Care of the infant and newborn in Malawi

The COIN Course

Participants Manual

Foreword

Malawi has achieved a 64% decline in under-5 mortality rate since 1990, and is ranked 7th in the world for this achievement, among high mortality countries. Most of this progress is due to a reduction in under five-mortality after the first month (post neonatal mortality) with reduction rates of 7.1% per year. Neonatal mortality continues to decrease, but at a slower rate of 3.5% per year. Malawi has also achieved impressive progress with institutional deliveries, and the majority of babies are now delivered in a health facility.
The recently developed newborn action plan for Malawi outlines a targeted strategy for accelerating the reduction of among others, preventable newborn deaths and aims to halve the number of neonatal deaths by 2020, with interventions that have proven to have an impact in the reduction of neonatal deaths in Malawi. Quality of care is one of the pledged pillar principles for ensuring attainment of the objectives. Skills improvement and training is one of the cornerstones of quality care, and addresses aspects of strategic objectives 3, 4, (partly 5) and 8 of the Malawi Newborn Action Plan.

The MOH fully recognizes the immediate and long-term health, social and economic repercussions of acute and prolonged morbidity and mortality among neonates and infants. To date, the MOH did not have guidelines for clinical care focused on neonates and infants, an age group with converging clinical problems and with a huge contribution to childhood mortality. It is in light of this that the MOH welcomes this training manual, that will help improve skills for care of newborns and infants in health care workers country-wide, and help reduce deaths among the most vulnerable age group of our population.

The trainings are intended to target medical assistants, clinical officers, nurses and essentially all nursing and clinical staff involved in looking after neonates and young infants.

The participants' manual contains guidelines on basic clinical management of neonates and young infants in health facilities in the Malawian primary and secondary health care level. While not being fully exhaustive, and focusing on the most common contributors to mortality among infants and newborns, the scope has been widened to include basic general approaches to emergency presentation of some problems that are not so common.

The manual fulfils, and is complementary to the existing MOH policies and guidelines, specifically those related to Maternal and Newborn, as well as Child Health, and should be utilized as a part of training in a continuum of care.

It is the hope of the Ministry that this document will be widely disseminated and utilized across the country to achieve the desired goal.

Lastly the Ministry of Health (MoH) would like to acknowledge and appreciate contributions made by individuals and institutions in various forms, culminating in the publishing of this training manual.

Signed:

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Secretary for Health.

Acknowledgements

The Ministry would like to extend sincere thanks to those who generously provided their input to the development of this course, including each member of the stakeholder group and the facilitators and candidates at the pilot course. We acknowledge members, past and present of the Department of Paediatrics and Child Health, both Blantyre and Lilongwe campuses, at the University of Malawi College of Medicine who have contributed to the material in the COIN course through their input into guidelines developed over the years. Thanks to members of the Paediatric and Child Health Association of Malawi (PACHA) and to all healthcare staff in Malawi who have contributed ideas and time to developing this document and who strive to ensure provision of optimal care to neonates and young infants. Our appreciation also goes to Bernadette O'Hare, Kondwani Kawaza, Rizine Mzikamanda and Elizabeth Molyneux, for the manual and associated material and to Mr Norman Lufesi, Ajib Phiri, Queen Dube, Chikondi Chimbatata, Hanny Friesen, Laura Newberry, and Andreas Hansmann for their input. We thank all PACHA members, facilitators and participants who have actively contributed to the success of the COIN Course.

PACHA are grateful to all the creators and developers of several life support courses especially WHO, the ETAT and ETAT+ teams in Africa, and the Child and New-born Health Group. Much of the material from these courses has been gratefully borrowed and adapted for this. 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) program and initiatives such as the Baby Friendly Hospital Initiative (BFHI), Help Babies Breathe (HBB) and Emergency Triage Assessment and Treatment (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 care of new born 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.

COIN 2017
By the end of 2016, several hundred health professionals had been trained using the COIN course. In order to incorporate all the excellent feedback we received from PACHA members, candidates and facilitators a technical working group (TWG) was held on 1st December 2016. This was attended by Msandeni Chiumia Chiphaliwali, Andreas Hansmann, Norman Lufesi, Ernest Moya, Bernadette O'Hare, Patriciah Siyabu, and Edison Sabola. The facilitator's manual, the participant's manual and the slides were updated and available on the PACHA website. The next update PACHA TWG for COIN 2018 is planned for December 2017.

