Chapter 8A
NEONATAL EMERGENCIES

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 CHARACTERESTICS

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 2-4weeks.
- 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
C	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
D	Blood sugar	If hypoglycemia present, give 10%Dextrose bolus 2ml/kg if not possible to take orally

Management of the Sick Neonate

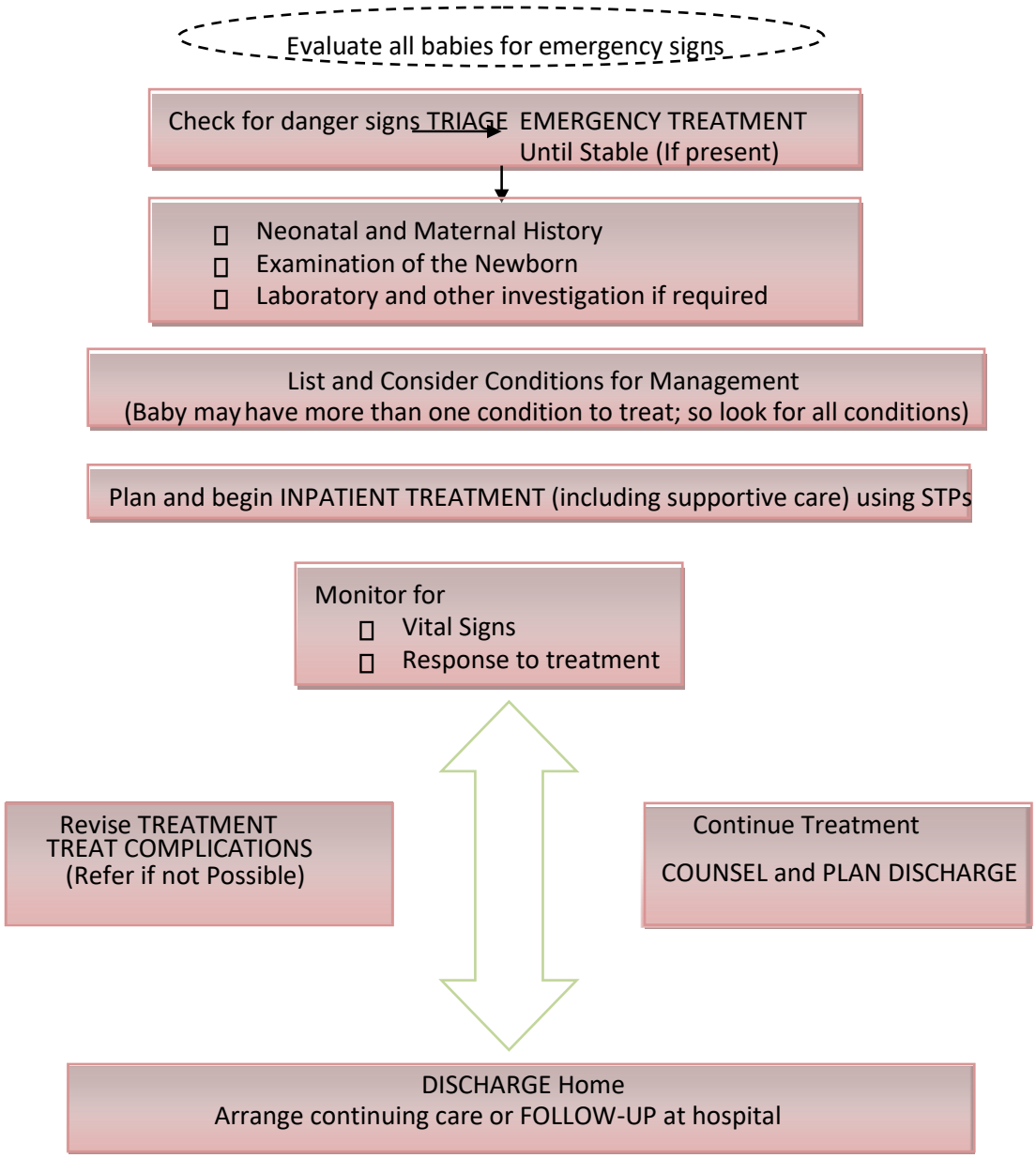


Figure 8A.1 Steps in management of the sick neonate.

RAPID ASSESSMENT AND IMMEDIATE MANAGEMENT OF EMERGENCIES

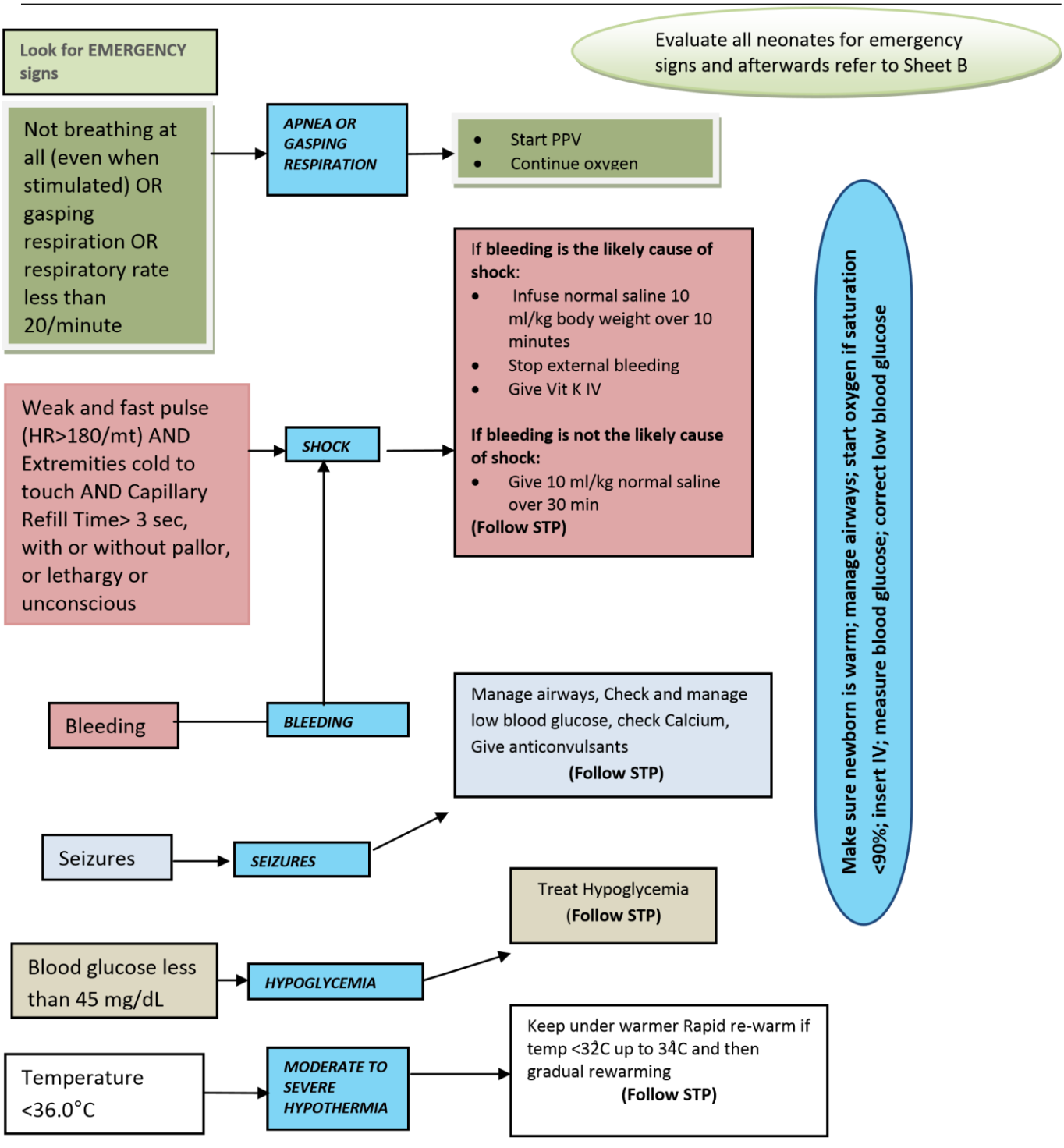


Figure 8A.2 Rapid assessment and immediate management of emergencies.

ASSESSMENT FOR SPECIFIC CONDITION

(AFTER EMERGENCY MANAGEMENT OR IF EMERGENCY SIGNS ARE ABSENT)

