiate respiration after positive pressure ventilation (PPV), 2% will be intubated to support respiratory function and 0.1% will require chest compression and/or epinephrine to survive.

The preferred sequence of neonatal resuscitation is A-B-C (Airway-Breathing-Circulation). Ensure that the 'Airway' is open and clear. Be sure that there is 'Breathing', whether spontaneous or assisted. Ensure that there is adequate 'Circulation' of oxygenated blood. Newly born babies are wet following birth and heat loss is great. Therefore, it is also important to maintain body temperature during resuscitation.

How do you prepare the resuscitation device for an anticipated resuscitation?
Assemble equipment:
The positive-pressure ventilation device should be assembled and connected to oxygen so that it can provide the necessary 90% to 100% concentration. If the bag is attached to an oxygen source, it fills with gas at the supplied FIO2. If the bag is not attached to an oxygen source, it fills by drawing room air (21% oxygen) into the bag.

Test the equipment:
Once the equipment has been selected and assembled, check the bag and mask to be sure they function properly. Bags that have cracks or tears, valves that stick or leak, or mask that are cracked or deflated must not be used. The equipment should be checked before each delivery. The operator should check it again just before its use.

4.8.1 How do you determine whether the baby requires resuscitation?

Was the baby born at term?

Term gestation? Good muscle tone? Breathing or crying?

Antepartum and intrapartum risk assessment need to be carried out to anticipate neonatal resuscitation.

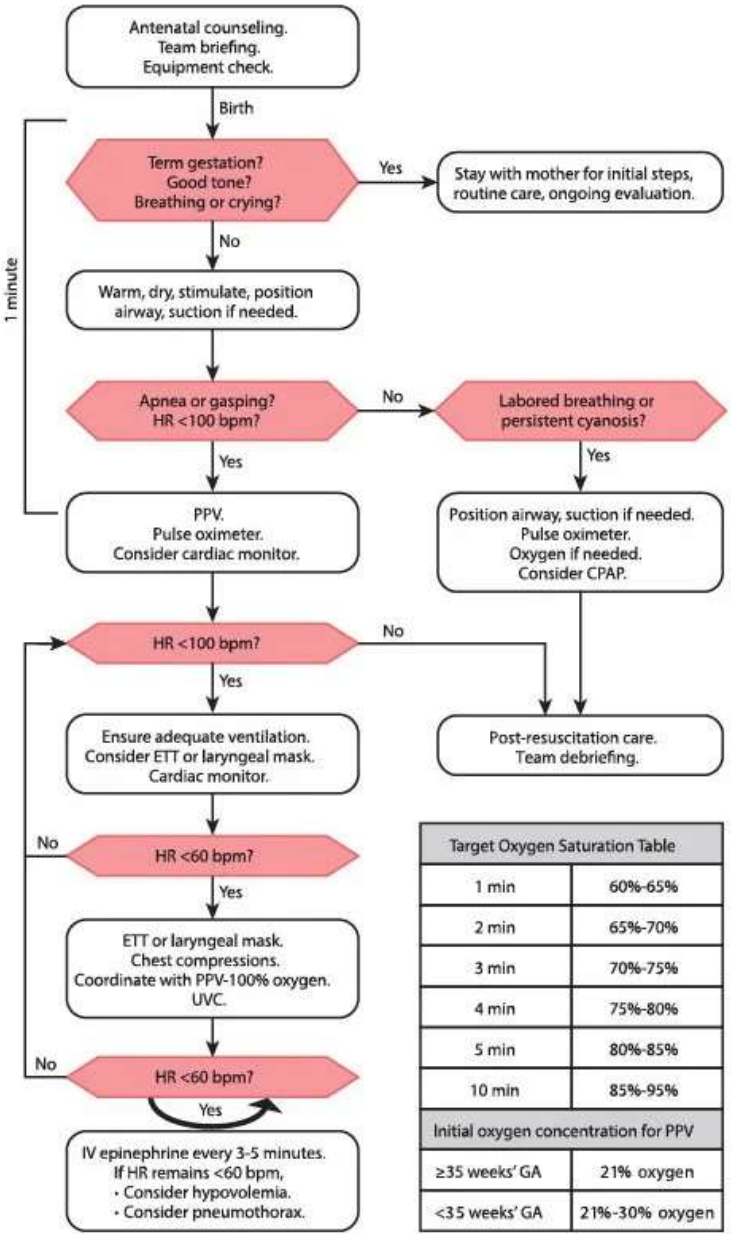
Is there good muscle tone?

Healthy term babies should be active and have the flexed extremities in position

Is the baby breathing or crying?

A vigorous cry indicates breathing. Gasping is a series of deep single or stacked inspirations that occur in the presence of hypoxia and/or ischemia. It is indicative of severe neurologic and respiratory depression and requires the same intervention as apnea.

Chart 10: Neonatal Resuscitation



4.8.2 What are the initial steps and how are they administered?

Once you decide that resuscitation is required, all of the initial steps should be initiated within a few seconds (30 seconds). Although they are listed as “initial” and are given in a particular order, they should continue to be applied throughout the resuscitation process.

Initial Steps of Newborn Care
» Provide warmth.
» Dry.
» Stimulate.
» Position the head and neck.
» Clear secretions if needed.

4.8.2.1 How do you provide the initial steps for vigorous, term newborns?

If all three rapid assessment questions are answered "Yes," the infant may remain with the mother, and the initial immediate neonatal care can be administered on the mother’s chest or abdomen:

- Provide warmth through skin-to-skin contact and cover the baby with a warm towel or blanket.
- Dry and gently stimulate the baby as needed.
- Position the baby on the mother’s chest or abdomen to keep the airway open.
- Clear the airway with a cloth if needed; use gentle suction only if the baby has difficulty clearing secretions.
- Monitor the baby’s breathing, tone, activity, color, and temperature for any additional interventions.

4.8.2.2 How do you provide the initial steps for non-vigorous and preterm newborns?

If the answer to any of the initial evaluation questions is "No" bring the baby to a radiant warmer because additional interventions may be required.

Provide warmth

The baby should be placed under a radiant warmer and ensure easy access for assessment and care.

Drying

Wet skin increases heat loss. Place the baby on a warm towel and gently dry them. If the towel gets wet, replace it with a fresh, warm one.

Drying is unnecessary for preterm babies under 32 weeks. They should be covered with polyethylene plastic to reduce heat loss.

Stimulation

Drying the baby often stimulates breathing. If not, brief additional tactile stimulation may help.

- » Gently rub the newborn's back, trunk, or extremities
- » Overly vigorous stimulation is not helpful and can cause injury.
- » Never shake a baby.

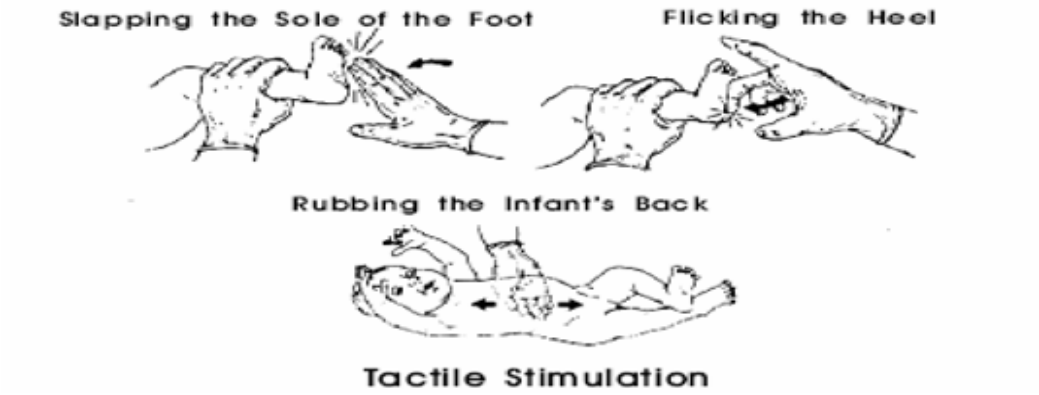


Figure 15: Tactile stimulation

Ensure open airway

The baby should be positioned on the back, with the neck slightly extended. To help maintain the correct position, you may place a rolled blanket or towel under the shoulders. This will bring the posterior pharynx, larynx, and trachea in line, which will facilitate unrestricted air entry. Care should be taken to prevent hyperextension or flexion of the neck, since either may restrict air entry (Figure: 16)

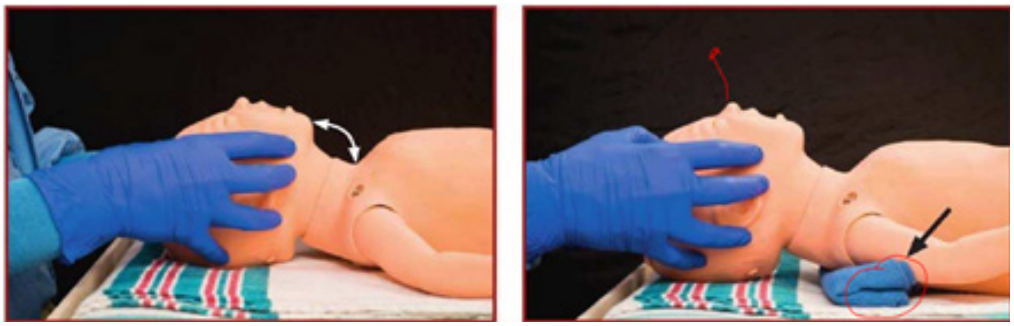


Figure 16: Correct sniffing position and optional shoulder rolls for maintaining the sniffing position

Clear airway secretion if needed

Secretions may be removed from the airway by wiping the nose and mouth with a towel or by suctioning with a bulb syringe or suction catheter. If the newborn has copious secretions coming from the mouth, turn the head to the side. This will allow secretions to collect in the cheek where they can be removed easily.

When using suction from the wall or from a pump, the suction pressure should be set so that when the suction tubing is blocked, the negative pressure (vacuum) reads approximately 100 mm Hg.

The **mouth is suctioned before the nose** to ensure that there is nothing for the newborn to aspirate if he or she should gasp when the nose is suctioned. If material in the mouth and nose is not removed before the newborn breathes, the material can be aspirated into the trachea and lungs. When this occurs, the respiratory consequences can be serious.

Avoid doing vigorous and deep suction which can lead to bradycardia. If bradycardia occurs during suctioning, stop suctioning and reevaluate the heart rate.

Often drying, stimulation and positioning the baby will initiate breathing.

4.8.3 What do you do after the initial steps?

The assessment after the initial steps should not take more than an additional 30 seconds.

The assessment should be in the following order:

Respiration

Is the baby apneic or gasping? If the baby is apneic or gasping, start PPV.

If the baby is breathing well with good chest movements, and the rate and depth of respirations increase after a few seconds of tactile stimulation then assess the heart rate.

Heart rate

The easiest and quickest method to determine the heart rate is to feel for the pulse at the base of the umbilical cord. Count the heart rate for 6 seconds and multiply by 10 to calculate the heart rate per minute. The heart rate should be more than 100 bpm. If the heart rate is less than 100 bpm, start PPV even if the baby is breathing.

Color

The baby should have pink lips and trunk. There should be no central cyanosis if the baby has good respiration and heart rate.

What do you do if the baby is breathing and heart rate at least 100 bpm, but has persistently central cyanosis?

A baby's skin color, changing from blue to pink, can provide the most rapid and visible indicator of adequate breathing and circulation. The baby's skin color is best determined by looking at the central part of the body. Cyanosis caused by inadequate oxygen in the blood will appear as a blue hue to the lips, tongue and central trunk. Acrocyanosis which is a blue hue to only the hands and feet does not generally indicate that the baby's blood oxygen level is low and should not, by itself, be treated with oxygen. Persistent central cyanosis or labored breathing requires supplemental oxygen. Give free-flow oxygen at the rate of 10 L/min with a tubing by cupped hand or a mask kept closer to the face. (Figure 17)

Figure 17: Delivering Oxygen

Visual assessment of cyanosis is unreliable for judging oxygen saturation and shouldn't guide oxygen therapy. Use a pulse oximeter on the right hand or wrist for accurate oxygen levels (as guided in NRP algorithm)

Free-flow oxygen cannot be given reliably by a mask attached to a self-inflating bag.

How do you know when to stop giving oxygen?

When the newborn no longer has central cyanosis, gradually withdraw the supplemental oxygen until the newborn can remain pink while breathing room air, or wean the oxygen as indicated by pulse oximetry.

If cyanosis persists despite administration of free-flow oxygen, the baby may have significant lung disease, and a trial of positive-pressure ventilation may be indicated.

4.8.4 Positive Pressure Ventilation

Indications of Positive Pressure Ventilation

- Baby is not breathing or is gasping,
- Heart rate is less than 100 bpm,
- Persistent central cyanosis (oxygen saturation cannot be maintained within the target range despite free-flow supplemental oxygen).

Ventilation of the lungs is the single most important and most effective step in cardiopulmonary resuscitation of the compromised newly born baby.

Use of Self Inflating bag to ventilate newborns

The self-inflating bag, as its name implies, inflates automatically without a compressed gas source (Figure:18). It remains inflated at all times, unless being squeezed. Peak inspiratory pressure or peak inflation pressure (PIP) is controlled by how hard the bag is squeezed.

The important characteristics of a self inflating bag to ventilate newborns are:

- **Appropriately sized bag:** You should use bags for newborns which have a volume of 200 to 750mL. Term newborns require only 15 to 25mL with each ventilation (5 to 8mL/Kg). Bags larger than 750mL, which are designed for older children and adults, make it difficult to provide such small volumes. Bags that are too small will not permit long inflation time.
- **Safety features:** To minimize complications resulting from high ventilation pressures, the self inflating bag has certain safety features to prevent or guard against inadvertent use of high pressures. They have a pressure-release valve (commonly called pop-off valve) (Figure 18), which is generally set by the manufacturer at 30 to 40 cm H2O. If peak inspiratory pressure greater than 30 to 40 cm H2O is generated, the valve opens, limiting the pressure being transmitted to the newborn.

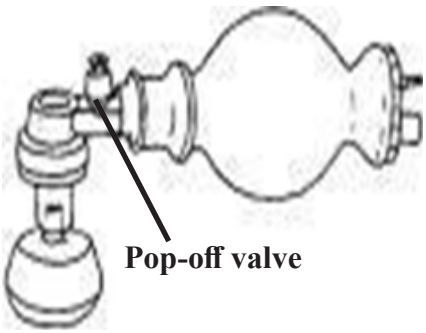


Figure 18: Pop-off valve of the self inflating Bag and mask.

Advantages and disadvantages of Self Inflating Bag

The self-inflating bag is more commonly found in the hospital delivery room and resuscitation cart. It is easier to learn to use, as it will refill after being squeezed, even if it is not attached to oxygen and even if its mask is not on a patient's face. The disadvantage is that you will be less likely to know if the oxygen line has become disconnected or if you have not achieved a good seal between the mask and the baby's face, both of which are necessary for effective resuscitation.

The important characteristics of face masks to effectively ventilate newborns:
A variety of mask sizes, appropriate for babies of different sizes, should be available at every delivery, since it may be difficult to determine the appropriate size before birth.

Masks come in two shapes: round and anatomically shaped. Anatomically shaped masks are shaped to fit the contours of the face. They are made to be placed on the face with the most pointed part of the mask fitting over the nose.

For the mask to be of the correct size, the rim will cover the tip of the chin, the mouth, and the nose but not the eyes. (Figure: 19)

- Too large-may cause possible eye damage and will not seal well
- Too small-will not cover the mouth and nose and may occlude the nose.

Be sure to have various-sized masks available. Effective ventilation of a preterm baby with a term-infant size mask is impossible.

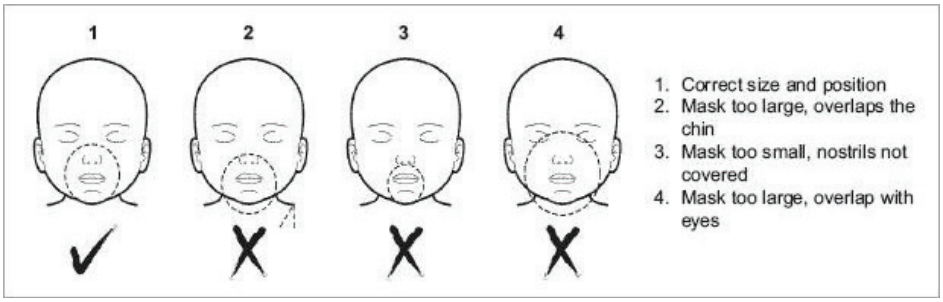


Figure 19: Face Mask

What do you need to check before giving positive-pressure ventilation?
Select the appropriate-sized mask: Remember, the mask should cover the mouth, nose, and tip of the chin, but not the eyes

Be sure there is a clear airway: You may want to suction the mouth and nose one more time to be certain there will be no obstruction to the assisted breaths that you will be delivering.

Position the baby's head: As described earlier, the baby's neck should be slightly extended (but not overextended) to maintain an open airway. One way to accomplish this is to place a small roll under the shoulders (Figure 16). If the baby's position has shifted, reposition the baby before continuing.

Position yourself at the bedside: You will need to position yourself at the baby's side or head to use a resuscitation device effectively. Both positions leave the chest and abdomen unobstructed for visual monitoring of the baby, for chest compressions, and for vascular access via umbilical cord should these procedures become necessary.

How do you position the bag and mask on the face?
Place the mask on the face so that it covers the nose and mouth, and the tip of the chin rests within the rim of the mask. You may find it helpful to begin by cupping the chin in the mask and then covering the nose (Figure 20)

The mask usually is held on the face with the thumb, index, and/or middle finger encircling much of the rim of the mask, while the ring and fifth bring the chin forward to maintain a patent airway.

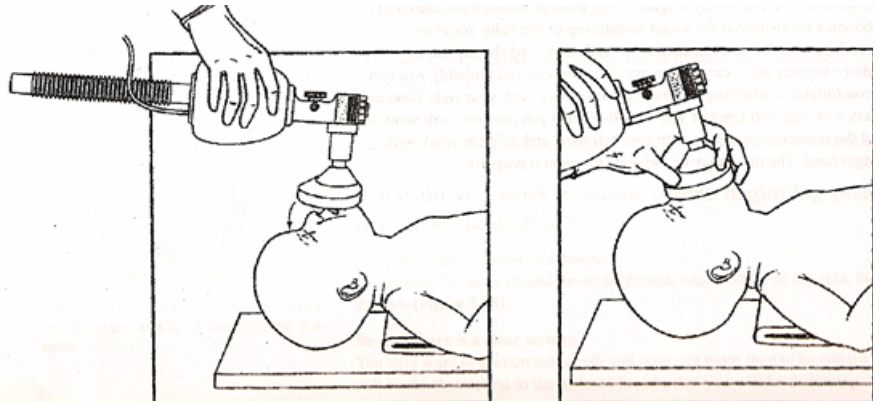


Figure 20: Positioning of the mask and bag

Why is establishing a seal between the mask and the face important?
An airtight seal between the rim of the mask and the face is essential to achieve the positive pressure required to inflate the lungs with the resuscitation devices.

How do you know how much inflation pressure to deliver?
The best indicator that the mask is sealed and the lungs are being adequately inflated are rapid improvement in heart rate, color, and muscle tone.

If these signs are not improving, you should look for the presence of chest movements with each positive-pressure breath and have an assistant listen to both sides of the lateral areas of the chest with a stethoscope to assess breath sounds.

What concentration of oxygen should be used to start positive-pressure ventilation?
Studies show that starting resuscitation with 21% oxygen for term and late preterm newborns, and 21%-30% oxygen for preterm newborns is as effective as using 100% oxygen. This helps avoid potential risks from using too much or too little oxygen.

- For newborns ≥35 weeks' gestation and term baby, set the blender to 21% oxygen.
- For those <35 weeks, use 21%-30% oxygen.
- Set the flowmeter to 10 L/min.

How often should you squeeze (ventilation rate) the bag?
During the initial stages of neonatal resuscitation, breaths should be delivered at a rate of **40 to 60 breaths per minute** to help maintain a rate of 40 to 60 breaths per minute.
Try saying to yourself as you ventilate the newborn:

Breathe……Two……Three; Breathe……..Two……Three……
(squeeze) (release……) (squeeze) (release……)

How much pressure should be used to start positive pressure ventilation?
Start with a PIP of 20-25 cm H_2O. Inflate the lungs until you see gentle chest rise and fall. Avoid overinflation to prevent pneumothorax. For preterm babies, chest movement may be less reliable, and successful ventilation can occur without visible chest rise.

How do you know if the baby is improving and that you can stop positive pressure ventilation?
Improvement is indicated by the following 3 signs:

- Increasing heart rate
- Improving color
- Spontaneous breathing

Within 15 seconds of starting PPV, the baby's heart rate should be increasing. If the **heart rate is rising** after 15 seconds, continue PPV and reassess after 30 seconds.

Within 30 seconds, it should exceed 100 bpm.

If the **heart rate isn't increasing** after 15 seconds,

- check if the chest is moving. If it is, continue PPV and review your technique. Reassess after 30 seconds.
- If the chest isn't moving, you may not be ventilating effectively. Follow the corrective steps as given in the table below to achieve chest movement with PPV.

	Corrective step	Action
M	Mask adjustment.	Reapply the mask and lift the jaw forward. Consider the 2-hand hold.
R	Reposition the head and neck.	Place head neutral or slightly extended.
Give 5 breaths and assess chest movement. If no chest movement ,do the next steps.		
S	Suction the mouth and nose.	Use a bulb syringe or suction catheter.
O	Open the mouth	Use a finger to gently open the mouth.
Give 5 breaths and assess chest movement. If no chest movement ,do the next steps		
P	Pressure increase.	Increase in 5-10 cm H2O increments to maximum recommended pressure. » Max 40 cm H2O term » Max 30 cm H2O preterm
Give 5 breaths and assess chest movement. If no chest movement ,do the next steps		
A	Alternative airway.	Insert a laryngeal mask or endotracheal tube.
Try PPV and assess chest movement and breath sounds.		

(Courtesy: NRP 8th edition)

- You will perform the corrective steps sequentially until you achieve chest movement with assisted breaths.

What do you do after 30 seconds of effective positive-pressure ventilation?

- The heart rate is greater than or equal to 100 bpm: Wean PPV and continue routine care
- The heart rate is at least 60 bpm but less than 100 bpm: Continue PPV till the heart rate is at least 100 bpm or more
- The heart rate is less than 60 bpm: Perform chest compression

4.8.5 Chest Compression

What are the indications for beginning chest compressions?

Chest compressions should be started whenever the heart rate remains less than 60 bpm despite effective positive-pressure ventilation for at least 30 seconds.

Why should you perform chest compressions?

Babies who have a heart rate below 60 bpm, despite stimulation and effective positive-pressure ventilation, probably have very low blood oxygen levels and significant acidosis. As a result, the myocardium is depressed and unable to contract enough to pump blood to the lungs to pick up the oxygen. Therefore, you will need to mechanically pump the heart while you simultaneously continue to ventilate the lungs until the myocardium becomes sufficiently oxygenated to recover adequate spontaneous function. This process also will help to restore oxygen delivery to the brain.

What are chest compressions?

Chest compressions, sometimes referred to as external cardiac massage, consist of rhythmic compressions of the sternum that:

- compress the heart against the spine.
- increase the intrathoracic pressure.
- circulate blood to the vital organs of the body

The heart lies in the chest between the lower third of the sternum and the spine. Compressing the sternum compresses the heart and increases the pressure in the chest, causing blood to be pumped into the arteries (Figure 21). When pressure on the sternum is released, blood enters the heart from the veins.

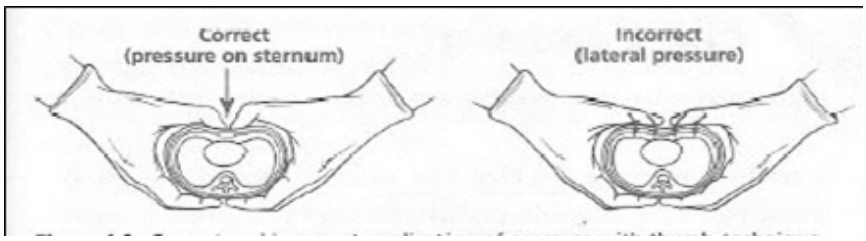


Figure 21: Correct method of applying the pressure with thumb technique of chest compressions.

How many people are needed to administer chest compressions, and where should they stand?

Remember that chest compressions are of little value unless the lungs are also being ventilated with oxygen. Therefore, two people are required to administer effective chest compressions: one to compress the chest and one to continue ventilation.

When chest compressions are started, you may be standing at the side of the warmer. One of your team members, standing at the head of the bed, will be providing coordinated ventilations through PPV or through an endotracheal tube if intubated.

The person performing chest compressions must have access to the chest and be able to position his or her hands correctly. The person assisting ventilation will need to be positioned at the baby's head to achieve an effective mask-face seal (or to stabilize the endotracheal tube) and watch for effective chest movement.

How do you position your hands on the chest to begin chest compressions?
There are two techniques for performing chest compression. These techniques are:

- **Thumb technique:** where the 2 thumbs are used to depress the sternum, while the hands encircle the torso and the fingers support the spine (Figure 22).
- **2-finger technique:** where the tips of the middle finger and either the index finger or ring finger of one hand are used to compress the sternum, while the other hand is used to support the baby's back (unless the baby is on a very firm surface) (Figure 22).

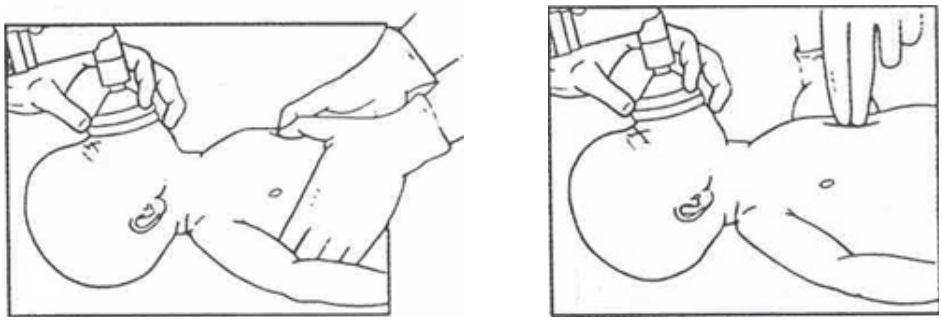


Figure 22: A Thumb Technique and Two Finger Technique

What are the advantages of one technique over the other?
The thumb technique is preferred because it usually is less tiring, and you can generally control the depth of compression better. This technique is superior in generating peak systolic and coronary perfusion pressure.

However, the 2-finger technique is more convenient if the baby is large or your hands are small. The 2-finger technique also is preferable to provide access to the umbilicus when medications need to be given by the umbilical route. Therefore, you should learn both techniques.

The two techniques have the following things in common:

- Position of the baby
- Firm support for the back
- Neck slightly extended.
- Compressions
- Same location, depth, and rate

Where on the chest should you position your thumbs or fingers?

Hands should be positioned on the lower third of the sternum, which lies between the xiphoid and a line drawn between the nipples (Figure 23). You can quickly locate the correct area on the sternum by running your fingers along the lower edge of the ribs until you locate the xiphoid. Then place your thumbs or fingers immediately above the xiphoid. Care must be used to avoid putting pressure directly on the xiphoid.

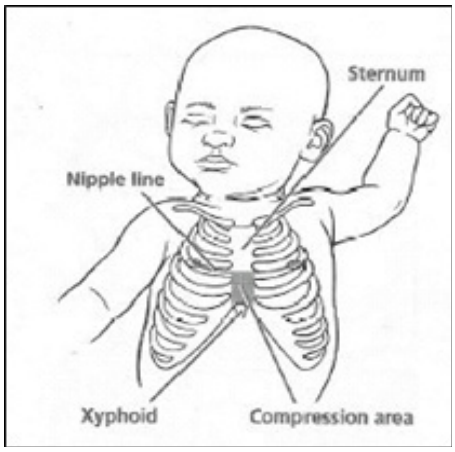


Figure 23: Landmark for chest compression.

How do you position your hands using the thumb technique?

The thumb technique is accomplished by encircling the torso with both hands and placing the thumbs on the sternum and the fingers under the baby's back supporting the spine. The thumbs will be used to compress the sternum, while your fingers provide the support needed for the back. The thumbs should be flexed at the first joint and pressure applied vertically to compress the heart between the sternum and the spine (Figure 21).

How do you position your hands using the 2-finger technique?

In the 2-finger technique, the tips of the middle finger and either the index or ring finger of one hand are used for compressions. Position the 2-fingers perpendicular to the chest as shown, and press with the fingertips (Figure 22).

How much pressure do you use to compress the chest?

Controlling the pressure used in compressing the sternum is an important part of the procedure.
With the fingers and hands correctly positioned use enough pressure to depress the sternum to a depth of approximately one third of the anterior posterior diameter of the chest. (Figure 23), and then release the pressure to allow the heart to refill. One compression consists of the downward stroke plus the release.

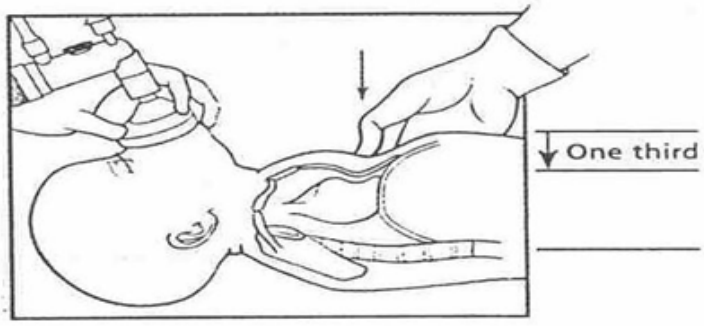


Figure 23: Applying Vertical Pressure

The thumbs or the tips of fingers should remain in contact with the chest at all times during both compression and release. Allow the chest to fully expand by lifting the thumbs or fingers during the release phase to permit blood to reenter the heart from the veins. However, do not lift the thumb or fingers completely off the sternum after compression. If the thumbs or fingers are completely off the sternum after compression, then:

» time is wasted in relocating the compression area.

» control over the depth of compression is lost.

» compression of the wrong area may result in trauma to the chest or underlying organs.

Complications associated with chest compressions:
Chest compressions can cause trauma to the baby.
Pressure applied too low, over the xiphoid, can cause laceration of the liver.
The ribs are fragile and can easily be broken and may cause injury to lungs.

How often do you compress the chest and coordinate compressions with ventilation?
During cardiopulmonary resuscitation, chest compressions must always be accompanied by positive-pressure ventilation. Avoid giving a compression and ventilation simultaneously, because one will decrease the efficacy of the other. Therefore, the 2 activities must be coordinated, with one ventilation interposed after every third compression, for a total of 30 breaths and 90 compressions per minute which is approximately 20 "events" per 60 seconds (1 minute).

One cycle of events will consist of 3 compressions plus one ventilation every 2 seconds.

Coordinated Compressions and Ventilations
3 compressions + 1 ventilation every 2 seconds

How can you practice the rhythm of chest compressions with ventilation?
Practice saying the words and compressing the chest.

One-and-Two-and-Three-and-Breathe-and-One-and-Two-and-Three-and-Breathe-and..…

Now time yourself to see if you can say and do these five events in 10 seconds. Remember, squeeze your hand only when you say "Breathe and"

One-and-Two-and-Three-and-Breathe-and-One-and-Two-and-Three-and-Breathe-and……

What oxygen concentration should be used with positive-pressure ventilation during chest compressions?

» When chest compressions are started, increase the FiO2 to 100%.

» Once the heart rate is greater than 60 bpm and a reliable pulse oximeter signal is achieved, adjust the FiO2 to meet the target oxygen saturation.

When should you check the baby's heart rate after starting compressions?
After 60 seconds of coordinated chest compressions and ventilation, pause the compressions briefly to reassess the heart rate.

When do you stop chest compressions?

If the heart rate is now above 60 bpm, discontinue chest compressions, but continue positive-pressure ventilation at a rate of 40 to 60 breaths per minute.

If the heart rate rises above 100 bpm and the baby is breathing spontaneously, wean PPV and move the baby to the nursery for post-resuscitation care.

4.8.6 Endotracheal Tube Intubation (ETT)

ETT is indicated if the baby's heart rate stays below 100 bpm and does not improve following PPV and corrective measures.

Benefits:

- To improve efficiency of ventilation after several minutes of effective positive pressure ventilation
- To facilitate coordination of chest compression and ventilation and maximize the efficiency of each ventilation
- To administer epinephrine if required to stimulate the heart

Procedure:

- Collect all the necessary equipment
- The laryngoscope is always held in the operator's left hand
- The correct–sized laryngoscope blade for a term newborn is No.1 and No. 0 for a preterm baby
- The intubation procedures should be completed within 20 seconds.
- Stabilize the newborn's head in the "sniffing" position.
- Deliver free-flow oxygen during the procedure
- Lift the blade slightly. Raise the entire blade, not just the tip.
- Look for the landmarks. Vocal cords should appear as vertical stripes on each side of the glottis or as an inverted letter "V".
- Suction if necessary for visualization
- Insert the tubes into the right side of the mouth
- If the cords are closed, wait for them to open. Insert the tip of the endotracheal tube until the vocal guide is at the level of the cords
- Hold the tube firmly against the baby's palate while removing the laryngoscope. Hold the tube in place while removing the stylet if one is used
- Estimate the proper depth of insertion by measuring from the middle of the nasal septum (arrow A) to the ear tragus (arrow B) and adding 1 cm to this measurement (Figure 24)

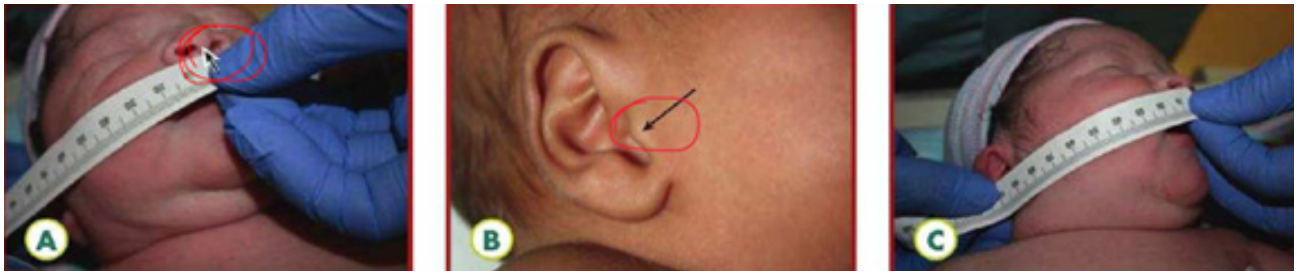


Figure 24. Measuring the naso tragus length

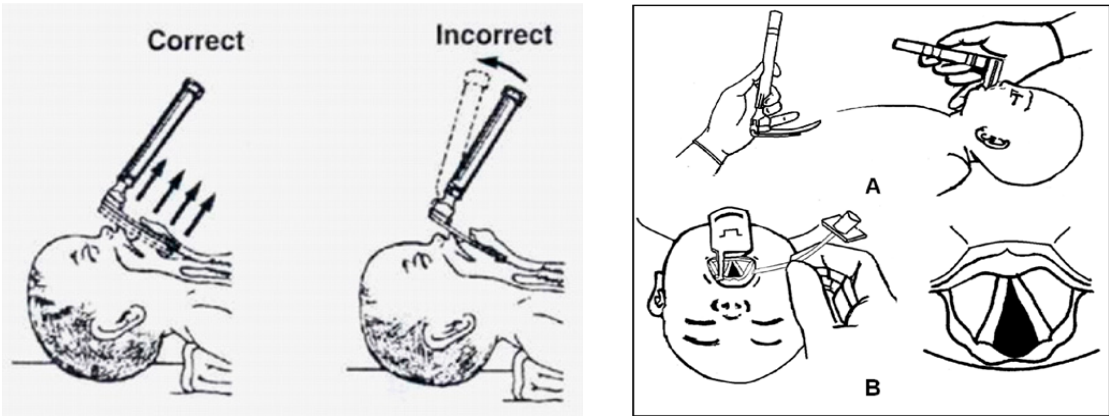
Correct placement of the endotracheal tube in the mid-trachea is indicated by:

- » symmetrical rise in the chest with each breath
- » breath sounds over the both lung fields but decreased or absent over the stomach
- » no gastric distension with ventilation
- » vapor in the tube during exhalation

Endotracheal tube (ETT) Sizes:

Weight	Gestational Age	Endotracheal Tube Size
Below 1KG	Below 28 weeks	2.5 mm ID
1-2 KG	28-34 weeks	3.0 mm ID
Greater than 2KG	Greater than 34 weeks	3.5 mm ID

(ID: Internal Diameter)



Holding and lifting the laryngoscope blade
Identification of landmarks, and endotracheal tube insertion

Figure 25: Process of endotracheal intubation

4.8.7 Drugs

Indication for use of Adrenaline

Despite good ventilation of the lungs with positive-pressure ventilation and improved cardiac output from chest compressions, a small number of newborns (fewer than 2 per 1,000 births) will still have a heart rate below 60 bpm. The heart muscle of these babies may have been deprived of oxygen for so long that it will not contract effectively despite now being perfused with oxygenated blood. These babies may benefit from receiving adrenaline to stimulate the heart. If there has been acute blood loss, they may benefit from volume replacement.

What is adrenaline and when should you give it?

Adrenaline hydrochloride (sometimes referred to as adrenaline chloride) is a cardiac stimulant. Adrenaline increases the strength and rate of cardiac contractions and causes peripheral vasoconstriction, which may increase blood flow through the coronary arteries and to the brain.

Adrenaline is indicated when the heart rate remains below 60 bpm after you have given 30 seconds of effective PPV and another 30 seconds of coordinated chest compressions and PPV.

How should you prepare adrenaline, and how much should you give?
Adrenaline is available as 1:1,000 (1 mg/ml). To make 1:10,000(1 mg/10 ml) dilute 1 ml of adrenaline with 9 ml of normal-saline.

Adrenaline should be given intravenously at 0.1 - 0.3 ml/kg of 1:10,000.Flush with 3-ml normal saline.

If IV access is delayed, consider giving it at 0.3 to 1mL/kg endotracheally.

What should you expect to happen after giving adrenaline?
Check the baby's heart rate 30 seconds after administering adrenaline. As you continue positive-pressure ventilation and chest compressions, the heart rate should increase to more than 60 bpm within 30 seconds after you give adrenaline.

If this does not happen, you can repeat the dose after 3 to 5 minutes. In addition, ensure that there is good air exchange as evidenced by adequate chest movement and presence of bilateral breath sounds.

What should you do if the baby is in shock, there is evidence of blood loss, and the baby is responding poorly to resuscitation?
If there has been a placental abruption or placenta previa, or blood loss from the umbilical cord, the baby may be in hypovolemic shock. In some cases, the baby may have lost blood into the maternal circulation and there will be signs of shock with no obvious evidence of blood loss.

Babies in shock appear pale, have delayed capillary refill and have weak pulses. They may have a persistently low heart rate, and circulatory status often does not improve in response to effective ventilation, chest compressions, and adrenaline.

If the baby is in shock and is not responding to resuscitation, administration of a volume expander may be indicated.

What can you give to expand blood volume? How much should you give? How can you give it?
The recommended solution for treating hypovolemia is an isotonic crystalloid solution. Acceptable solutions include

- 0.9% NaCl (Normal saline)
- Ringer's lactate.

The initial fluid is 10 ml/kg. However, if the baby shows minimal improvement after the first dose, you may need to give another dose of 10 ml/kg. In unusual cases of large blood loss additional doses might be considered.

A volume expander must be given into the vascular system. The umbilical vein is usually the most accessible vein in a newborn, although other routes (e.g., intraosseous) can be used. Sodium bicarbonate is better avoided in the labor room and is indicated when ventilation is established effectively.

When to terminate resuscitation?
An Apgar score of 0 at 20 minutes is a strong predictor of mortality and morbidity in late-preterm and term infants. The prognosis of babies with an Apgar score of 0 at 10 minutes must be discussed with the parents. Discontinue resuscitation if Apgar score is 0 at 20 minutes.

4.8.8 Neonatal Transfer

This depends on the capacity of the hospital. Conditions that require transfer to a center that provides neonatal intensive care include:

1. Birth weight < 1500 g
2. Gestational age < 32 weeks.
3. Respiratory distress (RR > 60 per minute or grunting/retractions) requiring ventilator support
4. Coma, convulsions or encephalopathy
5. Major Congenital anomalies
6. Severe Perinatal asphyxia
7. Abdominal distension/vomiting/bleeding per rectal
8. Severe neonatal jaundice ((Appears<24 hours/stains palms & soles/lasts>2 weeks)
9. Other conditions requiring neonatology consultation and consideration of transfer are:
   i. Infant of diabetic mother
   ii. Intrauterine growth retardation
   iii. Birth weight between 1500 and 2000 grams
   iv. Gestational age between 32-36 weeks
   v. Procedures unavailable at referring hospital
   vi. Large baby (4 kg or more)
   vii. Hypothermia less than 36.5ºC, or hyperthermia (≥38.5ºC) [If not improved with initial management]
   viii. Shock (cold periphery with CRT>3 seconds and weak & fast pulse) (if not improved with initial management)

SECTION 5:
CARE OF NEWBORN IN POSTNATAL WARD

A large majority of newborns after birth would be transferred to the postnatal wards for rooming-in with their mothers. These babies need to be monitored because they are at continued risk of hypothermia and feeding difficulties during the first few days of life. These babies can also become sick and develop danger signs. The mother-infant pair would need counseling and appropriate treatment when required.

5.1 Learning Objectives

After completion of this section the participant should be able to:

» examine all newborns to detect any signs of illness

» identify and manage newborns who need special care

5.2 The postnatal environment

A postnatal room should be kept warm with no draughts from open doors or windows. A temperature of 25-280C is required to help keep a baby warm. Ensure that a room thermometer is available to monitor the room temperature. A mother and her baby should be kept together in the same bed right from birth. This helps the mother to get to know her baby and form an early close loving relationship (bonding). She can also respond quickly when her baby wants to feed, which helps to establish breastfeeding and reduces breastfeeding difficulties.

5.3 Assessment of newborn

It is important to greet the mother appropriately before starting the examination of the baby. An important reason for this is to open good communication with the mother. Using good communication helps to reassure the mother that her baby will receive good care.

Review the labor and birth record to identify any risk factors or any events during the birth which may be important in the management of the mother and the baby. Ask the mother whether she or the baby has any problems and record what she says.

History Taking:

» Ask the mother if she has started breastfeeding the baby? Is there any difficulty in feeding the baby?

» Ask about the passage of meconium and urine.

- Meconium should be passed within 24 hours. Delay beyond 24 hours is unusual and the following underlying pathology should be considered (Hirschsprung's disease, Meconium ileus, Meconium plug, Intestinal dysmotility (especially in IUGR), Imperforate anus)
- Urine is normally passed within 48 hours. If the urine has not been passed within 48 hours, check if there are any feeding difficulties, check for hydration status and weight (for excessive weight loss)

» Does the baby have any other problems?

Examination

- General appearance
- Cry, activity, tone and colour (cyanosis, pallor, jaundice)
- Feel for fever and measure axillary temperature
- Feel for anterior fontanelle
- Count the breaths in one minute and look for chest indrawing
- Auscultate for heart murmurs and count the heart rate for one minute
- Examine the eyes for any discharge and swelling
- Examine umbilicus for any bleeding, redness or pus
- Examine for skin infection (pustules)
- Abdominal examination to look for organomegaly
- Perform Barlow and Ortolani test to detect DDH (Developmental Dysplasia of Hip)
- Examine for CTEV (Congenital Talipes Equinovarus)
- Examine for birth injuries
- Examine for congenital malformations and dysmorphism. Routine check for anal patency to detect imperforate anus
- Assess breastfeeding (Annexure 3)
- Measure weight daily

Advise and Care

Cord Care: Keep the umbilical stump clean and dry and not to apply anything on it. Give vitamin K if not given earlier (1 mg for term and 0.5 mg in preterm < 1500 grams)

Skin and Eye Care

Babies should not be bathed routinely in the hospital to prevent hypothermia. They may however be sponged with lukewarm water.

Apply tetracycline eye ointment if not applied at birth. Treat eye discharges if any.

Immunization

The baby should receive

- Hepatitis B (zero dose) within 24 hours of birth.
- BCG
- OPV-0

5.4 Normal Phenomena

There are a few developmental variants (benign skin lesions and conditions) which may be present and are concerning to the mother and family. These include milia, miliaria, erythema toxicum, epstein pearls, mongolian spots, enlarged breasts, capillary naevi etc. The mother and the family need to be reassured.

Transitional stools are the passage of frequent, loose stools which are yellowish-green in color. They occur between day 3 and day 14 of life. It needs NO treatment.

Vaginal white discharge/bleeding in female babies is normal.

Weight loss of up to 10% (10-12% in low-birth-weight babies) in the first few days of life is normal and most infants regain their birth weight by 7-10 days in term and 10-14 days in preterm.

5.5 Discharge criteria

Babies born by uncomplicated vaginal deliveries should be observed for at least 24 hours before discharge. Following criteria should be fulfilled for discharge.

- Passage of meconium and urine
- Feeding well
- No Jaundice
- No excessive weight loss
- No fever

5.6 Counsel the mother and the family on discharge:

- Warmth.
- Frequent breastfeeding.
- Hand washing with soap and water before breastfeeding, after changing the diapers and after using the toilet.
- Danger signs and care seeking practices .
- Immunization and post natal visits as per the schedule

5.7 Follow-up (Postnatal visit)

- In case of an institutional delivery, the first postnatal visit should be on the third day .
- In case of home delivery, the first postnatal visit should be as soon as possible.
- Subsequent postnatal visits for both cases will be on day 7- 14, 21 and 42
- The babies with low birth weight (LBW) should visit weekly till their weight reaches 2.5 kg
- At the follow up visits, the babies should also be assessed for illnesses and managed accordingly if any.
- In addition, health education must be given to the parents and the family on danger signs and when to return to the health facility immediately.
- Following the day 42 visit, every baby should be seen and assessed by a health worker monthly for 1 year and 3 monthly till 5 years of age for growth and development (using BCBST) and for intervention like C4CD plus, immunization, deworming and vitamin A and multivitamin supplementation.

SECTION 6:
MANAGEMENT OF A SICK YOUNG INFANTS

Sick young infants not only require supportive care but also require specific management for different conditions.

6.1 Learning Objectives

After completion of this section, the participant should be able to:

- manage specific conditions: perinatal asphyxia, sepsis (including pneumonia and meningitis), tetanus neonatorum and jaundice
- monitor sick newborn
- provide follow up care after discharge

6.2 Supportive care of a sick young infants

1. Provide warmth, ensure consistently normal temperature.
2. Secure peripheral intravenous line and start maintenance intravenous fluid. Avoid enteral feed if very sick.
3. If perfusion is poor as evidenced by capillary refill time (CRT) of more than 3 seconds, tachycardia with feeble pulse, manage shock as described earlier.
4. Infuse 2 ml/kg 10 % dextrose if indicated (hypoglycemia).
5. Administer injection Vitamin K 1 mg intramuscularly if not given at birth.
6. Start oxygen by nasal prong, hood or mask, if cyanosed or grunting. Monitor SpO2.
7. Provide gentle physical stimulation, if apneic.
8. Provide bag and mask ventilation with oxygen if breathing is inadequate.

