Management of extremely low birth weight baby

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Introduction

- ✓ ELBW: birth weight < 1000gm
- ✓ These babies are physiologically immature
- ✓ Extremely sensitive to small changes in respiratory management , fluid administration , nutrition and virtually all aspects of care
- ✓ Survival of ELBW babies is very high , and may have good long term development if optimal perinatal care is offered

Prenatal consideration

- ✓ ELBW infants should be delivered in a facility with high risk obstetric service and a level 3 or 4 NICU
- ✓ Prenatal administration of corticosteroids (betamethasone or dexamethasone) to the mother , even if there is no time for full course, reduces risk of RDS and other sequalae of prematurity (NEC, IVH, BPD)
- ✓ Antenatal magnesium sulfate is neuroprotective
- ✓ Parental education

Drugs and dosage of Antenatal Corticosteroids(ACS)

There are two drugs that are recommended to be used for ACS therapy

1.**Dexamethasone**- 6 mg every 12 hours for a total of 4 doses .

2.**Betamethasone**- a mixture (1:1) of betamethasone acetate(long acting) and betamethasone phosphate(fast acting) : 12 mg every 24 hours , a total of 2 doses.

- ✓ The first dose ACS course should be administered even if delivery is imminent and the likelihood to be able to give second dose is low. ACS single dose , less than 24 hours prior to delivery is still associated with significant reduction in neonatal morbidity and mortality.
- ✓ Chorioamnionitis is the only absolute contraindication for administering ACS

NICHD study(Eunice Shriver National Institute of Child Health and Human Development)

survival free from neurodevelopmental disability for infants born between 22 and 25 weeks of gestation was dependent not only on gestational age but also on the following parameters:

1.Sex

2. Birth weight

3.Exposure to antenatal corticosteroid

4.Singleton or multiple gestations

Delivery room care

- ✓ Resuscitation planning includes experienced personnel
- ✓ Immediately wrapping the undried baby's body and extremities in plastic wrap or placing them in a plastic bag, not forget to cover the head as it constitutes a significant body surface in neonate, more so in preterm
- ✓ Ensuring delivery room temp 26°
- ✓ Delayed cord clamping by at least 60 sec or more
- ✓ Resuscitation usually start with 21% to 30% oxygen
- ✓ Target saturation 90- 95 % only after initial 10 minutes

