Learning Objectives:

- To understand and demonstrate the assessment and stabilization of sick neonates in the post-resuscitation/pre-transport stabilization period.
- To understand and demonstrate standard treatment protocol for management of common newborn conditions at district hospital level.
INTRODUCTION

Neonatal emergencies are not uncommon problems. They appear either at the time of birth, during the in-hospital post-birth period, or at home within several weeks of discharge. In all instances they present significant diagnostic and treatment challenges to the clinician, and must be taken seriously. Early identification and treatment of infection, respiratory failure and shock in newborn improve survival. The neonatal resuscitation is discussed in Chapter 3B.

ANATOMICAL AND PHYSIOLOGICAL CHARACTERISTICS

Airway and Respiratory System
- They have a large head, short neck and a prominent occiput.
- The tongue is relatively large.
- The ‘sniffing’ position will not help bag mask ventilation or to visualize the glottis.
- The head needs to be in a neutral position.
- Neonates preferentially breathe through their nose.
- Their narrow nasal passages are easily blocked by secretions and may be damaged by a nasogastric tube or a nasally placed endotracheal tube.
- The airway is funnel shaped and narrowest at the level of the cricoid cartilage.
- An endotracheal tube must be inserted to the correct length to sit at least 1cm above the carina and be taped securely so as to prevent tube dislodgement with head movement.
- The neonate and infant have limited respiratory reserve.
- The chest wall is significantly more compliant than that of an adult.

Cardiovascular System
- In neonates the myocardium is less contractile causing the ventricles to be less compliant and less able to generate tension during contraction. This limits the size of the stroke volume. Cardiac output is therefore rate dependent.
- Vagal parasympathetic tone is the most dominant, which makes neonates and infants more prone to bradycardias.
- Bradycardia is associated with reduced cardiac output and mostly due to hypoxia. Therefore, it should be treated with oxygen and ventilation initially.
- The patent ductus contracts in the first few days of life and will fibrose within 2-4 weeks.
- Normal Blood Volumes of newborn is 85 – 90 ml/kg

Renal System
- Dehydration is poorly tolerated.
- Premature infants have increased insensible losses as that has a large surface area relative to weight.

Hepatic System
- Liver function is initially immature with decreased function of hepatic enzymes.
- There is a need of having high index of suspicion of Vitamin K deficiency in newborn due to immature hepatic system.

Glucose Metabolism
- Hypoglycemia is common in the stressed neonate and glucose levels should be monitored regularly.
- Neurological damage may result from hypoglycemia so an infusion of 10% glucose may be used to prevent this. However, it should be tapered gradually with monitor blood glucose as it can cause hypoglycemia if it is stopped abruptly.
- Hyperglycemia is usually iatrogenic or excessive stress due to sepsis.
Hematology
● A hemoglobin level in a newborn will be around 18-20 g/dl which is a hematocrit of about 0.6.
● The hemoglobin levels drop over 3-6 months to 9-12 g/dl as the increase in circulating volume increases more rapidly the bone marrow function.
● The vitamin K dependent clotting factors (II, VII, IX, X) and platelet function are deficient in the first few months.
● Vitamin K is given at birth to prevent hemorrhagic disease of the newborn.
● Transfusion is generally recommended when 15% of the circulating blood volume has been lost.

Temperature Control
● Babies and infants have a large surface area to weight ratio with minimal subcutaneous fat. They have poorly developed shivering, sweating and vasoconstriction mechanisms.
● Brown fat (located in small amounts around the scapulae, the mediastinum, the kidneys and adrenal glands) metabolism is required for non-shivering thermogenesis.
● It comprises 2-6% of neonatal body weight. More oxygen is required for the metabolism of these brown fat stores.
● Heat lost during anesthesia is mostly via radiation but may also be lost by conduction, convection and evaporation. The optimal ambient temperature to prevent heat loss is 34ºC for the premature infant, 32ºC for neonates and 28ºC in adolescents and adults.
● Low body temperature causes respiratory depression, acidosis, decreased cardiac output, increases the duration of action of drugs, decreases platelet function and increases the risk of infection.

Central Nervous System
● Neonates can appreciate pain and this is associated with increased heart rate, blood pressure and a neuro-endocrine response.
● The blood brain barrier is poorly formed.
● The cerebral vessels in the preterm infant are thin walled, fragile. They are prone to intraventricular hemorrhages.
● The risk is increased with hypoxia, hypercarbia, hypernatremia, low hematocrit, awake airway manipulations, rapid bicarbonate administration and fluctuations in blood pressure and cerebral blood flow.

Psychology
● Various adverse effect of unnecessary separation of mother and newborn has been observed.
● Not only psychological effect but also it may compromise breastfeeding practice, increase stress hormone and reduce protect against infection.
● Therefore, all newborn especially preterm newborn has to maintain “Zero separation” policy to reduce morbidity and mortality.

OVERVIEW OF NEONATAL EMERGENCY

| Table 8A.1 Basic Approach to Neonatal Emergencies |
|---------------------------------|------------------|
| **Assessment** | **Actions to be taken** |
| T Touch and feel | Keep baby warm |
| A Breathing | Position neck and check for breathing |
| B Apnea/Gasping | Call for help if not breathing |
Respiratory distress | Give positive pressure ventilation (PPV) immediately within golden 1 minutes  
Give supplemental oxygen or CPAP if breathing but not adequate and have respiratory distress

| Heart rate CRT | Start chest compression if HR<60 with FiO2 100% Oxygen  
Get vascular access and give adrenaline if HR<60  
Give NS bolus 10ml/kg slowly push if CRT>2 sec

| Blood sugar | If hypoglycemia present, give 10%Dextrose bolus 2ml/kg if not possible to take orally

### Management of the Sick Neonate

![Diagram of steps in management of the sick neonate]

**Figure 8A.1** Steps in management of the sick neonate.
Figure 8A.2 Rapid assessment and immediate management of emergencies.
ASSESSMENT FOR SPECIFIC CONDITION
(AFTER EMERGENCY MANAGEMENT OR IF EMERGENCY SIGNS ARE ABSENT)

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

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

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

*If taken more than 30 minutes before

**Newborn with hypothermia**
- Follow STP

**Preterm**
- Follow STP

**Newborn with sepsis**
- Suspect if any of following signs are present
  - Breathing difficulty, abnormal movements, unconscious or lethargic, not feeding or poor feeding, abdominal distension, or vomiting
- Maternal risk factors for sepsis present
- Follow STP

**Newborn with Seizure**
- Follow STP

**Neonate with breathing difficulty**
- Require bag and mask ventilation / intubation / drugs at birth
- Follow STP

**Neonate with birth asphyxia**
- Follow STP

**Neonate with jaundice**
- Follow STP

**Baby may have more than one condition to treat; so look for all conditions**

Figure 8A.3 Assessment for specific condition.
Root cause analysis of Apparent Life-Threatening Event (ALTE)

Classic mnemonic used by Neonatologists and Pediatric Emergency Physicians is "THE MISFITS."

T- Trauma (non-accidental and accidental)
H- Heart disease/Hypovolemia/Hypoxia
E- Endocrine (congenital adrenal hyperplasia, thyrotoxicosis)
M- Metabolic (electrolyte imbalance)
I- Inborn errors of metabolism (metabolic emergencies)
S- Sepsis (meningitis, pneumonia, urinary tract infection)
F- Formula mishaps (under or over dilution)
I- Intestinal conditions (volvulus, intussusception, necrotizing enterocolitis)
T- Toxins/Poisons
S- Seizures

Another mnemonic for the differential diagnoses of a critically ill neonate: NEO SECRETS.