6.3 Hypothermia

Newborn babies lose their body heat much faster than adults because they cannot maintain a stable body temperature. Pay special attention to ensure provision of warmth to the infant during examination or procedures

'Hypothermia' is defined as body temperature less than 36.5 ºC. Confirm the diagnosis of hypothermia by recording actual body temperature (axillary)

The management of hypothermia will depend on the severity of hypothermia (Chart 9 in chartbooklet)

Mild hypothermia (36 -36.5ºC).

- A baby with cold feet is considered to have mild hypothermia.
- skin-to-skin contact is the best way to keep a baby warm

Moderate hypothermia (32-36°C)

- Check blood glucose and treat if the young infant is hypoglycemic.
- Warm the young infant using skin to skin contact by the mother.
- If mother is not available, skin to skin contact may be provided by the father or any other adult.
- Ensure that the temperature of the room where the re-warming takes place is at least 25°C.

» If skin to skin contact is not possible or a young infant is having life-threatening problems (e.g. sepsis, severe breathing difficulty), radiant warmer may be used.

» Encourage mother to breastfeed more frequently. If the baby cannot be breastfed, give feed using an alternative feeding method.

Severe hypothermia (<32°C)

» Warm the baby immediately using a pre warmed radiant warmer or incubator.

» Remove cold or wet clothing, if present. Dress the baby in warm clothes and a cap, and cover with a warm blanket.

» Check and treat for hypoglycemia.

» Treat for sepsis.

» Start IV fluids.

» Provide oxygen if indicated

» Monitor the temperature of the baby half hourly.

If the baby's temperature is not up to 36.50C or more after 2 hours of 're-warming', reassess the baby for other problems.

Hyperthermia

» Hyperthermia is defined as the axillary temperature of > 37.50C

» Check room temperature (maintain at 25-280C)

» Look for possible cause; Look for signs of infection

» Look for signs of dehydration (sunken eyes, no tears while crying, skin pinch goes back slowly or very slowly, lethargy/irritable, reduced urine output)

» Management

- Keep the baby away from source of heat (warmer, heater, sunlight)
- Remove extra clothes and blankets
- Decrease the environmental temperature (if needed)
- If more than 39 ºC, sponge the baby with lukewarm water
- Ensure adequate feeding or fluids
- Treat dehydration if present
- Measure blood glucose; if less than 45 mg treat for hypoglycemia (see chart booklet)
- Send necessary investigations
- Treat underlying cause
- Recheck baby's temperature every one hour till normal
- Do not give antipyretic in neonates (< 1month)

6.4 Intravenous (IV) fluid therapy

Indication for IV fluid therapy

» Gestation age <30 weeks

» Birth weight < 1200 grams

» Birth weight >1200 g and /or Gestational age > 30 weeks and sick

- Severe respiratory distress (RR ≥ 70/ RR ≥ 60 and with severe retraction or grunting)
- Unconscious or lethargic
- Intolerance to gastric feed
- Abdominal distension and/or vomiting (bilious/bloody)
- Uncontrolled seizure

Fluid requirement of neonates is summarized below (ml/per kg body weight)

Day of life	Birth weight < 1500 gm	Birth weight >1500 gm
1	80	60
2	95	80
3	110	100
4	125	120
5	140	140
6	150	150
7 onwards	150	150

Type of fluid

» First 2 days: 10% dextrose

» After 2 days: Use N/5 in 10% dextrose. Prepare the fluid by adding 20 ml NS +79 ml of 10% dextrose + 1 ml KCL to make 100ml fluid.

» Introduce Expressed Breast Milk by orogastric tube or cup and spoon feeding or direct breastfeeding as soon as it is safe to do so. Reduce the rate of IV fluid as the volume of breast milk increases in infants. Discontinue IV fluids once oral intake reaches 2/3rd of total requirement.

Monitoring of the IV infusion very carefully.

» Use a monitoring sheet

» Calculate drip rate

» Check drip rate and volume infused every hour

» Check for edema/puffiness of eyes (could indicate volume overload)

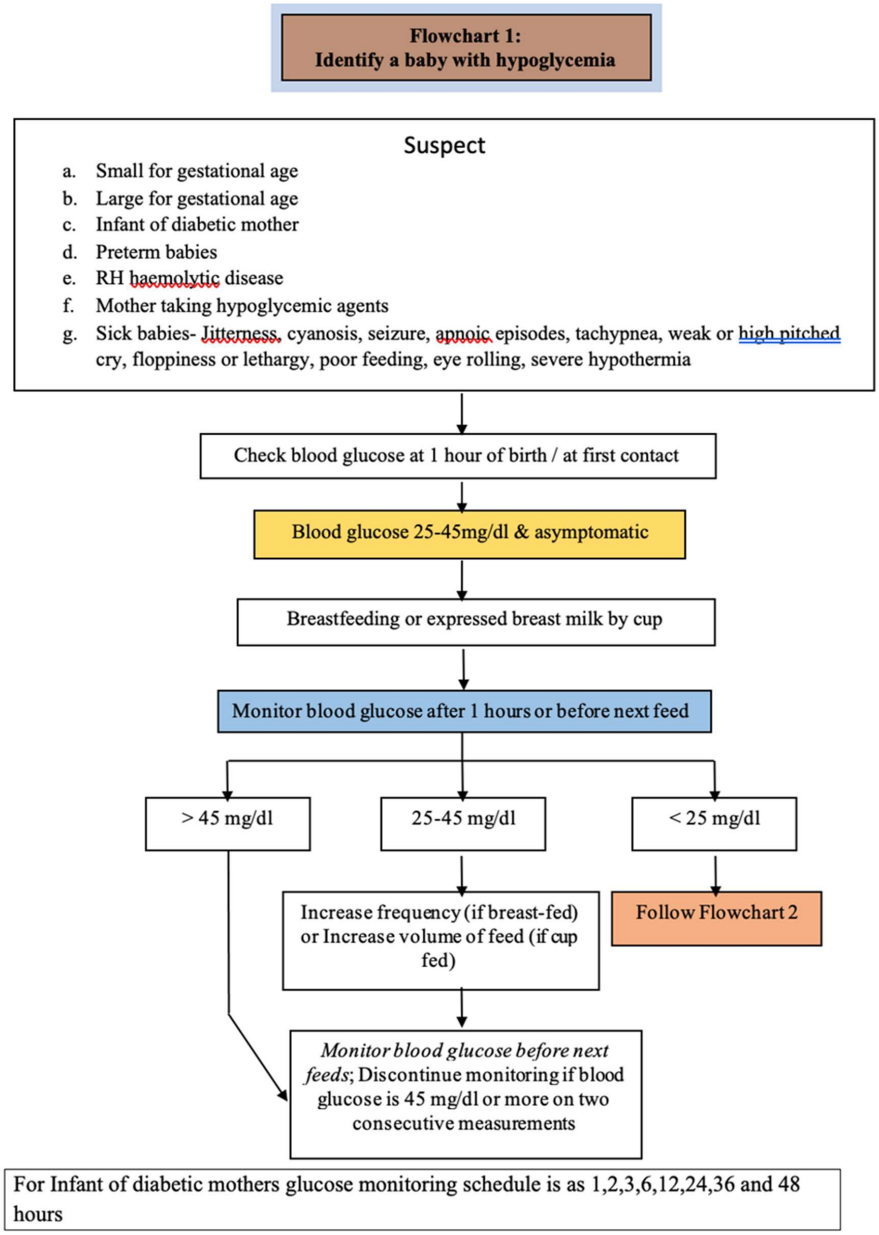
» Weigh baby daily to detect excessive weight gain (excess fluid) or loss (insufficient fluid); adjust IV fluids appropriately.

6.5 Hypoglycemia

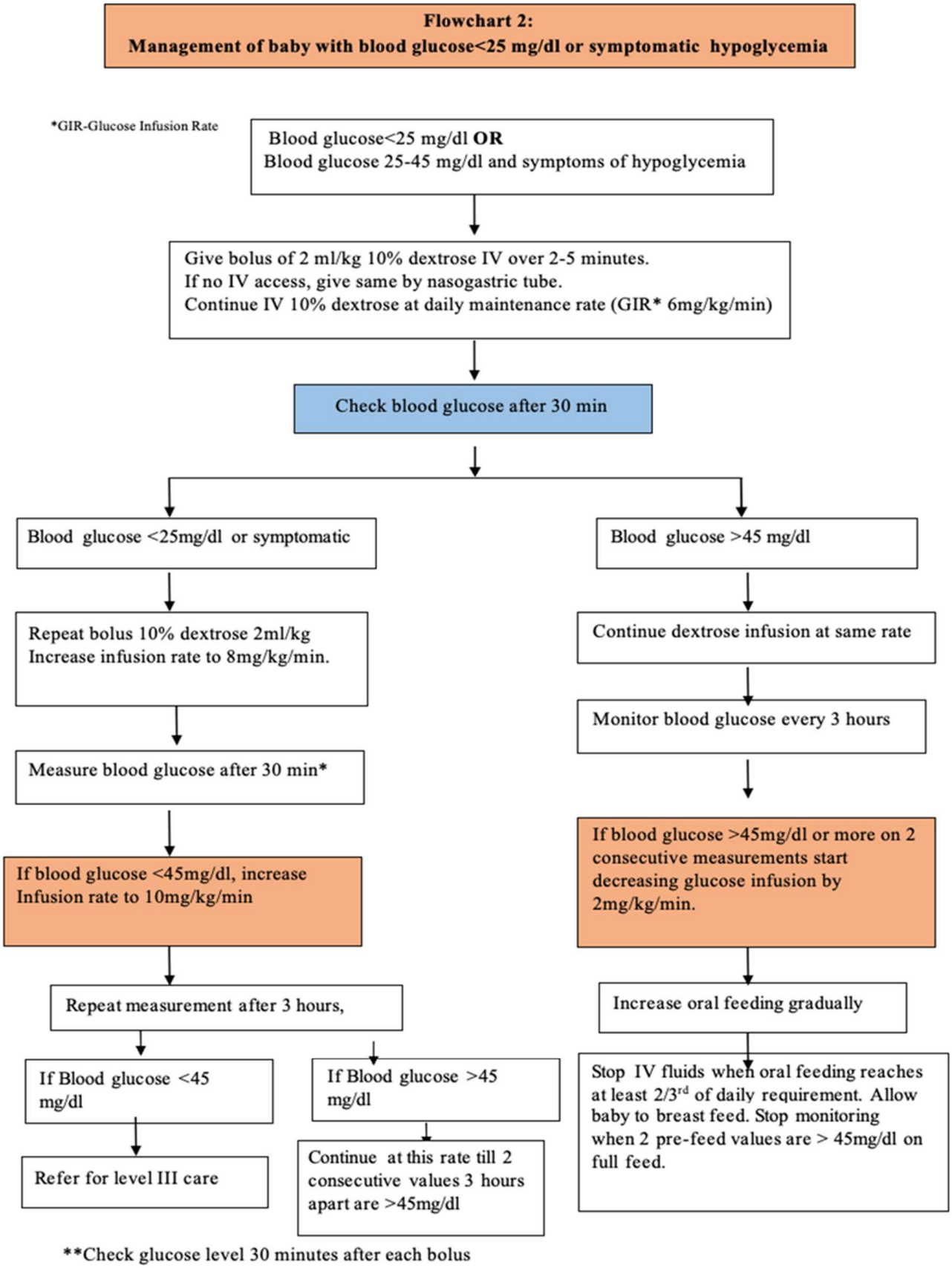
Hypoglycemia is one of the most common metabolic problems seen in newborn. Blood glucose levels in the first hours of life are typically lower than normal values of older children or adults.
In healthy infants, blood glucose levels can often be maintained in the appropriate range by initiating feeding soon after birth. Most cases of neonatal hypoglycemia are transient, respond readily to treatment, and are associated with an excellent prognosis.

Persistent hypoglycemia is more likely to be associated with abnormal endocrine conditions most commonly due to hyperinsulinemia, less frequently resulting from genetic or congenital defects in the metabolism of glucose, glycogen, and fatty acids. Possible neurologic sequelae associated with hypoglycemia is concerning and should be followed up closely.

Chart 11: Management of Neonatal hypoglycemia:
Management of hypoglycemia should follow the following treatment algorithms (flowchart 1 & 2)



(Courtesy: Facility Based Integrated Management of Neonatal and Childhood Illness (FB-IMNCI)- Nepal, 2019)



(Courtesy: Facility Based Integrated Management of Neonatal and Childhood Illness (FB-IMNCI)- Nepal, 2019)

Achieving appropriate glucose infusion rates using a mixture of D10 & D25							
Day	Volume (ml/kg/d)	Glucose infusion rate					
		6mg/kg/min		8mg/kg/min		10mg/kg/min	
		D10 (ml/kg/d)	D25 (ml/kg/d)	D10 (ml/kg/d)	D25 (ml/kg/d)	D10 (ml/kg/d)	D25 (ml/kg/d)
1	60	42	18	24	36	5	55
2	80	76	4	57	23	37	43
3	100	85*	-	90	10	71	29
4	120	100*	0	120	0	104	16
5	140	120*	-	-	-	137	3

***Add 20 ml/kg/day of NORMAL SALINE to provide 3 meq/Kg of Na**

» If hypoglycemia is persisting at 10 mg/kg/min of glucose infusion, give one dose of Hydrocortisone: 5 mg/kg and refer to a higher health facility for further management of persistent hypoglycemia.

Now we will learn through the following example to calculate glucose infusion rate.

Example: Calculating glucose infusion rate for treating hypoglycemia

A two-day old infant weighing 2.0 kg with hypoglycemic requires 6mg/kg/min of glucose infusion and daily fluid volume at 80 ml/kg/day.

Step 1: Total fluid needed on day 2 of life: 80 (ml/kg/day) x 2.0 (kg) = 160 ml/ day

Step 2: Look at Table to check composition of fluid

For 80 ml/kg/day @ 6mg/kg/min we need 76 ml/kg/day of Dextrose 10% and 4 ml/kg/day of Dextrose 25%.

Amount of D10 needed/day: 76 ml x 2.0 = 152 ml/day

Amount of D25 needed/day: 4 ml x 2.0 = 8 ml/day

Step 3: Writing fluid order for 8 hours

53 ml (51 ml D10+ 2 ml D25) in 8 hours @ 6 drops/min

» 6.6 ml/hour= 397 drops/hour = 397 drops/60 min = 6.6 drops/min

» In Micro infusion burette set 1 ml = 60 drops; so drops/min = ml/hr of fluid

Do not discontinue the glucose infusion abruptly to prevent rebound hypoglycemia.

6.6 Perinatal asphyxia

Inadequate oxygen supply to vital organs like the brain before, during or immediately after birth results in asphyxia which is recognized by no/poor cry, poor tone, gasping/ not breathing/ delayed initiation of breathing or need for assisted ventilation.

Perinatal asphyxia is defined as an Apgar score of < 7 at 1 minute of life. In moderate perinatal asphyxia, the Apgar score is 4-6 at 1 minute of life with slow breathing/gasping and in severe perinatal asphyxia, there is no breathing with an Apgar score of ≤ 3 minute of life.

Clinical features that these babies could manifest with, during the first 2-3 days of life include irritability or coma, hypotonia or hypertonia, convulsions, apnea, poor sucking and feeding difficulty.

Additional problems that these newborns may have include hypoglycemia, shock, AKI and multiorgan failure.

Management

- Check for emergency signs and provide emergency care as described in module 1.
- Place these babies under radiant warmer to maintain normal temperature as they usually have difficulty in maintaining normal body temperature.
- Check blood sugar and if hypoglycemia is detected, treat it.
- If convulsions are present, then follow management guidelines in section 3.6.2 (Module 1). If the baby needs an anticonvulsant drug to control convulsions review the baby after 72 hrs.

When to stop anticonvulsant medication?

Neurological examination of the baby is done prior to discharge and if it is normal, phenobarbitone can be stopped before discharge. If the neurological examination is abnormal, continue phenobarbitone for one month and neurological examination is performed after one month. If the neurological examination is normal then, taper the drug over 2 weeks and stop. If abnormal neurological examination persists, then refer the baby for EEG.

- Fluids: In a baby with emergency signs (breathing difficulty, shock, coma or convulsions), provide maintenance intravenous fluids according to age after initial stabilization of emergency signs.
- Feeding: If the baby has no emergency signs, vomiting or abdominal distention, consider enteral feeding. If the baby is sucking well, initiate breastfeeding or else initiate nasogastric feeding/ gavage feeding with breast milk in those with poor/no suck. Initiate feeding with 15 to 20 ml/kg/ day and increase by 15 to 20 ml/kg/day for next few days while gradually tapering off IV fluids.
- Breastfeeding should be encouraged to prevent hypoglycemia.

Withhold oral feeding in the following situations:

- acute phase in babies who are lethargic or unconscious, having frequent convulsions, apnea, shock or having moderate to severe respiratory distress.
- if there is bowel obstruction, necrotizing enterocolitis or feeding intolerance (vomiting, abdominal tension, no bowel movement, reduced bowel sounds, passage of blood in stool).
- Refer case of moderate to severe perinatal asphyxia

6.7 Neonatal Sepsis

Common systemic bacterial infections in young infants include sepsis, pneumonia and meningitis and all of these may have similar signs and symptoms. Neonatal sepsis is one of the three major causes of neonatal mortality and it is largely preventable.

Neonatal sepsis can be classified into two major categories depending on the onset of symptoms.

Early-onset sepsis (EOS) presents at birth or before 72 hours of life. They usually manifest with respiratory distress and pneumonia and the source of infection is from the maternal genital tract.

Late-onset sepsis (LOS) presents after 72 hours of life. LOS can be either healthcare-associated (HAI) or community-acquired infection. The neonates usually present with septicemia, pneumonia, or meningitis. Factors predisposing a neonate to an increased risk of HAI are prematurity, low birth weight, admission to the intensive care unit, mechanical ventilation, presence of invasive lines and administration of parenteral fluids. Poor hygiene, poor cord care, bottle feeding, and prelacteal feeds are the factors increasing the risk of community acquired LOS.

The various risk factors for EOS are:

- Maternal fever (temperature >38ºC) before delivery or during labor
- Prolonged rupture of membranes for more than 18 hours before delivery
- Foul smelling amniotic fluid
- Single unclean or more than three vaginal examinations during labor
- Prolonged labor (>24 hours both stages) and difficult delivery with instrumentation
- severe perinatal asphyxia (Apgar score ≤ 3 at 1 minute of life) and difficult resuscitation
- Low birth weight (<2500g) or preterm baby

Clinical manifestations:

The earliest signs of sepsis are often subtle and nonspecific. It may present with one or more of the following symptoms or signs:

- hypothermia (temperature less than 35.5 ºC or feels cold to touch) or fever (axillary temperature > 37.5 ºC or feels hot to touch)
- reduced activity, lethargy, irritability, poor cry or poor feeding.
- vomiting, abdominal distension, diarrhea
- hypotonia, convulsions, unconsciousness, bulging anterior fontanelle, vacant stare, high-pitched cry, excessive cry and irritability (suggestive of meningitis)
- bradycardia/tachycardia, poor perfusion with prolonged capillary refill time
- respiratory distress (fast breathing, severe chest indrawing, nasal flaring, grunting), apnea, gasping respiration and cyanosis.
- hypo/hyperglycemia.

Many of these symptoms may be present in other neonatal conditions e.g. perinatal asphyxia, hypoglycemia or hypothermia. In such situations take the help of risk factors and sepsis screen.

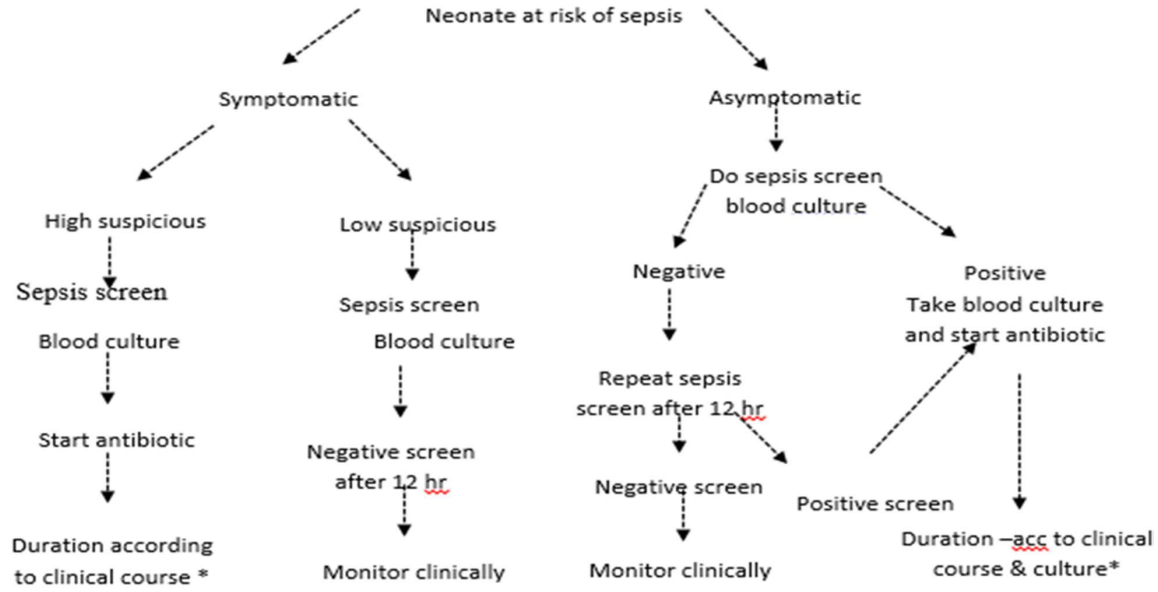
More specific localizing signs of infection which indicate serious bacterial infection include

» Many (≥10) or severe skin pustules /abscess

» Umbilical redness extending to the periumbilical skin or umbilicus draining pus

» Painful joints, joint swelling, reduced movement, and irritability if these parts are handled

Chart 12 : Approach to neonate at risk for neonatal sepsis



Culture sterile – 7-10 days	Culture Positive – 10-14 days
* Do lumber puncture if meningitis suspected clinically; if positive then treat for 21 days	

(Courtesy: Facility Based Integrated Management of Neonatal and Childhood Illness (FB-IMNCI)- Nepal, 2019)

Management of Neonatal sepsis

» Admit to hospital

» Investigation:

- **Sepsis screen:** Any two tests that come positive out of the following five tests strongly indicate presence of sepsis and the neonate may be started on antibiotics. If the initial sepsis screen is negative but clinical suspicion is strong, it may be repeated within 12 hours. If the repeat sepsis screen is still negative, sepsis can be excluded with reasonable certainty.

1. TLC <5000 or > 20,000/cubic mm (age > 72hrs)
2. Neutropenia: ANC (Absolute neutrophil count) <1800/cubic mm
3. ESR (>15 mm in 1 hour)
4. Positive CRP
5. Immature neutrophil to total neutrophil (I/T) ratio (>0.2)

- **Blood culture:** Where blood cultures are available, obtain blood cultures before starting antibiotics.
- **Lumbar puncture (LP):** LP should be considered in a neonate with LOS.
- **Radiology:** Chest X-ray should be considered in the presence of respiratory distress or apnea. An abdominal X-ray is indicated in the presence of abdominal signs such as abdominal distension.

» Treatment:
» Provide supportive care and monitoring for the sick neonate as described above.
» For EOS, consider antibiotics in a neonate with any one of the following:
  - Presence of ≥ 3 risk factors
  - Presence of ≥2 risk factors and a positive sepsis screen
  - A strong clinical suspicion of sepsis
» For LOS, antibiotics should be started with a positive sepsis screen and/or a strong clinical suspicion of sepsis.
» If not improving in 2–3 days, the antibiotic regime should be upgraded and referral to a higher center may be considered.
» Do not use prophylactic antibiotics in any circumstance, including neonates receiving IV fluids or with meconium aspiration syndrome or after exchange transfusion

Empirical choice of antibiotics and duration in neonatal sepsis (excluding meningitis)

Category	Antibiotic	Each Dose (mg/kg/ dose)	Frequency		Route	Duration (Days)
			< 7 days of age	>7 days of age		
1. EOS (First line) 2. LOS (community acquired)	Inj. Ampicillin	50	12 hourly	8 hourly	IV, IM	7-10
	Inj Cloxacillin should be considered if there is evidence of staphylococcal infection (skin pustules, omphalitis)					
	Inj. Cloxacillin	50	12 hourly	8 hourly	IV	7-10
	AND Inj.Gentamicin		24 hourly	24 hourly	IV, IM	7-10
1. EOS (Second line) 2. LOS (HAI)	Inj.Cefotaxime	50	12 hourly	8 hourly	IV, IM	7-10
	OR Inj Ciprofloxacillin	10	12 hourly	12 hourly	IV	7-10
	AND Inj. Amikacin	15	24 hourly	24 hourly	IV, IM	7-10
The duration of antibiotic therapy is 10 - 14 days if blood culture is positive (wherever available)						

Empirical choices of antibiotic and duration neonatal meningitis

	Antibiotic	Each Dose (mg/kg/dose)	Frequency		Route	Duration (Days)
			< 7 days of age	>7 days of age		
First line	Inj. Ampicillin	200 mg/kg/day	12 hourly	8 hourly	IV	21 days
	AND Inj. Gentamicin	4 (5-7.5 for > 1 month of age)	24 hourly	24 hourly	IV	21 days
Second line	Inj Cefotaxime	200 mg/kg/day	12 hourly	6 hourly	IV	21 days
	AND Inj. Amikacin	15	24 hourly	24 hourly	IV	21 days

Prevention:

1. Use infection prevention practices while caring for mother and newborn.
2. Treat mother's infection adequately during pregnancy.
3. Use clean delivery practices during labor and birth.
4. Treat mother with antibiotics if she has prolonged rupture of membrane (>18 hours).
5. Keep umbilical cord dry and uncovered.
6. Teach mother and family infection prevention practices
   - Hand washing
   - Minimum visitors
   - clean clothing
7. Exclusive breastfeeding.
8. Adequate and timely immunization.

6.8 Diarrhea

Diarrhea is uncommon in exclusively breastfed babies. Diarrhea is usually seen in babies who are on mixed feeding or on breast milk substitutes. In exclusively breast-fed babies, the stool is loose and bowel movements are frequent. If the stool is watery, stained with mucus and blood and the frequency has increased from the usual pattern, then the baby is said to have diarrhea. Diarrhea may be a sign of systemic sepsis.

Ask for:

» Duration of diarrhea

» Associated symptoms like fever, vomiting, irritability, poor feeding, reduced urination

Assess for:

» Breast feeding

» Signs and severity of dehydration

» Mucus and/or blood in the stool

» Weight loss

Management:
Assess for signs of dehydration and manage accordingly. And also assess for signs of possible sepsis.

Severity	Clinical features	Management
No dehydration	» Normal activity, no irritability » Feeding well » Urine output is adequate » Good weight gain » No fever	» Reinforce infection prevention practices in mother and the family » Encourage the mother to breastfeed » Follow up after 2-3 days » Follow up SOS if increased frequency, reduced feeding, reduced urine output and becomes febrile
Some dehydration	» Reduced activity, irritable » Breast feeds eagerly » Skin pinch does back slowly » Poor weight gain	» **Admit** » Send CBC,CRP, stool RE/Culture » RFT and Serum electrolytes wherever available » Start ampicillin and gentamicin if other signs of sepsis are present and low weight for age (diarrhea is a sign of sepsis) » Encourage mother to breastfeed more frequently » Monitor feeding, urine output, vital signs closely
Severe dehydration	» Lethargic or unconscious » Sunken eyes » Skin pinch very slow » Not able to breastfeed / poor feeding » Weight loss	» **Admit** » Send CBC,CRP, stool RE/Culture » RFT and Serum electrolytes wherever available » Start ampicillin and gentamicin (dose as for sepsis)
		» Secure IV line, administer IV normal saline 30 ml/kg over 1 hour and 70 ml/kg over 5 hours (Plan C) » Encourage the mother to continue breastfeeding after IV rehydration. » Monitor feeding, urine output, vital signs very closely » Refer after initial stabilization

Blood in stool:
Lower gastrointestinal bleeding is an alarming symptom in young infants. Benign causes include swallowed maternal blood (during delivery/ abrasion on the nipples), anal fissures, hemorrhagic disease of newborn and cow's milk protein allergy (CMPA). More serious causes are sepsis, infectious diarrhea, necrotizing enterocolitis (NEC, more common in preterm), malrotation/volvulus and a bleeding diathesis.

Symptom	Signs	Diagnosis and treatment
Blood in stool	» Well baby » 1st week of age » Bleeding from umbilicus may be present » No signs of sepsis	» Manage as hemorrhagic disease of newborn » Give Inj. Vit K 1 mg single dose
	» Sick baby » Fever	» Consider infectious diarrhea, sepsis/ NEC and initiate treatment and refer if necessary
	» Sick and irritable baby » Associated with vomiting and abdominal distension » Abdominal mass present	» Consider surgical condition like malrotation, hirshprung disease » Keep NPO, start IVF and empirical antibiotics. » Stabilize the baby and refer to higher center urgently

6.9 Tetanus Neonatorum

Tetanus Neonatorum can occur in a baby whose mother is not completely immunized with tetanus vaccine during the pregnancy or unclean cord cutting practice at birth.

Diagnosis
Neonatal tetanus is diagnosed by the presence of following signs and symptoms with its onset at 3 – 28 days of life:

- Irritability
- Difficulty in breastfeeding
- Trismus
- Muscle Spasms
- Convulsions
- Excessive crying

The WHO definition of a confirmed neonatal tetanus case is an illness occurring in an infant who has the normal ability to suck and cry in the first 2 days of life, but who loses this ability between days 3 and 28 of life and becomes rigid or has spasms.

Treatment

Tetanus immunoglobulin (TIG)

TIG is given to neutralize the circulating toxin. A single dose of 250 – 500 units IM should be administered without delay.

Antibiotics

The drug of choice is crystalline penicillin at a dose of 100,000 unit/kg/day 6 hourly IV to eliminate the source of toxin i.e. Clostridium tetani.

Alternative antibiotics are oral or IV metronidazole 15 mg/kg/day every 12 hourly for < 7 days old; 30mg/kg/day every 12 hourly > 7 days old and oral erythromycin 50 mg/kg/day every 6 – 12 hourly. Antibiotic therapy is given for 10 – 14 days.

Control of Spasms

This is the most important part of management as most deaths occur due to uncontrolled spasms resulting in hypoxic damage. Diazepam is the drug of choice and is started at a dose of 0.25 mg/kg/dose IV given every 3-6 hours. Once the spasms are controlled it can be given orally and decreased by 10% of its dose every third day. If spasms are not controlled, then the dose of diazepam can be increased up to 0.4 -0.6 mg/kg/dose IV.

Chlorpromazine can also be added at a dose of 1-2mg/kg/day in 4 divided doses orally by NG tube. Ensure appropriate supportive care including temperature maintenance, care of airway, breathing, circulation, fluids and nutrition.

Provide a quiet and comfortable environment for the baby as stimulation by light, sound and touch induce spasms.

Immunization: The neonate at discharge should be advised vaccination as per national EPI standard.

6.10 Management of Jaundice

More than 50% of normal newborns and 80% of preterm infants have jaundice. Jaundice can be physiological or pathological.

Physiological Jaundice: onset of yellowish discolouration of skin and eyes after 24 hours of life and which does not persist beyond 14 days in term and 21 days in preterm neonates.

Pathological Jaundice:

- Onset of jaundice is within 24 hrs. of life
- Lasting >14 days in term and >21 days in preterm Infants
- Jaundice involving palms and soles.

Investigations:

- Liver function test (Serum bilirubin: total/direct)
- CBC
- Blood groups of baby and mother and Coombs test if available

(Other investigations that may be required in some babies with suggestive history and examination findings include sepsis screen, thyroid function test, urine routine examination, Ultrasonography of abdomen etc.)

Treatment

Treatment of pathological jaundice is usually phototherapy or an exchange transfusion.

Quick guide on initiating Phototherapy and exchange transfusion based on serum bilirubin level

Phototherapy Bilirubin level in mg/dl			Exchange transfusion Bilirubin level in mg/dl	
	Healthy term baby	Preterm or any risk factors	Healthy term baby	Preterm or any risk factors
Day 1	Any visible jaundice		15	13
Day 2	15	13	25	15
Day 3	18	16	30	20
Day 4 & after	20	17	30	20

a) Exchange transfusion is not described in this manual. Neonates with serum bilirubin in the exchange transfusion level should be referred to a higher center. where exchange transfusion can be performed.

b) Risk factors include LBW (less than 2.5 kg at birth) or prematurity (born before 37 weeks gestation), haemolysis and sepsis, temperature instability, significant lethargy and asphyxia

c) VisibSSle jaundice anywhere on the body on day 1.

Continue phototherapy until serum bilirubin level is lower than threshold range or until baby is well and there is no jaundice of palms and soles.

Guideline for initiating phototherapy

Chart 14 provides guidelines on when to initiate phototherapy in newborns.

How do you use the chart?

» First plot the baby's total serum bilirubin against the baby's age in hours.

» Next decide whether the

(i) baby is > 38 weeks and well, or

(ii) baby is > 38 weeks with risk factors or 35-37 weeks and well, or

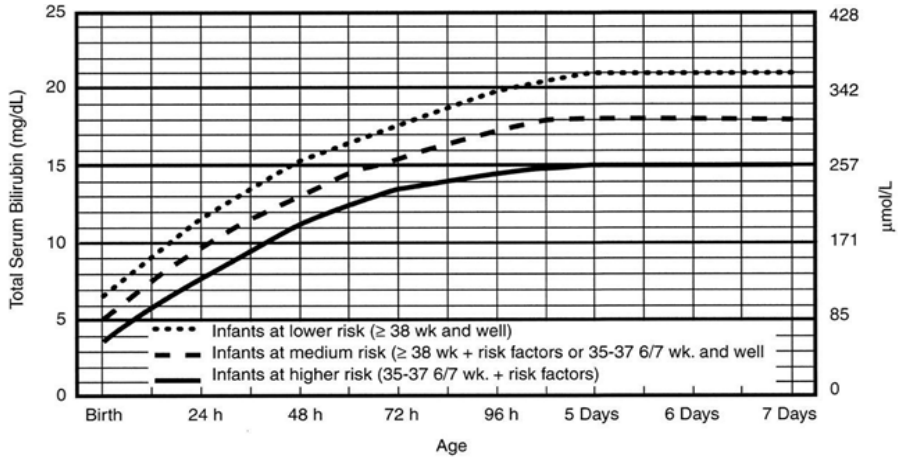
(iii) 35-37 weeks with risk factors and select the appropriate intervention line.

» If the plotted bilirubin value is above the selected intervention line, the baby requires to be started on phototherapy. If below the intervention line, observe and monitor bilirubin 12-24 hourly.

Monitoring baby on phototherapy:

Follow guidelines provided in chart 14 on monitoring the baby on phototherapy. Plot the follow up serum bilirubin against the baby's age and if it falls below the intervention line, stop phototherapy.

Chart 14: Guidelines for initiating Phototherapy in Neonatal Hyperbilirubinemia



- Use total bilirubin. Do not subtract direct reacting or conjugated bilirubin.
- Risk factors = isoimmune hemolytic disease, G6PD deficiency, asphyxia, significant lethargy, temperature instability, sepsis, acidosis, or albumin < 3.0g/dL (if measured)
- For well infants 35-37 6/7 wk can adjust TSB levels for intervention around the medium risk line. It is an option to intervene at lower TSB levels for infants closer to 35 wks and at higher TSB levels for those closer to 37 6/7 wk.
- It is an option to provide conventional phototherapy in hospital or at home at TSB levels 2-3 mg/dL (35-50mmol/L) below those shown but home phototherapy should not be used in any infant with risk factors.

Guidelines for Exchange transfusion:

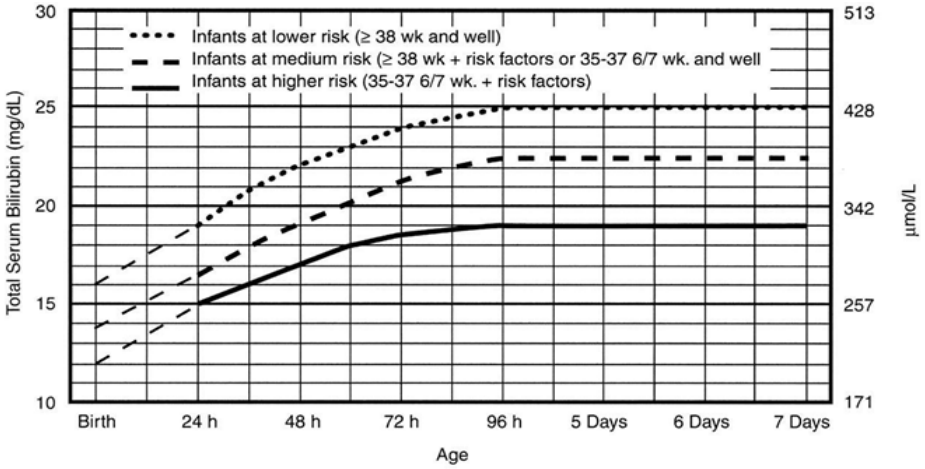
Chart 15 provides guidelines on how to decide when a baby needs an exchange transfusion.

How do you use the chart?

It is similar to the process described for phototherapy.

Exchange transfusion is not described in this manual. Neonates with serum bilirubin in the exchange transfusion level should be referred to a higher center where exchange transfusion can be performed.

Chart 15: Guidelines for Exchange transfusion in Neonatal Hyperbilirubinemia



- The dashed lines for the first 24 hours indicate uncertainty due to a wide range of clinical circumstances and a range of responses to phototherapy.
- Immediate exchange transfusion is recommended if infant shows signs of acute bilirubin encephalopathy (hypertonia, arching, retrocollis, opisthotonos, fever, high pitched cry) or if TSB is ≥5 mg/dL (85 µmol/L) above these lines.
- Risk factors - isoimmune hemolytic disease, G6PD deficiency, asphyxia, significant lethargy, temperature instability, sepsis, acidosis.
- Measure serum albumin and calculate B/A ratio (See legend)
- Use total bilirubin. Do not subtract direct reacting or conjugated bilirubin
- If infant is well and 35-37 6/7 wk (median risk) can individualize TSB levels for exchange based on actual gestational age.

Prolonged Jaundice

Jaundice lasting longer than 14 days in term or 21 days in preterm infants is a pathological jaundice. If the baby's stools are pale or the urine is dark, refer the baby to a specialized center for further evaluation and management.

6.11 Neonatal convulsion and spasm.

Convulsions occurring in the neonatal period can be due to various causes ranging from birth asphyxia, birth injuries, hypoglycemia or severe infections. The baby may be normal between the convulsions or may be lethargic, irritable and unconscious.

Types:

During the neonatal period any unusual repetitive or stereotypic movement may represent a convulsion. These movements are usually accompanied by alterations in autonomic functions such as blood pressure or heart rate and a drop in SpO2.

» **Generalized convulsion:**
- repetitive jerking movements of limbs and face
- continuous extension and flexion of arms and legs which can be either synchronous or asynchronous
- apnea (cessation of breathing for more than 20 seconds)

» **Focal convulsion:**
- Repetitive jerky movement or sustained posture involving one part of the body
- and the baby is conscious

» **Subtle seizures:**
- repetitive blinking, deviation of eyes, fluttering of eyelids or blank stare
- repetitive oral and buccal movements (smacking)
- purposeless movement of limbs (bicycling or swimming movements)
- apnea
- and the baby is conscious

» **Myoclonic seizures:**
- rapid movement usually of flexion involving both upper limbs and less commonly the lower limbs and is most often associated with an EEG seizure pattern.

Non epileptic phenomena like jitteriness and Benign neonatal sleep myoclonus are the most common entities which can be misdiagnosed as seizure in neonates.

Jitteriness (tremors):

» high frequency, low amplitude, and oscillatory (not jerking) movements
» activated/exacerbated by arousal
» can be provoked by stimulation
» can be suppressed by gentle restraint
» are not accompanied by autonomic changes (eg- tachycardia, tachypnea, hypoxia or
» apnea)
» are not accompanied by abnormal eye movements

Benign neonatal sleep myoclonus:

- multifocal jerks seen in transition to and during sleep
- present only during sleep and the jerking ceases on awakening
- seen in term, healthy and thriving neonates
- may be present from birth to 3 months

Causes:

» perinatal asphyxia and hypoxic ischemic injury (major cause in the first 72 hrs. of life)
» Hypoglycemia (commonly seen in SGA, LGA and IDM)
» Hypocalcemia (commonly seen in SGA, LGA and IDM)
» Hyponatremia and hypernatremia
» Intracranial bleed, structural malformations of the CNS
» Meningitis (most important cause after 3 days of life)
» Metabolic disorders (Inborn errors of metabolism)
» Drug withdrawal – heroin and barbiturate use in mothers

Differential Diagnosis:

The following clinical features will help differentiate seizures (due to some causes) from spasm from Tetanus. (Refer table on next page)

Management:

The first step in treatment is to **identify and treat the underlying cause** e.g. perinatal asphyxia, hypoglycaemia, hypocalcemia and infections. Seizure control will be very difficult unless the underlying cause is addressed.

Management of convulsion:

(Refer module 1, Section 3.6.2 and Chart 8 in Chart Booklet)

Maintenance therapy

» Monotherapy is the most appropriate strategy to control seizures.
» Attempts should be made to stop anti-epileptic drugs and wean the baby to only phenobarbitone at 3-5 mg/kg/day if the baby was on multiple drugs
» Duration of therapy should be guided by cause, course, and neurological status of the baby.

Differential diagnosis of Neonatal Seizure and spasm

Findings			Probable Diagnosis
History	**Examination**	**Investigations or other known diagnosis**	
» Time of onset, day 1 to 3. » History of maternal diabetes. » Poor or no feeding.	» Convulsions,jitteriness » Lethargy, or unconsciousness » Small baby (<2.5 kg at birth or born before 37 weeks of gestation) » Large baby (more than 4 kg at birth)	Blood glucose <45 mg/dl (2.6mmol/l)	Hypoglycemia
» Mother not immunized with tetanus toxoid. » Poor feeding or no feeding after having fedwell initially. » Time of onset, day 3 to 14. » Unclean birth. » Application of unclean or harmful substances ~(e.g. animal dung) to umbilicus.	» Spasms	Infection of umbilicus	Tetanus
» Time of onset, day 2 or later	» Seizures » Lethargy or unconsciousness » Bulging anterior fontanelle	Sepsis	Possible meningitis
» Complicated or difficult labour or birth(fetal distress). » Failure of a baby to spontaneously breathe at birth. » Resuscitation required at birth. » Time of onset within 24 hours of birth.	» Convulsions or unconscious » Lethargy or unconsciousness » Breathing difficulty » Abnormal body temperature » Floppiness or reduced activity » Irritability		Asphyxia or other brain injury
» Time of onset,day 1-7 » Sudden deterioration of condition. » Sudden pallor	» Convulsions or unconscious » Small baby (<2.5 kg at birth or born before 37 weeks of gestation) » Severe breathing difficulty		Intraventricular bleeding
» Time of onset of encephalopathy,day 3 to 7. » Serious jaundice. » Late or no treatment of serious jaundice	» Convulsions » Opisthotonus » Poor or no feeding » Lethargy or floppiness	» Positive coombs test » High serum bilirubin	`bilirubin encephalopathy (Kernicterus)

6.12 Congenital Anomalies

There are many types of congenital anomaly. Some require urgent surgical attention, while others are treated when the child is older. Early recognition and timely treatment results in better outcomes. A congenital anomaly in a baby is distressing to the parents and family. Counseling of the parents and the family is an integral component of the management to allow the family to prepare themselves regarding the condition and the treatment options.

6.12.1 Cleft lip and cleft palate

These may occur together or separately (Figure 26). Reassure the parents that the condition can be corrected surgically at an appropriate age.

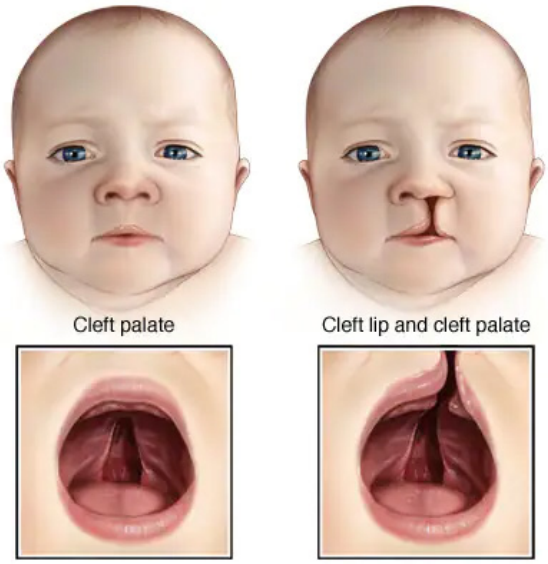


Figure 26: Orofacial cleft anomalies

Treatment

Infants with isolated cleft lip can feed normally, whereas cleft palate is associated with feeding difficulties. The infant can swallow normally but is unable to suck adequately, and milk regurgitates through the nose and may aspirate into the lungs and can lead to lung infections. Cleft palate can be seen in a child with Pierre Robin Sequence (micrognathia, glossoptosis and upper airway obstruction during sleep)

In severe cases, expressed breast milk should be fed via cup and spoon-feeding method and adequate sterility should be ensured. The technique of feeding is to deliver a bolus of milk over the back of the tongue into the pharynx with a spoon, pipette or some other pouring device. The infant will then swallow normally.

Due to the feeding difficulty, adequate support and close monitoring of feeding and growth is important for these infants and aspirations and recurrent pneumonia is a common complication.

Surgical closure of the lip can be done at 6 months of age and of the palate at 1 year of age. Intrahospital referral to the dental unit should be done for registration and for further referral to a higher center at an appropriate age.

After repair, follow-up is required to monitor for hearing impairment (middle-ear infections are common) and delay in speech and speech problems.

6.12.2 Bowel obstruction

Bowel obstruction in a newborn may be due to esophageal atresia, hypertrophic pyloric stenosis, bowel atresia (duodenal atresia, ileal atresia), malrotation with volvulus, meconium plug syndrome, Hirschsprung disease (colonic aganglionosis) or imperforate anus.

The level of obstruction determines the clinical presentation. Proximal obstruction presents as vomiting with minimal distension and distal obstruction as abdominal distension with vomiting occurring towards the late stage.

Bilious vomiting (green) in a young infant is due to malrotation with midgut volvulus until proven otherwise and is a surgical emergency. It may present as a sudden onset of bilious vomiting in an infant who has passed some normal stools after birth.

Hypertrophic pyloric stenosis presents as non-bilious (not green) projectile vomiting after feeding typically between 3 and 6 weeks of age. The baby feeds vigorously after vomiting. The most common complications are electrolyte imbalance and poor weight gain.

Treatment

- » Prompt resuscitation and urgent consultation by a surgeon wherever available.
- » Give nothing orally. Insert a nasogastric tube
- » Maintenance intravenous fluid plus the loss (output from nasogastric tube and vomitus): N/5 in 10% dextrose (Prepare the fluid by adding 20 ml NS +79 ml of 10% dextrose + 1 ml KCL to make 100ml fluid)
- » Correct shock, if present, with 10- 20 ml/kg bolus of normal saline or Ringer's lactate as a rapid IV bolus.
- » Administer ampicillin (50 mg/kg/dose IV stat and 12 hourly (< 7 days old); 8 hourly (> 7 days old) plus gentamicin (4 mg/kg/dose IV stat and once a day) plus metronidazole (15 mg/kg/dose stat loading dose, followed by 7.5 mg/kg every 12 h starting 24 h after the loading dose).