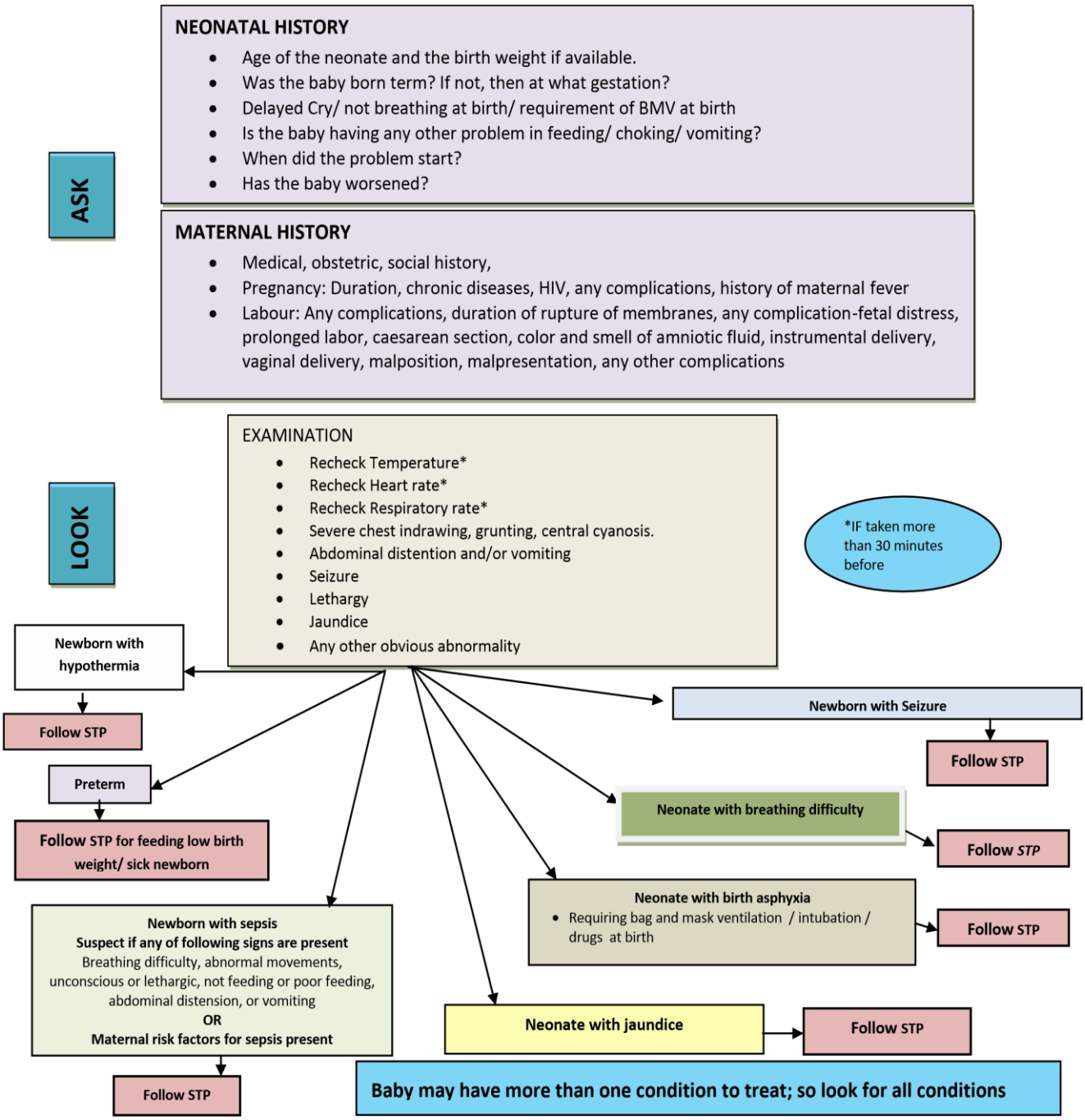


Figure 8A.3 Assessment for specific condition.

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℃ 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.

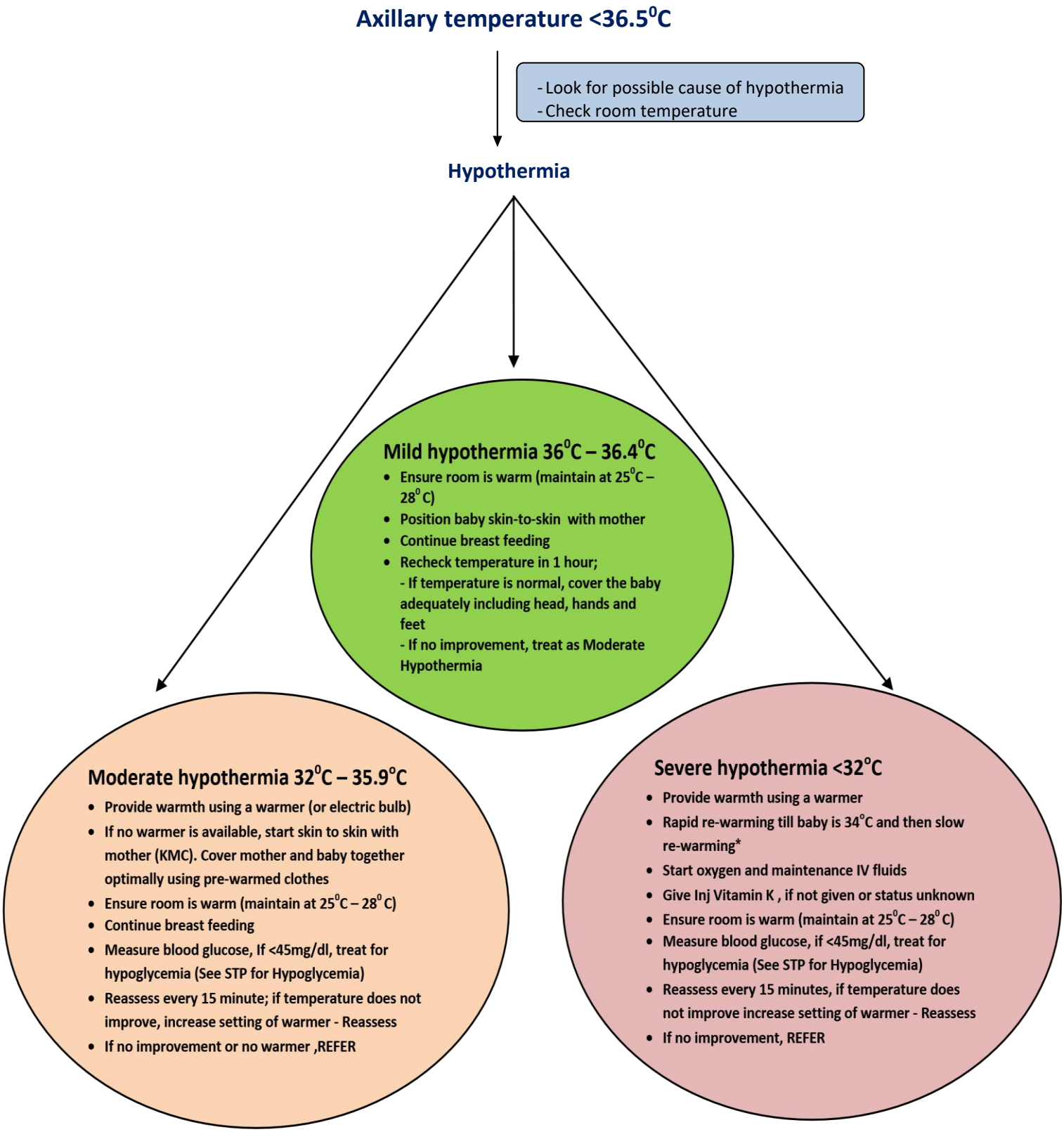


Figure 8A.4 Management of hypothermia.

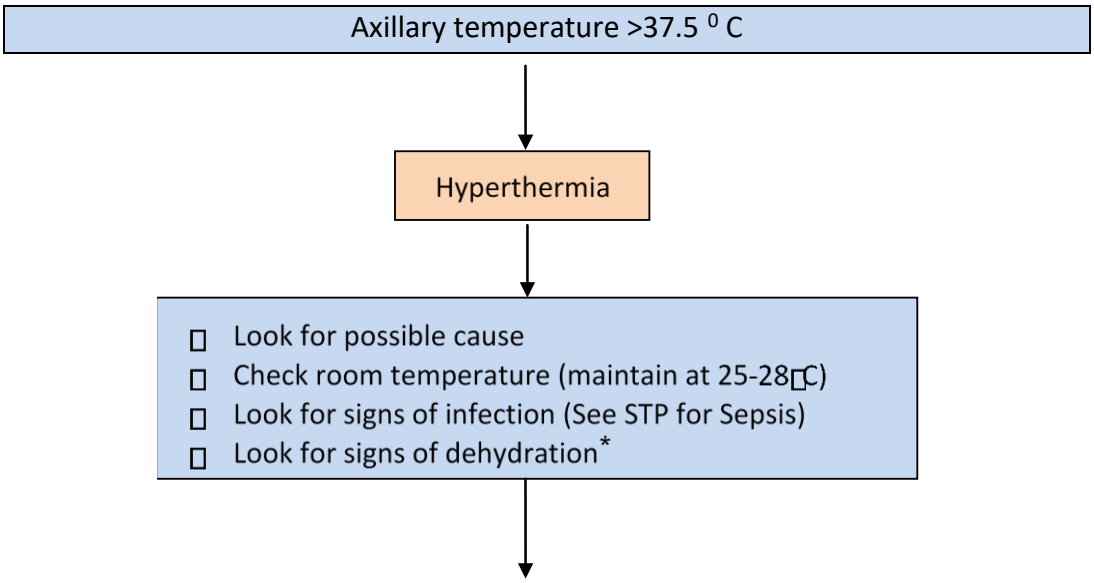


Figure 8A.5 Management of hyperthermia

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 JDWNRH in the country.
- Therefore, as soon as severe birth asphyxia occurs, contact to the Pediatricians on duty in JDWNRH 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