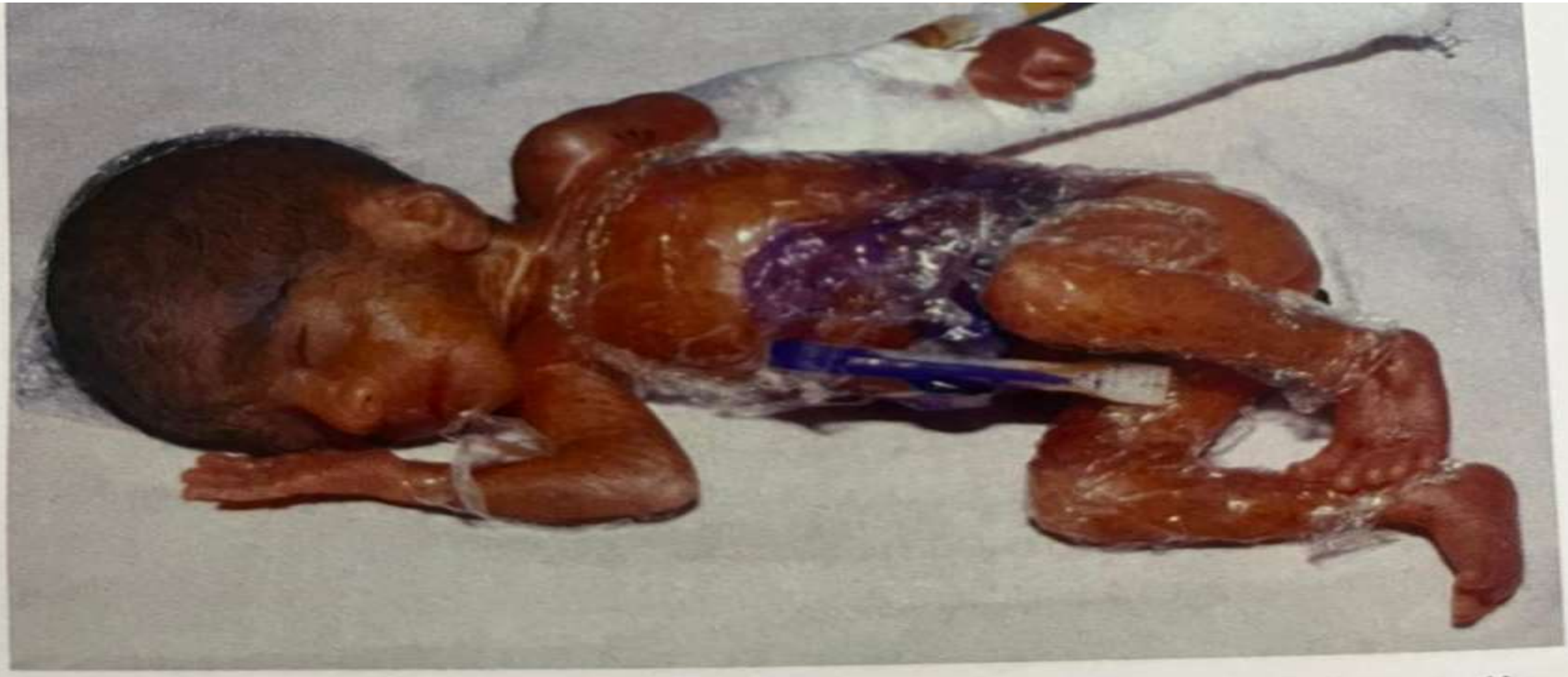


Figure 17.4 The extremely LBW baby covered with a cellophane sheet to prevent convective heat loss and evaporative losses of water from skin.

Care after resuscitation

Immediately after resuscitation, the plastic-wrapped infant should be placed in a prewarmed transport incubator for transfer to the NICU.

Figure 17.5 Extremely low birth weight infant being nursed in an intensive care incubation and is attached to various electronic monitors.

NICU care

- ✓ ELBW require initial respiratory support
- ✓ Fluid volume, glucose , blood gases , and electrolytes should be monitored frequently
- ✓ Optimal nutrition should be started at birth as MEN and high dose parenteral nutrition
- ✓ Monitoring itself may pose increased risks because

  -Each laboratory test requires a significant percentage of baby's total blood volume,

  -tiny vessels may be hard to cannulate without several attempts and

  -limited skin integrity increases susceptibility to injury or infection.

Respiratory support

1.CPAP

2.Conventional ventilation

3. Surfactant therapy

4.HFOV

5. Caffeine citrate

CPAP

- It is generally initiated at 6 cm H2O pressure , and increased in 1 cm increments to a maximum of 8 cm if oxygen increment exceeds 30% - 40%.
- Prevention of atelectasis is to ensure that the CPAP is not interrupted , even briefly.
- If oxygen requirement rises even after maximal pressure has been reached , or recurrent apnea , mechanical ventilation and surfactant therapy indicated

Early use of CPAP- based on recent evidences , the American academy of pediatrics committee on fetus and newborn

Early use of CPAP with subsequent selective surfactant therapy in ELBW results in lower rates of BPD/ death when compared with treatment with prophylactic or early surfactant therapy.

Conventional ventilation

- ✓ Generally use pressure limited SIMV , in a volume guarantee mode as a primary mode of ventilation
- ✓ The lowest possible tidal volume 4-5 ml/kg body weight
- ✓ A short inspiratory time 0.3 to 0.35 sec should be used
- ✓ Avoid hyperoxia (> 95%) ,limiting hyperoxia may also reduce the incidence or severity of chronic lung disease
- ✓ Choosing right positive end expiratory pressure(PEEP) to recruit lungs adequately to achieve optimum FRC.

Surfactant therapy

- ✓ Respiratory failure secondary to surfactant deficiency is a major cause of mortality and morbidity in ELBW baby.
- ✓ Term neonates usually have a surfactant storage pool of 100mg/kg, whereas preterm neonates have an estimated pool only 4-5 mg/kg at birth.
- ✓ We administer surfactant to infants with RDS who are ventilated with a mean airway pressure of at least 7 cm H2O and have FIO2 of 0.3 or higher in the first 2 hours of birth.
- ✓ Many treated infants can be rapidly transitioned to CPAP shortly after surfactant administration.

