- perinatal asphyxia is an insult to the foetus or new born due to a lack of oxygenand or lack of perfusion to various organ

- it is often associated with tissue lactic acidosis and hypercarbia
- there is no definite definition for perinatal asphyxia
- the american academy of pediatric committee on fetus and new born has suggested essential criteria for defining perinatal asphyxia

Essential criteria for perinatal asphyxia

- Prolonged metabolic or mixed acidemia (pH <7.0) on an umbilical arterial blood sample
- Persistence of Apgar score of 0-3 for >5 min
- Neurological manifestations, e.g. seizures, coma, hypotonia or hypoxic ischemic encephalopathy (HIE) in the immediate neonatal period
- Evidence of multiorgan dysfunction in the immediate neonatal period

- national neonatology forum of india and WHO use an apgar of 0-3 and 4-7 at 1 min to define severe and moderate birth asphyxia
- for the community setting NNF defines asphyxia as absence of cry at 1 min and severe asphyxia as absent or inadequate breathing at 5 minutes

PATHOPHYSIOLOGY OF ASPHYXIA

- PRIMERY APNEA-when an infant is deprived of oxygen an initial brief period of rapid braething occurs .if the asphyxia continues the respiratory movement cease and infant enters into a period of apnea called primery apnea
- during this period heart rate will fall,neuromuscular tone diminishes,blood pressure normal
- usually tactile stimulation -reinitiate respiration
- SECONDARY APNEA-if the asphyxia continues infant devolops deep gasping respiration ,blood pressure will fall ,infant become flaccid
- infant is unresponsive to stimulation
- they are indistinguishable hence when faced with an apneic infant at birth one should assume-secondary apnea

1. LUNG INFLATION

- during intrauterine life lungs do not take part in gas exchange which is take care of by plcenta
- lungs are filled with fluid secreted by type 2 aleveolar cells
- fluid is reabsorbed into the perivascular space then into blood and lymphatics
- removal is slowed in when the labour is absent -elective cs
- removal of fluid from the alveoli is facilitated respiration soon after birth
- problem in clearing of fluid can occur in any condition which causes inadequate dilatation of alveoli like in prematurity or sedation

PULMONARY CIRCULATION

- during intra uterine life there is little blood flow to the pulmonary circulation due to pulmoary vasoconstriction but after birth pulmonary vasodilatation take place and resistence will fall down
- in an asphyxiated infant due to hypoxia and acidosis the pulmonary arterioles remain constricted and ductus arteriosus remains open
- it will lead to poor oxygenation of tissues due to inadequate uptake of oxygen
- in mildly asphyxiated children whose oxygen and ph are slightly lowered can be corrected by quickly restoring the circulation
- but in infants with severe asphyxia ventilation alone is not useful they require combination of oxygenation and correction of metabolic acidosis

CARDIAC FUNCTION AND SYSTEMIC CIRCULATION

- in asphyxia there is redistribution of blood flow to preserve the blood suply to vital oragan like heart and brain
- so there will be vasoconstriction in bowel,kidney,skin,muscle
- if the asphyxia is prolonged the cardiac function and cardiac output too detoriate and blood flow to all organ is further reduced
- it will lead to progressive organ damage
- at this stage it is neccessary to give cardiac stimulant and volume expander to support heart and circulation

NEUROPATHOLOGY

these differs according to gestation

- TERM

- selective neuronal necrosis- involves cerebral cortex ,hippocampus,basal ganglia,cerebellum,and anterior horn cells of spinal cord depending on site it manifest as diminished conciousness,seizures,and abnormalities of feeding,breathing
- parasagittal cerebral injury-it is vulnarable to ishcemia resulting in proximal limb weakness that may devolop quadriparesis
- status marmoratus of basal ganglia and thalamus-longterm sequale such as choreoathetosis,quadriparesis and retardation
- focal and multifocal ischemic cerebral necrosis

- PRETERM

- selective neuronal necrosis-it is rare in preterm diencephalic neuronal necrosis restricted to thalamus and brainstem with or wthout hypothalamus and lateral geniculate body is seen

- periventricular leukomalacia-it results from hypoxic ischemic leading to coagulative necrosis and infarction of periventricular white matter
- cerebral cotex is spared due to rich suply of arteries

DIAGNOSIS

levene classification of hypoxic ischemic encephalopathy

feature	mild	moderate	severe
conciousnes	irritability	lethargy	comatose
tone	hypotonia	marked hypotonia	severe hypotonia
seizure	no	yes	prolonged
sucking/respiration	poor suck	unable to suck	unable to susstain spontaneous respiration

PREPERATION FOR RESUSCITATION

- ❖ each delivary should be viewed as an emergency and basic readiness must be ensured to manage hypoxia

I. a radiant heat sourse must be ready for use

II. all resuscitation equipment immediately and should be working

III. atleast one skilled person in neonatal resuscition

EVALUATION

- it is based primerely on three signs-respiration,heart rate,and color
- LOW HEART RATE is the most important sign