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

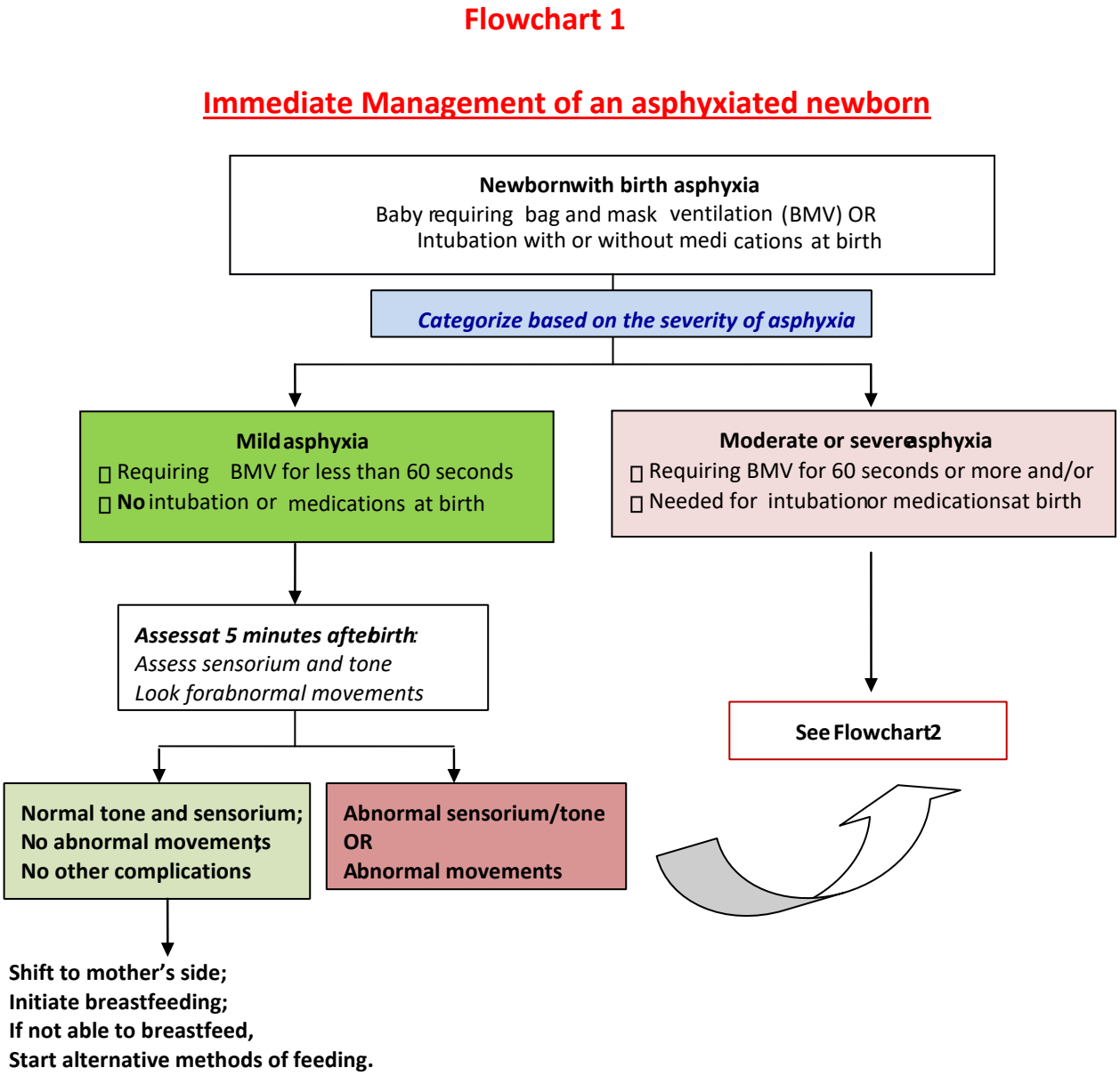
Table 8A.3 Inclusion criteria for therapeutic hypothermia

Criteria A **Objective findings of systemic hypoxic ischemic injury**	Physiological criteria: the presence of one or more signs as follows An APGAR score of 5 or less at 10 mins after birth A continued need for resuscitation, including endotracheal or mask ventilation at 10 mins after birth 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
Criteria B (optional) **Subjective findings of encephalopathy** **It is best to have the neonate examined by neonatologist or pediatric neurologist knowledgeable of neonatal encephalopathy**	Neurologic examination Moderate to severe encephalopathy according to criteria modified from Sarnat and Sarnat, such as lethargy, stupor, or coma. 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.
Criteria C (optional) **Moderate to severe aEEG abnormalities**	aEEG (amplitude-integrated electroencephalography) findings: if possible at least 30 mins duration, moderate (upper margin > 10 u V and lower margin < 5 u V) or severe (upper margin < 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.

Source: NCPR textbook 2015.

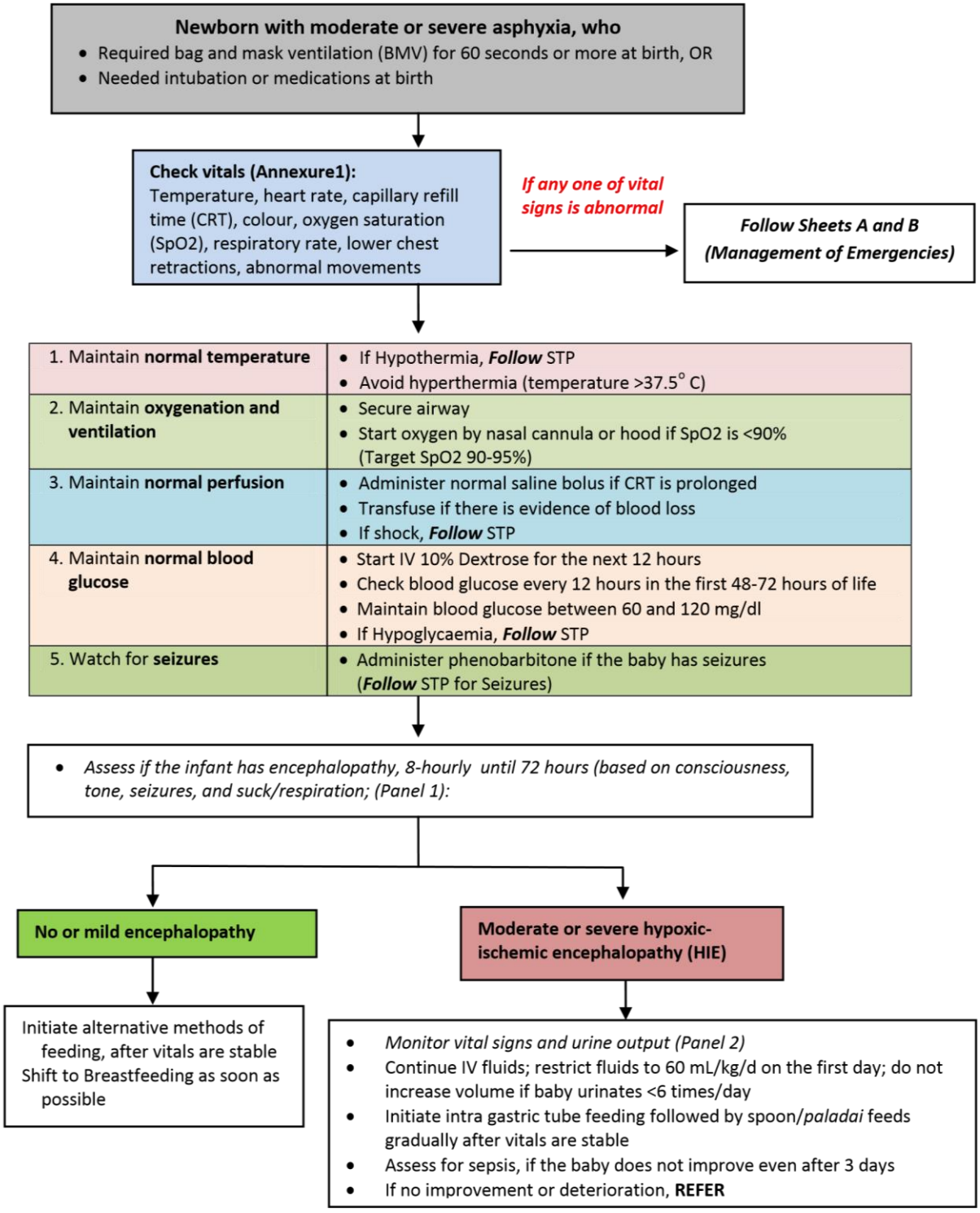
MANAGEMENT OF AN ASPHYXIATED NEWBORN

Figure 8A.6 Management of asphyxiated newborn.



Flowchart 2

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



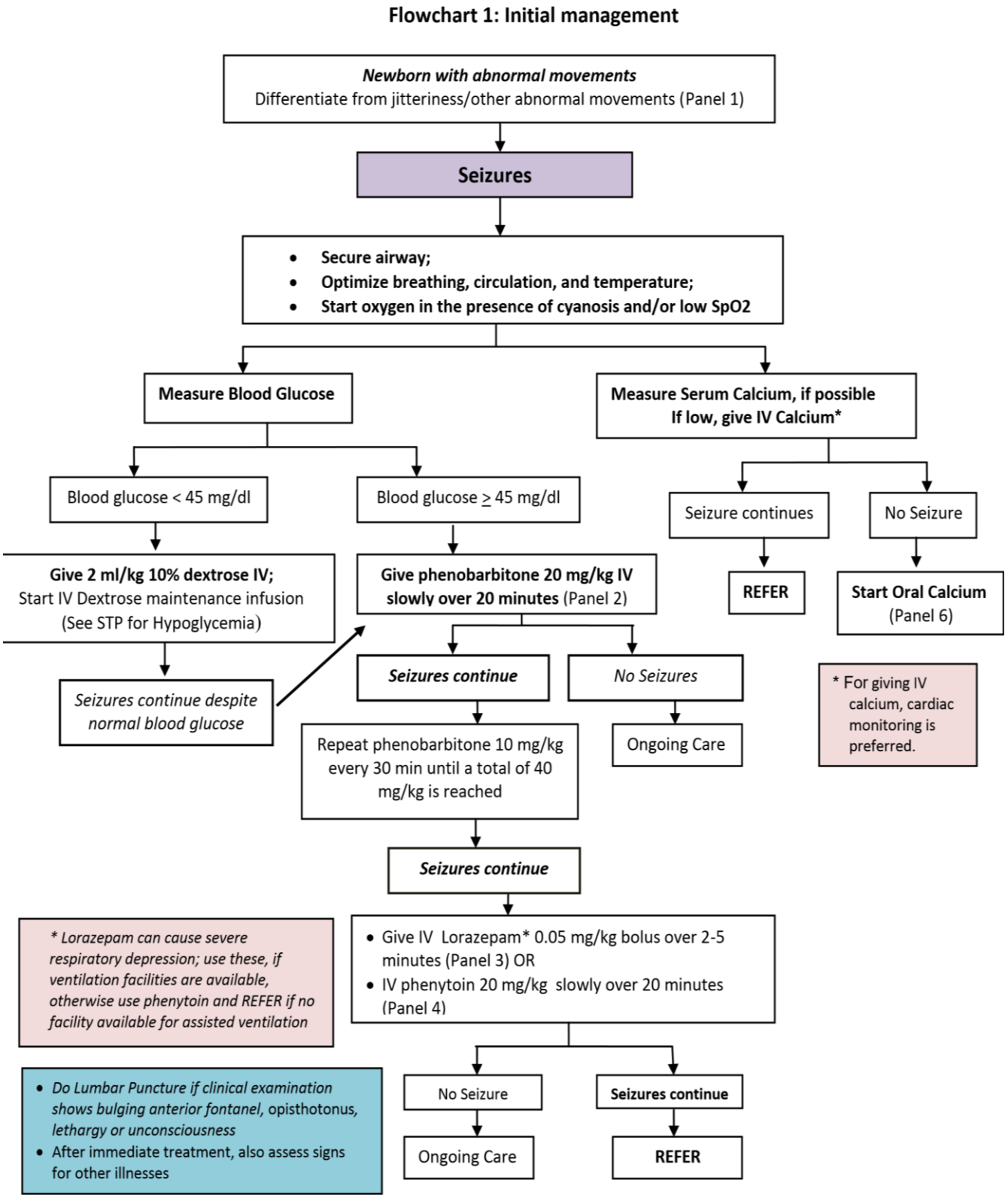
Panel 1: Classification of hypoxic-ischemic encephalopathy (Levene)