High Frequency Oscillatory ventilation

- For infants with an air leak syndrome , especially pulmonary interstitial emphysema, HFOV indicated
- Some units use HFOV as a primary mode of ventilation

Caffeine citrate

- ✓ Based on cohort studies showing that earlier initiation of caffeine (2 hour or 3 days) at standard dose is associated with

  -lower incidence of BPD and

  - lesser duration of mechanical ventilation among less than 28 weeks .
- ✓ Caffeine is clearly indicated in preterm babies with frequent apnea.
- ✓ In view of more CPAP use , early administration of caffeine will help in reducing CPAP failure .
- ✓ It also facilitate extubation, may be stopped after 5-7 days of therapy.
- ✓ It should be continued until 34 weeks post menstrual age and stopped thereafter if no episode of apnea has occurred in last 7 days.

Dose of caffeine citrate

- ✓ Loading dose- 20mg/ kg of caffeine citrate.
- ✓ Maintenance dose – 5-10 mg/kg of caffeine citrate. `
- ✓ Therapeutic drug level -5-20micgm/ml , do not routinely measure serum drug concentration because of wide therapeutic index.
- ✓ Apnea in infants born less than 28 weeks frequently persist beyond 34 of PMA , and caffeine is continued until spells resolve.

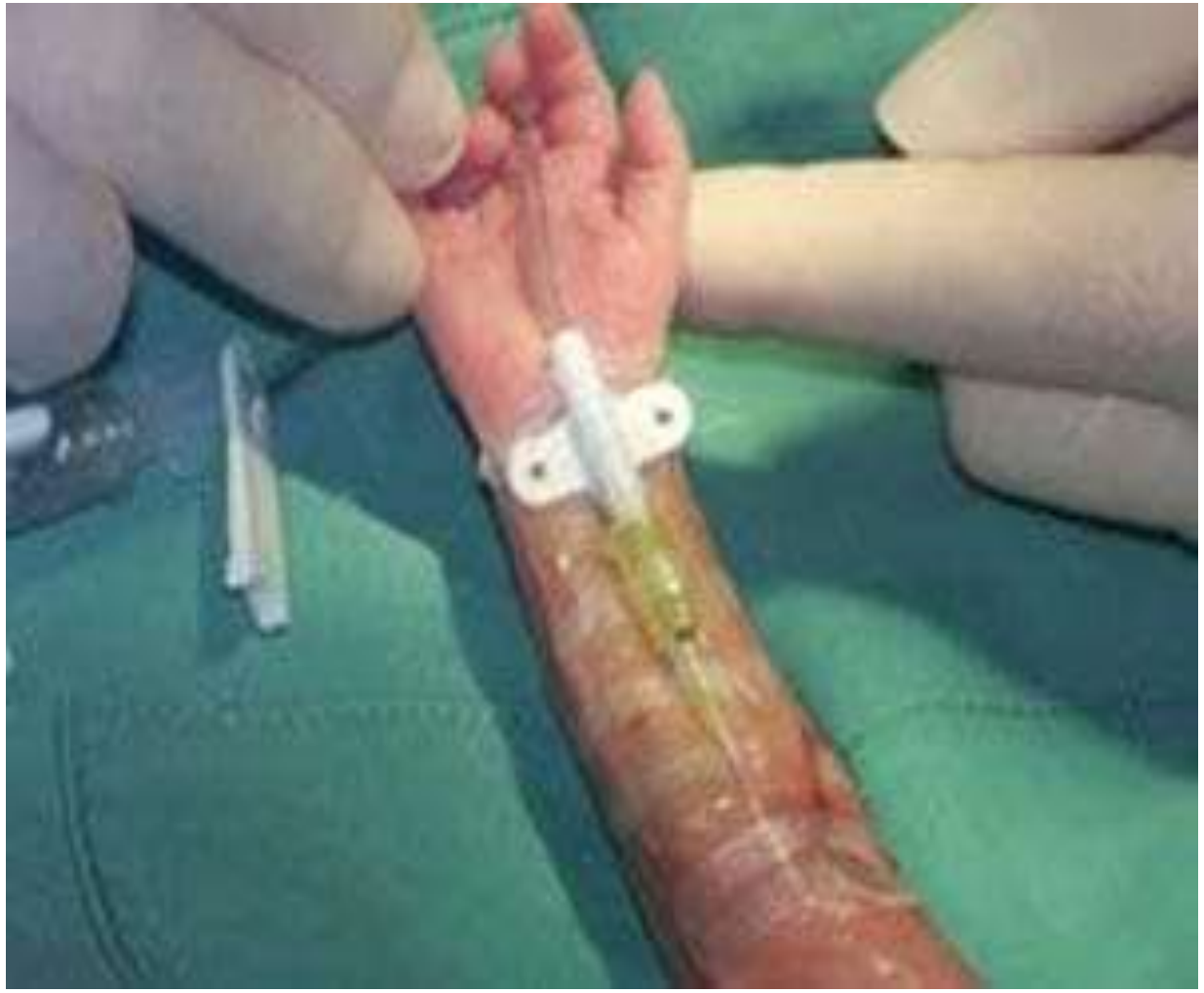
Fluid and electrolytes

- ✓ Fluid requirements increase as the gestational age decreases < 28 weeks ,due to increased surface area to –body ratio and immaturity of the skin.
- ✓ Renal immaturity may results in large losses of fluid and electrolytes that must be replaced.

Route of administration

- Whenever possible, a double lumen umbilical venous line should be placed shortly after birth, along with an umbilical arterial line for infants requiring higher level of support, those with blood pressure instability .
- Dwell time for UVC is limited to 10 days in most cases.
- CLABSI (catheter related blood stream infections) are higher with increasing g dwell time.
- A reasonable approach to remove UVC early by day 4.
- PICC (percutaneously inserted central venous catheter) can be used if long term IV access is required.

PICC line



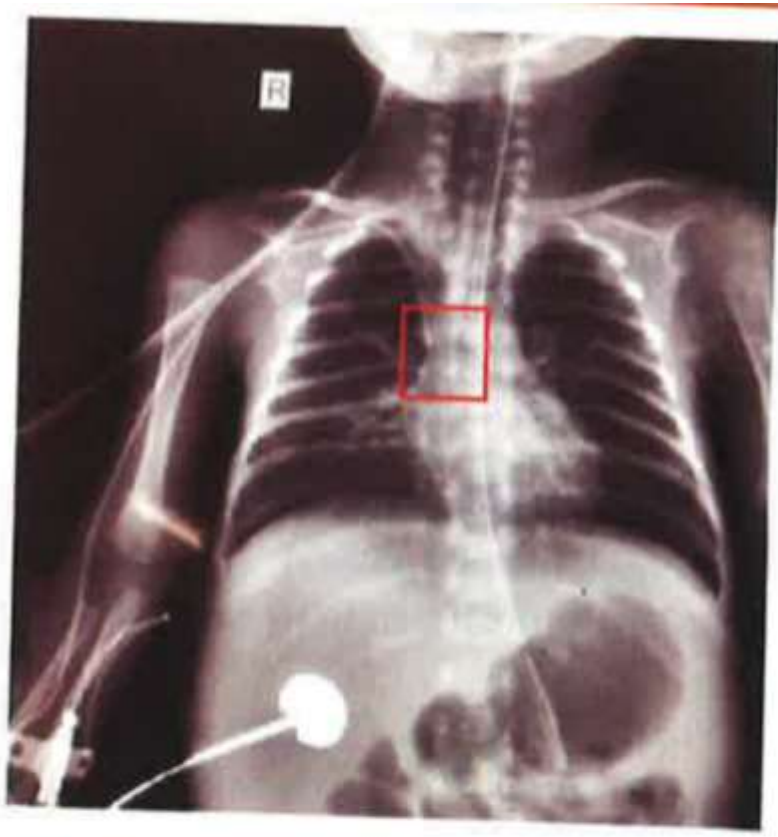


Figure 40.4: Anteroposterior radiograph of chest showing satisfactory position of PICC line (red box) inserted in the right upper limb.