➢ ROLE OF APGAR SCORE

- it is an objective method for evaluating the new born condition
- it is generally performed at 1 minute and again at 5 minutes after birth
- but resucitation should be initiated before the 1 minute score so APGAR SCORE IS NOT USED TO GUIDE THE RESUSCITATION
- but it can be used asses how the baby is responding to resuscitation
- apgar score should be obatained every 5 minutes for upto 20 minutes if the 5 minute apgar score is less than 7

apgar score

Sign	0	1	2
Heart rate	Absent	Slow (<100 beats/min)	normal
Respiration	Absent	Weak cry	good strong cry
Muscle tone	Limp	Some flexion	active movement
Reflex irritability	No response	Grimace	cough or sneeze
Color	Blue or pale	Body pink, extremities blue	completely pink

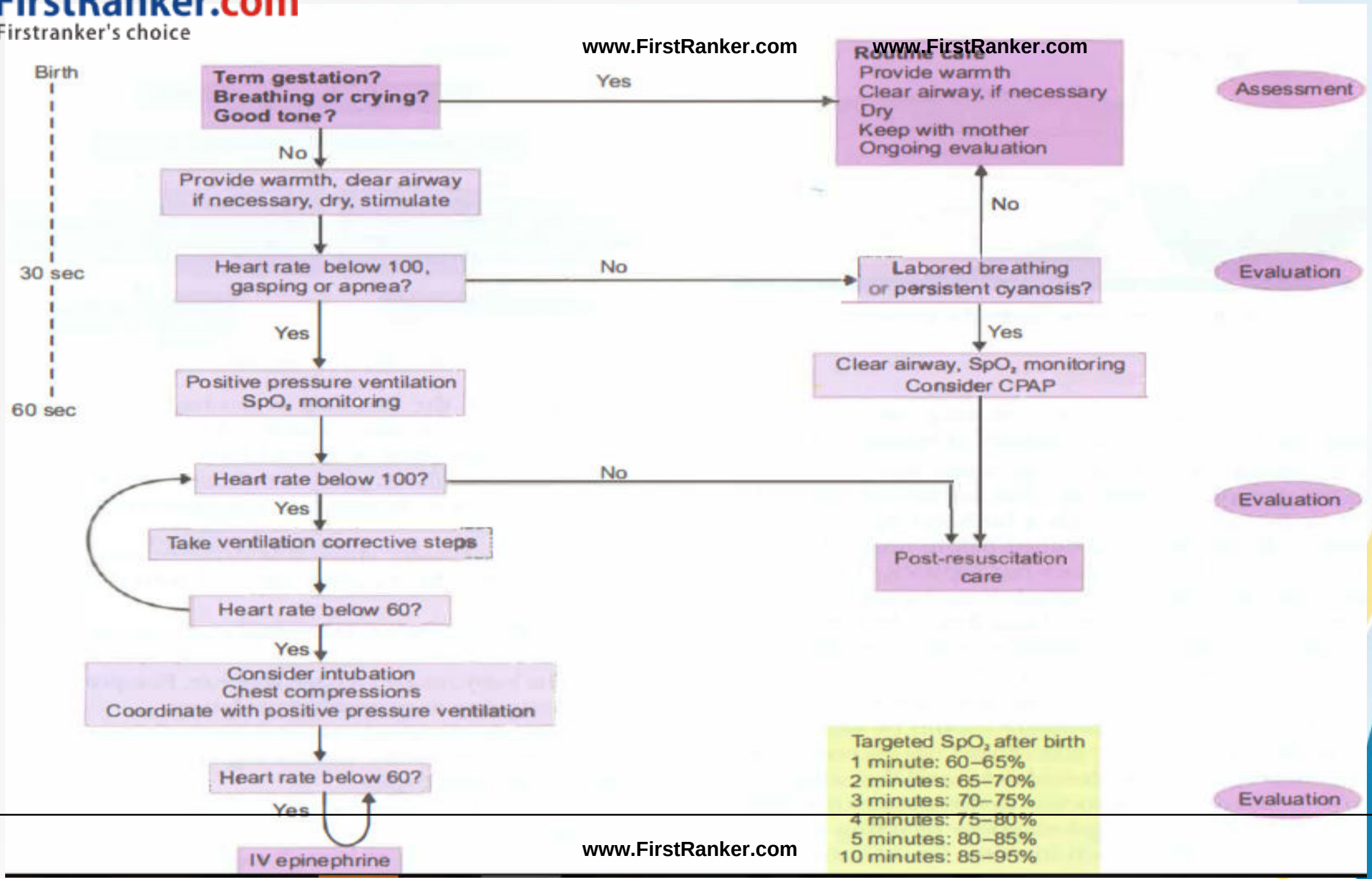
➢TABC OF RESUSCITATION

- T-TEMPERATURE-provide warmth dry the baby and remove the wet linen
- A-AIRWAY-position the infant clear the airway(wipe baby mouth and nose or suction the mouth and nose some instance the trachea .insert an endotracheal tube if necessary to ensure an open airway
- B-BREATHING-tactile stimulation to initiate respiration,positive pressure breaths canbe given either with bag and mask or bag and ET tube when necessary
- C-CIRCULATION-maintain the circulation with chest compression and medication