Feature	Mild	Moderate	Severe
Consciousness	Irritability	Lethargy	Comatose
Tone	Hypotonia	Marked hypotonia	Severe hypotonia
Seizures	No	Yes	Prolonged
Sucking/respiration	Poor suck	Unable to suck	Unable to sustain spontaneous respiration

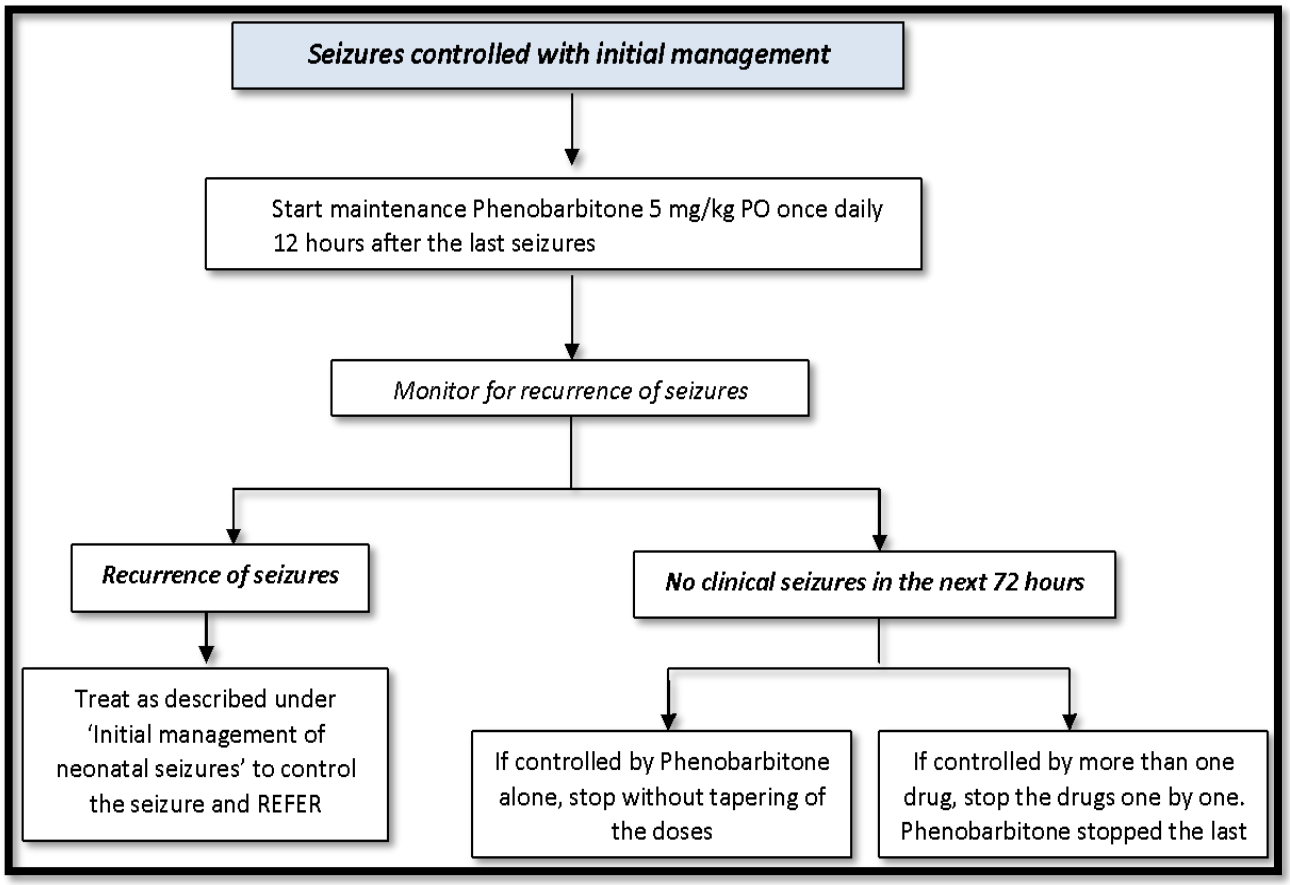
Panel 2: Monitoring of an asphyxiated baby

Signs	At admission	2 hr	4 hr	6 hr	8 hr	10 hr	12 hr
Temperature							
Color							
Heart rate							
Capillary Refill Time							
Respiration Rate							
Oxygen saturation (SpO2)							
Urine output (8 hourly)							
Neurological examination (Panel 1) (8 hourly): ***Consciousness*** ***Tone*** ***Seizures*** ***Sucking/ respiration***							

Figure 8A.7 Management of newborn with seizures.



Flowchart 2: Ongoing Management



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

Panel 2: Protocol for administering phenobarbitone	
Presentation	Injection 200 mg/ml; 1 ml ampoules
Dosage	Loading dose: 20 mg/kg IV or IM Maintenance: 5 mg/kg/day PO (once daily)
Route	Intravenous and per oral
Directions for use	Take 0.1 mL of solution and dilute with 0.9 mL of water for injection to make 1 mL Resultant concentration is 20 mg/mL Give required amount slowly over 15-20 minutes.
Caution	May cause respiratory arrest

Panel 3: Protocol for administering lorazepam	
Presentation	Injection 2 mg/ml OR 4 mg/ml; 1 ml ampoules
Dosage	Loading dose: 0.05 mg/kg IV; May be repeated, if necessary.
Route	Intravenous route
Directions for use	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.
Caution	May cause respiratory arrest

Panel 4: Protocol for administering phenytoin	
Presentation	Injection 100 mg/2ml
Dosage	Loading dose: 15-20 mg/kg IV
Route	Intravenous route
Directions for use	Dilute in normal saline Give slowly at a rate 1 mg/kg/min infusion over 15-20 minutes
Caution	After giving, flush the cannula with saline to prevent phlebitis Do not use cloudy solutions

Panel 5: Protocol for administering IV calcium gluconate	
Presentation	9 mg/ml ampoules
Dosage	1-2 ml/kg/dose every 6-8 hourly
Directions for use	Dilute in equal amount of distilled water Inject very slowly while MONITORING HEART RATE If there is bradycardia, discontinue the injection.
Caution	Take care to avoid extravasation, if being given as infusion, as it may cause sloughing of skin

Panel 6: Protocol for administering oral calcium	
Presentation	Suspension containing elemental calcium and elemental phosphorus in ratio of 2 :1
Dosage	120 mg/Kg/day calcium and 60 mg/kg/day phosphorus; divided into 8 hourly doses
Caution	Ensure compliance

Table 8A.4 Differential diagnosis of neonatal seizures and spasms.

Findings			Probable Diagnosis
History	**Examination**	**Investigations or Other Known Diagnoses**	
• 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

