



**Care of the infant and newborn in Malawi**

## **The COIN Course**

**Participants Manual**



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## Acknowledgements

We are grateful to the Ministry of Health, the Reproductive Maternal and Newborn Child Health (RMNCH) Unit for their support and encouragement which has allowed the development of the COIN course. We acknowledge and are grateful to all the creators and developers of several life support courses especially WHO, the ETAT and ETAT+ teams in Africa, the Child and Newborn Health Group. Much of the material from these courses has been gratefully borrowed but adapted for these sources. All the trainings and the approaches to training are intended to be as consistent as possible with the WHO / UNICEF Integrated Management of Childhood Illnesses (IMCI) programme and initiatives such as the Baby Friendly Initiative (BFI), Help Babies Breathe (HBB) and ETAT that are implemented in Malawi. The basic text describing the evidence based care promoted through this course is the WHO's 'Pocketbook of Hospital Care for Children' and in the Guidelines and Protocols for Neonatal and Young Infant Care in Malawi. We have used and blended established guidelines to produce the best approach for our setting.

This is a course about newborns and infants and though accidents can happen at this age trauma is rare and therefore it has been omitted from this course.

We appreciate the critical role that good care of mothers will make to the outcomes of neonates and young infants and are committed to working collaboratively with our colleagues in maternal health towards our common goal of improving maternal and child health in Malawi.

Sincere thanks to those who generously provided their input to the course during the development and piloting cycle, including the members of the stakeholder group, facilitators and candidates at the pilot course. We acknowledge members, past and present of the Department of Paediatrics and Child Health who have contributed to the material in this course by developing guidelines for this age group over the years. Special thanks to the Head of the Department of Paediatrics and Child Health, Dr Queen Dube and Dr Mac Mallewa for their full support, input and advice during the development of this course. Thanks to members of the Paediatric and Child Health Association of Malawi (PACHA) and to all the members of staff in the department who always try to provide optimal care of neonates and young infants. Thanks to Professor Elizabeth Molyneux and Dr Bernadette O'Hare for editing the manual and the training curriculum and to Drs Ajib Phiri, Laura Newberry, Hanny Friesen and Mr Lufesi for their contributions.

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## Foreword

**The majority of deaths in neonates and young infants can be prevented with low cost technology and low cost interventions.** It has been estimated that with optimal treatment of neonatal illness, we can reduce up to half of all preventable neonatal deaths.

In addition to providing care to newborns at birth, a health facility also receives sick young infants with diverse clinical presentations. Some of them are extremely sick and need emergency treatments. This course will deal with care of newborns at birth, the first few days of life and sick young infants who are likely to be encountered in a health facility.

There is a lot of overlap between the clinical presentation and the management of conditions in the neonate and the young infant (defined as an infant less than two months of age). In this manual, when referring to both age groups we will discuss as the Neonate and Young Infant (NYI). The young infant who requires resuscitation may well be a neonate who is only a few days old. The approach to initial resuscitation is very slightly different between the neonate and young infant but the skills required are the same and you will practice these during this course.

This manual is for the candidate and is supported by course material including lectures, videos, drills and scenarios. The course provides an evidence base where available and usual practice where there is no evidence. We have tried to strike the right balance between best practice and most pragmatic for our setting as well as incorporate current practices. There are many grey areas in medicine and despite latest evidence there may be no right answer. In this course we have used the best possible answer in order to give the candidate clear direction in a given situation. However, these are guidelines and if there is a good clinical reason to deviate from them, then that is also good clinical practice.

### Learning Objectives of the course

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After completion of this course the participant should be able to

- ❖ Provide care at birth for all newborns including low birth weight
- ❖ Provide neonatal resuscitation for those who need it
- ❖ Provide resuscitation for young infants
- ❖ Provide emergency assessment and treatment for sick young infants
- ❖ Understand which infants may benefit from referral and safe transport
- ❖ Counsel families on common problems arising in this age group
- ❖ Carry out an audit and introduce quality improvement in their own facility

This training course is divided into several sections to help you achieve these objectives. Remember there is considerable overlap between the neonate and the YI

Section I – Mostly about the newborn

Section II – The nuts and bolts of care for the NYI – warmth, oxygen, fluids and glucose

Section III – How to manage the conditions that are common to the NYI

Section IV – Care pathways, essential equipment for care of the NYI

Section V – Wall charts or job aids – intended for printing and placing in all clinical areas where NYI are cared for including the clinic, the ward and the nursery.

### Acronyms and abbreviations

NYI	Neonate and young infant
TPR	Temperature, Pulse rate and Respiratory rate
HIV	Human Immunodeficiency Virus
VDRL	Venereal Disease Reference Laboratory
HBB	Help Babies Breathe
ETAT	Emergency Triage and Treatment
BMV	Bag Mask Ventilation
IV	Intravenous (fluids)
IM	Intramuscular
PO	Per oral
OD	Once per day
OG(T)	Oro Gastric (Tube)
NG (T)	Naso Gastric (Tube)
BD	Twice per day
TiD	Three times per day
OiD	Four times per day
STAT	Immediately
SpO2	Oxygen saturations
WHO	World Health Organisation
<	Below or less than
>	Above or more than

## SECTION I

### Session 1 Routine care of the normal newborn infant

#### Why is care of the normal term infant so important?

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**The vast majority of babies need no intervention at birth other than routine normal care.** If this is done well, it vastly reduces the likelihood of problems.

#### Learning objectives

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

- ❖ Provide routine care for every newborn
- ❖ Offer relevant and timely information, advice and support to caregivers
- ❖ Identify newborns with danger signs and who need special care

Most newborns should be transferred to the post-natal wards for rooming-in with their mothers. These babies still need to be monitored because they are at continued risk of hypothermia and feeding difficulties during the first few days of life. These babies can also become sick and develop danger signs. The mother-infant pair needs counselling and appropriate treatment when required. Newborns born in health facilities should not be sent home in the crucial first 48 hours of life.

A postnatal room should be kept warm with no draughts from open doors or windows. A temperature of at least 25°C is required to help keep a baby warm. A mother and her baby should be kept together in the same bed or same room right from birth. This helps the mother form an early close loving relationship (bonding), she can also respond quickly when her baby wants to feed, which helps establish breast feeding and reduces breastfeeding difficulties.

### Key facts for providers – Routine care of the term newborn

Keep mother and baby together if possible

Encourage unrestricted frequency and duration of breastfeeding

Assess breastfeeding in terms of position and attachment

After ensuring the baby is dry and warm, apply chlorhexidine (CHX) to the tip of the cord, the stump and around the base of the stump. (Apply CHX once within 24 hours after the birth, but preferably in the first 2 hrs.)

A full examination of the newborn must be done, on admission, at 24 hours and at discharge from the post-natal ward.

Tetracycline Eye Ointment (TEO) should be administered to both eyes once after birth according to national guidelines

HIV and VDRL exposure status must be known and acted on if exposed

Vitamin K should be administered to all newborns (1mg IM to term infants)

BCG vaccine should be administered to all newborns

Oral polio vaccine should be administered to all newborns

### Daily routine care of the newborn

#### 1. Review labour and birth record

Review the labour and birth record to identify risk factors or any events during the birth that may be important in the management of the mother and the baby.

#### 2. Ask the mother

“Is the baby sucking well?”

*Healthcare professional should discuss a woman’s progress with breastfeeding within the first two days postpartum to assess if she is on course to breastfeed effectively.*

“Has the baby passed stools?”

*Meconium should be passed by 24 hours. Passage after 24 hours is NOT NORMAL and needs investigation*

“Has the baby passed urine?”

*Urine should be passed by 48 hours. It is NOT NORMAL if not passed by 48 hours.*

*Babies who develop jaundice within the first 24 hours after birth should be evaluated*

#### 3. Examine the baby on admission to the post-natal ward, at 24 hours and before discharge



### **Key facts for providers - How to examine the newborn**

DO on admission to the post-natal ward, at 24hours, and at discharge

- **ABCCCD**

*then*

- **Temperature, Pulse rate and Respiratory rate (TPR)**

*then*

- **Head to toe**

- Head – moulding, signs of birth trauma
- Eyes – Jaundice, check for the red reflex
- Lips/mouth – cyanosis, pallor (Neonatal teeth may sometimes be present)
- Chest –severe chest in drawing, listen for grunting. (Gynaecomastia is often present and is normal, do not squeeze the breast tissue)
- Abdomen – is the umbilicus red or discharging? Look for abdominal wall defects

### **Assessment of danger signs**

The following signs should be assessed during each postnatal care contact, and the newborn should be referred for further evaluation if any of the following danger symptoms or signs are present:

#### **Key facts for providers and mothers/guardians - Danger symptoms or signs (1)**

- not feeding well
- convulsions
- drowsy or unconscious
- movement only when stimulated or no movement at all
- central cyanosis
- fast breathing (> 60 breaths per min), grunting, severe chest indrawing
- raised temperature, > 38 °C, hypothermia, < 35.5 °C
- red umbilicus

## Parental education about maintaining Infant Health

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At each postnatal contact parents should be offered information and guidance to enable them to care for their baby.

Key facts for providers and mothers/guardians	
<b>Warmth</b>	Appropriate clothing of the baby for ambient temperature is recommended. This means 1-2 layers of clothes more than adults, and use of hats/caps
<b>Skin</b>	Babies are not bathed routinely in the hospital to prevent complications like hypothermia and infection, they may however be sponged with lukewarm water.
<b>Cord Care</b>	Chlorhexidine is applied once after birth. After this instruct the mothers not to apply anything to the cord but keep clean and dry
<b>Nappy rash</b>	Prevent with frequent nappy changes and cleansing and exposure of the perianal area in order to reduce babies' contact with faeces and urine. Cleansing agents should not be added to bath water nor should lotions or medicated wipes be used. When required, the only cleansing agent that should be used is mild non-perfumed soap. Cloth nappies are preferred to plastic nappies.
<b>Thrush</b>	If thrush is identified in her baby, the breast feeding woman should be offered information and guidance about relevant hygiene practices. Symptomatic thrush (difficulty feeding) requires antifungal treatment
<b>Jaundice</b>	<p>Parents should be offered information about physiological jaundice including: 50% of newborn and 80% of preterm have some jaundice. It may be normal or abnormal. Normal or physiological jaundice occurs around 3-4 days after birth.</p> <p>The mother of a breastfed baby who has signs of jaundice should be actively encouraged to breastfeed frequently, and the baby awakened to feed if necessary.</p> <p>Breastfed babies with jaundice should <b>not</b> be routinely supplemented with formula, water or dextrose water.</p> <p>Parents should be advised to contact the health care professional if their jaundice is worsening, or their baby appears unwell in any way. If jaundice remains after 14 days in an otherwise healthy baby it should be evaluated.</p>
<b>Weight loss</b>	<p>Weight loss of 10% in the first days of life is normal</p> <p>Most term infants regain their birth weight by 10-14 days.</p>

<b>Hygiene</b>	Advise mother to wash hands with soap and water after using the toilet and after cleaning the baby.
<b>Danger signs</b>	Remind mother about danger signs and care seeking.

## Breastfeeding

**Benefits of breastfeeding** – babies who are exclusively breastfed for 6 months will get the greatest health benefits and disease prevention.

Colostrum – this will meet the needs of the baby in the first few days after birth

Discomfort at the start of breast feeds in the first few days is not uncommon, but this should not persist.

A baby may have a variable feeding pattern, at least over the first few days, as the baby takes small amounts of colostrum and then takes increasingly larger feeds as the milk supply comes in.

When the milk supply is established, a baby will generally feed every 2–3 hours, but this will vary between babies and, if her baby is healthy, the baby's individual pattern should be respected.

If a baby does not appear satisfied after a good feed from the first breast, the second breast should be offered.

### How to assess Breast-feeding

Assess breast feeding in all newborns;

1. first assess the **position**
2. then assess the **attachment**
3. then assess the **sucking**

Ask mother if the infant has breastfed in the previous hour?

If infant has not fed in the previous hour, ask the mother to put her infant to the breast.

Observe the breastfeed for 4 minutes

### 1. Check for correct positioning

#### Signs of good position

Baby's body is well supported.

The head, neck and the body of the baby are kept in the same plane.

Entire body of the baby faces the mother. Baby's abdomen touches mother's abdomen



*Good (left) and poor (right) positioning of infant for breastfeeding*

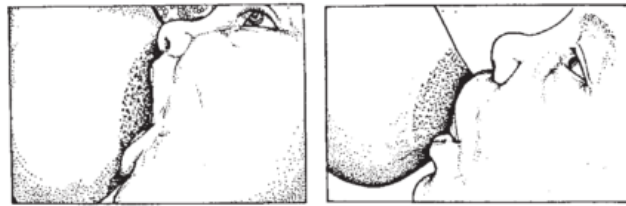
## 2. Signs of a good attachment

Chin touching breast

Mouth wide open

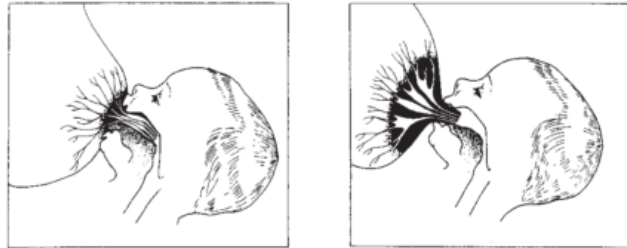
Lower lip turned outward

More areola above than below the mouth



*Good (left) and poor (right) attachment of infant to the mother's breast*

Poor attachment results in painful nipples → Breast milk not removed effectively thus causing breast engorgement → poor milk supply hence baby is not satisfied and irritable → breast produces less milk resulting in a frustrated baby who refuses to suck.  
→ poor weight gain



*Good (left) and poor (right) attachment: cross-sectional view of breast and infant*

## 3. Check for baby's sucking

Effective sucking is when the infant shows slow deep sucks, sometimes pausing

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

### Key facts for providers and mothers/guardians – Breast feeding

1. If breastfeeding is not progressing, support and assistance with positioning and attachment on the breast should be provided
2. If nipple pain persists after repositioning consider evaluation for thrush or cracks.
3. If signs and symptoms of engorgement are present a woman should be encouraged to:
  - Wear a well-fitting bra or binder.
  - Feed frequently, including prolonged breastfeeding from the affected breast
  - Massage breasts and if necessary, hand express milk
  - Take analgesia if necessary.
4. If signs and symptoms of mastitis are present a woman should be advised to:
  - Continue breastfeeding and/or hand expression to ensure effective milk removal
  - Gently massage the breast to relieve any blockage
  - Seek assistance with positioning and attachment
  - Take analgesia compatible with breastfeeding, for example paracetamol
  - Increase her fluid intake.

If signs and symptoms of mastitis persist more than several hours a woman should contact her healthcare provider and may require antibiotic treatment.

If the baby is not taking sufficient milk directly from the breast and supplementary feeds are necessary, expressed breast milk should be given by a cup or spoon. (Supplementation with fluids other than breast milk is **not** recommended unless medically indicated.

## Common congenital infections

### HIV:

All newborns born to HIV positive mothers should be managed according to the Malawian 2014 Integrated Guidelines for providing HIV services in Children and Adults (2). The lactating mother should be treated with antiretroviral (ARV) medication.

Nevirapine syrup is given to all HIV exposed babies as soon as possible after birth until six weeks. At six weeks the dried blood spot (DBS) is done and the baby will start co-trimoxazole preventative therapy (CPT) 120 mg, which they will continue until they are confirmed HIV negative at least six weeks after breast feeding has stopped.

Birth weight	Dose of Nevirapine
<2500g	1.0 ml every 24 hours
>2500g	1.5 mls every 24 hours

## Syphilis:

Treat all infants of mothers who are VDRL seropositive and are untreated or inadequately treated or there is not clear documentation of full treatment. If unsure it is safer to treat.

Clinical findings suggestive of syphilis	Treatment:
Small for dates, Jaundice Recurring rashes Anaemia Hepatosplenomegaly "Snuffles" (a serous rhinitis)	Proven or highly probable disease:  X pen 50 000U/kg bd x for 10 days  Emphasise the importance in all cases that both mother and father receive treatment

## Infants of mothers with tuberculosis

If the mother has active lung tuberculosis (TB) in the third trimester or TB was diagnosed after the birth, manage according to the National TB Control Programme, Chapter 5(3). Examine her baby closely for symptoms and signs of disease. If the baby is well, commence isoniazid (H) prophylaxis at 10 mg/kg/day and continue for 6 months. Do not give BCG vaccine.

Re-evaluate the infant at the age of 6 weeks, noting weight gain and taking an X-ray of the chest, if possible. If the infant is doing well and tests are negative, continue prophylactic isoniazid to complete 6 months of treatment. If any findings suggest active disease, start full anti-TB treatment, according to national guidelines.

- Breast feed as normal
- Delay BCG vaccination until 2 weeks after treatment is completed.
- If BCG has already been given, repeat 2 weeks after the end of isoniazid treatment.

### Dose of Isoniazid (H) for NYI exposed to TB but *not* infected

Babies weight	Isoniazid dose
< 2.5 kg	25mg (1/4 tablet) every 24 hours
2.5-5kg	50mg (1/2 tablet) every 24 hours

If the baby is not well at birth and has signs/symptoms suggestive of TB disease, collect gastric aspirates where possible and commence full TB treatment according to national guidelines.

### Discharge and providing follow-up care

Correct planning of discharge from the hospital is very important for the newborn.

Infants who are discharged from the hospital should return for follow-up care to the nearest health facility. Communicate with the health personnel who will be responsible for follow-up care by writing in the health passport.

#### Key facts for providers and mothers/guardians – discharge

- Ensure breast feeding is established
- Write the birth weight
- Indicate if any neonatal problems such as jaundice, sepsis or asphyxia
- Ensure HIV exposure status is known and recorded in the passport.
- Ensure Vitamin K has been administered and recorded
- Ensure BCG and oral polio have been received and recorded
- Counsel on exclusive breast feeding, keeping baby warm and to seek health care early if they identify any of the **danger signs in-between postnatal care visits**. Ask the parent to repeat the danger signs so that you know they have remembered them.
- Follow-up schedule (at home or as close to home as possible) - **at one week and at six weeks**

## Session 2 Care of the low birth weight/preterm infant

### Why is care of the low birth weight infant so important in Malawi?

12% of babies in Malawi are born with low birth weight; therefore all health care providers must be familiar with the care of this group of infants.

### Learning objectives

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

- ❖ List the main problems associated with low birth weight (LBW) /preterm baby
- ❖ Describe the management of the feeds for a LBW/preterm baby
- ❖ Describe the steps involved in tube feeding

A neonate who weighs less than 2500 gm is a **low birth weight** baby. Nearly 75% of neonatal deaths occur among low birth weight neonates. Even after recovering from neonatal complications, some LBW babies remain more prone to malnutrition, recurrent infections, and neurodevelopment handicaps. Infants with LBW may be small due to either prematurity or intra uterine growth retardation (IUGR). IUGR results in a baby who is small for gestational age (SGA). It is helpful to try and decide if the baby is premature or SGA as the management is slightly different. SGA babies are symmetrically small. Remember of course they may be both premature and SGA. There are maturity charts or scoring systems that can help to decide the gestational age of a baby.

**Very low birth weight infants**- less than 1500 g (3 lbs. 4 oz) at birth.

**Extremely low birth weight** – less than 1000 g (2lbs. 4 oz) at birth.

### Management at delivery of low birth weight/premature babies

The delivery of an expected LBW baby should be in hospital. Premature labour as well as intrauterine growth retardation is an indication for referral before the baby is born, (in-utero transfer), of the mother to a better equipped facility.

### Deciding where a LBW baby should be managed

The mother and the family under the supervision of a health care worker can manage an otherwise healthy LBW newborn with a birth weight of **1800grams or above at home**.

Infants below this weight are at risk of hypothermia, feeding problems, apnoea, respiratory distress syndrome and necrotizing enterocolitis. The risks associated with keeping the child



in hospital (e.g. hospital-acquired infections) should be balanced against the potential benefit of better care, such as reviewing the infants at least twice a day to assess feeding ability, fluid intake or the presence of any danger signs. The risk of hospital-acquired infection can be reduced by using Kangaroo Mother Care.

The indications for hospitalization of a neonate include the following

- a) Birth weight less than 1800 gm and/or less than 34 weeks of gestation
- b) Neonate who is unable to feed from the breast or by cup
- c) A sick neonate

### How to estimate the gestational age

Often the gestational age of newborn infants is not clear and approximations have to be made. The most accurate way to do this is to use a maturity chart. Approximate gestational age can be estimated +/- 2 weeks by adding 20 to the score obtained from the following table:

#### Approximate gestational age based on physical characteristics

	1	2	3	4
<b>Breast size</b>	<5mm	5 – 10mm	10mm	
<b>Nipple</b>	No areola	Areola present Nipple formed	Areola raised Nipple well formed	
<b>Skin opacity</b>	Lots of veins and tributaries visible	Some veins and tributaries visible	Large blood vessels only	Few/ none vessels visible
<b>Scalp hair</b>	Fine	Coarse + silky		
<b>Ear cartilage</b>	None	Antitragus only	Antihelix	Helix
<b>Fingernails</b>	Don't reach fingertip	Reach fingertip	Pass fingertip	
<b>Plantar creases</b>	None	Anterior transverse crease only	Creases on 2/3 of sole	Creases on whole of sole

Another way is to use the birth weight but this is less accurate as there may be a lot of variation between babies of the same gestational age. The average weight of all babies in Malawi is 3280 g (2010 MDHS). The average weight for mothers < 20 years is 3097g and

for mothers > 20 years the average birthweight is 3280 kg (4). Estimations of likely weights at different gestational ages have been made based on these, see graph below –

Mothers aged <20 years				Mothers aged >20 years			
Gest Age	Percentile			Gest age	Percentile		
	75th	mean	25th		75th	mean	25th
26	882	821	760	26	938	870	801
27	1016	945	875	27	1080	1001	922
28	1161	1081	1000	28	1235	1145	1054
29	1318	1227	1135	29	1402	1299	1197
30	1486	1383	1279	30	1580	1464	1349
31	1663	1547	1432	31	1768	1639	1509
32	1847	1719	1591	32	1965	1821	1677
33	2038	1897	1755	33	2168	2009	1850
34	2233	2078	1923	34	2375	2201	2027
35	2429	2261	2092	35	2584	2394	2205
36	2624	2442	2260	36	2791	2586	2382
37	2815	2619	2424	37	2993	2774	2555
38	2997	2789	2581	38	3188	2954	2721
39	3170	2950	2730	39	3371	3124	2877
40	3328	3097	2866	40	3539	3280	3021
41	3470	3229	2988	41	3690	3420	3150

Thanks to Alfred Ngwira of Lilongwe University of Agriculture and Natural Resources for the estimations on birthweights:

### Common problems in LBW, preterm and small for gestational age neonates

Common problems of LBW/ preterm neonates	Problems of small for date babies (IUGR)
Respiratory distress syndrome Apnoea Inability to breast feed Hyperbilirubinaemia Hypoglycaemia Hypothermia Retinopathy of prematurity Sepsis Necrotizing enterocolitis	Asphyxia Polycythaemia Hypoglycaemia Hypothermia Sepsis

### Keeping the LBW babies dry and warm (prevention of hypothermia)

The definition of **Continuous Kangaroo Mother Care (KMC)** is care of a preterm infant carried skin-to-skin with the mother. Its key features include early, continuous and prolonged skin-to-skin contact between the mother and the baby, and exclusive breastfeeding (ideally) or feeding with breast milk. Mortality, hypothermia, rates of infection and readmission are lower in neonates nursed in continuous KMC when compared with conventional care (5).