N- Inborn errors of metabolism
E- Electrolyte abnormalities
O- Overdose (toxin, poison)
S- Seizures
E- Enteric emergencies
C- Cardiac abnormalities
R- Recipe (formula, herbs, additives)
E- Endocrine crisis
T- Trauma S Sepsis

STANDARD TREATMENT PROTOCOLS FOR MANAGEMENT OF COMMON NEWBORN CONDITIONS

Management of hypothermia
Newborn lose heat easily due to 4 mechanisms (Evaporation, Radiation, Conduction and Convection). Make sure the baby’s skin is not wet, not kept near the cold wall or draft, or on cold surface. If moderate to severe hypothermia, initially use high setting of the warmer and if the baby’s temperature has been increasing at least 0.5°C per hour over the last 3 hours, rewarming is successful, shift to lower setting of warmer and continue measuring the baby’s temperature every 2 hours. Do not forget to rule out infection if environmental causes are excluded.

Management of Hyperthermia
Most common cause of neonatal hyperthermia is due to environmental factor. Next common is dehydration fever. If both are excluded it is important to rule out infection.
Axillary temperature <36.5°C

Hypothermia

- Look for possible cause of hypothermia
- Check room temperature

Mild hypothermia 36°C – 36.4°C
- Ensure room is warm (maintain at 25°C – 28°C)
- Position baby skin-to-skin with mother
- Continue breast feeding
- Recheck temperature in 1 hour;
  - If temperature is normal, cover the baby adequately including head, hands and feet
  - If no improvement, treat as Moderate Hypothermia

Moderate hypothermia 32°C – 35.9°C
- Provide warmth using a warmer (or electric bulb)
- If no warmer is available, start skin to skin with mother (KMC). Cover mother and baby together optimally using pre-warmed clothes
- Ensure room is warm (maintain at 25°C – 28°C)
- Continue breast feeding
- Measure blood glucose, if <45mg/dl, treat for hypoglycemia (See STP for Hypoglycemia)
- Reassess every 15 minute; if temperature does not improve, increase setting of warmer - Reassess
- If no improvement or no warmer, REFER

Severe hypothermia <32°C
- Provide warmth using a warmer
- Rapid re-warming till baby is 34°C and then slow re-warming
- Start oxygen and maintenance IV fluids
- Give Inj Vitamin K, if not given or status unknown
- Ensure room is warm (maintain at 25°C – 28°C)
- Measure blood glucose, if <45mg/dl, treat for hypoglycemia (See STP for Hypoglycemia)
- Reassess every 15 minutes, if temperature does not improve increase setting of warmer - Reassess
- If no improvement, REFER

Figure 8A.4 Management of hypothermia.
Axillary temperature >37.5 °C

Hyperthermia

- Look for possible cause
- Check room temperature (maintain at 25-28°C)
- Look for signs of infection (See STP for Sepsis)
- Look for signs of dehydration

- Keep baby away from source of heat (warmer, heater, sunlight)
- Remove extra clothes
- Decrease environmental temperature (if needed)
- Recheck baby’s temperature every 1 hour till normal
- If >39°C, sponge the baby with luke warm water
- Treat underlying cause
- Ensure adequate feeding or fluids
- Treat dehydration, if present
- Measure blood glucose; if <45mg/dL, treat for hypoglycemia (See STP for Hypoglycemia)
- **Do not give antipyretic**

* Signs of dehydration in a newborn:
  - Sunken eyes, or
  - depressed fontanelle, or
  - loss of skin elasticity, or
  - dry tongue and mucous membrane

Figure 8A.5 Management of hyperthermia
Management of an asphyxiated newborn

- Apgar score is very important parameter to anticipate the neurodevelopmental prognosis among asphyxiated newborns. Therefore, do not forget to record in MCH handbook as well as referral note.
- Severe birth asphyxiated newborn may be benefited by “Therapeutic hypothermic (Baby cooling) therapy” if it can be initiated within 6 hours after birth. Therapeutic hypothermic therapy will protect the injured brain insulted by hypoxia and hypo perfusion from its secondary damage. Currently, it is available only in JDWRH in the country.
- Therefore, as soon as severe birth asphyxia occurs, contact to the Pediatricians on duty in JDWRH and consider urgent referral by the fastest mode of transport with passive cooling (remove heat source) if fulfill the criteria of baby cooling therapy.
- Asphyxiated newborn condition will be changed as time passed. The clinical course is very important to document to anticipate prognosis. Therefore, please record and attach the table in panel 2 to the referral note.

Table 8A.2 Exclusion criteria for therapeutic hypothermia

<table>
<thead>
<tr>
<th>Contraindications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neonates more than 6 hours of age at the time of therapy</td>
</tr>
<tr>
<td>Neonates with gestational age of less than 36 weeks or birth weight of less than 1800g.</td>
</tr>
<tr>
<td>Neonates judged by the attending neonatologist as having a major congenital abnormality and unlikely to benefit from therapeutic hypothermia</td>
</tr>
<tr>
<td>Unavailability of necessary equipment</td>
</tr>
</tbody>
</table>

Table 8A.3 Inclusion criteria for therapeutic hypothermia

<table>
<thead>
<tr>
<th>Criteria A</th>
<th>Physiological criteria: the presence of one or more signs as follows</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective findings of systemic hypoxic ischemic injury</td>
<td>An APGAR score of 5 or less at 10 mins after birth</td>
</tr>
<tr>
<td>(optional)</td>
<td>A continued need for resuscitation, including endotracheal or mask ventilation at 10 mins after birth</td>
</tr>
<tr>
<td>pH of less than 7.00 or a base deficit of 16mmol/L or more in an umbilical cord blood sample or an arterial or venous blood sample obtained within 60 mins of birth</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Criteria B (optional)</th>
<th>Neurologic examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subjective findings of encephalopathy</td>
<td>Moderate to severe encephalopathy according to criteria modified from Sarnat and Sarnat, such as lethargy, stupor, or coma.</td>
</tr>
<tr>
<td>In addition, one or more of the following: hypothermia, abnormal reflexes (including oculomotor or pupillary abnormalities), an absent or weak suck, or clinical evidence of seizure.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Criteria C (optional)</th>
<th>aEEG (amplitude-integrated electroencephalography) findings: if possible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate to severe aEEG abnormalities</td>
<td>at least 30 mins duration, moderate (upper margin &gt; 10 u V and lower margin &lt; 5 u V) or severe (upper margin &lt; 10 u V) abnormal background aEEG voltage, or seizures (a sudden increase in voltage accompanied by narrowing of the aEEG activity band followed by a brief period of burst-suppression.</td>
</tr>
</tbody>
</table>

Source: NCPR textbook 2015.
**MANAGEMENT OF AN ASPHYXIATED NEWBORN**

**Figure 8A.6** Management of asphyxiated newborn.

**Flowchart 1**

**Immediate Management of an asphyxiated newborn**

- **Newborn with birth asphyxia**
  - Baby requiring bag and mask ventilation (BMV) OR intubation with or without medications at birth

  **Categorize based on the severity of asphyxia**

- **Mild asphyxia**
  - Requiring BMV for less than 60 seconds
  - No intubation or medications at birth

  **Assess 5 minutes after birth**
  - Assess sensorium and tone
  - Look for abnormal movements

  - Normal tone and sensorium; No abnormal movements; No other complications
  - Abnormal sensorium/tone OR Abnormal movements

  Shift to mother’s side; Initiate breastfeeding; If not able to breastfeed, Start alternative methods of feeding.