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

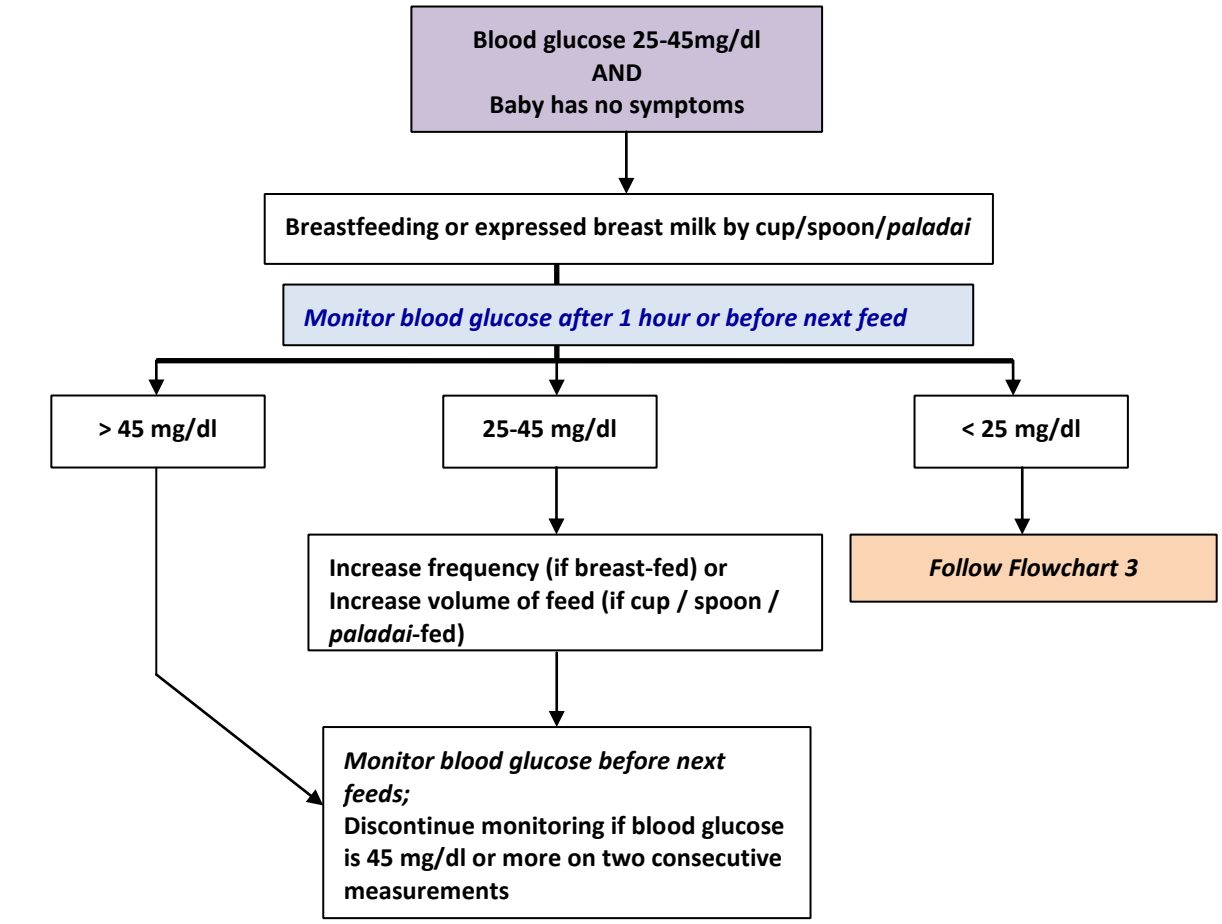
Blood glucose <45 mg/dl

Hypoglycemia

Follow Flowchart 2 or 3

Flowchart 2

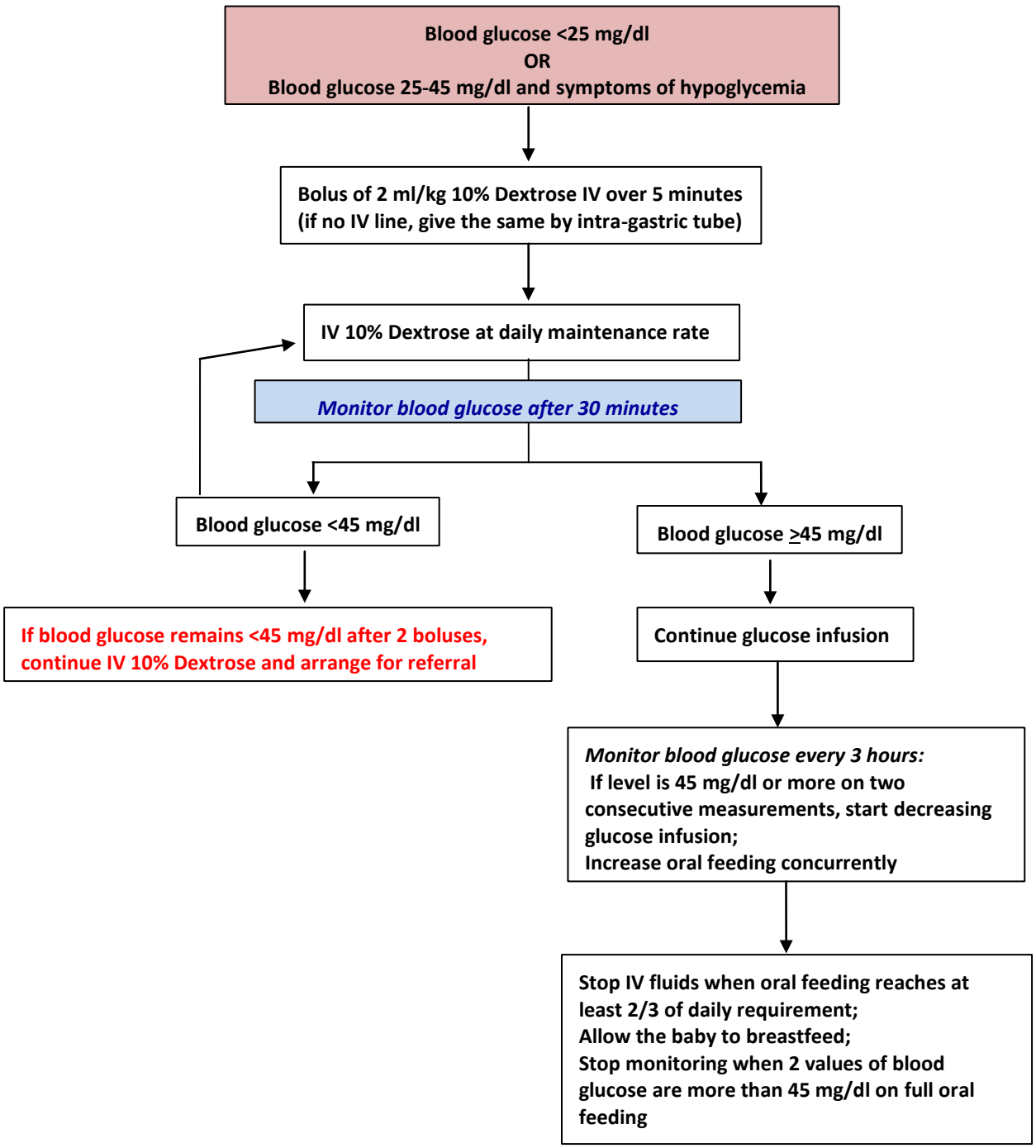
Management of a baby with blood glucose of 25-45 mg/dl but no symptoms of hypoglycemia

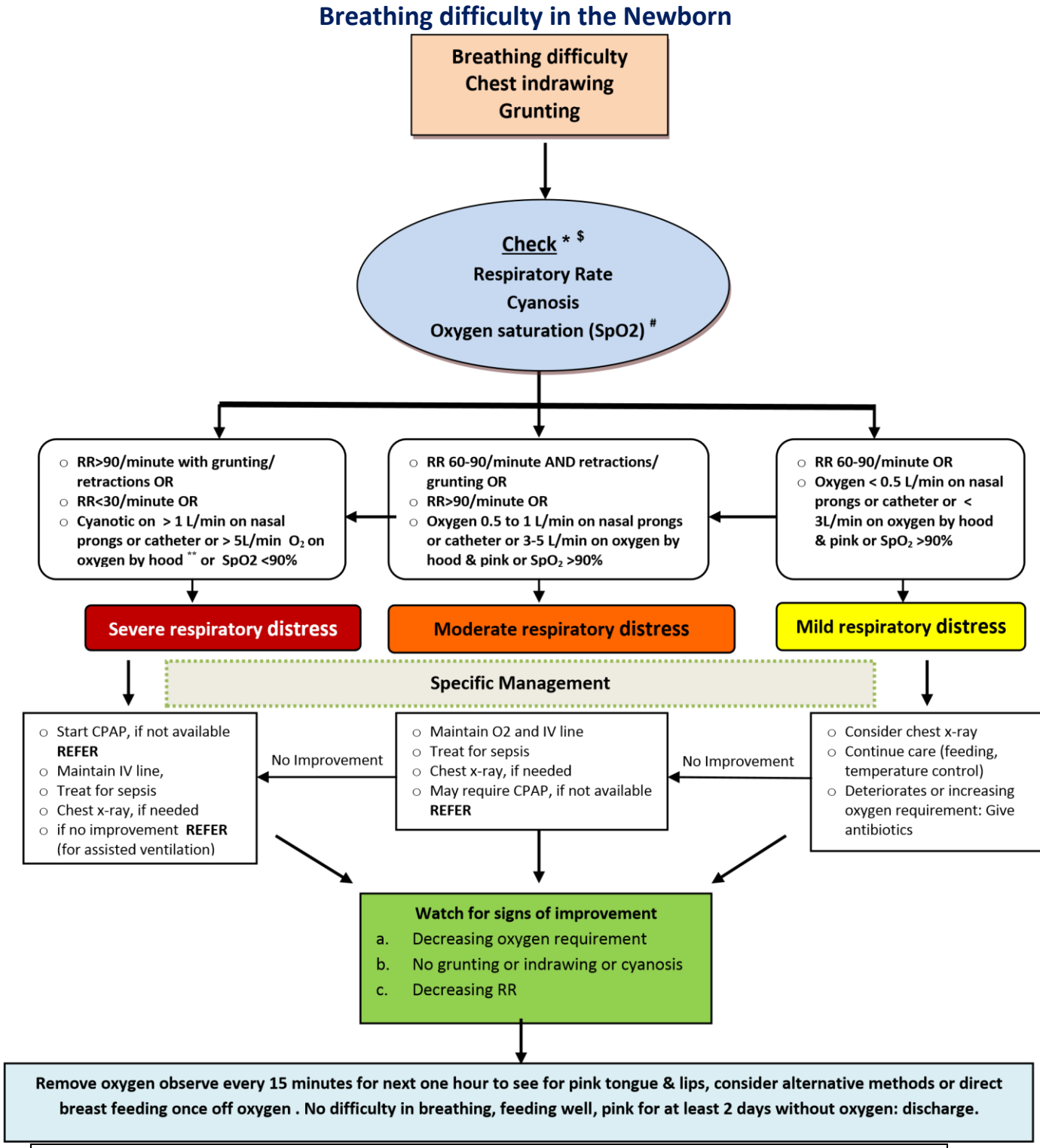


Baby with blood glucose 25-45 mg/dl who has symptoms of hypoglycemia, follow Flowchart 3

Flowchart 3

Management of a baby with blood glucose less than 25 mg/dl OR/AND symptoms of hypoglycemia





*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

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

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 8A.5 Downe's Score

FEATURE	SCORE 0	SCORE 1	SCORE 2
Cyanosis	None	In room air	In FiO^2 40%
Retraction	None	Mild	Moderate to severe
Grunting	None	Audible with stethoscope	Audible without stethoscope
Air entry	Normal	Decreased	Barely
Respiratory rate	<60	60-80	>80 or apnea

***Result**: Score 4-7 Clinical respiratory distresses, Score >7 Impending respiratory failures*

Silverman Anderson Score: 5 Clinical Parameters for Silverman Score: Upper Chest, Lower Chest, Xiphoid Retractions, Nares Dilation, Expiratory Grunting.