Acronyms and abbreviations

<	Below or less than		
>	Above or more than	MCH	Maternal and Child Health
AMAMI	Association of Malawian Midwives	MNH	Maternal and Neonatal (Newborn) Health
ARI	Acute Respiratory Infection	MOH	Ministry of Health
bCPAP	bubble Continuous Positive Airways pressure	NG (T)	Naso Gastric (Tube)
BD	Twice per day	OD	Once per day
BMV	Bag Mask Ventilation	OG(T)	Oro Gastric (Tube)
CHSU	Community Health Services Unit	QiD	Four times per day
COM	College of Medicine	PACHA	Paediatric and Child Health Association
ETAT	Emergency Triage and Treatment	PO	Per oral
HBB	Help Babies Breathe	QECH	Queen Elizabeth Central Hospital
HIV	Human Immunodeficiency Virus	RHD	Reproductive Health Department
IM	Intramuscular	SGA	Small for Gestational Age
IMCI	Integrated Management of Childhood Illness	SpO2	Oxygen saturations
IUGR	Intrauterine Growth Retardation	STAT	Immediately
IV	Intravenous (fluids)	TB	Tuberculosis
KCH	Kamuzu Central Hospital	TiD	Three times per day
KCN	Kamuzu College of Nursing	TPR	Temperature, Pulse rate and Respiratory rate
KMC	Kangaroo Mother Care	UNICEF	United Nations Childrens Emergency Fund
LBW	Low Birth Weight	VDRL	Venereal Disease Reference Laboratory
NYI	Neonate and Young Infant		

Contributor's to COIN 2016

AHC Kawonga	Medical Council of Malawi	Registrar & CEO
Ajib Phiri	COM/PACHA/KCH	Senior Lecturer
Alice Kadango	KCN-MCH	Lecturer
Beata Zuza	MOH (SEZ)	Zonal Nursing Officer
Bernadette O'Hare	PACHA/COM/University of St Andrews	Senior Lecturer
Charles Mulilima	MCHS-Blantyre	Lecturer
Chifundo Kuyeli	LSTM	Senior Technical Officer
Elizabeth Molyneux	PACHA/COM/QECH	Professor
Elizabeth Mpunga	Project Concern International	NEWBORN CARE Advisor
Ellen Lekera	Save the Children International	District Clinical Coordinator
Eneles Kachule	RHD	MNH Officer
Esnath Kapito	AMAMI	Publicity Secretary
Humphreys Nsona	MOH-IMCI unit	Program Manager
Hanny Friesen	PACHA/ COM/KCH	Senior Lecturer
Kondwani Mkandawire	Medical Council of Malawi	Assistant Registrar
Kyaw Aung	UNICEF	Country Director
Laura Newberry	IDRC-COM	Lecturer
Lydia Chimtembo	Save the Children International	MNH Specialist
Maureen D. Majamanda	KCN	Child Health Lecturer
Mercy Jere Makwakwa	MaiKhanda	Program Manager
Modester Nyasulu	QECH	Nursing Officer
Norman Lufesi	MOH-CHSU/ PACHA	ARI Program Manager
Queen Dube	COM-PACHA, MOH, QECH	Consultant Pediatrician
Reuben Ligowe	Save the Children	NEWBORN CARE Manager
Rhino Mchenga	CMED-MOH	Deputy Director
Richard Luhanga	Save the Children	Facility MNH specialist
Rizine Mzikamanda	COM-PACHA	Medical Officer
Rozina Banda	AMAMI	Lecturer - MCHS
Thandi Ngulube	RICE University [bCPAP]	Office Manager
Zione Dembo	PACHI	

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Contents

Introduction to the course

The majority of deaths in neonates and young infants can be prevented with low cost interventions. It has been estimated that we can reduce up to half of all preventable neonatal deaths, with optimal treatment of neonatal illness.
In addition to providing care to newborns at birth, a district health facility also receives sick young infants with diverse clinical presentations, some of whom 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 secondary level 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 participating in a training on the **Care of the Young Infant and Newborn (COIN).** This manual is supported by course material including lectures, videos, drills and scenarios. The training is targeted at nurses, clinicians and medical assistants and will be useful for any nursing and clinical staff looking after newborns and young infants in health facilities. 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 the best and most pragmatic practice for our setting as well as incorporated current practices. There are grey areas in medicine and despite latest evidence there may be no right answer. In this course we have tried to give the candidate a 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. If unclear about the management of a NYI, the next step is to consult a colleague at your facility or to discuss with colleagues from your central hospital.