- **Moderate or severe asphyxia**
  - Requiring BMV for 60 seconds or more and/or needed for intubation or medications at birth

  See Flowchart 2
Flowchart 2

Management of a newborn who has been resuscitated for moderate or severe birth asphyxia

Newborn with moderate or severe asphyxia, who
- Required bag and mask ventilation (BMV) for 60 seconds or more at birth, OR
- Needed intubation or medications at birth

Check vitals (Annexure 1):
- Temperature, heart rate, capillary refill time (CRT), colour, oxygen saturation (SpO2), respiratory rate, lower chest retractions, abnormal movements

If any one of vital signs is abnormal
- Follow Sheets A and B (Management of Emergencies)

1. Maintain normal temperature
   - If Hypothermia, Follow STP
   - Avoid hyperthermia (temperature >37.5°C)

2. Maintain oxygenation and ventilation
   - Secure airway
   - Start oxygen by nasal cannula or hood if SpO2 is <90%
     (Target SpO2 90-95%)

3. Maintain normal perfusion
   - Administer normal saline bolus if CRT is prolonged
   - Transfuse if there is evidence of blood loss
   - If shock, Follow STP

4. Maintain normal blood glucose
   - Start IV 10% Dextrose for the next 12 hours
   - Check blood glucose every 12 hours in the first 48-72 hours of life
   - Maintain blood glucose between 60 and 120 mg/dl
   - If Hypoglycaemia, Follow STP

5. Watch for seizures
   - Administer phenobarbitalone if the baby has seizures
     (Follow STP for Seizures)

- Assess if the infant has encephalopathy, 8-hourly until 72 hours (based on consciousness, tone, seizures, and suck/respiration; Panel 1):

- No or mild encephalopathy
  - Initiate alternative methods of feeding, after vitals are stable
  - Shift to Breastfeeding as soon as possible

- Moderate or severe hypoxic-ischemic encephalopathy (HIE)
  - Monitor vital signs and urine output (Panel 2)
  - Continue IV fluids; restrict fluids to 60 mL/kg/d on the first day; do not increase volume if baby urinates <6 times/day
  - Initiate intra gastric tube feeding followed by spoon/paladai feeds gradually after vitals are stable
  - Assess for sepsis, if the baby does not improve even after 3 days
  - If no improvement or deterioration, REFER
Panel 1: Classification of hypoxic-ischemic encephalopathy (Levene)

<table>
<thead>
<tr>
<th>Feature</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consciousness</td>
<td>Irritability</td>
<td>Lethargy</td>
<td>Comatose</td>
</tr>
<tr>
<td>Tone</td>
<td>Hypotonia</td>
<td>Marked hypotonia</td>
<td>Severe hypotonia</td>
</tr>
<tr>
<td>Seizures</td>
<td>No</td>
<td>Yes</td>
<td>Prolonged</td>
</tr>
<tr>
<td>Sucking/respiration</td>
<td>Poor suck</td>
<td>Unable to suck</td>
<td>Unable to sustain spontaneous respiration</td>
</tr>
</tbody>
</table>

Panel 2: Monitoring of an asphyxiated baby

<table>
<thead>
<tr>
<th>Signs</th>
<th>At admission</th>
<th>2 hr</th>
<th>4 hr</th>
<th>6 hr</th>
<th>8 hr</th>
<th>10 hr</th>
<th>12 hr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Color</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Heart rate</td>
<td></td>
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<tr>
<td>Capillary Refill Time</td>
<td></td>
<td></td>
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<tr>
<td>Respiration Rate</td>
<td></td>
<td></td>
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<tr>
<td>Oxygen saturation (SpO2)</td>
<td></td>
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<td></td>
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<tr>
<td>Urine output (8 hourly)</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Neurological examination (Panel 1) (8 hourly):</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Consciousness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seizures</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sucking/respiration</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Figure 8A.7 Management of newborn with seizures.

Flowchart 1: Initial management

Newborn with abnormal movements
Differentiate from jitteriness/other abnormal movements (Panel 1)

Seizures

- Secure airway;
- Optimize breathing, circulation, and temperature;
- Start oxygen in the presence of cyanosis and/or low SpO2

Measure Blood Glucose

Blood glucose < 45 mg/dl
- Give 2 ml/kg 10% dextrose IV; Start IV Dextrose maintenance infusion (See STP for Hypoglycemia)

Seizures continue despite normal blood glucose

Blood glucose ≥ 45 mg/dl
- Give phenobarbitone 20 mg/kg IV slowly over 20 minutes (Panel 2)

Seizures continue
- Repeat phenobarbitone 10 mg/kg every 30 min until a total of 40 mg/kg is reached

Seizures continue
- Give IV Lorazepam* 0.05 mg/kg bolus over 2-5 minutes (Panel 3) OR
- IV phenytoin 20 mg/kg slowly over 20 minutes (Panel 4)

No Seizures
- Ongoing Care

Seizure continues
- REFER

Measure Serum Calcium, if possible
If low, give IV Calcium*

Seizure continues
- REFER

No Seizure
- Start Oral Calcium (Panel 6)

* For giving IV calcium, cardiac monitoring is preferred.

* Lorazepam can cause severe respiratory depression; use these, if ventilation facilities are available, otherwise use phenytoin and REFER if no facility available for assisted ventilation

Do Lumbar Puncture if clinical examination shows bulging anterior fontanel, opisthotonus, lethargy or unconsciousness
- After immediate treatment, also assess signs for other illnesses
Flowchart 2: Ongoing Management

**Panel 1: Convulsions vs Jitteriness**

<table>
<thead>
<tr>
<th>Convulsions</th>
<th>Jitterness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have both fast and slow components Slow movements (1-3 jerks per second)</td>
<td>Fast movements (4-6 per second); tremors are of equal amplitude</td>
</tr>
<tr>
<td>Not provoked by stimulation</td>
<td>Provoked by stimulation</td>
</tr>
<tr>
<td>Does not stop with restraint</td>
<td>Stops with restraint</td>
</tr>
<tr>
<td>Neurological examination - often abnormal</td>
<td>Neurological examination – usually normal</td>
</tr>
<tr>
<td>Often associated with eye movements (tonic deviation or fixed stare) and/or autonomic changes (changes in heart rate)</td>
<td>Not associated with eye movements or autonomic changes</td>
</tr>
</tbody>
</table>

**Panel 2: Protocol for administering phenobarbitone**

<table>
<thead>
<tr>
<th>Presentation</th>
<th>Injection 200 mg/ml; 1 ml ampoules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dosage</td>
<td>Loading dose: 20 mg/kg IV or IM</td>
</tr>
<tr>
<td></td>
<td>Maintenance: 5 mg/kg/day PO (once daily)</td>
</tr>
<tr>
<td>Route</td>
<td>Intravenous and per oral</td>
</tr>
<tr>
<td>Directions for use</td>
<td>Take 0.1 mL of solution and dilute with 0.9 mL of water for injection to make 1 mL</td>
</tr>
<tr>
<td></td>
<td>Resultant concentration is 20 mg/mL</td>
</tr>
<tr>
<td></td>
<td>Give required amount slowly over 15-20 minutes.</td>
</tr>
<tr>
<td>Caution</td>
<td>May cause respiratory arrest</td>
</tr>
</tbody>
</table>
### Panel 3: Protocol for administering lorazepam