Table 8A.6 Silverman's Score

FEATURE	SCORE 0	SCORE 1	SCORE 2
Upper chest movement	Synchronous	Inspiratory lag	See-saw respiration
Lower chest retractions	None	Minimal	Marked
Xiphoid retraction	None	Minimal	Marked
Nasal flaring	None	Minimal	Marked
Grunting	None	Audible with stethoscope	Audible with stethoscope

***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.

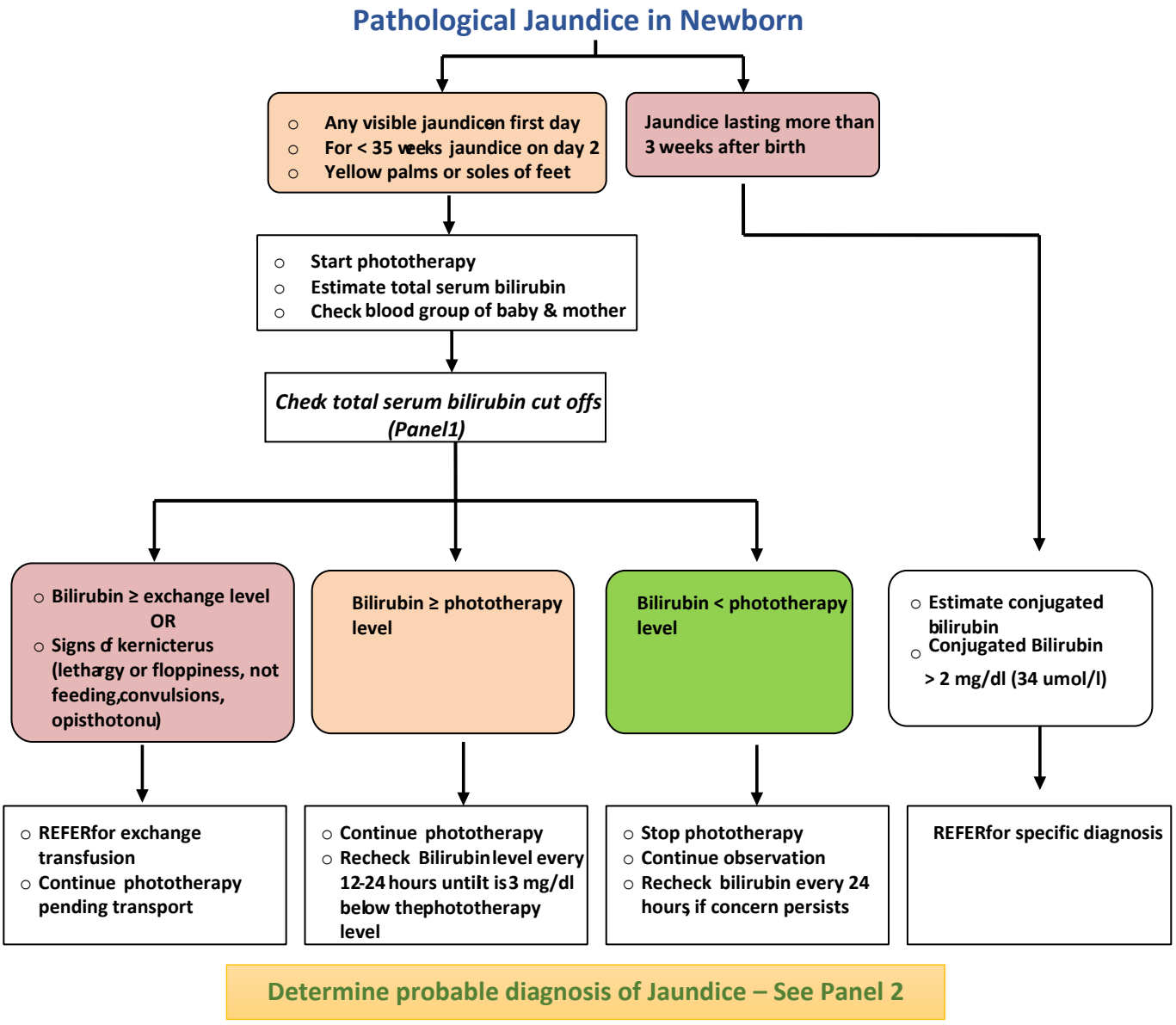


Figure 8A.10 Management of pathological jaundice in newborn.

Panel 1: Total serum bilirubin cut offs for phototherapy or exchange transfusion				
Age	**Phototherapy**		**Exchange stransfusion**	
	Healthy babies	**Babies with risk factors***	**Healthy babies**	**Babies with risk factors***
Day 1	Any visible jaundice		15mg/dl	10mg/dl
Day 2	15mg/dl	10mg/dl	25mg/dl	15mg/dl
Day ≧3	18mg/dl	15mg/dl	25mg/dl	20mg/dl

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

Panel 2: Specific Diagnoses and Treatment for neonatal jaundice		
Diagnosis	**Counseling and Actions**	**Treatment**
Cephalhematoma/ extensive bruises	Takes 4-6 weeks to disappear	Phototherapy, if bilirubin level above the cut-off Exchange transfusion if bilirubin above the cut off Promote feeding optimally
Hemolytic jaundice (ABO or Rh incompatibility, G6PD deficiency; previous family history, hepato-splenomegaly, pallor)	Recheck Hemoglobin on follow up 2-4 weeks Anti- D prophylaxis for Rh incompatibility Avoid drugs & chemicals in G6PD deficiency - Sulfas, antimalarial, aspirin, fava beans, mothballs If the cause of jaundice is Rh factor incompatibility, advice mother regarding future pregnancies	
Prematurity	Frequent feeding	
Neonatal hepatitis	In case of clay or white colored stool, high colored urine staining the clothes, baby needs referral	Need specific management (Referral to higher center)

Panel 3: Tips for delivering safe and effective phototherapy

1. Protect the eyes with eye patches/covers
2. Keep the baby naked with a small nappy to cover the genitalia
3. Place the baby as close to the lights as the manufacturers' instructions allow.
4. Use white cloth or aluminum foil around the light source to reflect light back onto the baby, making sure not to impede the airflow that cools the bulbs
5. Do not place anything over the top of the phototherapy unit. This may block air vents or light and items may fall on the baby
6. Encourage frequent breastfeeding. Unless there is evidence of dehydration, supplementing breastfeeding or providing IV fluids is unnecessary
7. Change position from supine to prone after each feed in order to expose the maximum surface area of baby to phototherapy
8. Keep diaper area dry and clean
9. Phototherapy does not have to be continuous and can be interrupted for feeding, clinical procedures, and to allow maternal bonding
10. Monitor temperature every 4 hours and weight every 24 hours. Giving frequent feeding will prevent excessive weight loss and temperature from rising
11. Measure serum bilirubin every 12-24 hours. Visual assessment of jaundice during phototherapy is unreliable
12. Change tube lights every 6 months (or usage time >1200 hrs) whichever is earlier; or if tube ends blacken or if tubes flicker. Life of Compact Fluorescent lamps is 3000 hours while that of LED bulbs is 30,000 to 50,000 hours

NEONATAL SEPSIS

Clinical presentation of sepsis in newborn can be non-specific. Therefore, in any situation, you should have a high index of suspicion to infection when you take care of any sick neonates.

Temperature	Hyperthermia (more common in full term infant)
Irregularity	Hypothermia (more common than fever in Preterm)

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:
  - 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:
- 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
- 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

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

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

Antibiotics	Each dose	Frequency			
		Age 1 to 7 days		Age 8 days or more	
Ampicillin for sepsis	50mg/kg/dose	12 hourly		8 hourly	
Ampicillin for meningitis	100 mg/kg/dose	12 hourly		8 hourly	
Cloxacillin for sepsis	50mg/kg/dose	8 hourly		8 hourly	
Gentamicin (for sepsis or meningitis)		<2Kg	4 mg/kg/dose q48h	<2Kg	4mg/kg/dose q36h
		2Kg or more	4mg/kg/dose q24h	2Kg or more	4mg/kg/dose q24h
Cefotaxime for sepsis	50mg/kg/dose	12 hourly		8 hourly	
Cefotaxime for meningitis	50mg/kg/dose	8 hourly		6 hourly	