**Intermittent KMC** is the practice of skin-to-skin care alternated with the use of a hot cot, a radiant warmer or an incubator care for the baby. Intermittent KMC is associated with reduced rates of hypothermia and infection compared to conventional care.

#### In Malawi there are three categories of KMC

1. **Facility KMC** – recommended for all neonates with a birth weight of < 1500 grams
2. **Ambulatory KMC** – 1500 – 1800 grams after discharge from a facility but continues to be followed up by that facility
3. **Community KMC** - > 1800 grams and clinically stable

If neither continuous nor intermittent KMC is possible then an overhead radiant warmer, incubator or a Hot Cot may be used to keep the baby warm. The room where a LBW baby is nursed should be kept warm (25C). The baby should wear a hat to cover the head. Wet clothing should be changed frequently to keep baby warm and dry. Regular monitoring of axillary temperature should be carried out.

#### Key facts for providers and mothers/guardians – Skin-to-skin contact (Kangaroo mother care)

If there are no signs of distress, a mother can provide a warm environment with “Kangaroo care” for the baby at home or hospital. Place the baby, with a nappy, socks and hat, upright inside mothers’ clothing against mother’s bare skin between her breasts, with the infants head turned to one side. Tie the infant to the mother with a cloth and cover the mother and infant with the mother’s clothes.

Let baby suckle at the breast as often as s/he wants, but at least every 2 hours. Mother should sleep propped up so that the baby stays upright. If environmental temperature is low add a blanket to mother’s wrap. When mother wants to bathe or rest, ask the father or another family member to ‘Kangaroo’ the baby or wrap the infant in several layers of warm clothing, covered with blankets and keep in a warm place.



### Feeding the LBW infant

Breast milk is the preferred milk because it has a high electrolyte and protein content necessary for rapid growth of the baby. The antibodies and other anti - infective factors in mother's milk are very necessary for the survival of a preterm baby.

### How often? Scheduling of enteral feeds

Weight	Ideal feeding regime
<1500g or < 32 weeks	Feed every two hours
1500-1800 or 32-34 weeks	<i>Ideally</i> feed every two hours
>1800g or > 34 weeks	Feed every three hours

### Key facts for providers and mothers/guardians – feeding LBW/premature infants

Feeding **should be scheduled** because preterm infants rarely demand feeds. Work out a schedule with the mother for her to follow. LBW babies may take longer on the breast.

### Which Route?

Birth weight, gestation, presence or absence of sickness and individual feeding efforts of the baby determine the decision as to how a LBW neonate should receive fluids and nutrition. The gestational age is one of the most important determinants as co-ordinated sucking and swallowing does not develop until about 34 week's gestation.

### Likely route according to age

Birth weight	<1500 grams	1500 – 1800 grams	1800 - 2000 grams	2000-2500 grams
Gestational age (see table)	<32 weeks	32-34 weeks	34-35 weeks	35-36 weeks
1-3 days	Tube feeds	Tube feeds or cup	Breast feed, if unsatisfactory use cup	Breast feed, if unsatisfactory use cup
3 days – 3 weeks	Tube or cup	Breast feed, if unsatisfactory use cup	Breast feed	Breast feed

Those unable to feed directly on the breast, but who are clinically stable, can be given expressed breast milk (EBM) by oro-gastric tube or cup feeding. The mother should express her own milk into a sterile container.

In order to promote lactation, and enable the baby to learn to suck, all babies more than 1500 grams and 32 weeks on cup, or tube feeds should be put on the breast before each feed for 5-10 minutes.

### Is the baby able to breastfeed effectively?

- When offered the breast, baby roots, attaches well and sucks effectively
- Is s/he able to suck long enough to satisfy needs

### Is the baby able to accept feeds by alternative methods?

- When offered cup feeds, the baby opens the mouth, takes milk and swallows without coughing/spluttering
- They are able to take adequate quantity to satisfy needs

## Judging adequacy of nutrition

The key measure of optimal feeding is the weight pattern of the baby.

A preterm LBW	<p>Loses up to 10 percent cumulative weight loss during the first week of life</p> <p>Birth weight is usually regained by the <u>end of 2 weeks of life</u>. (may be longer in very premature babies).</p> <p>Observe for:</p> <p><b>Inadequate feeding</b> – insufficient breast milk, inadequate amounts prescribed if tube or cup fed (has the amount been increased appropriately?) mother sick so unable to come to every feed, orphan.</p> <p><b>Structural abnormality</b> e.g. cleft palate/lip</p> <p><b>Abnormal fluid losses</b> (diarrhoea or polyuria))</p> <p><b>Persistent hypothermia due to low environmental temperature</b>, which diverts energy from growth to heat production (may be a sign of underlying sepsis)</p>
Small for Dates babies	Should not have any appreciable weight loss at all and they should start gaining weight early.

**Maintenance feeds by gastric tube or by cup– see wall charts at the end of manual**

## Vitamin supplements and iron for preterm infants

Supplement	Route	Timing and duration
Vitamin K <i>National Guidelines</i>	0.5mg in pre term neonates IM	Birth
Multivitamin preparation <i>if available</i>	0.3-0.6ml (5-10 drops) /day (which usually provides vitamin A of 1000 IU/day and vitamin D 400 IU/day)	When taking full feeds until 6 months
Iron <i>if available</i>	<p>Start iron supplements at 2 weeks of age if tolerating full enteral feeds at a dosage of 2–4 mg/kg per day until 6 months of age.</p> <p>Syrup usually contains 50mg iron in 5 mls or 10mg per ml so a 2 kg baby will get 0.5 mls</p>	2 weeks until 6 months

**Key facts for providers and mothers – Breast Milk Expression**

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

- To maintain milk production and for feeding the baby who is premature, low birth weight or sick and cannot breast feed for some time.
- To relieve breast problem e.g. engorgement.

**Technique of expression – teach her to:**

- Wash her hands with soap and water thoroughly before expression. Sit or stand comfortably, and hold the clean container near her breast.
- Put the thumb on her breast above the nipple and areola, and her first finger on the breast below the nipple and areola, opposite the thumb. She supports the breast with her other fingers.
- Press her thumb and first finger slightly inwards towards the chest wall.
- Press her breast behind the nipple and areola between her fingers and thumb. She must press on the lactiferous sinuses beneath the areola. Sometimes in a lactating breast it is possible to feel the sinuses. They feel like peanuts.
- If she can feel them, she can press on them, Press and release, press and release.
- This should not hurt – if it hurts the technique is wrong. At first no milk may come, but after pressing a few times, milk starts to drip out.
- Press the areola in the same way from the sides, to make sure that milk is expressed from all segments of the breast.
- Avoid rubbing or sliding her fingers along the skin. The movements of the fingers should be more like rolling.
- Avoid squeezing the nipple itself. Pressing or pulling the nipple cannot express milk.
- Express one breast for at least 3-5 minutes until the flow slows; then express the other side; and then repeat both sides. She can use either hand for either breast.
- Explain that to express breast milk adequately may take 20-30 minutes. Having the baby close or handling the baby before milk expression may help the mother to have a good let-down reflex. It is important not to try to express in a shorter time. To stimulate and maintain milk production one should express milk frequently – at least 8 times in 24 hours.

For tube feeding; use size French size 5 or 6 nasogastric tube.

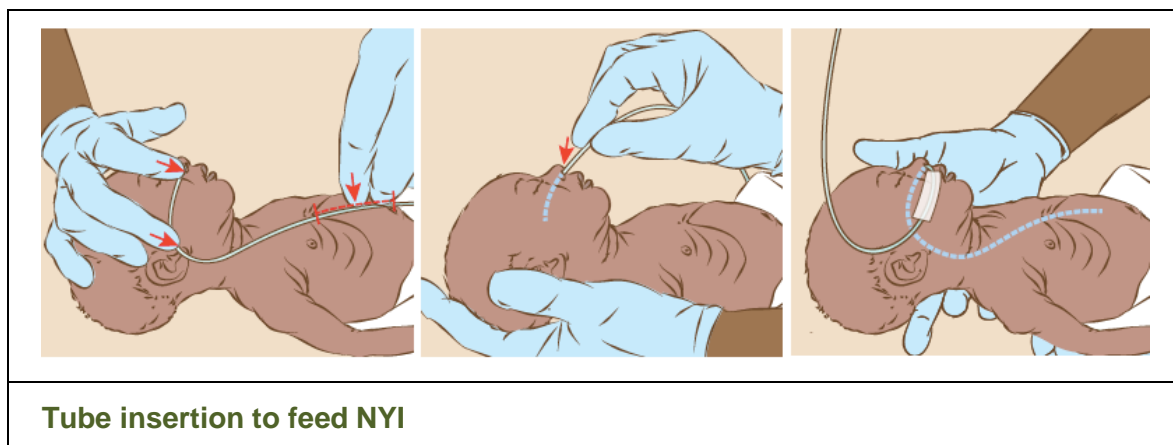
### **Nasogastric tube feeding (NG tube)**

The catheter is measured from the tip of the nose to the ear lobe and then to the midpoint between the xiphoid and umbilicus. Mark the position with a piece of tape. This length of the tube should be inserted through the nose.

### **Orogastric tube feeding (OG tube)**

For the orogastric catheter, the distance between angle of mouth to earlobe, and then to the midpoint between the xiphoid and umbilicus. Mark the position with a piece of tape. The length of tube is used for insertion.

During nasogastric or orogastric insertion, the head is slightly raised and a wet (not lubricated) catheter is gently passed through the nose (nasogastric) or mouth (orogastric) down through the oesophagus to the stomach. Its position is verified by aspirating the gastric contents, and by injecting air and auscultating over the epigastric region.



At the time of feeding, the outer end of the tube is attached to a 10/20ml syringe (without plunger) and milk is allowed to trickle by gravity. There is no need to burp a tube-fed baby. The nasogastric or orogastric tube may be inserted before every feed or left in situ for up to 3 days. While pulling out a feeding tube, it must be kept pinched and pulled out gently. Tube feeding may be risky in very small babies. They have small stomach capacity and the gut may not be ready to tolerate feeds. Stasis may also result from paralytic ileus due to several conditions. Thus, tube-fed babies are candidates for regurgitation and aspiration. It is important therefore to take precautions. Before the next feed, aspirate the stomach, if the aspirate is more than 25 percent of the last feed, the baby should be evaluated for any illness. The feeds may have to be decreased in volume or stopped.



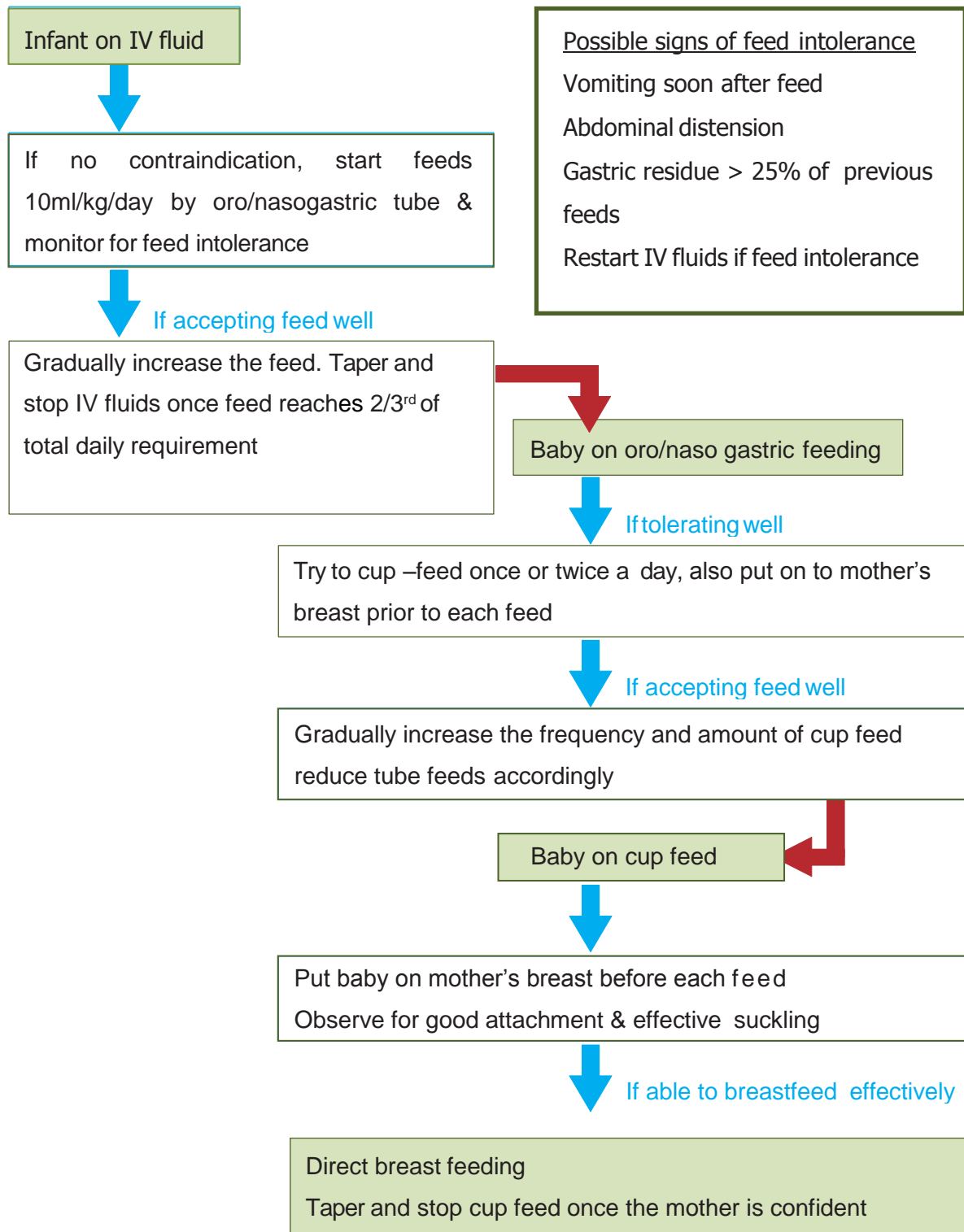
### Steps of oro-/nasogastric tube feeding

1. Before starting a feed, check the position of the tube.
2. For each feed take a clean syringe and remove the plunger
3. Connect the barrel of the syringe to the end of the gastric tube
4. Pinch the tube and fill the barrel of the syringe with the required volume of milk
5. Hold the tube with one hand, release the pinch and elevate the syringe to 5-10 cm above the level of the baby
6. Let the milk run from the syringe through the gastric tube by gravity
7. Do not force milk through the gastric tube by using the plunger of the syringe
8. 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 syringe; lowering the syringe slows the milk flow, raising the syringe makes the milk flow faster.
9. Observe the baby during the entire gastric tube feed. Do not leave the baby unattended.
10. Keep the gastric tube capped between feeds.
11. Avoid flushing the tube with water or saline after giving feeds.
12. Progress to feeding by cup/spoon 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.
13. Replace the gastric tube with another clean gastric tube after 3 days, or earlier in case it is pulled out or becomes blocked.

### Steps of cup feeding

Baby should be awake and held sitting semi-upright on caregiver's lap. Put a small cloth on the front of chest to catch drip of milk

1. Put a measured amount of milk in the cup
2. Hold the cup so that the pointed tip rests on the baby's lower lip
3. Tip the cup to pour a small amount of milk at a time into the baby's mouth
4. Feed the baby slowly
5. Make sure that the baby has swallowed the milk already taken before giving anymore
6. When the baby has had enough, he or she will close her mouth and will not take anymore. Do not force the baby to feed



## **Key facts for providers– discharge of the LBW/preterm infant**

A well LBW baby can be discharged when:

- S/he is fully breast fed or breast feeding supplemented by EBM by cup and gaining weight for 3 consecutive days.
- Is able to maintain normal body temperature.
- Mother is confident of taking care of the baby

### **1. Write in the health passport**

- The birth weight and gestational age if known
- Indicate if any problems in addition to LBW such as jaundice or sepsis.
- Ensure HIV exposure status is known and recorded in the passport.
- Ensure Vitamin K has been administered and recorded
- Ensure BCG and oral polio has been received and recorded

### **2. Follow-up schedule (at home or as close to home as possible)**

Scheduled visits for assessing growth and monitoring for illness

These visits should be at weekly intervals till the infant reaches 2.5kg

### **3. Vaccinations in LBW/preterm babies**

If the LBW baby is not sick, the vaccinations schedule is the same as for term babies.

A sick LBW baby however, should receive these vaccines only on recovery.

### **4. Counselling for care of LBW at home.**

- Counsel on exclusive breast feeding, keeping baby warm and to seek health care early if they identify any of the **danger signs in-between postnatal care visits.** Ask the parent to repeat the danger signs so that you know they have remembered them.
- Mother must be informed about her own nutrition and health.

## Session 3 –Resuscitation of the neonate

### Why is care at birth important?

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This is the critical period of transition from intra-utero life to extra-utero independent existence. Effective care at birth is needed to anticipate problems with this transition and to provide support to ensure stabilization. Most babies born with apnoea at birth will start to breathe themselves within 60 –90 seconds if they have a clear airway.

### Which babies require resuscitation?

Approximately 10% of newborns require some assistance to begin breathing at birth; very few, only about **1% need more than basic resuscitation to survive.**

### Learning objectives

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

- ❖ Prepare for providing care at birth
- ❖ Provide care at birth for all newborns
- ❖ Describe essential newborn care at delivery
- ❖ Describe which newborns need more than essential newborn care at delivery
- ❖ Resuscitate newborn infants who need more than essential newborn care

### Preparation for a delivery

The recommended temperature for the delivery room is 25C. Equipment should be in an area in the delivery room for facilitating immediate care of the newborn. This area is essential for all health facilities where deliveries take place. Equipment needs to be checked regularly and supplies replaced after they are used. Equipment, all surfaces and hands must be clean. To prevent drafts of air shut all windows and switch off fan before birth and if a resuscitaire is available, it should be warmed up 30 minutes before the delivery. You should have several pre-warmed absorbent towels or cloths available. Initially, the baby is placed on one of the towels that can be used to dry most of the fluid. This towel should then be removed and a fresh cloth should be used for continued drying and stimulation

For many infants, resuscitation cannot be anticipated before delivery. Therefore: be prepared for resuscitation at every delivery.

## High risk deliveries

These are deliveries where it is more likely that resuscitation will be required. These include deliveries to mothers -

- Who are sick
- Who had a previous foetal or neonatal death
- With pre-eclampsia
- With multiple pregnancies
- Who are delivering preterm

The delivery may progress in a way that makes it more likely that the infant will require resuscitation; such deliveries include those where there is

- An abnormal presentation as it may take some time for the delivery
- A prolonged second stage
- A prolapsed cord
- A prolonged rupture of the membranes
- Meconium staining of the liquor

Before birth check that all equipment and supplies are available and are in working condition and identify which personnel will help if resuscitation is required.



### Equipment

- Radiant warmer if available
- Suction equipment
- Self-inflating resuscitation bag (250ml-500ml) with masks (size 0 and 1)
- Oxygen
- Clock
- Room thermometer

### Supplies

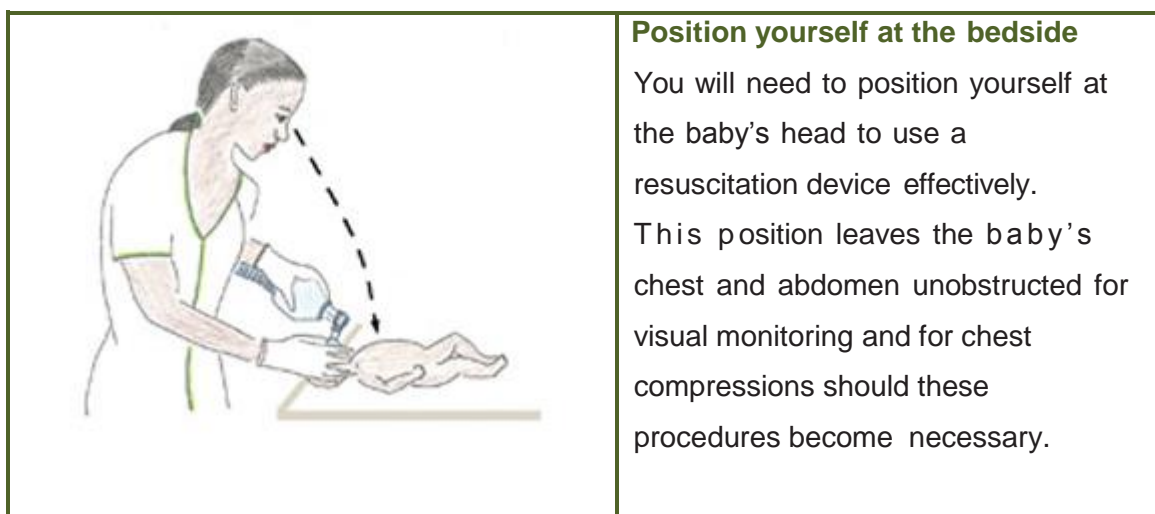
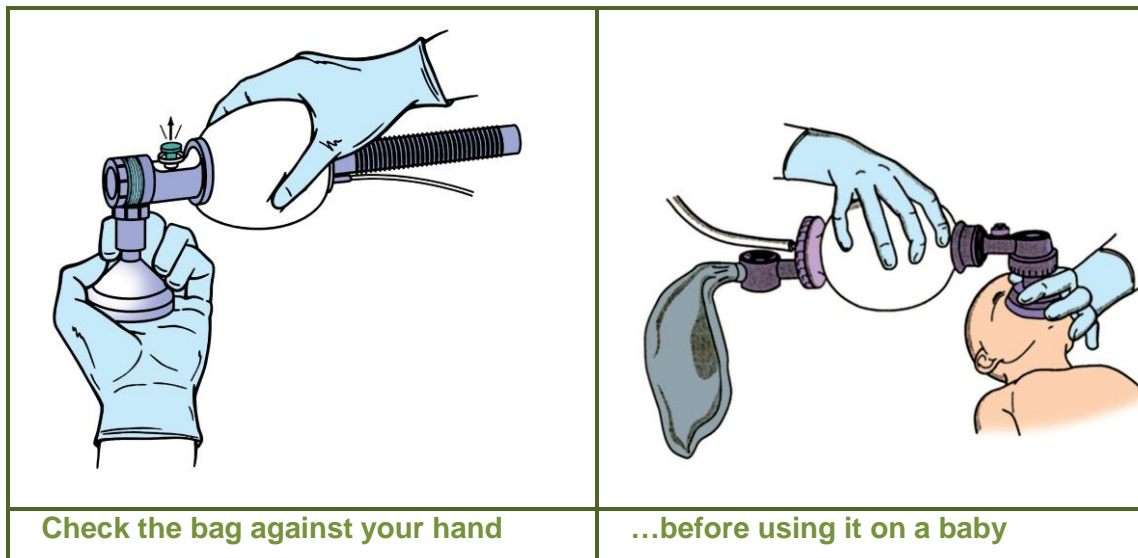
- DRY warm cloths x 2  
(Advise mother in antenatal clinic to bring TWO absorbent clothes)
- Sterile cord ties
- Sterile gloves
- Sterile blade/scissors
- Mucus extractors
- Suction catheters (10F, 12F)
- Feeding tube (6F, 8F)

## Prepare personnel

Nurse/midwives should identify a helper and explain roles: Helper may be a qualified nursing staff, another untrained hospital staff or relative of mother. You should assign and explain the role to helper according to his/her skill. Their role may be to help you dry and stimulate the infant or to feel the cord for the heart rate.