<table>
<thead>
<tr>
<th>Presentation</th>
<th>Injection 2 mg/ml OR 4 mg/ml; 1 ml ampoules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dosage</td>
<td>Loading dose: 0.05 mg/kg IV; May be repeated, if necessary.</td>
</tr>
<tr>
<td>Route</td>
<td>Intravenous route</td>
</tr>
<tr>
<td>Directions for use</td>
<td>Take 1.0 mL of solution and dilute with 9.0 mL of water for injection to make 10 mL. Dilute again by adding 1.0 mL of the reconstituted solution to 9.0 mL of water for injection to make 10 mL. Resultant concentration is 0.02 or 0.04 mg/mL (depending upon the original concentration in the ampoule). Give the required amount slowly over 2-5 minutes.</td>
</tr>
<tr>
<td>Caution</td>
<td>May cause respiratory arrest</td>
</tr>
</tbody>
</table>

### Panel 4: Protocol for administering phenytoin

<table>
<thead>
<tr>
<th>Presentation</th>
<th>Injection 100 mg/2ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dosage</td>
<td>Loading dose: 15-20 mg/kg IV</td>
</tr>
<tr>
<td>Route</td>
<td>Intravenous route</td>
</tr>
<tr>
<td>Directions for use</td>
<td>Dilute in normal saline. Give slowly at a rate 1 mg/kg/min infusion over 15-20 minutes</td>
</tr>
<tr>
<td>Caution</td>
<td>After giving, flush the cannula with saline to prevent phlebitis. Do not use cloudy solutions</td>
</tr>
</tbody>
</table>

### Panel 5: Protocol for administering IV calcium gluconate

<table>
<thead>
<tr>
<th>Presentation</th>
<th>9 mg/ml ampoules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dosage</td>
<td>1-2 ml/kg/dose every 6-8 hourly</td>
</tr>
<tr>
<td>Directions for use</td>
<td>Dilute in equal amount of distilled water. Inject very slowly while MONITORING HEART RATE. If there is bradycardia, discontinue the injection.</td>
</tr>
<tr>
<td>Caution</td>
<td>Take care to avoid extravasation, if being given as infusion, as it may cause sloughing of skin</td>
</tr>
</tbody>
</table>

### Panel 6: Protocol for administering oral calcium

<table>
<thead>
<tr>
<th>Presentation</th>
<th>Suspension containing elemental calcium and elemental phosphorus in ratio of 2 : 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dosage</td>
<td>120 mg/Kg/day calcium and 60 mg/kg/day phosphorus; divided into 8 hourly doses</td>
</tr>
<tr>
<td>Caution</td>
<td>Ensure compliance</td>
</tr>
</tbody>
</table>
Table 8A.4 Differential diagnosis of neonatal seizures and spasms.

<table>
<thead>
<tr>
<th>History</th>
<th>Examination</th>
<th>Investigations or Other Known Diagnoses</th>
<th>Probable Diagnosis</th>
</tr>
</thead>
</table>
| • Time of onset day 1 to 3  
  • History of maternal diabetes  
  • Poor or no feeding | • Convulsions, jitteriness  
  • Lethargy, or unconsciousness  
  • Small baby (less than 2.5 kg at birth or born before 37 weeks gestation)  
  • Large baby (more than 4 kg at birth) | Blood glucose less than 45 mg/dl (2.6 mmol/l) | Hypoglycemia |
| • Mother not immunized with tetanus toxoid  
  • Poor feeding or no feeding after having fed well 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 labor or birth (fetal distress)  
  • Failure of baby to spontaneously breathe at birth  
  • Resuscitation required at birth  
  • Time of onset within 24 hours of birth | • Convulsions or unconsciousness  
  • Lethargy or unconsciousness  
  • Breathing difficulty  
  • Abnormal body temperature  
  • Floppiness or reduced activity  
  • Irritability | Asphyxia or other brain injury | |
| • Time of onset day 1 to 7  
  • Sudden deterioration of condition  
  • Sudden pallor | • Convulsions or unconsciousness  
  • Small baby (less than 2.5 kg at birth or born before 37 weeks 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  
  • Opisthotonos  
  • Poor or no feeding  
  • Lethargy or floppiness | Positive Coombs test  
  High Serum Bilirubin | Bilirubin encephalopathy (kernicterus) |
Management of hypoglycemia in newborns
- If asymptomatic ensure adequate breast feeding is established & frequently breast feed
- Recheck blood sugar after half hour.
- If baby is symptomatic with, seizure, lethargy, jitteriness, apnea etc. Give 10% Dextrose IV 2ml/kg bolus, check blood sugar if low, repeat and start 10% dextrose IV infusion.
- Assess breast feeding and feed frequently once stabilize.

Figure 8A.8 Management of hypoglycemia in newborn.

Flowchart 1:
Identify a baby with hypoglycemia

**SUSPECT:**
1. Small baby (birth weight <2 kg)
2. Large baby (birth weight of 4 kg or more)
3. Baby of diabetic mother

Check blood glucose every 12 hours until 48-72 hours of life

Blood glucose <45 mg/dl
Hypoglycemia

Follow Flowchart 2 or 3

**SUSPECT:**
- Baby with one or more emergency signs
- Baby with one or more of the following clinical features – lethargy/stupor, poor suck or difficulty in feeding, jitteriness, convulsions, apnea

Check blood glucose every 12 hours until the baby is stable or the symptoms have resolved
Flowchart 2

Management of a baby with blood glucose of 25-45 mg/dl but no symptoms of hypoglycemia

Blood glucose 25-45 mg/dl AND Baby has no symptoms

Breastfeeding or expressed breast milk by cup/spoon/paladai

*Monitor blood glucose after 1 hour or before next feed*

- > 45 mg/dl
  - Increase frequency (if breast-fed) or increase volume of feed (if cup/spoon/paladai-fed)
  - *Monitor blood glucose before next feeds; Discontinue monitoring if blood glucose is 45 mg/dl or more on two consecutive measurements*

- 25-45 mg/dl
  - Follow Flowchart 3

- < 25 mg/dl
  - *Follow Flowchart 3*

Baby with blood glucose 25-45 mg/dl who has symptoms of hypoglycemia, follow Flowchart 3
Flowchart 3
Management of a baby with blood glucose less than 25 mg/dl OR/AND symptoms of hypoglycemia

Blood glucose <25 mg/dl
OR
Blood glucose 25-45 mg/dl and symptoms of hypoglycemia

- Bolus of 2 ml/kg 10% Dextrose IV over 5 minutes (if no IV line, give the same by intra-gastric tube)

- IV 10% Dextrose at daily maintenance rate

  **Monitor blood glucose after 30 minutes**

- Blood glucose <45 mg/dl

  - If blood glucose remains <45 mg/dl after 2 boluses, continue IV 10% Dextrose and arrange for referral

- Blood glucose >45 mg/dl

  - Continue glucose infusion

    **Monitor blood glucose every 3 hours:**
    - If level is 45 mg/dl or more on two consecutive measurements, start decreasing glucose infusion;
    - Increase oral feeding concurrently

    **Stop IV fluids when oral feeding reaches at least 2/3 of daily requirement:**
    - Allow the baby to breastfeed;
    - Stop monitoring when 2 values of blood glucose are more than 45 mg/dl on full oral feeding
Breathing difficulty in the Newborn

**Breathing difficulty**
- Chest indrawing
- Grunting

**Check**
- Respiratory Rate
- Cyanosis
- Oxygen saturation (SpO2)

**Severe respiratory distress**
- RR>90/minute with grunting/retractions OR
- RR<30/minute OR
- Cyanotic on > 1 L/min on nasal prongs or catheter or > 5L/min O2 on oxygen by hood or SpO2 <90%