Rate of fluid administration for the first 2 days for infants on radiant warmer

Birth weight(g)	Fluid rate(ml/kg/day)	Frequency of electrolyte testing
500-600	110-120	8 hourly
600-800	100-110	8-12 hourly
800-1000	80-100	12 hourly

Fluid composition

- ✓ Initial fluid should consist of dextrose solution in a concentration sufficient to maintain serum glucose levels > 45 mg/dl
- ✓ Immature infants do not tolerate dextrose concentrations > 10%
- ✓ Use of dextrose 7.5 % or 5 % solutions is frequently needed
- ✓ Usually, a glucose administration rate of 4-10 mg/kg/min is sufficient
- ✓ Hypo-osmolar solution should be avoided
- ✓ If hyperglycemia persist above 180-220mg/ dl with glycosuria , an insulin infusion at a dose of 0.05 to 0.1 unit /kg/hour may be required

Nutritional support

- ✓ Parenteral nutrition begun shortly after birth using a standard protein administration of 2-3 g/kg/day
- ✓ On subsequent days increase the protein administration to a maximum of 3 to 4g/kg/day
- ✓ Parenteral lipids are begun on day 1 at 1g/kg/day and advanced each day to a maximum of 3g/kg/day
- ✓ Healthy preterm neonates require 110-120 kcal/kg/day for their adequate growth

- Safe initiation of enteral feeds begins with the introduction of small amounts of expressed breast milk (10-20 ml/kg/day), with the goal of priming the gut by inducing local factors necessary for normal function
- Once successful tolerance of feedings is established at 90-100ml/kg/day, caloric density is advanced to 24cal/30ml, and then volume advanced to 150 to 160 ml/kg/day
- Once neonate reaches 60 -100 ml/ kg feed, one sachet of milk fortifier can be added to 25 ml EBM

cardiovascular support

- ✓ Maintenance of blood pressure within standard range
- ✓ Early hypotension is more commonly due to altered vasoreactivity than hypovolemia, so therapy with fluid boluses is generally limited to 10-20 ml/kg , after which pressor support, initially with dopamine is begun.
- ✓ Corticosteroids for catecholamine –unresponsive hypotension
- ✓ Delayed cord clamping has been shown to decrease the incidence of early hypotension in premature infants.

PDA management

- ✓ Avoidance of excess of fluid administration
- ✓ Consider medical therapy if hemodynamically significant PDA
- ✓ Consider surgical ligation after failed medical therapy
- ✓ Drug of medical management of PDA:

1. Indomethacin
2. Ibuprofen
3. paracetamol

Indomethacin	Loading dose- 0.2mg/kg/dose Subsequent dose- 0.1mg/kg/dose , 12 hourly 2 doses	Reduces the relative risk of NEC
Ibuprofen	Loading dose 10mg/kg/dose Subsequent dose 5mg/kg/dose ,24 hourly ,2 doses	NEC and intestinal perforation risk is not increased significantly , as per latest RCT and nelson 21 Ed
Paracetamol	15mg/kg every 6 hourly for 3 days	Also effective in medical closure with less side effect

Infection control

- ✓ Scrupulous hand hygiene
- ✓ Limiting blood drawing and skin punctures
- ✓ Protocol for CVL insertion, minimize dwell time
- ✓ Screen for infection immediately, when there are perinatal risk factor for infection and treat with prophylactic antibiotics(ampicillin and gentamicin) pending culture results
- ✓ Fluconazole prophylaxis recommended when baseline incidence of fungal infection is high

Follow up screening

1. Cranial ultrasound
2. Audiology screening
3. Ophthalmological examination
4. Vaccination
6. Neurodevelopmental follow up program

- ✓ Cranial USG - All infants with GA < 32 weeks at day 7-10 of life
- ✓ Audiology screening- examine at 34 weeks of gestations or greater. ABR in NICU and confirmatory BERA must be completed before 3 month of age
- ✓ ROP screening-for infants birth weight < 1200gm first screening recommended between 2 and 3 week of life

Immunization

- ✓ Receive their routine immunization according to same schedule as term infants except hep B vaccine
- ✓ Hep B is given as early as 30 days of life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