## Test the equipment required to provide newborn resuscitation

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



### **Baby is delivered**

Most newborns require only simple supportive care at and after delivery. Deliver the baby on to mother's abdomen as in the Help Babies Breathe protocol, note the time of birth.

#### **Key facts for providers - How to provide essential newborn care at delivery**

1. Dry the infant with a clean cloth. Observe the infant while drying
2. Maintain the infant in skin-to-skin contact position with the mother
3. Cover the infant to prevent heat loss.
4. Clamp and cut the cord at least 1 min after birth.
5. Encourage the mother to initiate breastfeeding within the first hour.
6. Skin-to-skin contact and early breastfeeding are the best ways to keep an infant warm and prevent hypoglycaemia.

The baby is placed on the first dry warm cloth, which can be used to dry most of the fluid. This cloth should then be removed and the second cloth should be used for continued drying and stimulation.



TWO clothes are required – one to dry and a fresh one to wrap

After birth the baby remains wet with amniotic fluid which if not dried immediately can lead to heat loss. This heat loss may result in rapid decrease in infant's body temperature.

Breathing and warmth go together and breathing should be assessed whilst drying the baby. Drying itself often provides sufficient stimulation for breathing to start in mildly depressed newborn babies.

### What other forms of stimulation may help a baby breathe?

- Safe and appropriate methods of providing additional stimulation include:
- Gently rubbing the newborn's back, trunk, or extremities with the towel
- Flicking the soles of the babies feet

All the initial steps should be initiated within a few seconds.

### How do you determine whether the baby requires resuscitation?

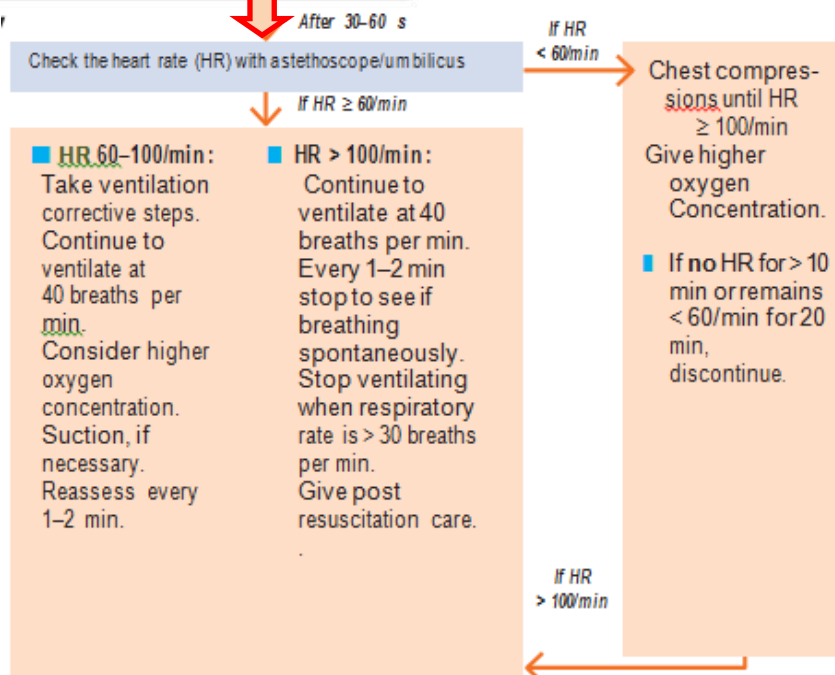
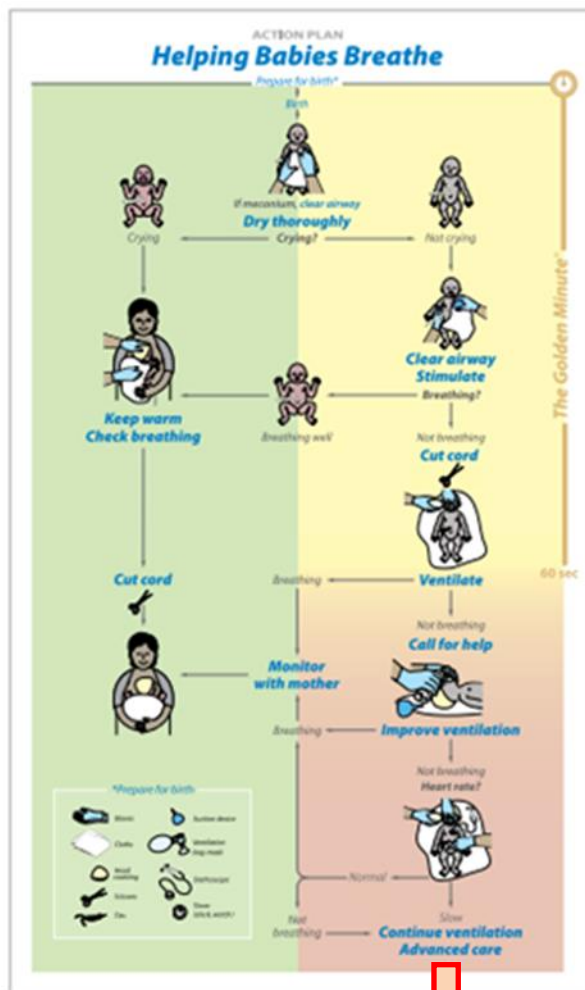
Assessment	Decision
Baby is crying	No need for resuscitation or suctioning. Provide routine care.
Baby is not crying, but his chest is rising regularly	No need for resuscitation or suctioning. Provide routine care.
Baby is gasping	Start resuscitation immediately.
Baby is not breathing	Start resuscitation immediately.
Baby has very poor tone	Start resuscitation immediately.

### If the baby requires resuscitation provide warmth

- If the baby requires resuscitation s/he should be placed on a resuscitaire or under a radiant warmer so that the resuscitation team has easy access to the baby and the radiant heat helps reduce heat loss.
- Further drying will also provide stimulation and prevent heat loss.
- Leave the baby uncovered to allow full visualization and to permit the radiant heat to reach the baby.
- Often, positioning the baby and suctioning secretions will provide enough stimulation to initiate breathing.
- If two people are present, the second person can be drying the baby while the first person is positioning and clearing the airway.



## Resuscitation of the Newborn - Help Babies Breathe +



Positive pressure ventilation should be initiated with air for infants with gestation > 32 weeks. For very preterm infants, it is preferable to start with 30% oxygen if possible.

## ABCs of Resuscitation

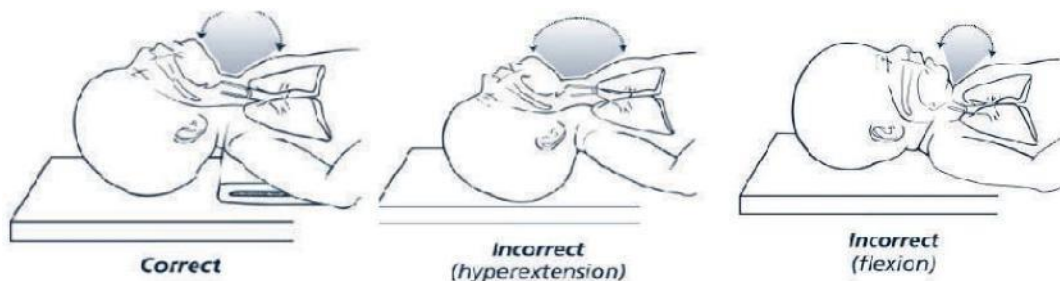
Ensure that the **Airway** is open and clear

Be sure that there is **Breathing**, whether spontaneous or assisted

Make certain that there is adequate **Circulation** of oxygenated blood.

It is important to maintain body temperature during resuscitation as newly born babies are wet following birth and heat loss is great.

### **A** Open the airway by slightly extending the neck



The baby should be positioned on the back, with the neck slightly extended in the “neutral” position. The neutral position while supine is the best position for assisted ventilation with a mask. Care should be taken to prevent hyperextension or flexion of the neck, since either may restrict air entry.



**Correct head position to open up airway and for bag ventilation.**

**Do not hyperextend the neck.**

If the baby has a large occiput (back of head) resulting from moulding, oedema, or prematurity, you may place a rolled cloth to help the position.

## Clear airway (as necessary)

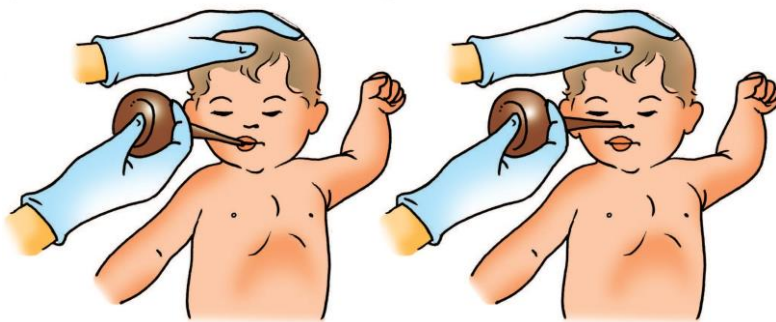
### How do you clear the airway if no meconium is present?

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

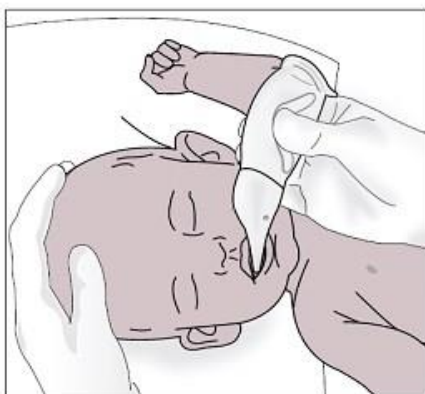
Use a bulb syringe or a catheter attached to mechanical suction to remove any fluid that appears to be blocking the airway.

After delivery, the appropriate method for clearing the airway further will depend on

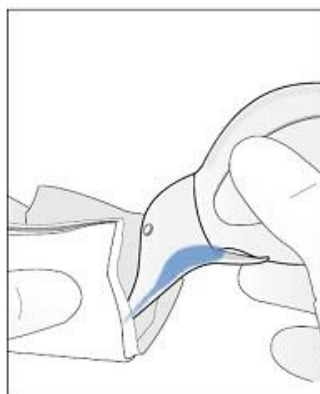
- The presence of meconium on the baby's skin or in the airway.
- The baby's level of activity.



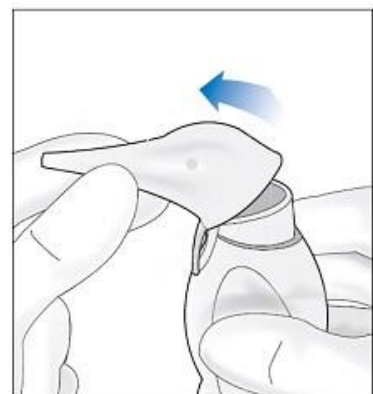
### Suction the Mouth and Nose (M before N)



*To suction*



*To empty during suction*



*To prepare for cleaning after use*

### Penguin suction device

What to do if meconium is present and the baby is pink, crying and has a good tone?

If the baby born with meconium-stained fluid has a normal respiratory effort, normal muscle tone, and a heart rate greater than 100 bpm, simply clear secretions if necessary.

### **What do you do if meconium is present and the baby is not vigorous?**

If the baby is born through meconium stained amniotic fluid and has depressed respirations, has depressed muscle tone, and/or has a heart rate below 100 bpm, suctioning of the mouth and nose soon after delivery is indicated.

### **What do you do after the initial steps?**

Evaluate the baby in the following order:

**Respiration;** there should be good chest movements, and the rate and depth of respirations should increase after a few seconds of stimulation.

**Heart rate;** the heart rate should be more than 100 bpm.



The easiest and quickest method to determine the heart rate is to feel for the pulse at the base of the umbilical cord or you can listen over the heart using a stethoscope.

A good way to indicate to your colleague the rate of the heartbeat is to tap it out with your finger.

**Count the heart rate for 6 seconds and multiply by 10 to calculate the heart**

**rate per minute.**

**Colour;** the baby should have pink lips and trunk. There should be no central cyanosis once the baby has good respiration and heartbeat.

## **B - Positive Pressure Ventilation with bag and mask**

Indications for bag and mask ventilation are:

- Baby is not breathing or is gasping,

- Heart rate is less than **100 bpm**, even with spontaneous breathing
- Persistent central cyanosis despite oxygen

**Ventilation is the single most important and most effective step in cardio-pulmonary resuscitation of the compromised newly born baby.**

Priority should be given to providing adequate ventilation rather than to chest compressions.

### Appropriately sized masks

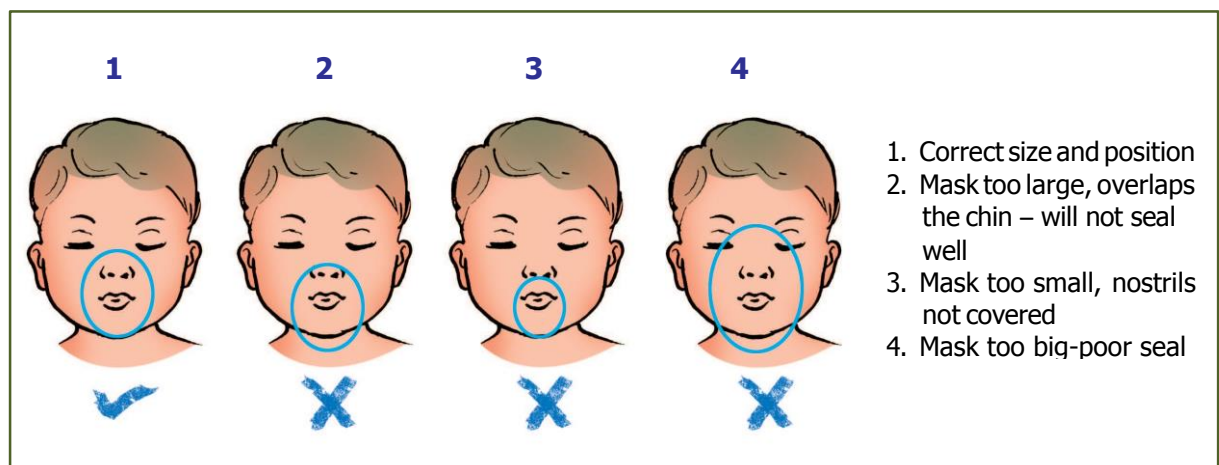
A variety of mask sizes, appropriate for babies of different sizes, should be available at every delivery, since it may be difficult to determine the appropriate size before birth. For the mask to be of the correct size, the rim will cover the tip of the chin, the mouth, and the nose but not the eyes.

Too large- will not seal well and may cause eye damage.

Too small-will not cover the mouth and nose and may occlude the nose.

### Shape of face masks

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



### How do you position the bag and mask on the face?

Place the mask on the face so that it covers the nose and mouth, and the tip of the chin rests within the rim of the mask.

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

patent airway.

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### ***Ventilating a neonate with bag and mask***

***Pull the jaw forwards towards the mask with the third finger of the hand holding the mask.***  
***Do not hyperextend the neck.***



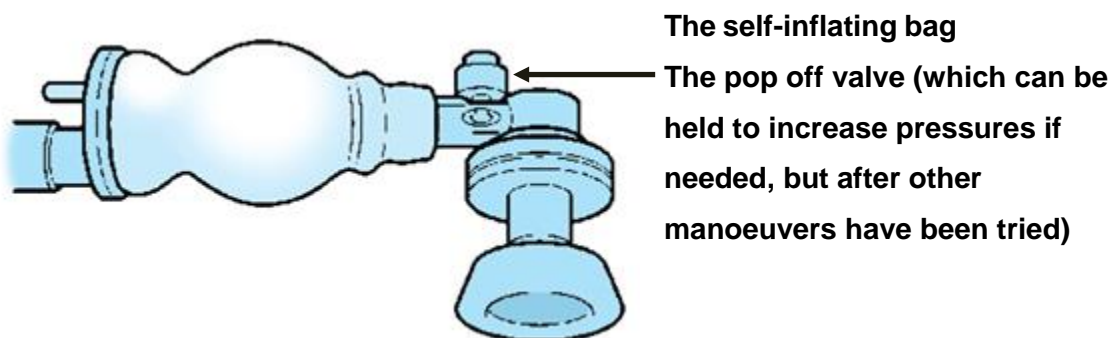
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### **Safety features**

To minimize complications resulting from high ventilation pressures, bags have certain safety features to prevent or guard against inadvertent use of high pressures. They have a pressure-release valve (**commonly called pop-off valve**), which generally is set by the manufacturer at 30 to 40 cm H<sub>2</sub>O. If a peak inspiratory pressure greater than 30 to 40 cm H<sub>2</sub>O is generated, the valve opens, limiting the pressure that is transmitted to the newborn.

### **Use of self-Inflating bag to ventilate newborns**

The self-inflating bag, as its name implies, inflates automatically, it remains inflated at all times, unless being squeezed. Peak inspiratory pressure (PIP) also called peak inflation pressure is controlled by how hard the bag is squeezed.



### **How to assess the effectiveness of positive-pressure ventilation?**

The best indicator that the mask is sealed and the lungs are being adequately inflated is the chest movements with each breath. Most newborns respond to effective ventilation with a rising heart rate that exceeds 100 beats per minute, improvement in colour and, finally, spontaneous respiratory effort.

### **What ventilation rate should you provide during bag and mask?**

During the initial stages of neonatal resuscitation, breaths should be delivered at a rate of 40 to 60 breaths per minute, or slightly less than once a second.

### **What concentration of oxygen should be used when giving positive-pressure ventilation during resuscitation?**

Resuscitation of term newborns with **room air** is just as successful as resuscitation with 100% oxygen. Ventilation of the lungs is the single most important and most effective step, regardless of the concentration of oxygen being used.

During ventilation of preterm babies born at or before 32 weeks of gestation, it is recommended to start oxygen therapy with 30% oxygen. If blended oxygen is not available then it is better to use air rather than with 100% oxygen (5).

### **How do you know if the baby is improving and that you can stop positive pressure ventilation?**

Improvement is indicated by the following 4 signs:

- Increasing heart rate
- Improving colour
- Spontaneous breathing
- Improving muscle tone

### **What do you do if the heart rate, colour, and muscle tone do not improve and baby's chest is not moving during bag and mask ventilation?**

Possible reasons for ineffective ventilation:

1. The seal is inadequate
2. The airway is blocked
3. Not enough pressure is being used to inflate the lungs

#### **1. Inadequate seal**

If you hear or feel air escaping from around the mask, reapply the mask to the face and try to form a better seal. Use a little more pressure on the rim of the mask and lift the jaw a little more forward. Do not press down hard on the baby's face. The most common place for a leak to occur is between the cheek and bridge of the nose.



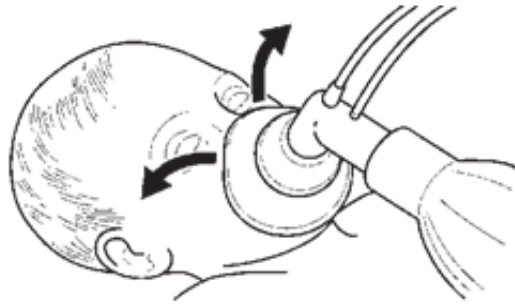
## Why is establishing a seal between the mask and the face so important?

An airtight seal between the rim of the mask and the face is essential to achieve the positive pressure required to inflate the lungs with the bag.

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### **Inadequate seal**

If you hear air escaping from the mask, form a better seal. The commonest leak is between the nose and the cheeks.



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## **2. Blocked airway**

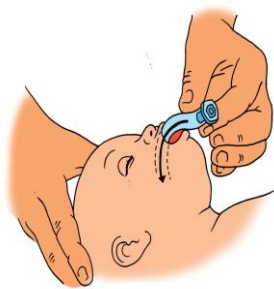
Another possible reason for insufficient ventilation of the baby's lungs is a blocked airway.

To correct this -

- Check the baby's position and extend the neck a bit further.
- Check the mouth, oropharynx, and nose for secretions; suction the mouth and nose if necessary.
- Try ventilating with the baby's mouth slightly open (especially helpful in extremely small premature babies with very small nares).
- Place a Guedal airway to help keep the airway open

## **Insertion of an oropharyngeal (Guedel) airway**

The oropharyngeal or Guedel airway can be used to improve airway opening. An appropriate sized airway goes from the angle of the mouth to the angle of the jaw when laid on the face with the convex side up.



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Select an appropriate sized airway

Position the child to open the airway

Insert the oropharyngeal airway the convex side up.

Re-check airway opening.

Use a different sized airway or reposition if necessary.

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### 3. Not enough pressure

Gradually increase the pressure by squeezing the bag more every few breaths until there are visible chest movement with each breath. If this does not work, occlude the pop off valve for a few breaths to see if the chest moves better.

#### Technique for improving positive-pressure ventilation by bag and mask

Corrective Steps	Actions
Mask adjustment	Be sure there is a good seal of the mask on the face.
Reposition airway	The head should be in the “neutral position”
Suction mouth and nose	Ventilate with the baby’s mouth slightly open and lift the jaw forward  if these manoeuvres do not help place an airway
Pressure increase	Gradually increase the pressure every few breaths, until there are visible movements with each breath.

#### Is there anything else to do if positive-pressure with a bag and mask is to be continued for more than 2 minutes?

The problems related to gastric/abdominal distention and aspiration of gastric contents can be reduced by inserting an orogastric tube, aspirating gastric contents, and leaving the gastric tube in place and uncapped to act as a vent for stomach gas throughout the remainder of the resuscitation.