**Moderate respiratory distress**
- RR 60-90/minute AND retractions/grunting OR
- RR>90/minute OR
- Oxygen 0.5 to 1 L/min on nasal prongs or catheter or 3-5 L/min on oxygen by hood & pink or SpO2 >90%

**Mild respiratory distress**
- RR 60-90/minute OR
- Oxygen < 0.5 L/min on nasal prongs or catheter or < 3L/min on oxygen by hood & pink or SpO2 <90%

**Specific Management**

- No Improvement
  - Start CPAP, if not available
  - Maintain IV line
  - Treat for sepsis
  - Chest x-ray, if needed
  - If no improvement REFER (for assisted ventilation)

- No Improvement
  - Maintain O2 and IV line
  - Treat for sepsis
  - Chest x-ray, if needed
  - May require CPAP, if not available
  - REFER

- No Improvement
  - Consider chest x-ray
  - Continue care (feeding, temperature control)
  - Deteriorates or increasing oxygen requirement: Give antibiotics

**Watch for signs of improvement**
- Decreasing oxygen requirement
- No grunting or indrawing or cyanosis
- Decreasing RR

Remove oxygen observe every 15 minutes for next one hour to see for pink tongue & lips, consider alternative methods or direct breast feeding once off oxygen. No difficulty in breathing, feeding well, pink for at least 2 days without oxygen: discharge.

*Refer to Panel for assessment of respiratory distress

$ Signs of surgical conditions - scaphoid abdomen (diaphragmatic hernia), drooling of saliva (esophageal atresia)

# If Pulse Oximeter is available

** Congenital heart disease should be ruled out if cyanosis but no distress at > 5 L/ min

*** Aminophylline may be required in preterm infant to manage apnoea

Figure 8A.9 Management of breathing difficulty in the newborn.
Panel 1: WHO Classification of respiratory distress

<table>
<thead>
<tr>
<th>Classification</th>
<th>Respiratory Rate (bpm)</th>
<th>Grunting or Chest indrawing</th>
<th>Requirement of oxygen by hood</th>
<th>Requirement of oxygen Nasal catheter/Cannula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe</td>
<td>More than 90&lt;br&gt;Less than 30</td>
<td>Present</td>
<td>&gt;5L/min</td>
<td>&gt;1 L/min</td>
</tr>
<tr>
<td>Moderate</td>
<td>More than 90</td>
<td>Absent</td>
<td>3-5 L/min</td>
<td>0.5-1.0 L/min</td>
</tr>
<tr>
<td>Mild</td>
<td>60 – 90</td>
<td>Present</td>
<td>3-5 L/min</td>
<td>0.5-1.0 L/min</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Absent</td>
<td>3 L/min</td>
<td>0.5 L/min</td>
</tr>
</tbody>
</table>

Downes Score & Silverman Anderson Score

Downes score and Silverman Anderson (SAS) are two important clinical scores to assess the severity of respiratory distress. SAS score is ideal for preterm infants and Downes score for term infants.

**Downe's Score**: There are 5 criterions: Respiratory Rate, Retractions, Cyanosis, Air entry, grunting. Each of these is rated on a scale of 0, 1, 2. The total score is then evaluated.

<table>
<thead>
<tr>
<th>Table 8A.5 Downe’s Score</th>
<th>FEATURE</th>
<th>SCORE 0</th>
<th>SCORE 1</th>
<th>SCORE 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyanosis</td>
<td>None</td>
<td>In room air</td>
<td>In FiO$^2$ 40%</td>
<td>Moderate to severe</td>
</tr>
<tr>
<td>Retraction</td>
<td>None</td>
<td>Mild</td>
<td>Audible with stethoscope</td>
<td>Audible without stethoscope</td>
</tr>
<tr>
<td>Grunting</td>
<td>None</td>
<td>Audible</td>
<td>Audible with stethoscope</td>
<td>Audible without stethoscope</td>
</tr>
<tr>
<td>Air entry</td>
<td>Normal</td>
<td>Decreased</td>
<td>Barely</td>
<td></td>
</tr>
<tr>
<td>Respiratory rate</td>
<td>&lt;60</td>
<td>60-80</td>
<td>&gt;80 or apnea</td>
<td></td>
</tr>
</tbody>
</table>

**Result**: Score 4-7 Clinical respiratory distresses, Score ≥ 7 Impending respiratory failure.


<table>
<thead>
<tr>
<th>Table 8A.6 Silverman's Score</th>
<th>FEATURE</th>
<th>SCORE 0</th>
<th>SCORE 1</th>
<th>SCORE 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper movement chest movement</td>
<td>Synchronou s</td>
<td>Inspiratory lag</td>
<td>See-saw respiration</td>
<td></td>
</tr>
<tr>
<td>Lower chest retractions</td>
<td>None</td>
<td>Minimal</td>
<td>Marked</td>
<td></td>
</tr>
<tr>
<td>Xiphoid retraction</td>
<td>None</td>
<td>Minimal</td>
<td>Marked</td>
<td></td>
</tr>
<tr>
<td>Nasal flaring</td>
<td>None</td>
<td>Minimal</td>
<td>Marked</td>
<td></td>
</tr>
<tr>
<td>Grunting</td>
<td>None</td>
<td>Audible with stethoscope</td>
<td>Audible with stethoscope</td>
<td></td>
</tr>
</tbody>
</table>

**Result**: Score 10 = Severe Respiratory stress, Score ≥ 7 = Impending Respiratory Failure and Score 0 = No respiratory distress.

**PNEUMOTHORAX** can be the differential diagnosis of respiratory distress in newborn, which may require urgent intervention to stabilize before referral. Trans illumination-Diagnosis of pneumothorax can be made by trans illumination even if x-ray facility is not available. Needle aspiration can be done to rescue the newborn from tension pneumothorax.
before transfer and referral if pneumothorax is suspected. Insert needle/IV cannula directly over the top of the rib in the second or third intercostal space in the mid clavicular line.

**Pathological Jaundice in Newborn**

- Any visible jaundice first day
- For < 35 weeks jaundice on day 2
- Yellow palms or soles of feet

**Jaundice lasting more than 3 weeks after birth**

- Start phototherapy
- Estimate total serum bilirubin
- Check blood group of baby & mother

Check total serum bilirubin cut offs (Panel 1)

- Bilirubin ≥ exchange level
- Signs of kernicterus (lethargy or floppiness, not feeding, convulsions, opisthotonos)

**Panel 1: Total serum bilirubin cut offs for phototherapy or exchange transfusion**

<table>
<thead>
<tr>
<th>Age</th>
<th>Phototherapy</th>
<th>Exchange transfusion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Healthy babies</td>
<td>Babies with risk factors*</td>
</tr>
<tr>
<td>Day 1</td>
<td>Any visible jaundice</td>
<td>15mg/dl</td>
</tr>
<tr>
<td>Day 2</td>
<td>15mg/dl</td>
<td>10mg/dl</td>
</tr>
<tr>
<td>Day ≥ 3</td>
<td>18mg/dl</td>
<td>15mg/dl</td>
</tr>
</tbody>
</table>

*Gestation <35 weeks or weight <2000 grams, sepsis, hemolysis, asphyxia, sick baby.