RESUSCITATION ALGORITHM

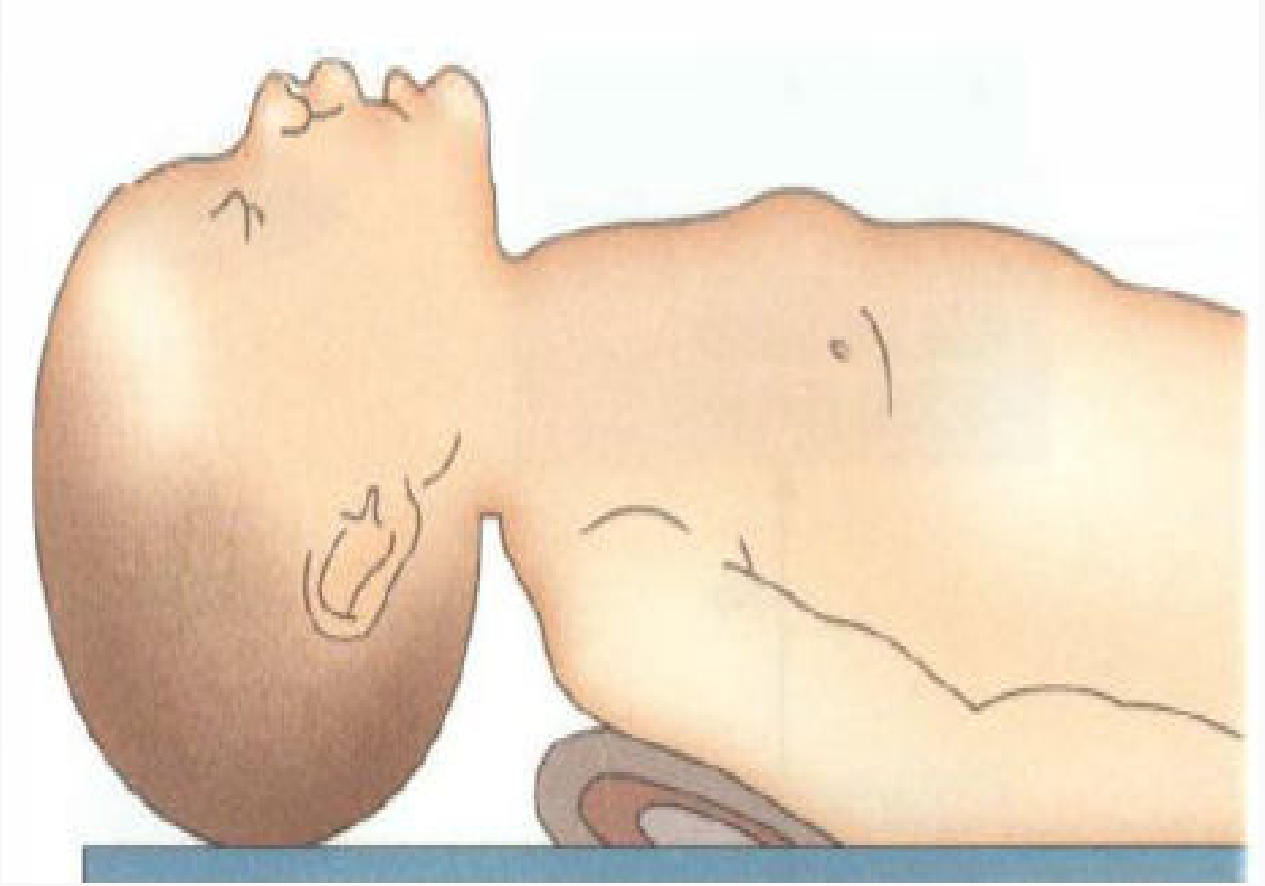
- at the time of birth three questions about new born should be asked

1. TERM GESTATION
2. BREATHING OR CRYING
3. GOOD MUSCLE TONE(flexed posture and active movement by the baby)



➢ INITIAL STEPS

- warmth-baby should be place under a heat source preferably under radiant warmer.the baby should not be covered with blankets or towels to ensure the full visualization and to permit the radiant heat to reach the baby
- positioning-the baby should be placed on her babck or side with the neck slightly extended.this brings the posterior pharynx ,larynx,and trachea in line facilitates breathing.to help maintain the correct position place rolled blanket or towel under the shoulder elevating them 3/4 or 1 inch off the matress



- clear airway if necessary-it depend on the presence or absence of meconeum. if no meconeum is present secretion may be removed from the airway by wiping the nose and mouth with a clean cloth or by suctioning with a bulb syringeor suction catheter.if the infant has copious secretion from the mouth the head should be turned to the side
- DRY,STIMULATE,REPOSITION-after suctioning the baby should be adequately dried using a pre warmed linen to prevent heat loss.the wet linen should be removed away from the baby.if the baby continues to have poor respiratory efforts additional tactile stimulation in the form of flicking the soles or rubbing the back gently