## C - Chest Compression

#### What are the indications for beginning chest compressions?

Chest compressions should be started whenever the heart rate remains less than 60 bpm **despite** effective positive-pressure ventilation. (You assess the heart rate after the first 30 seconds of effective ventilation. Use the umbilical cord or listen with a stethoscope in the newborn. If the pulse is slow or absent in the neonate you give BMV for 30 seconds and reassess, if it is still slow or absent then you start chest compressions.)

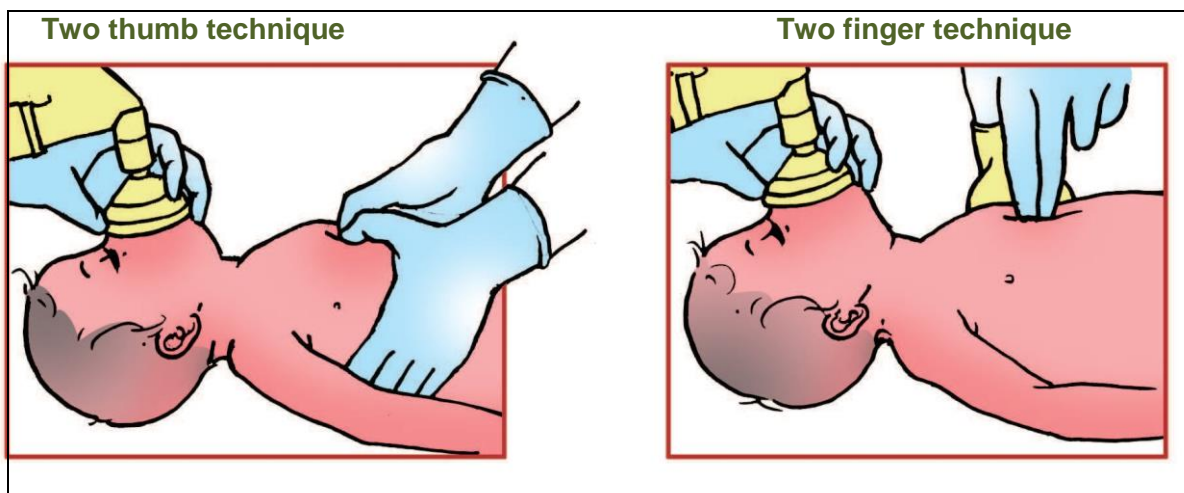
## How many people are needed to administer chest compressions, and where should they stand?

Remember that chest compressions are of little value unless the lungs are also being ventilated with oxygen. Therefore, 2 people are required. One administers effective ventilation and one to compress the chest.

## How do you position your hands on the chest to administer chest compressions?

There are two techniques for performing chest compression. These techniques are

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



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



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

### How do you position your hands using the thumb technique?

The thumb technique is accomplished by encircling the thorax with both hands and placing the thumbs on the sternum and the fingers under the baby's back supporting the spine.

The thumbs can be placed side by side or, on a small baby, one over the other.

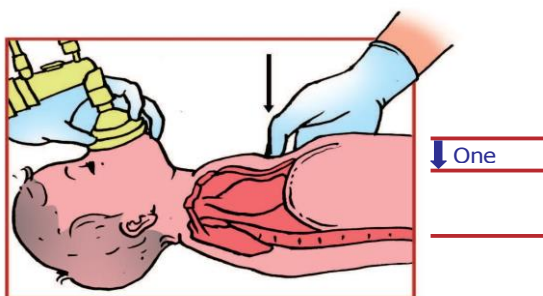
The thumbs will be used to compress the sternum, while your fingers provide the support needed for the back. The thumbs should be flexed at the first joint and pressure applied vertically to compress the heart between the sternum and the spine. Lift your thumbs off the chest during ventilation to avoid restricting effective ventilation.

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

In the 2-finger technique, the tips of the middle finger and either the index or ring finger of one hand are used for compressions. Position the 2-fingers perpendicular to the chest as shown, and press with the fingertips. As with the thumb technique, apply pressure vertically to compress the heart between the sternum and the spine.

### How much pressure do you use to compress the chest?

Controlling the pressure used in compressing the sternum is an important part of the procedure. With the fingers and hands correctly positioned, use enough pressure to depress the sternum to a depth of approximately one third of the anterior posterior diameter of the chest and then release the pressure to allow the heart to refill. One compression consists of the downward stroke plus the release. The actual distance compressed will depend on the size of the baby.



**Depress the sternum to a depth of approximately one third of the diameter of the chest**

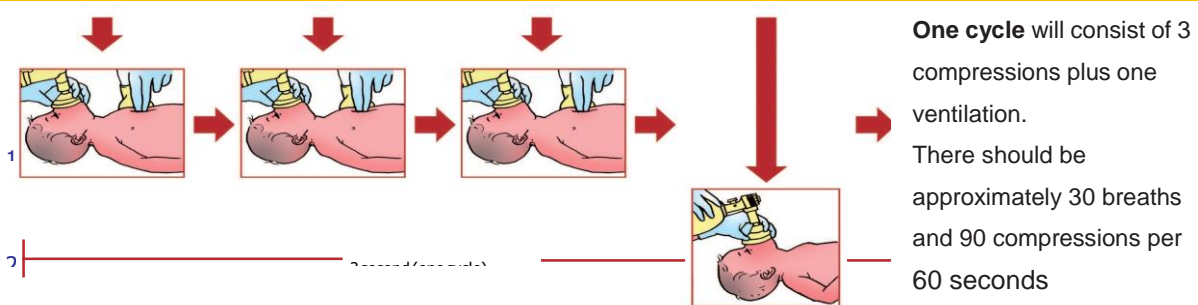
## Are there dangers associated with administering chest compressions?

Chest compressions can cause trauma to the baby.

Two vital organs lie within the ribcage-the heart and lungs. Pressure applied too low, over the xiphoid, can cause laceration of the liver. Also, the ribs are fragile and can easily be broken.

## How often do you coordinate compressions with ventilation?

Three compressions to one BMV i.e. a ratio of 3:1



One.....and Two.....and Three.....And Bag .....and

After approximately 30 seconds of well-coordinated chest compressions and ventilation, stop compressions long enough to determine the heart rate again. Feel the pulse at the base of the cord.

### If the heart rate is now above 60 bpm

Discontinue chest compressions, but continue positive-pressure ventilation now at a more rapid rate of 40 to 60 breaths per minute.

Once the heart rate rises above 100 bpm and the baby begins to breathe spontaneously, slowly withdraw positive pressure ventilation and assess for spontaneous ventilation.

### If the heart rate remains below 60 bpm

Despite good ventilation of the lungs with positive-pressure ventilation and improved cardiac output from chest compressions, a very small number of newborns (fewer than 2 per 1,000 births) will still have a heart rate below 60 bpm. Continue cardiopulmonary resuscitation in these neonates.

**What should you do if the baby is in shock, there is evidence of blood loss, and the baby is responding poorly to resuscitation?**

Babies in shock appear pale, have delayed capillary refill and have weak pulses. They may have a persistently low heart rate, and circulatory status often does not improve in response to effective ventilation, and chest compressions. If the baby appears to be in shock and is not responding to resuscitation, administration of a volume expander (fluids) and blood may be indicated.

### **What should you do after a baby has been successfully resuscitated?**

Babies who required prolonged bag and mask ventilation and /or chest compressions are likely to have been severely stressed. Following resuscitation, some babies will breathe normally, some will have ongoing respiratory distress. All babies should have a heart rate above 100 beats per minute (bpm) and normal SpO2 by 10 minutes.

### **Post Resuscitation Care**

Babies requiring bag and mask ventilation (more than 5 minutes) and/or chest compressions require post resuscitation care. These babies need to be transferred to the newborn care unit. They require ongoing evaluation, monitoring and management.

### **Cessation of resuscitation**

It is appropriate to discontinue after effective resuscitation efforts if:

- Infant is not breathing and heartbeat is not detectable beyond 10 min, stop resuscitation.
- If no spontaneous breathing and heart rate remains below 60/min after 20 min of effective resuscitation, discontinue active resuscitation.

Record the event and explain to the mother or parents that the infant has died. Give them the infant to hold if they so wish.

**Refer immediately** to the nearest health facility with a neonatal care unit if the baby:

- ❖ Has birth weight less than 1800 grams
- ❖ Has major congenital malformation/ severe birth injury
- ❖ Has severe respiratory distress
- ❖ Bag and Mask more than 5 minutes or needing chest compression

## Session 4 Breathing difficulties in the newborn

### Why are breathing difficulties in the newborn so important?

Breathing difficulties are the most common way that sick neonates present to the healthcare worker. There are several different possible diagnoses and these need to be considered in order to provide the correct management.

### Learning objectives

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

- ❖ Describe how to manage a neonate with respiratory distress
- ❖ Define apnoea and describe how to treat and prevent apnoea

### Newborns at risk of developing breathing problems

- Preterm Infants
- Infants born to mothers with fever, prolonged ROM, foul-smelling amniotic fluid.
- Meconium in amniotic fluid.
- Infants born by Caesarean Section or after a quick delivery
- Infants with birth asphyxia
- Infants of Diabetic Mothers

### Signs and symptoms

- Fast breathing- respiratory rate of more than 60 breaths per minute.
- Grunting
- Nasal flaring
- Cyanosis
- Severe chest in drawing

### Possible causes

- Respiratory distress syndrome (common in premature neonates)
- Transient Tachypnoea of the Newborn (TTN) (common in babies born by Caesarean Section or after a quick delivery)
- Sepsis (more common in very premature and where there are risk factors for sepsis such as prolonged rupture of the membranes)
- Pneumonia
- Meconium aspiration (note not born through meconium but born through meconium *and* has respiratory distress)
- Cardiac failure

- **Management**

- Clear airway if necessary, position.
- Give oxygen via nasal cannula 0.5-1 litre per minute. (30-35% oxygen concentration)
- Give antibiotics if persistent respiratory distress after 4 hours of age or if the working diagnosis includes sepsis, pneumonia or meconium aspiration syndrome.
- Feed via a NGT if the baby is in severe respiratory distress

Consider CPAP If the newborn condition does not improve

Continuous positive airway pressure therapy is recommended for the treatment of preterm newborns with respiratory distress syndrome and should be started as soon as the diagnosis is made (5).

### **Continuous Positive Airway Pressure (CPAP)**

#### **Definition:**

A process of giving continuous flow of air under regulated pressure through the airway.

#### **Indication:**

Newborn presenting with severe respiratory distress primarily from a respiratory complication

Patients with the following conditions can benefit from bCPAP:

- Respiratory distress syndrome
- Meconium aspiration syndrome
- All forms of pneumonia or pneumonitis
- Apnoea of prematurity

*Refer to the  
CPAP  
procedure  
manual for  
the rest of the  
management*

Babies unlikely to benefit from CPAP

- Newborn with stage III HIE
- Newborn with cyanotic congenital heart disease

### **Management of a baby on CPAP**

Admit the baby near the nurses' station for close observation.

Monitor vital signs every 15 minutes until stable then every 30 minutes.

Check oxygen saturation for the first 30 minutes if saturation does not improve then increase concentration of oxygen.

Feed through OG tube

Inspect position of the nasal prongs 2 hourly to ensure patent airway.

Put nasal drops (normal saline) every 4hrs to prevent nasal dryness.

## Apnoea

Definition: cessation of breathing for longer than 20 seconds which may be associated with bradycardia. It may be primary due to prematurity or secondary to other conditions such as -

- Respiratory Distress
- Infections
- Cold-stressed babies who are being warmed
- Low Blood volume or low Hematocrit
- Low blood glucose

## Investigations

Blood sugar

Temperature

PCV

Sepsis work up

CXR

Consider if the baby is having a seizure

## Treatment

Determine cause and treat

General measures: tactile stimulation, correct anaemia, maintain normal body temperature; look for electrolyte imbalance, intraventricular haemorrhage, signs or symptoms of sepsis, patent ductus arteriosus, necrotising enterocolitis and gastro-oesophageal reflux, and treat accordingly.

Give aminophylline for prevention of apnoeas of prematurity

Aminophylline doses: 6mg/kg PO stat to load (may also be given IV)

followed by 2.5mg/kg bd (twice daily) PO (may also be given IV)

Dissolve 100mg tablets in 20mls of water, each ml of solution contains 5mg of aminophylline

See wall chart for the doses of oral aminophylline when using a solution made from a tablet.



### **When to start aminophylline**

About 25% of neonates <34 weeks have apnoeas of prematurity therefore it is reasonable to start aminophylline prophylactically to all premature infants of gestational age <34 weeks or weight < 1800 grams

### **When to stop aminophylline**

Stop aminophylline when both of the following conditions have been met -

The gestational age >37 weeks (or weight of > 2500 g if gestational age is not known)  
**and** the infant has been apnoea free for 7 days

## Session 5 Birth asphyxia

Birth asphyxia is very common in Malawi and the optimal management of these infants is therefore very important.










### Learning objectives

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

- ❖ Identify birth asphyxia
- ❖ Classify birth asphyxia
- ❖ Describe the management of babies who have birth asphyxia

**Suspect asphyxia if a child has been given low APGAR scores at birth**

	Score 0	Score 1	Score 2
Appearance			
Pulse	No pulse	< 100/min.	> 100/min.
Grimace			
Activity			
Respirations	No respirations	Weak, slow	Strong cry

### Post Resuscitation care of asphyxiated newborn

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Lack of oxygen supply to organs before, during or immediately after birth results in asphyxia which is recognized by either delayed onset of breathing/cry with/without need for assisted ventilation.

Clinical features that these babies could manifest immediately and during the first 2-3 days of life include irritability or coma, hypotonia or hypertonia, convulsions, apnea, poor suck and feeding difficulty. Classify the degree of Hypoxic Ischaemic Encephalopathy (HIE) according to the table below. Babies with mild and moderate HIE generally have a good prognosis and do well. An infant who, within a week of birth, is still floppy or spastic, unresponsive and cannot suck has a severe brain injury and will do poorly.

### Classification of Hypoxic Ischemic Encephalopathy (HIE)

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

### Distinguishing between convulsions and 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

### Key facts for providers' - supportive management of birth asphyxia

Check for emergency signs ABC and provide emergency care

Place these babies under radiant warmer to **maintain normal temperature** as they usually have difficulty in maintaining normal body temperature.

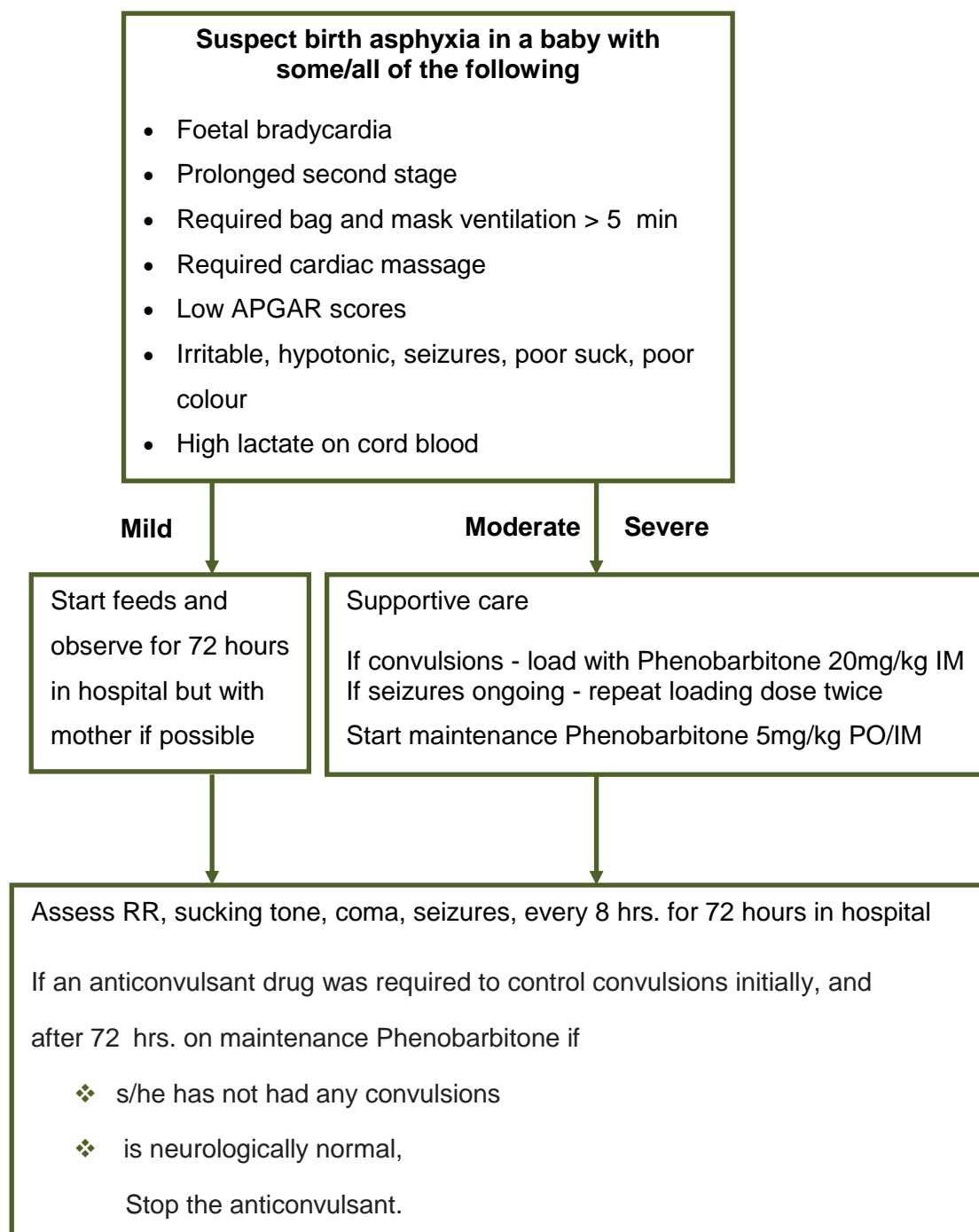
**Check blood glucose** and if hypoglycaemia is detected, treat

If not hypoglycaemic check blood glucose every 12 hrs.

**Fluids:** In a baby with emergency signs (breathing difficulty, shock, coma or convulsions), provide maintenance intravenous fluids using wall charts and according to age after initial stabilization of emergency signs.

**Feeding:** If the baby has neither emergency signs nor abdominal distension, consider enteral feeding. If the baby is sucking well, initiate breast feeding or initiate tube feeding with breast milk in those with poor/no sucking using wall charts to determine the volume.

## Management of Birth Asphyxia



Document in health passport and classify HIE as mild, moderate or severe.

If severe arrange follow up as the infant may develop epilepsy and need physiotherapy

## SECTION II -Session 6 Temperature control in NYI

### Learning objectives

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

- ❖ Identify hypothermia
- ❖ Classify the degree of hypothermia
- ❖ Be able to measure temperature with and without a thermometer
- ❖ Describe how hypothermia occurs and how to prevent it in the neonate
- ❖ Describe methods to rewarm a hypothermic NYI

The NYI is most vulnerable to hypothermia during the first few hours after birth, although the condition may occur later too, for example during bathing, on a cold night or during transportation, if measures to keep the baby warm are inadequate. (Sick or low birth weight babies admitted to neonatal units with hypothermia are **more likely to die** than those admitted with normal temperatures).

### Classification

The NYI has a normal body temperature between 36.5-37.5°C.

Classification of hypothermia	Temperature
Mild hypothermia	36.0-36.4°C (96.8-97.5°F)
Moderate hypothermia	32.0-35.9°C (89.6- 96.6°F)
Severe hypothermia.	below 32.0°C (89.6°F)

### Assessment of temperature by touch

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An easy way to assess newborn baby's temperature is by 'touch'. This can be easily taught to mothers and health workers. The baby's abdomen is felt with the back of hand and compared with the health care worker's forehead. Abdominal temperature represents the core temperature and it is reliable in the diagnosis of hypothermia. The warm and pink feet of the baby indicate that the baby is in thermal comfort. But when feet are cold and trunk is warm, it indicates that the baby has cold stress.

### Temperature recording

Preferably use an electronic thermometer in the NYI.

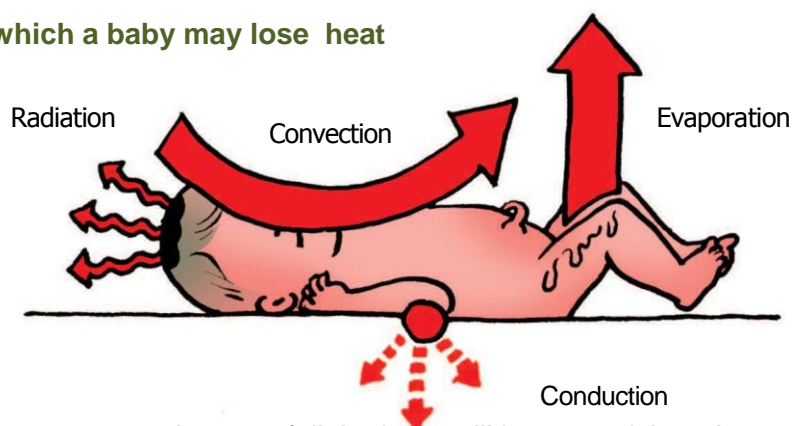
**Axillary temperature:** This method is as good as rectal and probably safer (less risk of injury or infection). The temperature is read after one minute. For digital thermometers, record the temperature after the reading has stabilized with a bleep.

**Rectal temperature:** Do not use this method for routine monitoring. However, it is the best guide for core temperature in cold (hypothermic) sick neonates.

#### Four ways a neonate may lose heat to the environment

Newborn baby's temperature falls within seconds of being born and sick NYI are often hypothermic

#### The 4 ways by which a baby may lose heat



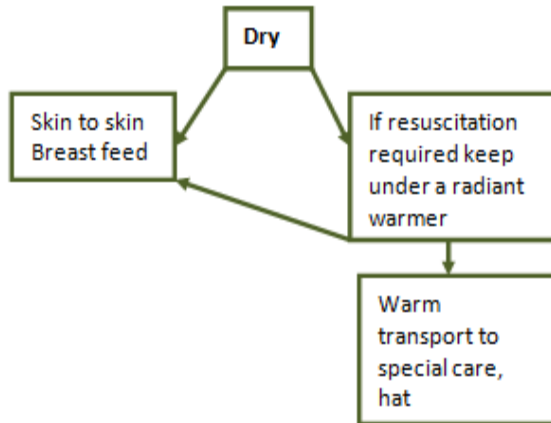
If the temperature continues to fall the baby will become sick and may even die.

Method of heat loss	Prevention
Evaporation (e.g. wet baby)	Immediately after birth dry baby with a clean, warm, dry cloth
Conduction (e.g. contact with a cold surface of a weighing scale).	Put the baby on the mother's abdomen or on a warm surface, delay weighing if room too cold
Convection (e.g. exposure to draught)	Close the windows, switch off fans
Radiation (e.g. Cold surroundings)	Provide a warm, draught free room for delivery; at least 25°C

## Key facts for providers - How to examine the newborn

### The warm chain for the neonate

These are procedures to be taken at birth and during the next few hours and days in order to minimize heat loss in all newborns.