At the back of the manual there are 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.

On the last day of the COIN course there is an examination which includes an MCQ to test knowledge, a competency based assessment which tests skills. Attitude includes attendance and participation and this is assessed throughout the course.

Learning Objectives of the course

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
- Use and care for essential equipment
- 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 daily sections to help you achieve these objectives. Remember there is considerable overlap between the neonate and the YI

Day 1 – Mostly about the new-born

Day 2 – The basics required to provide care for both the newborn and young infant – warmth, oxygen, fluids and glucose

Day 3 – How to manage the conditions that are common to the NYI

Day 4 – Care pathways, essential equipment including maintenance, CPAP

Day 5 – Audit and quality improvement plans (made in teams from each facility)

Exam which is an MCQ (80% required to pass and a practical exam)

Both parts must be passed to be awarded a COIN certificate

Day 1 Session 1:

Routine Care of the Normal New born Infant

Learning objectives

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

Why is care of the normal term infant so important?

The vast majority of newborns require no intervention at birth other than routine normal care. If this is done well, it vastly reduces the likelihood of problems. Most newborn's 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 baby warm. A mother and her baby should be kept together from birth if possible. 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 breast feeding difficulties(1).

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**?"

Health care professionals should discuss a mother's progress with breastfeeding within the first two days after delivery to assess if she is on course to breastfeeding effectively.

"**Has the baby passed stools**?"

Term babies should pass meconium by 24 hours of birth. Passage after 24 hours is NOT NORMAL and needs evaluation by a clinician.

"**Has the baby passed urine**?"

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

"Is the baby jaundiced (yellow)?"

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

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 Tetracycline Eye Ointment (TEO) should be administered to both eyes once after birth according to national guidelines Vitamin K should be administered to all newborns (1mg IM to term infants)	After ensuring the baby is dry and warm, and the eyes are clean, 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 HIV and VDRL exposure status must be known and acted on if exposed BCG vaccine should be administered to all newborns Oral polio vaccine should be administered to all newborns

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

Key facts for providers - How to examine the newborn

Do on day zero (on admission) to the post-natal ward, at 24hours and at discharge

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

Head to toe

- Look for congenital abnormalities
- Head – fontanelle, moulding, signs of birth trauma
- Eyes – Jaundice, check for the red reflex
- Lips/mouth – cyanosis, pallor , cleft lip/palate
- Chest –severe chest in drawing, listen for grunting and murmurs,
- Abdomen – is the umbilicus red or discharging? Look for abdominal wall defects, organomegaly.
- Check for normal genitalia, femoral pulses, patent anus.
- Turn baby around, check for spina bifida

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, poor feeding, vomiting
2. Lethargy
3. Convulsions
4. Low body temperature (<35.5 °C)
5. Fever (>38 °C)
6. Chest in-drawing
7. Fast breathing (breathing rate >60 per minute), grunting
8. Any jaundice in first 24 hours of life, or yellow palms and soles at any age

Parental education about maintaining Infant Health

At each post-natal contact, parents should be offered information and guidance to enable them to care for their baby.

Key facts for providers and mothers/guardians	
Warmth	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
Skin	Babies are not bathed routinely in the hospital to prevent complications like hypothermia and infection, they may however be sponged with lukewarm water.
Cord Care	Chlorhexidine is applied once after birth. After this instruct the mothers not to apply anything to the cord but keep clean and dry
Nappy Rash	Prevent with frequent nappy changes and cleansing and exposure of the perineal 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.
Thrush	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.
Jaundice	Parents should be offered information about 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. 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. Breastfed babies with jaundice should **not** be routinely supplemented with formula, water or dextrose water. Parents should be advised to contact the health care professional if their baby's jaundice is worsening, or if their baby appears unwell in any way. If jaundice remains after 14 days in an otherwise healthy baby it should be evaluated.
Weight Loss	Weight loss of 10% in the first days of life is normal. Most term infants regain their birth weight by 10-14 days.
Hygiene	Advise mother to wash hands with soap and water after using the toilet and after cleaning the baby.
Danger Signs	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 (first yellowish milk after delivery)– this will meet the needs of the baby in the first few days after birth.

Discomfort for the mother 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 the baby is healthy, his/her individual pattern should be respected.

Empty both breasts at each feed.