Figure 8A.10 Management of pathological jaundice in newborn.
Panel 2: Specific Diagnoses and Treatment for neonatal jaundice

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Counseling and Actions</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cephalhematoma/external bruises</td>
<td>Takes 4-6 weeks to disappear</td>
<td>Phototherapy, if bilirubin level above cut-off</td>
</tr>
<tr>
<td>Hemolytic jaundice (ABO or Rh incompatibility, G6PD deficiency; previous family history, hepatosplenomegaly, pallor)</td>
<td>Recheck Hemoglobin on follow up 2-4 weeks Anti-D prophylaxis for Rh incompatibility Avoid drugs &amp; chemicals in G6PD deficiency - Sulfas, antimalarial, aspirin, fava beans, mothballs If the cause of jaundice is Rh factor incompatibility, advice mother regarding future pregnancies</td>
<td>Exchange transfusion if bilirubin above the cut-off Promote feeding optimally</td>
</tr>
<tr>
<td>Prematurity</td>
<td>Frequent feeding</td>
<td>Need specific management (Referral to higher center)</td>
</tr>
<tr>
<td>Neonatal hepatitis</td>
<td>In case of clay or white colored stool, high colored urine staining the clothes, baby needs referral</td>
<td></td>
</tr>
</tbody>
</table>
Change in behavior |
---|
Lethargy, irritability or moaning  

Skin |
---|
Poor peripheral perfusion, cyanosis, pallor, petechial, rashes  

Gastrointestinal problems |
---|
Feeding intolerance, vomiting, diarrhea, or abdominal distention with or without visible bowel loops  

Cardiopulmonary |
---|
Tachypnea, respiratory distress, apnea, tachycardia and hypotension  

Metabolic |
---|
Hypoglycemia, hyperglycemia, or metabolic acidosis  

Focal infections |
---|
Cellulitis, omphalitis, conjunctivitis, otitis media or osteomyelitis  

A. TREAT FOR SEPSIS IF  
Breathing difficulty (RR>60/min) AND Severe chest drawing OR grunting OR ANY TWO of the FOLLOWING SIGNS ARE PRESENT:  
1) Fast breathing (RR >60/min)  
2) Convulsions  
3) Unconscious or Lethargic (no spontaneous movements)  
4) Abnormal body temperature (axillary temperature <36.5° or >37.5° C)  
5) No feeding or feeding poor after having fed well  
6) Abdominal distension and/or vomiting  

B. WHEN AGE of the baby is 3DAYS or less, TREAT IF:  
Any of the following two maternal risk factors present: maternal fever, foul-smelling or purulent amniotic fluid, prolonged rupture of membranes >18 hours  
Reassess after 2 days and treatment is continued only if there are signs of sepsis (or positive blood culture)  

C. Suspect meningitis if the baby has convulsions, opisthotonos, unconsciousness, lethargy or a bulging anterior fontanel  
Treat seizures, if present (see STP on Seizure)  
If possible, perform a lumbar puncture and send the cerebrospinal fluid (CSF) to the laboratory for cell count, Gram stain, culture and sensitivity.  
Begin treatment for meningitis while waiting for laboratory confirmation  

Management:  
Sepsis (when meningitis is not suspected)  
1. Take a blood sample, and send it to the laboratory for hemoglobin & hematocrit (to decide the need for blood transfusion), peripheral blood smear (to confirm sepsis), and culture and sensitivity, when possible  
2. Treat the baby with intravenous (IV) antibiotics: ampicillin (or penicillin) and gentamicin according to baby’s age and weight (See Panel) for at least 10 days  
3. If a baby with sepsis is at greater risk of staphylococcus infection (e.g. extensive skin pustules, abscess, or omphalitis in addition to signs of sepsis), they should be given cloxacillin and gentamicin instead of ampicillin and gentamicin.  
4. Assess the baby’s condition every six hours for signs of improvement:  
   • If baby’s condition is improving after 72 hours of treatment with antibiotics:  
     o Continue ampicillin and gentamicin to complete 10 days of treatment.  
   • If the baby’s condition is NOT improving after 72 hours of treatment with antibiotics:
If the blood culture is positive, change antibiotics according to the results of the culture and sensitivity, and give new antibiotics for 10 days.

If the blood culture is not possible or the organism cannot be identified: discontinue ampicillin. Give IV cefotaxime, in addition to gentamicin, for 10 days.

**Meningitis:**

✓ Give IV ampicillin and IV gentamicin according to the baby's age and weight (Panel). Remember than for meningitis, higher dose of ampicillin is given.

✓ If possible, confirm the diagnosis of meningitis:
  
  o White blood cell count in the CSF is 20/mm3 or more if the baby is less than seven days old; or 10/mm3 or more if the baby is seven days or older; OR
  
  o Culture or Gram stain of the CSF is positive.

✓ If the baby’s condition is improving after 48 hours of treatment with antibiotics, continue the antibiotics for 14 days or for seven days after signs of improvement are first noted, whichever is longer.

✓ If the baby’s condition is not improving after 48 hours of treatment, change antibiotics. Discontinue ampicillin. Give IV cefotaxime according to the baby’s age and weight in addition to gentamicin, for 14 days or for seven days after signs of improvement are first noted, whichever is longer.

✓ If still no improvement, REFER

<table>
<thead>
<tr>
<th>Supportive Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continue IV fluids as required (See STP)</td>
</tr>
<tr>
<td>Maintain temperature (See STP)</td>
</tr>
<tr>
<td>Give Oxygen as required</td>
</tr>
<tr>
<td>Introduce feeding as soon as possible</td>
</tr>
<tr>
<td>Manage seizure (See STP)</td>
</tr>
<tr>
<td>Manage abdominal distension:</td>
</tr>
<tr>
<td>Nil orally</td>
</tr>
<tr>
<td>Gastric aspiration 2 hourly until no distension</td>
</tr>
<tr>
<td>If not improved in 12 hours, REFER to higher center</td>
</tr>
</tbody>
</table>

**Table 8A.6 Antibiotics dosage for sepsis and meningitis in neonate**

<table>
<thead>
<tr>
<th>Antibiotics</th>
<th>Each dose</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Age 1 to 7 days</td>
<td>Age 8 days or more</td>
</tr>
<tr>
<td>Ampicillin for sepsis</td>
<td>50mg/kg/dose</td>
<td>12 hourly</td>
</tr>
<tr>
<td>Ampicillin for meningitis</td>
<td>100mg/kg/dose</td>
<td>12 hourly</td>
</tr>
<tr>
<td>Cloxacillin for sepsis</td>
<td>50mg/kg/dose</td>
<td>8 hourly</td>
</tr>
<tr>
<td>Gentamicin (for sepsis or meningitis)</td>
<td>&lt;2Kg 4 mg/kg/dose q48h</td>
<td>&lt;2Kg 4mg/kg/dose q36h</td>
</tr>
<tr>
<td></td>
<td>2Kg or more 4mg/kg/dose q24h</td>
<td>2Kg or more 4mg/kg/dose q24h</td>
</tr>
<tr>
<td>Cefotaxime for sepsis</td>
<td>50mg/kg/dose</td>
<td>12 hourly</td>
</tr>
<tr>
<td>Cefotaxime for meningitis</td>
<td>50mg/kg/dose</td>
<td>8 hourly</td>
</tr>
</tbody>
</table>
Shock in Newborn

- Weak & fast pulse (HR>180/min) AND
- Extremities cold to touch AND
- Capillary Refill Time >3 sec
  
  With or without the following signs:
  - Colour - very pale
  - Lethargy, not arousable on stimulation

Provide warmth
Secure airway
Support breathing, circulation and temperature
Start oxygen, if saturation (<90%) is low
Measure blood glucose; correct hypoglycemia (follow STP)

If bleeding is NOT the likely cause

- Establish IV access
- Give IV normal saline or Ringer Lactate 20 ml/kg body weight over the first hour
- Give IV 10% Dextrose at maintenance rate
- Treat for Sepsis (follow STP)
- Continue O2 as required