### 10 steps in warm chain:

1. Warm delivery room
2. Immediate drying
3. Skin to skin contact
4. Breast feeding
5. Bathing and weighing postponed
6. Appropriate clothing/bedding
7. Mother and baby kept together
8. Warm transportation
9. Warm resuscitation
10. Training and awareness raising

## Signs and symptoms of hypothermia

The body cannot function well when it is cold. The baby

- is less active / lethargic
- does not breast feed well has a weak cry
- has respiratory distress

## **Prevention of Hypothermia in the neonate**

### **In the delivery room**

#### **Skin-to-skin contact (Kangaroo mother care)**

If there are no signs of distress, a mother can provide a warm environment with skin to skin contact for the baby. If the baby is <2500 grams this should be continued as kangaroo mother care. Place the baby, with a nappy and hat; upright inside mothers' clothing against mother's bare skin over the chest (a loose blouse, sweater or wrap tied at the waist holds the baby). The baby should wear a hat. Let baby suckle at the breast as often as s/he wants, but at least every 2 hours.

#### **Bathing and weighing postponed**

Bathing should be delayed until at least 24 hours after birth. Blood, meconium and some of the vernix will have been wiped off during drying at birth. The remaining vernix does not need to be removed as it is harmless, may reduce heat loss and is reabsorbed through the skin during the first days of life.

Weighing the baby at birth also puts it at risk of heat loss and should be postponed for several hours unless the room temperature is warm.

#### **Cot-nursing in hospital (mother cannot stay with the baby)**

##### **Appropriate clothing and bedding**

As a general rule, newborns need one or two more layers of clothing and bedding than adults. Covers should not be tight to allow air spaces between the layers as trapped air is a very efficient insulator. Keep ambient atmospheric temperature warm for baby's weight and postnatal age. Monitor body temperature frequently at least 3 hourly during the initial postnatal days.

##### **Hot cot**

If a baby cannot stay with his mother using Kangaroo care then a warm cot is helpful. The Blantyre Hot Cot is a simple incubator that uses four 60 watt light bulbs to raise the air temperature within the cot by 1.5C per light bulb. A baby may need one, two, three or all four bulbs to be on to stay warm.



### Treatment of established hypothermia in the NYI

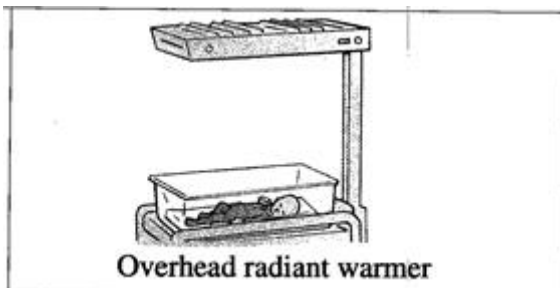
The NYI should be quickly rewarmed. The method selected for rewarming will depend on how sick the NYI is and availability of mother, staff and equipment.

**The methods to use include:**



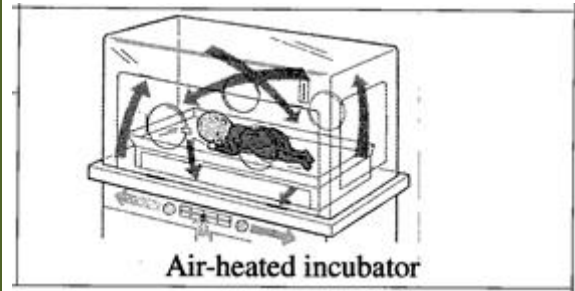
**Skin-to-skin contact** – This is the ideal method, if the baby is clinically stable. Make sure the room is warm. Place baby in skin-to-skin contact in a pre-warmed shirt opening at the front, a nappy, hat and socks. Cover the baby on the mother's chest with her clothes and an additional warmed blanket. Keep the baby with the mother until the temperature is normal.

**In a hot cot:** Either a preheated Blantyre Hot Cot or a cot with a hot water bottle (this should be removed before the baby is put in). Remove baby's cold clothes and replace - with pre-warmed clothes



**Under a radiant warmer**

**In an incubator** - air-heated incubator, with the air temperature set at 35-36°C. Once the baby's temperature reaches 34°C, the rewarming process in an air-controlled incubator should be monitored to avoid overheating.



Note: There is insufficient evidence to support superiority of either radiant warmers or incubators over the other for the care of preterm babies. In making any choice between the two devices, the health-care providers' preferences and costs should be considered (5).

### **Supportive Management**

The mother should continue breast feeding as normal but If the infant is too weak to breast feed, breast milk can be given by gastric tube. Every hypothermic newborn should be assessed for infection.

Monitor oxygen saturations, heart rate and glucose, some infants may develop apnoeas during rewarming.

Monitor axillary temperature every hour till it reaches 36.5°C

## Session 7 How to manage hypoglycaemia in NYI

Hypoglycaemia is common in LBW and very sick NYI and should always be considered early in the management. 20% of infants < 7 days have hypoglycaemia. And there is an increased association with mortality, convulsions and permanent brain injury.

### Learning objectives

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

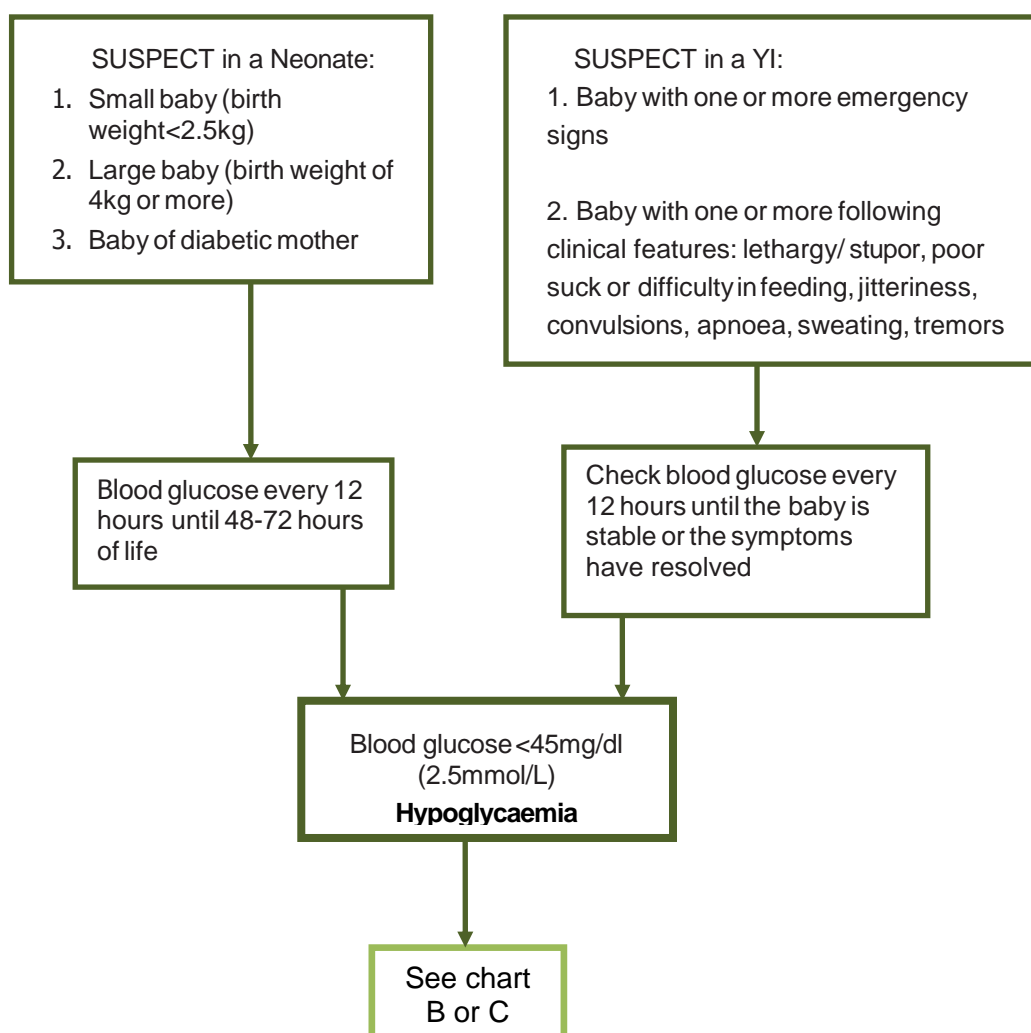
- ❖ Define hypoglycaemia
- ❖ Describe the treatment of hypoglycaemia in a symptomatic and asymptomatic NYI

Defined as < 45mg/dl (2.5 mmol/L) for NYI

**Check for blood glucose in all sick NYI**

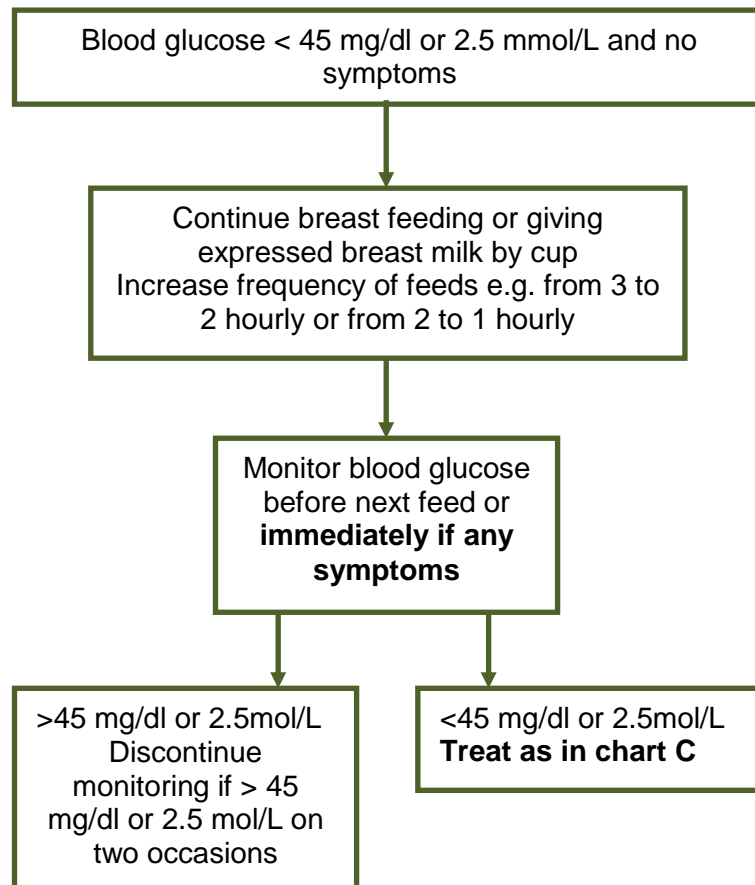
### Identify a NYI with hypoglycaemia

Chart A



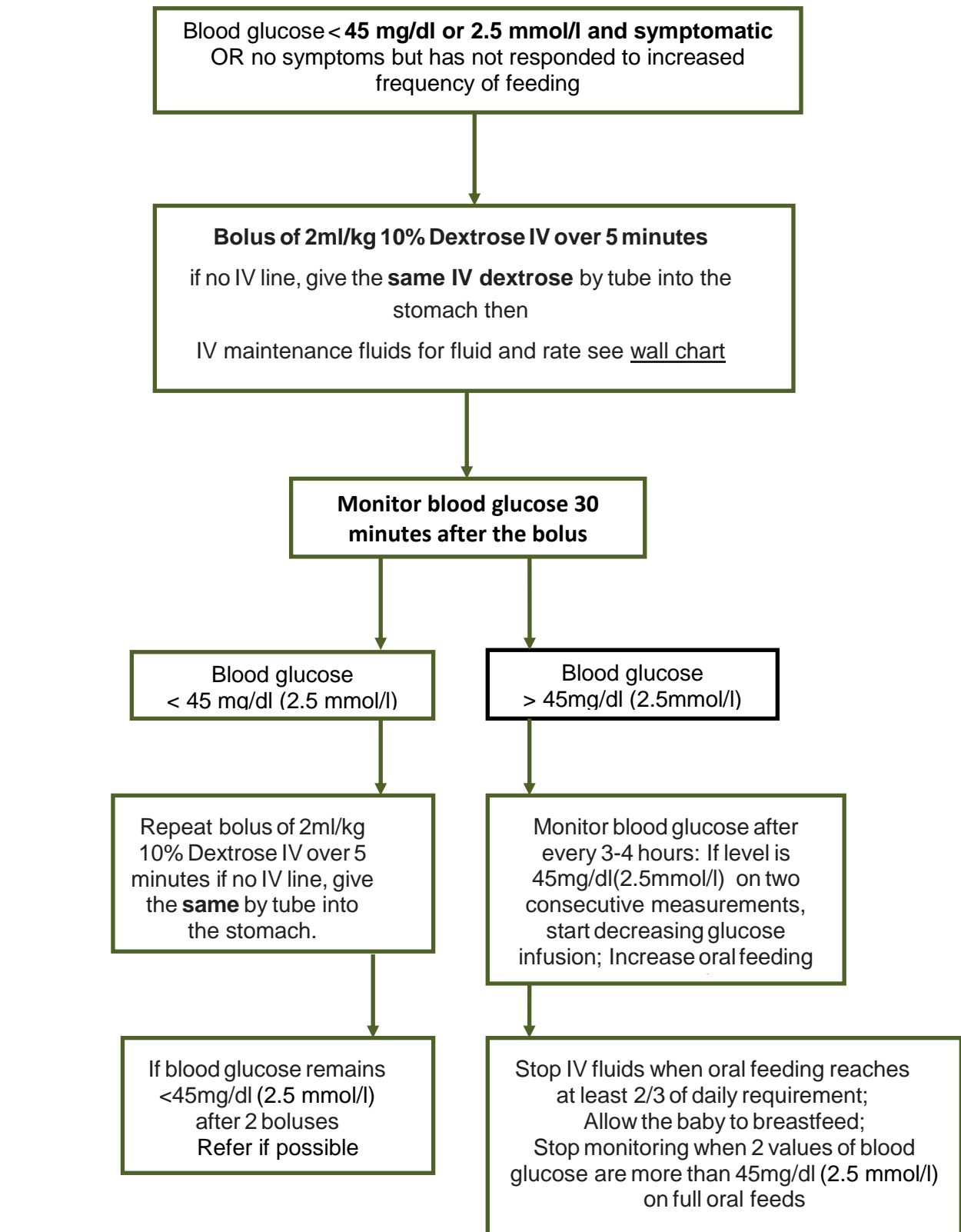
**Management of a baby with blood glucose of less than <45 mg/dl  
(2.5 mmol/l) and NOT symptomatic**

**Chart B**



**Management of a baby with blood glucose of less than < 45 mg/dl  
(2.5 mmol/l) and symptomatic**

**Chart C**



## How to make up a 10% dextrose solution when you only have 50% dextrose

	Water for Injection or Ringers Lactate or Normal Saline	50% Dextrose
	<b>4 parts</b>	<b>1 part</b>
<b>5 ml syringe</b>	<b>4mls</b>	<b>1ml</b>
<b>10 ml syringe</b>	<b>8mls</b>	<b>2mls</b>
<b>20 ml syringe</b>	<b>16mls</b>	<b>4mls</b>
<b>50 ml syringe</b>	<b>40mls</b>	<b>10mls</b>
<b>100 ml burette</b>	<b>80mls</b>	<b>20mls</b>
<b>200 ml bag</b>	<b>160mls</b>	<b>40mls</b>

To make a litre bag of fluids up to 10% dextrose you will require 200mls of 50% dextrose

Instead empty out some of the fluid until there is only 200mls left (4 parts) and then add 50mls of 50% dextrose (1 part) to make up 250mls of a 10% dextrose solution.

<b>250mls in a litre bag</b>	<b>200mls</b>	<b>50mls</b>
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## Session 8 How to deliver oxygen to a NYI

### Learning objectives

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

- ❖ Know when to administer oxygen
- ❖ Describe when oxygen is needed
- ❖ Know how to deliver oxygen therapy
- ❖ Know when to stop oxygen therapy

### An infant who has signs of severe respiratory distress requires oxygen

Grunting  
Cyanosis  
Head nodding  
Respiratory rate > 80/min  
Severe lower chest in-drawing  
Apnoeic spells  
Unable to feed due to respiratory distress

Confirm with oxygen saturations if available.  
The NYI requires oxygen if oxygen saturation is **less than 90% (<90%)**

A baby with cyanosis or severe respiratory distress should be allowed to take a comfortable position of his choice and should be given oxygen immediately via prongs or catheter. Escalate the oxygen therapy in a stepwise fashion depending on availability.

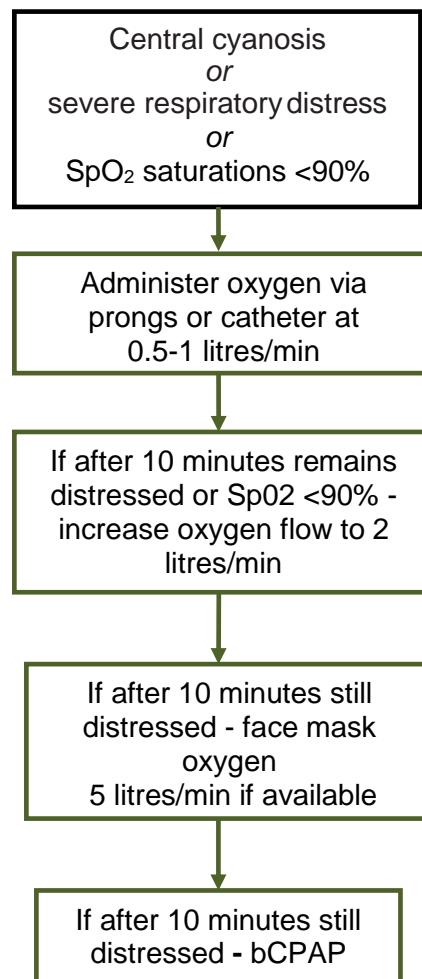
### If the baby's breathing difficulty does not improve on prongs or catheter oxygen, despite increasing the flow:

Place the NYI on oxygen at a high flow rate (5 litres/min) via face mask if possible or if this is unavailable, or if the breathing difficulties persist then place the baby on bCPAP if available

### Monitor and teach the mother to monitor the infant, look for the following problems

1. Displacement of the prongs or catheter
2. The concentrator malfunctioning or being accidentally switched off
3. The airways may become blocked with mucus
4. The abdomen may become distended with air

## Stepwise escalation of oxygen therapy according to the NYI condition



If breathing difficulty is so severe that the baby has central cyanosis even with high flow oxygen or bCPAP, organize transfer of the NYI to a tertiary hospital if possible.

### When and how to stop oxygen therapy

Continue giving oxygen continuously until the infant is able to maintain a SaO<sub>2</sub> >90% in room air. When stable and improving, take the infant off oxygen and recheck oxygen saturations after 30 minutes. If the infant's saturations remain above 90% s/he may remain off oxygen but check the saturations 4 hourly thereafter on the first day off oxygen to ensure the child is stable.

Where pulse oximetry is not available, the duration of oxygen therapy is guided by clinical signs. If oxygen saturations are not available the oxygen can be stopped if the baby does not have respiratory distress, but keep under review and recommence if the respiratory distress increases after stopping the oxygen.

Avoid prolonged SpO<sub>2</sub> >95% in premature newborn infants.



The source of oxygen is generally the oxygen concentrator. These usually deliver 5 litres of oxygen per minute and there is a gauge for adjusting the concentration of oxygen. The filter at the back of the concentrator should be cleaned every day to keep them working well. Sufficient oxygen should be given to keep oxygen saturations above (>) 90%

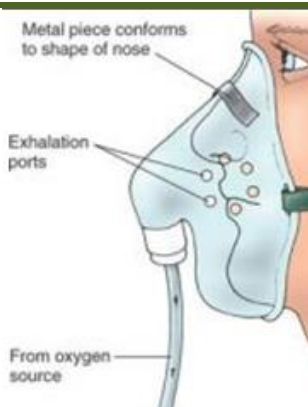


**Nasal Prongs:** Prongs come in different sizes. Nasal prongs are preferred over nasal tube or catheter for delivering oxygen to young infants. Place them just inside the nostrils and secure with a piece of tape on the cheeks near the nose.

Take care that the nostrils are kept clear of mucus, which could block the flow of oxygen. A flow rate of 0.5-1 litres/min will deliver 30-

35% oxygen concentration in the inspired air. If severe respiratory distress or saturations < 90% increase oxygen to 2 litres/min

**Nasal tube or catheter:** Use a 6 French size catheter. Determine the distance the tube should be passed by measuring the distance from the side of the nostril to the inner margin of the eyebrow. Gently insert the catheter into the nostril. A flow rate of 0.5-1 litres/min in infants will deliver 30-35% oxygen. Aim for oxygen saturations >90%. If < 90% increase oxygen to 2 litres/min



A simple **face mask** will deliver 40-60% oxygen in an emergency and if the infant is very distressed.

A minimum of 5 litres of oxygen per minute is needed to prevent rebreathing of expired air.

A face masks with a reservoir attached will deliver 100% oxygen may be used for resuscitation.

The problem with this method is that it may require one concentrator per NYI which may be challenging if several NYI require oxygen at the same time.

## Session 9 Fluid management in a NYI

### Learning objectives

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

- ❖ Describe how maintenance fluids are calculated according to weight and age
- ❖ List indications for Intravenous (IV) fluids
- ❖ Describe how to monitor a NYI who is receiving IV fluids
- ❖ Describe when and how to introduce oral fluids

### Feeding

Exclusive breast-feeding is recommended in the majority of cases as it provides the best protection from disease and nutrition whilst promoting growth and development. Well term infants should be breast fed on demand. If this is not possible – e.g. mum or infant is sick, then expressed breast milk should be given. **Maintenance fluid is the amount of fluid required to replace losses and is calculated on the age and weight of the infant.**

Feeds are given every two or every three hours by naso/oro-gastric tube or cup feeding depending upon the maturity of the baby. Premature infants < 34 weeks may not be able to breast feed and will require tube or cup feeds. Premature infants should be fed smaller volumes, more frequently as their stomach volume is small, ideally every two hours. During the first few days of life, baby's kidneys' do not function normally and feeds are therefore increased slowly over the first few days.

#### The calculation of oral maintenance fluids for NYI who are unable to breast feed

Day of life	How to calculate maintenance fluid requirements (1)
Day 1	60 ml/kg per day
Day 2	90 ml/kg per day
Day 3	120 ml/kg per day
Day 4	150 ml/kg per day
Day 7 and LBW	When the infant tolerates oral feeds well, the amount of fluid might be increased to 180 ml/kg per day after some days.

See [wall charts](#) for the volume of feeds to give NYI depending on their age, maturity and feeding regime.