How to assess Breast-feeding

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 and assess for the following:

1. First assess the **position**
2. Then assess the **attachment**
3. Then assess the **sucking**

1. Position

Observe the breastfeed for 4 minutes

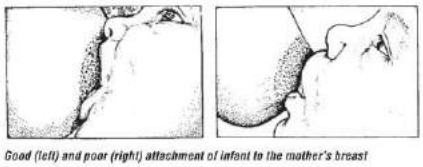
Signs of good positioning:

Baby's body is well supported.

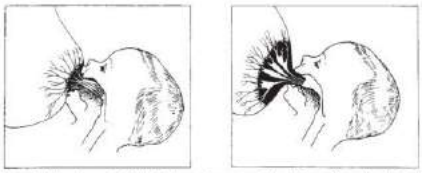
The head, neck and the body of the baby are kept in the same plane.

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

2. Attachment



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



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

Signs of good attachment:

Chin touching breast

Mouth wide open

Lower lip turned outward

More areola above than below the mouth

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

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, the mother 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 the mother 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 not recommended).

Common Congenital Infections

HIV:

All newborns born to HIV positive mothers should be managed according to the current Malawi 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:

- A dried blood spot (DBS) is done for HIV PCR
- The baby is started on co-trimoxazole preventative therapy (CPT) 120 mg, which they will take 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 no 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 000iu/kg bid x for 10 days Emphasize the importance in all cases that both parents receive treatment

Infants of mothers with tuberculosis

If the mother has active lung tuberculosis (TB) in the third trimester or TB was diagnosed after delivery, 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**
< 2500g	25mg (1/4 tablet) every 24 hours
2500-5000g	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 first thing in the morning using a nasogastric tube. Send for gene Xpert and culture 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 and birth date
- 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 after discharge

Session 2 Care of the low birth weight/preterm infant

Learning objectives

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
- ❖ Counsel the mother on discharge

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

14% 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.

A neonate who weighs less than 2500 g 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 neurodevelopmental 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 at birth.
Extremely low birth weight – less than 1000 g at birth.

Common problems in LBW, preterm and SGA neonates

Increased risk of

- Hypothermia
- Inability to breast feed
- Hypoglycaemia
- Infection/ Sepsis
- Respiratory Distress Syndrome
- Polycythaemia
- Apnoea
- Hyperbilirubinaemia
- Retinopathy of prematurity

Often just require support and close observation

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 by adding the scores of the following features shown below (Parkin Score (2))

Approximate gestational age based on physical characteristics

	0	1	2	3	4
SKIN TEXTURE	Very thin	Thin and smooth	Smooth, medium thickness Rash and superficial peeling	Slight thickening superficial cracking and peeling especially of hands and feet	Thick superficial or deep cracking
SKIN COLOUR	Dark red	Uniformly pink	Pale pink	Pale, nowhere really pink except ear, lips, palms, soles	
EAR FIRMNESS	**Soft pinna** No springing back into position spontaneously	**Soft pinna along the edge** Slow spontaneous return into position	**Thin Cartilage in pinna edge** Readily springs back into position	**Firm Pinna** with definite cartilage	
BREAST SIZE	No breast tissue palpable	Breast tissue palpable on one/ both sides neither being >0.5cm in diameter	Breast tissue palpable on both sides 0.5-1 cm in diameter	Breast tissue palpable on both sides >1cm in diameter	

SCORE	1	2	3	4	5	6	7	8	9	10	11	12
GESTATION AGE	27	30	33	34½	36	37	38½	39½	40	41	41½	42

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 of the mother, (in-utero transfer), 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 LBW neonate include the following:

a. A sick neonate
b. A LBW neonate who is not gaining weight
c. Neonate who is unable to feed from the breast or by cup

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. All newborns weighing 2000 g or less at birth should be provided as close to continuous Kangaroo mother care as possible (3).