Monitor hourly (Panel 2):
- Heart rate, oxygen saturation
- Capillary refill time
- Urine output
- Sensorium

If signs of shock improve

- Continue maintenance IV fluid as per weight and day of life (follow STP)
- Reassess above parameters hourly
- Give specific treatment based on diagnosis (follow specific STP)

If bleeding is the likely cause

- Establish IV access
- Give IV normal saline or Ringer Lactate 10 ml/kg body weight over 10 min
- If no improvement, repeat fluid of 10 ml/kg once after 20 minutes as above
- Immediately give a blood transfusion using type O, Rh negative blood
- Give Vitamin K 1 mg IV

Determine Diagnosis (Panel 1)

If signs of shock persist

- Continue IV Fluid and O2
- REFER

Figure 8A.11 Management of shock in newborn.
## Panel 1: Diagnostic clues based on history and clinical examination

<table>
<thead>
<tr>
<th>Cause</th>
<th>History / Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood loss</td>
<td>Antepartum hemorrhage&lt;br&gt;Blood loss internal/external Age day 1&lt;br&gt;Follow STP on Emergency Management – Sheet A</td>
</tr>
<tr>
<td>Asphyxia</td>
<td>Need for Resuscitation for poor respiratory efforts at birth&lt;br&gt;Hypoxic ischemic encephalopathy (See STP for Management of asphyxiated neonates)</td>
</tr>
<tr>
<td>Sepsis</td>
<td>Predisposing factors for infection&lt;br&gt;Age &gt; day 3&lt;br&gt;Follow STP</td>
</tr>
<tr>
<td>Severe dehydration</td>
<td>Loose stool, vomiting, failure to feed + Signs of dehydration</td>
</tr>
<tr>
<td>Cardiac</td>
<td>Term baby; normal at birth&lt;br&gt;Age day 3-4&lt;br&gt;Look for feeble or delayed femoral pulse, cardiac murmur (coarctation of aorta)</td>
</tr>
<tr>
<td>Persistent Pulmonary Hypertension of the Newborn (PPHN)</td>
<td>Meconium stained term baby Age day 1-3&lt;br&gt;REFER</td>
</tr>
</tbody>
</table>

## Panel 2: Monitoring of baby with shock

<table>
<thead>
<tr>
<th>Signs</th>
<th>At admission</th>
<th>1 hr</th>
<th>2 hr</th>
<th>3 hr</th>
<th>4 hr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart Rate/min</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capillary refill time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urine output</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensorium</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature difference (core-extremities)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Follow STP on Emergency Management – Sheet A
STABILISATION, TRANSFER AND DISCHARGE OF SICK NEWBORN

**Determine the indication** to transport the baby to higher health facility:
- Birth weight < 1000 grams / gestation < 28 weeks
- Severe respiratory distress
- Shock not responding to fluid boluses and vaspressors
- Severe jaundice needing exchange transfusion
- Major congenital malformations e.g. meningomyelocele, complex heart disease
- Refractory seizures
- Abdominal distension with bilious vomiting

**Preparation for baby**
- Stabilize the baby (temperature, airway, breathing, circulation and blood sugar)
- Secure IV line and give necessary treatment before transfer
- Oxygen if indicated

**Prepare for transport**
- Counsel the parents and family before transport
- Communicate with & write a brief note to the referral hospital
- Arrange a capable healthcare provider, mother and a relative to accompany (if available)
- Assemble supplies and equipment to carry and arrange for transport (see box)
- Give one dose of antibiotics before transport

**Care during transport**
- Monitor frequently (temperature, airway and breathing, circulation, IV cannula and infusions)
- Ensure that the baby receives feeds or fluid
- Oxygen if indicated
- Stop the vehicle, if necessary, to manage problems

**Feedback after transport**
Communicate with team at referral hospital to know:
- Condition of the baby at arrival
- Outcome of the baby
- Post-discharge advice & follow up

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

Figure 8A.12 Transport of a sick baby.
### Table 8A.7 Supplies and equipment to carry

<table>
<thead>
<tr>
<th>Equipment and supplies</th>
<th>Drugs &amp; fluids</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Cover adequately-socks, cap Source of warmth, blanket Resuscitation equipment: o bag</td>
<td>• Any drug (e.g. antibiotics) the baby is receiving if a dose is anticipated during the trip</td>
</tr>
<tr>
<td>o appropriately sized mask o suction apparatus o oxygen cylinder with flow meter</td>
<td>• IV fluid (0.9% NaCl, Ringer lactate, 10% dextrose)</td>
</tr>
<tr>
<td>o nasal catheter, or head box</td>
<td></td>
</tr>
<tr>
<td>Stethoscope, thermometer</td>
<td></td>
</tr>
<tr>
<td>• Fluids &amp; feeds: o Expressed breast milk o Oro gastric tube to feed o IV infusion set o Butterfly set or IV set</td>
<td></td>
</tr>
<tr>
<td>• Syringes and needles (various sizes and types)</td>
<td></td>
</tr>
<tr>
<td>• Adhesive tape</td>
<td></td>
</tr>
<tr>
<td>• Sterile gloves</td>
<td></td>
</tr>
<tr>
<td>• Antiseptic solution and cotton wool balls</td>
<td></td>
</tr>
<tr>
<td>• Extra napkins (diapers)</td>
<td></td>
</tr>
<tr>
<td>• A source of illumination: Torch</td>
<td></td>
</tr>
</tbody>
</table>

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

### Kangaroo Mother Care and Feeding of low birth weight and sick newborns

#### Kangaroo mother care (KMC)

Kangaroo mother care is the life-saving skill for the small babies who need thermal protection, nutrition, emotional support and infection prevention. 3 components of KMC are 1. KMC position, 2. KMC nutrition, 3.KMC follow up.

![KMC position and feeding of newborn](Source: WHO KMC guideline 2003)
**Figure 8A.14** Feeding of low birth weight and sick newborns.

### Flowchart 1: Deciding the initial feeding method

**Assessment**

- **Is the baby clinically stable?**
  - Yes
  - No

- **Is birth weight more than 1000 grams?**
  - Yes
  - No

- **Is the baby able to breast feed effectively?**
  - Yes
  - No
  - When offered breast, the baby roots, attaches well and suckles effectively
  - Able to suckle long enough to satisfy needs

- **Is the baby able to accept feeds by alternative methods?**
  - Yes
  - No
  - When offered cup or spoon feeds, the baby opens the mouth, takes milk and swallows without coughing/spluttering
  - Able to take an adequate quantity to satisfy needs

**Action**

- **Start intravenous fluids** (Also see Flowchart 2)

- **Start intravenous fluids** (Also see Flowchart 2)

- **Initiate breastfeeding**

- **Give oral feeds by cup/spoon/ paladai**

- **Start oro-/naso- gastric tube feeds**

* Paladai is a small cup with a beak
Flowchart 2: For babies on IV Fluids: Progression to oral feeds

**Infants on IV fluids**

- If hemodynamically stable:
  - Start MEN* / trophic feeds 10-15 ml/kg/day by oro/nasogastric tube &
  - Monitor for feed intolerance #

- If tolerating well:
  - Gradually increase the feed by 10-15 ml/kg/day

**Baby on oro/nasogastric feeding**

- If tolerating feed well #
  - Try to spoonfeed once or twice a day
  - Also, put onto mothers’ breast

- If accepting feed well:
  - Gradually increase the frequency and amount of spoon/paladai feed
  - Reduce tube feeds accordingly

**Baby on spoon/paladai feed**

- Put baby on mother breast before each feed
- Observe for good attachment & effective sucking