### Intravenous fluids

If there is a contraindication to oral feeding (including naso, oro-gastric tube and cup feeding) give IV fluids. Contra- indications to oral feeds may be medical or surgical.

### Contra indications to enteral feeding

Medical indications	Surgical indications
Apnoea Severe respiratory distress Frequent convulsions Unconscious	Bowel obstruction – vomiting and abdominal distension Necrotizing enterocolitis

#### Which fluid?

The choice of fluid depends on the age of the NYI. 10% dextrose is used for the first two days of life. On the third day this is changed to Ringers Lactate with added glucose to make it up to 10% dextrose(1).

#### What volume?

Maintenance fluid is the amount of fluid required to replace losses and is calculated on the age and weight of the infant. However parenteral IV fluids can quickly overhydrate a NYI.

**Do not exceed 100 ml/kg per day when administering maintenance fluids by the IV route to NYI.**

See wall charts for the volume of fluids per hour based on the child's weight and age.

**Monitor the IV infusion very carefully** (ideally through an in-line burette).

- Use a monitoring sheet.
- Calculate the drip rate.
- Check the drip rate and volume infused every hour.

#### Monitor the NYI clinical status

- Heart rate, pulse volume, respiratory rate and skin perfusion.
- Check for oedema/puffiness of eyes (may indicate volume overload)
- Weigh baby daily to detect excessive weight gain (excess fluid) or loss (insufficient fluid); adjust IV fluids appropriately.
- Check how frequently they are passing urine

Weight and urine output are the best overall clinical guides to assessing the adequacy of therapy. Introduce milk feeding by oro-gastric tube or breastfeeding as soon as it is safe to do so. Oral feeds are slowly increased while IVs are gradually withdrawn, the oral intake must be taken into account when calculating the IV rates. Reduce the IV fluid rates as the volume of

milk feeds increases in infants on oro-gastric feeds. Discontinue IV fluids once oral intake reaches 2/3rd total.

### Introducing enteral feeds when the baby has been on IV fluids

If stable and feeds are not contraindicated	If there is a contraindication to oral fluids/feeds
<p>Start enteral feeds 10mls/kg/day</p> <p>Measure gastric residual volume (GRV) by aspirating the stomach before next feed.</p> <p>If &gt;25% of total feed and/or there is abdominal distension do not increase the volume.</p> <p>Increase the feed if tolerated and stop the IV fluids when the baby is on 2/3rds maintenance</p> <p>If there is vomiting consider restarting IV fluids and stopping enteral feeds.</p>	<p>Continue IV fluids according to age</p> <p>Do not increase fluids and consider restricting fluids <b>if</b> there is</p> <ul style="list-style-type: none"> <li>• weight gain,</li> <li>• tachycardia,</li> <li>• oedema</li> <li>• puffy eyes</li> </ul>

### How to calculate the rate of IV fluids

<p><b>Giving IV fluids</b> How many drops a minute?</p> <p>In Malawi we have 3 different types of giving sets</p> <p>They have <b>1ml of fluid = 20 drops</b> ( most common)  <b>1 ml of fluid = 15 drops</b> (often with blood)  <b>1 ml of fluid = 60 drops</b> (paediatric)</p> <p>The plastic wrap in which the drip set is packed Has this information</p> <p><small>In tiny letters in one corner eg 1ml = 20drops</small></p>	<p><b>Giving IV fluids</b> How many drops a minute?</p> <p>To calculate how many drops at which to run the drip</p> $\frac{\text{Amount of fluid} \times \text{number of drops/ml}}{\text{number of minutes}}$ <p>If we want to give <b>40ml/hr</b> and <b>1ml of fluid = 20 drops</b></p> $\frac{40}{60} \times \frac{20}{1} = \frac{40}{3} = 13 \text{ drops a minute}$
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## Session 10 Jaundice

More than 50% of normal newborns and 80% of preterm infants have some jaundice.

Jaundice may be normal or abnormal and the healthcare worker needs to be familiar with its management.

### Learning objectives

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

- ❖ Describe physiological and pathological jaundice, including prolonged jaundice
- ❖ Describe how to evaluate jaundice including assess its severity
- ❖ Describe the management a jaundiced NYI

Physiological	Pathological	Prolonged/ pathological
Appears after 48 hours Maximum by 4 <sup>th</sup> and 5 <sup>th</sup> day in term and 7 <sup>th</sup> day in preterm Disappears without any treatment	Starting on the first day of life  Associated with fever  Deep jaundice: palms and soles	Jaundice lasting for longer than 14 days in term infants and 21 days in preterm infants.  Stool clay coloured and urine dark yellow
	Haemolysis  Congenital infection  Neonatal sepsis	Hypothyroidism Neonatal hepatitis Biliary atresia

### Evaluation for aetiology

#### History

Birth weight, gestation and postnatal age	Jaundice of prematurity
Assess clinical condition (well or ill) Lethargy, poor feeding, sepsis, urinary tract infection	Sepsis often causes jaundice
Birth asphyxia (5 min Apgar of 3 or less)	Birth asphyxia is often associated with jaundice

Onset of jaundice before 24 hours of age Family history of significant haemolytic disease Previous sibling received phototherapy Failure of phototherapy to lower the TSB	Incompatibility between mothers and babies blood, may cause severe haemoglobinopathy
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### On examination

Temperature instability: CNS signs (e.g. lethargy)	Meningitis, sepsis
Cephalohaematoma or significant bruising	This can lead to jaundice
Petechiae, hepato-splenomegaly	Congenital infection

### Assessment of severity of jaundice

Assess the level of jaundice clinically: blanching reveals the underlying colour. Neonatal jaundice first becomes visible in the face and forehead and gradually becomes visible on the trunk and extremities. This can be used to decide clinically when the baby should be treated. If possible confirm with a transcutaneous bilirubinometer or a serum bilirubin

Also assess for features of acute bilirubin encephalopathy, also called kernicterus and for dehydration which is commonly associated.

The bilirubinometer is useful to measure transcutaneous serum bilirubin but not widely available. It should be used on the chest and the forehead (which is not directly exposed to the phototherapy) and whichever value is highest should be used

### Treatment

The treatment for jaundice is phototherapy plus treating the underlying cause, for example sepsis.

**When to start phototherapy for jaundice see wall charts**

### Phototherapy

**Blue lights** : 4-6 fluorescent tubes (wavelength 450-475 nm) placed about 18" away from the cot or incubator. Blue tubes need to be changed after every 1500 hrs or every 3-6 months of usage

**LED lights** - as effective as blue fluorescent lights and recommended for providing intensive phototherapy. The lights are cold (may need to be used together with a warming device for sick and small babies). Bulbs have a very long life span: survive up to 50,000 hrs or 1 year in continuous use.

### **When to stop phototherapy**

Continue phototherapy until the serum bilirubin level is lower than the threshold range *or* until the **jaundice is limited to area 1 in preterm infants and areas 1+2 in term infants**.

### **Whilst on phototherapy:**

- Baby's eyes should be covered with gauze pad.
- Check bilirubin level daily if possible.
- Turn baby 2 hourly.
- Monitor signs of dehydration
- Ensure the baby is feeding well – top up with EBM via cup or NGT if necessary
- Encourage mother- child bonding.

### **Investigations**

**Infection screen** – infection must be excluded in any baby who is unwell and jaundiced or has risk factors for sepsis

LP, blood culture, urinalysis

Blood grouping and Rh status (both baby and mother) Coombs test if available

PCV

VDRL

### **Prolonged Jaundice**

Jaundice lasting longer than 14 days in term or 21 days in preterm infants is abnormal. If the baby's stools are pale or the urine is dark, refer the baby to a specialized centre for further management including doing both direct and indirect serum bilirubin level, ultrasound and thyroid function tests.

## SECTION III Session 11 Triage of the sick infant

'Triage' means 'sorting'

### Learning objectives

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

- ❖ Define triage
  - ❖ Identify personnel who can be trained to triage
  - ❖ Describe how to triage
  - ❖ Demonstrate triage skills
- Triage is the process of rapidly assessing all sick children when they first arrive in hospital and sorting them according to their need.
  - Triage assessment can be done anywhere such as in outpatients, or the ward.
  - Triage should be carried out, on arrival, to all new patients to the hospital.
  - Triage can be done by any trained person – e.g. a health worker, a receptionist, a guard

Those with life threatening illness must be seen immediately as EMERGENCIES,

Those who are less sick must be seen next and are PRIORITIES

Those who are non-urgent cases can wait their turn in the QUEUE.

**EMERGENCY**  
**[E]**

**patient must be seen at once**  
**may need lifesaving treatment**

**PRIORITY**  
**[P]**

**patient needs rapid assessment**  
**needs to be seen soon**

**NON URGENT**  
**[Q]**

**patient can safely wait to be seen – NYI are never in this category**

### EMERGENCIES

The ABCD concept is used to identify emergencies. This is a logical and quick way of identifying how sick a child is; it does not take the place of a thorough examination to make a diagnosis but is a screening tool to identify problems that require immediate attention.



## Emergencies are sent straight to the best place for resuscitation

For triage we need to know;

	Emergency Signs	Emergency Treatments
AIRWAY and BREATHING	Not breathing, centrally cyanosed, noisy breathing, severe respiratory distress	Manage the airway Give oxygen If present remove foreign body
CIRCULATION	Cold hands Capillary Refill T >3secs Weak fast pulse	Stop any bleeding Give oxygen Start IV fluids 10ml/kg
COMA CONVULSION	Unconscious Convulsing Low blood sugar	Manage airway Give oxygen Give 10% glucose IV Position the baby
DEHYDRATION	Lethargy Sunken eyes Prolonged skin pinch	No malnutrition Give IV fluids + NGT Severe malnutrition Give NGT try to avoid IV

## PRIORITIES

When emergencies have been excluded, signs and symptoms for priority are looked for. Priority signs can be remembered with the letters 3TPR, MOB. But remember that ***all infants less than 2 months of age are priorities***. This is because infants can deteriorate rapidly; they are difficult to assess without a thorough examination; and to prevent them remaining in a queue exposed to infections from other children.

**Priorities are sent to the front of the queue to be seen quickly.**

PRIORITY SIGNS are:

Tiny (less than 2 month of age)  
Temperature (high temperature as judged by your hand)  
Trauma

**3Ts**

Pain  
Pallor  
Poisoning

**3Ps**

Respiratory distress (not life threatening)  
Referral (urgent)  
Restless

**3Rs**

Malnutrition  
Oedema Burns

**MOB**

## Session 12 - Resuscitation of the young infant

This session covers resuscitation of a young infant (who may be just a few days old but who has not just been delivered). There are a lot of similarities with neonatal resuscitation and the skills required are similar.

### Learning objectives

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

- ❖ Demonstrate the resuscitation of a sick young infant

**The resuscitation of the YI is very similar to the newborn, except for the initial steps**

**First make sure baby is warm and sugar is normal**

Temperature	Hypoglycaemia
All sick NYI are prone to hypothermia Maintain thermal environment Keep the infant dry and well wrapped. Hats help to reduce heat loss. Keep the room warm (at least 25°C). Keep the baby under a radiant warmer	Check for blood glucose in all infants presenting with emergency signs, and all sick NYI:  If you cannot measure blood glucose, give a bolus dose.

### Managing Airway and Breathing

The letters **A** and **B** in “**ABCD**” represent “airway and breathing”.

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

Is the airway open?

Is the child breathing?

Is the child blue (centrally cyanosed)?

Does the child have severe respiratory distress?


#### Is the baby breathing?

**Look:** If active or crying, the child is obviously breathing. If none of these, look to see if the chest is moving.

**Listen:** Listen for any breath sounds. Are they normal?

**Feel:** Can you feel the breath at the nose or mouth of the child?

# A

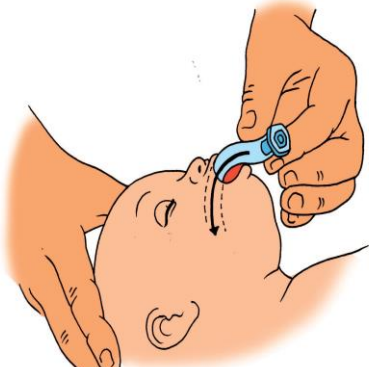
<p><b>INFANT</b></p>  <p><i>Neutral position to open the airway in an infant</i></p> <p><b>Head tilt-chin lift maneuver for opening airway</b></p>	<p>The neck is slightly extended and the head is tilted by placing one hand onto the child's forehead.</p> <p>Lift the mandible up and outward by placing the fingertips of the other hand under the chin.</p>
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Conscious	Unconscious
Inspect the mouth and remove secretions	Open the airway with head tilt and chin lift
Let the infant assume a position of maximum comfort	Inspect the mouth and remove secretions
Give oxygen	Check if maneuver has improved air entry by looking at the chest
Continue assessment	If not, insert airway

## Insertion of an oropharyngeal (Guedel) airway

The oropharyngeal or Guedel airway can be used in an unconscious infant to improve airway opening. It may not be tolerated in a patient who is awake and may induce choking or vomiting. Guedel airways come in different sizes; an appropriate sized airway goes from the angle of the mouth to the angle of the jaw when laid on the face with the convex side up.

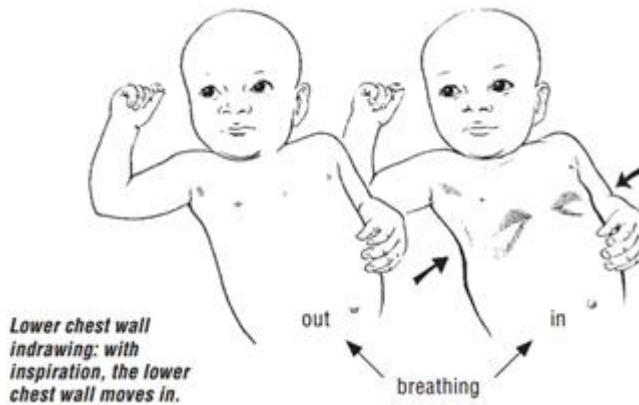
### Insert an oropharyngeal airway in an infant: convex side up

	<p>Select an appropriate sized airway</p> <p>Position the child to open the airway</p> <p>Using a tongue depressor, insert the oropharyngeal airway the convex side up.</p> <p>Re-check airway opening.</p> <p>Use a different sized airway or reposition if necessary.</p>
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## B

### Does the child have Severe Respiratory Distress?

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Is there difficulty in breathing while breastfeeding? Is the baby breathing very fast, has severe lower chest wall in-drawing, or using the accessory muscles for breathing which cause the head to nod with every inspiration? Are there any abnormal noises heard when breathing? A short noise when breathing out in young infants is called grunting. Grunting is a

sign of severe respiratory distress.

#### Signs of severe respiratory distress

Grunting  
Head nodding  
Respiratory rate  $\geq 80/\text{min}$   
Severe lower chest in-drawing  
Apnoeic spells  
Unable to feed due to respiratory distress  
Cyanosis

#### Giving oxygen to a baby with respiratory distress

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A baby with severe respiratory distress should be allowed to take a comfortable position of his choice and should be given oxygen. Oxygen may be provided with a catheter or prongs. If the baby's breathing difficulty worsens or the baby has central cyanosis while on catheter or prongs: increase the flow rate of oxygen and if this does not improve the clinical condition, give oxygen at a high flow rate via a face mask (5 litres/min), if available.

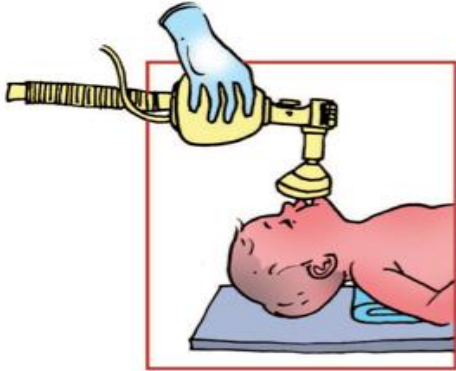

#### Management of airway in a child with gasping or who has just stopped breathing

If the baby is not breathing, you need to manage the airway and support the breathing with a bag and mask.

## Ventilate with bag and mask (BMV)

If the child is not breathing even after the above manoeuvres or spontaneous ventilation is inadequate (as judged by insufficient chest movements and inadequate breath sounds), ventilate with a self-inflating bag and mask.

During bag and mask ventilation it may be necessary to move the baby's head and neck gently through a range of positions to determine the optimum position for airway patency and effectiveness of ventilation. A neutral position **without hyperextension** of the neck is usually appropriate for infants. Infants may need padding under the shoulder to prevent excessive flexion of the neck that occurs when their prominent occiput rests on the surface on which the child lies.

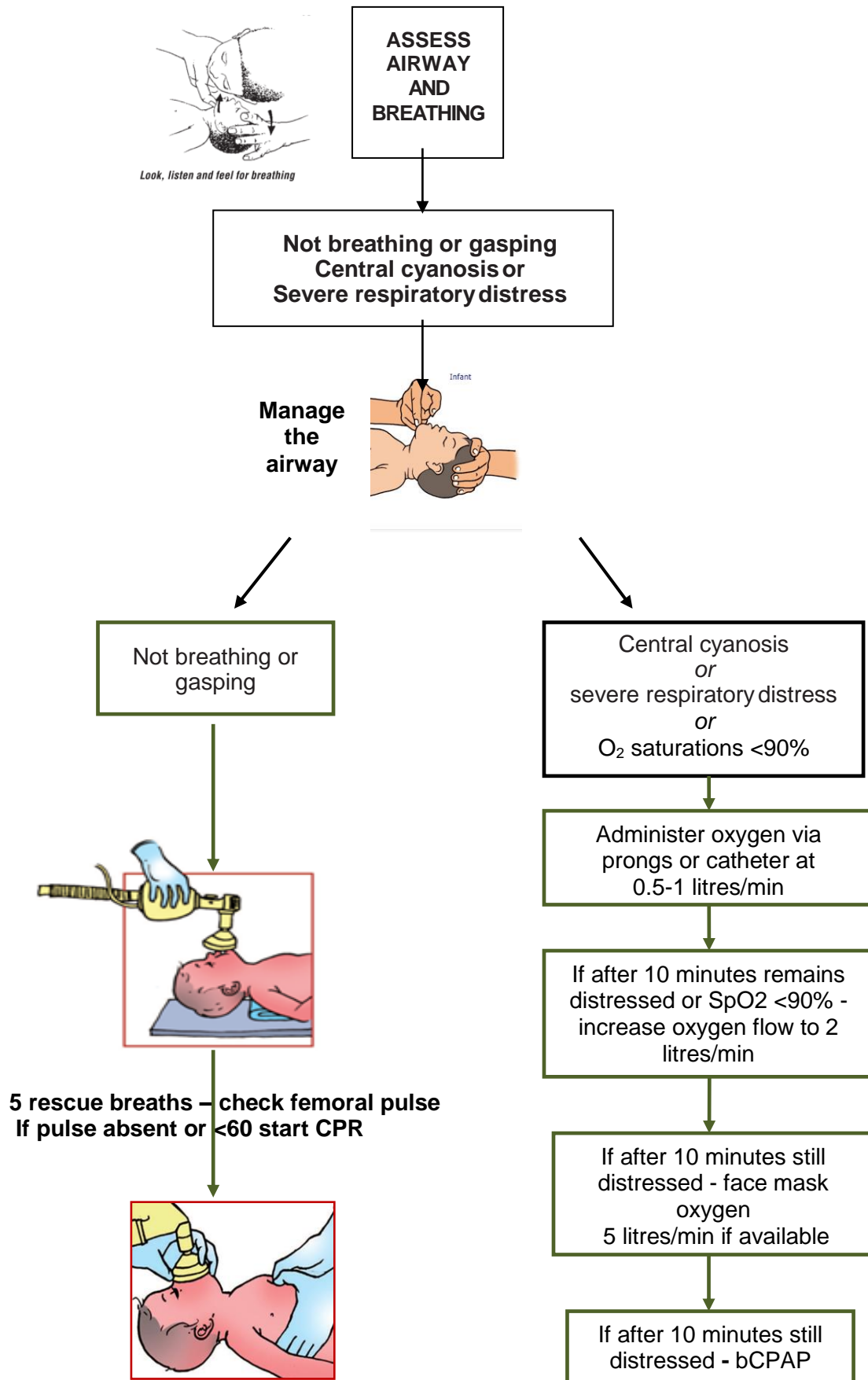
	 <p>■ INFANT</p> <p><i>Neutral position to open the airway in an infant</i></p>
<b>Bag and mask ventilation. Masks should be available in several sizes (size 0, 1)</b>	<b>Padding for an infant to maintain a patent airway</b>

**Call for help in any child who needs Bag and Mask Ventilation (BMV) since some of these infants may additionally need chest compression.**

After five effective ventilations, check the pulse (femoral) for ten seconds. If pulse is absent, the second person should start chest compression. Note: while it is often possible to resuscitate a baby who has stopped breathing but still has a good heart beat i.e. a respiratory arrest, it is almost never possible to resuscitate a baby whose heart has stopped, i.e. a cardiorespiratory arrest.

## Chest compressions (as in a neonate)

## Emergency assessment and management of NYI airway and breathing



## Session 13 Breathing difficulties in the young infant

### Learning objectives

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

- ❖ Describe how a YI with difficulties in breathing may present
- ❖ List the most likely causes
- ❖ Describe the management of the YI with breathing difficulties

YI with breathing difficulties will present with fast breathing and difficulties with feeding. On examination there may be grunting, head bobbing, fever, cyanosis, intercostal, sternal and subcostal recession. On auscultation there may be crepitations.

The main differential diagnoses in this age group are

- Pneumonia
- PJP if exposed to HIV
- Bronchiolitis

### Supportive treatment

#### Nutrition

If the baby is breathing < 60/minute, breast feeding may be tried, if they are struggling to feed, change to NG feeds. If the baby is breathing fast (e.g. 60-80/minute) feed by oro or nasogastric feeds every two hours with expressed breast milk (restricted maintenance)

If the baby is breathing very fast >80/minute, consider IV fluids (100mls/kg/day)

#### Oxygen –escalate stepwise

Administer oxygen via nasal prongs or nasal catheter, start with 0.5 litres/minute and increase stepwise to 2 litres/minute if O<sub>2</sub> saturations remain <90%.

If desaturating (<90%) on 2 litres of oxygen administer high flow oxygen (5 litres/min) by face mask if available or put on bCPAP if available.

#### Specific treatment

Treat with IV antibiotics if pneumonia is suspected (fever, crepitations on examination) – see wall charts for doses. High dose cotrimoxazole and steroids if PJP is suspected see wall chart for doses.

## Session 14 Shock in NYI

### Learning objectives

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

- ❖ Define shock in a NYI
- ❖ Describe the steps in the management of shock in a NYI

The letter C in “ABCD” stands for Circulation, Coma and Convulsions.

This module will help with the systematic, assessment, resuscitation and treatment of all NYI with life-threatening conditions that are most frequently seen in infants less than 2 months of age.