6.12.3 Abdominal wall defects

There is a defect in the abdominal wall and the bowel and abdominal organs protrude out of the defect.

There are two types of abdominal wall defects: Omphalocele and Gastroschisis. In omphalocele, there is always a transparent sac covering the extruding bowel and the umbilical cord is inserted in the caudal area of the sac where as in gastroschisis, the bowel is exposed and is lateral to the umbilicus which is in its normal position (usually to the right)

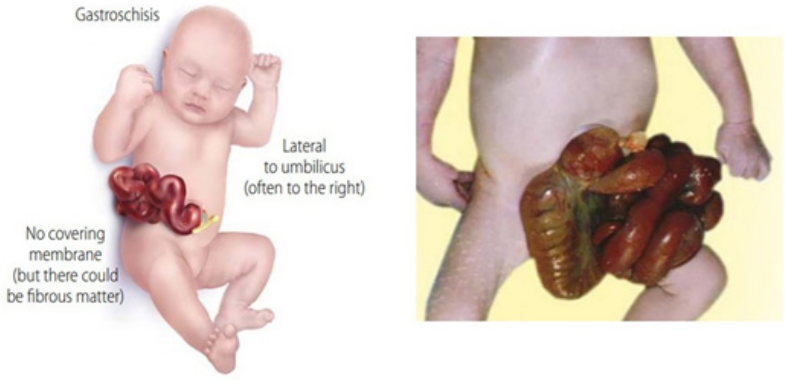


Figure 27 A: Gastroschisis

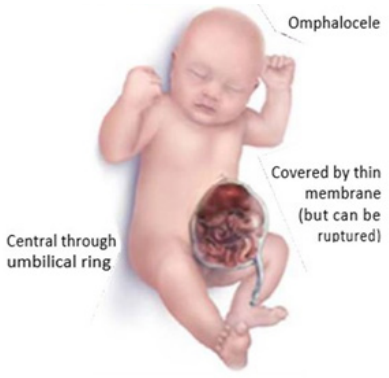


Figure 27 B: Omphalocele

Treatment

- » Apply a sterile dressing, and cover with a plastic bag or cling film (to prevent fluid loss). An exposed bowel can lead to rapid fluid loss and hypothermia.
- » Give nothing orally. Insert a nasogastric tube
- » Maintenance intravenous fluid plus the loss (output from nasogastric tube and vomitus): N/5 in 10% dextrose (Prepare the fluid by adding 20 ml NS +79 ml of 10% dextrose + 1 ml KCL to make 100ml fluid)
- » Correct shock, if present, with 10- 20 ml/kg bolus of normal saline or Ringer's lactate as a rapid IV bolus.
- » Administer ampicillin (50 mg/kg/dose IV stat and 12 hourly (< 7 days old); 8 hourly (> 7 days old) plus gentamicin (4 mg/kg/dose IV stat and once a day) plus metronidazole (15 mg/kg/dose stat loading dose, followed by 7.5 mg/kg every 12 h starting 24 h after the loading dose).
- » Consult the surgeon urgently.

6.12.4 Neural Tube Defects:

The central nervous system (CNS) starts as a neural tube and folds into the brain and spinal cord by a complex mechanism during early embryological development. Failure of normal closure results in neural tube defects, one of the most serious congenital malformations in newborns.

Myelomeningocele: Myelomeningocele is the most common neural tube defect.
It involves a dorsal herniation of the defective spinal cord segment through a defect in the dura, bone and soft tissues of the posterior thoracic, lumbar or sacral regions—lumbar myelomeningocele being the most common one. Hydrocephalus occurs in around two-thirds of these children and may be associated with neurological problems (bowel, bladder and motor deficits in the lower extremities).

Anencephaly: Anencephaly is the most severe form of neural tube defect. The scalp, cranial vault, and dura are defective, exposing neural tube derivatives that should have been brain. The defect usually extends through the foramen magnum and involves the brainstem. It is not compatible with life.

Causes: The exact cause of these neural tube defects is unknown. The proposed causes include folic acid deficiency, maternal ingestion of the anticonvulsant carbamazepine and valproic acid; and folic acid antagonists such as certain antimalarial drugs, maternal hyperthermia and prenatal irradiation. These congenital malformations carry an increased recurrence risk of 2% to 3% for couples with one

affected pregnancy, with a higher risk if more than one sibling is affected. Affected individuals have a 3% to 5% risk of having an offspring with a primary neural tube defect.

Prevention: Studies have shown a 50% to 70% reduced incidence of neural tube defects in women who take multivitamins for at least 3 months prior to conception and during the first month of pregnancy. Therefore, it is recommended that women of childbearing age who are capable of becoming pregnant consume 0.4 mg of folic acid per day to reduce their risks of having a fetus affected with myelomeningocele or other neural tube defects.

Treatment

- » Apply a sterile dressing.
- » Consult a surgeon experienced in pediatric surgery if available or refer to a higher center where a neurosurgeon is available.
- » Administer ampicillin (50 mg/kg/dose IV stat and 12 hourly (< 7 days old); 8 hourly (> 7 days old) plus gentamicin (4 mg/kg/dose IV stat and once a day)
- » Basic counseling to the mother and the family

6.12.5 Developmental Dysplasia of Hip (DDH)

DDH affects 1-2 in every 1000 births. Early diagnosis is crucial because delay in diagnosis and treatment can lead to hip osteoarthritis requiring surgical intervention.
Family history of DDH and breech presentation are risk factors for DDH. Ortolani and Barlow's maneuvers must be performed during the postnatal period to screen for DDH. Barlow's maneuver tries to dislocate the hip by adducting and pushing it posteriorly, while Ortolani attempts to reduce a subluxated hip by abducting and pushing it anteriorly.

In a neonate with abnormal clinical examination, USG hip should be offered to confirm the finding. An USG hip must also be done in all neonates with risk factors before they are 6 months old.

In older infants, DDH can manifest as limitation of hip abduction and asymmetric thigh folds and shorter limb on the affected side when the condition is unilateral.

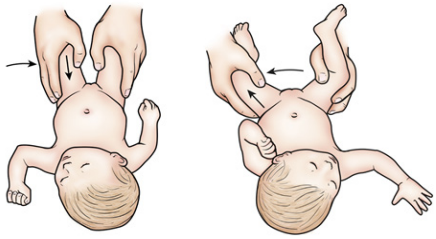


Figure 28A: Barlow's and Ortolani maneuver

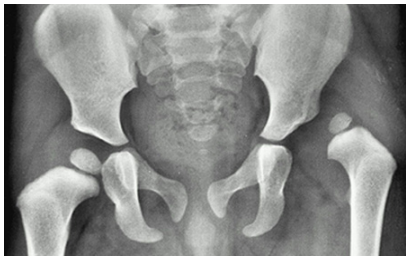


Figure 28B: Radiological finding of dislocation of left hip

Treatment

- » Consult an orthopedic technician or orthopedic surgeon if available.
- » Keep the hip in flexion and abduction by using Pavlik harness for children less than 6 months old and a hip spica cast is used in older children. The traditional way in many cultures of carrying the child on the back with the hip flexed and abducted will serve the same purpose.
- » Surgical management is required for patients presenting late and those not responding to conservative treatment for sufficient time (3-4 years of age).
- » Serial X rays are used to monitor the treatment.

6.12.6 Congenital Talipes equinovarus (club foot)

Clubfoot, also known as congenital talipes equinovarus (CTEV), is a congenital foot abnormality that is seen in 1-2 in every 1000 births and is more common in male infants. The chance of correction is improved by making the diagnosis on time and treatment through serial plaster cast.

The foot cannot be placed in the normal position. In a normal foot, the dorsum of the foot can be passively extended to the anterior aspect of the distal leg, but this movement is not possible in CTEV. The deformity includes the following features: forefoot adduction, inversion (in turning) of the heel and plantar flexion of the foot.

Treatment

- » Consult orthopedic surgeon/technician
- » Mild positional deformity (the foot can be passively corrected): simple stretching of foot beginning shortly after birth. Refer to the physiotherapy technician.
- » In moderate deformity, treatment starts with serial manipulation and casting of the foot (Ponseti method), soon after the birth. Apply this in the sequence 1, then 2, then 3 as in figure 29. These manipulations and casting are repeated every 1-2 weeks until the deformity is corrected. After the deformity is corrected fully, foot abduction orthosis is prescribed to prevent the recurrence of the deformity till 3-4 years of age.
- » Severe deformity, failure of the conservative management and late presentation will require surgical intervention which is generally done after the age of 4 years.

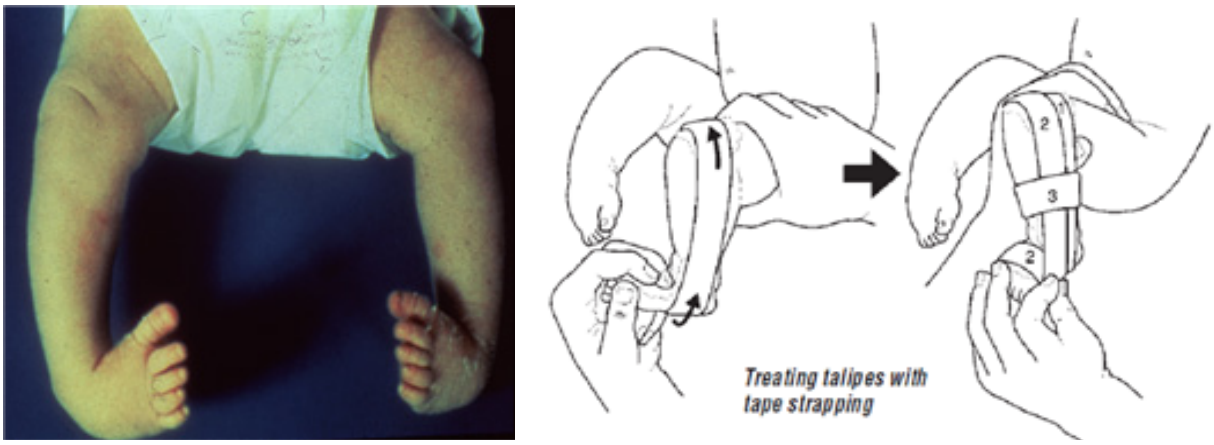


Figure 29: Clubfoot and treatment

6.13 Vertical /Perinatal Infections

Diseases such as STI, Hepatitis B, and HIV can be transmitted vertically from mother to child. They may also manifest perinatally. TB can be transmitted in the perinatal period. For management of such cases, follow appropriate National guidelines.

6.14 Monitoring of sick young infant

All sick young infants should be monitored closely to detect improvement or worsening. The table given below provides a checklist for monitoring. The record should document the parameters and the frequency of monitoring along with time and date.

Checklist for monitoring sick young infant

Sl. no.	Checklist	Assessment	Action
1	Temperature	Mild hypothermia	Rewarm by KMC
		Moderate/severe hypothermia	Rapid rewarming by radiant warmer
		Fever	Removal of excess clothing,change environment, sepsis screen
2	Airway	Obstruction	Open airway (nasal lavage,position and suction
3	Breathing	Apnea/Gasping	PPV with bag and mask
		Respiratory distress	Oxygen
4	Circulation	Cold to touch and prolonged CRT with fast pulse >180/min	Give 10-20 ml/kg NS/RL in 5-10mins
5	Fluids	Intake/output chart	Maintenance fluid
6	Medication	Suspected sepsis	Antibiotics
7	Feeding	amount, duration, frequency	As per feeding guideline
8	Monitor	Temperature,Respiration, Colour, Heart rate, CRT, Danger signs	Manage as per the findings

Sl. no.	Checklist	Assessment	Action
9	Communication	understanding of illness,the current condition of the baby,any other concerns of the parents.	**For home care:** » exclusive breastfeeding » maintain temperature » cord & eye care » danger signs » maternal health **Care during transfer:** » inform parents about the need for a referral and the place. » communicate with a higher health center. » maintain ABC and ensure warmth. » ensure patency of peripheral line and appropriate administration of IV fluids. » monitor vitals. » document the findings, events and care provided during the transfer. » Mother to accompany as far as possible
10	Follow up	any new concerns, physical examination	» check if the young infant is on any medication (whether short term/ long term and ensure that parents are giving the medications as advised. » ensure that they attend the routine growth monitoring and C4CD plus and developmental delays » advise on immunization, complementary feeding

(Mnemonic for monitoring: T.A.B.C.F.M.F.M.C.F.)

6.15 Discharge from the hospital

Careful monitoring of the infant's overall response to treatment and correct planning of discharge from the hospital are just as important as making the diagnosis and initiating the treatment. The discharge process for all sick infants should include:

» Giving a discharge summary with all the following details:
  - Details of the young infant
  - Birth and perinatal details
  - Correct time and date of admission and discharge from the hospital
  - Diagnosis, relevant and pertinent findings on history, examination and investigation, treatment and progress during the hospital stay, and condition of the young infant on discharge.
  - Danger signs and when to follow up

» Counseling the mother and the family on feeding, dose and duration of medications and the danger signs.

» Ensuring the infant's immunization status and record card are up-to-date and tell the parents the date for next postnatal visit.

» Communicate with the health personnel who had referred the infant or who will be responsible for follow-up care (this will lead to more appropriate referrals to hospital and better relationship between hospital and community health workers)

» Instructions on when to return for follow-up care and signs indicating the need to return immediately

6.16 Providing follow-up care

1. Infants who are discharged from the hospital should be brought to the hospital for follow-up care to check the young infant's condition in relation to the present problem and to address any new concerns.
2. Mother should be advised to bring the child immediately to the hospital if the young infant develops any of the following signs:
   - poor breastfeeding
   - develops fever/ feels cold to touch
   - vomiting, loose stool with mucus and blood in it and reduced urine output
   - cough, fast breathing and difficulty in breathing
   - reduced activity and irritable

3. Remind the mother of the young infant's next immunization visit.

4. Ensure that the BCDST has been administered on the young infant.

EXERCISE 4

1. What should you assess initially in the emergency room when a sick young infant arrives?

2. What are the signs that make you suspect meningitis in a sick young infant?

3. List the principles of management of tetanus neonatorum.

4. List the essential investigations you should do in a young infant with jaundice.

5. A term neonate weighing 3 kg who initially had respiratory distress is improving and is started on 5 ml EBM 3 hourly by NG tube on day 5 of life. How will you adjust the IV fluids for this baby (write the volume, composition and infusion rate)

SECTION 7:
MANAGEMENT OF LOW-BIRTH-WEIGHT BABIES (LBW)

A neonate who weighs less than 2,500 gm at birth is a low-birth-weight baby. Even though LBW infants constitute only 15% of the total live births, around 80% of neonatal deaths and 50 % of infant deaths occur among the LBW infants. An extra attention to warmth, infection prevention practices and optimal feeding can prevent most of these deaths. Even after surviving the neonatal period, the LBW infants are at risk of long-term complications like feeding issues leading to malnutrition, recurrent infections and adverse neurodevelopmental outcomes. In addition to influencing the immediate survival of a neonate, nutritional management also influences the subsequent growth and development of LBW infants.

7.1 Learning objectives:

The participant after completing this section should be able to:

- enumerate problems of Preterm & LBW.
- prescribe maintenance intravenous fluid requirement for a sick LBW neonate as per the baby's birth weight or current body weight.
- describe the different modes of enteral feeding for a LBW neonate as per the baby's birth weight or current body weight.

7.2 Low Birth Weight (LBW)

A neonate can be a LBW baby due to two reasons. Firstly, a neonate will have a birth weight less than 2500 grams because they are born before term (< 37 weeks of gestation). Since fetal size and weight are directly related to the period of gestation, it is obvious that if the delivery takes place prematurely, the baby is likely to have low weight at birth. However, the birth weight will be appropriate to the gestational age (AGA).

The second situation that leads to low birth weight is intrauterine growth retardation (IUGR). The period of gestation may be full term or preterm, but the baby is undernourished and undersized and therefore is born with low birth weight as compared to the period of gestation. Such a baby is also called a small-for-date (SFD) or small for gestational age (SGA) neonate. Sometimes, a LBW neonate may be both preterm as well as small for-date.

How to recognize preterm and SFD infants?

Babies born before 37 completed weeks are called preterm. Preterm babies have distinct physical features that are helpful to the health care professional to make the diagnosis especially in the situation of unknown LMP (last menstrual period), without early antenatal ultrasonography and unbooked pregnancies.

The pinna is soft and devoid of cartilage therefore it does not recoil back promptly on being folded. The breast areola is poorly pigmented and the breast nodule is usually absent or < 5 mm in diameter. The deep skin creases are present only on the anterior one third of the soles. In males, the scrotum does not have rugae and testes are not descended into the scrotum. In female infants, the labia are widely separated and don't cover the labia minora completely. The back of the preterm babies has abundant growth of fine hair called lanugo.

Problems seen in of preterm neonates:

- hypothermia
- inability to breastfeed
- respiratory distress and respiratory distress syndrome
- apneic spells (apnea of prematurity)
- intraventricular hemorrhage and periventricular leukomalacia
- metabolic problems like hypoglycemia and hypocalcemia
- feeding intolerance and necrotizing enterocolitis (NEC)
- low immunity and infections
- retinopathy of prematurity.

Problems of SFD neonates:

- feeding issues
- fetal distress, MSAF (meconium-stained amniotic fluid) and perinatal asphyxia
- meconium aspiration syndrome (MAS)
- hypothermia
- hypoglycemia
- infections

7.3 MANAGEMENT

Delivery of LBW babies

Ideally, an anticipated preterm delivery should be conducted in a facility with comprehensive EmONC services. Premature labor as well as IUGR are indications for referral of the pregnant mother to such health facilities. This in-utero transfer is safer, more desirable with a better outcome than transferring a neonate with LBW after birth.

Deciding the place where an LBW baby should be managed

All LBW babies with birth weight < 1500 grams and gestation age < 32 weeks should be referred to a higher center with NICU facility.

LBW babies with birth weight > 1500 and gestational age > 32 weeks can be managed at the health facility by the medical officers with close consultation with the pediatrician/ neonatologist.

The indications for hospitalization of a neonate < 2500 grams are the followings:

(a) birth weight less than 1800 gm

(b) an LBW neonate who is unable to feed from the breast or by cup and spoon

(c) A sick LBW neonate

Stable LBW babies with birth weight > 1800 grams and where breastfeeding has been established can be discharged home with close follow up and monitoring of feeding and weight gain by the medical officer.

Keeping LBW babies warm:
In the hospital:
Overhead radiant warmer or incubator may be used to keep the baby warm. In addition, skin to skin contact should be encouraged in the hospital.
Regular monitoring of axillary temperature should be carried out in all hospitalized babies.

At home
The room where a LBW baby is nursed should be kept warm.

Advise and encourage the mother and the family to give skin to skin contact at home as well as this care is a proven method to maintain thermal stability for the LBW neonates.

The baby should be clothed warmly. Two or three layers of clothes are generally required. If the room is not warm enough, a woolen sweater should also be put on. Feet should be covered with socks, hands with mittens and head with a cap. Besides, a blanket should be used to cover the baby.

If a young infant is maintaining normal body temperature, the trunk feels warm to touch and the soles and the palms are pink and warm. In early stages of hypothermia (cold stress), the trunk is warm but the soles and palms are cold to touch and the baby requires additional warmth immediately.

Nutrition and fluids:
Optimization of feed and good nutritional management is essential for immediate survival and for subsequent growth and development of LBW infants. Simple interventions such as early initiation and establishment of breastfeeding and avoidance of prelacteal feeds have been shown to improve their survival in a resource limited setting.

Unlike in term infants with normal birth weight who can feed directly from their mother's breasts, feeding in LBW infants is challenging because of the following:

1. LBW infants who are born premature do not have adequate feeding skills therefore they are not able to breastfeed directly and would require other modes of feeding methods.
2. They are prone to have significant illnesses which would require keeping them nil per orally in the first few weeks of life.
3. Because their gut is immature, they are more likely to experience feed intolerance necessitating slower increase in their oral feeding, adequate monitoring and treatment.

Mode for providing feeds and intravenous fluids
The modes of feeding and intravenous fluid of a LBW neonate depends on the gestation age, feeding skills of the individual baby, birth weight, gestation age and presence or absence of illness.

Maturation of oral feeding skills in LBW infants	
Gestational age	**Maturation of feeding skills**
< 28 weeks	No proper sucking efforts No propulsive motility in the gut
28 – 31 weeks	Sucking bursts develop No coordination between suck/swallow and breathing
32 – 34 weeks	Slightly mature sucking pattern Coordination between breathing and swallowing begins
< 34 weeks	Mature sucking pattern More coordination between breathing and swallowing

Breast milk is the ideal feed for the low-birth-weight babies.

All preterm infant's mothers should be counseled and supported in expressing their own milk for feeding their infants. Milk expression should ideally be initiated within hours of delivery for the infant to get the benefits of feeding colostrum. After that, it should be done every 2-3 hours to facilitate exclusive breast feeding and to maintain lactation in the mother. Expressed breast milk can be stored for about 6 hours at room temperature.

Sick infants are usually started on intravenous fluids. Enteral feeds should be initiated as soon as they are hemodynamically stable. Sepsis, unless associated with shock / sclerema, is not a contraindication for enteral feeding.

Enteral feeding should be initiated immediately after birth in healthy LBW infants with the appropriate feeding method determined by their gestation age and oral feeding skills.

Maturation of oral feeding skills in LBW infants			
Age	**GA 28 – 31 weeks**	**GA 32- 34 weeks**	**GA > 34 weeks**
Initial 24 hours of life	OG/NG feeding with IVF	Gavage	Direct breastfeeding. If not satisfactory, give EBM via cup and spoon
After 1 – 3 days	Gavage	EBM via cup and spoon	Direct breastfeeding
After 1 – 3 weeks	EBM via cup and spoon	Direct breastfeeding	Direct breastfeeding
After 4 – 6 weeks	Direct breastfeeding	Direct breastfeeding	Direct breastfeeding

The traditional way of deciding the initial feeding method in LBW infants based on their birth weight is not ideal because the feeding ability depends mainly on gestation rather than birth weight. However, not all infants born at a particular gestation would have the same feeding skills. Therefore, every neonate should be evaluated for the oral feeding skills expected for the gestational age and decide the feeding method accordingly.

Breastfeeding requires effective sucking, swallowing, and proper coordination between sucking/ swallowing and breathing. These complex skills mature with increasing gestation

All stable LBW infants should be put on their mother's breasts, irrespective of their initial feeding method. The immature sucking observed in preterm infants born before 34 weeks might not meet their daily fluid and nutritional requirements but helps in the rapid maturation of their feeding skills and improves the milk secretion in their mothers (non-nutritive sucking).

Note:

1. Baby may be fed by gavage (tube feeding) or cup and spoon feeds. Ensure use of expressed breast milk (Annexure 4). Start with small volume, and gradually build up.
2. When the baby is on gavage or cup and spoon feeds, it is important that he is put on the breast before every feed. Although the baby may not obtain much milk, it will help promote lactation and enable the baby to learn and develop oral feeding skills.
3. Transition the baby from one mode of feeding to another carefully and gradually.

4. The feeding of every baby should be individualized. The above recommendations should only serve as a broad guideline.

Most LBW babies with gestational age > 34 weeks and birth weight more than 1800 grams are able to feed directly from the breast. However, some of them may not be able to suck satisfactorily during the first few days of life. During this period, the feeds may be provided by cup and spoon.

Your Facilitator will now conduct a DRILL ON MODE OF FEEDING

Enteral feeds

Amount and scheduling of enteral feeds

The daily total fluid requirement for all LBW infants irrespective of their mode of feeding is given below. In a stable and growing LBW baby, daily intake of feeds should be gradually built up to 180-200 ml/kg/day. LBW babies should be fed every 2-3 hours with the first feed started as early as possible. LBW babies may take longer on the breast as compared to their normal weight counterparts.

Total fluid requirement of LBW neonates according to birth weight and day of life.

Age (days)	Birth weight & total fluid requirement (ml/kg/day)	
	>1500 g	< 1500 g
1	60	80
2	80	95
3	100	110
4	120	125
5	140	140
6	150	150
7 onwards	180	180

Techniques of methods of feeding

Gavage feeds

For gavage feeding, feeding catheter (Fr 5 to 8) is required for nasogastric or orogastric placement.

For nasogastric catheter insertion, the length of the catheter to be inserted is measured from the external nares to the tragus of the ear, and from there to the xiphoid process. For the orogastric catheter insertion, the distance between angle of mouth to tragus of ear and then the xiphoid process is the length of the catheter to be inserted from the mouth.

During nasogastric or orogastric insertion, the head is slightly raised and a wet (not lubricated) catheter is gently passed through the nose or mouth down through the esophagus to the stomach. Its position is verified by aspirating the gastric contents, and by injecting air and auscultation over the epigastric region. At the time of feeding, the outer end of the tube is attached to a 10 ml syringe (without plunger) and milk is allowed to trickle by gravity. At the end, about 2 ml of sterile water should be injected to rinse the tube. The baby should be placed in the right lateral position for 15 to 20 minutes to avoid

regurgitation. The nasogastric or orogastric tube may be left in situ for 2 or 3 days. While pulling out a feeding tube, it must be kept pinched and pulled out gently while applying constant negative pressure with a syringe to avoid trickling of gastric mucus into the trachea.

In premature babies, gavage feeding should be slowly increased because of the risk of developing necrotizing enterocolitis (NEC) and should be monitored carefully. Before every feed, the abdominal girth (just above the umbilical stump) should be measured and residual feed should be aspirated and measured. If the abdominal girth increases by more than 2 cm from the baseline or if the pre-feed aspirate is more than 25 percent of the last feed, the baby should be evaluated for NEC and must be kept nil per orally till abdominal distension improves and no new symptoms develop.

Cup-spoon feeds

Feeding with a cup and spoon has been found to be safe in LBW babies. This mode of feeding is a bridge between gavage feeding and direct breastfeeding. Since the neonates with a gestation of 32 to 34 weeks have a slightly mature sucking pattern and the coordination between breathing and swallowing begins to develop, they will be able to feed via this method.

Technique of cup and spoon feeding.

- Take baby in the lap and in semi-upright position with head well supported
- Place the spoon with the breast milk to the baby's lips and rest the spoon lightly on the lower lip.
- Touch the edge of the spoon to the outer parts of the upper lip.
- Tip the spoon so that milk just reaches the lip.
- Do not pour milk into the baby's mouth (this can cause aspiration).
- Continue feeding in this manner till the desired amount has been fed.
- Burp the baby.
- Place in the right lateral position with the head supported a little higher than the rest of the body.

Baby may also feed directly by cup.

If the baby does not actively accept and swallow the feed, try gentle stimulation. If he is still sluggish, do not insist on this method. It is better to switch back to gavage feeds till the baby is ready.

Adequacy of nutrition

The key measure of optimal feeding is the weight pattern of the baby. A preterm LBW baby loses up to 1 to 2 percent weight every day amounting to 10 percent cumulative weight loss during the first week of life. Birth weight is regained by day 10- 14. SFD-LBW babies who are otherwise healthy also lose 10% of their weight in the first week of life and their birth weight should be regained by day 7- 10.

Optimal feeding is indicated by regaining of the birth weight at expected days of age and then gaining around 15- 20 grams/kg/day (at least 200-300 grams/ week), adequate bowel and bladder movement, adequate sleep and no irritability.

All LBW babies should be weighed daily and length and OFC should be measured weekly till they are discharged from the hospital. Weekly weight monitoring is done till they reach a body weight of 2 – 2.5 kg and after that, it should be monitored monthly at the MCH unit.

Excessive weight loss, or inadequate weight gain indicates inadequate feeding, cold stress, excessive insensible water loss or systemic illness like sepsis.

Vitamin supplements
All LBW babies should receive intramuscular vitamin K 0.5 mg at birth.

All LBW babies (1500 grams to 2499 grams) should receive:

- vitamin D, 400 IU OD which is started at 2 weeks of age (when they are on full enteral feeds) and is continued till 1 year of age.
- elemental iron (2 mg/kg/day) which is started at 4 weeks of life and is continued till 1 year of age.

Vaccinations in LBW babies
The vaccination schedule for healthy and clinically stable LBW babies should receive all vaccinations routinely as per the schedule at the same chronologic age as term and normal weight infants except live vaccines.

For Hepatitis B vaccine at birth, will depend on the maternal HBsAg status and birth weight of the baby:

1. Maternal HBsAg negative status and birth weight > 2kg: should receive the Hep B vaccine within 24 hours of birth
2. Maternal HBsAg negative status and birth weight < 2 kg: should receive Hep B vaccine on discharge or at 1 month of chronological age (whichever is earlier)
3. Mother HBsAg either **positive or UNKNOWN** status, give birth dose of Hep B vaccine **irrespective of birth weight** along with HBIG.

BCG vaccine should be given once the baby reaches 2 kg.

7.4 Discharge and Follow up

LBW babies can be discharged when:

- breastfeeding has been established
- gaining weight for 3 consecutive days
- no signs of illness
- is able to maintain normal body temperature when roomed-in with mother
- mother is confident of taking care of the baby

Counseling at Discharge
Mother and family must be provided counseling for care of LBW at home. They should be informed about:

- providing exclusive breast milk to the baby
- how to keep baby warm at home
- identifying ‘danger signs” for seeking medical help
- scheduled visits for assessing growth, monitoring illness and providing immunization. These visits should be at weekly intervals till the infant reaches 2500 gm.
- mother must be informed about her nutrition and health.

EXERCISE 5

1. Define Low birth weight. What proportion of babies would LBW in globally?

2. Enumerate 4 physical features that can help differentiate a preterm from a term LBW.

3. Enumerate problems of SFD LBW neonates.

4. Calculate the total fluid requirement of a 1500 gm baby who is 6 days old.

5. How will you initiate feeding in a 3 days old neonate who was born at 32 weeks of gestation with a birth weight of 1400 grams?

SECTION 8: NEONATAL TRANSPORT

If the baby needs to be transferred to a higher health facility, or brought from a primary health center (PHC) or to a different service unit within the same facility (e.g. from the delivery room to the newborn special care unit), ensure a safe and timely transfer. It is important to prepare the baby for transfer, communicate with the receiving or sending facility, and provide care during transfer.

8.1 Learning Objectives

After completion of this section, you should be able to:

- identify babies who need referral
- provide counseling and family support
- prepare and organize referral
- provide pre-referral stabilization and advice enroute

8.2 Referral and Transport

The success of transportation of a sick neonate depends on early identification, stabilization, referral and care during transport.

Indications of transfer to higher facility/ tertiary care center

- Birth weight < 1500 g
- Gestational age < 32 weeks.
- Respiratory distress (RR > 60 per minute or grunting/retractions) requiring ventilator support
- Coma, encephalopathy, refractory convulsions
- Severe Perinatal asphyxia
- Abdominal distension/bilious vomiting/bleeding per rectal
- Shock not responding to fluid challenge and vasopressors
- Severe jaundice needing exchange transfusion
- Major congenital malformations e.g. Tracheo-esophageal fistula, diaphragmatic hernia, meningomyelocele etc

Pre transport preparation

Assessment

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

Stabilize the neonate

Stabilize with respect to temperature, airway, breathing, circulation and blood sugar. Give first dose of antibiotics, injection ampicillin and gentamicin whenever indication is present

Write a referral note

Write a complete referral note providing details of the baby's condition, treatment given to the baby and the reasons for referral.

Encourage mother to accompany

Mother should accompany the baby for breastfeeding and warmth 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 whenever required to provide care to the baby enroute, and to facilitate transfer to the referral facility.

Communication

» Explain the condition, the prognosis and the reasons for transfer of the baby

» Inform the referral facility (Emergency department/ ward) prior to sending the baby.

» Communicate with the concerned specialist/doctor at the referral facility prior to referral and request for feedback.

Ensure warm transport

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

1. **Transport incubator:** This is the most preferred method to transport sick baby
2. **Skin to skin care** This is also an effective, safe and convenient method.
   - Baby is wearing a cap and a napkin
   - Baby is placed facing the mother in skin-to-skin contact between breasts
   - Baby's back is covered by cloth or a gown/ 'kabney' and secured by tying it at the back of the person providing skin-to-skin contact.

[The skin-to-skin contact can also be provided by the father or any other family member].

3. **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.
4. **Improvised method:** Polythene covering can be used for ensuring temperature stability during transport of preterm babies.

The use of a hot water bag (rubber) is not recommended because of considerable risks of accidental burns to the baby if it is not wrapped properly and remains in direct contact with the baby's body.

8.3 Provide other care during transportation

The accompanying person should be explained to ensure the following:

1. **Ensure that the feet are warm.**
   - 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, remove the soiled napkin, dry the baby and put on a dry and clean napkin immediately.
2. **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 required.

3. Check breathing

- Watch the baby's breathing.
- If the baby stops breathing, inform the accompanying health care professional immediately and provide tactile stimulation to the soles to restore breathing.

4. Provide feeds

- Breast feed if the baby is active.
- If the baby is unable to breastfeed, an alternative feeding method must be used.

8.4 Family support

One of the most important and often very difficult aspects of transport is the emotional support of the parents and the family. Hospitalization and the need for referral to another health facility is a major stress and can send the parents and the entire family into an emotional and financial crisis.

Communicating with them at every stage, calmly accepting emotional outbursts and reassuring the parents that their baby is being cared for can reduce parental anxiety.

Some of the interventions to support the family and reduce the stress which must be incorporated into the transport process are:

1. Allow parents to see and touch their baby prior to transport.
2. Information about the receiving hospital including location etc.
3. Consider maternal transfer along with the baby whenever possible.

EXERCISE 6

1. What are the indications of referral to a higher health facility?

2. What are the various components of "Neonatal transport"?

EXERCISE 7

Case Study 1:

1. A baby is delivered at full term at your hospital. The baby cries immediately at birth and was handed over to you. How will you proceed further?

2. The baby weighed 2.8 kg with no obvious signs of sickness or malformations. What is your assessment? What should be done now?

3. You visit the baby at 2 hours of age. What would you ensure at this stage?

4. You visit the baby at 24 hours of age, the mother complains that she has very little breast milk. What would you advise?

5. What other signs should be looked for at 24 hours of age?

Case Study 2:

1. A baby was delivered vaginally at home at 33 weeks of gestation. The baby weighed 1600 grams and there was no perinatal birth asphyxia. The baby was brought into your hospital at 1 hour of age and the axillary temperature was 35-degree C.

   What is your diagnosis?

   What immediate measures will you take to manage this baby?

2. At 3 hours of life, the temperature was normal. The baby was active with no respiratory distress but did not suck well at the breast, nor did he accept feed with a cup and spoon. How would you provide fluid & nutrition to this baby?

3. At day 3 of life, the baby weighed 1550 grams, feeding via cup and spoon were tried which the baby accepted well but sucking at the breast was poor. How will you feed the baby (quantity and frequency)?

4. What advice should be given to the mother to ensure lactation?

5. When will you discharge this baby?

6. The baby is being discharged on day 10 with a body weight of 1800 grams. What advice will you give regarding the mother and baby?

7. The baby returns for follow up on day 28. The weight of the baby is 1850 gm. How would you manage?

Case Study 3:
A 7-day old newborn is brought in with complaints of fast breathing and inability to feed at the breast. The weight today is 2250 grams as against 2450 grams at birth. The temperature is 36°C, respiratory rate is 80/min with moderate retractions and grunt but no cyanosis.

1. What is your diagnosis?

2. How will you manage the baby?

Case Study 4:
A baby born at 35 weeks of gestation was feeding well. On day 5 of life, he developed discharge from the umbilicus followed by refusal of feeds and lethargy the next day. He vomited twice, had a feeble cry and on the way to the hospital had a convulsion.

At the hospital:
- Weight was 2400 grams
- Temperature was 37°C
- Drowsy
- RR-56/min, no retractions, no grunt
- CRT-5 seconds.
- Abdominal distention and poor bowel sound with a normal fontanelle.

1. What is your diagnosis?

2. How will you manage this baby?

Annexure 3: Breastfeeding Assessment

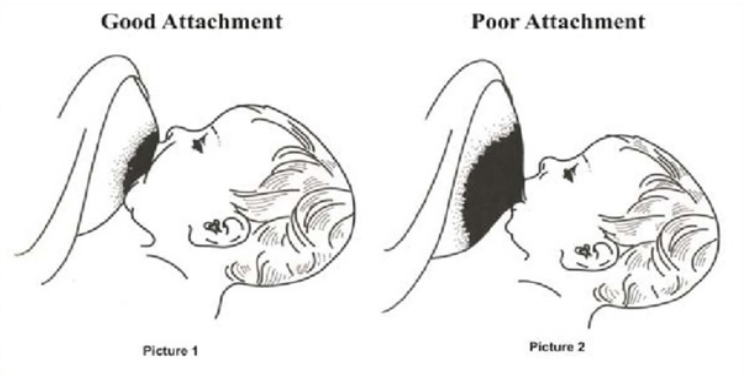
» Assess breastfeeding in all newborns: Evaluate every newborn for breastfeeding to ensure proper nutrition and health.

» Ask the mother if the infant has breastfed in the previous hour. This helps assess feeding frequency and identify any potential issues with breastfeeding.

» If the infant has not fed in the previous hour, ask the mother to put her infant to the breast. Observe for at least a few minutes to assess latching and positioning.

Check attachment of baby on mother's breast

Four Signs of Good Attachment
Baby's mouth is wide open
Lower lip is turned outwards
Baby's chin touches mother's breast
More areola visible above than below



Ensuring good attachment is essential because poor attachment can cause:

» pain or/and sore nipple.

» insufficient breast milk removal which can result in breast engorgement.

» insufficient milk intake leaving the baby unsatisfied and irritable after feeding.

» reduced milk production leading to poor weight gain.

» parental anxiety

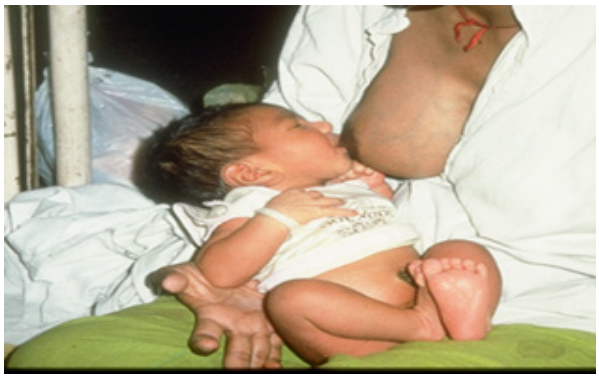
If attachment is not good, check for correct positioning

Signs of correct position of the baby while breast-feeding are:

Four Signs of Good Attachment

Baby's body is well supported.
The head, neck and the body of the baby are kept in the same plane.
Entire body of the baby faces the mother.
Baby's abdomen touches mother's abdomen

Good position of breastfeeding



Poor position of breastfeeding

Check for baby's sucking

Effective sucking: few slow deep sucks followed by a pause

If not sucking well, then look for ulcers or white patches in the mouth (thrush).

Video on breastfeeding

Annexure 4: Breast Milk Expression

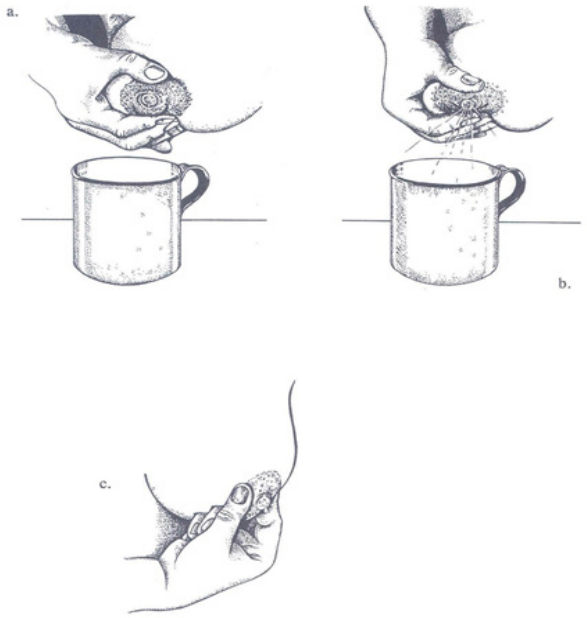
It is useful for all mothers to learn how to express and store their breast milk.
Expression of breast milk is required in the following situations:

- To maintain milk production and feed a baby who is premature, low birth weight or sick and unable to breastfeed.
- Working mothers can express and store the breast milk to ensure for exclusive breastfeeding when they go to work
- To relieve breast problems e.g. engorgement.

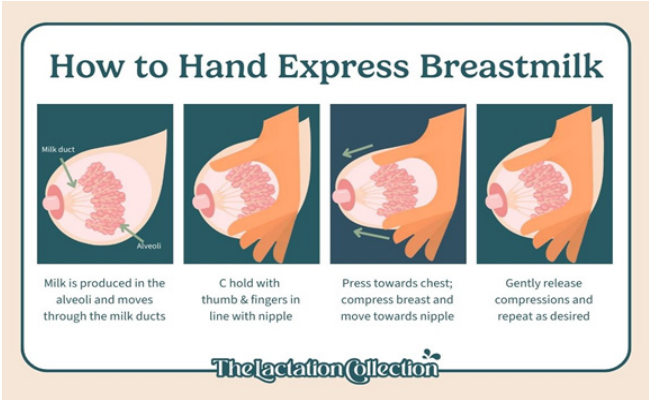
Technique of expression

- Wash her hands with soap and water thoroughly.
- Sit comfortably, and hold the clean container near the breast.
- Put the thumb on her breast above the nipple and areola, and her index finger on the breast below the nipple and areola, opposite to the thumb. She supports the breast with her other fingers.
- Press her thumb and index finger slightly inwards towards the chest wall.
- Press her breast behind the nipple and areola between her finger and thumb. She must press on the lactiferous sinuses beneath the areola. Sometimes in a lactating breast it is possible to feel the sinuses. They are like peanuts. If she can feel them, she can press on them and release and continue the rhythm. At first no milk may come, but after pressing a few times, milk starts to drip out. This should not be painful. If it hurts, then the technique is wrong.
- Press the areola in the same way from the sides, to make sure that milk is expressed from all segments of the breast.
- Avoid rubbing or sliding her fingers along the skin. The movements of the fingers should be more like rolling.
- Avoid squeezing the nipple itself. Pressing or pulling the nipple will not express milk.
- Express one breast for at least 3-5 minutes until the flow slows, then express the other side and then repeat on both sides.

a. Place finger and thumb each side of the areola and press inwards towards the chest wall.
b. Press behind the nipple and areola between your finger and thumb.
c. Press from the sides to empty all segments.



Technique to express breastmilk by hand



» Explain that it may take 20-30 minutes to express breast milk adequately. Having the baby close or handling the baby before milk expression may help the mother to have a good let-down reflex. It is important not to try to express in a shorter time. To stimulate and maintain milk production one should express milk frequently, at least 8 times in 24 hours.

Storing expressed breast milk

» Wash the container thoroughly with soap and water.

» Cover the container of expressed breast milk (EBM) with a clean cloth or a lid.

» EBM can be kept at room temperature for 6 hours, or in the refrigerator for 24 hours or in the deep freeze at -20°C for 3 months.

» EBM stays in good condition longer than animal milk because of the protective substances it contains. It is not advisable to boil the EBM.I f it needs to be warmed, place the container in a bowl of warm water.

» Gently shake the container to recombine the separated fat globules with the rest of the milk before feeding.

» Feed with a cup or spoon and discourage feeding with a bottle.

Annexure 5: Clinical skills

1. Temperature recording and thermal control

Learning objective

Upon completion of this session, each participant should be:

1. able to record axillary temperature in a newborn
2. able to clinically assess hypothermia and normal temperature.
3. well versed with ways to achieve thermal control during domiciliary, institutional care and during transport.

Requirements

» thermometer
» A mannequin/newborn
» Cotton Swabs
» Cotton cloth
» A wrist watch
» Mother or any caregiver to demonstrate kangaroo mother care

Rationale

Temperature recording is a simple bedside tool to assess the baby's temperature and ascertain the degree of hypothermia

Procedure

1. Dry baby from head to toe, on the back, front, axillae and groin and discard wet linen.
2. Wrap the baby using a cotton cloth to keep warm. Spread the sheet, fold one corner on itself, place the baby's head on the folded corner so as to cover the head till the hairline on forehead. Cover over the right shoulder & tuck on the left side. Fold from the foot end & tuck beneath the chin & finally cover over the left shoulder and tuck on the right side.
3. Tactile assessment
   - Wash hands and dry them
   - Rub them together to warm them
   - Touch the baby's soles & palms with the dorsum of your hands
   - Now touch the baby's chest using the dorsum of your hands
   - If both are warm-normothermic; if periphery is cold but chest is warm – cold stress: if both are cold – hypothermic baby.
4. Record temperature
   - Place the baby supine or on the side
   - Ensure that the armpit is dry
   - Abduct arm at shoulder. Clean the thermometer with cotton swab and place the bulb of the thermometer in the apex of the axilla
   - Hold arm in adduction at shoulder & flexion at the elbow for three minutes.
   - Remove thermometer & read temperature

5. Kangaroo Mother Care
   - Ask mother or caregiver to wear a loose shirt or blouse
   - Unbutton top 2-3 button & slip baby with only the napkin on, inside the shirt.
   - Ensure skin to skin contact between baby & caregiver
   - Tie a belt or string at the belt level to prevent the baby from slipping down
   - Cover both the mother and baby with a woolen shawl or sheet
   - Encourage frequent breastfeeding.

2. Infection prevention

Learning objective

Upon completion of this session each participant should be able to:

» demonstrate steps of hand washing
» clean and disinfect newborn care equipment and environment.
» provide routine eyes & cord care
» advise mothers regarding maternal & baby hygiene.

Requirement

» Soap
» Running water
» Hand washing chart
» Disposable delivery kit
» Cord clamp
» Cord stump
» Spirit
» Sterile Cotton
» Sterile blade
» Mannequin
» Disinfectant solution
» Bag & mask
» Laryngoscope
» Thermometer
» Radiant warmer
» Oxygen hood
» Skin probe
» Cots/mattresses
» Bed sheet
» Suction machine

Rationale

Prevention of infection in newborns is easily achievable by simple measures like hand-washing and keeping the baby's environment clean. Prevention is much more rewarding than treating neonatal sepsis.

Procedure

Hand washing

» Wet hands and apply soap

» Rub hands, first palms & fingers, then back of hands followed by rubbing of thumb, rub fingertips in the palms & lastly wrists

» Keep elbows dependent & rinse the hands in the same order

Equipment disinfection

i) Self inflating bag & mask

» disinfect daily and sterilize weekly

- dismantle the parts of the bag and mask and clean with detergent daily and after each use
- Sterilize by immersing in 2% gluteraldehyde, rinse with clean water and dry with sterile linen (washed and sun dried) (weekly)
- Reassemble the parts

ii) Laryngoscope

» Wipe blade with 70% isopropyl alcohol after use.

iii) Thermometer

» Ideal to have separate for each baby

» Wipe with alcohol after use

» Store in bottle containing dry cotton

iv) Oxygen hood

» Clean every day or after use with detergent

v) Cots and mattresses

» Clean everyday with 3% phenol or 5% Lysol

» Replace mattresses whenever surface covering is broken

vi) Suction apparatus

» Suction bottle should contain 3% phenol or 5% Lysol

» Suction bottle should be cleaned with detergent and changed daily

» Change the tube connected to the bottle daily. Flush with water and dry

» Soak for disinfection in 2 % gluteraldehyde

» Ideally suction catheters should be disposable ones.

vii) Feeding utensils

» Cup and spoon should be boiled for at least for 15 min before use.