- If able to breastfeed effectively:
  - Taper and stop spoon/paladai feed once the mother is confident

---

* Possible signs of feed intolerance:
  - Vomiting soon after feed
  - Abdominal distension
  - Gastric residue > 25% of previous feed

* Revert to IV fluids if feed intolerance

---

* Minimal Enteric Nutrition
Panel 1: Steps of spoon/paladai feeding

- Baby should be awake and held sitting semi-upright on caregiver’s lap; put a small cloth on front of chest to catch drips of milk
- Put a measured amount of milk in the spoon/paladai
- Hold the spoon/paladai so that the pointed tip rests lightly on the baby’s lower lip
- Tip the spoon/paladai to pour a small amount of milk into the baby’s mouth at a time
- Feed the baby slowly
- Make sure that the baby has swallowed the milk already taken before giving any more
- When the baby has had enough, he or she will close his or her mouth and will not take any more. Do not force-feed the baby.
- Wash the spoon/paladai with soap and water and then put in boiling water for 20 minutes to sterilize before next feed

Panel 2: Steps of oro-/naso-gastric tube feeding

- Before starting a feed, check the position of the tube
- For each feed take a fresh syringe (ideally sterile disposable) and remove the plunger
- Connect the barrel of the syringe to the end of the gastric tube
- Pinch the tube and fill the barrel of the syringe with the required volume of milk
- Hold the tube with one hand, release the pinch and elevate the syringe barrel to 5-10 cm above the level of the baby
- Let the milk run from the syringe through the gastric tube by gravity
- DO NOT force milk through the gastric tube by using the plunger of the syringe
- It should take about 10-15 minutes for the milk to flow into the baby’s stomach: control the flow by altering the height of the syringe; lowering the syringe slows the milk flow, raising the syringe makes the milk flow faster
- Observe the infant during the entire gastric tube feed. Do not leave the baby unattended.
  STOP THE FEED if the baby shows any of the following signs: breathing difficulty, change in colour/looks blue, becomes floppy, and vomits
- Keep the end of the gastric tube between feeds capped; if the baby is on CPAP, the tube is preferably left open for about half an hour after the feeding
- Avoid flushing the tube with water or saline after giving feeds
- Progress to feeding by cup/spoon/paladai when the baby can swallow without coughing or spitting milk. This could be possible in as little as one or two days, or it may take longer than one week
- Replace the gastric tube with another clean gastric tube after three days, or earlier in case it is pulled out or becomes blocked.

IV FLUID THERAPY FOR NEWBORNS

- For first 24-48 hours the fluid for maintenance is 10% Dextrose
- Thereafter make N/5 in10 % dextrose, add 0.5-1ml KCl to every 100ml fluid
- Use micro drip set if available and double check drop rate. (Total fluid volume/24=drops/min)
- If micro drip set is not available use the normal drip set but ensure that drop the baby gets only required amount of fluid. Double check the drop rate.
Indications for IV Fluids

- Birth weight < 1000 grams OR
- Birth weight > 1000 grams and sick; or Sick Newborn of any birth weight

**Indications of sickness: Presence of one of the following**
- Fast breathing (RR > 60/min)
- Unconscious or Lethargic (no spontaneous movements)
- No feeding or feeding poor after having fed well; or intolerance to gastric feeds
- Abdominal distension and/or vomiting (bilious/bloody)
- Uncontrolled seizures

**Less than 1000 grams**

<table>
<thead>
<tr>
<th>Day of Life</th>
<th>Fluid amount (mL/kg/day)</th>
<th>Nature of fluid</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>80</td>
<td>10% dextrose</td>
</tr>
<tr>
<td>2</td>
<td>95</td>
<td>10% dextrose</td>
</tr>
<tr>
<td>3</td>
<td>110</td>
<td>10% dextrose with</td>
</tr>
<tr>
<td></td>
<td></td>
<td>sodium 3mmol/kg,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>potassium 2mmol/kg**</td>
</tr>
<tr>
<td>4</td>
<td>125</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>140</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>150</td>
<td></td>
</tr>
</tbody>
</table>

**More than 1000 grams AND/OR Sick Newborn**

<table>
<thead>
<tr>
<th>Day of Life</th>
<th>Fluid amount (mL/kg/day)</th>
<th>Nature of fluid</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>60</td>
<td>10% dextrose</td>
</tr>
<tr>
<td>2</td>
<td>80</td>
<td>10% dextrose</td>
</tr>
<tr>
<td>3</td>
<td>100</td>
<td>10% dextrose with</td>
</tr>
<tr>
<td></td>
<td></td>
<td>sodium 3mmol/kg,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>potassium 2mmol/kg</td>
</tr>
<tr>
<td>4</td>
<td>120</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>140</td>
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<tr>
<td>6</td>
<td>150</td>
<td></td>
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<tr>
<td>7</td>
<td>150</td>
<td></td>
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</tbody>
</table>

*Reassess after 24-48 hours*

**Stable and able to accept oral feeds**
- START on enteral feeds 10-15mL/kg/day, divided 2 hourly
- Measure abdominal girth
- Increase 20-30mL/kg/day
- STOP feeding (bilious/blood-stained gastric aspirate, GRV>25%/>3mL)**

**NO**
- Continue i.v. fluids
- Deduct the same amount from daily i.v. fluid requirement
- Increase to full feeds over 12-24 hours
- STOP feeding (bilious/ blood-stained gastric aspirate, GRV>25%/>3mL)**

**Figure 8A.15** IV fluid therapy for newborn.

* DO NOT INCREASE fluid on the next day, if weight gain, tachycardia, oedema feet, puffy eyes, urine output < 1mL/kg/hr. ** If the premixed solutions are not available, add normal saline 20 ml/kg to the required volume of 10% dextrose, but infuse only the required daily volume

*** Measure gastric residual volume (GRV) only if there is increase in abdominal girth by 2 cm, above baseline.
Advise for essential care for the neonate at discharge

**Feed breast milk**
- Breast milk is the best and is the only food baby needs for first six months
- Mother needs to breastfeed day and night, at least eight times in 24 hours
- Mother need to take nutritious meals and should drink lots of clean water
- For a small baby who finds difficult to suckle, express breast milk and collect in a clean cup to feed the baby with a palatal, cup or spoon

**Keep clean**
- Wash your hands with clean water and soap before every feed and after visiting toilet and handling baby’s faces / urine
- Keep the surroundings clean
- Keep the cord stump clean, do not apply anything on cord

**Keep warm**
- Keep the baby well wrapped in a clean dry cloth or blanket (in cold season)
- Cover baby’s head with part of cloth/ blanket or put a cap on the head
- Keep the room warm avoid direct draught of air
- Keep next to mother for warmth, it promotes lactation and mother-baby bonding
- Encourage KMC for Low birth weight babies

**Counsel and educate the mother and family**
- Build confidence of the family in taking care of baby at home
- Ensure that the family understands importance of administering prescribed medicines for the whole duration
- Educate mother when to report for follow up after discharge
- Educate mother when to report early if there is worsening of conditions at any time after discharge
- Educate mother for signs of well baby feeds on breast, active behavior, pink extremities and trunk & extremities are warmth to touch
- Ensure baby is gaining weight on follow up
- Advise for timely immunization

**Reference**
1. Standard Treatment Protocols for Management of Common Newborn Conditions at Small Hospital, Department of Pediatrics, AIIMS, 2013. *Available on Android 3.0Plus Tablet/Mobile application as “AIIMS-WHO-CC STPs”*
5. WHO Kangaroo Mother Care a practical guide 2003.