### Assessment

All sick infants are assessed for **A**irway, **B**reathing, **C**irculation, **C**oma, **C**onvulsions and severe **D**ehydration (**ABCD**). In view of the poor outcome in many small infants due to co-existent hypothermia and hypoglycaemia, the management of these is detailed here with ABCD. Efforts should be made to maintain normal blood glucose and a normal body temperature while managing ABCD.

### Assess the circulation for signs of shock

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After the airway and breathing has been assessed, check circulation:

Rapid assessment of circulation

- Cold hands?
- Capillary refill time > 3 seconds?
- Fast weak pulse?
- Not alert?

Also important to recognize

- Sunken eyes/ decreased skin turgor?
- Pallor?
- Severe wasting/ oedema?

*Also assess oxygen saturation, heart rate and blood pressure*



### Is the Capillary Refill Time Longer than 3 Seconds?

Capillary refill is a simple test that assesses how quickly blood returns to the skin after pressure is applied. It is carried out by applying pressure to the centre of the chest over the sternum for 3 seconds. The capillary refill time is the time from release of pressure to complete return of the pink colour. It should be less than 3 seconds. If it is more than 3 seconds the child may be in shock. This sign is reliable except when the room temperature is low, as cold environment can cause a delayed capillary refill. In such a situation check the pulses and decide about shock.



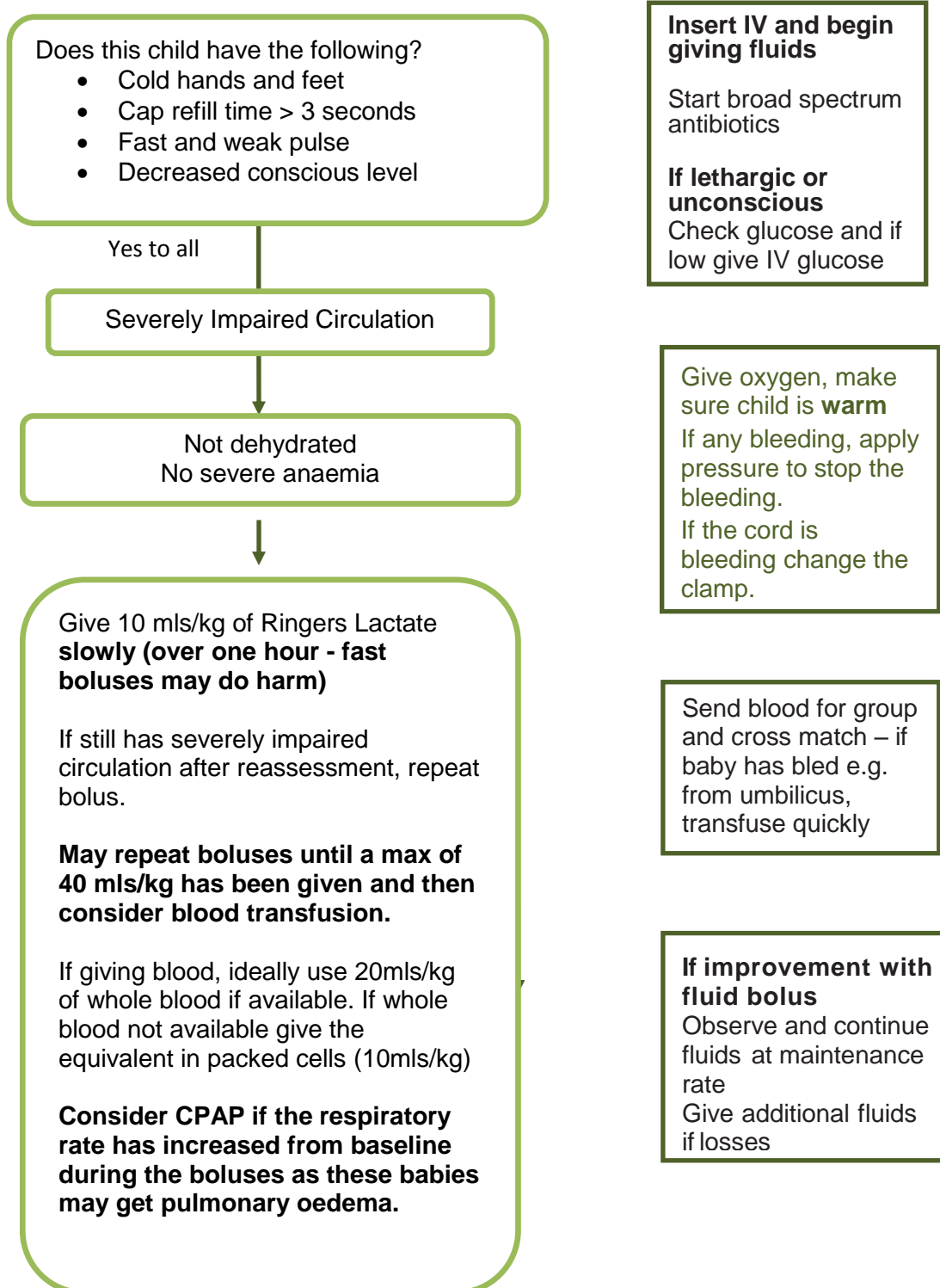
### Is the pulse weak and fast?

Evaluation of pulses is critical to the assessment of systemic perfusion. The radial should be felt. If it is strong and not obviously fast (rate greater than 160/min in an infant), the pulse is adequate; no further assessment is needed. In an infant if the radial pulse cannot be felt, palpate for the femoral pulse, if a baby has a weak radial and femoral pulse, it is an ominous sign. Assess hydration status.

### Treatment of Shock

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

## Giving fluids for shock or impaired circulation



## Session 15 Sepsis in NYI

NYI have immature immune systems and have just been colonised with bacteria during their recent delivery. They are therefore prone to infections which are likely to cross barriers, for example between the lungs and blood and blood and meninges. Many NYI infections can be prevented by good hygiene at the time of birth, appropriate umbilical cord care, appropriate eye care, using KMC and avoiding separation of the mother and infant.

### Learning objectives

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

- ❖ Describe the risks for sepsis in a NYI
  - ❖ Describe how a NYI may present with sepsis
  - ❖ List the management steps of sepsis in a NYI
- 

Common systemic bacterial infections in young infants include sepsis, pneumonia and meningitis and all these may present alike. Sepsis is a clinical syndrome of systemic illness accompanied by septicaemia. (a bacterium in the blood which is normally sterile). It is also called bacteraemia.

### Maternal risk factors for sepsis and clues to infection

The risk factors for sepsis in the NYI are:

- Intrapartum maternal fever (temperature > 38°C)
- Membranes ruptured more than 18 hours before delivery
- Foul smelling or purulent amniotic fluid

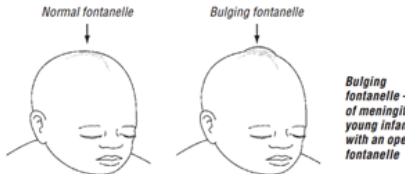
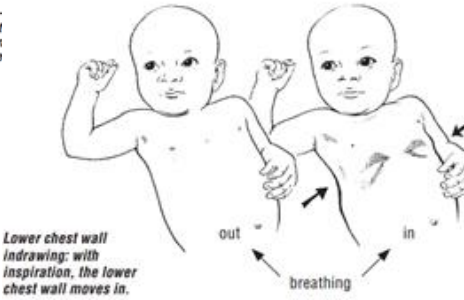

The babies born to mothers with these risk factors may be symptomatic or asymptomatic. Both symptomatic and asymptomatic should be treated as having sepsis with IV antibiotics as the risk is so great and the mortality rates are high.

#### Key fact for providers

Infants with sepsis may present in the first few days of life, before they have been discharged or they may go home and be readmitted with sepsis.

The management of both groups is the same.

## Symptoms and signs of sepsis in a NYI

Symptoms	Lethargic, decreased movement
<p>Axillary temperature 37.5°C or above (or feels hot to touch) or temperature &lt; 35.5°C</p> <p>Bulging fontanelle</p>  <p>Normal fontanelle      Bulging fontanelle</p> <p>Bulging fontanelle - of meningitis young infant with an open fontanelle</p> <p>Grunting, nasal flaring, fast breathing, chest in drawing, crepitation's in the lungs</p>  <p>Lower chest wall indrawing: with inspiration, the lower chest wall moves in.</p>  <p>Peri-umbilical flare in umbilical sepsis. The inflammation extends beyond the umbilicus to the abdominal wall.</p> <p>Umbilical redness extending to the periumbilical skin or umbilicus draining pus</p> <p>Many skin pustules/big boil (abscess), joint swelling, reduced movement of limbs</p>	

Many of these symptoms and signs can be caused by other conditions eg perinatal asphyxia, hypoglycaemia or hypothermia. Look for these risk factors and do a sepsis screen. If the sepsis screen is negative and the infant remains asymptomatic, antibiotics may be discontinued after five days

### Investigations:

WBC < 5000 or > 20,000/cu mm (age >72 hrs)  
 Lumbar puncture if available, before IV antibiotics  
 Blood culture, if available, before IV antibiotics  
 Urine culture if available, before IV antibiotics

### Initial assessment and treatment of sepsis in the NYI

#### ABCCCD

Provide supportive care and monitoring for the sick NYI

Start empiric antibiotics; give penicillin and gentamicin – see doses in wall charts

Give flu/cloxacillin (if available) instead of penicillin if extensive skin pustules or abscess as these may be indications of staphylococcus infection.

## Empiric antibiotic therapy of sepsis

Antibiotic	Each Dose	Frequency		Route (Days)
		<7days age	>7days age	
Inj. Penicillin or	50,000iu/kg	12 hrly	6 hrly	IV, IM
AND				
Inj. Gentamicin	LBW 3mg/kg/dose Term 5mg/kg/dose	24 hrly	24hrly (7.5mg/kg/dose )	IV, IM

### Key fact for providers - Supportive care for NYI with sepsis

Ensure warm

Respiratory support with oxygen or CPAP if there is severe respiratory distress or apnoeas. Gentle stimulation if apnoeic, consider aminophylline if premature and current ages is estimated to be < 37 weeks gestation

If shocked treat according to the impaired circulation protocol

If hypoglycaemic, infuse 2mls/kg of 10% dextrose stat and recheck in 30 minutes, continue maintenance 10% dextrose

If they have not received Vitamin K, give 1mg intramuscularly as septic NYI may have an increased tendency to bleed

If very sick, e.g. continuous convulsions, avoid oral feeds, give maintenance IV fluids

Treat convulsions if present, treat jaundice if present with phototherapy

### Key fact for providers – Empiric antibiotics and duration

Empiric means that the organism causing the sepsis has not yet been identified and the antibiotics selected will treat the organisms most likely to cause this presentation in this age group and is guidelines.

If there is no blood culture or the blood culture is negative and the baby is well then continue to treat with the empiric antibiotics for a minimum of 5 days.

If the baby was clinically septic - treat for 7-10 days (except meningitis and bone/joint infection may require longer).

If not improving in 48 hours the antibiotic treatment may need to be changed.

## Session 16 Coma and Convulsion

**C** represents “**Coma and Convulsion**”. In the ABCCCD system

### Learning objectives

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

- ❖ Describe the assessment of a NYI in a coma
- ❖ Describe the management of a NYI in a coma
- ❖ Describe the stepwise management of a NYI with a convulsion

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

#### **Key fact for providers – how to assess the NYI for coma and convulsion**

##### **(AVPU)**

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

- A** Is the baby Alert? If not,
- V** Is the baby responding to Voice? If not,
- P** Is the baby responding to Pain? (rub the sternum)
- U** The baby who is Unresponsive to voice (or being shaken) AND to pain is Unconscious.

This assessment depends on your observation of the child and not on the history from the parent. Children who have a history of convulsion, but are alert, need a complete clinical history and investigation, but no emergency treatment for convulsions. Sometimes, in infants, the jerky movements may be absent, but there may be twitching (abnormal facial movements), apnoea, and abnormal movements of the eyes, hands or feet.

**You have to observe the infant carefully.**

<b>Tetanus</b>	<b>Convulsions</b>
<b>Conscious</b>	<b>Unconscious</b>
<b>Increases</b> with stimulation	<b>Does not change</b> in response to stimulation

## Initial management of coma and convulsions

COMA	CONVULSION
Manage the airway Position the child Consider an airway Check the blood sugar Give IV glucose if low	Manage the airway Position the child Check the blood sugar Give IV glucose if low  Give anticonvulsant if still seizing

## Treatment of coma and convulsion

---

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

### Convulsion

To manage the airway of a convulsing child gentle suction of secretions should be done, the infant put on his side and oxygen started. Do not try to insert anything in the mouth to keep it open.

**Managing convulsions < 2 weeks and > 2 weeks - see wall charts**

#### Key fact for providers

##### **Do not use Diazepam for control of convulsions in Neonates < 2 weeks**

Rectal administration is quicker than placing an IV line in an emergency

When giving rectal medication hold the buttocks together for a few minutes to stop it running out.

Give rectal injections using a 2ml syringe.

Rectal diazepam acts within 2 to 4 minutes.

Wait 10 minutes between medications to see if the child has stopped fitting

Seek help of a senior or more experienced person, if available.

Diazepam and phenobarbitone can both affect the child's breathing, so it is important to reassess the airway and breathing regularly and have a bag and mask of correct size available.

Do not give oral medication until the convulsion has been controlled

(danger of aspiration)

### Dose of Phenobarbitone for young infants

Inj. Phenobarbitone intravenous dose (200mg/ml) Dose is 20mg/kg		
Weight of Infant	Initial dose	Repeat dose
2kg or less	0.2ml	0.2ml
2 to 4kg	0.3ml	0.3ml

### Dosage of diazepam

Diazepam given rectally 10mg / 2ml solution	
Age / weight	Dose 0.1ml/kg
2 weeks to 2 months	(<4kg) 0.3ml

May cause respiratory arrest

Paraldehyde given rectally 10mg / 2ml solution	
Age / weight	Dose : 0.2ml/kg IM, 0.4ml /kg PR; Injection 10 ml ampoules
2kg	0.4mls IM or 0.8 mls PR
3kg	0.6mls IM or 1.2mls PR
4kg	0.8mls IM or 1.6mls PR

Do not leave in plastic syringe for longer than 10-15 min



## Session 17 Meningitis

Suspect meningitis in an infant with sepsis or if they present with the clinical symptoms or signs of meningitis: remember NYI often do not have neck stiffness.

### Learning objectives

---

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

- ❖ Describe how a NYI with meningitis may present
- ❖ Describe the management of a NYI with meningitis

### Symptoms and signs

Drowsiness, lethargy or unconscious

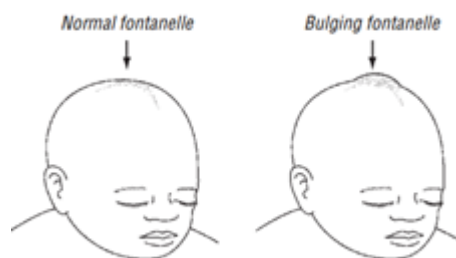
Persistent irritability

High pitched cry

Apnoeic episodes

Convulsion

Bulging fontanelle



### Investigations

1. To confirm the diagnosis of meningitis a lumbar puncture must be done immediately unless the young infant is convulsing actively or is unstable.
2. Blood culture
3. Urine microscopy and culture or a urine analysis

**Key fact for providers - Supportive care for NYI with meningitis**

Ensure warmth

Respiratory support with oxygen or CPAP if there are signs of severe respiratory distress or apnoeas.

Gentle stimulation if apnoeic, consider aminophylline if premature and current age is estimated to be < 37 weeks gestation

If shocked treat

If hypoglycaemic, infuse 2mls/kg of 10% dextrose stat and recheck in 30 minutes, continue maintenance 10% dextrose

If they have not received Vitamin K, give 1mg intramuscularly

Treat convulsions if present; treat jaundice if present with phototherapy

If very sick, e.g. continuous convulsions, avoid oral feeds, give maintenance IV fluids according to the wall chart for maintenance fluids

Reassess therapy based on culture and antibiotic sensitivity results if feasible

Continue IV antibiotics for at least 2 weeks (e.g. GBS) or 3 weeks (Gram negative bacteria)

Measure the NYI head circumference every 3 days as an intracranial abscess or hydrocephalus may develop. If circumference is increasing do ultrasound scan.

**Empiric therapy for meningitis – how to calculate the dose, for doses see wall charts**

Antibiotic	Each Dose	Frequency		Route
		<7days	>7days	
Inj. Penicillin and Gentamicin	100,000iu/kg/dose	12 hrly	6 hrly	IV
	LBW 3mg/kg/dose Term 5mg/kg/dose For first week Then 7.5mg/kg/dose thereafter	24 hrly	24 hrly	IV
OR				
Inj. Ceftriaxone	100mg/kg/dose	24 hrly	24 hrly	IV

## Session 18 Diarrhoea and dehydration in NYI

In triage the letter D stands for Dehydration. In this session we will look at the assessment of the degree of dehydration in the infant with diarrhea or vomiting or due to poor feeding.

### Learning objectives

---

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

- ❖ Assess the severity of dehydration
- ❖ Describe the management of mild, moderate and severe dehydration

The normally frequent yellowish or slightly greenish loose seedy stools (like a pea soup) of about 10 – 12 times per day of breastfed babies are not diarrhoea. These are normal BF stools.

If the stools have changed from the usual pattern and are many and watery, it is diarrhoea.

When a young infant presents with diarrhoea or vomiting:

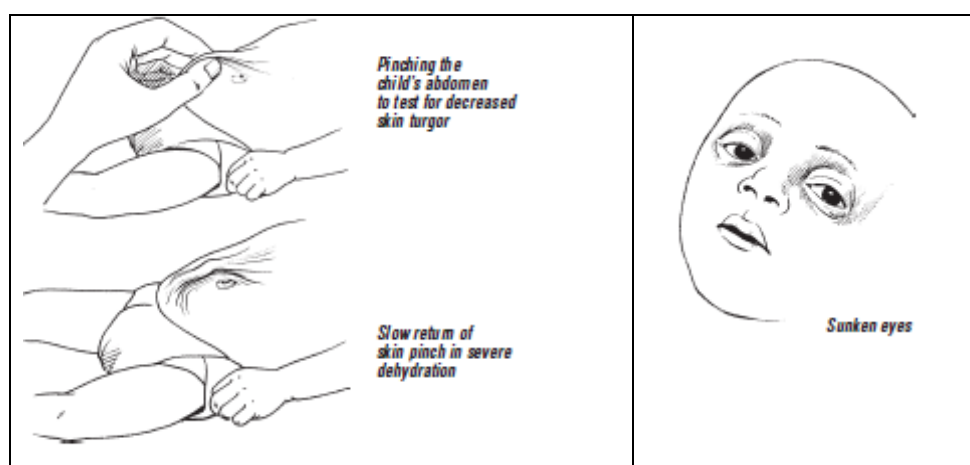
### Ask:

- Duration: for how long has the child had diarrhoea or vomiting?
- Is there blood in the stool?

### Examine the infant and assess the severity of dehydration:

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

- Is the child lethargic?
- Does the child have sunken eyes?
- Does a skin pinch take longer than 2 seconds to go back?



**Assessment of the degree of dehydration:**

Degree of dehydration	Examine the child	Manage the child	Management plan
Severe dehydration	Does the child have at least 2 of the following signs: <ul style="list-style-type: none"> <li>• Unable to drink or drinking poorly</li> <li>• Lethargic or unconscious?</li> <li>• Sunken eyes?</li> <li>• Skin pinch goes back very slowly, &gt; 2 seconds</li> </ul>	Manage severe dehydration: <b>Plan C</b> Admit or refer	<b>C</b>
Some dehydration	Does the child have at least 2 of the following signs: <ul style="list-style-type: none"> <li>• Restless, irritable</li> <li>• Thirsty, drinking eagerly</li> <li>• Sunken eyes</li> <li>• Skin pinch goes back slowly</li> <li>• &lt; 2 seconds</li> </ul>	Manage some dehydration <b>Plan B</b> If signs of sepsis or low weight: Start antibiotics Admit or refer	<b>B</b>
No dehydration	Not enough signs to classify as severe or some dehydration  Skin pinch goes back immediately	Manage with <b>Plan A</b> Home care Advise mother when to return immediately Follow up in 3 days Advise mum to return earlier if not improving	<b>A</b>

After examining the child decide on the degree of dehydration and choose the appropriate WHO management for diarrhoea, plan A, B or C

**Treatment of severe dehydration – plan C**

Management of severe dehydration needs IV fluids, but if the child can drink give ORS by mouth or via NG tube if the child is unable to drink, while the drip is set up.

**Plan C:** give 100 ml/kg Ringer's lactate solution IV, (or, if not available use normal saline; do not use dextrose 5% solution) as follows:

Age	First give 30 ml/kg in	Then give 70 ml/kg in
Below 2 months	1 hour	5 hours

Also give ORS (5 ml/kg/hour) as soon as the child can drink, usually after 3 – 4 hours. If IV treatment is not possible, give ORS 20 ml/kg/hour for 6 hours (120ml/kg) by NG tube.

Reassess the infant every hour.

Provide supportive care – keep the infant warm, ensure O<sub>2</sub> saturations >90%; if jaundiced treat, check blood sugar and treat if <2.5 mmol/l or 45 mg/dl.

### Treatment of some dehydration – plan B –

Determine the amount of ORS to give during the first 4 hours. The approximate amount of ORS required (in ml) can be calculated by multiplying the child's weight (in kg) by 75. If the child wants more ORS than shown, give more.

#### Volume of ORS – Plan B for the NYI

Weight	Amount of ORS
1 – 2 kg	30 mls every hour for 4 hours
2 – 4 kg	60 mls every hour for 4 hours
4 - 6 kg	90 mls every hour for 4 hours

### Teach the mother how to give ORS solution

Give frequent small sips from a cup or spoon or small amounts via a NG tube. If the child vomits, wait 10 minutes, then continue, but more slowly. Continue breastfeeding. Teach mother danger signs and tell her to call if the condition of the infant worsens, for example if diarrhoea worsens or child has persisting vomiting. Then child needs to be reassessed immediately.

### After 4 hours: reassess the child and classify the degree of dehydration

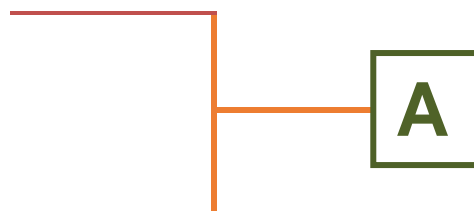
Select the appropriate plan to continue treatment, for example if the infant is no longer dehydrated move to Plan A. *The infant should no longer be dehydrated, but needs ORS to prevent dehydration if he still has diarrhoea or is vomiting.*

Teach mother how to prepare ORS solution at home and give her enough packets to complete rehydration. Advise her to give **at least 50ml after each loose stool** and show her using her own cup how much this is

Instruct the mother to give Zinc (half tablet, 10 mg) per day for 10 days

### Treatment of no dehydration – Plan A - Explain the 3 Rules of Home Treatment

Give extra fluid – as much as the child will take,  
Continue breast feeding frequently and for longer at each feed  
When to return



## SECTION IV

### Module 19 Essential Newborn and Young Infant Resuscitation

#### Equipment and Supplies

##### Learning objectives

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

- ❖ Describe the minimum equipment required to provide NYI resuscitation
- ❖ Assemble the minimum equipment required to provide NYI resuscitation

This equipment should be available in an area in the delivery room for facilitating immediate care of the newborn. This area is essential for all health facilities where deliveries take place. This needs to be checked regularly and supplies replaced after they are used.