» Feeding tubes should be preferably disposable ones.

Care of Cord & eyes

» Cord should be kept dry and nothing should be applied on it Keep cord dry

» Eyes should be cleaned from medial to lateral side with separate sterile saline soaked cotton swabs for each eye.

3. Feeding methods with expressed breast milk

Learning objectives

Upon completion of this session, each participant should be able to:

» advise mother on manual expression of breast milk.

» provide gavage feeds to the baby

» provide cup and spoon feeding to the baby

» advise mother regarding therapy for retracted nipples.

» allay fears & anxiety of a lactating mother regarding the production , adequacy and benefits of breast milk.

Requirements

» Lactating mother / Standardized mother with breast dummy

» Cup, spoon and bowl

» 6 fr & 8 fr feeding tubes

» 10 ml & 5 ml syringes

» Adhesive tape

» Mannequin

» Blade

» Stethoscope

Rationale

Benefits of breast milk are many and exclusive breast feeding should be encouraged and established before discharge from the hospital.

Procedure

Manual expression of breast milk

» Ask mother to sit comfortably, lean forward and support the breast over a bowl using both hands

» Position the thumb and the forefinger at the margin of areola on both sides & press the breast tissue into the ribcage

» Maintaining the backward pressure start bringing the thumb & the forefinger of each hand towards the nipple

» Repeat the same several times till no further milk can be expressed.

Gavage feeding

» Take 6 fr or 8 fr catheter depending on the gestation and weight

» Measure length from angle of mouth to tragus to xiphisternum

» Insert the tube from mouth till the desired length has been introduced

» Check position using a syringe & a stethoscope to auscultate the gush of air

» Tape the tube & close outer end after removing the syringe

» To instill feed, take a 10 ml syringe barrel without the plunger and insert nozzle into the open end of the feeding tube.

» Check residue at next feeding session & proceed to feed

Cup and spoon feeding

» Take the baby in the lap, hold the baby semi upright with the head well supported.

» Stimulate the angle of the mouth and rest the spoon with 1-2 ml milk at the angle of the mouth.

» Pour milk slowly into the open mouth & watch for swallowing. Gently stroke behind the ear or on the sole.

» Continue feeding in this manner till the desired amount has been fed.

» Burp the baby

» Place in the right lateral position with the head supported a little higher than the rest of the body.

Treatment of Retracted nipples

» Take a 10 ml syringe, cut the nozzle end transversely using a new blade. Take care that the syringe barrel's cut margin is not ragged.

» Insert plunger into the barrel from the cut nozzle end

» Place the barrel's open end on the areola including the nipple in the barrel & pull back the plunger as far as possible.

» Repeat this several times & after that put the baby to the breast to encourage suckling.

4. Assessing capillary refill time (CRT) & securing venous access:

Learning objective

Upon completion of this session each participant should be able to:

i) assess perfusion by using CRT method

ii) catheterize the umbilical vein

iii) demonstrate peripheral venous access on an improvised model.

Requirements

i) Stopwatch/wrist watch

ii) Umbilical cord 1 ft

iii) Blade

iv) Forceps

v) Normal saline

vi) 2ml/5ml syringe

vii) 5fr. feeding tube or umbilical venous catheter

viii) Splint, straw,
ix) IV cannula
x) Polythene sheet
xi) Spirit
xii) Iodine
xiii) Gloves
xiv) Soap & Water
xv) adhesive tape

Rationale

i) CRT is a simple sign to assess peripheral perfusion of a baby. A CRT of >3 seconds denotes poor peripheral perfusion. This can also be prolonged in hypothermia due to peripheral vasoconstriction. If the baby is hypothermic, CRT should be reassessed after the baby has become euthermic.

ii) Umbilical venous access is an IV access which can be secured quickly for infusing volume expanders & drugs during resuscitation.

iii) peripheral IV access: To provide parenteral fluids & medications

Procedure

CRT assessment

» Wash and dry hands
» Press the forehead or sternum using index finger /thumb for 3 sec, release and look at the blanched area for return of color. Note the time taken for the return of color. Normal CRT is up to 3 sec
» CRT>3 secs indicate poor perfusion, however in presence of hypothermia interpretation may be fallacious.

Umbilical Venous Cannulation

» Wash hands & dry.
» Wear gloves
» Connect syringe to the catheter, flush the catheter with saline & keep ready
» Take a small piece (about 10 cm long) of fresh umbilical cord in a kidney tray
» Hold the cord with the forceps
» Cut the umbilical cord transversely and cleanly with a sterile blade.
» Identify the 2 arteries & 1 vein. The umbilical vein is a thin-walled patulous large opening in contrast to the arteries which are thick walled and much smaller in caliber. (In the normal position, the umbilical vein is at 11-12 'O' clock position)
» Insert the saline filled catheter (3.5, 5 or 6Fr) gently into the vein (backflow of blood can be appreciated in a live baby by pulling at the plunger)
» In actual situations the length of the catheter to be inserted is usually 1-2 cm below the skin till there is a free flow of blood.
» Inject the drug or fluid .
» Pinch the catheter & remove.

» Press the cord to prevent bleeding.

i) Peripheral IV Access

» Select the vein (dorsum of hand/foot)
» Wash hands and dry
» Wear gloves
» Prepare skin- betadine, spirit, let dry between applications
» Hold the limb proximally to make the vein prominent
» Pierce skin distal to the intended site of puncture
» Insert needle into the vein (feeling of give way)
» Ensure free flow
» Secure the cannula by adhesive tape
» Secure splint
» Inject fluid/medications
» Check distal limb for adequacy of circulation

Annexure 6: Equipment demonstration

Radiant warmer

Learning objective

Upon completion of this section the participant should:

i) know the parts of the warmer

ii) be able to demonstrate the function of the warmer.

iii) know the dangers associated with its usage and should be able to manage minor equipment maintenance.

Parts

i) Bassinet

ii) Quartz rod

iii) Skin probe and air probe

iv) Control panel

v) Heater output

Functioning

i) Connect to main switch

ii) For pre-warming, keep heater output to maximum.

iii) Place baby on the bassinet

iv) Connect probe

v) Read temperature on display

vi) Adjust heater output

- If below 36oC; High
- If between 36-36.5oC; Medium
- If between 36.5-37.5oC; Low
- If >37.5oC; remove baby/switch off warmer.

vii) Measure temperature 1/ 2 hourly for 2 hours & then 2 hourly.

Cleaning and disinfection

i) Glutaraldehyde 2 %

ii) Soap/detergent(daily)

Dos and Donts

i) Do check temperature ½ hourly for 2 hours and then 2 hourly.

ii) Do ensure probe is connected

iii) Do ensure side walls are fastened up

iv) Do ensure adequate clothing in case of electricity failure

v) Do not leave the baby unattended.

Troubleshooting

i) Check fuse

ii) Check plug

iii) Check cords

Side effects

i) Hyperthermia

ii) Hypothermia

Maintenance

i) Calibration

ii) Annual Maintenance Contract/ maintain log book

2. Phototherapy unit

Learning objective

Upon completion this section the participant should:

i) know the parts of a phototherapy unit.

ii) be able to understand and demonstrate the functioning of a phototherapy unit

iii) be able to provide phototherapy to a baby

Parts

Tubes	-	6 numbers
Color	-	White (2) and blue (4)
Watt	-	20
Irradiance	-	4-8uw/cm2/nm
Duration	-	3 months
Wavelength	-	420-460nm
Distance	-	30-45 cms

Procedure

i) Connect to the main switch.

ii) Switch on the unit & check that all tube lights are working

iii) Place baby naked on the unit

iv) Cover the eyes and male genitalia

v) Change position frequently (every 2 hours)

vi) Increase fluid intake

- Breast feed more frequently
- Spoon/Gavage/IV: Increase by 20 ml/kg/day

vii) Provide continuous phototherapy

viii) Do not cover the baby during phototherapy.

Cleaning and disinfection
Glutaraldehyde 2%
Soap/detergent

Dos and Don'ts
i) Do cover eyes
ii) Do check temperature: prevent hypo/hyperthermia
iii) Do check weight daily
iv) Do frequent breastfeeding/increase total fluid requirement
v) Do reassess frequently.

Troubleshooting
i) Check fuse
ii) Check plug
iii) Check Cord
iv) Change tube if flickering or ends are blackened

Ineffective phototherapy could be due to:
i) baby covered and not given continuous phototherapy
ii) nonfunctional tubes (some/all)
iii) flickering light
iv) tube ends have black circles

Side effects
i) Hyperthermia/Hypothermia
ii) Increased insensible water loss

Maintenance
i) Change tubes if ends are black or every three months
ii) Check flux (if possible)
iii) Annual Maintenance Contract/ maintain log book

3. Suction machine

Learning objectives

Upon completion of this section the participant should know:

i) the parts of a suction machine

ii) how to use a suction machine and

iii) how it is sterilized.

Parts

i) Suction Catheter

ii) Suction tubing

iii) Suction bottles

Type

i) Dee Lee's suction trap

ii) Foot operated

iii) Electric (if available)

Procedure

i) Connect to the main switch on the unit and occlude distal end to check the pressure. Ensure it does not exceed 100 cm of water

ii) Take disposable suction catheter and connect to suction tubing

iii) Perform suction gently

iv) Switch off the suction machine.

Cleaning and disinfection

i) Wash suction bottle with soap & water

ii) Change solution every day

Dos and Don'ts:

i) Do suction gently

iii) Do use only disposable suction catheters

iv) Do check adequacy of suction pressure

v) Do not do vigorous & deep suction

Troubleshooting

i) Check fuse

ii) Check cord

iii) Check for leakages in the bottle/tubing

Side effects

i) Local trauma
ii) Bradycardia
iii) Apnea
iv) Infection

Maintenance

i) Check for adequacy of suction pressure
ii) Change tubing if leaky or broken
iii) Annual Maintenance Contract/ maintain log book

4. Self inflating bag and mask

Learning objectives

Upon completion of this section the participant should:

i) know the parts of a bag & types of masks
ii) be able to demonstrate the use of a bag
iii) know how to clean a bag & mask

Parts

i) Body of the bag
ii) Oxygen inlet
iii) Air inlet
iv) Safety valve/pressure release valve.
v) Patient outlet
vi) Valve assembly
vii) Ensure adequate seal
viii) Perform PPV-Check for chest rise.

Procedure

i) Assemble bag
ii) Check bag
iii) Connect to oxygen source
iv) Attach the reservoir
v) Fix appropriate size mask
vi) Apply mask on mannequin

Indications

i) Apnea or gasping respiration
ii) HR<100/min
iii) Central cyanosis despite free flow oxygen

Contraindications

i) Congenital diaphragmatic hernia

ii) Thick meconium-stained liquor

Cleaning and disinfection

i) Wash with soap and water daily

ii) Soak in glutaraldehyde 2% for 6 hours once a week

iii) Clean mask with spirit after each use

Dos and Don'ts

i) Do check bag prior to use

iii) Do choose appropriate size mask

iv) Do use enough pressure to obtain easy chest rise

v) Do check for adequacy of ventilation

- Chest rise, increase in HR, improvement in color
- Appearance of spontaneous respiratory effort

vi) Do check and maintain adequate seal

vii) Do not Perform overzealous PPV

Troubleshooting

i) Change bag

ii) Check for oxygen source

iii) Remedial actions for no chest rise

Maintenance

i) Clean and disinfect as per protocol

ii) Replace if damaged or leaky

5. Weighing Machine

Learning objectives

Upon completion of this section the participant should be

i) know how to calibrate the weighing machine

ii) be able to demonstrate the use of the weighing machine

Parts

i) Pan or baby tray

ii) Weight scale dial

Procedure

i) Wipe/clean the weighing pan
ii) Check for and adjust zero error
iii) Calibrate using a known weight
iv) Place baby with sheet
v) Note weight (a)
vi) Remove baby
vii) Weigh the sheet above (b)
viii) Subtract b from a (a-b)
ix) Record weight

Cleaning and disinfection

i) Clean with soap and water
ii) Wipe with spirit swab after each use

Dos & Donts:

i) Do always look for and adjust zero error
ii) Do always calibrate using a known weight
iii) Do remove excessive clothing
iv) Do record weight only when the needle is stationary & not oscillating.
v) Do not weigh baby naked
vi) Do not stack up line or other objects on the weighing pan when not in use

Troubleshooting

i) Place on a flat firm surface
ii) Calibrate before each use
iii) Record zero error if it cannot be corrected and account for it

Maintenance

i) Calibration
ii) Annual Maintenance Contract/ maintain log book

Annexure 7: Performa for Assessment of Sick Neonate

Name: _____ Age(days): _____ Sex: _____ Reg.No.:_____

Date of birth: _____+_ Time of birth: _____ am / pm Birth Weight: _____gms

Mother's name: _____MCH Reg.No.: _____

Present address: _____

Permanent address: _____

History

Antenatal History

Leaking PV: Present / Absent Duration _____(hrs)

Chorioamnionitis: Present / Absent

PIH: Yes / No Medications _____

Pedal Edema: Present / Absent Gestational Diabetes Yes / No

Maternal Immunization: Last Td date _____

Any other illness:_____

Place of Delivery: Institution / Home

Type of Delivery: Normal Vaginal/Forceps/Vacuum/Caesarean

Presentation: Normal/ Breech / other

Conducted by: _____

Condition of Baby at Birth: Normal / Depressed

Apgar score: _____

Need of Resuscitation: Y/N

Details of Resuscitation _____

Baby's History

- Poor suck / not able to feed
- Lethargy / decreased movement
- Seizure
- Diarrhea
- Jaundice
- Bleeding
- Vomiting
- Passage of meconium
- Passage of urine

Examination

Vitals: Temp: _____RR: _____HR: _____CRT: _____

Resp Distress: Nasal flaring/ grunting/retraction/ apnea/ cyanosis

Anterior Fontanelle: normal/ bulging

Pustules: less than 10, more than 10

Umbilical Discharge/ Redness: Present/ Absent

Ear Discharge: Present/ Absent

Pallor: Present / Absent

Jaundice: Present / Absent Till: Face / Chest / Abdomen / Hands & Feet

Abdominal distension: Present/ Absent

Activity: lethargy/ restless/ decreased body movement

Abnormal movement: seizure/ jitteriness

Systemic Examination:

CVS _____

Resp. _____

Abdomen_____

Provisional Diagnosis

_____

Plan of Management:

1. _____

2._____

3._____

4._____

5._____

6._____

Monitoring

Annexure 8: NEONATAL MONITORING CHART DURING TRANSFER

Name: Age/Sex: MCH Reg.No:
C/O: Address: Date and time of Referral:
DOB: Birth Weight: POG:
Apgar score:
Resuscitation at Birth: Yes/No Mode of delivery:
Body weight: Length: OFC: RBS at start of Journey:

FEEDING:

Type	NG size and date of insertion	Amount (ml)	Time /frequency	remarks

VITALS AND IO CHARTING:

VITALS					INTAKE (ml)				OUTPUT (ml)			
Time	TEMP	PULSE	RESP	SPO2	IVF	RATE	Amount	FEEDING	URINE	STOOL	VOMIT	ASPIRATE

MEDICATIONS:

TIME	NAME	ROUTE	REMARKS

RESUSCITATION during transfer: YES/NO
OXYGEN THERAPY: YES/NO
IF YES: Via hood/Prong/Mask
Litres /Min:

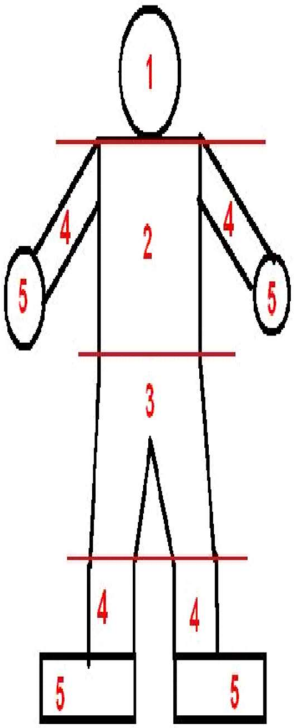
PROBLEM LIST:

1. Seizures
2. Vomiting
3. Others

NAME OF ESCORT: SIGNATURE:

DESIGNATION: PHONE NO:

Annexure 9: Clinical Assessment of Neonatal Jaundice



Kremer's Rule/Zones:

Zone	Bilirubin
1	5 mg/dl
2	10
3	12
4	15
5	>15

MODULE 3

Care of Sick Child

INTRODUCTION

A referral hospital receives sick children with diverse clinical presentations. Some of them are extremely sick and need emergency life saving treatment. The triage process and how to provide emergency treatment has already been discussed.

The sections (9-12) provide guidance for the management of common conditions in children from 2 months up to 5 years of age. These include diagnosis and management of children presenting with cough or difficult breathing, diarrhoea, fever and anagement of severe acute malnutrition in a hospital.

Learning objectives

- Management of common problems of sick children (2 months up to 5 years of age).
- Management of severe acute malnutrition in children in a district hospital.

SECTION 9:
CASE MANAGEMENT OF CHILDREN PRESENTING WITH COUGH OR DIFFICULT BREATHING

Cough and difficult breathing are common problems in young children. Most episodes of cough are due to the common cold, with each child having several episodes a year. This section provides guidelines for managing the important conditions that cause cough or difficult breathing in children aged 2 months to 5 years. The commonest severe illness presenting with cough or difficult breathing is pneumonia.

9.1 Learning objectives:

After completion of this section the participant should be able to:

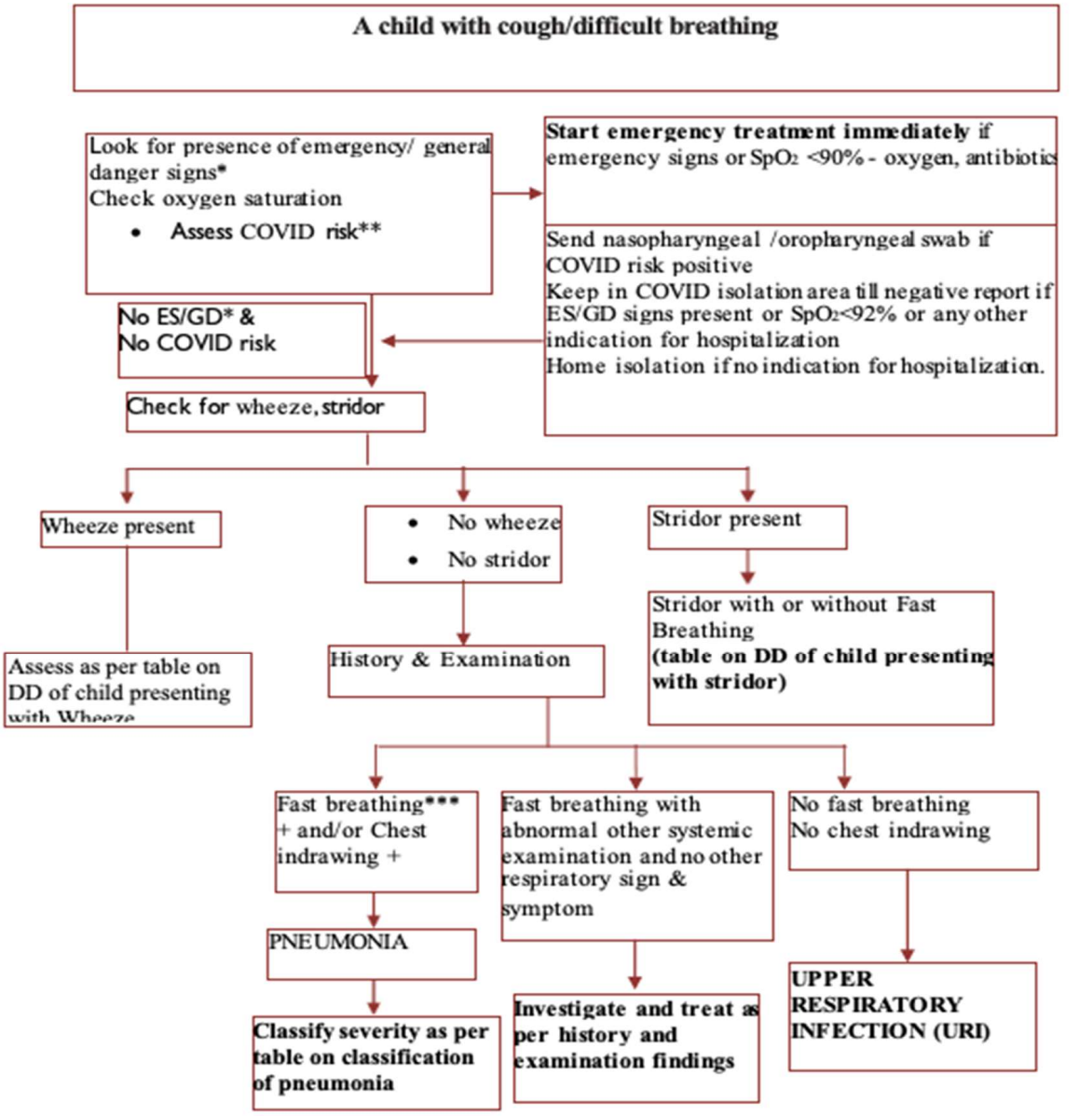
- assess a child with cough or difficult breathing
- manage pneumonia
- understand approach to a child presenting with wheeze
- manage acute asthma
- understand approach to a child presenting with stridor

9.2 History and examination:

For a child presenting with cough or difficult breathing take history and do examination as per given below:

History	Examination	INVESTIGATION
Enquire about following information: Cough » duration in days » paroxysms with whoops or vomiting or central cyanosis Exposure to someone with acute respiratory infections and tuberculosis in the family History of choking or sudden onset of symptoms Immunisation history Personal or family history of asthma.	**General physical** » Central cyanosis » Grunting, nasal flaring, wheeze, stridor » Head nodding (a movement of the head synchronous with inspiration indicating severe respiratory distress) » Raised jugular venous pressure (JVP) in older children » Severe palmar pallor **Chest** » Respiratory rate (count for 1 minute when the child is calm) » Lower chest wall indrawing » Apex beat displaced / trachea shifted from midline » Auscultation: coarse crackles, bronchial breath sounds or rhonchi, gallop rhythm/ murmur » Percussion signs of pleural effusion (stony dullness) or pneumothorax (hyper-resonance) **Abdomen** » Enlarged liver and spleen.	» Pulse oximetry (if available) – to guide when to start and stop oxygen therapy » Chest X-ray: in children with severe pneumonia, not responding to treatment or with complications, or associated with HIV

Chart 18: Approach to a child with cough/difficulty breathing



*Emergency/General Danger Signs (ES/GD): Not breathing at all or gasping, Obstructed breathing, Central cyanosis, Oxygen saturation <90%, Severe respiratory distress, Shock, Coma, Convulsions, Inability to breastfeed or drink or persistent vomiting (Initial management of children with emergency signs have already been covered in ELA1 Section 2).

** Fever with cough or loss of smell/taste or difficult breathing of less than 10 days or H/o contact with COVID case in last 2 weeks

***Fast breathing: ≥ 60 breaths/min in a child aged <2 months; ≥50 breaths/min in a child aged from 2 months up to12 months; ≥ 40 breaths/min in a child aged from 1year up to 5 years.

(Courtesy: F-IMNCI, Ministry of Health & Family Welfare, GOI, 2023)

Differential diagnosis of the child presenting with an airway or severe breathing problem

Diagnosis	In favour
Pneumonia	» cough with fast breathing and fever » lower chest wall indrawing » crepitations on auscultation
Asthma	» history of recurrent wheezing » prolonged expiration » wheezing or reduced air entry » response to bronchodilators
Foreign body aspiration	» history of sudden choking » sudden onset of stridor or respiratory distress » unilateral reduced air entry or wheeze
Retropharyngeal abscess	» slow development over days, getting worse » inability to swallow » high fever
Croup	» barking cough » hoarse voice » associated with upper respiratory tract infection
Diphtheria	» bull neck appearance of neck due to enlarged » lymph nodes » inflamed throat » grey pharyngeal membrane » no Penta/DTP vaccination
Congenital heart disease	» difficulty in feeding » central cyanosis, respiratory distress » heart murmur, basal crepitations » enlarged liver » failure to thrive
Pneumothorax	» sudden onset of respiratory distress » chest pain » Hyper-resonance on percussion » Shift in mediastinum

9.3 Pneumonia

The IMNCI algorithm classifies children with cough and rapid breathing as pneumonia and further grades the severity depending upon chest indrawing and other features of respiratory distress. However at a first referral facility this should be further assessed for other causes of rapid breathing, as listed in the Table below.

Differential diagnoses of a child presenting with acute onset difficulty breathing:

A. Respiratory causes 1. Pneumonia, 2. Asthma, 3. Bronchiolitis, 4. Effusion and Empyema, 5. Pneumothorax, 6. Viral croup, 7. Foreign body in the airways.
B. Non- respiratory causes 1. Congestive Heart Failure, 2. Raised IntraCranial tension e.g. Meningitis, 3. Metabolic Acidosis e.g. Diabetic Ketoacidosis, Renal failure.

Children with distress due to respiratory causes will have cough as an important symptom, while other causes usually do not have significant cough. It is important to rule out acyanotic congenital heart disease particularly in children who present with recurrent pneumonia and congestive heart failure which can present with respiratory distress. A careful systemic evaluation for a murmur, basal crepitations, hepatomegaly should be done and you should seek help from a more experienced person, when in doubt.

Consider the possibility of tuberculosis in a child with pneumonia if:

- child has fever and cough for more than 2 weeks,
- not gaining weight,
- exposure to TB contact and
- is not responding to appropriate antibiotic therapy.

The patient should be investigated for TB using chest radiograph, stool or gastric aspirate for AFB (GeneXpert) and Tuberculin test.

Pneumonia is usually diagnosed on the basis of fever, cough, fast breathing and signs of respiratory distress. You should use history, examination and investigations to arrive at the diagnosis.
It is important to differentiate cases with rapid breathing due to pneumonia from those with asthma or wheeze due to lower respiratory infections.

Children with wheeze and fast breathing and/or chest indrawing, particularly those with a past history of similar episodes should, therefore, be given a trial of rapid acting inhaled bronchodilator (up to 3 cycles).

Give the rapid-acting bronchodilator (salbutamol) by one of the following methods:

- nebulizer
- metered dose inhaler (MDI) with spacer device (Annexure 14)

In such a situation treat pneumonia with antibiotics only if there is no response to bronchodilators.

Chest X ray is not indicated routinely to establish diagnosis of pneumonia.

Indications for chest X-ray
a) Severe pneumonia, b) Where complications are suspected, c) Patient fails to respond to the antibiotic therapy, or d) Recurrent pneumonia. e) Diagnosis is not clear.

Community Acquired Pneumonia

The management of pneumonia is guided by the severity of the disease as given below:

Classification of the severity of pneumonia

Sign and symptom	Classification	Treatment
Any of the following signs: » central cyanosis » oxygen saturation <90% » severe respiratory distress (laboured or very severe fast breathing (RR>70 bpm) or severe lower chest indrawing or head nodding or stridor or grunting) » not able to drink due to respiratory distress.	**Severe pneumonia**	» Admit to hospital » Manage the airway » Give oxygen » Give recommended antibiotic » Treat high fever if present
» fast breathing » chest indrawing » crackles on auscultation	**Pneumonia**	» Give appropriate antibiotic for 5 days » Soothe the throat and relieve cough with a safe remedy » Treat high fever if present

Treatment of Severe Pneumonia

» Admit the child to hospital.

» Obtain chest Xray if available.

» In case of severe distress, stabilise and oxygenate the child before sending for radiography.

» CBC, Blood culture to be sent, where possible, in severely ill child

» Give antibiotics:

- Injectable Ampicillin (50 mg/kg/dose IM/IV every 6 hours) OR
- Benzylpenicillin (50,000 units /kg/dose every 6 hours) AND
- Gentamicin (5-7.5 mg/kg/dose IM/IV once a day).

» If the child responds well, the child may be discharged after 5 days to continue treatment at home with oral Amoxicillin 25 mg/kg/dose two times a day for a total course of 7-10 days.

» If the child does not improve by 48 hours, reassess and upgrade to injection Ceftriaxone (80 mg/kg/dose IM or IV once daily) for 7- 10 days.

» Whenever you are suspecting Staphylococcal pneumonia, add injection Cloxacillin (50 mg/Kg/dose, every 6 hourly) to any of the above choice of antibiotics.

Staphylococcal pneumonia is suspected if:

» there is a rapid progression of the disease, or

» there is Pneumatocele, or Pneumothorax, or Effusion on chest X-ray, or

» child has large pustules or abscess or infected scabies or

» post- measles pneumonia which is not responding within 48 hours to the initial therapy.

When the child improves, continue Cloxacillin orally 4 times a day for a total course of 3 weeks. Children with complicated pneumonia (Empyema) need longer therapy for 4-6 weeks.

» Give oxygen to maintain SPO2 above 90%.

» Give supportive care

- Ensure that the child receives daily maintenance fluids appropriate for the child's age. Encourage breastfeeding and oral fluids once the distress settles and the child is able to feed.
- If the child has fever (≥38.50C) which appears to be causing distress, give oral paracetamol (15mg/kg/dose).
- If wheeze is present, give a rapid-acting bronchodilator (as described in the next section)
- Gentle suctioning may be done to remove any thick secretions

Monitor the child

The child should be checked by nurses at least every 3 hours and by a doctor at least twice a day. A patient who is improving on treatment should have:

» an improvement in the respiratory rate;

» reduced indrawing of the lower chest wall;

» reduced fever, and/or

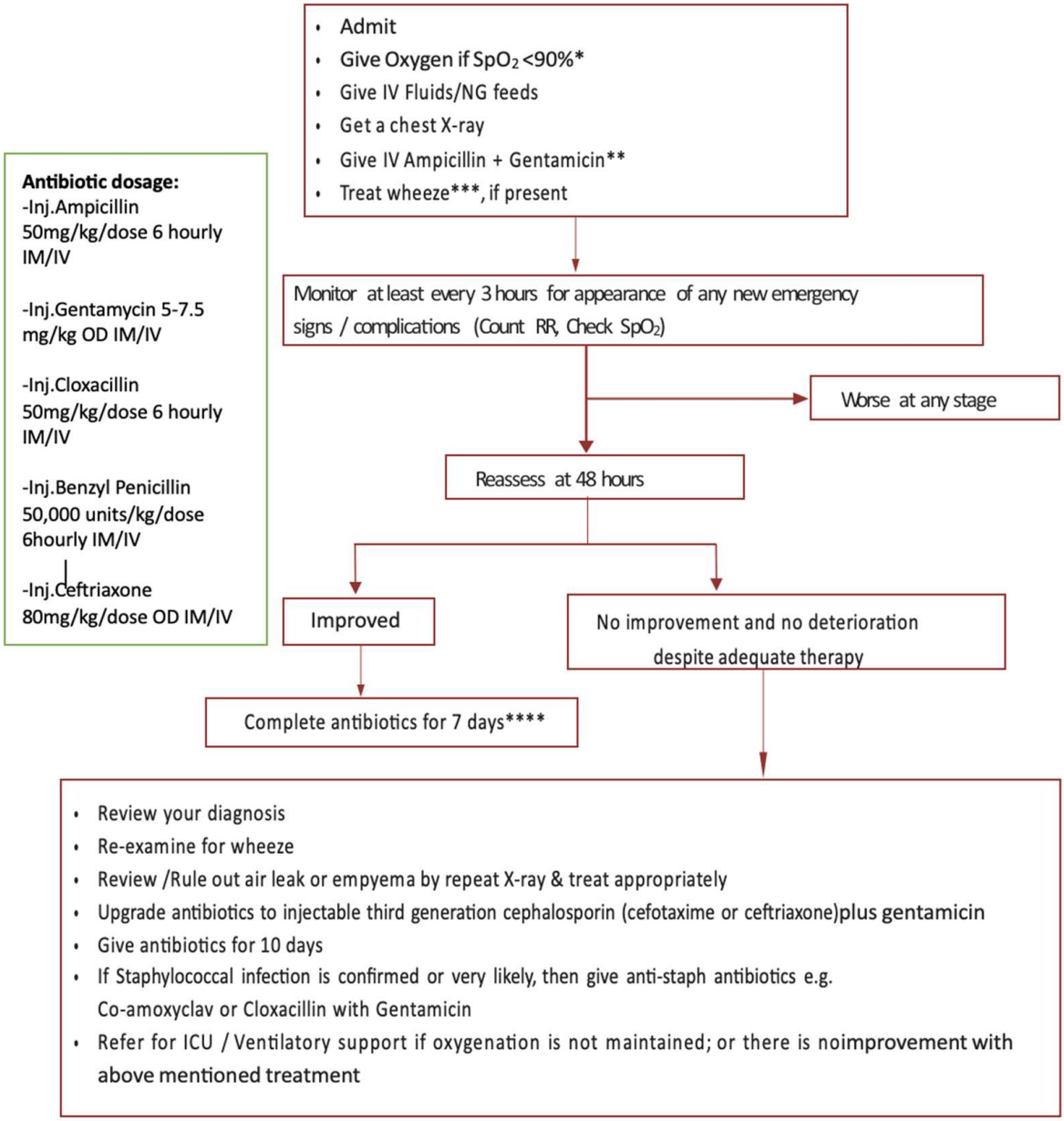
» improved ability to eat and drink.

Watch for complications

If the child has not improved after two days, or if the child's condition has worsened, look for complications or other diagnoses. If possible, obtain a repeat chest X-ray.

Consider transfer to a higher facility in case of poor response or deterioration despite second line therapy.

Chart 19: Flowchart on Treatment of severe pneumonia



* < 94 % in presence of other emergency signs

** If staphylococcal infection is suspected, give anti-staph antibiotic like Co-amoxyclav or Cloxacillin and Gentamicin; incase of severe pneumonia with septic shock consider Ceftriaxone and Vancomycin (Box 3.2)

***In case the child improves significantly with bronchodilator therapy, review the diagnosis

****Shift to oral drugs as soon as the child is able to take orally

(Courtesy: F-IMNCI, Ministry of Health & Family Welfare, GOI, 2023)

9.4 Pleural effusion and empyema

A child with severe pneumonia should be suspected to have pleural effusion or empyema if any one of the following is present.

- Fever persists despite antibiotic therapy.
- Breath sounds are reduced or absent over the affected area.
- On examination, the chest is dull on percussion.
- A pleural rub may be heard at an early stage before the effusion is fully developed.
- A chest X-ray shows fluid on one or both sides of the chest.

Diagnostic pleural tap should be done to make a diagnosis. Frank pus (thick or thin) is aspirated in cases of Empyema.

Treating Empyema

Chest drainage

Subsequent management of fluid in the pleural cavity depends on the character of the fluid obtained and lab investigations. Always send the fluid specimen for gram staining, culture and ZN staining for AFB. Chest thoracotomy should be done to drain the pus from the pleural cavity unless the collection is very small. If the condition is bilateral and significant, both sides need to be drained. Consult Surgeon if available to place the intercostal chest tube drain and its subsequent management.

Antibiotics

Staphylococcus aureus is a common causative organism of empyema. Give Cloxacillin (50 mg/kg/dose IM or IV every 6 hours) and Gentamicin (5-7.5 mg/kg/dose IM or IV once a day) as anti-staphylococcal drugs. Usually intravenous antibiotic therapy is needed for 7-10 days. Unlike pneumonia, the fever takes a little longer to subside. When the child improves, continue with cloxacillin orally, 4 times a day for a total of 3-4 weeks (6 weeks if loculated).

Supportive therapy: Every child should receive oxygen and other supportive therapy as discussed above under “Severe Pneumonia”.

Failure to improve

If fever and other signs of illness continue beyond 5-7 days, despite adequate chest drainage and antimicrobial therapy, assess for reasons for non response like phlebitis, septic emboli or less commonly tuberculosis. Consider referring for further evaluation.

9.5 Child presenting with wheeze

In the first 2 years of life, wheezing is mostly caused by acute viral respiratory infections such as bronchiolitis. After the first 2 years of age, wheezing is usually due to wheeze associated with lower respiratory infections (WALRI) and asthma in older children. Sometimes children with pneumonia present with wheeze. It is important to consider pneumonia as an alternative diagnosis, particularly in the first 2 years of life. The differential diagnosis of wheezing in a child is given below.

Differential diagnosis of the child presenting with wheeze

Diagnosis	In favour
Asthma	» History of recurrent wheeze (>3 episodes annually), unrelated to coughs and colds » Hyperinflation of the chest » Prolonged expiration » Reduced air entry (if very severe airway obstruction) » Good response to bronchodilators » Family history of asthma and atopy
Bronchiolitis	» First episode of wheeze in a child aged <2 years » Wheeze episode at time of seasonal bronchiolitis » Hyperinflation of the chest » Prolonged expiration » Reduced air entry (if very severe, airway obstruction) » variable response to bronchodilators
Wheeze associated with lower respiratory infection (WALRI)	» Wheeze always related to cough and cold » No family or personal history of asthma/eczema/hay fever » Prolonged expiration » Good response to bronchodilators
Foreign body	» History of sudden onset of choking or wheezing » Wheeze may be unilateral » Air trapping with hyper-resonance and mediastinal shift » Signs of lung collapse: reduced air entry and impaired percussion note » No response to bronchodilators
Pneumonia	» Fever » Cough with fast breathing » Lower chest wall indrawing » Crackles /Crepitations on auscultation

9.5.1 Asthma

Asthma is a chronic inflammatory condition of the airways associated with variable airflow obstruction that is often reversible. It is characterised by recurrent episodes of wheezing, cough, and difficulty in breathing, which respond to treatment with bronchodilators and anti-inflammatory drugs. Any child with more than 3 episodes of wheezing is likely to have asthma particularly in the presence of personal or family history of atopy.

Severity assessment of asthma

Mild-Moderate	Severe or life threatening
» Talks in phrases » Prefers sitting to lying » Respiratory rate increased, but accessory muscles not used » Oxygen saturation ≥ 92 % on room air » Agitated	» Talk in words » Central cyanosis » Sits hunched forwards » Accessory muscles in use » Oxygen saturation < 92% on room air » Drowsy, confused or silent chest » Tachycardia

Asthma clinical score (PRAM) to assess the severity of Asthma

Signs	0	1	2	3
Suprasternal Indrawing (Tracheal tug)	Absent		Present	
Scalene retractions (use of accessory muscles)	Absent		Present	
Wheezing	Absent	Expiratory only	Inspiratory and expiratoty	Audible without stethoscope/silent chest with minimal air entry
Air entry	Normal	Decreased at bases	Widespread decrease	Absent/minimal
Spo2 in room air	≥94%	90-93 %	≤89%	

Severity	Asthma Clinical Score
Mild	0-4
Moderate	5-8
Severe	9-12
Impending respiratory failure	Regardless of score,presence of lethargy ,cyanosis, decreasing respiratory effort,and/or rising pCO2

Treatment of acute asthma

The mainstay of drug therapy is bronchodilators and steroids.

The types of drug used, their doses are largely governed by the severity of the attack.

Mild/Moderate episode: Alert child with no cyanosis/signs of severe respiratory distress

» Give Oxygen to maintain SpO2 94-98%

» Rapid-acting bronchodilators:

- Salbutamol nebulization 3 doses at 20 min interval OR

» Salbutamol by MDI with spacer: introduce 2 puffs into the spacer and allow the child to take 5 breaths. Repeat 2 puffs every 20 minutes (two times). 2 puffs via MDI is equivalent to a single nebulised dose.

» Reassess the child after 1 hour

- If the respiratory distress has resolved completely, and there are occasional or no wheezing/ rhonchi on auscultation, this is considered as a good response. Keep this child under observation for the next 4 hours to see that the response is sustained. If the child continues to stay well and does not have fast breathing, advise the mother on home care with inhaled salbutamol.
- If the response is partial or poor i.e. tachypnoea has improved partially, rhonchi have decreased and the child is stable and able to take orally:

» Start oral steroids: Prednisone 1-2mg/kg/day in 2 -3 divided doses (maximum dosage 20 mg/day in children aged 0 to 2 years, 30 mg/day in children aged 3 to 5 years).

» Keep this child under observation for the next 4 hours to see that there is no further deterioration.

» Such patients can then be sent home on oral steroids and inhaled salbutamol. Steroids are used for 3-5 days and no tapering of dose is necessary.

- The patients with deterioration are treated as severe episode.

Severe episode (presence of severe respiratory distress or talks in words or silent chest)
Initial treatment:

» Admit the patient

» Give oxygen to target SpO2 > 90%

» Rapid-acting bronchodilators:

- Salbutamol nebulization 3 doses at 20 min interval OR
- Salbutamol by MDI with spacer: introduce 2 puffs into the spacer and allow the child to take 5 breaths. Repeat 2 puffs every 20 minutes (two times). 2 puffs via MDI is equivalent to a single nebulised dose.

» Injection Adrenaline (0.01 ml/kg/dose of 1:1000) subcutaneously every 20 minutes for three times. This is preferred when there is very severe wheeze or in a silent chest.

» IV steroids are necessary for patients with impending or actual respiratory arrest or those who are intolerant of oral glucocorticoids:

- Injection Hydrocortisone 10 mg/kg IV stat followed by 5 mg/Kg every 6 hours OR
- Injection Dexamethasone 0.6mg/kg IV/IM Stat and once daily.
- Steroids are used for 3-5 days and no tapering of dose is necessary.

» Continuous monitoring of the sensorium, respiratory rate, oxygenation, chest finding is very important in this potentially life threatening situation. Reassess after every 20-30 min initially and every 1-2 hours after the patient starts responding.

» Nebulised beta agonists and systemic steroids are the mainstay of treatment and other drugs are added if only the response is poor or ill sustained.

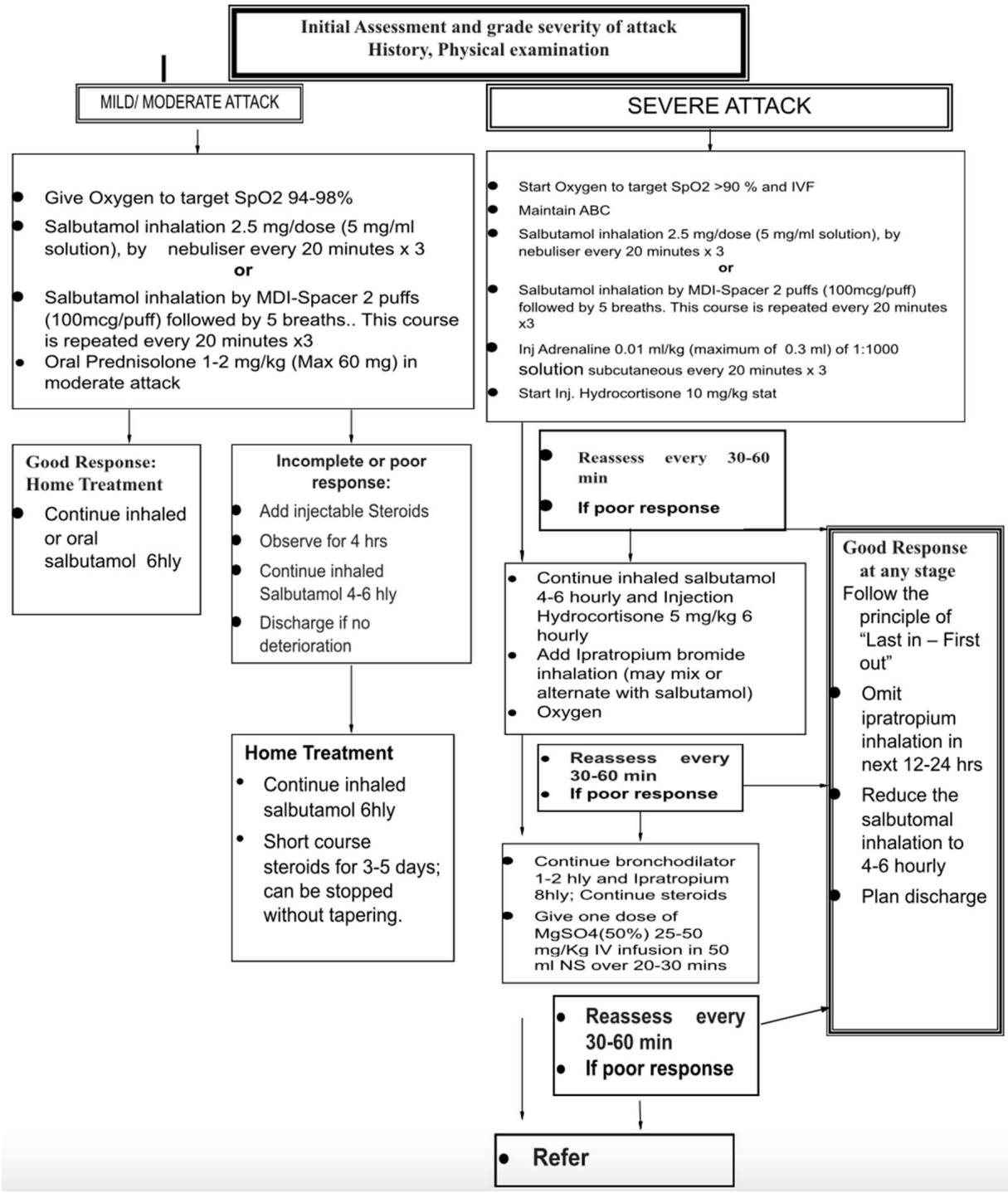
Reassessment after initial treatment and further management:

» Partial response:
- Continue salbutamol inhalation as before for another hour.
- If available, add Ipratropium bromide 250 micrograms to the nebulized salbutamol solution (2.5mg) with adequate amounts of normal saline to make up to a total solution of 4mLs and give 3 doses of the mixed solution 20 minutes apart in the first hour.
- If the child starts improving or is stable, continue Salbutamol inhalations 1 or 2 or 4 hourly depending upon the time for which the response to initial treatment is sustained. Ipratropium bromide should be continued at 8 hourly intervals.
- Once the good response is seen, you should stop ipratropium inhalation and then gradually increase the interval between salbutamol inhalations every 6 hours and plan discharge.
- Continue systemic steroids for 3-5 days.

» Poor or no response: after treatment with Salbutamol and ipratropium
- Give one dose of Injection 50 % Magnesium Sulphate intravenous (25-50 mg/kg/dose diluted in 50 ml normal saline and given over 20-30 minutes)
- Reassess frequently at every 30 min to 1 hour.
- Plan and arrange transfer to a higher facility continuing the current treatment in case of any deterioration or if no response is seen in the next 4-6 hours.

» Whenever the patient shows good response and the response is sustained for 4-6 hours, medications can be decreased. Follow the “Last in - first out” principle to withdraw medications. Then gradually decrease the frequency of salbutamol inhalation to 4-6 hourly.

» Plan discharge when
- The patient is able to take orally,
- Does not need oxygen therapy, and
- Is on 4-6 hourly salbutamol inhalations.



How to give asthma medications?

Salbutamol nebulization

- The flow rate of oxygen should be at least 6-8 litres/minutes when giving salbutamol nebulization.
- Place the salbutamol solution in the nebulizer chamber and add sterile saline to make a volume of usually 3-4 ml. Nebulize until the solution is finished.
- The dose of salbutamol is 2.5 mg (i.e. 0.5 ml of the 5 mg/ml nebulizer solution)
- This can be given 1-4-hourly initially, reducing to 6–8 hourly once the child's condition improves. If necessary in severe cases, it can be given more frequently.

Salbutamol by metered-dose inhaler with a spacer device

Spacer devices with a volume of 250-750 ml are commercially available. Impoverished spacers using plastic bottles can also be used (see chart booklet).