Shock in Newborn

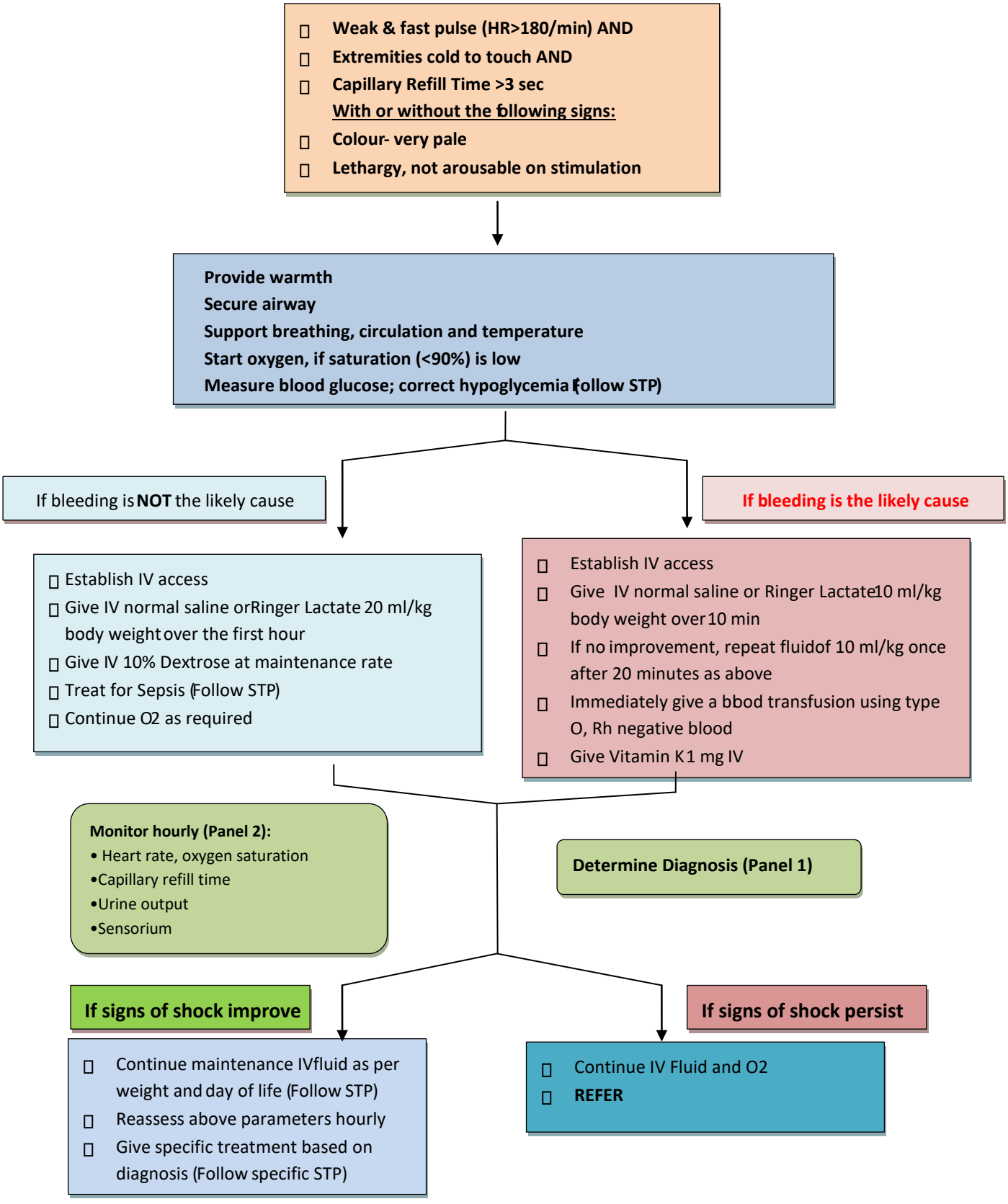


Figure 8A.11 Management of shock in newborn.

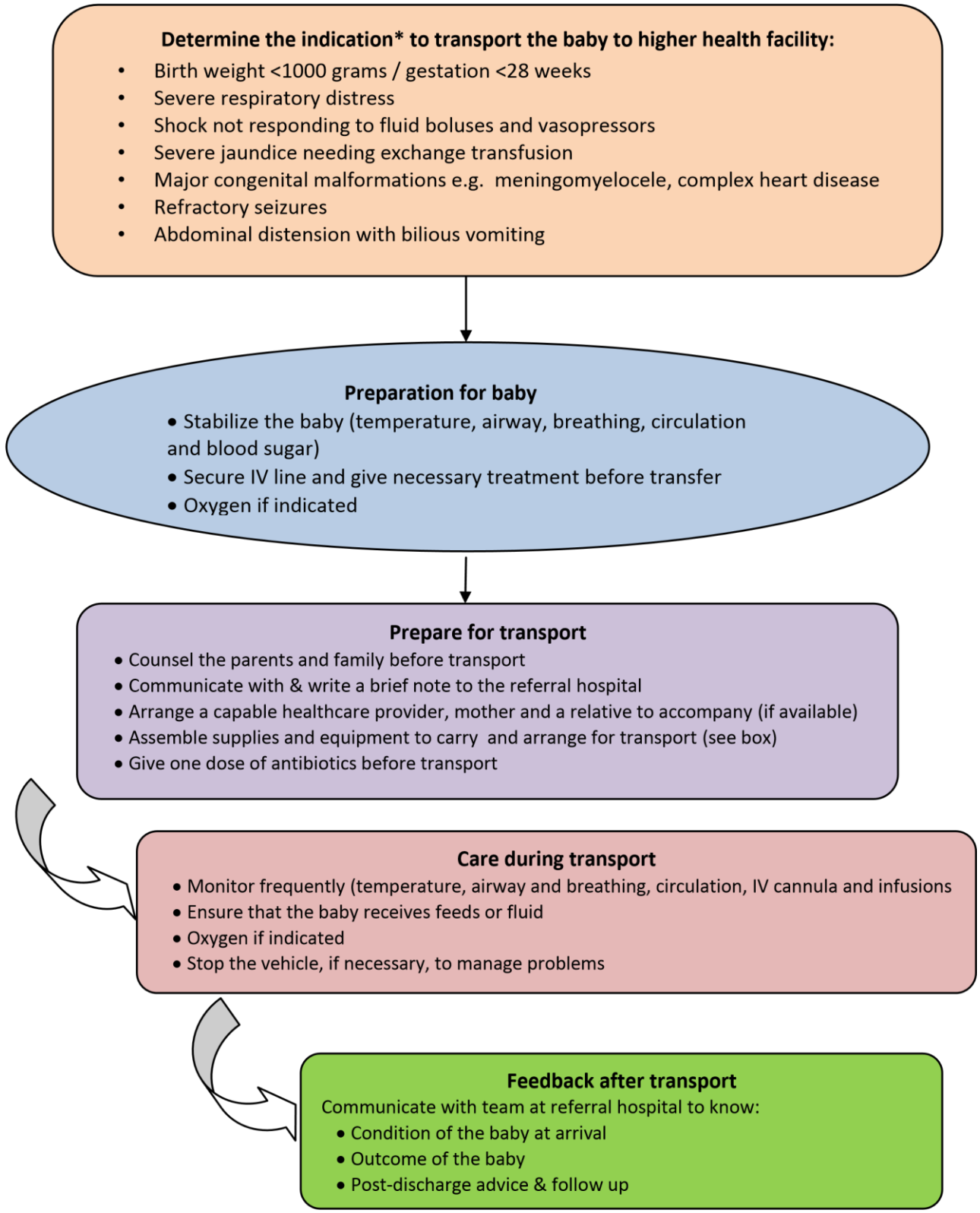
Panel 1: Diagnostic clues based on history and clinical examination

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

Panel 2: Monitoring of baby with shock

Signs	At admission	1 hr	2 hr	3 hr	4 hr
Heart Rate/min					
Capillary refill time					
Urine output					
Sensorium					
Temperature difference (core-extremities)					

STABILISATION, TRANSFER AND DISCHARGE OF SICK NEWBORN



**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

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

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

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.

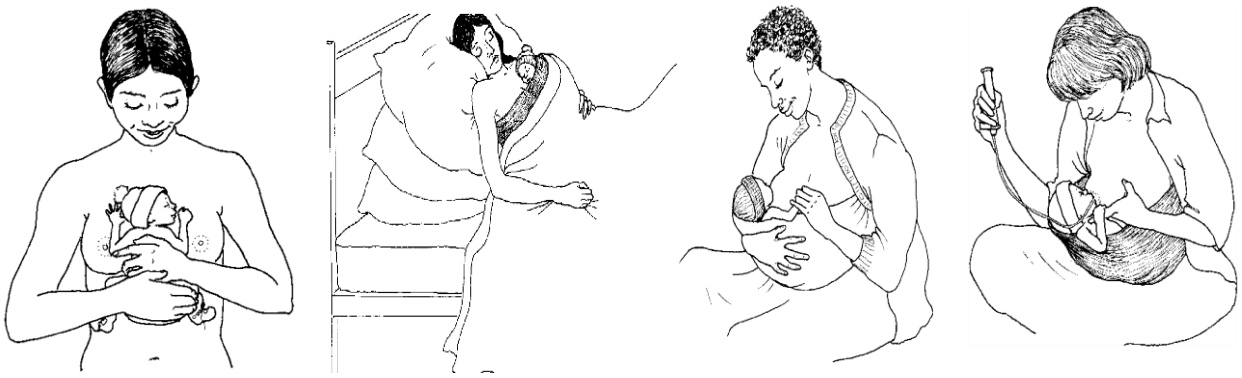
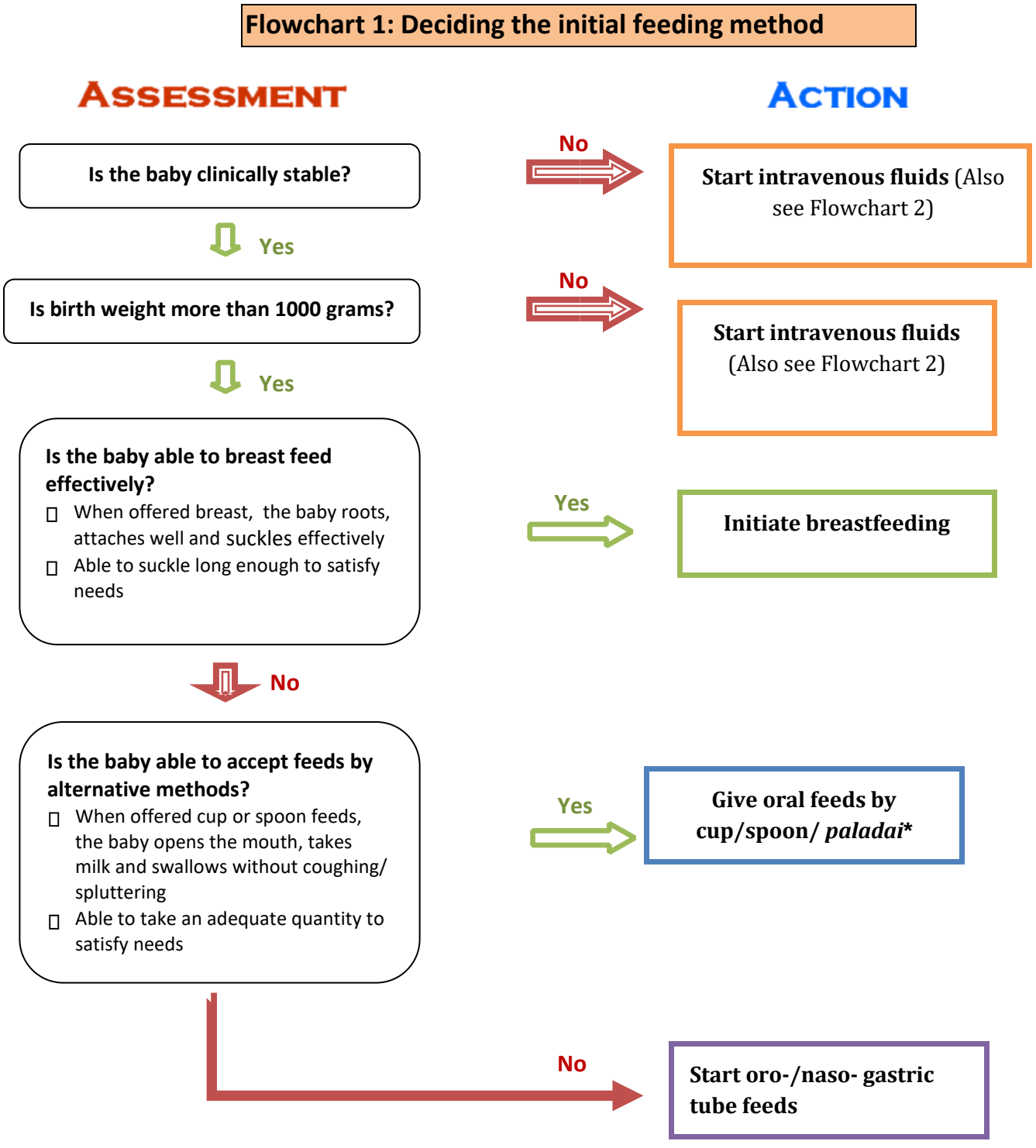