##### Equipment and supplies for resuscitation of the NYI

Equipment	Supplies
Radiant warmer with bassinet Suction equipment Self-inflating resuscitation bag (250ml-500ml) with masks (size 0 and 1) Oxygen concentrator Clock Room thermometer Pulse oximeter Weighing scales Guedel airways	DRY warm cloths x2 (absorbent) Sterile cord ties Sterile Gloves Sterile blade/scissors Mucus extractors Suction catheters (10F, 12F) Feeding tube (6F, 8F) IV cannula (24G)
Drugs	Intravenous fluids
Penicillin, Gentamicin, Ceftriaxone Phenobarbitone Oral Nevirapine for HIV-exposed infants Aminophylline Vitamin K (1mg for term 0.5mg for preterm) Chlorhexidene gel ( Single-day 7.1% CHX gel product)	Intravenous fluids- Ringers Lactate or Normal Saline Intravenous dextrose

For equipment and audit tools also see also the Neonatal Toolkit for Implementing Health Services (6).

## Session 20 Discharge from the hospital

### Learning objectives

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

- ❖ Describe the elements of the discharge of a NYI from hospital
- ❖ List discharge planning advice for family

Planning of discharge from the hospital is as important as diagnosis and treatment.

**Correct timing** of discharge from the hospital – this is when the diagnosis is clear and treatment has been started and the NYI is clinically improved. The NYI has to remain in hospital while receiving oxygen, IV treatment or if feeding has not been established.

#### Counsel the mother on

- Correct treatment if the NYI is still on treatment
- Exclusive breast feeding of the infant at home
- Keeping the NYI warm including KMC if < 2kg
- Remind her about the danger signs

#### Providing follow-up care

- Infants who are discharged from the hospital should return for follow-up in relation to the present problem as needed, but not routinely.
- Plan the routine follow up with their local provider depending on the weight, age and exposure status of the NYI
- Discuss where and when the NYI will receive their next scheduled immunization
- Discuss where she will access care if the NYI has a danger sign

#### Record keeping

Ensure the infant's immunization status and record is up-to-date

Ensure the HIV exposure status is recorded

Communication with the health personnel who referred the infant or who will be responsible for follow-up care (Write in health passport and ask mother to show this note to them)

## Session 21 Referral and transport of the sick NYI

### Learning objectives

---

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

- ❖ List conditions which need urgent referral
- ❖ List conditions which need less urgent referral

If the baby needs to be transferred to a special care neonatal unit, ensure a safe and timely transfer. It is important to **prepare the baby for transfer, communicate** with the receiving facility, and **provide care** during transfer.

### Indications of transfer from district to tertiary neonatal care unit

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Abdominal distension with bilious vomiting etc.

Major congenital malformations e.g. Tracheo-esophageal fistula, diaphragmatic hernia, meningomyelocele etc.

### Components of neonatal transport

#### Assess

Make careful assessment of the baby. Make sure that there is a genuine indication for referral. Ideally discuss with the referral centre as in some cases there may be no benefit from transferring.

#### Stabilize the neonate

Stabilize with respect to temperature, airway, breathing, circulation and blood sugar. Give the first dose of antibiotics.

#### Write a note

Write a precise note for the providers at the referral facility providing details of the baby's condition, results of investigations, reasons for referral and treatment given to the baby. Explain the need for referral and mother should come with the baby.

**Send ALL x-rays and investigations with the infant.**



**Step 1: Determine the indication to transport the baby to a higher health facility;**

Major congenital malformations

These may require urgent referral such as gastrointestinal atresia and imperforate anus or less urgent referral such as meningomyelocele, and spina bifida

Abdominal distension with bilious vomiting require urgent referral

**Step II: Preparation for baby**

Stabilise the baby (temperature, airway, breathing, circulation and blood sugar)

Ensure baby is kept warm with kangaroo care or warmly dressed and covered

Oxygen if indicated (either a tank of oxygen or a portable concentrator if available)

Secure IV line if necessary and give treatment before transfer

**Step II: 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

Give one dose of antibiotics before transport

Bring extra drugs for the journey such as anticonvulsants if the child is fitting

IV fluids if they are shocked, IV glucose if their sugar was low

**Step IV: 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

**Step V: Feedback by tertiary hospital**

Communicate with team at referral hospital and inform them:

Diagnosis of the condition

Outcome of the baby, Post-discharge advice & follow up

# Nursery Admission sheet

Name of facility \_\_\_\_\_ District: \_\_\_\_\_ Admissio no \_\_\_\_\_

<b>Reason for transfer/referral to nursery:</b>			
<b>Transferred/referred by:</b>		<b>Date of admission:</b>	
Time of admission:		D.O.B:	Birth weight:
Babies name:		Birth Reg No:	Time of birth: Age in days_____
Admitted/ Referred from:	LW / Theatre / Referred from outside (please circle) Home(self) / Other Hospital: HC:		
Address:			
Mother's name:	Gravida:	Para:	Married / Divorced / Widowed / Single
Religion:			
Number of children: Alive: ..... Healthy? Y / N Dead: ..... Cause of death:			
HIV test?	Y / N	If yes when? Date: Result: NR / R	Mother on HAART? Y / N
How many months on HAART before delivery?		Baby given NVP Y / N	

## Pregnancy and delivery

STDs / Hypertension / Diabetes Mellitus / Thyroid disorders / Anaemia / Malaria / Heart disease			
Other:			
Gestational age: _____Weeks			
Method of gestational age assessment:		Fundal height / LMP / Ballard / USS - date of scan:	
Rupture of membranes (ROM)	Date: / / Time:	Length of time between ROM & birth: hrs	
Vaginal bleeding	Y / N	Maternal fever/ Offensive liquor	Y / N
Pre-eclampsia/convulsion	Y / N	Polyhydramnios / Oligohydramnios (circle)	Y / N
Duration of labour: (hrs)	Prolonged 2 <sup>nd</sup> stage	Y / N	
Presentation:	Vertex / Brow / Breech / face (circle)		
Mode of delivery:	Vaginal / Caesarian Section		
	Spontaneous / Other		
	Vacuum extraction	Y / N	Why.....
Meconium present	Y / N	If Yes, Thick / Thin	
Maternal analgesia	Y / N	If Yes, which drug:.....	
Apgar scores:	1 min: /10,	5 min: /10,	10 min: /10
Resuscitations measures: (please circle)	Suctioning / Bag-Valve-Mask ventilation / Oxygen / CPR If BMV, how long?		
<b>Risk Factors for neonatal sepsis?</b>	Maternal fever in labor Y / N PROM > 18hr Y / N Born before arrival Y / N Prematurity < 37/40 Y / N Offensive liquor Y / N		



Date\_\_\_/\_\_\_/\_\_\_ Time\_\_\_:\_\_\_

## Queen Elizabeth Central Hospital Paediatric Admission Sheet

**NAME**  
**AGE** **HIV** **R/NR/E/U**

### HISTORY

Fever Y/N How long for..  
Convulsions Y/N Description..  
Diarrhoea Y/N How long for..  
Vomiting Y/N How long for..  
Cough Y/N How long for..  
Difficulty Breathing Y/N How long for..  
Rash Y/N Description..  
Pallor Y/N How long for..  
Jaundice Y/N How long for..  
Oedema Y/N How long for..  
Problems Urinating Y/N How long for..  
Problems Feeding Y/N How long for..  
Other..

Further History..

### BACKGROUND

Known Diagnoses..

Previous Admissions..

Birth History..

**HIV**

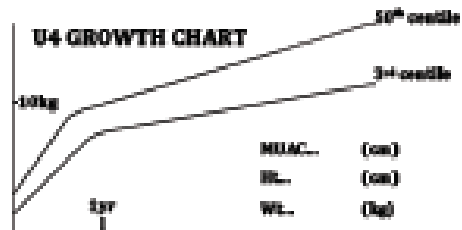
Child	R/NR/E/U	Mother	R/NR/U
	RDY/PCR/verbal		RDY/verbal
	Date..		Date..
COT	Y/N Started..	COT	Y/N Started..
ART	Y/N Started..	ART	Y/N Started..
PWCT	Y/N Comment..		

Allergies Y/N comment..

Transfusions Y/N dates..

Vacc Complete Y/N comment..

Recent Meds Y/N list..



### FAMILY HISTORY

Details Please

TB contact Y/N  
Epilepsy Y/N  
Diabetes Y/N

Mother well Y/N  
Father well Y/N  
Parents separated Y/N When..  
Number of siblings ..... Alive... Dead..  
Siblings well Y/N Ages..

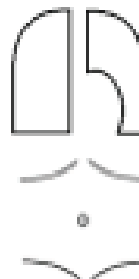
### EXAMINATION General Description

Please Draw/Comment  
on Your Findings

T Sats  
PR BP CRT  
Blantyre Coma Score (BCS) =  
Nutrition good/fair/poor  
Pallor 0 + ++ +++  
Jaundice 0 + ++ +++  
Oedema 0 + ++ +++  
Rash 0 + ++ +++  
Dehydration 0 + ++ +++  
Specty..

Finger clubbing Y/N  
Lymphadenopathy Y/N  
Oral thrush/sores Y/N  
Respiratory signs Y/N  
Cardiac signs Y/N  
Hepatomegaly Y/N.....cm  
Splenomegaly Y/N.....cm  
Neurological signs Y/N  
Neck stiffness Y/N  
Ear signs Y/N  
Other..

HS



**DIFFERENTIAL DIAGNOSIS..**

**PLAN..**

Signature...

Name...

Grade...

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6. Phiri A. Neonatal Toolkit for Implementing Health Services. UN Commission on Life Saving Commodities for Women and Childrens Health. 2015.

Address					Ph					Rel				NYI care Pathway									
Name				Date Admit			DOB			Age		M / F						Hosp No					
Weight (kg)      Birth weight (kg)				Day 1			Day 2			Day 3				Day 4				Day 5					
Medications/Time (actual times Day 1)								6a	10a	2p	10p	6a	10a	2p	10p	6a	10a	2p	10p	6a	10a	2p	10p
IV Fluids/Blood																							
Oxygen Sats																							
RR																							
HR																							
BP																							
BCS (1,2,3,4,5)																							
Blood Glucose (mmol/l or mg/dl)																							
Temp (C or F)																							
Cough (Y/N)																							
Feeding (Y/N)																							
Vomiting (Y/N; 1x, 2x etc)																							
Diarrhoea (Y/N; 1x, 2x etc)																							
Passing Urine (Y/N; 1x, 2x etc)																							
Convulsions (Y/N; 1x, 2x etc)																							
Dehydration (0, +, ++, +++)																							
Oedema (0, +, ++, +++)																							
Pallor (0, +, ++, +++)																							
Jaundice (Area 1-5)																							
Cyanosis (Y/N)																							
Chest Signs (Y/N)																							
Neck stiffness (Y/N)																							
Spleen Size (cm)																							
Liver Size (cm)																							
PCV																							
MPS																							
Blood Culture																							
CSF																							
Explained to parents Y/N																							
Date of discharge /death				Outcome																			

## When to start phototherapy for jaundice

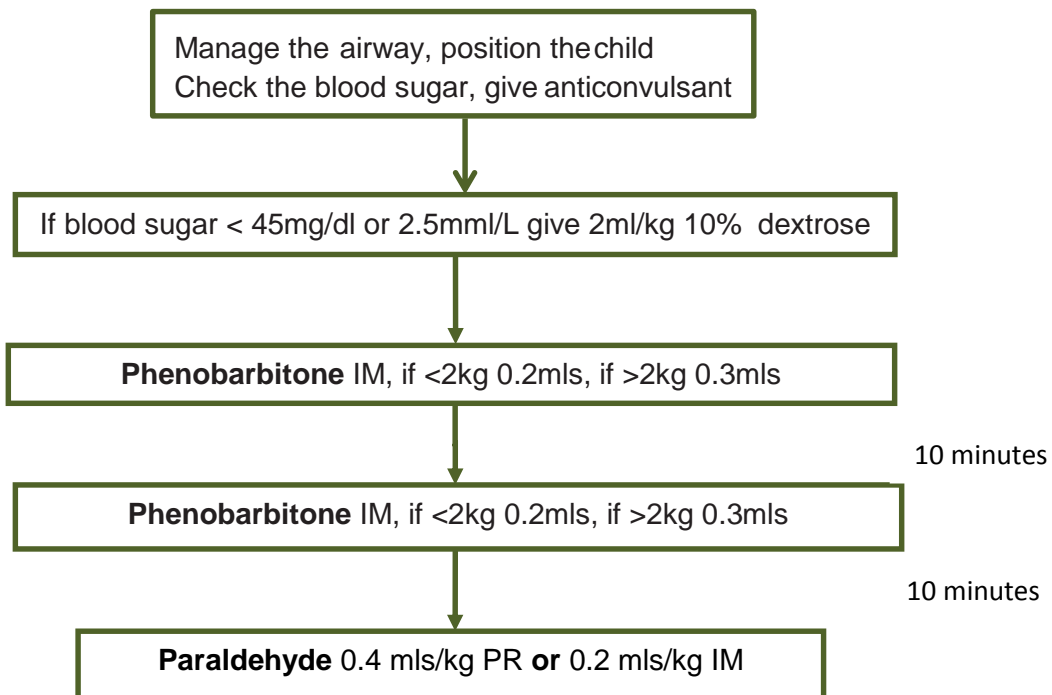
**On all babies who are jaundiced in the first 24 hours of life**

Start phototherapy		Areas where jaundice is visible
	If the jaundice is limited to area 1, then the serum bilirubin is likely in the range 150-200 mmol/L. Only start phototherapy if day 1	
Area 1 + 2	If the jaundice involves area 1+2 i.e. over the trunk, then the serum bilirubin is likely in the range 200-300 mmol/L. If preterm, low birth weight, or term but sick and there is jaundice over the trunk start phototherapy	
Area 1-5 i.e. involves palms and soles	If the jaundice extends to include all areas (1-5) including the soles then the serum bilirubin is likely >340 mmol/L. Start phototherapy on all babies including healthy term babies if the jaundice extends to include the palms and soles.	

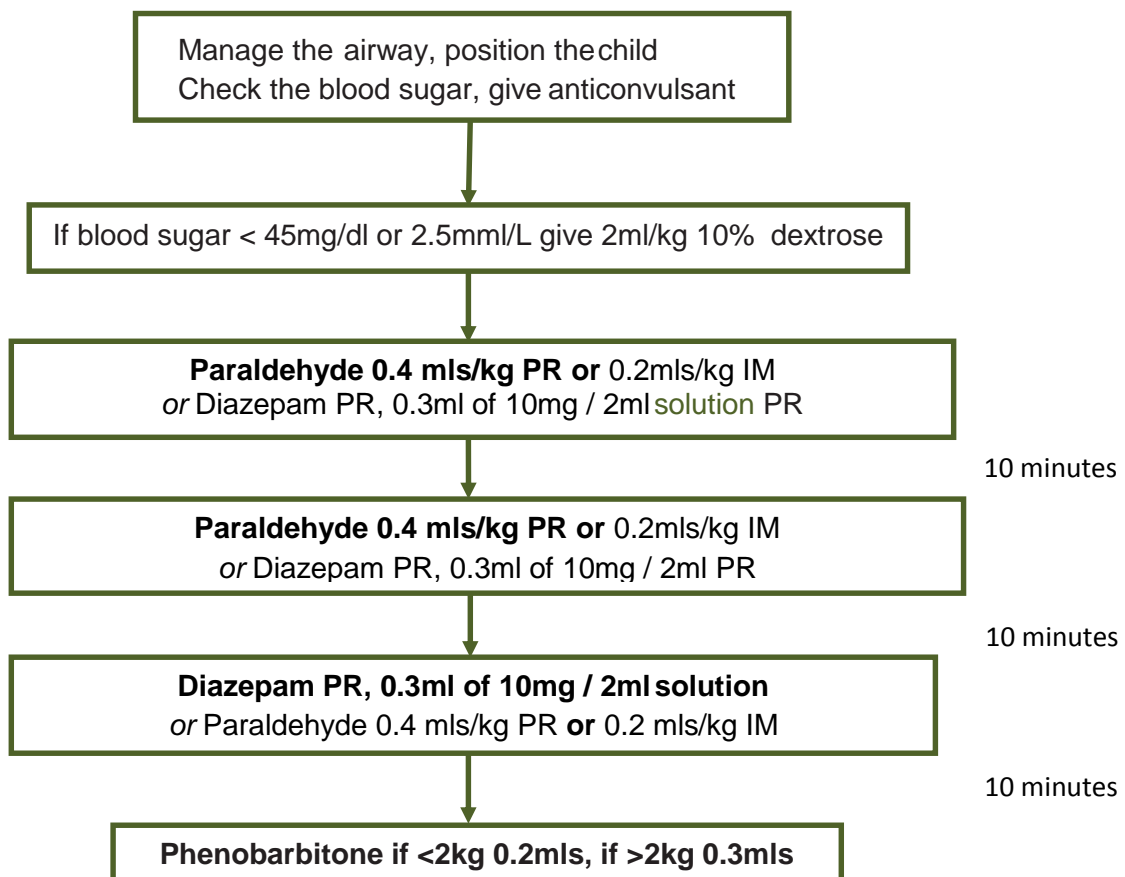
## When to start phototherapy – serum bilirubin or transcutaneous bilirubin available

Day of life	Healthy term Baby		Preterm < 35 weeks, LBW,	
	mg/dl	mmol/L	mg/dl	mmol/L
Day 1	Treat any visible jaundice with phototherapy			
Day 2	15	260	10	170
Day 3	18	310	15	260
Day 4 and there after	20	340	17	290

**Infant from birth up to 2 weeks of age with seizures**



**Managing seizures beyond 2 weeks of age**





### Maintenance feeds by gastric tube or by cup by weight band

Age days mls Wgt kg	Day 1 60/kg/d	Day 2 90/kg/d	Day 3 120/kg/d	Day 4 onwards 150/kg/d	Day 7 onwards LBW/SGA 180mls/kg
Two hourly feeds					
0.75- 0.99	4	7	9	11	13
1.0 -1.24	6	8	11	14	17
1.25 -1.49	7	10	14	17	21
Two/Three hourly feeds					
1.5 - 1.74	8/13	12/18	16/24	20/30	24/37
1.75- 1.99	9/14	14/21	19/28	23/35	28/42
2.0 - 2.24	11/16	16/24	21/32	27/40	32/48
2.25 -2.49	12/18	18/27	24/36	30/45	36/53
2.5- 2.74	13/20	20/30	26/39	33/49	
2.75 - 2.9	14/22	22/32	29/43	36/54	
3.0 - 3.24	16/23	23/35	31/47	39/59	
3.25 -3.49	17/25	25/38	35/53	42/63	
3.5 - 3.74	18/27	27/41	34/54	45/68	
3.75 – 3.9	19/29	29/44	39/58	48/73	
4.0 - 4.24	21/31	31/46	41/62	52/77	
4.25 -4.49	22/33	33/49	44/66	55/82	
4.5 - 4.74	23/35	35/52	46/69	58/87	
4.75 - 5.0	24/35	37/55	49/73	61/91	

### IV maintenance fluids by age and weight band

Age days mls Wgt kg	Day 1 60/kg/d mls/hr	Day 2 90/kg/d mls/hr	Day 3 onwards (throughout infancy) 100/kg/d mls/hr
	10% dextrose		RL +10% dextrose
0.75 -0.99	2	3	4
1.- 1.24	3	4	5
1.25 -1.49	3	5	6
1.5 - 1.74	4	6	7
1.75 – 1.9	5	7	8
2.0 - 2.24	5	8	9
2.25 -2.49	6	9	10
2.5 - 2.74	7	10	11
2.75 - 2.9	7	11	12
3.0 - 3.24	8	12	13
3.25 -3.49	8	13	14
3.5 - 3.74	9	14	15
3.75 - 3.9	10	15	16
4.0 - 4.24	10	15	17
4.25 -4.49	11	16	18
4.5 -4.74	12	17	19
4.75 - 5.0	12	18	20

## Dose of antibiotics by weight band –

**COIN**  
Wall chart IV  
**Drug doses**

Weight in kg	Penicillin 50,000iu/k g/dose <b>Sepsis</b> dose	Penicillin 100,000iu/ kg/dose <b>Meningitis</b> dose	Weight in kg	Gentamicin 3mg/kg/ Dose OD <b>1<sup>st</sup> week</b> LBW	Gentamicin 5mg/kg/ Dose OD <b>1<sup>st</sup> week</b> Term	Gentamicin 7.5mg/kg Dose LBW & term <b>Week 2</b> <b>onwards</b>
	BD 1 <sup>st</sup> week, QID week 2 onwards					
0.5-0.99	50,000	100,000				
			0.75-0.99	2.5		6.5
1-1.49	75,000	150,000	1.0-1.24	3.5		8
			1.25-1.49	4		10
1.5-1.99	100,000	200,000	1.5-1.74	5		12
			1.75-1.99	5.5		14
2.0-2.49	125,000	250,000	2-2.24	6		16
			2.25-2.49	7		18
2.5-2.99	150,000	300,000	2.5-2.74		13	20
			2.75-2.99		14	22
3.0-3.49	175,000	350,000	3-3.24		16	23
			3.25-3.49		17	25
3.5-3.99	200,000	400,000	3.5-3.74		18	27
			3.75-3.99		19	29
4-4.49	225,000	450,000	4- 4.24		21	31
			4.25-4.49		22	33
4.5 -4.99	250,000	500,000	4.5 – 4.74		23	35
			4.75-4.99		24	36

### Aminophylline for prevention of apnoeas of prematurity

Dissolve 100mg tablets in 20mls of water, each ml contains 5mg of aminophylline

Weight	Stat dose to load	Aminophylline solution	BD dose	Aminophylline solution
<b>0.75- 0.99</b>	5mg	1ml	2mg	0.4mls
<b>1.0 -1.49</b>	7.5mg	1.5mls	3mg	0.6mls
<b>1.5 – 1.99</b>	10mg	2mls	4mg	0.8mls

### High dose Cotrimoxazole and steroids for presumed PJP

Cotrimoxazole 60mg/kg BD for 3 weeks (21 days) then prophylactic CPT of 120mg OD

Prednisolone 2mg/kg OD for 10 days then Prednisolone 1mg/kg OD for 10 days then  
stop