- Remove the cap and shake the Metered dose inhaler (MDI).
- Place the child's mouth over the opening in the spacer. In a younger child one may attach a face mask to the spacer. The child's neck should be supported in slight extension.
- Release 2 puffs (200 micrograms of Salbutamol) into the spacer chamber after attaching the MDI to the other end of the spacer.
- Allow normal breathing for 3–5 breaths. A slow deep breath is preferred but may not be feasible if the child is not taught earlier. If the child is crying, the drug delivery may be severely compromised.
- Repeat the procedure till the required number of the puffs are given.

Subcutaneous adrenaline

Subcutaneous injection of adrenaline, 0.01 ml/kg/dose of 1:1000 solution (up to a maximum of 0.3 ml), which is measured accurately with a 1 ml tuberculin syringe, is given subcutaneously.

Ipratropium bromide

Inhaled ipratropium bromide may add to the bronchodilator effects of inhaled salbutamol but is less effective when used alone. The dose is 250 mcg per nebulization. Ipratropium nebulization can be done together with salbutamol or can be alternated with salbutamol nebulization for up to 24 - 48 hours. When Ipratropium and Salbutamol are mixed together, the final volume is still the same (3-4 ml).

Steroids

Oral prednisolone at 1-2 mg/kg/day is given stat and in 1-2 divided doses which is continued for 3-5 days.

Parenteral steroids do not confer any advantage in an outpatient setting but may be used in hospitalised children who are severely distressed, drowsy or unable to retain oral medication. Injection Hydrocortisone 10 mg/kg IV stat followed by 5 mg/kg every 6 hours or injection dexamethasone 0.6 mg/kg/dose IV stat and OD should be given.

Magnesium Sulphate

Injection Magnesium Sulphate infusion may be useful as an additive therapy if the initial treatment to rapid acting beta 2 agonists and ipratropium fails. Usually 25-50 mg/ kg/dose of (0.05 - 0.1 ml) 50% Magnesium Sulphate is measured with a 1ml syringe and this is added to 50 ml of normal saline. This solution is then given as intravenous infusion over 30 min. Rapid infusion can cause hypotension and striated muscle relaxation.

Antibiotics

Antibiotics should not be given routinely for acute asthma. However, antimicrobial treatment is indicated when there is persistent fever and other signs of pneumonia. Mere presence of crackles is not evidence of pneumonia and does not warrant antibiotics.

Supportive care

Ensure that the child receives daily maintenance fluids as per the body weight. Encourage breastfeeding and oral fluids. Encourage adequate complementary feeding for the young child, as soon as food can be taken.

Monitor the child

A hospitalised child should be assessed by a nurse every 3 to 6 hours as and by a doctor at least twice a day. Record the respiratory rate and watch for signs of impending respiratory failure. Monitor oxygen therapy.

Follow-up care

Asthma is a chronic and recurrent condition. A long-term treatment plan should be made based on the frequency and severity of symptoms. This may include intermittent or regular treatment with bronchodilators, inhaled steroids or short course of oral steroids depending upon the severity.

Demonstration of use of Nebuliser and MDI with spacer

9.5.2 Bronchiolitis

Bronchiolitis is a lower respiratory viral infection, which is typically most severe in young infants, occurs in annual epidemics and is characterised by airways obstruction and wheezing. It is most commonly caused by respiratory syncytial virus. Infants and young children with bronchiolitis may present with a wide range of clinical symptoms and severity from mild distress to impending respiratory failure.

Typical features of bronchiolitis include:

- age less than 2 years
- preceding upper respiratory illness and/or rhinorrhea
- mild fever
- difficulty in feeding, breastfeeding or drinking owing to respiratory distress
- lower chest wall indrawing
- hyperinflation of the chest, with increased resonance to percussion
- fine crackles and wheeze on auscultation of the chest
- nasal discharge, which can cause nasal obstruction.
- unpredictable response to a rapid-acting bronchodilator

Risk factors for severe disease include age less than 12 weeks, prematurity, underlying cardiopulmonary disease, or immunodeficiency.

Management

- Mild cases (without respiratory distress) may be managed at home.
- Severe cases should be hospitalised. Supportive care is the mainstay of treatment for hospitalised children. Give oxygen to all children with severe respiratory distress or oxygen saturation ≤ 90%. All children should be monitored for the correct position of the prongs and blocked nose with mucus. Check and record RR and SpO2 at least every 3 hours.

Other treatment

- Nebulized epinephrine (2 ml of Inj. Adrenaline 1:1000 solution in 2 ml of normal saline) may decrease distress or improve oxygenation.The dose can be repeated 4 hourly for 1- 2 days depending on the severity and response.
- In case of severe disease, particularly if the child has personal or family history of atopy, Salbutamol nebulization can be given. Continuation of further doses should be only if there is a clinical response with initial doses.
- 3% hypertonic saline nebulization (4 ml every 4 hours) may be tried for hospitalised children.
- Routine antibiotics have no role. It should be used in young infants or in a sick looking infant where the distinction from pneumonia may be difficult.

Supportive care

- If the child has fever, give Paracetamol
- Ensure that the hospitalised child receives daily maintenance fluids appropriate for age in case oral acceptance is poor, but avoid overhydration.
- Encourage breastfeeding and oral fluids whenever a child is able to accept orally.
- Nasogastric feeding should be considered if the child is unable to maintain oral intake (expressed breast milk should be given).
- Gentle nasal suction should be used to clear secretions in infants where nasal blockage appears to be causing respiratory distress.

Monitoring

- A hospitalised child should be assessed by a nurse at least every 3 hours and by a doctor at least twice a day.
- Watch for signs of respiratory failure, i.e. increasing hypoxia and respiratory distress leading to exhaustion.

Complications

- If the child fails to respond to oxygen therapy or the child's condition worsens suddenly, obtain a chest X-ray to look for evidence of pneumothorax. If severe respiratory distress is persistent, consider transfer to a facility with an ICU/ ventilation facility.

Infection control

- Bronchiolitis is very infectious and may be dangerous to other young children admitted in the hospital with other conditions.The following strategies may reduce cross-infection: Hand-washing by health personnel between patients, non-sharing of nebulizer tubes and oxygen tubing.
- In addition, it is well established that exclusive breastfeeding for at least 6 months decreases the morbidity of respiratory infections in young children.

Discharge

- An infant with bronchiolitis can be discharged when respiratory distress improves (no fast breathing/chest indrawing and maintaining SpO2 >90 % on room air), clinically stable and the infant is feeding well.
- Counsel families that infants are at risk for recurrent bronchiolitis if they live in families where adults smoke or if infants are not breastfed. Advise the parents against smoking and indoor pollution

9.6 Conditions presenting with stridor

Stridor is a harsh noise during inspiration, which is due to narrowing of the air passage in the oropharynx, subglottis or trachea. If the obstruction is severe, stridor may also occur during expiration. The major causes of severe stridor are viral croup, foreign body, diphtheria, retropharyngeal abscess and trauma to the larynx.

Differential diagnosis of the child presenting with stridor

Diagnosis	In favour
Viral croup	» Barking cough » Hoarse voice » Respiratory distress
Retropharyngeal abscess	» Soft tissue swelling » Difficulty in swallowing » Fever
Foreign body	» Sudden history of choking » Respiratory distress
Diphtheria	» Bull neck appearance due to enlarged cervical nodes and oedema » inflamed throat » Grey pharyngeal membrane » Blood-stained nasal discharge » No evidence of Pentavalent/ DTP vaccination
Epiglottitis	» Soft stridor » Septic child » Little or no cough » Drooling of saliva » Inability to drink
Congenital anomaly (Laryngomalacia)	» Stridor present since birth
Anaphylaxis	» History of allergen exposure » Wheeze » Shock » Urticaria and oedema of lips and face
Burns	» Swollen lips and smoke inhalation

9.6.1 Viral Croup

Croup causes obstruction in the upper airway which, when severe, can be life threatening. Most severe episodes occur in infants.

Severity	Clinical feature	Treatment
Mild croup	» Fever » hoarse voice » barking or hacking cough » Stridor that is heard only when the child is agitated.	» Home care (fluid, feeding, when to return)
Moderate-Severe croup	» Stridor when the child is calm » Rapid breathing and indrawing of the lower chest wall.	» Admit to hospital » Steroid: Single dose dexamethasone IM/IV (0.6 mg/kg) or oral prednisolone (1-2 mg/kg/dose). » Adrenaline: Nebulized adrenaline (1-2 ml of 1:1000 solution up to maximum of 5ml) » Oxygen therapy » Intubation or Tracheostomy in children with impending airway obstruction.

Consider intubation and tracheostomy

» If there are signs of incipient airway obstruction, such as severe indrawing of the lower chest wall and restlessness, consider intubating the child with an endo-tracheal tube one size smaller than the appropriate size; if expertise is available. This is preferred over tracheostomy, when feasible.

» If this is not possible, transfer the child urgently to a hospital where intubation or emergency tracheostomy can be done.

Intubation or Tracheostomy should only be done by experienced staff

9.7 Conditions presenting with Chronic cough

Chronic cough is an unremitting cough that lasts for ≥14 days. Many conditions may present with a chronic cough such as TB, pertussis, foreign body or asthma as shown below

Differential diagnosis of the child presenting with chronic cough

Diagnosis	In favour
Tuberculosis	» Weight loss or failure to thrive » Anorexia, night sweats » Enlarged liver and spleen » Chronic or intermittent fever » History of exposure to infectious tuberculosis » Signs of fluid in chest (dull to percussion/reduced breath sounds)
Asthma	» History of recurrent wheeze, cough » Hyperinflation of the chest » Prolonged expiration » Reduced air entry (in very severe airway obstruction) » Good response to bronchodilators
Foreign body	» Sudden onset of choking or stridor » Unilateral chest signs (e.g. wheezing or hyperinflation) » Recurrent lobar consolidation » Poor response to medical treatment
Pertussis	» Paroxysms of cough followed by whoop, vomiting, cyanosis or apnoea » Subconjunctival haemorrhages » No history of Pentavalent/DPT immunisation
HIV	» Known or suspected maternal or sibling HIV infection » History of blood transfusion » Failure to thrive » Oral thrush » Chronic parotitis » Skin infection with herpes zoster (past or present) » Generalised lymphadenopathy » Chronic fever » Persistent diarrhoea » Finger clubbing
Bronchiectasis	» History of tuberculosis or aspirated foreign body » Poor weight gain » Purulent sputum, bad breath » Finger clubbing » Localised signs on X-ray
Lung abscess	» Reduced breath sounds over abscess » Poor weight gain / chronically ill child » Cystic or cavitating lesion on chest X-ray

EXERCISE 8

1. Please write down the treatment plan for Norbu who is 4 year old and weighs 15 kg. He has a severe attack of bronchial asthma and has not responded to initial two hours of inhalations with Salbutamol and Ipratropium. Write down his treatment plan assuming a poor response to your subsequent therapy.

2. Deki has been referred to you with severe respiratory distress. She is 9 months old and has a fever, cough and boils over her body for 3 days. She is found to have central cyanosis and severe respiratory distress. She has no diarrhoea or signs of shock. Her temperature is 390C.

a) How do you triage this case? What emergency treatment would you give?

b) What would you ask more in history and look for in the examination?

c) What are the diagnostic possibilities? What investigations would you do?

3. Examination of the chest reveals absent breath sounds on the left side, hyper-resonance on percussion and shift of mediastinum to right. Gram staining from pus discharge from the skin lesions show gram +ve cocci.

a) What is your likely diagnosis?

SECTION 10:
CASE MANAGEMENT OF CHILDREN PRESENTING WITH DIARRHOEA

10.1 Learning objectives

After completion of this section the participant should be able to:

- assess & classify dehydration in a child presenting with diarrhoea
- manage cases of diarrhoea with or without dehydration
- manage cases of dysentery
- assess and manage cases of persistent diarrhoea

10.2 Diarrhoea

Diarrhoea is common in children especially in those between 6 months and 2 years of age. It is more common in children under 6 months who are fed cow's milk or breast milk substitutes. If an episode of diarrhoea lasts less than 14 days, it is acute diarrhoea. Acute watery diarrhoea causes dehydration and contributes to malnutrition. The death of an infant with acute diarrhoea is usually due to dehydration. If the diarrhoea lasts for 14 days or more, it is persistent diarrhoea. Up to 20% of episodes of diarrhoea become persistent. Persistent diarrhoea often causes nutritional problems and contributes to deaths in children.

Diarrhoea with blood in the stool, with or without mucus, is called dysentery. The most common cause of dysentery is Shigella. Amoebic dysentery is not common in young children.

The assessment and classification of dehydration is described below

Classification	Signs or symptoms	Treatment
Severe dehydration	**Two of the following signs:** » Lethargy/ unconsciousness » Sunken eyes » Unable to drink or drinks poorly » Skin pinch goes back very slowly (>2 seconds)	» Give fluids for severe dehydration (Plan C)
Some dehydration	**Two or more of the following signs:** » Restlessness, irritability » Sunken eyes » Drinks eagerly, thirsty » Skin pinch goes back slowly	» Give fluids for some dehydration (Plan B) » After rehydration, advise mother on home care » Follow up in 5 days if not improving
No dehydration	Not enough signs to classify as some or severe dehydration	» Give advices to treat diarrhoea at home (Plan A) » Advise mother when to return immediately. » Follow up in 5 days if not improving.

10.2.1 Severe dehydration treatment (Plan C)

Children with severe dehydration require rapid IV rehydration with close monitoring, which is followed by oral rehydration once the child starts to improve sufficiently. In areas where there is a cholera outbreak, give doxycycline which is the drug of choice in children above 2 years of age.

Ringer's lactate solution is the preferred IV solution. If it is not available, normal saline can be used. IV 5% dextrose is not effective and should not be used. In addition all children with diarrhoea should receive ORS solution at the rate of 5ml/kg/hr when they are able to drink. This provides optimal electrolytes which may not be adequately supplied by the IV fluid.

» Give 100 ml/kg of the chosen solution as mentioned below.

AGE	First give 30 ml/kg in	Then give 70 ml/kg in
Infants (under 12 months)	1 hour*	5 hours
Children (12 months up to	30 minutes*	21/2 hours

» Reassess the child every 15-30 minutes. If hydration status is not improving, give the IV drip more rapidly.

» Also give ORS (about 5 ml/kg/hour) as soon as the child can drink: usually after 3-4 hours (infants) or 1-2 hours (children).

» If IV treatment is not possible, give ORS 20 ml/kg/hour for 6 hours or (120 ml/kg) by NG tube.

» Reassess an infant after 6 hours and a child after 3 hours. Re classify dehydration and treat accordingly (plan A, B, or C). Refer to Chart 21, 22 and 23 in Chart Booklet

» If possible, observe the child for at least 6 hours after rehydration to be sure that the mother can maintain hydration by giving the child ORS solution by mouth.

» Prescribe zinc supplement for all cases of diarrhoea for 10-14 days.

10.3 Dysentery

Dysentery is diarrhoea presenting with loose frequent stools containing visible blood. It is usually associated with fever, abdominal cramps and rectal pain. Dysentery in children is mostly due to Shigella but can be caused by Salmonella, E.coli, C.jejuni & infrequently by E.histolytica.

Management

Assess the child for signs of dehydration and give fluids according to Treatment Plan A, B or C.

CHILD WITH LOOSE STOOL WITH BLOOD		
↓		
Severely Malnourished ?	→ Yes →	
↓		
NO		
↓		
Give Antimicrobial For Shigella		Admit
↓		
Better In 2 Days	→ Yes →	
↓		
NO		Complete 3 Days Treatment
↓		
Dehydrated, Age < 1 Year Or Measles in Past 6 Weeks	→ Yes →	Admit
↓		
NO		
↓		
Change To Second Antimicrobial For Shigella		Complete 3 Days Treatment
↓		
Better In 2 Days	→ Yes →	
↓		
NO		
↓		
Admit Or Treat For Amoebiasis		

Antimicrobials that are effective for treatment of Shigellosis	Antimicrobials that are INEFFECTIVE for treatment of Shigellosis
Cotrimoxazole (4 mg/Kg/dose of Trimethoprim) BD for 5 days OR Ciprofloxacin 15mg/Kg BD for 3 days OR Ceftriaxone (75 mg/kg) IM/IV OD for 5 days	» Metronidazole » Tetracyclines - Chloramphenicol » Amoxicillin » Nitrofurans (e.g. nitrofurantoin) » Aminoglycosides (e.g. gentamicin) » Cephalosporins (e.g. Cephalexin)

Nutritional management

Ensuring a good diet is very important as dysentery has a marked adverse effect on nutritional status.

Manage complications

- **Potassium depletion:** This can be prevented by giving ORS solution (when indicated) or potassium-rich foods such as bananas, coconut water or dark green leafy vegetables.
- **High fever:** If the child has high fever (≥ 38.5 ° C) which appears to be causing distress, give paracetamol and consider bacterial sepsis.
- **Rectal prolapse:** Gently push back the rectal prolapse using a surgical glove or a wet cloth. Alternatively, prepare a warm solution of saturated magnesium sulphate and apply compresses with this solution to reduce the prolapse by decreasing the oedema.

» **Convulsions:** can occur due to dyselectrolytemia , hypoglycemia and fever which should be treated accordingly. Avoid giving rectal diazepam.

» **Haemolytic-uraemic syndrome (HUS):** Where laboratory tests are not possible, suspect HUS in patients with easy bruising, pallor, altered consciousness, and low or no urine output and refer such cases.

» **Toxic Megacolon:** Toxic megacolon usually presents with fever, abdominal distension, pain and tenderness with loss of bowel sounds, tachycardia and dehydration. Give IV fluids for dehydration, pass a nasogastric tube and start antibiotics.

10.4 Persistent diarrhoea

Admit the child with persistent diarrhoea if:

» dehydrated (severe persistent diarrhoea) or

» has associated severe malnutrition or severe illness, or

» no improvement with OPD management for persistent diarrhoea

Assess

1. Assess for dehydration
2. Screen for intestinal infections: Stool routine & culture if facility is available.
3. Screen for non-intestinal infections: Pneumonia, UTI, Sepsis, Otitis media & Oral thrush.
4. In areas where HIV is highly prevalent, suspect HIV if there are other clinical signs or risk factors.

Treatment

1. Admit if severely dehydrated, suspected systemic infections and failure to thrive
2. Manage dehydration as per Plan A, B or C.
3. Give antimicrobial therapy if:

» Associated with systemic infection and severe malnutrition: Combination of parenteral ampicillin and gentamicin is usually appropriate.

» Presence of blood in stools: Give an oral antibiotic to Shigella (e.g. Ciprofloxacin/Cotrimoxazole).

» **Amoebiasis:** Give oral metronidazole 10 mg/kg, 3 times a day for 5 days only if:

- microscopic examination of fresh faeces reveals trophozoites of E. histolytica with red blood cells, OR
- no clinical improvement after treating suspected Shigella with Cotrimoxazole and Ciprofloxacin

» **Giardiasis:** Give oral metronidazole 5 mg/kg, 3 times a day, for 5 days if trophozoites of Giardia lamblia are seen in the faeces.

4. Give zinc supplements for 10-14 days

Zinc sulphate:	Up to 6 months	=	10 mg OD
	> 6 months	=	20 mg OD

5. Nutrition

Children treated in hospitals require special diets & the goal is to give a daily intake of at least 110 Kcal/kg. Breastfeeding should be continued.

» Up to 6 months

- Encourage exclusive breastfeeding. Help mothers who are not breastfeeding exclusively to do so.

- If a child is not breastfeeding, give a breast milk substitute that is low in lactose such as yogurt or is lactose free commercial formula. Use a spoon or cup; do not use a feeding bottle. Once the child improves, help the mother to re-establish lactation.

» 6 months or older

- Feeding should be restarted as soon as the child can eat. Reduced lactose diet should be given 6 times a day to achieve a total intake of at least 110 calories/kg/day). Many sick children will eat poorly, until any serious infection has been treated for 24–48 hours. Such children may require nasogastric feeding initially.

Recommended diets for persistent diarrhoea

Given in Annexure 12 are three diets recommended for children and infants aged >6 months with severe persistent diarrhoea. If the child is not improving after 7 days of treatment, stop the first diet and give the next diet for 7 days.

The most important criterion is weight gain. Ensure weight gain for at least three consecutive days before you change the diet.

Give additional bananas and well cooked vegetables to children who are responding well. After 7 days of treatment with an effective diet, resume an appropriate diet for their age, including milk, which provides at least 110 calories/kg/day. Children may then return home, but follow them up regularly to ensure continued weight gain and compliance with feeding advice.

6. Monitoring: Check body weight, vital signs, feeding, frequency of diarrhoeal stools and urine output every day

7. Give supplementary multivitamins and minerals:

Give supplement vitamins and minerals, twice the RDA for at least 2 weeks. Introduce iron supplements only after the diarrhoea has ceased.

If such preparations are not available, provide vitamin A (single dose) if the child has not received it as pre-referral treatment. In addition to zinc, iron and vitamin A, children with persistent diarrhoea also require supplementation with folate, copper and magnesium.

- Vitamin A (single dose) 6 - 12 months: 1,00,000 IU
  >12 months: 2,00,000 IU

RDA for a child aged 1 year is:

» Folate 50 micrograms
» Zinc 3 mg
» Vitamin A 400 micrograms
» Iron 10 mg
» Copper 1 mg
» Magnesium 75 mg

EXERCISE 9

1. Sonam is 8 months old and weighs 6.0 Kg. He has had diarrhoea for the last 20 days with some dehydration. He has been referred to you with a diagnosis of severe persistent diarrhoea, low weight for age and anaemia. His diet includes animal milk, cooked cereal and some mashed vegetables.

a) Should Sonam be admitted?

b) In which situation you will start antimicrobial therapy?

c) What type of diet should Sonam be taking?

d) List the names of multivitamins and minerals which should be prescribed to Sonam as supplements.

SECTION 11:
CASE MANAGEMENT OF CHILDREN PRESENTING WITH FEVER

Fever is a common presenting complaint and common cause of hospital admission. It is defined as an axillary temperature of more than 37.5 C. The causes of fever are usually benign like URTI and viral fever but some causes can be life threatening. The consequences of delayed or missed diagnosis can be serious and over treatment may be hazardous too. As discussed in the ETAT section, look for emergency signs and initiate treatment before taking detailed history and examination.

11.1 Learning objectives

After completion of this section the participant should be able to identify and manage the life threatening causes of fever in children.

- Manage cases of severe malaria
- Manage cases of bacterial meningitis
- Manage cases of dengue
- Manage cases of UTI and Septicemia
- Manage cases of Scrub Typhus
- Manage cases of Typhoid fever

11.2 Categories of Children presenting with fever

There are four major categories of children presenting with fever

- Fever due to infection without localised signs
- Fever due to infection with localised signs .
- Fever with rash.
- Fever lasting more than 7 days

Some causes of fever are only found in certain regions (e.g. dengue haemorrhagic fever, relapsing fever). Other fevers are seasonal (e.g. malaria, meningococcal meningitis) or can occur in epidemics (measles, meningococcal meningitis).

Differential diagnosis of fever without localizing signs

Diagnosis	In favour
Malaria (only in children exposed to malaria transmission)	» Sudden onset of fever with rigors followed by sweating. » Febrile paroxysms occur every alternate day » Blood film positive or rapid diagnostic test for malarial parasites » Severe anaemia » Enlarged spleen
Septicaemia	» Seriously and obviously ill with no apparent cause » Purpura, petechiae » Shock or hypothermia in severely malnourished
Typhoid	» Seriously and obviously ill with no apparent cause » Vomiting/pain » Abdominal tenderness » Jaundice » Mild Hepatosplenomegaly
Urinary tract infection	» Costo-vertebral angle or supra pubic tenderness » Crying on passing urine » Passing urine more frequently than usual » Incontinence in previously continent child » White blood cells and/or bacteria in urine microscopy

Differential diagnosis of fever with localized signs

Diagnosis of Fever	In Favour
Meningitis/Encephalitis	» Fever with headache, vomiting » Convulsions » Altered level of consciousness » Stiff neck » Bulging fontanelle » Meningococcal rash (petechial or purpuric) » Focal neurological deficit signs
Otitis media	» Red immobile ear-drum on otoscopy » Pus draining from ear » Ear pain
Mastoiditis	» Tender swelling behind the ear

Diagnosis of Fever	In Favour
Osteomyelitis	» Local tenderness » Refusal to move the affected limb » Refusal to bear weight on affected limb
Septic arthritis	» Hot, tender and swollen joints.
Skin and soft tissue infection	» Cellulitis » Skin boils » Pustules » Pyomyositis (purulent infection of muscles)
Pneumonia	» Cough with fast breathing » Lower chest wall in-drawing » Fever » Coarse crackles,consolidation,effusion » Nasal flaring » Grunting
Viral upper respiratory tract infection	» Symptoms of cough/cold » No systemic upset
Retropharyngeal abscess	» Sore throat in older child » Difficulty in swallowing,drooling of saliva » Tender cervical nodes
Sinusitis	» Facial tenderness on percussion over affected sinus » Foul nasal discharge
Hepatitis	» Severe anorexia » Abdominal pain » Jaundice with dark urine

Differential diagnosis of fever with rash * (* fever with rash is a notifiable disease)

Diagnosis of Fever	In favour
Measles	» Generalised maculopapular rashes » Cough, runny nose, red eyes » Recent exposure to a measles case » No documented measles immunization
Rubella	» Low grade Fever » Macular rashes » Lymphadenopathy
Other Viral infections	» Mild systemic upset » Transient non-specific rash
Meningococcal infection	» Petechial or purpuric rash » Bruising » Shock » Stiff neck (if meningitis)
Dengue haemorrhagic fever	» High grade fever with headache and bodyache Abdominal tenderness » Skin petechiae » Bleeding from nose or gums, or in vomitus » Bleeding in stools or black stools » Enlarged liver and spleen » Shock
Rickettsial fever (eg. Scrub typhus)	» Fever and headache » Malaise, weakness and cough » Maculopapular/petechial rash initially on trunk and axilla and later spreads to rest of the body except face, palms and soles » Sometimes neurological disturbance » The bite sites may become red with a black scab (Eschar) » Lymphadenopathy » Hepatosplenomegaly

11.3 Malaria

Plasmodium vivax and *P. falciparum* are responsible for most of the malaria cases. Use of appropriate anti-malarial drugs is very important to save lives in malaria cases. National malaria policy 2008 recommends doing microscopy and Rapid Diagnostic Test (RDT) in all clinically suspected malaria cases in high risk areas and microscopy in low risk areas. Policy also recommends using standardized full course of treatment to prevent emergence of resistant cases.

What is severe malaria?

It is defined as presence of any of the following features in a child with microscopy or RDT positive for malaria indicates severe malaria:

- Altered consciousness
- Multiple convulsions i.e more than 2 episodes in last 24 hours
- Severe anaemia (haematocrit < 15% or haemoglobin < 5g/dl)
- Hypoglycaemia (Blood glucose < 45 mg/dL in normal children/ < 54 mg/dL in children with severe acute malnutrition)
- Respiratory distress often with laboured breathing with chest indrawing, hypoxia (SpO2< 90% in room air) and crepitations on auscultation
- Jaundice
- Significant bleeding: recurrent or prolonged bleeding from the nose, gums or venipuncture sites, hematemesis or malena
- Shock/impaired circulation

Severe malaria, which is most commonly due to P. falciparum, is a life threatening condition. The illness starts with high grade fever, headache, restlessness and often vomiting. Children can deteriorate rapidly over 1–2 days, going into coma (cerebral malaria) or shock, or manifesting convulsions, severe anaemia and acidosis.

It is observed that P.falciparum infection may lead to complications in 0.5% to 2% of cases. Mortality may result in about 30% of such cases if timely treatment is not given. Use of appropriate anti-malaria drugs is very important not only to save the life in such cases but also to contain the spread of this species.

Emergency measures: to be taken within the first hour

- Check and correct hypoglycemia
- Treat convulsions
- Manage shock, if present
- If the child is unconscious, minimize the risk of aspiration pneumonia (Insert a nasogastric tube and remove the gastric contents)
- Treat severe anaemia, if present
- Antimalarial treatment (Parenteral Artesunate either intravenous and intramuscular) is the drug of choice. Parenteral Artemether or Quinine should be given if parenteral Artesunate is not available)
- Provide supportive care if child is unconscious

Also give treatment for bacterial meningitis if cannot be excluded.

Antimalarial Treatment

Severe malaria is an emergency and treatment should be given as per severity and associated complications. Parenteral quinine or artemisinin derivatives should be used irrespective of chloroquine resistance status of the area.

Treatment for severe malaria

(Follow the latest National Malaria treatment guideline/ WHO guideline)

Drug	Route of administration	Schedule
Quinine	IV	*Loading dose* of 20mg/kg body weight of quinine dihydrochloride salt given over a 4 hour period in IV fluid (glucose 5% preferred to prevent hypoglycemia) then give *maintenance dose* of 10 mg/kg after 8 hours and repeated 8 hrly until the patient is able to take Quinine tablet orally. The oral dose of quinine is 10mg/kg body weight given every eight hours. The total duration of treatment is 7 days including both IV and oral treatment. The infusion rate should not exceed 5mg/kg body weight per hour. Quinine can be given by IM injections in the same dosage if IV infusion is not possible. It should be diluted in normal saline to a concentration of 60-100 mg/ml salt, the dose divided equally and administered on the two anterior thighs (not on the buttock).
Artemether	IM	3.2mg/kg body weight IM given on admission then 1.6mg/kg IM once a day followed by a full course of combination therapy (Coartem®) as soon as the patient can swallow.
Artesunate	IM/IV/Rectal IM/IV/Rectal	2.4mg/kg body wt., IM/IV given at 0, 12hr, 24 hrs followed by once a day for 7 days. Rectal dose 10mg/kg body weight, repeated if expelled within 30 minutes of insertion.

NOTE:

Antimalarial drugs should be given parenterally for a minimum of 24 hours and replaced by oral medications as soon as it can be tolerated.

- Loading dose of quinine can be given at recommended doses even in acute renal failure (ARF) or severe jaundice up to 48 hrs. Subsequent doses should be reduced to half. In such cases, the volume of intravenous fluid for administration of quinine can be reduced to half (Quinine dihydrochloride 10 mg salt/ kg body weight diluted in 5% Dextrose, 5 ml/kg body weight, or 1 mg of quinine salt/ 0.5 ml of fluid).
- A loading dose of quinine should not be given if the patient has received quinine, quinidine or mefloquine within the preceding 12 hrs, or the previous history of drug intake cannot be ascertained. If these conditions exist, patients should be treated with a maintenance dose of quinine only. The maximum dose in adults should not exceed 2000 mg/day and 1800 mg/day or 600 mg/dose in children.
- Monitor pulse and blood pressure at least every 2 hrs while the patient is on quinine infusion.
- Avoid standing and sitting postures of the acutely sick patient during quinine therapy to prevent severe postural hypotension.

Provide supportive care of an unconscious child

- Care of an unconscious child - position the child and take care of airway, breathing, and circulation as you have learnt in the section ETAT (Module 1)
- Take the following precautions in the delivery of fluids
- Check for dehydration and treat appropriately.
- During rehydration, examine frequently for signs of fluid overload. The most reliable sign of overhydration is an enlarged liver. Additional signs are gallop rhythm, fine crackles at lung bases and/or fullness of neck veins when upright. Eyelid oedema is a useful sign in infants.
- In children with no dehydration, ensure that they receive their daily fluid requirements but take care not to exceed the recommended limits. Be particularly careful in monitoring IV fluids

Monitor the child

The child should be checked by nurses at least every 3 hours and by a doctor at least twice a day. Monitor temperature, pulse rate, respiratory rate and blood pressure every 6 hours, for at least the first 48 hours

- Check blood sugar every 3 hourly until the child is conscious
- Monitor the rate of IV infusions
- Fluid intake and output

* For treatment of other types of malaria, refer to the latest National Guideline for Management of Malaria.

Management of common complications of severe malaria

1. **Severe Anaemia (Hb < 5g/dL or Hematocrit < 15%)**

- Transfuse 10ml/kg Packed cells (PRC) or 20ml/kg whole blood over 3-4 hours.
- Check the respiratory rate and pulse rate every 15 min. If there is any evidence of fluid overload (facial puffiness, enlarged liver, tachypnea, tachycardia) due to the blood transfusion, give IV Furosemide (1-2mg/kg) and transfuse very slowly.
- After the transfusion, if Hb remains low i.e < 5g/dL, repeat the transfusion.
- Give a daily Iron-folate or Iron syrup for 14 days at discharge and follow up after 14 days. Treat for 3 months, as it takes 2-4 weeks to correct anemia and 1-3 months to build up an iron store.

2. **Respiratory distress: often due to severe metabolic acidosis. It may also be due to congestive cardiac failure in case of severe anemia. The management includes**:

- Supplemental oxygen to keep SpO2 > 90%
- Correction of Dehydration
- Correction of Severe Anemia
- Titration of fluid therapy according to urine output

Monitor response by continuous clinical observation (oxygen saturation, Hb, packed cell volume, blood glucose and acid-base balance if available)

Further reading: Recent National Malaria Treatment guideline 2024/ WHO Malaria Update 2023)

WHO recommends 0.25mg/kg single dose on first day of treatment for falciparum malaria without G6PD testing and for vivax or mixed infections 0.5mg/kg of primaquine for 7 days in children above 6 months as compliance may be better than 0.25 mg/kg for 14 days. G6PD deficiency should be ruled out for both 0.25 or 0.5 mg/kg doses regimen

When G6PD status is unknown and G6PD testing is not available, a decision to prescribe primaquine should be based on an assessment of the risks and benefits of adding primaquine

11.4 Meningitis/Encephalitis

Early diagnosis is essential for effective treatment. This section covers management of meningitis in children and infants over 2 months old.

Suspect meningitis if the child has fever, vomiting, headache, irritability, inability to feed and seizures. Children with meningitis have neck stiffness with photophobia. Anterior fontanelle often may be bulging. Usually in encephalitis there is a rapid deterioration of sensorium with associated focal neurological deficit.

The diagnosis is confirmed with a lumbar puncture and examination of the CSF. However, start the treatment immediately even if lumbar puncture is not possible or lumbar puncture cannot be done because the child has signs of raised intracranial pressure.

Lumbar puncture is contraindicated in following situations:

- Raised ICP
- Severe thrombocytopenia (platelet count < 50,000 cu/mm)
- Shock
- Patient with hemodynamic instability
- Skin infection over LP site

CSF findings in various types of meningitis

	Appearance	Cells	Proteins	Glucose
Normal	Crystal clear	<6, all mononuclear	< 40 mg/dl	50-80 mg/dl >2/3 of blood glucose
Bacterial, untreated	Cloudy or purulent*	100s to 1000s, all polymorphonuclear	Increased 100-500 mg/dl	Decreased usually <40 mg/dl (<50% serum glucose)
Bacterial, partially treated	Clear or slightly clouded	Increased, mostly polymorphonuclear, later mononuclear	Increased	Decreased or normal
Viral	Clear or slightly opalescent	0 to few hundred, mononuclear	20-125 mg/dl	Normal
Tubercular	Straw coloured or slightly cloudy	250-500 mononuclear	45-500 mg/dl	Decreased (<50% serum glucose)

*** May be clear during the first few hours of illness**

Note: CSF and blood sample can also be sent for viral studies (eg. JE)

Treatment:

Start treatment with antibiotics immediately if meningitis is clinically suspected and the CSF is obviously cloudy. You should also start antibiotics if a lumbar puncture is not possible or is contraindicated or is traumatic.

1. Steroid

In bacterial meningitis, give steroids 15-20 minutes before antibiotics.
Injection Dexamethasone 0.15mg/kg/dose 6 hourly for 4 days.

2. Antimicrobial therapy - Start IV antibiotics as soon as possible.

a. Chloramphenicol : 25 mg/kg IM/ IV every 6 hours, plus
Ampicillin : 50 mg/kg IM/ IV every 6 hours ,for 10 days

OR

b. Chloramphenicol : 25 mg/kg IM/ IV every 6 hours, plus
Benzylpenicillin : 60 mg/kg (100 000 units/kg) every 6 hours IM/IV, for 10 days.

OR

c. Ceftriaxone: 50 mg/kg IM/ IV, over 30–60 minutes every 12 hours; or 100 mg/kg IM/ IV, once daily for 7-10 days;

OR

d. Cefotaxime: 50 mg/kg IM/ IV, every 6 hours for 10 days.

3. Management of raised intracranial pressure

» All cases should be looked for following signs of raised intracranial pressure
- Unequal pupil
- Rigid posture or posturing
- Focal paralysis in any of the limbs or trunk
- Irregular breathing

» Raised intracranial pressure can be managed by;
- Intravenous mannitol (0.25-0.5gm/kg/dose i.e. 1.25-2.5 ml/kg of 20% mannitol) OR
- Hypertonic Saline (3% Saline) at (0.1- 1ml/kg/hr) OR
- Injection furosemide 1-2mg/kg/dose twice daily.

» If raised ICP is refractory to medical management, refer to a higher center for urgent neuroimaging and surgical intervention.

4. Review antibiotic therapy when CSF results are available. If the diagnosis is confirmed, the total antibiotic duration will depend on the isolation of organisms in CSF culture . Usually the duration ranges from 7-14 days for gram positive organisms. For gram negative organisms, the duration is 21 days.

» **If there is poor response to treatment:**

» Consider the presence of common complications, such as subdural effusions (persistent fever plus focal neurological signs or reduced level of consciousness) or a cerebral abscess. If these are suspected, refer the child to a hospital with specialized facilities for further management.

» Look for other sites of infection which may be the cause of fever, such as cellulitis at injection sites, arthritis or osteomyelitis.

» In malarious areas, take a blood smear to check for malaria since cerebral malaria should be considered as a differential diagnosis or co-existing condition. Treat with an antimalarial if malaria is diagnosed.

Supportive care: as discussed earlier (see section on severe malaria)

Fluid and Nutritional Management

There is no good evidence to support fluid restriction in children with bacterial meningitis. Give them their daily fluid requirement.

Give due attention to acute nutritional support and nutritional rehabilitation.

Monitor the child

Nurses should monitor the child's state of consciousness, respiratory rate and pupil size every 3 hours during the first 24 hours (thereafter, every 6 hours), and a doctor should monitor the child at least twice daily. Management of complications such as convulsions, hypoglycemia is the same as Module 1.

Discharge

On discharge, assess all children for neurological problems, especially hearing loss. Measure and record the head circumference of infants. If there is neurological damage, refer the child for physiotherapy, if possible, and give simple suggestions to the mother for passive exercises. Sensorineural deafness is common after meningitis. Arrange a hearing assessment on all children one month after discharge from hospital.

11.5 Dengue fever

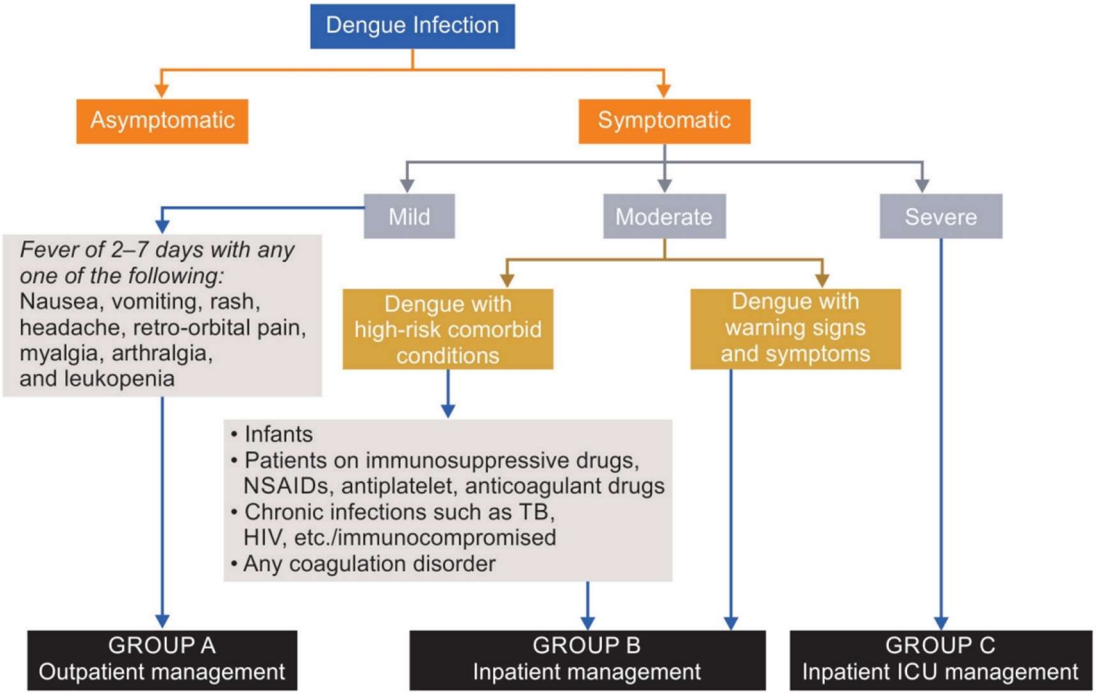
Suspect dengue fever in an area of dengue risk if a child has fever lasting more than 2 days. Headache, pain behind the eyes, joint and muscle pains, abdominal pain, vomiting and/or a rash may occur but are not always present. It can be difficult to distinguish dengue from other common childhood infections.

Causative organism, dengue virus is an arthropode borne virus and has 4 serotypes (Den I, II, III and IV). Aedes aegypti, a day time mosquito, is the principal vector in India and countries of the South-east Asian region, mostly seen in the rainy season or in months following the rainy season.

Clinical Phases of Dengue fever and common complications

	Phases of Dengue	Common complications
1	Febrile Phase (2-7 days)	Dehydration; high fever may cause neurological disturbances and febrile seizures in young children
2	Critical Phase (3-7 days)	Shock from plasma leakage; severe hemorrhage; organ impairment
3	Recovery phase (24-48 hours after critical phase)	Hypervolemia (only if intravenous fluid therapy has been excessive and/or has extended into this period)

Chart 28 A: Clinical features and Case Classification Dengue infection based on severity



(ICU: intensive care unit; HIV: human immunodeficiency virus; TB: tuberculosis)

(Courtesy: IAP guideline on childhood dengue 2022)

Severe dengue

Severe dengue occurs during a critical phase with severe plasma leakage, bleeding and severe organ involvement leading to:

- » Dengue shock syndrome
- » Fluid accumulation with respiratory distress (Effusion or Ascites)
- » Impaired consciousness
- » Myocardial dysfunction, Severe Hepatitis (ALT/AST > 1000 IU), Acute kidney injury

Therefore the following **warning signs** are crucial to be assessed during febrile phase to prevent progressing to severe dengue:

1. Abdominal pain/tenderness
2. Persistent vomiting
3. Clinical fluid accumulation (Ascites and pleural effusion)
4. Mucosal bleed
5. Lethargy and restlessness
6. Liver enlargement >2cm
7. Increase in hematocrit (above 20 % of the baseline) concurrent with rapid decrease in platelet count to about 100,000 cells/mm3.

*** Cases of dengue with warning signs will usually recover with early intravenous fluid rehydration**

Diagnosis of dengue

Dengue fever can be diagnosed using the clinical and laboratory criteria. Antigen testing or serology can be done for confirmation of the diagnosis.

1. **Probable dengue fever/dengue hemorrhagic fever:** Acute febrile illness of 2-7 days with two or more features such as "headache, retro-orbital pain, myalgia, arthralgia, rash and hemorrhagic manifestations" during an outbreak.

   OR

   Non Enzyme-linked immunosorbent assay (non-ELISA) based nonstructural glycoprotein-1 (NS1) antigen/immunoglobulin M (IgM) tested to be positive.

2. **Confirmed dengue fever:** Clinical features of dengue fever with at least ONE of the following:

» Demonstration of IgM antibody against dengue virus by ELISA

» Demonstration of dengue virus antigen (NS1) by ELISA

» Isolation of dengue virus by viral culture

Management of Dengue

The case management of dengue fever includes classification of severity of infection (chart 28A), maintaining adequate intravascular volume (oral or intravascular) and close monitoring of the vital signs, platelet count and hematocrit.

Group A: Outpatient/Home Management, treatment of dengue fever (mild symptomatic)

Most children can be managed at home provided the parents have reasonable access to the hospital.

» Encourage oral fluid intake with clean water or ORS solution to replace losses from fever and vomiting.

» Give paracetamol for high fever if the child is uncomfortable. Do not give aspirin or ibuprofen as these drugs may aggravate bleeding.

» Counsel the mother to bring the child back for daily follow-up but to return immediately if any of the following occur: severe abdominal pain; persistent vomiting; cold, clammy extremities; lethargy or restlessness; bleeding e.g. black stools or coffee-ground vomitus.

» Follow up the child daily until the temperature is normal. Check the haematocrit daily where possible. Check for signs of severe disease.

» Admit any child with signs of severe disease (mucosal or severe skin bleeding, shock, altered mental status, convulsions or jaundice) or with a rapid or marked rise in haematocrit.

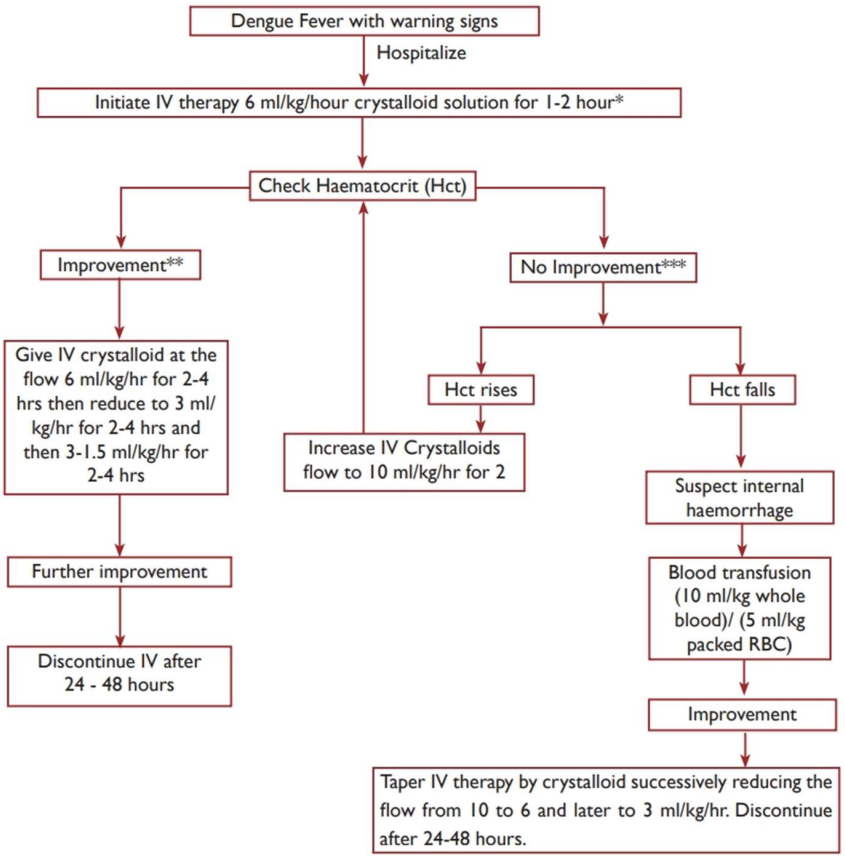
Group B: Inpatient Management for moderate dengue cases

Two **categories** of dengue patients should be admitted and managed in the hospital:

a. Dengue with **warning signs and symptoms-** intravascular volume replacement as in **Chart 28B and Chart 29A.**

b. Dengue with high risk comorbid conditions - without warning signs, encourage oral fluids, if not tolerated start intravenous fluid therapy at the appropriate maintenance rate.