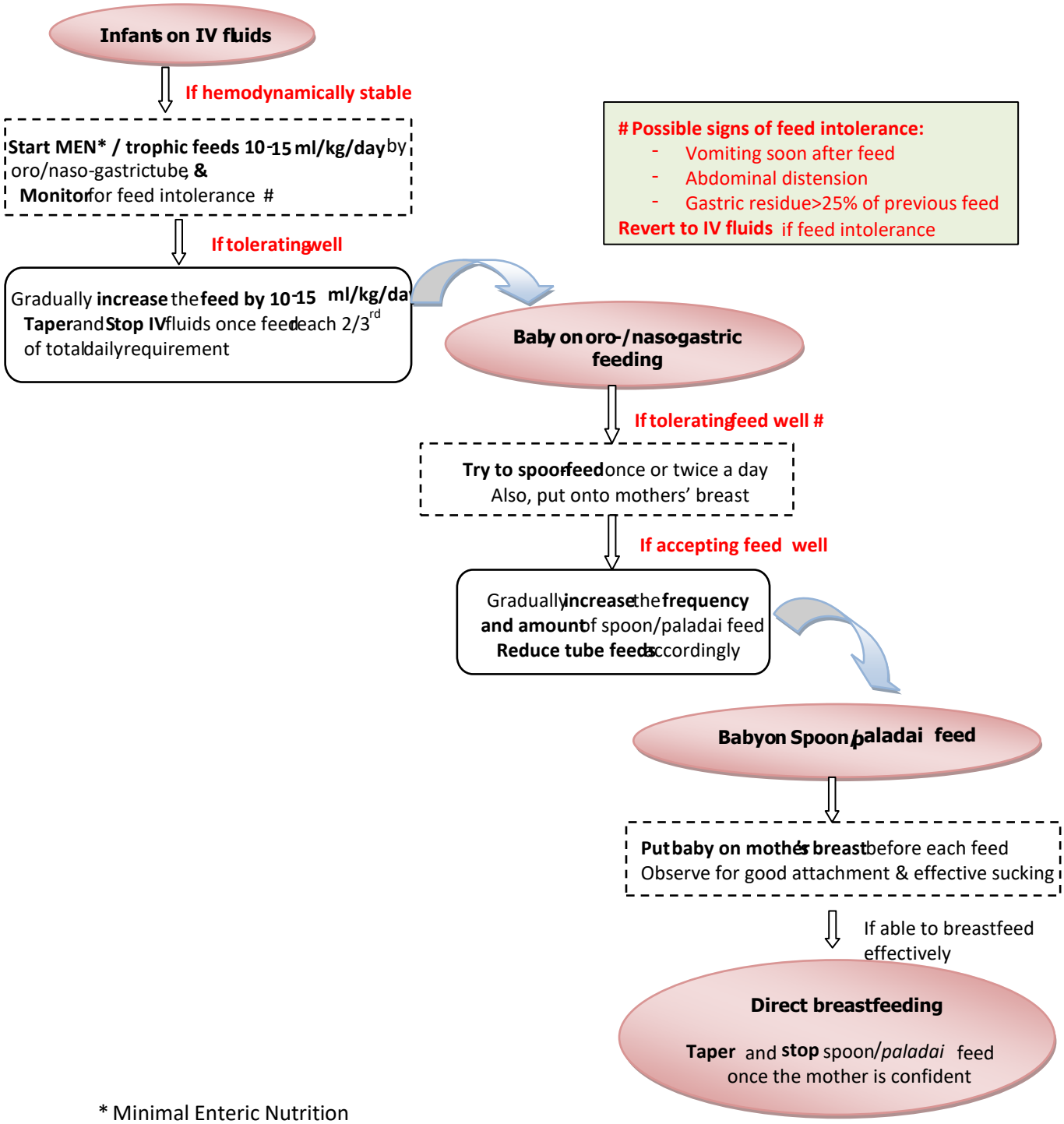
Figure 8A.13 KMC position and feeding of newborn (Source: WHO KMC guideline 2003)

Figure 8A.14 Feeding of low birth weight and sick newborns.



* Paladai is a small cup with a beak

Flowchart 2: For babies on IV Fluids: Progression to oral feeds



* 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

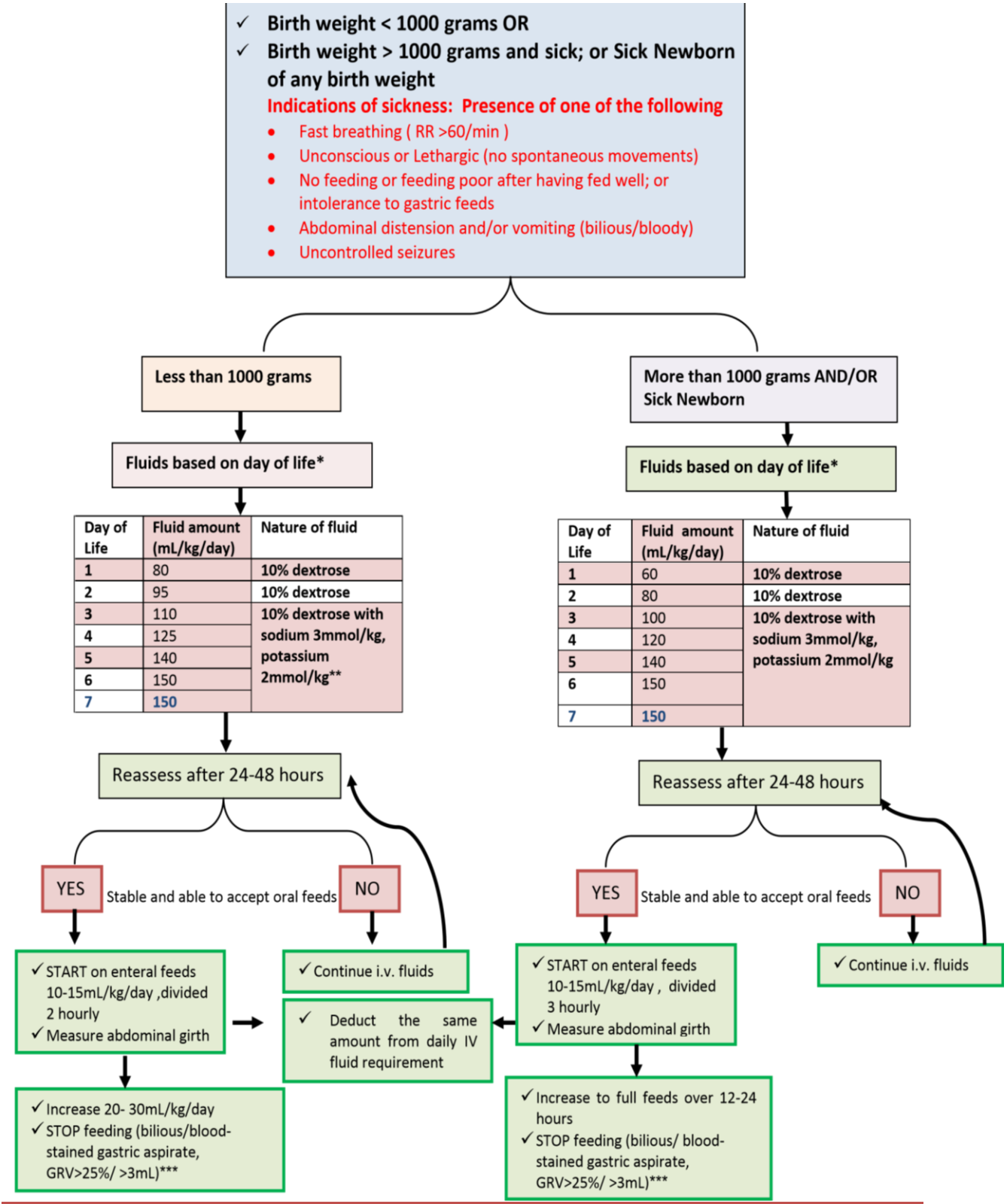
Panel 2: Steps of oro-/naso-gastric tube feeding

- 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



* 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.

Figure 8A.15 IV fluid therapy for newborn.

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 paladai, 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

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