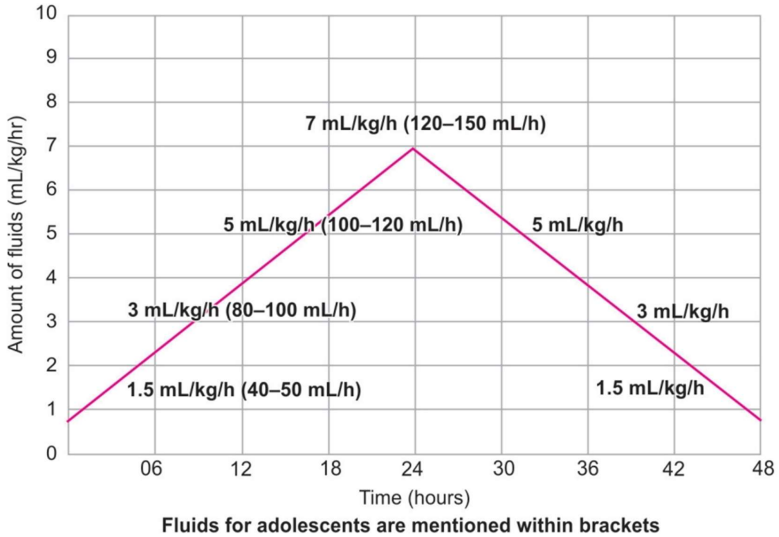
Chart 28B: Fluid management for patients with dengue fever with warning signs



(Courtesy: F-IMNCI, Ministry of Health & Family Welfare, GOI, 2023)

Notes:
*Fluid requirement should be calculated according to lean body mass
**Improvement: Hct falls, pulse rate and blood pressure stable, urine output rises
***No improvement: Hct or pulse rate rises, pulse pressure falls < 20mmHg and urine output falls.

Chart 29A: Empiric Guide to safe fluid therapy in dengue patients with warning signs at bedside in resource-limited setting



Fluids for adolescents are mentioned within brackets

(Courtesy: WHO collaborating for case management of Dengue/DHF/DSS. Bangkok,Thailand: Queen Sirikit National Institute of child health.)

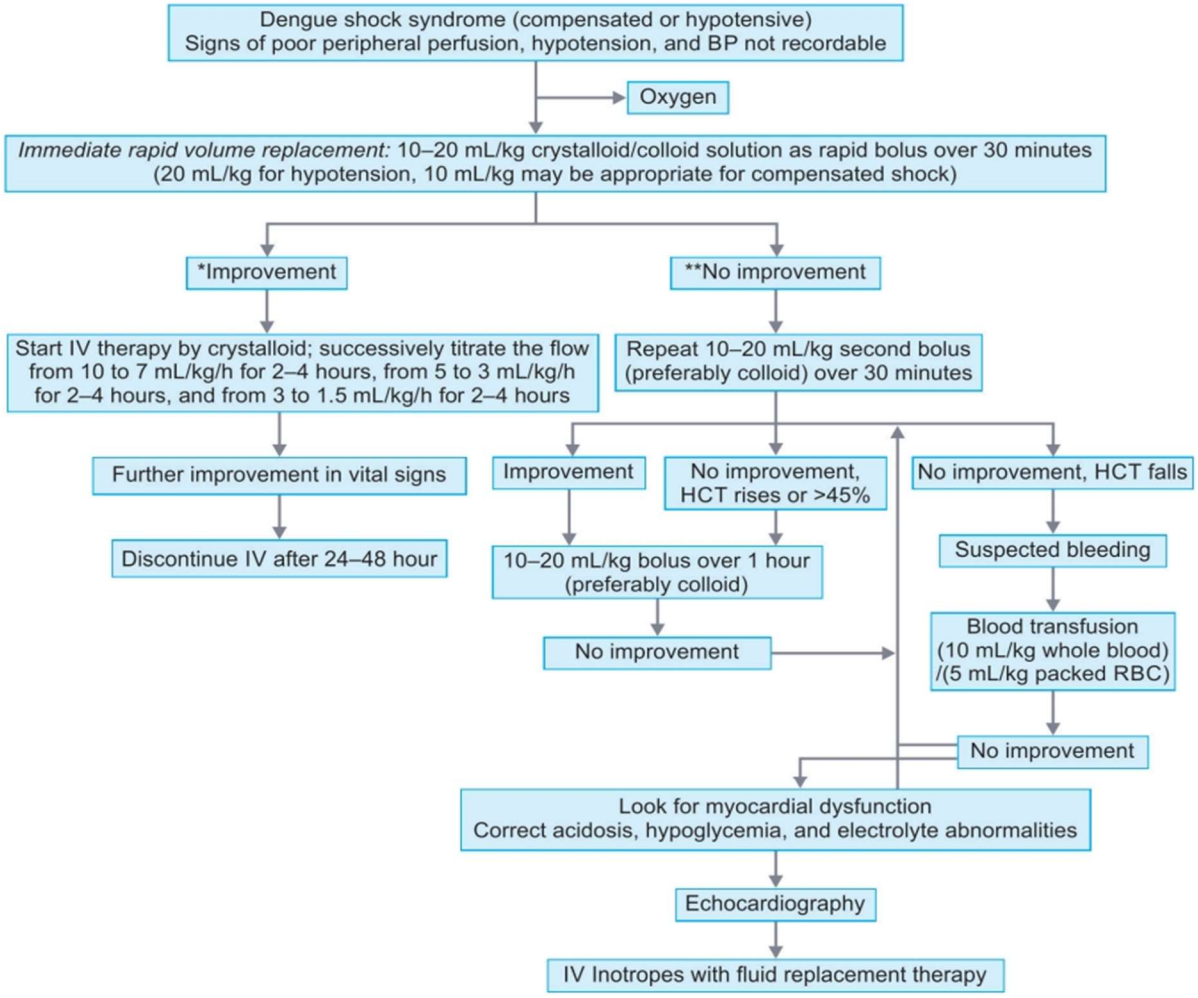
Group C: Inpatient ICU management

Manage all Severe Dengue cases in ICU set up. Severe dengue management is categorised as dengue shock (Hypotensive or Compensated) as in **chart 28C and chart 29B.**

Compensated Dengue Shock- is defined as when systolic blood pressure > 2SD for the age or Pulse Pressure > 20mmHg

Hypotensive Dengue Shock- is defined as when systolic blood pressure < 2 SD below normal for the age or Pulse Pressure < 20mmHg

Chart 28C: Fluid management algorithm for dengue patients with dengue shock (Hypotensive or Compensated)



(HCT: hematocrit; IV: intravenous; RBC: red blood cells)

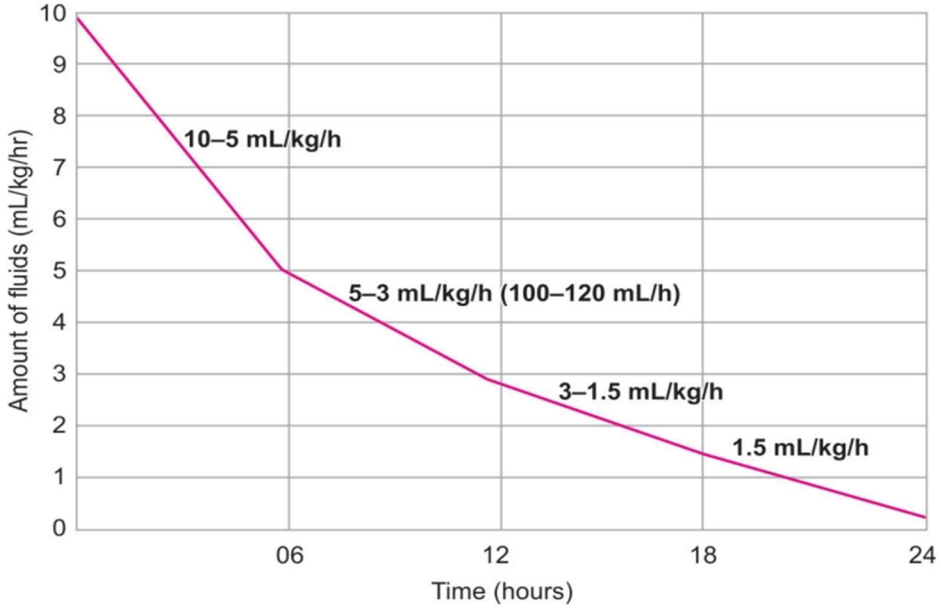
(Courtesy: IAP guideline on Dengue Shock, 2022)

Notes:

*Improvement: Hct falls, pulse rate and blood pressure stable, urine output rises

**No improvement: Hct or pulse rate rises, pulse pressure falls < 20mmHg and urine output falls.

Chart 29B: Guide for the IV fluids rate in profound shock after initial resuscitation (This chart can be used as a guide in resource limited settings)



(Courtesy: WHO collaborating for Case Management of Dengue/DHF/DSS.Bangkok,Thailand:Queen Sirikit National of Child Health)

Indications of blood transfusion in Dengue infection:

Platelet transfusions may be indicated in the following situations;

- Platelets count < 10,000/cu.mm in absence of bleeding manifestations.
- Hemorrhage with or without thrombocytopenia

Packed cell transfusion/fresh frozen plasma (FFP) along with platelets may be required in cases of severe bleeding with coagulopathy.

Monitoring

- In children with shock, monitor the vital signs hourly (particularly the pulse pressure, if possible) until the patient is stable, and check the haematocrit 3–4 times per day. The doctor should review the patient at least four times per day and only prescribe intravenous fluids for a maximum of 6 hours at a time.
- For children without shock, nurses should check the child's vital signs (temperature, pulse and blood pressure) at least four times per day and the haematocrit once daily, and a doctor should review the patient at least once daily.
- Check the platelet count daily, where possible, in the acute phase.
- Keep a detailed record of all fluid intake and output.

Criteria for discharge for admitted dengue patients:

- Afebrile for at least 24 hours
- Normal blood pressure and adequate urine output
- No respiratory distress
- Persistent count > 50,000/cumm

11.6 Urinary Tract Infection

Urinary tract infection (UTI) is common in infants and children. In young children, urinary tract infection often presents as nonspecific signs.

Suspect urinary tract infection in all infants and children with:

- » Fever of ≥38 °C for at least 24 hours without obvious cause
- » Vomiting, poor feeding
- » Irritability, lethargy, failure to thrive, abdominal pain, loose stools, jaundice (especially in young infants)
- » Specific symptoms such as increased frequency, pain on passing urine, abdominal (loin) pain
- » History of chronic constipation

A careful examination should be done to look for features suggesting underlying structural abnormality (distended bladder, enlarged kidneys,tight phimosis, vulval synechiae, palpable fecal mass, patulous anus, neurological deficit in lower limbs, previous surgery of the urinary tract, anorectal malformation or meningomyelocele) that can predispose the child to urinary tract infection.

Diagnosis

UTI diagnosis requires analysis of urine by dipstick or microscopy and urine culture. If culture facility is not available, diagnosis can be made clinically with the supporting evidence of urine microscopy or dipstick.

Uncomplicated UTI - inflammation of urinary bladder (lower urinary tract) with symptoms including dysuria, frequency, urgency, malodorous urine, incontinence, hematuria and suprapubic pain.

Complicated UTI (Pyelonephritis) - diffuse pyogenic infection of the renal pelvis and parenchyma (upper urinary tract) with fever and loin pain/tenderness.

Urine dipstick: If dipstick is positive for leukocyte nitrite or esterase, UTI is very likely

Urine microscopy: in an uncentrifuged sample > 10 WBCs per high power field are suggestive of UTI.

Treatment

Antimicrobial therapy is given based on the local sensitivity pattern. If culture sensitivity pattern are not available, **the following antibiotics can be given in uncomplicated UTI:**

1. Cotrimoxazole (4 mg/kg/dose of trimethoprim twice daily) for 3-5 days

OR

2. Amoxicillin (15mg/kg/dose thrice daily) for 3-5 days

OR

3. Nitrofurantoin (5-7 mg/kg/day in 4 divided doses) for 3-5 days. Fixed dose based on weight band can be prescribed (as in table 1 below)

Indications for admission in children with UTI

» Infants younger than 3 months

» Complicated UTI presenting as;

- Severely ill children (sepsis, dehydration and vomiting)
- Fever persisting after 3 days of appropriate antibiotic treatment as above.

Antibiotic therapy for admitted children:

Start parenteral following antibiotics until the child is afebrile,

1. Injection Gentamicin 5- 7.5mg/kg/dose OD

OR

2. Injection Ceftriaxone 75 mg / kg in single dose or two divided dose

OR

3. Injection Ciprofloxacin 10mg/kg/dose twice daily

Switch to following oral antibiotics after the child becomes afebrile,

1. Cephalexin 25-50mg/kg/day in 2 to 4 divided dose

OR

2. Ciprofloxacin 15mg/kg/dose BD

OR

3. Cotrimoxazole (4 mg/kg/dose of trimethoprim twice daily)

Total duration of antibiotics - 7 to 10 days

Indications of ultrasonography in UTI:

1. Recurrent UTI (> 2 episodes)
2. Age less than 6 months of age
3. Male child

.Not indicated in uncomplicated UTI (Cystitis)

11.7 Septicemia

Septicaemia should be considered in a child with acute fever who is severely ill. It can occur with association with meningitis, pneumonia, urinary tract infection or any other bacterial infection.

The common causative agents include Streptococcus, Haemophilus influenza, Staphylococcus aureus and enteric Gram-negative bacilli such as Escherichia coli and Klebsiella (in patients with severe malnutrition/ immunodeficiency state).

Diagnosis

The child's history helps to determine the likely source of sepsis. Always undress the child fully and examine carefully to look for:

- Signs of local infection such as abscess, cellulitis, joint swelling, ear discharge, pus points over tonsils.
- Signs of meningeal irritation (neck retraction, bulging fontanelle).
- Signs of deep seated infections such as tenderness and guarding in abdomen, renal angle fullness/ tenderness.
- Bleeding manifestations such as petechiae, purpura, ecchymosis

Investigations

It will depend on case presentations and laboratory facilities availability. Basic investigations can be advised:

Complete Blood Count, Urinalysis, Smear for malaria parasite/RDT, Chest Xray, Culture (blood/ urine) if available.

Treatment

Start empirical broad spectrum antibiotics immediately if clinically suspected of sepsis;

- Give IV Ampicillin at 50 mg/kg every 6 hours plus IV Gentamicin 7.5 mg/kg once a day for 7-10 days

OR

- Give IV Ceftriaxone at 80-100 mg/kg IV once daily or 2 divided dose over 30-60 minutes for 7-10 days
- Give IV Cloxacillin at 25 mg/kg/dose IV 6 hourly (If staphylococcal sepsis suspected or patient has Septic Shock)

Monitoring

The child should be checked by a nurse, at least every 3 hours and by a doctor, at least twice a day:

- Check for the presence of new complications, such as shock, cyanosis, reduced urine output, signs of bleeding (petechiae, purpura, bleeding from venipuncture sites) or skin ulceration

11.8 Typhoid fever:

Suspect typhoid fever if a child presents with fever persisting for more than 3 days, plus ANY of the following: diarrhoea or constipation, vomiting, abdominal pain, headache, malaise, loss of appetite or cough.

Typhoid fever can present atypically in young infants as an acute illness with shock and hypothermia.

Clinical features

The main clinical features of typhoid fever are:

- Fever with no obvious focus of infection
- No stiff neck or other specific signs of meningitis, or a lumbar puncture for meningitis is negative
- Signs of systemic upset e.g., inability to drink or breastfeed, lethargy, disorientation/ confusion, vomiting
- Hepatosplenomegaly, tense and distended abdomen

Diagnosis

- Complete blood counts in most cases with typhoid fever are normal. Leucopenia or pancytopenia is seen in 10-25 % cases.
- The definitive diagnosis of typhoid fever is the isolation of S.typhi organisms in blood/stool/bone marrow culture and culture should be done whenever possible.

Management

Since the emergence of multidrug resistant (MDR) typhoid fever in the regional countries like India, Nepal and Pakistan, third generation cephalosporins are recommended for treatment of typhoid fever.

Cases requiring hospitalization should be treated with ceftriaxone (80mg/kg IV or IM once daily). In ambulatory patients cefixime (20 mg/kg/day in 2 divided doses) can be used.

In areas where sensitive strains have reemerged, use of chloramphenicol (25 mg/kg/dose, 8 hourly) or Co-trimoxazole (4 mg/kg/dose of Trimethoprim, twice daily) are recommended.

Other drugs used to treat typhoid fever include fluoroquinolones (ciprofloxacin 15-20 mg/kg/day in 2 divided doses, ofloxacin 10-20 mg/kg/day in 2 divided doses) and azithromycin (10-20 mg/kg/day).

Duration of antibiotic treatment should be for 5 days after the child becomes afebrile or 10-14 days whichever is longer.

The cases with typhoid fever should be closely monitored for complications like gastrointestinal hemorrhage, intestinal perforation, hypotension and shock. Antipyretics for fever and maintenance intravenous fluids may be required initially in cases that have poor oral intake.

11.9 Rickettsial Fevers

There are two main groups, mainly spotted fevers and typhus. The spotted fever is transmitted by ticks whereas typhus is spread by mite, ticks or fleas.
Scrub typhus is increasingly being diagnosed in Bhutan.

Signs and symptoms

- Fever (remittent) and headache
- Malaise, weakness and cough
- Rash (maculopapular involving trunks ,face and limbs including palms and soles)
- The bite sites may become red with a black scab (Eschar). Eschar is a pathognomonic sign of scrub typhus.
- Painless lymphadenopathy
- Hepatosplenomegaly
- CNS involvement - meningitis/encephalitis

Investigations:

- CBC- Total leucocytes count (TLC) during early course of the disease may be normal or there may be leukopenia but later in the course of the disease, leukocytosis is seen, i.e. WBC count > 11,000/µl.
- Thrombocytopenia (<100,000/microlitre) is seen in majority of patients
- Raised transaminase level are also observed
- Serological tests (ELISA)

Management

- Tab. Doxycycline 2 mg/kg/dose BD 5 days OR
- Tab. Azithromycin 10 mg/kg/day OD for 5 days OR
- I.V Chloramphenicol 50 to 100 mg/kg/day, 6 hourly for 5 days or till afebrile for 3 days.

11.10 Fever lasting longer than 7 days

As there are many causes of prolonged fever, it is important to know the most common causes in a given area. Investigations for the most likely cause can then be started and treatment decided.

Additional differential diagnosis of fever lasting longer than 7 days

Diagnosis	IN FAVOUR	Diagnosis	IN FAVOUR
Abscess	» Fever with no obvious focus of infection (deep abscess) » Tender or fluctuant mass » Local tenderness or pain » Specific signs depend on site - Subphrenic, liver, Psoas, Retroperitoneal, lung, renal, etc	Infective endocarditis	» Weight loss » Enlarged spleen » Anaemia » Heart murmur » Petechiae » Splinter haemorrhages in nail beds » Microscopic haematuria » Finger clubbing
Rheumatic fever	» Heart murmur which may change over time » Arthritis/arthralgia » Cardiac failure » Fast pulse rate » Pericardial friction rub » Chorea » Recent known streptococcal infection	Tuberculosis	» Weight loss » Anorexia, night sweats » Cough » Lymphadenopathy » Enlarged liver and/or spleen » Family history of TB » Chest X-ray » Tuberculin test
Connective Tissue Disorders	» Joint pain, swelling » Myalgia » Rashes » Anaemia » Weight loss » Effusion » Ascites » heamaturia/ frothy urine	Childhood Malignancies	» Weight loss » Anaemia » Bleeding manifestations » Lymphadenopathy » Enlarged liver and/or spleen » Mass or lump in the body
Kala-azar	» Endemic area » Enlarged spleen and/or liver » Anaemia » Weight loss		

EXERCISE 10

Pema, a 4 year old child has been urgently referred to you with classification of very severe febrile disease. Not very low weight and anaemia. She is from a high malaria risk area. She is in a coma and has no signs of shock. The child is not severely malnourished and has some pallor. Her temperature is 39.2o C.

a. How would you triage this child? What emergency treatment would you give?

b. Enlist important points in history and physical examination.

c. What is your differential diagnosis?

d. What investigations would you like to do?

Further examination reveals that she has no rash and no stiff neck. CSF examination is normal and blood smear shows asexual forms of Plasmodium falciparum.

e. What is the most likely diagnosis? How would you manage the case?

SECTION 12:
CASE MANAGEMENT OF CHILDREN WITH SEVERE ACUTE MALNUTRITION (SAM)

Malnutrition remains one of the most common causes of morbidity and mortality among children. Risk of mortality in children with mild to moderate malnutrition is approximately 2.2 times higher than children with normal nutritional status. Children with severe acute malnutrition usually have 8-9 times higher risk of mortality with common infections like pneumonia, diarrhoea etc. These deaths may be prevented by early detection of growth faltering, timely intervention to prevent further deterioration of nutritional status and protocol based treatment of children with severe acute malnutrition.

This section provides simple, specific guidelines for the management of severely malnourished children.

12.1 Learning objectives

After completion of this section the participant should be able to:

- recognize criteria for hospital admission of malnourished children
- perform initial assessment of the severely malnourished child
- understand organisation of care for malnourished child
- provide general treatment for malnutrition and associated conditions.
- understand discharge and follow-up guidelines of the severely malnourished child

12.2 Severe acute malnutrition

Diagnosis

- Weight for Height/Length <-3 Z score of median of WHO child growth standards

OR

- Bipedal edema
- Mid-upper arm circumference <115mm

If weight-for-height or weight-for-length cannot be measured, use the clinical signs for visible severe wasting (see Figure30 and 31)

Criteria for admission

Children with severe acute malnutrition with loss of appetite or any medical complication have **complicated severe acute malnutrition** and should be admitted for inpatient care. Children who have a good appetite and no medical complications can be managed as outpatients.

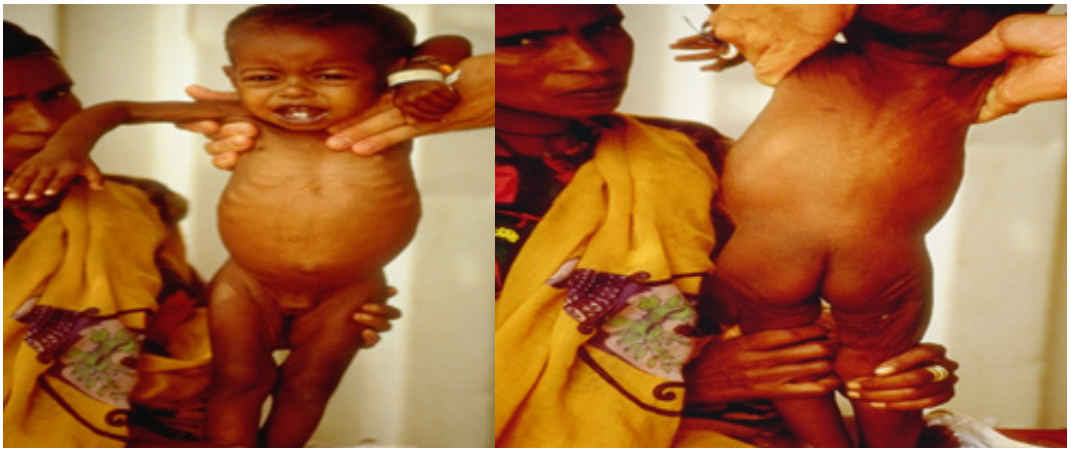


Figure 30: Child with Marasmus (Baggy Pants Appearance)

Figure 31: Child with Kwashiokar

Assessment of severely malnourished child

A good history and physical examination is required for deciding the treatment but always start the emergency treatment first. The details of history and examination can be recorded later.

Take a history concerning	On examination, look for
» Recent intake of food and fluids » Usual diet (before the current illness) » Breastfeeding » Duration and frequency of diarrhoea and vomiting » Type of diarrhea (watery/ bloody) » Loss of appetite » Family circumstances (to understand the child's social background) » Chronic cough » Contact with tuberculosis » Recent contact with measles » Known or suspected HIV infection. » Immunizations	» Anthropometry-measure weight, height/ length, and/or mid arm circumference » Oedema » Pulse, respiratory rate, pulse » Signs of dehydration » Shock (cold hands, slow capillary refill, weak and rapid pulse) » Severe palmar pallor » Eye signs of vitamin A deficiency (as seen in Figure 32): - dry conjunctiva or cornea, - Bitot's spots - Corneal ulceration - Keratomalacia » Localising signs of infection, including ear and throat infections, skin infection or pneumonia » Signs of HIV infection. » Fever (temperature ≥ 37.5° C) or Hypothermia (axillary temperature <35.0° C) » Mouth ulcers » Skin changes of kwashiorkor: - Hypo or hyperpigmentation - Desquamation - Ulceration (spreading over limbs, thighs, genitalia, groin, and behind the ears) - Exudative lesions (resembling severe burns) often with secondary infection (including Candida).

Note: Children with vitamin A deficiency are likely to be photophobic and will keep their eyes closed. It is important to examine the eyes very gently to prevent corneal rupture.

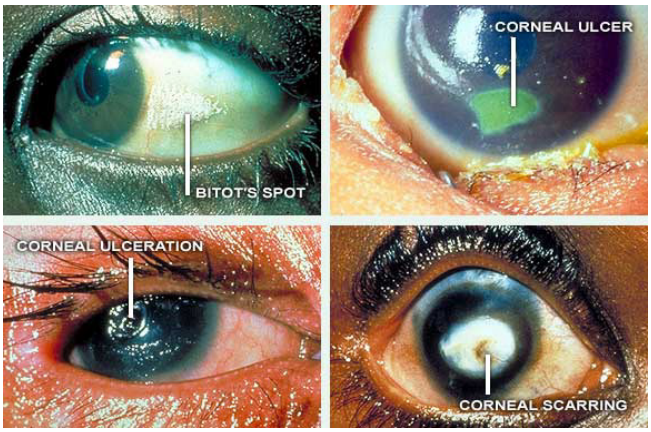


Figure 32: Signs of vitamin A deficiency

Laboratory Tests

» Hemoglobin or complete blood count and peripheral blood smear in all children with severe palmar pallor

» Blood sugar

» Serum electrolytes (sodium, potassium, and calcium whenever possible)

» Screening for common infections: Children with SAM often harbour occult infections.

- blood/urine culture (if possible)
- Urine routine examination & microscopy
- Stool routine examination
- Chest x-ray (for TB screening with positive history of contact)
- Gastric aspirate/stool for AFB/GeneXpert
- Blood smear or RDT for Malaria; if febrile
- Serology Screening for HIV

12.3 Organization of care

On admission, the child with severe malnutrition should be separated from infectious children and kept in a warm area (25–28°C, with no draughts), and constantly monitored. Bathing should be kept to a minimum, after which the child should be dried immediately.

Facilities and sufficient staff should be available to ensure correct preparation of appropriate feeds, and to carry out regular feeding during the day and night. Accurate weighing machines are needed, and records should be kept of the feeds given and the child's weight so that progress can be monitored.

12.4 Providing general treatment for malnutrition

» The triage process and assessment of children with severe malnutrition and management of shock has already been discussed in module 1.

» If there are any clinical signs of vitamin A deficiency (e.g. night blindness, conjunctival xerosis with Bitot's spots, corneal xerosis or ulceration, or keratomalacia), give vitamin A on day 1, day 2 and at day 14:

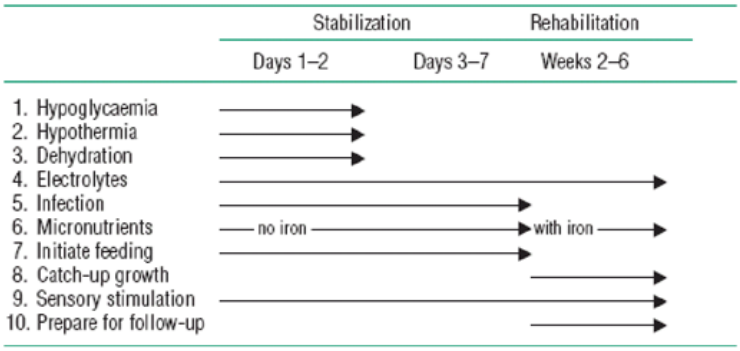
- 50,000 IU to infants < 6 months,
- 1,00,000 IU to infants between 6-12 months of age and
- 2,00,000 IU for children> 12 months

» When there is corneal ulceration, instil ciprofloxacin or chloramphenicol eye drops and atropine drops (0.1%) into the eye, cover with a saline soaked eye pad, and bandage.

» Severe anaemia, if present, will need urgent treatment.

There are ten essential steps in two phases:

1. Initial stabilisation phase
2. Longer rehabilitation phase.



The focus of initial management is to prevent death while stabilising the child

Principles for management of malnutrition- Important things NOT TO DO and why?

- » Do not give IV fluids routinely. IV fluids can easily cause fluid overload and heart failure. Only give IV fluids to children with signs of shock.
- » Do not give diuretics to treat oedema. The oedema will go away with proper feeding. Giving diuretics will worsen a child's electrolyte imbalance and may cause death.
- » Do not give high protein formulas. Almost all severely malnourished children have infections, impaired liver and intestinal function. Because of these problems, they are unable to tolerate the usual amount of dietary protein.
- » Do not give iron during the initial feeding phase. Add iron only after the child has been on catch-up formula for 2 days (usually during week 2). Giving iron early in treatment has been associated with free radical generation and may interfere with the body's immune mechanisms against proliferating bacteria.

12.4.1 Hypoglycaemia

All severely malnourished children are at risk of developing hypoglycemia (blood glucose <54 mg/dl) which is an important cause of death. Measure blood sugar on admission. If the blood glucose cannot be measured, assume that all children with severe malnutrition have hypoglycemia and give a feed or 10 % glucose immediately on admission.

Treat and prevent hypoglycemia

- » If the child is lethargic/ unconscious/convulsing, give IV 10% glucose 5 ml/kg followed by 50 ml of 10% glucose by NG tube. If IV dose cannot be given immediately, give the NG dose first.
- » If the child is not lethargic/ not unconscious/ not convulsing, give the first feed of F-75/Starter diet and then continue with 2 hourly feeds, day and night. If the first feed is not quickly available, give 50 ml of 10% glucose or sugar solution (4 full teaspoons of sugar in 200 ml or one cup of water) orally or by nasogastric tube, followed by the first feed as soon as possible.
- » Give 2-hourly feeds, day and night, at least for the first day.
- » Give appropriate antibiotics and start feeding as soon as possible.
- » Keep the baby warm and check the temperature 8 hourly .

Monitoring

If the initial blood glucose was low, repeat blood sugar after 30 minutes of 10 % dextrose.

If the axillary temperature falls <35°C or if there is deterioration in the level of consciousness, check blood sugar level

» If glucose is again <54 mg/dl, repeat the 10% glucose or sugar solution.

12.4.2 Manage hypothermia

What is hypothermia?

If the axillary temperature is <35°C or does not register on a normal thermometer, assume hypothermia. Treat all hypothermic children for hypoglycaemia and for infection as well.

Maintain warm room

» Place the bed in a warm, draught-free part of the ward and keep the child covered.

» Change wet nappies, clothes and bedding to keep the child and the bed dry.

» Avoid exposing the child to cold (e.g. after bathing, or during medical examinations).

Treat and prevent hypothermia

» Make sure the child is clothed (including the head). Cover with a warmed blanket and place a heater (not pointing directly at the child) or lamp nearby, or put the child on the mother's bare chest or abdomen (skin-to-skin) and cover them with a warmed blanket/clothing. Do not use hot water bottles.

» Feed the child immediately (if necessary, rehydrate first).

» Give appropriate antibiotics.

» Give 2 hourly feed through the night till the temperature is stable.

Monitoring

» Take the child's temperature 2-hourly until it rises to more than 36.5°C. Take it half-hourly if a heater is being used.

» Ensure that the child is covered at all times, especially at night. Keep the head covered, preferably with a warm bonnet to reduce heat loss.

» Check for hypoglycemia whenever hypothermia is present.

12.4.3 Dehydration

Recognize dehydration

Correct estimation of dehydration is difficult in severely malnourished children. Many of the signs that are normally used to assess dehydration are unreliable in a child with severe acute malnutrition. The loss of supporting tissue and absence of subcutaneous fat make the skin thin and loose. It flattens very slowly when pinched or may not flatten at all. Edema if present may mask elasticity of the skin, hence dehydration in SAM tends to be over diagnosed and its severity is overestimated.

Remember a child with severe acute malnutrition may be dehydrated even in the presence of oedema.

Ask the mother if the child has had watery diarrhoea or vomiting. If the child has watery diarrhoea or vomiting, assume dehydration and start rehydration (Also ask about blood in the stool, as this will affect choice of antibiotics).

Treatment

Since signs of dehydration are not reliable in severely acute malnourished children, rehydrating orally or through a nasogastric tube is recommended (Refer Annexure 17.4 for NG insertion and rehydration technique) with modified ORS* or commercially available ORS for children with SAM (Re-SoMal - Rehydration solution for malnourished children).

Remember: Use IV rehydration only if the child has signs of shock and is lethargic or has lost consciousness.

Preparation of modified ORS*

Dissolve 1 packet of standard ORS in 2 litres of water (instead of 1 litre), add 50g of sugar (5 tablespoon full) and 30 ml of injection potassium chloride containing (40mEq/L of potassium).

In case, preparation of modified ORS is not possible, start rehydration with low osmolarity ORS. If the child has profuse watery diarrhoea or cholera is suspected, use low osmolarity ORS without any modification for rehydration.

Calculate amount of modified ORS/Re-SoMal to give

How often to give ORS (Re-SoMal)	Amount to give
Every 30 minutes for the first 2 hours	5 ml/kg body weight
Alternate hours for up to 10 hours	5-10 ml/kg**

** The amount offered in this range should be based on the child's willingness to drink and the amount of ongoing losses in the stool. Starter F-75 diet is given in alternate hours during this period (e.g F-75 diet at 2, 4, 6 hours and ORS at 3, 5, 7 hours) until the child is rehydrated.

If the child has already received IV fluids for shock and is switching to ORS, omit the first 2-hour treatment and start with the amount for the next period of up to 10 hours.

Monitor the child who is taking ORS

Monitor every 30 minutes for the first 2 hours and then hourly;

- Respiratory rate
- Pulse rate
- Urine output- Ask: Has the child passed urine since last checked?
- Frequency of stools and vomiting- Ask: Has the child had a stool or vomited since last checked?

If you find signs of overhydration (increasing respiratory rate by 5/min and pulse rate by 15/min), stop ORS (Re-SoMal) immediately and reassess after 1 hour.

Prevent dehydration from ongoing losses:

Measures to prevent dehydration from continuing watery diarrhoea are similar to those for well-nourished children.

- If the child is breastfed, continue breastfeeding.
- Give ORS (Re-SoMal) 50-100ml after each watery loose stool between feeds to replace stool losses.

Feeding during rehydration:
Breastfeeding should not be interrupted during rehydration. Begin to give the F-75 diet as soon as possible, orally or by NG tube, usually within 2-3 hours after starting rehydration.

12.4.3.1 Shock in severely malnourished children

Shock from dehydration and sepsis are likely to coexist in severely malnourished children. They are difficult to differentiate on clinical signs alone. Children with dehydration will respond to IV fluids. Those with septic shock and no dehydration will not respond. The amount of fluid given is determined by the child's response. Overhydration must be avoided.

Give IV fluids to severely malnourished child if:
- » child is lethargic or unconscious and
- » has cold hands plus
  - prolonged capillary refill (longer than 3 seconds) AND
  - weak and fast pulse

Prolonged capillary refill time
You have already read how to check for capillary refill.

Tachycardia
2 months up to 12 months: 180 beats or more per minute
12 months up to 5 years: 160 beats or more per minute

Management of shock in a child with SAM
(Refer Module 1 and chart 34 in chart booklet)

- » Give oxygen
- » Intravenous rehydration:
  - The only indication for IV infusion in a severely malnourished child is circulatory collapse caused by severe dehydration or septic shock. In case of inability to secure intravenous access, an intraosseous route should be used.
  - Since Ringer's lactate with 5% dextrose is not commercially available, use half normal (N/2) saline with 5% dextrose as rehydrating fluid.
  - Give IVFluid , 15 ml/kg over 60 minutes with continuous monitoring (pulse rate, pulse volume, respiratory rate, capillary refill time, urine output).
  - Monitor pulse and respiratory rates every 10-15 min. If there is improvement (pulse slows; faster capillary refill) at the end of the first hour of IV fluid infusion, consider diagnosis of severe dehydration with shock. Repeat rehydrating fluid at the same rate over the next hour and then switch to reduced osmolarity ORS at 5-10 ml/kg/hour, either orally or by nasogastric tube.
  - If there is no improvement or worsening after the first hour of the fluid bolus, consider septic shock and treat accordingly.
- » Administer IV antibiotics
- » Caution:

» Do not use 5% dextrose alone

» Add potassium to the IV fluids; 1.5ml per 100ml; after the patient passes urine. 1 ml of potassium chloride provides 2 mmol of potassium. Thus if you add 1ml to 100 ml it will give 20 mEq/litre. You should not increase to more than 40 mEq/litre.

» Monitor frequently and look for features of over hydration and cardiac decompensation. Increasing respiratory rate (>5 per minute) and increasing pulse rate (> 15 per minute), increasing edema and periorbital puffiness indicates overhydration which may be dangerous and may lead to heart failure.

12.4.4 Electrolyte imbalance

» Give supplemental potassium at 3-4 mmol/kg/day for at least 2 weeks. Potassium can be given as syrup potassium chloride; the most common preparation available has 20 mmol/15 ml.

» On day 1, give 50% magnesium sulphate IM once (0.3mL/kg) up to a maximum of 2 ml. Thereafter, give 50% magnesium (0.4–0.6 mmol/kg daily) orally. If oral commercial preparation is not available you can give injection magnesium sulphate (50% which has 2 mmol/ml) orally as magnesium supplements mixed with feeds.

» Prepare food without adding salt to avoid sodium overload

12.4.5 Infection

Presume and treat infection

Assume all children with severe malnutrition admitted in a hospital have an infection and give broad spectrum antibiotics. If a specific infection is identified (such as Shigella), give appropriate antibiotics according to the condition identified. Hypoglycemia and hypothermia are often signs of severe infection.

Select antibiotics as shown in the table below.

STATUS	ANTIBIOTICS
All admitted case without medical complication and good appetite	Give oral amoxicillin 15mg/kg/dose TDS for 5 days
All admitted cases with any complications other than shock, meningitis and dysentery	» Inj. Ampicillin 25 mg/kg/dose 6 hourly and Inj. Gentamicin 5- 7.5 mg/kg OD for 7 days » Add Inj. Cloxacillin 100 mg/kg/day 6 hourly if staphylococcal infection is suspected » Revise therapy based on sensitivity report
For septic shock or worsening/ no improvement in initial hours	» Give Inj. Ceftriaxone 100 mg/kg OD/BD along with Inj. Gentamicin 5-7.5mg/kg/day OD for 7-14 days. Do not give a second dose of gentamicin until the child passes urine.
Meningitis	» Inj. Ceftriaxone 100 mg/kg OD PLUS Gentamicin 5- 7.5 mg/kg once a day for 10-14 days
Dysentery	» If a child is sick or has already received ciprofloxacin, give Inj. Ceftriaxone 100 mg/kg OD for 5 days.

* For children receiving Gentamicin check RFT every 3rd day

Treat Associated Conditions

- Give antimalarials if blood smear/RDT is positive for malaria parasites
- Start ATT if tuberculosis is diagnosed or strongly suspected (Positive TB contact history and findings in Chest X-ray)
- Suspect HIV if he has also other problems like persistent diarrhoea, oral thrush, pneumonia, parotid swelling or generalised lymphadenopathy. Investigate and follow HIV guidelines
- Severe anaemia: Give whole blood or packed cell transfusion if Hb is < 4g/dl or Hb is 4-6 g/dl and the child has respiratory distress. Give 10 ml/kg slowly over 4-6 hours and give Inj. Frusemide 1 mg/kg at the start of the transfusion.
- If eye problems (keratomalacia) due to vitamin A deficiency, in addition to vitamin A doses instil chloramphenicol/ciprofloxacin eye drops 2-3 hourly and atropine eye drops 3 times a day for 7-10 days. Also cover the eyes with pad and bandage.
- Skin lesions: Bathe or soak the affected areas for 10 minutes in 1% potassium permanganate solution and apply antibacterial cream to skin sores and any barrier cream (zinc cream) to the raw areas.
- Persistent diarrhoea: Diarrhoea is common in severe malnutrition but with cautious refeeding, it should subside during the first week. In the rehabilitation phase, the poorly formed loose stools are not a cause for concern, provided the child's weight gain is satisfactory. If the child has persistent diarrhoea, screen for non-intestinal infections and treat appropriately. Continue breastfeeding and try to give feeds with low lactose initially and subsequently change to lactose free options if diarrhoea persists. (Annexure-11)

Response to treatment for infection

Good response

- Alert and active
- Improved activity and weight gain > 5 gm/kg/day
- Absence of clinical and lab. evidence of infections
- Absence of complications like hypoglycaemia or hypothermia

Poor response

- Lethargic, poor activity
- Poor appetite or no weight gain
- Clinical/ lab. evidence of infections
- Danger signs present

If poor response

- Ensure child has received appropriate and adequate antibiotics
- Check whether vitamin and mineral supplements are given correctly (see below)
- Reassess for possible sites of infection
- Suspect resistant infections (malaria, tuberculosis) or HIV
- Look for lack of stimulation and other social problems

12.4.6 Micronutrients

Give a single dose of oral vitamin A to all children with SAM unless there is evidence that the child has received vitamin A dose in the last 1 month.

Vitamin A orally in single dose as given below:

- < 6 months : 50,000 IU
- 6-12 months : 1,00,000 IU
- Older children: 2,00,000 IU
- Give same dose on Day 0,1 and 14 if there is clinical evidence of vitamin A deficiency

Other micronutrients should be given daily for at least 2 weeks:

- Multivitamin supplement: Twice Recommended Daily allowance (should contain vitamin A, C, D, E and B12 & not just vitamin B-complex):
- Folic acid: 5mg on day 1, then 1 mg/day
- Zinc : 2mg/kg/day
- Copper: 0.3 mg/kg/day (if separate preparation not available use commercial preparation containing copper).
- Iron: start daily iron supplement after 2 days of the child being on catch up diet (F-100). Give elemental iron in the dose of 3mg/kg/day in two divided doses, preferably between meals.

12.4.7 Initiate feeding

Essential features of initial feeding are:

- Start feeding as early as possible
- Feed the child if alert and drinking even during rehydration
- Give frequent and small nutrient rich feeds of low osmolarity and low lactose
- Offer 130 ml/kg/day of liquids (100 ml/kg/day if child has severe oedema), 80-100 Kcal/kg/day and 1-1.5 g/kg/day of proteins
- Use nasogastric feeding till child takes orally 75% of all feeds
- If the child is breastfed, continue breastfeeding but give the F-75 feed also
- Ensure night feeds.

Feeding formula: What is F-75?

F-75 is the starter formula to use during initial management. It is started as soon as possible and continued for 2-7 days until the child is stabilised. Severely malnourished children cannot tolerate usual amounts of proteins and sodium at this stage, or high amounts of fat. They may die if given too much protein or sodium. F-75 is specially made to meet the child's needs without overwhelming the body's systems in the initial stage of treatment which provides 75 calories /100 ml and 0.9 gm of protein/100 ml.

Recommended schedule with gradual increase in feed volume is as follows

Days	Freq	Vol/kg/feed	Vol/kg/day
1-2	2 hourly	11 ml	130 ml
3-5	3 hourly	16 ml	130 ml
6 onwards	4 hourly	22 ml	130 ml

Feed the child F-75 orally, or by NG tube if necessary:

Oral feeding

It is best to feed the child with a cup and spoon. Encourage the child to finish the feed. It takes skill to feed a very weak child, so nursing staff should do this task first and mother may help with feeding later when the child becomes stronger. Encourage breastfeeding on demand between F-75 feeds.

Nasogastric feeding

It may be necessary to use a NG tube if the child is very weak. Use an NG tube if the child does not take 80% of the feed for 2-3 consecutive feeds.

Remove the NG tube when the child takes:

- 80% of the day's amount orally; or
- two consecutive feeds fully by mouth.

Record intake and output on a 24-Hour food intake chart

Record the information on a 24-Hour food intake chart (Refer Annexure 14)

Criteria for increasing volume/decreasing frequency of feed

1. If there is vomiting, significant diarrhoea, or poor appetite, continue 2-hourly feeds.
2. If there is little or no vomiting, diarrhoea is less than before and finishing most feeds (> 80%), change to 3-hourly feeds.
3. After a day on 3-hourly feeds: If there is no vomiting, occasional diarrhoea, and most feeds are consumed, change to 4-hourly.

(Refer Annexure 18 for F-75 feeding volumes)

How to prepare the feeds

- Wash hands before measuring ingredients
- Mix sugar and oil, then add the fresh milk. Add boiled, cooled water up to 100 ml, stirring all the time. Whisk vigorously so that oil does not separate out. If using milk powder, mix milk and sugar in a jug, then add oil and stir to make a paste. Add cooled boiled water to the 100 ml mark.
- Milk cereal diets need cooking. Mix the rice flour, milk or milk powder, sugar, oil in a measuring jug. Slowly add boiled and cooled water up to 100 ml. Transfer to a cooking pot and whisk the mixture vigorously. Boil gently for 4 minutes, stirring continuously. Some water will evaporate, so transfer the mixture to a measuring jug and add enough water to make 100 ml. Cooking can be avoided if you use puffed rice powder or commercial pre-cooked rice preparation as cereal flour. The below charts give the composition for a 100 ml diet. Prepared diet may be kept at room temperature for 6 hrs or 24 hrs wherever there is a facility for refrigeration, 1-litre diet could be prepared by multiplying the requirement of each constituent by 10.
- The initial cereal based low lactose (low osmolarity) diet is recommended for those with persistent diarrhoea.

Initial diets recommended in severe malnutrition: F-75

Diets contents (per 100ml)	F-75 Starter	F-75 Starter (Cereal based) Ex: 1	F-75 Starter (Cereal based) Ex: 2
Fresh cow's milk or equivalent (ml)*	30	30	25
Sugar (g) (Approximate measure of one level teaspoon)	9 (1 + 1/2)	6 (1)	3 (1/2)
Cereal flour: Powdered puffed rice (g) (Approximate measure of one level teaspoon)	- 	2.5 (3/4)	6 (2)
Vegetable oil (g) (Approximate measure of one level teaspoon)	2 (1/2)	2.5 (1/2+)	3 (3/4)
Water: make up to (ml)	100	100	100
Energy (kcal)	75	75	75
Protein (g)	0.9	1.1	1.2
Lactose (g)	1.2	1.2	1.0

* Can replace fresh milk 30 ml with 3.5 gm whole dried milk

Monitoring

Monitor and record (see Annexure 13)

- Amounts of feed offered and left over
- Stool frequency and consistency
- Vomiting
- Daily body weight

Demonstration on filling of 24 hour food intake chart

12.4.8 Catch-up growth

Recognize readiness for transition

Signs that a child has reached this phase are:

- return of appetite (easily finishes 4-hourly feeds of F-75)
- Resolution of edema

Begin giving F-100 slowly and gradually

Make a gradual transition from starter to catch-up formula.

Feeding formula: What is F-100?

- F-100 is used as a catch-up formula to rebuild wasted tissues. F-100 contains more calories and

protein.

» Replace the starter F-75 with an equal amount of catch-up F-100 for 2 days. Give a milk-based formula, such as catch-up F-100 which contains 100 kcal/100 ml and 2.9 g of protein per 100 ml.

» Then on the 3rd day, increase each successive feed by 10 ml as long as the child is finishing feeds. Continue increasing the volume of feed if the child consumes > 80% of the prescribed amount. The maximum amount of volume/feed that a child will be able to consume is around 220 ml/kg/day which will provide 220 kcal/kg/day and 4–6 g of protein/kg/day.

(Refer Annexure 18 F-100 feeding volumes)

» Continue breastfeeding between F 100

12.4.9 Sensory stimulation

Malnourished children are less active, weak and lethargic. They need emotional, physical stimulation and interaction for them to achieve their developmental milestones on time.

Hence during rehabilitation phase, provide:

» tender loving care

» a cheerful stimulating environment

» teach mother/caregiver to give structured play therapy for 15-30 minutes two times a daily.

» Encourage physical activity as soon as child is improving

» Encourage maternal involvement as much as possible (eg. comforting, feeding, play).

Recovery is faster in children who receive sensory stimulation and are involved in play daily.

Catch up diet: F-100

Diets Contents (per 100ml)	F-100 Catch-up	F-100 Catch-up (cereal based) Ex: 1
Fresh milk or equivalent (ml)	95	75
Sugar (g) (Approximate measure of one level teaspoon)	5 (1)	2.5 (1/2-)
Cereal flour: Puffed rice (g) (Approximate measure of one level teaspoon)	-	7 (2)
Vegetable oil (g) (Approximate measure of one level teaspoon)	2 (1/2)	2 (1/2)
Water to make (ml)	100	100
Energy (kcal)	101	100
Protein (g)	2.9	2.9
Lactose (g)	3.8	3

The catch-up cereal based low lactose (lower osmolarity) diets are recommended for those with persistent diarrhoea.

12.4.10 Failure to respond to treatment

Criteria for failure to respond to treatment

Primary failure:

- Failure to regain appetite — Day 4
- Failure to start to loose oedema — Day 4
- Oedema still present — Day 10
- Failure to gain at least 5 gm/kg of body weight per day — Day 10

Secondary failure:

- Failure to gain at least 5 gm/kg of body weight per day during rehabilitation for 3 successive days

If the weight gain is < 5 g/kg/day, determine:

- whether this occurred in all cases being treated (if so, a major review of case management is required)
- whether this occurred in specific cases (reassess these children as if they were new admissions).

Inadequate feeding

Check:

- That night feeds are given.
- That target energy and protein intakes are achieved. Is the actual intake (i.e. what was offered minus what was left over) correctly recorded? Is the quantity of feed recalculated as the child gains weight? Is the child vomiting or ruminating?
- Feeding technique: is the child being fed frequent feeds, appropriate amounts?
- Quality of care: are staff motivated/gentle/loving/patient?
- All aspects of feed preparation: scales, measurement of ingredients, mixing, taste, hygienic storage, adequate stirring.
- Whether complementary food given to the child are energy dense.
- Vitamins and mineral supplements are given appropriately

Look for Untreated infection

If feeding is adequate and there is no malabsorption, suspect a hidden infection. The following are easily overlooked: urinary tract infections, otitis media, tuberculosis and giardiasis. In such a case:

- Re-examine carefully
- Repeat urine microscopy for white blood cells
- Examine the stool
- If possible, take a chest X-ray.

Psychological Problems

Check for atypical behaviour such as stereotyped movements (rocking), rumination (i.e. self-stimulation through regurgitation), and attention seeking. If neurodevelopmental disorder is suspected, the child needs further evaluation for feeding issues. For the child who ruminates, firmness with affection can assist. Encourage the mother to spend time and play with the child

Monitoring progress during treatment

Good weight gain: > 10 g/kg/day, continue with the same treatment

Moderate weight gain: 5-10 g/kg/day, check whether intake targets are being met or if infection has been overlooked

Poor weight gain: <5g/kg/day, make a full re assessment, particularly for:

- » inadequate feeding
- » untreated infection
- » HIV infection
- » psychological problems

Child is considered to have recovered when he reaches a weight for height -1 Z score of median of WHO child growth standards.

12.4.11 Discharge and prepare for follow-up

Criteria for discharge from hospital care

	Criteria
Child	» Weight for height reached -2SD of WHO median reference value » Eating adequate amount of nutritious food that mother can prepare at home » Consistent weight gain (>5 gm/kg/day) in last 3 consecutive days » All vitamin and mineral deficiencies have been treated » All infections and other conditions have been treated or are being treated like anemia, diarrhoea, malaria, tuberculosis » immunisation as per the schedule
Mother or caretaker	» Able to take care of the child » Able to prepare appropriate foods and feed the child » Has been trained to give structured play therapy and sensory stimulation » Knows how to give home treatment for common problems and recognizes danger signs warranting immediate medical assistance

The target weight for discharge is equivalent to -2 SD of the median WHO reference values for weight-for-height. The usual weight gain is about 10-15 gm/kg/day. With high energy feeding, most severely malnourished children reach the target weight for discharge after 2-4 weeks.

Before discharge, ensure that the mother or caregiver understands the importance of continuing correct feeding for her child and is able to prepare nutritious complementary food. Appropriate mixed diets are the same as those recommended for a healthy child given at least 5 times a day providing 100-120 Kcal/kg/day. Continue breastfeeding. Discharge the child after a full recovery to avoid relapse and death after discharge. Follow-up regularly at 1, 2, 4 weeks, then monthly till 1 years of age and then 3 monthly for 5 years.

Discharge before full recovery

In some cases, parents will insist for early discharge or the hospital does not have resources to look after all the malnourished children till full recovery, an early discharge may be planned.

Criteria for early discharge

	Criteria
Child	» Has a good appetite, eating at least 120-130 Kcal/kg/day and receiving adequate micronutrients » Has lost oedema » Consistent weight gain (at least 5 gm/kg/day for 3 consecutive days) » Completed antibiotic treatment » Completed immunisation appropriate for age
Mother or caretaker	» Trained on appropriate feeding » Has financial resources to feed the child » Motivated to follow the advice given

If a child is discharged early, plan for the follow-up until recovery either at a clinic in the OPD or local health worker who will take responsibility for continuing supervision. Write a detailed discharge note mentioning inpatient treatment given, weight on discharge, treatments to be continued, feeding recommendations (150 Kcal/kg/day and protein 4 gm/kg/day) and the action the health worker is expected to take. In general, a child should be weighed weekly and if there is failure to gain weight over a 2-week period or weight loss between any two measurements, the child should be referred back.

Preparation of F-75 and F-100 diets – Demonstration and Practice by the participants

EXERCISE 11

1. Rinchen, a 10 months old boy weighing 4.0 kg is brought with loose stools and vomiting for 2 days. He is irritable, eyes are sunken and skin pinch goes back slowly. The child has no breathing problem or signs of shock. His length is 68 cm.

a) How do you triage this child?

b) Does he need hospitalization?

c) How would manage his dehydration?

2. Karma is 2 years old and he weighs 6.0 kg and the length is 75cm. He has loose stools with blood for 3 days. He is lethargic, eyes are sunken and skin pinch goes back very slowly. He has no signs of shock and no respiratory distress. When offered fluids, he is not able to drink.

a) How do you triage this child?

b) Does he need hospitalization?

c) How would you manage the dehydration?

d) How would you treat dysentery?

3. Deki is 1 year old, weighs 5.0 kg and her length is 66 cm. She has been referred urgently to the hospital for lethargy & inability to drink or feed. She has no breathing problem, her extremities are cold & capillary refill time is > 5 seconds. She has no diarrhoea, her axillary temperature is 360C and she has some pallor.

a) How do you triage this child?

b) Write the emergency treatment for this child?

4. An 11 months old Pema has been referred for severe malnutrition and anaemia. He has no cough, diarrhea or fever. He weighs 4.8 kg and has visible severe wasting and some pallor.

a) How would you triage this child?

b) On assessmen,t Pema has no obvious signs of infection and blood sugar is 40 mg/dl. Write the treatment plan?

c) The length of the child is 66 cm. Determine the weight-for- length from the Table (Annexure 14).

d) When will you start feeding this child?

e) What investigations would you like to do?

f) He is not breastfed and is being given diluted cow's milk with a feeding bottle and dal soup. When offered milk in the ward he took only 2-3 spoonfuls. The nurse can give 2 hourly feeds. Write the feeding plan for the first 48 hours.

g) After 6 days you observe that the child is more active and demanding feeds. He has taken the nasogastric tube out. The nurse reports that when offered, he consumed about 90-100 ml. Write your plan of action?

4. Ngawang, a 1 year old boy, has been brought to the hospital with a cough and difficulty breathing for 3 days. He is restless and irritable but able to feed. He has no cyanosis, respiratory rate is 52 per minute with chest indrawing, no signs of dehydration and has warm extremities. He weighs 7.5 kg and has no visible wasting and no pedal edema. However, he has some pallor. Mother gives history that, the child had measles 8 days back and passed blood in stools for 2 days.

a) Enumerate the emergency and priority signs from the above case description?

b) What history would you take?

c) What would you like to examine in the child?

On examination you found that the child has no eye complications but has 2 superficial mouth ulcers and on chest auscultation reveals bilateral crepitations.

e) What is the probable diagnosis in this case and write the possible differential diagnosis?

f) What investigations would you like to perform?

g) Write the treatment for the child?

h) How would you monitor the child in the hospital?

i) What complications might occur?

SECTION 13:
ANAEMIA IN CHILDREN

Anaemia is very common in children in developing countries including our country. Mild to moderate anaemia is a common comorbidity in children visiting health facilities for various conditions.

Nutritional anaemia is the most common cause of anaemia in children. Nutritional anaemia results from deficiency of iron, folic acid and vitamin B12. Iron deficiency anaemia (IDA) commonly occurs in the later part of infancy and preschool children particularly if they are not receiving a balanced diet.

13.0 Learning Objectives

After completion of this section the participant should be able to:

- describe how to approach a case of anaemia
- discuss treatment of nutritional anaemia
- enumerate indications for blood transfusion

Assess anaemia/pallor in each patient attending the health facility. Severe anaemia in a child is suggested by the presence of severe palmar pallor and may be associated with a fast pulse rate, difficulty in breathing, or confusion or restlessness. There may be additional signs of heart failure such as gallop rhythm, an enlarging liver and rarely pulmonary oedema.

13.1 Clinical Approach

Common findings in history and on physical examination are given below.

Take a history concerning	On examination, look for
» Duration of symptoms » Usual diet (before the current illness) » Family circumstances (to understand the child's social background) » Prolonged fever » Worm infestation » Bleeding from any site » Lymph node enlargement » Previous blood transfusions » Similar illness in the family (siblings)	» Severe palmar pallor » Hyperpigmentation of knuckles » Skin bleeds (petechial and/or purpuric spots) » Lymphadenopathy » Hepato-Splenomegaly » Signs of heart failure (gallop rhythm, raised JVP, respiratory distress, basa crepitations) » Yellowish discoloration of eyes » Sternal tenderness

Laboratory Diagnosis

- Haemoglobin<11 gm/dl in children aged 6 months - 5 years indicates anaemia.
- Complete blood count and peripheral blood smear should be done in all anaemic children. Blood films should be examined for malaria parasites, particularly in high malaria risk areas.
- Children with IDA will have microcytic-hypochromic anaemia. IDA will have low MCH, MCV, MCHC in red cell indices. IDA will have red cell distribution width (RDW) >16%. Usually, leucocyte counts and platelet counts are normal.

» A high reticulocyte count indicates hemolytic anaemia.
» Stool examination for ova, cyst and occult blood may be done.
» Children with folate and/or B12 deficiency will have macrocytic anaemia. These cases may have associated leukopenia and/or thrombocytopenia. The reticulocyte count is also low.
» Bone marrow examination is required in presence of abnormal clinical examination and when aplastic anaemia is suspected. Such cases should be referred for further evaluation.

Treatment

All children with IDA should be treated using oral iron 4-8 mg/kg/day of elemental iron. Older children who can take tablets can be given FS/FA tablets. Iron therapy should be continued for a period of 8-12 weeks after normal haemoglobin level is achieved.

The children on iron therapy should be evaluated for response to treatment. Iron therapy results in prompt clinical response (return of appetite, decreased irritability). Repeat complete blood count after 1 month of therapy.

Children not responding to treatment should be evaluated for compliance to treatment and adequacy of dose and presence of infections such as UTI and chronic infections or may be referred to rule out other causes of anaemia.

For treatment of megaloblastic anaemia, due to B12 deficiency, give a therapeutic dose of B12 along with iron and folic acid, for at least 3 months.

Deworming

» Give deworming agents to all children more than one year with anaemia at the time of discharge.
» Albendazole (tab 400 mg)
  - • 1 tab once, then every 6 months – if the child >2 years
  - • ½ tab once, then every 6 months if the child ≤ 2 years

Blood Transfusion

Indications

» Severe anemia (Hb < 4g/dl or Hct < 12%)
» Anemia (Hb 4-6 g/dl or Hct 13-18%) with any of the following clinical features:
  - Clinically detectable dehydration
  - Shock
  - Impaired consciousness
  - Heart failure
  - Deep, laboured breathing

Methods and precaution during blood transfusion are described in Annexure 15

EXERCISE 12

1. Karma, a 2-year-old female child, weighing 9 kg is brought to hospital with history of increasing pallor and lethargy for two months. The mother tells that the child has become irritable, is not interested in playing and refuses to eat anything. Her feeding history revealed that the child was predominantly on milk feeds and took cereal-based feed only occasionally. On examination, she has severe pallor, temperature 37°C, pulse rate 100/min, BP - 88/54 mmHg and respiratory rate 30/min. Her systemic examination is normal and haemoglobin is 3 gm/dl.

a. What is the most likely diagnosis?

b. What investigations will you order? Outline the initial treatment?

c. Discuss further treatment and follow-up?

SECTION 14:
APPROACH TO A CHILD WITH POISONING

Suspect poisoning in any unexplained illness in a previously healthy child. Consult standard textbook of paediatrics for management of exposure to specific poisons. Only the principles for managing ingestion of a few common poisons are given here.

Diagnosis

A diagnosis is based on a history from the child or caregiver, a clinical examination and the results of investigations, where appropriate.

» Obtain full details of the poisoning agent, the amount ingested and the time of ingestion. Attempt to identify the exact agent involved by examining the container, when relevant. Check that no other children were involved.

» The symptoms and signs depend on the agent ingested and therefore vary widely.

» Check for signs of burns in or around the mouth or stridor (upper airway or laryngeal damage), which suggest ingestion of corrosives.

Principles for ingested poisons

» All children who present as poisoning cases should quickly be assessed for emergency signs (ABC and level of consciousness), as some poisons depress breathing, cause shock or induce coma.

» Admit all children who have deliberately/accidently ingested iron, pesticides, paracetamol or some other drugs.

» Children who have ingested corrosives or petroleum products should not be sent home without observation for at least 6 hours. Corrosives can cause esophageal burns, which may not be immediately apparent, and petroleum products, if aspirated, can cause chemical pneumonitis and pulmonary oedema, which may take some hours to develop.

» Check for hypoglycemia; if blood glucose estimation facility is not available and the child has a reduced level of consciousness, treat it as hypoglycemia.

» Identify the specific agent and remove or adsorb it as soon as possible. Treatment is most effective if given as quickly as possible after the poisoning event, ideally within 1 hour.

» Vomiting should not be attempted in suspected hydrocarbon (petrol/ kerosene oil) or corrosive(acid/ alkali) ingestion.

» If the child has swallowed other poisons, never use salt as an emetic, as this can be fatal.

» Mix charcoal in 8–10 times volume of water, e.g. 5 g in 40 ml of water. If possible, give the whole amount at once; if the child has difficulty tolerating it, the charcoal dose can be divided. The dose of activated charcoal is 0.5-1g/kg for children ≤ 1 year of age and 25-50 gm for children 1-12 years of age.

» Undertake gastric lavage only if staff has experience in the procedure, if ingestion was less than 1 hour and the condition is life-threatening. Make sure a suction apparatus is available in case the child vomits. Place the child in the left lateral head-down position. Measure the length of tube to be inserted. Pass a nasogastric tube into the stomach and ensure that the tube is in the stomach. Perform lavage with 10 ml/kg of normal saline (0.9%). The volume of lavage fluid returned should approximate the amount of fluid given. Lavage should be continued until the recovered lavage solution is clear of particulate matter.

If the child has ingested corrosives or petroleum derivatives, gastric lavage should not be done.

- Give a specific antidote, if this is indicated. Refer relevant textbooks or call up relevant specialists in case an antidote is not known.
- Give general care.
- Keep the child under observation for 4–24 hours, depending on the poison swallowed.
- Keep unconscious children in the recovery position.
- Consider transferring the child to a higher center if the child is deteriorating or has severe respiratory distress or is in congestive heart failure.

Management of snakebite

Snake bite should be considered in any case of severe pain or swelling of a limb or in any unexplained illness presenting with bleeding or abnormal neurological signs. Some cobras spit venom into the eyes of victims, causing pain and inflammation.

The first aid recommended is based on the mnemonic (Do it) "R.I.G.H.T."

It consists of:

R: Reassure the patient. 70% of all snake bites are from non-venomous species. Only 50% of bites by venomous species actually envenomate the patient.

I: Immobilize in the same way as a fractured limb. Use bandages or cloth to hold the splints,not to block the blood supply or apply pressure. Do not apply any compression in the form of tight ligatures, they don't work and can be dangerous.

G and H: Get to Hospital immediately. Traditional remedies have NO PROVEN benefit in treating snakebite.

T: Tell the doctor of any systemic symptoms such as ptosis that manifest on the way to hospital. Incision, suction, electric shocks, cryotherapy and washing the wound are contraindicated.

Diagnosis and testing

Bite marks to determine whether the biting species was venomous or non-venomous are of no use. Many venomous species are in possession of more than one set of fangs and non-venomous species can leave just two punctures from enlarged teeth, which can appear to be fang-like.

General signs include shock, vomiting and headache. Local swelling that may gradually extend up the bitten limb. Few patients may show features of external bleeding i.e. gums,wounds or sores and internal, especially intracranial.Signs of neurotoxicity like respiratory difficulty or paralysis, ptosis, bulbar palsy (difficulty in swallowing and talking), limb weakness or signs of muscle breakdown i.e. muscle pains and black urine may be present.

The 20 Minute Whole Blood Clotting Test (20 WBCT) is adopted as the standard test for coagulopathy. It is simple to carry out but requires a clean, new and dry test tube. A few ml of fresh venous blood is left undisturbed for 20 minutes, and then gently tilted. If the blood is still liquid this is evidence of coagulopathy and confirms that the biting species is Viperine. Cobras or Kraits do not cause anti-hemostatic symptoms.

Anti-Snake Venom administration criteria

Anti-Snake Venom (ASV) should not be used without evidence of systemic envenomation or severe local swelling. Systemic envenomation will be evident from the 20WBCT, signs of spontaneous bleeding or by visual recognition of neurological impairment such as ptosis. Severe local symptoms are defined as swelling rapidly crossing a joint or involving half the bitten limb, in the absence of a tourniquet. Once the tourniquet has been removed for more than one hour, if the swelling continues, this should be viewed as venom generated and not due to the continuing effect of the tourniquet. Only local swelling is not grounds for administering ASV.

ASV doses and administration

As each vial of polyvalent ASV neutralises 6 mg of Russell's viper venom, the initial dose is 8-10 vials for both adults and children. Maximum ASV dose is around 25 vials. ASV should be administered over one hour.

Adverse reactions, either anaphylactoid or pyrogenic, have often been identified as reasons not to administer ASV in PHCs. The fear of these potentially life-threatening reactions has caused reluctance amongst some doctors to treat snake bites. However, if these adverse reactions are handled early with appropriate drugs, these reactions are easily treatable and should not restrict doctors from treating snakebite.

Symptoms suggesting allergic reaction

- Urticaria, itching, chills
- Diarrhoea, abdominal cramps, nausea, vomiting
- Fever, tachycardia, hypotension
- Angio-oedema

Management of allergic reactions

1. Discontinue ASV
2. 0.01mg/kg (0.5 mg) of 1:1000 adrenaline should be given IM.
3. In addition, give antihistamine and steroid at the dose of 0.25 - 1 mg/kg of promethazine IV and 2 mg/kg of hydrocortisone IV.
4. If after 10 to 15 minutes the patient's condition has not improved or is worsening, a second dose of adrenaline is given. This can be repeated for a third time. Usually, 2 doses of adrenaline will be sufficient.
5. Once the patient has recovered, the ASV can be restarted slowly for 10-15 minutes, keeping the patient under close observation. Then the normal drip rate should be resumed.

Repeat doses of ASV

In hemotoxic snake bites, once the initial dose has been administered over one hour, no further ASV is given for 6 hours. 20 WBCT test every 6 hours, will determine if additional ASV is required. This reflects the period the liver requires to restore clotting factors.

In the case of neurotoxic bites, once the first dose of ASV has been administered, atropine sulphate 50 microgram/kg IV followed by IM Neostigmine 0.04 mg/kg is given (Neostigmine test) and patient is observed for 30-60 minutes to monitor improvement in ptosis and other neurological signs. If after 1-2 hours, the patient has not improved or has worsened, then a second and final dose of ASV should be given. At this point the patient will have received a sufficient dose of ASV, and will either recover or require mechanical ventilation; in either event further ASV will not help.

Other Treatment

Seek a surgical opinion if there is severe swelling in a limb, it is pulseless or painful or there is local necrosis.

Supportive care

- Provide adequate pain relief.
- Elevate the limb if swollen.
- Give anti-tetanus prophylaxis.
- Antibiotic treatment is not required unless there is tissue necrosis at the wound site.
- Avoid IM injections.
- Monitor the patient very closely immediately after admission, then hourly for at least 24 hours,as envenoming can develop rapidly.

SECTION 15:
DEVELOPMENTAL DELAY IN CHILDREN

In children, delayed milestones may indicate a developmental delay that could be due to poor stimulation or a sign of developmental disorders. Therefore, it is essential to recognise red flags/ delays on time so that early intervention can be provided which will allow the child to develop to their maximum potential. Studies have shown that beginning intervention earlier in a child with developmental delay leads to improved outcomes and also improves engagement of a family in the child's developmental progress.

Health care providers must be aware of certain red flags in parents and the family which may adversely affect the developmental outcome of the child. If a parent is frequently insensitive to an infant's communication, and is not able to recognize and handle the infant's cues, support to family may be warranted to explore difficulty in attachment and responsive caregiving.

All children visiting a health facility should be administered Bhutan Child Development Screening Tool (BCDST) to detect any delay at the earliest. C4CD Plus must be implemented in all children visiting the health facility for routine growth monitoring and immunisation. Applying C4CD Plus is one of the early intervention services to a child with developmental delay which will improve the developmental outcome of the child. In addition, this service will encourage the interaction and engagement between the child and the parent thereby providing necessary stimulation to the child and improving the parent-child bonding.

Children with delays (Eg motor delay: cerebral palsy, muscular dystrophy; social communication delay; autism spectrum disorder and other language disorders) should be referred to relevant health professionals whenever available or consultation with a paediatrician should be sought.

Upper limit of age of attainment of milestone

Milestones	Age
Visual fixation or following	2 month
Vocalisation	6 month
Sitting without support	10 month
Standing with assistance	12 month
Hands and knees crawling	14 month
Standing alone	17 month
Walking alone	18 month
Single words	18 month
Imaginative play	3 year
Loss of comprehension, single words or phrases at any age.	

Annexure 10: Diets for persistent diarrhoea

The Initial Diet A:[Reduced lactose diet; milk rice gruel, milk sooji, gruel, rice with curd]

Ingredients	Measure	Approximate quantity
Milk	1/3 cup	40 ml
Sugar	½ level tsp	2 g
Oil	½ level tsp	2 g
Puffed rice powder*	4 level tsp	12.5 g
Water		To make 100 ml

* Can be substituted by cooked rice or sooji

Preparation

- » Mix milk, sugar, rice together
- » Add boiled water & mix well
- » Add oil

The feed can now be given to the child

The second Diet B: [Lactose-free diet with reduced starch]
About 50-70% of children improve on the initial Diet A. Remaining children, if free of systemic infection, are changed to Diet B which is milk (lactose) free and provides carbohydrates as a mixture of cereals and glucose. Milk protein is replaced by chicken, egg or protein hydrolysate.

Ingredients	Measure	Approximate quantity
Egg white	3 level tsp	15 g
Glucose	3/4 level tsp	3 g
Oil	1 level tsp	4 g
Puffed rice powder*	2 level tsp	7 g
Water	¾ cup	To make 100 ml

* Can be substituted with cooked rice

Preparation
Whip the egg white well. Add puffed rice powder, glucose, oil and mix well. Add boiled water and mix rapidly to avoid clumping.

The Third Diet C: [Monosaccharide based diet]

Overall 80-85% patients with severe persistent diarrhea will recover with sustained weight gain on the initial Diet A or the second Diet B. A small percentage may not tolerate a moderate intake of the cereal in Diet B. These children are given the third diet (Diet C) which contains only glucose and a protein source as egg or chicken. Energy density is increased by adding oil to the diet.

Ingredients	Measure	Approximate quantity
Chicken or	2 ½ level tsp	12 g
Egg white	5 level tsp	25 g
Glucose	¾level tsp	3 g
Oil	1 level tsp	4 g
Water	½ - ¾ cup	To make 100 ml

Preparation

Boil chicken, remove the bones and make chicken puree. Mix chicken puree with glucose and oil. Add boiled water to make a smooth paste.

Or

Whip the egg white well. Add glucose, oil and mix well. Add boiled water and mix rapidly to avoid clumping.

Annexure 11:Intravenous fluids

The following table gives the composition of intravenous fluids that are commercially available and commonly used in neonates, infants and children. Please note that none of the fluids contains sufficient calories for the long-term nutritional support of children. Oral feeding and administration of fluids by mouth or nasogastric tube, whenever possible, is always preferred to intravenous fluid.

	Composition						
	Na+	K+	Cl-	Ca++	Lactate	Glucose	Calories
IV fluid	mmol/l	mmol/l	mmol/l	mmol/l	mmol/l	G/l	/l
Ringer's lactate (Hartmann's)	130	4.0	112	1.8	27	-	-
Normal saline							
(0.9% NaCl)	154	-	154	-	-	-	-
5% Glucose	-	-	-	-		50	200
10% Glucose	-	-	-	-	-	100	400
0.45 NaCl / 5% glucose	77	-	77	-	-	50	200

Fluid Management

The total daily fluid requirement of a child is calculated with the following formula:

- For the first 10 kg, 100 ml/kg
- For the next 10 kg, 50 ml/kg
- For each subsequent kg, 25 ml/kg

For example, an 8 kg baby receives 8 x 100 ml = 800 ml per day, a 15 kg child receives 1250 ml/ day (10 x 100) + (5 x 50)

Maintenance fluid requirements

Body weight of child Fluid (ml/day)

Body weight of child	Fluid (ml/day)
2 kg	200 ml/day
4 kg	400 ml/day
6 kg	600 ml/day
8 kg	800 ml/day
10 kg	1000 ml/day
12 kg	1100 ml/day
14 kg	1200 ml/day
16 kg	1300 ml/day
18 kg	1400 ml/day
20 kg	1500 ml/day
22 kg	1550 ml/day
24 kg	1600 ml/day
26 kg	1650 ml/day

Give the sick child more than the above amount if there is fever (increase by 10% for every 10 C of fever).

Annexure 12: 24-Hour food intake chart

Ward

Name

Hospital number

Age

Weight

Date of Admission

Date ..... Feed: ..... feeds of ..... ml each = ... ml per day

Time	Type of feed	Volume offered (ml)	Volume left in cup (ml)	Amount taken by child (ml)	Vomit estimate (ml)	Watery diarrhoea (Yes/No)
Totals:				Sub-total		Total taken in 24 hrs

Annexure 13: Common Drug dosages

DRUG	DOSE	ROUTE
Adrenaline	**For wheeze** 0.01 ml/kg (up to a maximum of 0.3 ml) of 1:1000 solution (or ml/kg of 1:10000 solution) **For severe viral Croup** A trial of 0.3 ml/kg of 1:1000 nebulized solution	SC
Amoxicillin	**For Pneumonia** 25 mg/kg two times a day OR 15 mg/kg three times per day	Oral
Ampicillin	25- 50 mg/kg every 6 hours	IV
Benzylpenicillin (penicillin G)	**General dosage** 50000 units/kg every 6 hours **For meningitis** 100000 units /kg every 6 hours	IM/IV
Cefotaxime	50 mg/kg every 6 hours	IM/IV
Ceftriaxone (given over 30 mins in infusion)	**For sepsis and severe pneumonia** 50-80 mg/kg/day once daily **For meningitis** 50 mg/kg every 12 hours (max single dose 4 g) OR 100 mg/kg once daily	IM/IV IM/IV IM/IV
Chloramphenicol	Calculate EXACT dose based on body weight. Only use these doses if this is not possible. **For meningitis** 25 mg/kg every 6 hours (maximum 1g per dose) **For other conditions** 25 mg/kg every 8 hours (maximum 1 g per dose)	IV IM Oral
Cefixime	Typhoid fever: 20 mg/kg/day in 2 divided doses for 10-14 days	Oral
Cephalexin	For UTI: 25-50mg/kg/day in 2 to 4 divided dose	Oral
Cetirizine	2.5mg/dose OD,above 6 months of age to 2 years; 2.5-5 mg OD/BD in divided dose for 2-5 years of age	Oral

DRUG	DOSE	ROUTE
Ciprofloxacin	10-15 mg/kg per dose given twice per day (max 500 mg per dose)	Oral/IV
Cloxacillin	25-50 mg/kg every 6 hours	IV/Oral
Cotrimoxazole (trimethoprim- sulfamethoxazole, TMP-SMX)	4 mg trimethoprim/kg and 20 mg sulfa-methoxazole/kg two times per day	Oral
Dexamethasone	**For severe croup/severe asthma** 0.6mg/kg single dose	IM/IV
Diazepam	**For convulsions** 0.5 mg/kg 0.2-0.3 mg/kg	Rectal IV
Furosemide	**For cardiac failure** 1-2 mg/kg every 12 hours	Oral or IV
Gentamicin	5 - 7.5 mg/kg once per day	IM/IV
Hydrocortisone	Severe Asthma: 10 mg/Kg stat followed by 5 mg/Kg up to 3- 5 days Transfusion reaction: 0.25 mg/Kg	IV
Metronidazole	15-30mg/kg/day in 2-3 divided doses	IV/Oral
Midazolam	0.1mg/Kg/dose	IV/Rectally
Paracetamol	10-15 mg/kg, up to 4 times a day	Oral
Phenobarbital	**Loading dose** 15-20 mg/kg in 50 ml DNS over 20-30 mins **Maintenance dose** 2.5-5 mg/kg per day	IV Oral/IV
Phenytoin	**Loading dose:** 20 mg/Kg in 50 ml NS over 20-30 mins **Maintenance dose:** 5-8 mg/Kg per day in 2 divided dose	IV IV/Oral
Potassium	2-4 mmol/kg/day	Oral
Prednisolone	1-2 mg/kg once a day	Oral
Promethazine	0.1-0.2 mg/Kg/dose BD/TDS for children more than 2 years	Oral/IV/IM
Salbutamol	Acute episode 6-8 hourly Inhaler with spacer: 2 doses contains 200 µg Nebulizer: 2.5 mg/dose	Inhale

Annexure 14: WHO Growth Reference Charts

Weight for length reference card (below 87cm)

Boy's weight					Length	Girl's weight (Kg)				
-4 SD	-3 SD	-2 SD	-1 SD	Median	(cm)	Median	-1 SD	-2 SD	-3 SD	-4 SD
1.7	1.9	2.0	2.2	2.4	**45**	2.5	2.3	2.1	1.9	1.7
1.8	2.0	2.2	2.4	2.6	**46**	2.6	2.4	2.2	2.0	1.9
2.0	2.1	2.3	2.5	2.8	**47**	2.8	2.6	2.4	2.2	2.0
2.1	2.3	2.5	2.7	2.9	**48**	3.0	2.7	2.6	2.3	2.1
2.2	2.4	2.6	2.9	3.1	**49**	3.2	2.9	2.7	2.4	2.2
2.4	2.6	2.8	3.0	3.3	**50**	3.4	3.1	2.9	2.6	2.4
2.5	2.7	3.0	3.2	3.5	**51**	3.6	3.3	3.1	2.8	2.5
2.7	2.9	3.2	3.5	3.8	**52**	3.8	3.5	3.3	2.9	2.7
2.9	3.1	3.4	3.7	4.0	**53**	4.0	3.7	3.5	3.1	2.8
3.1	3.3	3.6	3.9	4.3	**54**	4.3	3.9	3.7	3.3	3.0
3.3	3.6	3.8	4.2	4.5	**55**	4.5	4.2	3.9	3.5	3.2
3.5	3.8	4.1	4.4	4.8	**56**	4.8	4.4	4.2	3.7	3.4
3.7	4.0	4.3	4.7	5.1	**57**	5.1	4.6	4.4	3.9	3.6
3.9	4.3	4.6	5.0	5.4	**58**	5.4	4.9	4.6	4.1	3.8
4.1	4.5	4.8	5.3	5.7	**59**	5.6	5.1	4.9	4.3	3.9
4.3	4.7	5.1	5.5	6.0	**60**	5.9	5.4	5.1	4.5	4.1
4.5	4.9	5.3	5.8	6.3	**61**	6.1	5.6	5.4	4.7	4.3
4.7	5.1	5.6	6.0	6.5	**62**	6.4	5.8	5.6	4.9	4.5
4.9	5.3	5.8	6.2	6.8	**63**	6.6	6.0	5.8	5.1	4.7
5.1	5.5	6.0	6.5	7.0	**64**	6.9	6.3	6.0	5.3	4.8
5.3	5.7	6.2	6.7	7.3	**65**	7.1	6.5	6.3	5.5	5.0
5.5	5.9	6.4	6.9	7.5	**66**	7.3	6.7	6.5	5.6	5.1
5.6	6.1	6.6	7.1	7.7	**67**	7.5	6.9	6.7	5.8	5.3
5.8	6.3	6.8	7.3	8.0	**68**	7.7	7.1	6.9	6.0	5.5
6.0	6.5	7.0	7.6	8.2	**69**	8.0	7.3	7.0	6.1	5.6
6.1	6.6	7.2	7.8	8.4	**70**	8.2	7.5	7.1	6.3	5.8
6.3	6.8	7.4	8.0	8.6	**71**	8.4	7.7	7.2	6.5	5.9
6.4	7.0	7.6	8.2	8.9	**72**	8.5	7.8	7.4	6.6	6.0
6.6	7.2	7.7	8.4	9.1	**73**	8.7	8.0	7.5	6.8	6.2
6.7	7.3	7.9	8.6	9.3	**74**	8.9	8.2	7.7	6.9	6.3
6.9	7.5	8.1	8.8	9.5	**75**	9.1	8.4	7.8	7.1	6.5
7.0	7.6	8.3	8.9	9.7	**76**	9.2	8.5	8.0	7.2	6.6
7.2	7.8	8.4	9.1	9.9	**77**	9.4	8.7	8.1	7.4	6.7
7.3	7.9	8.6	9.3	10.1	**78**	9.6	8.9	8.3	7.5	6.9
7.4	8.1	8.7	9.5	10.3	**79**	9.8	9.1	8.5	7.7	7.0
7.6	8.2	8.9	9.6	10.4	**80**	10.1	9.2	8.7	7.8	7.1
7.7	8.4	9.1	9.8	10.6	**81**	10.3	9.4	8.8	8.0	7.3
7.9	8.5	9.2	10.0	10.8	**82**	10.5	9.6	9.0	8.1	7.5
8.0	8.7	9.4	10.2	11.0	**83**	10.7	9.8	9.2	8.3	7.6
8.2	8.9	9.6	10.4	11.3	**84**	11.0	10.1	9.4	8.5	7.8
8.4	9.1	9.8	10.6	11.5	**85**	11.2	10.3	9.7	8.7	8.0
8.6	9.3	10.0	10.8	11.7	**86**	11.5	10.5	9.7	8.9	8.1

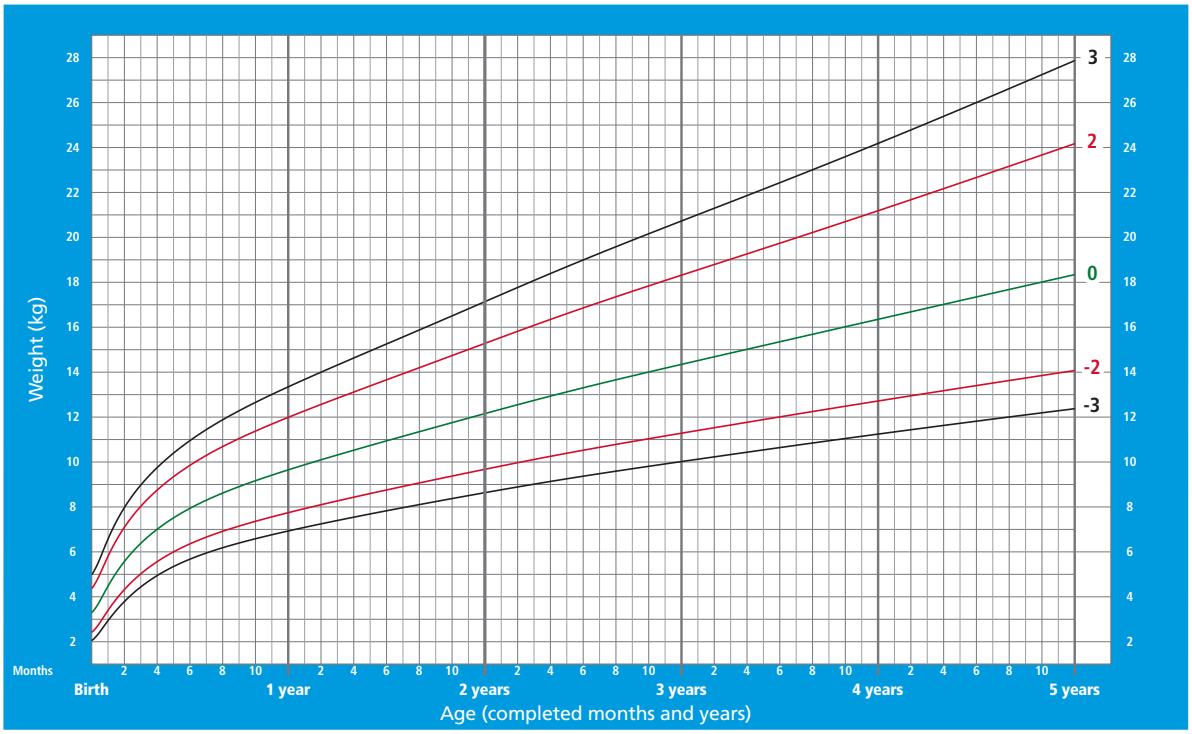
Weight for Height reference card (87 cm and above)

Boy's weight					Length	Girl's weight (Kg)				
-4 SD	-3 SD	-2 SD	-1 SD	Median	(cm)	Median	-1 SD	-2 SD	-3 SD	-4 SD
1.7	1.9	2.0	2.2	2.4	**45**	2.5	2.3	2.1	1.9	1.7
1.8	2.0	2.2	2.4	2.6	**46**	2.6	2.4	2.2	2.0	1.9
2.0	2.1	2.3	2.5	2.8	**47**	2.8	2.6	2.4	2.2	2.0
2.1	2.3	2.5	2.7	2.9	**48**	3.0	2.7	2.6	2.3	2.1
2.2	2.4	2.6	2.9	3.1	**49**	3.2	2.9	2.7	2.4	2.2
2.4	2.6	2.8	3.0	3.3	**50**	3.4	3.1	2.9	2.6	2.4
2.5	2.7	3.0	3.2	3.5	**51**	3.6	3.3	3.1	2.8	2.5
2.7	2.9	3.2	3.5	3.8	**52**	3.8	3.5	3.3	2.9	2.7
2.9	3.1	3.4	3.7	4.0	**53**	4.0	3.7	3.5	3.1	2.8
3.1	3.3	3.6	3.9	4.3	**54**	4.3	3.9	3.7	3.3	3.0
3.3	3.6	3.8	4.2	4.5	**55**	4.5	4.2	3.9	3.5	3.2
3.5	3.8	4.1	4.4	4.8	**56**	4.8	4.4	4.2	3.7	3.4
3.7	4.0	4.3	4.7	5.1	**57**	5.1	4.6	4.4	3.9	3.6
3.9	4.3	4.6	5.0	5.4	**58**	5.4	4.9	4.6	4.1	3.8
4.1	4.5	4.8	5.3	5.7	**59**	5.6	5.1	4.9	4.3	3.9
4.3	4.7	5.1	5.5	6.0	**60**	5.9	5.4	5.1	4.5	4.1
4.5	4.9	5.3	5.8	6.3	**61**	6.1	5.6	5.4	4.7	4.3
4.7	5.1	5.6	6.0	6.5	**62**	6.4	5.8	5.6	4.9	4.5
4.9	5.3	5.8	6.2	6.8	**63**	6.6	6.0	5.8	5.1	4.7
5.1	5.5	6.0	6.5	7.0	**64**	6.9	6.3	6.0	5.3	4.8
5.3	5.7	6.2	6.7	7.3	**65**	7.1	6.5	6.3	5.5	5.0
5.5	5.9	6.4	6.9	7.5	**66**	7.3	6.7	6.5	5.6	5.1
5.6	6.1	6.6	7.1	7.7	**67**	7.5	6.9	6.7	5.8	5.3
5.8	6.3	6.8	7.3	8.0	**68**	7.7	7.1	6.9	6.0	5.5
6.0	6.5	7.0	7.6	8.2	**69**	8.0	7.3	7.0	6.1	5.6
6.1	6.6	7.2	7.8	8.4	**70**	8.2	7.5	7.1	6.3	5.8
6.3	6.8	7.4	8.0	8.6	**71**	8.4	7.7	7.2	6.5	5.9
6.4	7.0	7.6	8.2	8.9	**72**	8.5	7.8	7.4	6.6	6.0
6.6	7.2	7.7	8.4	9.1	**73**	8.7	8.0	7.5	6.8	6.2
6.7	7.3	7.9	8.6	9.3	**74**	8.9	8.2	7.7	6.9	6.3
6.9	7.5	8.1	8.8	9.5	**75**	9.1	8.4	7.8	7.1	6.5
7.0	7.6	8.3	8.9	9.7	**76**	9.2	8.5	8.0	7.2	6.6
7.2	7.8	8.4	9.1	9.9	**77**	9.4	8.7	8.1	7.4	6.7
7.3	7.9	8.6	9.3	10.1	**78**	9.6	8.9	8.3	7.5	6.9
7.4	8.1	8.7	9.5	10.3	**79**	9.8	9.1	8.5	7.7	7.0
7.6	8.2	8.9	9.6	10.4	**80**	10.1	9.2	8.7	7.8	7.1
7.7	8.4	9.1	9.8	10.6	**81**	10.3	9.4	8.8	8.0	7.3
7.9	8.5	9.2	10.0	10.8	**82**	10.5	9.6	9.0	8.1	7.5
8.0	8.7	9.4	10.2	11.0	**83**	10.7	9.8	9.2	8.3	7.6
8.2	8.9	9.6	10.4	11.3	**84**	11.0	10.1	9.4	8.5	7.8
8.4	9.1	9.8	10.6	11.5	**85**	11.2	10.3	9.7	8.7	8.0
8.6	9.3	10.0	10.8	11.7	**86**	11.5	10.5	9.7	8.9	8.1

Weight-for-age BOYS

World Health Organization

Birth to 5 years (z-scores)

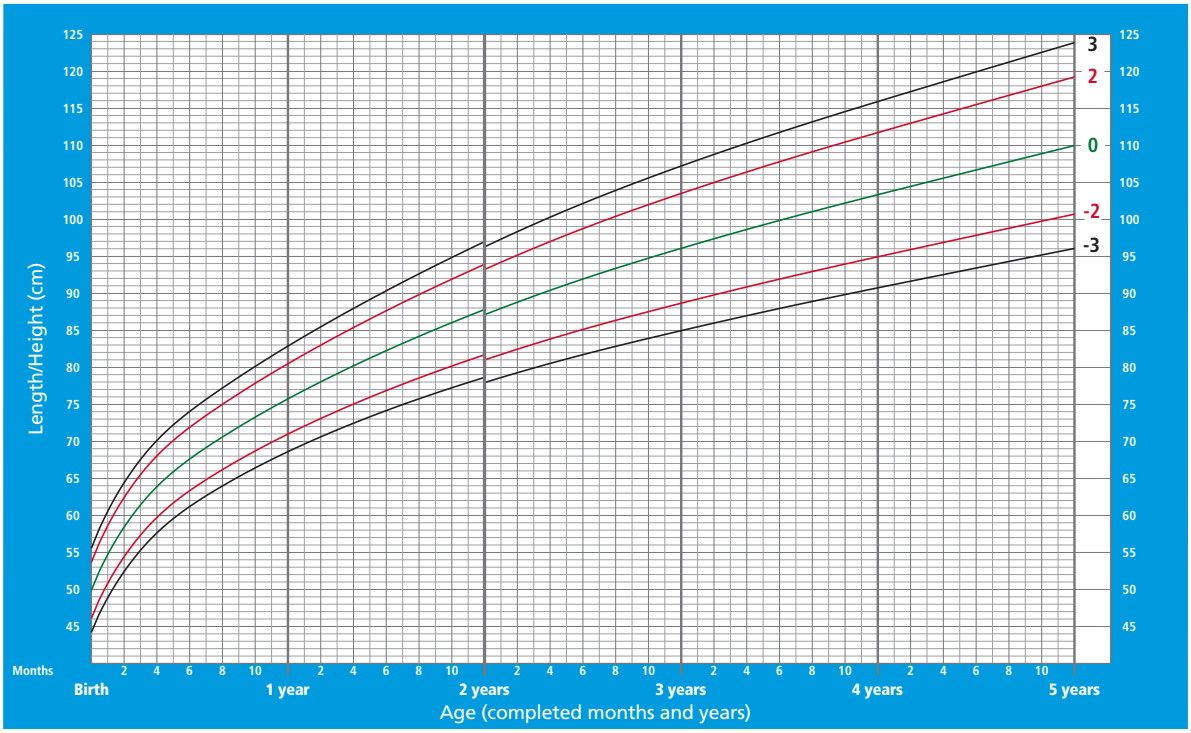


WHO Child Growth Standards

Length/height-for-age BOYS

World Health Organization

Birth to 5 years (z-scores)

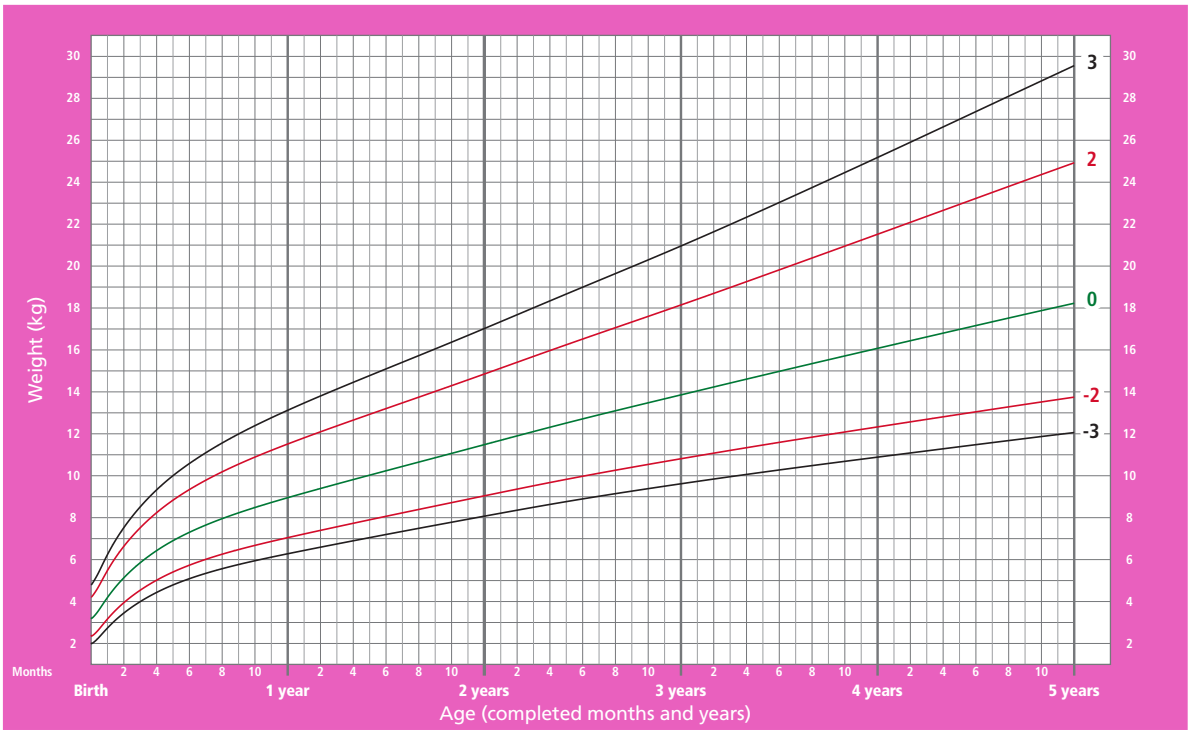


WHO Child Growth Standards

Weight-for-age GIRLS

Birth to 5 years (z-scores)

World Health Organization

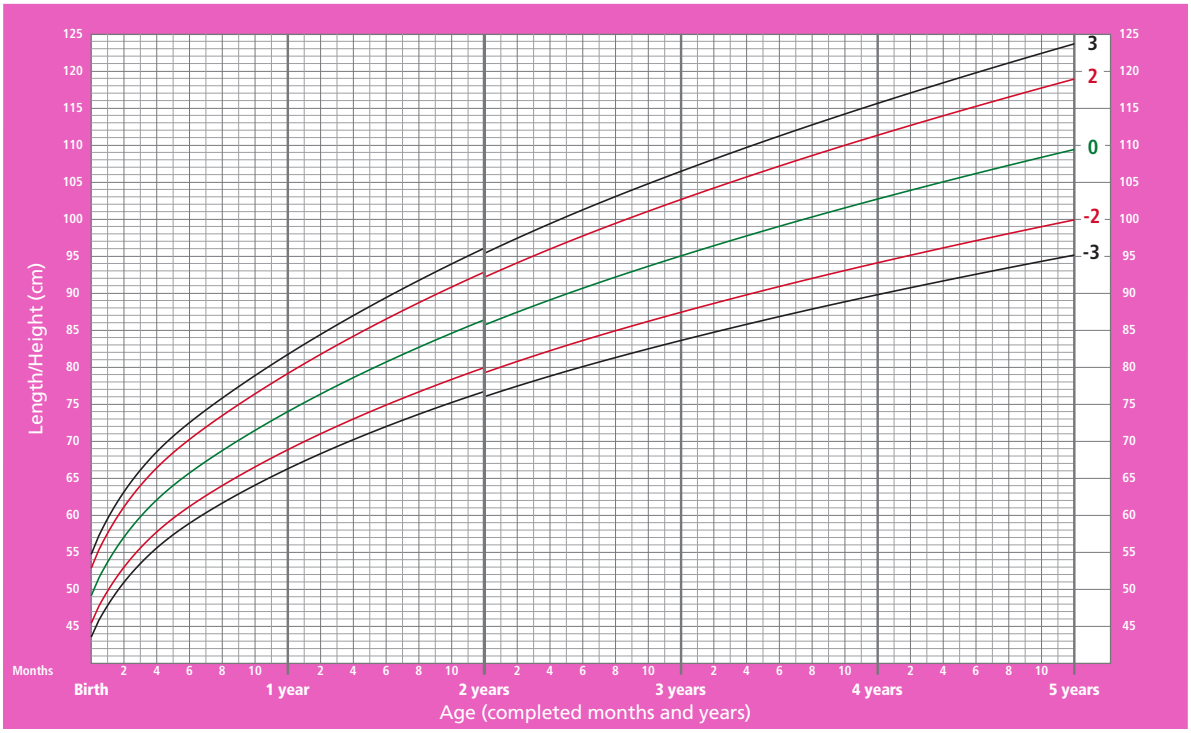


WHO Child Growth Standards

Length/height-for-age GIRLS

Birth to 5 years (z-scores)

World Health Organization

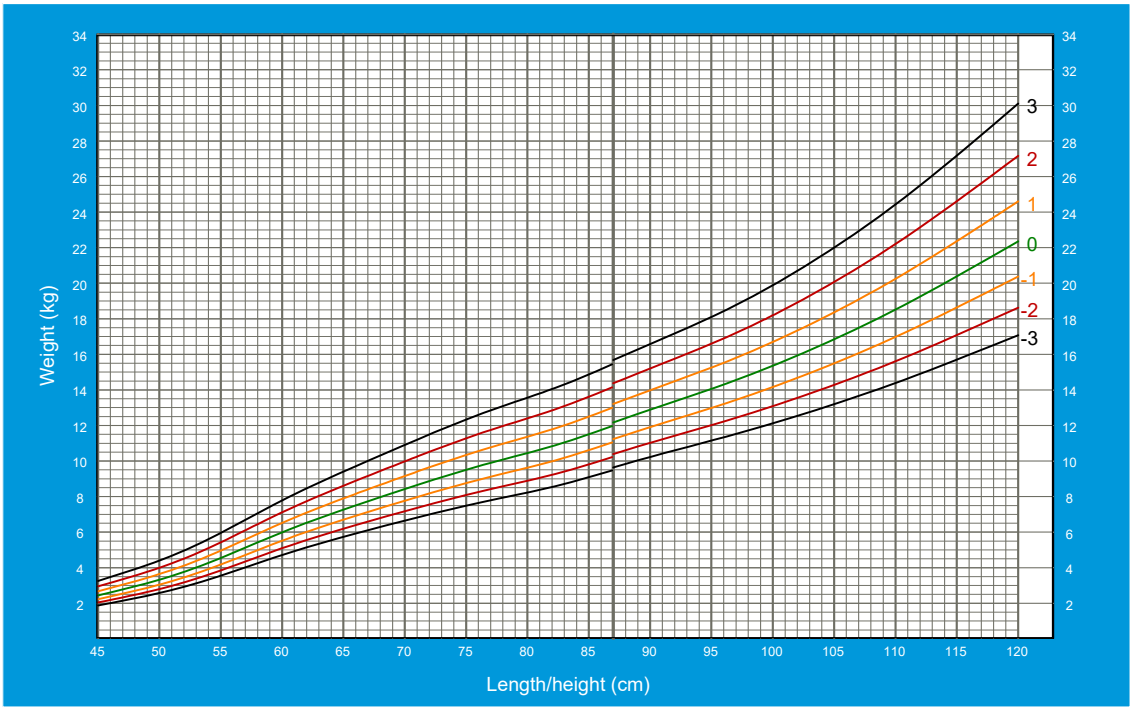


WHO Child Growth Standards

Weight-for-length/height BOYS

World Health Organization

Birth to 5 years (z-scores)

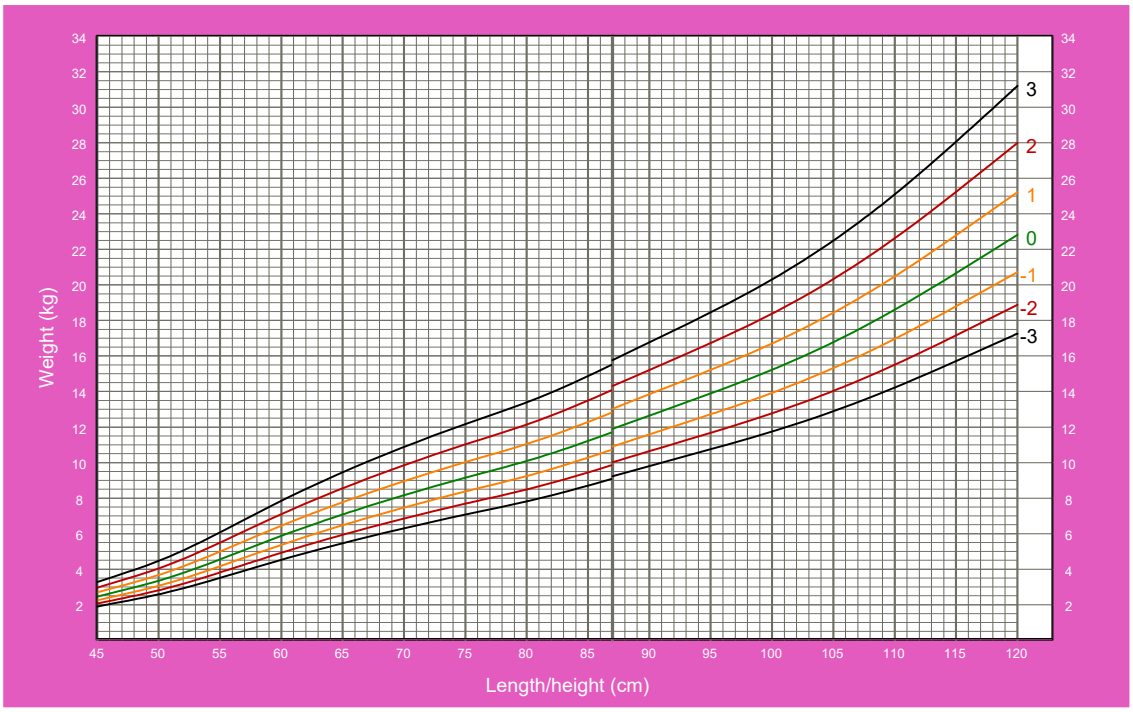


WHO Child Growth Standards

Weight-for-length/height GIRLS

World Health Organization

Birth to 5 years (z-scores)



WHO Child Growth Standards

Annexure 15: Procedures and skills

15.1. Safe injection practices

- Wash your hands thoroughly. Wear gloves if possible.
- Use disposable needles and syringes. Or else, sterilize reusable needles and syringes.
- Clean the chosen site with a spirit/alcohol swab in a circular fashion from the centre to the periphery. Wait for 30 seconds to allow the spirit to dry.
- Carefully check the dose of the drug to be given and draw the correct amount into the syringe.
- Expel the air from the syringe before injecting.
- Always record the name and amount of the drug given.
- Discard disposable syringes in a safe container.

Intramuscular

In >2-year-old children, give the injection in the outer thigh or in the upper, outer quadrant of the buttock, well away from the sciatic nerve. In younger or severely malnourished children, use the outer side of the thigh midway between the hip and the knee, or over the deltoid muscle in the upper arm. Push the needle (23–25 gauge) into the muscle at a 90°angle (45°angle in the thigh). Draw back the plunger to make sure there is no blood (if there is, withdraw slightly and try again). Give the drug by pushing the plunger slowly till the end. Remove the needle and press firmly over the injection site with a small swab or cotton wool.

Subcutaneous

Select the site, as described above for intramuscular injection. Push the needle (23–25 gauge) under the skin at a 45°angle into the subcutaneous fatty tissue. Do not go deep to enter the underlying muscle. Draw back the plunger to make sure there is no blood (if there is, withdraw slightly and try again). Give the drug by pushing the plunger slowly till the end. Remove the needle and press firmly over the injection site with cotton wool.

Intradermal

For an intradermal injection, select an undamaged and uninfected area of skin (e.g. over the deltoid in the upper arm). Stretch the skin between the thumb and forefinger of one hand; with the other, slowly insert the needle (25 gauge), bevel upwards, for about 2 mm just under and almost parallel to the surface of the skin. Considerable resistance is felt when injecting intradermally. A raised, blanched bleb showing the surface of the hair follicles is a sign that the injection has been given correctly.

15.2 Procedures for giving parenteral fluids

Insertion of an indwelling IV cannula in a peripheral vein

Select a suitable vein to place the cannula or gauge 21 or 23 butterfly needle.

Peripheral Vein

- Identify an accessible peripheral vein. In young children aged >2 months, this is usually the cephalic vein in the antecubital fossa or the fourth interdigital vein on the dorsum of the hand.
- An assistant should keep the position of the limb steady and should act as a tourniquet by obstructing the venous return with his fingers lightly closed around the limb.
- Clean the surrounding skin with an antiseptic solution (such as spirit, iodine, isopropyl alcohol, or 70% alcohol solution), then introduce the cannula into the vein and insert most of its length. Fix the catheter securely with tape. Apply a splint with the limb in an appropriate position (e.g. elbow extended, wrist slightly flexed).

Scalp Veins

These are often used in children aged <2 years but work best in young infants.

» Find a suitable scalp vein (usually in the midline of the forehead, the temporal area, or above or behind the ear).

» Shave the area if necessary and clean the skin with an antiseptic solution. The assistant should occlude the vein proximal to the site of puncture. Fill a syringe with normal saline and flush the butterfly set. Disconnect the syringe and leave the end of the tubing open. Introduce the butterfly needle as described above. Blood flowing back slowly through the tubing indicates that the needle is in the vein.

» Care should be taken not to cannulate an artery, which is recognized by palpation. If there should be a pulsatile spurting of blood, withdraw the needle and apply pressure until the bleeding stops; then look for a vein.

Care of the Cannula

Secure the cannula when introduced. This may require the splinting of neighbouring joints to limit the movement of the catheter. Keep the overlying skin clean and dry. Fill the cannula with heparin solution or normal saline immediately after the initial insertion and after each injection.

Common Complications

Superficial infection of the skin at the cannula site is the commonest complication. The infection may lead to a thrombophlebitis which will occlude the vein and result in fever. The surrounding skin is red and tender. Remove the cannula to reduce the risk of further spread of the infection. Apply a warm moist compress to the site for 30 minutes every 6 hours. If fever persists for more than 24 hours, antibiotic treatment (effective against staphylococci) should be given, e.g. cloxacillin.

IV drug administration through an indwelling cannula

Attach the syringe containing the IV drug to the injection port of the cannula and introduce the drug. Once all the drug has been given, inject 0.5 ml heparin solution (10–100 units/ml) or normal saline into the cannula until all the blood has been expelled and the catheter is filled with the solution.

If infusion through a peripheral vein or scalp vein is not possible, and it is essential to give IV fluids to keep the child alive:

» set up an intraosseous infusion

» or use a central vein

» or perform a venous cut down.

15.3 Intraosseous access:

» Participants can practice on chicken thigh bone or any other animal bone

» Gather necessary supplies.

» Wash hands and put on clean examination gloves.

» Can use sterile intraosseous needle, bone marrow needle, or 2-gauge needle.

» Identify the insertion site (proximal end of tibia or distal end of femur):

- The site at the proximal end of the tibia is 1 cm below and 1 cm medial to the tibial tuberosity;
- The site at the distal end of the femur is 2 cm above the
- lateral condyle

» Prepare the skin over the insertion site using a swab or cotton- wool ball soaked in antiseptic

solution, and allow to dry.

» Hold the needle (with the attached syringe if using a hypodermic needle) in the other hand at a 90-degree angle to the selected insertion site, angled slightly towards the foot.

» Advance the needle using a firm, twisting motion and moderate, controlled force. Stop immediately when there is a sudden decrease in resistance to the needle, which indicates that the needle has entered the marrow cavity.

» Once the needle is properly positioned, remove the stylet (if a bone marrow or intraosseous needle was used) and attach the syringe.

» Aspirate using the syringe to confirm that the needle is correctly positioned. The aspirate should look like blood (if in a live baby)

- Secure the needle in place using tape, and splint the leg as for a fractured femur ensuring that the elastic bandage does not interfere with the needle or infusion set.
- Inspect the infusion site every hour.
- Remove the intraosseous needle as soon as alternative IV access is available, and within eight hours, if possible.

15.4. Nasogastric tube insertion and rehydration technique

Use this if the child is not lethargic/unconscious, but is not accepting orally or IV rehydration is not possible.

» Use a sterile NG tube 8-10F size for children less than 2 years and 10-12 F for children 2-5 years.

» Place the patient on his or her back, with the head slightly raised. Older children and adults may prefer to sit up.

» Measure the length of tube to be inserted by placing the tip just above the navel. Then stretch the tubing over the back of the ear and forward to the tip of the nose. Mark the tube with a piece of tape where it touches the end of the nose. This mark shows the length of tubing needed to reach from the tip of the nose to the stomach.

» Moisten the tube with a water-soluble lubricant or plain water; do not use oil.

» Pass the tube through the nostril having a larger opening. Gently advance it until the tip is in the back of the throat. Each time the patient swallows, advance the tube another 3.5cm. If the patient is awake, ask him or her to drink a little water.

» If the patient chokes, coughs repeatedly or has trouble breathing, the tube has probably passed into the trachea. Pull it back 2cm–4cm until the coughing stops and the patient is comfortable. Wait a minute, and then try to insert the tube again.

» Advance the tube each time the patient swallows until the tape marker reaches the nose. If the patient is comfortable and not coughing, the tube should be in the stomach.

» Look into the patient's mouth to be certain that the tube is not coiled in the back of the throat. Confirm that the tube is in the stomach by attaching a syringe and withdrawing a little stomach fluid. You could also do this by placing a stethoscope just above the navel. Inject air into the tube with an empty syringe. Listen for the air entering the stomach.

» Fasten the tube to the face with tape and attach IV tubing that is connected to a clean IV bottle containing ORS solution. Regulate the infusion to a rate of 20 ml/kg per hour, or less with careful monitoring.

» If an IV bottle is not available, a syringe (with the barrel removed) can be attached to the tube and used as a funnel. Hold the syringe above the patient’s head and pour

ORS solution into it at regular intervals.

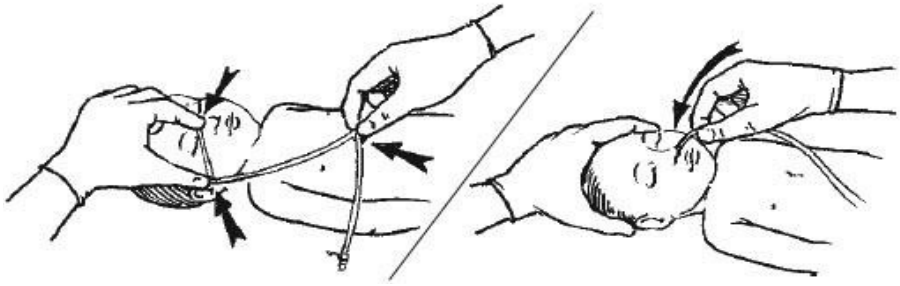


Figure A:Measurement of Nasogastric Tube

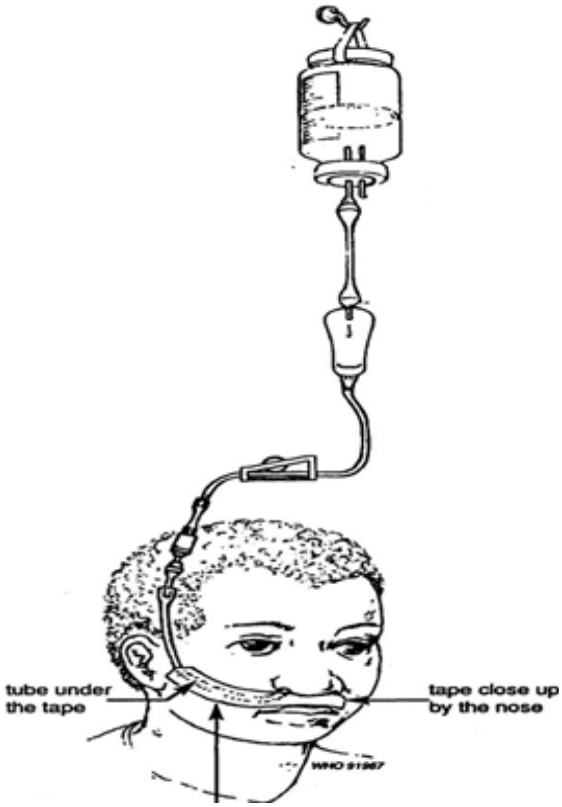


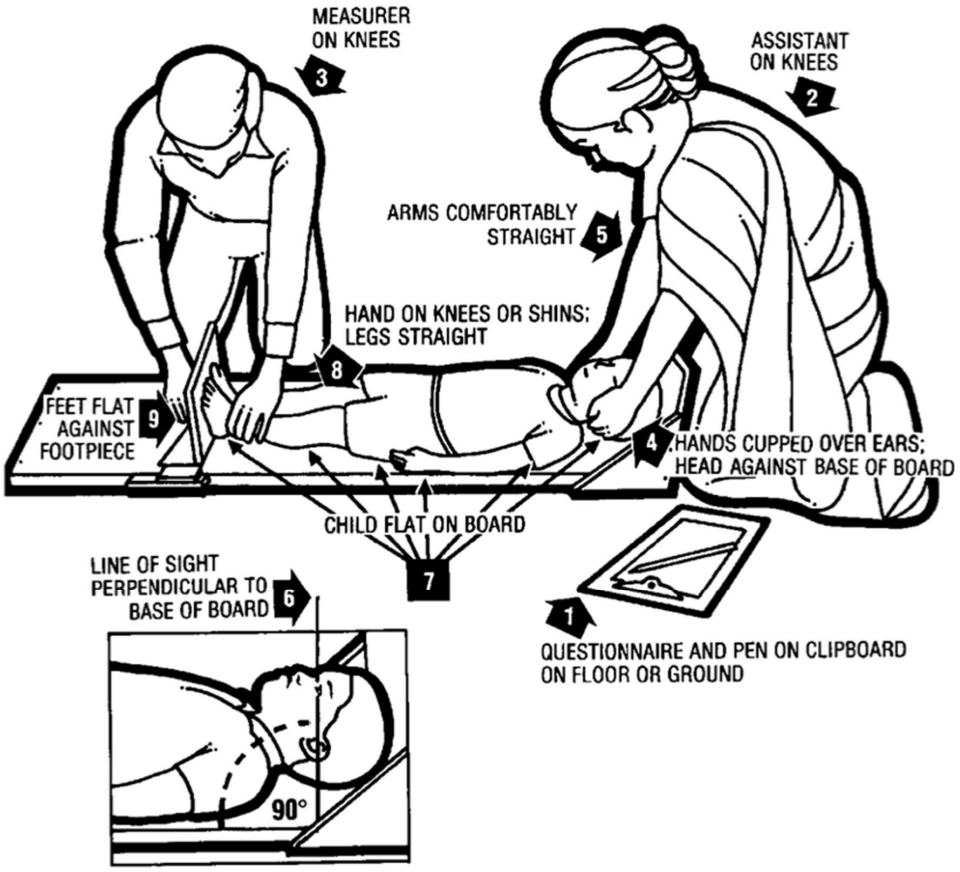
Figure B : Technique for Nasogastric Rehydration

15.5 Measuring length /Height/Weight

Infantometer

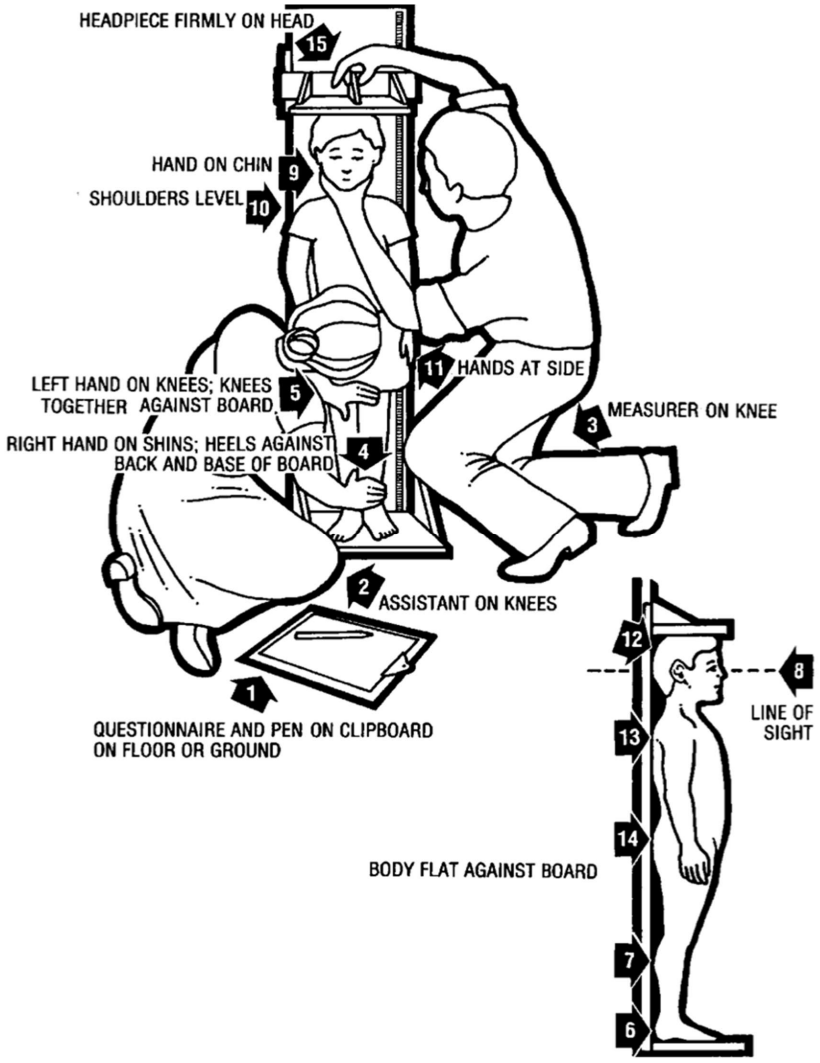
- » Measure length while supine, if length < 85 cm or in children too weak to stand (subtract 0.5 cm if > 85cm).
- » Use a measuring board with a headboard and sliding foot piece.
- » Measurement will be most accurate if child is naked, if not possible ensure clothes do not get in the way of measurement.
- » Work with a partner. One person should stand behind the headboard.
- » Position the crown of the head against the headboard, compressing the hair.
- » Hold the head with two hands and tilt upwards until the eyes look straight upwards.
- » Check that the child lies straight along the centre of the board.
- » The other person straightens the knees.

» Place the foot piece firmly against the feet, with toes pointing up.
» Measure length to the last 0.1 cm.



Stadiometer

» Remove the child's socks & shoes.
» Work with a partner.
» Help the child stand with the back of the head, shoulder blades, buttocks, calves and heels touching the vertical board.
» Hold the child's knees and ankles to keep the legs straight and feet flat.
» Position the head so that the child is looking straight ahead.
» Place the headboard firmly on top of the head and compress the hair.
» Measure the height to the last completed 0.1 cm.

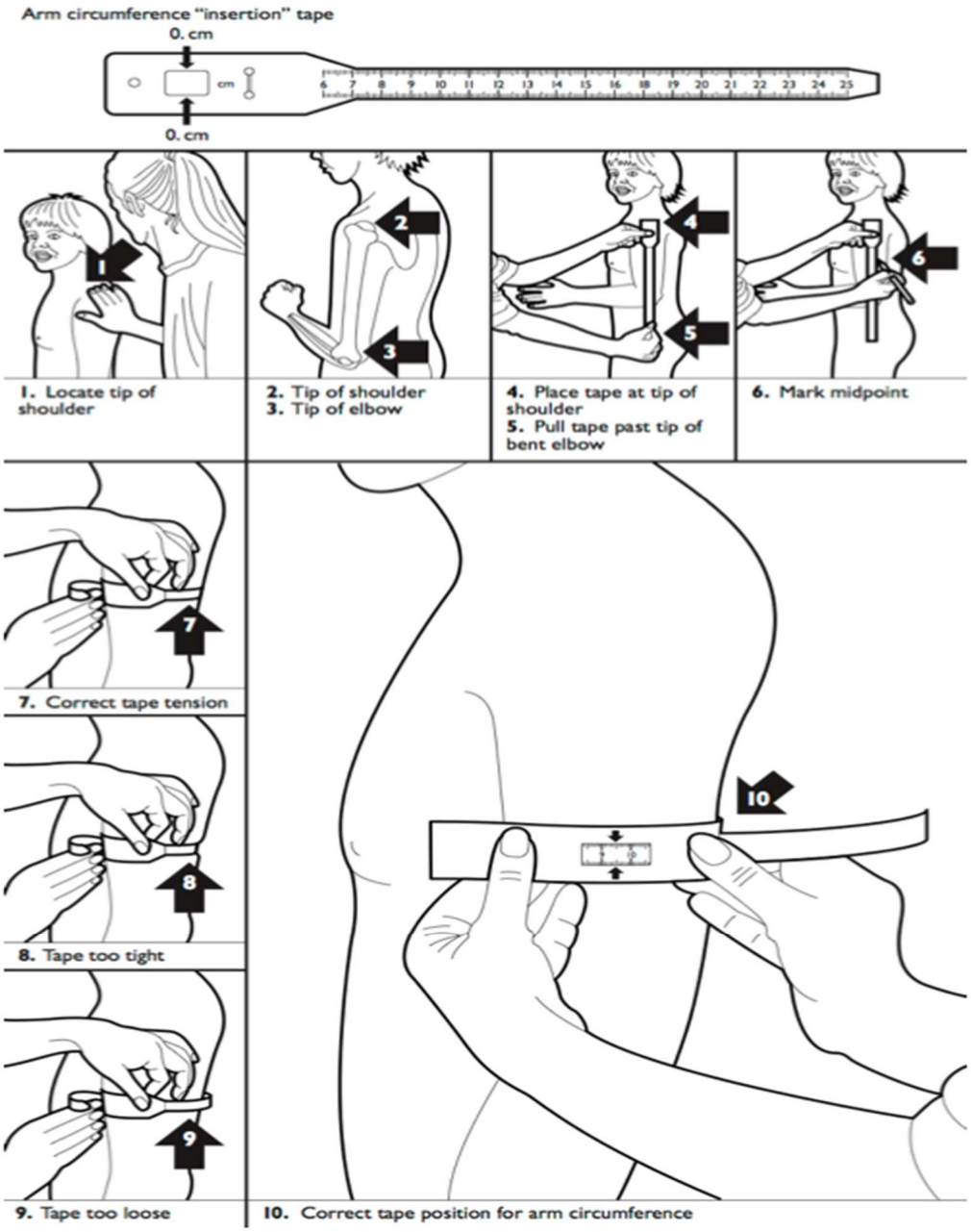


Measuring Weight

- » Leave a cloth in the weighing pan to prevent chilling the child.
- » Adjust the scales to zero with the cloth in the pan.
- » Place the naked child gently on the cloth in the weighing pan.
- » Wait for the child to settle and the weight to stabilize.
- » Measure the weight (to the nearest 10 g) and record immediately.

Standardization of the scales should be performed weekly or whenever the scales are moved.

15.6 Measuring Mid-upper arm circumference (MAUC)



15.7 Use of Nebuliser

- Continuous flow oxygen at 6 to 8 liters per minute can also be used.
- Attach an aerosol mask to the top of the nebuliser.
- Put the drug and 2-4 ml of normal saline in the nebuliser compartment.
- Treat the child until all the liquid in the nebuliser has been almost used up, which usually occurs in 5-10 minutes.
- Bronchodilators can be effectively given by nebulisation using an electric air compressor.
- Tubing and nebuliser should be washed with detergent and dried prior to reuse.

15.8. Use of MDI with spacers:

USE OF A SPACER

- Spacer is a way of effectively delivering bronchodilator drugs
- Works as well as nebuliser if correctly used
- No child < 5 years should be given inhaler without spacer
- Introduce 2 puffs into the spacer chamber and allow normal breathing for 3-5 breaths
- Repeat up to 3 times every 20 minutes
- If spacer is being used for the first time, prime by 4-5 extra puffs from the inhaler

Spacers can be made in the following way:

- Use a plastic cup or a 500 ml drink bottle or similar
- Cut a hole in the base in the same shape as the mouthpiece of inhaler
- Spacer devices with a volume of 750 ml are commercially available

To use an inhaler with a spacer:

- Remove the inhaler cap. Shake the inhaler well
- Insert mouthpiece of inhaler through the hole in the bottle
- The child should put the opening of the bottle into his mouth
- Press down the inhaler while the child continues to breath normally
- Wait for 3 to 4 breaths and repeat
- For younger children place the cup over the child's mouth and use as a spacer in the same way

15.9 Calculating weight gain

This example shows how to calculate weight gain of a child. It is for a weight gain over 3 days:

- Current weight of the child in grams = 6300 g
- Weight 3 days ago in grams = 6000 g

Step 1. Calculate weight gain in g (6300–6000 = 300 g)

Step 2. Calculate average daily weight gain (300g ÷ 3 days = 100g/day)

Step 3. Divide by child's average weight in kg {(initial weight+current weight)/2} (100 g/day ÷ 6.15kg = 16.3 g/kg/day).

Annexure 16: Chart for F-75 and F-100 feeding volumes

16.1 Volume of F-75 for children without oedema

Weight of child (kg)	Volume of F-75 per feed (ml)[a]			Daily total (130 ml/kg)	80% of daily total[a] (minimum)
	Every 2 hours[b] (12 feeds)	Every 3 hours[c] (8 feeds)	Every 4 hours (6 feeds)		
2.0	20	30	45	260	210
2.2	25	35	50	286	230
2.4	25	40	55	312	250
2.6	30	45	55	338	265
2.8	30	45	60	364	290
3.0	35	50	65	390	310
3.2	35	55	70	416	335
3.4	35	55	75	442	355
3.6	40	60	80	468	375
3.8	40	60	85	494	395
4.0	45	65	90	520	415
4.2	45	70	90	546	435
4.4	50	70	95	572	460
4.6	50	75	100	598	480
4.8	55	80	105	624	500
5.0	55	80	110	650	520
5.2	55	85	115	676	540
5.4	60	90	120	702	560
5.6	60	90	125	728	580
5.8	65	95	130	754	605
6.0	65	100	130	780	625
6.2	70	100	135	806	645
6.4	70	105	140	832	665
6.6	75	110	145	858	685
6.8	75	110	150	884	705
7.0	75	115	155	910	730
7.2	80	120	160	936	750
7.4	80	120	160	962	770
7.6	85	125	165	988	790
7.8	85	130	170	1014	810
8.0	90	130	175	1040	830
8.2	90	135	180	1066	855
8.4	90	140	185	1092	875
8.6	95	140	190	1118	895
8.8	95	145	195	1144	915
9.0	100	145	200	1170	935
9.2	100	150	200	1196	960
9.4	105	155	205	1222	980
9.6	105	155	210	1248	1000
9.8	110	160	215	1274	1020
10.0	110	160	220	1300	1040

[a] Volumes in these columns are rounded to the nearest 5 ml.
[b] Feed 2-hourly for at least the first day. Then, when little or no vomiting, modest diarrhoea (<5 watery stools per day), and finishing most feeds, change to 3-hourly feeds.
[c] After a day on 3-hourly feeds: If no vomiting, less diarrhoea, and finishing most feeds, change to 4-hourly feeds.

16.2 Volume of F-75 for children with severe (+++) oedema

Weight with +++ oedema (kg)	Volume of F-75 per feed (ml)[a]			Daily total (100 ml/kg)	80% of daily total[a] (minimum)
	Every 2 hours[b] (12 feeds)	Every 3 hours[c] (8 feeds)	Every 4 hours (6 feeds)		
3.0	25	40	50	300	240
3.2	25	40	55	320	255
3.4	30	45	60	340	270
3.6	30	45	60	360	290
3.8	30	50	65	380	305
4.0	35	50	65	400	320
4.2	35	55	70	420	335
4.4	35	55	75	440	350
4.6	40	60	75	460	370
4.8	40	60	80	480	385
5.0	40	65	85	500	400
5.2	45	65	85	520	415
5.4	45	70	90	540	430
5.6	45	70	95	560	450
5.8	50	75	95	580	465
6.0	50	75	100	600	480
6.2	50	80	105	620	495
6.4	55	80	105	640	510
6.6	55	85	110	660	530
6.8	55	85	115	680	545
7.0	60	90	115	700	560
7.2	60	90	120	720	575
7.4	60	95	125	740	590
7.6	65	95	125	760	610
7.8	65	100	130	780	625
8.0	65	100	135	800	640
8.2	70	105	135	820	655
8.4	70	105	140	840	670
8.6	70	110	145	860	690
8.8	75	110	145	880	705
9.0	75	115	150	900	720
9.2	75	115	155	920	735
9.4	80	120	155	940	750
9.6	80	120	160	960	770
9.8	80	125	165	980	785
10.0	85	125	165	1000	800
10.2	85	130	170	1020	815
10.4	85	130	175	1040	830
10.6	90	135	175	1060	850
10.8	90	135	180	1080	865
11.0	90	140	185	1100	880
11.2	95	140	185	1120	895
11.4	95	145	190	1140	910
11.6	95	145	195	1160	930
11.8	100	150	195	1180	945
12.0	100	150	200	1200	960

[a] Volumes in these columns are rounded to the nearest 5 ml.
[b] Feed 2-hourly for at least the first day. Then, when little or no vomiting, modest diarrhoea (<5 watery stools per day), and finishing most feeds, change to 3-hourly feeds.
[c] After a day on 3-hourly feeds: If no vomiting, less diarrhoea, and finishing most feeds, change to 4-hourly feeds.

16.3 volumes of free feeding with F-100

Weight of Child (kg)	Range of volumes per 4-hourly feed of F-100 (6 feeds daily)		Range of daily volumes of F-100	
	Minimum (ml)	Maximum (ml)[a]	Minimum (150 ml/kg/day)	Maximum (220 ml/kg/day)
2.0	50	75	300	440
2.2	55	80	330	484
2.4	60	90	360	528
2.6	65	95	390	572
2.8	70	105	420	616
3.0	75	110	450	660
3.2	80	115	480	704
3.4	85	125	510	748
3.6	90	130	540	792
3.8	95	140	570	836
4.0	100	145	600	880
4.2	105	155	630	924
4.4	110	160	660	968
4.6	115	170	690	1012
4.8	120	175	720	1056
5.0	125	185	750	1100
5.2	130	190	780	1144
5.4	135	200	810	1188
5.6	140	205	840	1232
5.8	145	215	870	1276
6.0	150	220	900	1320
6.2	155	230	930	1364
6.4	160	235	960	1408
6.6	165	240	990	1452
6.8	170	250	1020	1496
7.0	175	255	1050	1540
7.2	180	265	1080	1588
7.4	185	270	1110	1628
7.6	190	280	1140	1672
7.8	195	285	1170	1716
8.0	200	295	1200	1760
8.2	205	300	1230	1804
8.4	210	310	1260	1848
8.6	215	315	1290	1892
8.8	220	325	1320	1936
9.0	225	330	1350	1980
9.2	230	335	1380	2024
9.4	235	345	1410	2068
9.6	240	350	1440	2112
9.8	245	360	1470	2156
10.0	250	365	1500	2200

[a] Volumes per feed are rounded to the nearest 5 ml.

Annexure 17: Blood transfusion

Use blood that has been screened and found negative for transfusion-transmissible infections. Do not use blood that has passed its expiry date or has been out of the refrigerator for more than 2 hours. Large volume rapid transfusion at a rate >15 ml/kg/hour of blood stored at 4° C may cause hypothermia, especially in small babies. Preferably give packed cells if available in place of whole blood.

Blood Transfusion

General indications for blood transfusion:	Before transfusion, check the following:	During transfusion, check the following:
Acute blood loss, when 20–30% of the total blood volume has been lost and bleeding is continuing Severe anaemia if packed cells are available, give 10 ml/kg over 3-4 hours preferably. If not, give whole blood 20 ml/kg over 3-4 hours. Septic shock, if IV fluids are insufficient to maintain adequate circulation and in addition to antibiotic therapy.	» The blood is of the correct group and the patient's name and number are on both the label and the form (in an emergency, reduce the risk of incompatibility or transfusion reactions by cross-matching group-specific blood or giving O-negative blood if available. » The blood transfusion bag has no leaks. » The blood pack has not been out of the refrigerator for more than 2 hours, the plasma is not pink or has large clots, and the red cells do not look purple or black. » Any signs of heart failure. If present, give 1mg/kg of furosemide IV at the start of the transfusion in children whose circulating blood volume is normal. Do not inject into the blood pack. » Do a baseline recording of the child's temperature, respiratory rate and pulse rate. The volume transfused should initially be 20 ml/kg body weight of whole blood, given over 3–4 hours.	» If available, use an infusion device to control the rate of the transfusion » Check that the blood is flowing at the correct speed. » Look for signs of a transfusion reaction (see below), particularly carefully in the first 15 minutes of the transfusion. » Record the child's general appearance, temperature, pulse and respiratory rate every 30 minutes. » Record the time the transfusion was started and ended, the volume of blood transfused, and the presence of any reactions.

Transfusion reactions

If a transfusion reaction occurs, first check the blood pack labels and patient's identity. If there is any discrepancy, stop the transfusion immediately and notify the blood bank immediately.

Type of transfusion reaction	Signs and symptoms*	Management
Mild reactions (Due to mild hypersensitivity)	» Itchy rash	» Slow the transfusion » Give promethazine 0.25 mg/kg (dilute 25 mg/ml with 10 to 20 ml NS) IV slowly over 10 to 15 mins » Continue the transfusion at the normal rate if there is no progression of symptoms after 30 minutes » If symptoms persist, treat as moderate reaction
Moderately severe reactions (Due to moderate hypersensitivity, non-hemolytic reactions, pyrogens or bacterial contamination)	» Severe itchy rash (urticaria) » Flushing » Fever >38 ° C or >100.4 °F (Note: fever may have been present before the transfusion) » Rigors » Restlessness » Raised heart rate.	» Stop the transfusion, but keep the IV line open with normal saline » Give IV hydrocortisone, or promethazine 0.25 mg/kg (dilute 25 mg/ml with 10 to 20 ml NS) IV slowly over 10 to 15 mins » Give a bronchodilator, if wheezing » Send the following to the Blood Bank: the blood-giving set that was used, blood sample from another site, and urine samples collected over 24 hours. » If there is improvement, restart the transfusion slowly with new blood set and observe carefully » If no improvement in 15 minutes, treat as life-threatening reaction (see below), and report to doctor in charge and to the Blood Bank.
Life-threatening reactions (Due to haemolysis, bacterial contamination and septic shock, fluid overload or anaphylaxis)	» Fever>38°Cor >100.4° F (note: fever may have been present before the transfusion) » Rigors » Restlessness » Raised heart rate » Fast breathing » Black or dark red urine (haemoglobinuria) » Unexplained bleeding » Confusion » Collapse	» Stop the transfusion, but keep the IV line open with normal saline » Maintain airway and give oxygen » Give epinephrine (adrenaline) 0.01 mg/kg body weight (equal to 0.1 ml of 1 in 10000 solution » Treat shock » Give IV hydrocortisone, or promethazine 0.25 mg/kg (dilute 25 mg/ml with 10 to 20 ml NS) IV slowly over 10 to 15 mins » Give a bronchodilator, if wheezing » Report to doctor in charge and to blood laboratory as soon as possible » Maintain renal blood flow with IV furosemide 1mg/kg » Give antibiotic as for septicaemia

* Note that in an unconscious child, uncontrolled bleeding or shock may be the only signs of a life-threatening reaction.

After transfusion:
Reassess the child. If more blood is needed, a similar quantity should be transfused.

Give treatment with iron (daily dose of iron/folate tablet or iron syrup) for 14 days, once acute infections have been treated.

» Ask the parent to return with the child after 14 days. Assess the child for response to iron therapy. Children become less irritable and have improved appetite. Rise in Hb can be documented by 10-14th day. If there is no response to iron therapy, assess for the cause (inadequate dose taken, diarrhoea, malabsorption, presence of infection like UTI and TB). Treatment should be given for 3-4 months, where possible. It takes upto 8 weeks to correct the anaemia and 2–3 months after the haemoglobin reverts to normal to build up iron stores

Annexure 18: Recommendations for Care for Child Development

Recommendations for Care for Child Development

NEWBORN, BIRTH UP TO 1 WEEK	1 WEEK UP TO 6 MONTHS	6 MONTHS UP TO 9 MONTHS	9 MONTHS UP TO 12 MONTHS	12 MONTHS UP TO 2 YEARS	2 YEARS AND OLDER
Your baby learns from birth  **PLAY**Provide ways for your baby to see, hear, move arms and legs freely, and touch you. Gently soothe, stroke and hold your child. Skin to skin is good.  **COMMUNICATE** Look into baby's eyes and talk to your baby. When you are breastfeeding is a good time. Even a newborn baby sees your face and hears your voice. **FEED** Immediately after birth put baby in skin-to-skin contact with mother. Start breastfeeding within one hour of birth. Breast feed on demand	 **PLAY** Provide ways for your child to see, hear, feel, move freely, and touch you. Slowly move colourful things for your child to see and reach for. Sample toys: shaker rattle, big ring on a string.  **COMMUNICATE** Smile and laugh with your child. Talk to your child. Get a conversation going by copying your child's sounds or gestures. **FEED**only breastmilk Recognize the baby is hungry before baby starts crying	 **PLAY** Give your child clean, safe household things to handle, bang, and drop. *Sample toys: containers with lids, metal pot and spoon.*  **COMMUNICATE** Respond to your child's sounds and interests. Call the child's name, and see your child respond. **FEED** Continue breastfeeding on demand. Start giving soft, semi-solid foods; Talk to the child during feeding with eye to eye contact. Feed slowly and patiently. If the child refuses new food try different combinations & textures	 **PLAY**Hide a child's favourite toy under a cloth or box. See if the child can find it. Play peek-a-boo.  **COMMUNICATE** Tell your child the names of things and people. Show your child how to say things with hands, like "bye bye".*Sample toy: doll with face.* **FEED** Continue breastfeeding on demand. Feed the baby directly. Encourage the child to eat, do not force feed.. Allow the child to hold and eat chewable foods, snacks under supervision. Minimize distractions during meals.	 **PLAY**Give your child things to stack up, and to put into containers and take out. *Sample toys: Nesting and stacking objects, container and clothes clips.*  **COMMUNICATE** Ask your child simple questions. Respond to your child's attempts to talk. Show and talk about nature, pictures and things. **FEED** Sit with the child during meals to make sure that the child eats nutritious foods and eats enough while learning to feed her/himself.	 **PLAY**Help your child count, name and compare things. Make simple toys for your child. *Sample toys: Objects of different colours and shapes to sort, stick or chalk board, puzzle.*  **COMMUNICATE** Encourage your child to talk and answer your child's questions. Teach your child stories, songs and games. Talk about pictures or books. *Sample toy: book with pictures.* **FEED**Continue responsive e complementary feeding. Even during illness continue to feed the child. Give extra food and attention to feeding after an illness so that child recovers fully.

•Give your child affection and show your love•Be aware of your child's interests and respond to them•Praise your child for trying to learn new skills

Annexure 19: Child's Developmental Milestones


World Health
Organization
Bhutan