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

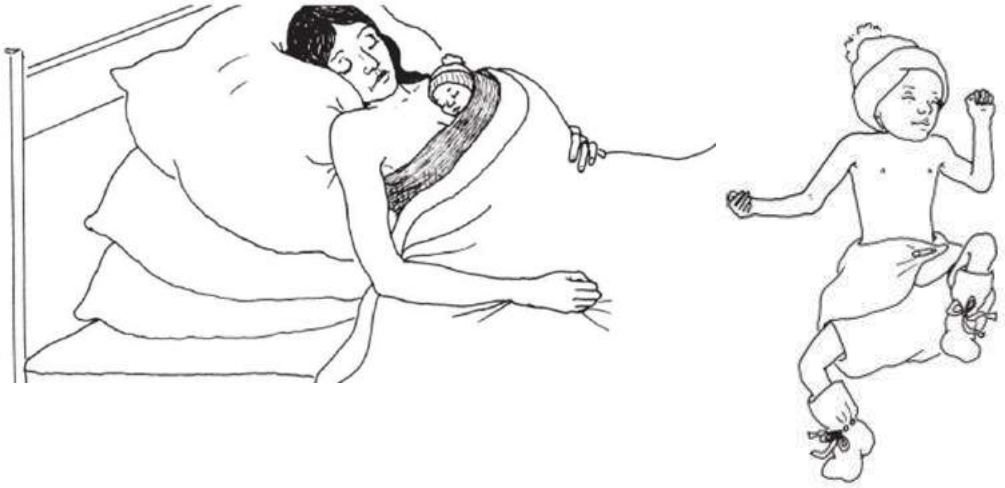
1. **Facility KMC** – recommended for all neonates with a birth weight of < 1500 grams
2. **Ambulatory KMC** – 1500 – 1800 grams after discharge from a facility but continues to be followed up by that facility
3. **Community KMC** - >1800 grams and clinically stable

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 done.

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 infant's 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 or >32 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 – 2500 grams
Gestational age	<32 weeks	32-34 weeks	>34-35 weeks
1-3 days	Tube feeds	Tube feeds or cup	Breast feed, if unsatisfactory use cup
3 days – 3 weeks	Tube or cup	Breast feed, if unsatisfactory use cup	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 of gestation should be put on the breast for 5-10 minutes before or after cup-

or tube feeding.

Is the baby able to breastfeed effectively?

- When offered the breast, the baby roots, attaches well and sucks effectively
- S/he is 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
- S/he is 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	Loses up to 15 percent cumulative weight loss during the first week of life Birth weight is usually regained by the end of 2 weeks of life. (May be longer in very premature babies). Observe for: **Inadequate feeding**: • 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 **Structural abnormality e.g. cleft palate/lip** **Persistent hypothermia due to low environmental temperature,** which diverts energy from growth to heat production (may be a sign of underlying sepsis)
Small for Dates babies	Should not have any appreciable weight loss at all and they should start gaining weight early.

If nutrition supply of the baby is found to be inadequate due to reduced milk supply of the mother, there are several ways to increase the milk production:

- Increase the rate of breastfeeding/expression of both breasts to at least three hourly and ensure both breasts are emptied completely on each occasion
- Increase the intake of nutritious food and increase the amount of liquids of the mother
- Ask the mother to rest sufficiently
- Treat any underlying illness in the mother

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

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.

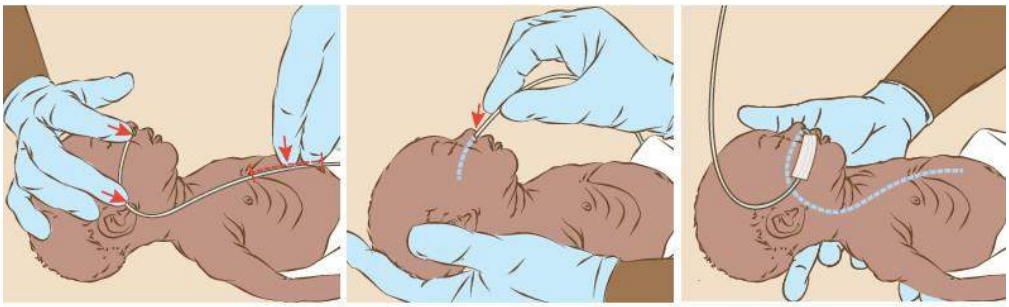
Nasogastric tube feeding (NG tube)

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

Oro-gastric tube feeding (OG tube)

For the oro-gastric 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

Prevention of apnoeas – see session 4 on breathing difficulties in the newborn

Vitamin supplements and iron for preterm infants

Supplement	Route	Timing and duration
Vitamin K *National Guidelines*	0.5mg in pre term neonates IM	Birth
Multivitamin preparation *if available*	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 *if available*	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. Syrup usually contains 50mg iron in 5 mls or 10mg per ml so a 2 kg baby will get 0.5 mls	2 weeks until 6 months

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.
- Has not had apnoea for seven 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 weight.

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. Discuss about her own nutrition and health.

Session 3 – Resuscitation of the new born

Learning objectives

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

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

This session covers resuscitation of a newborn (who has just been delivered).

Why is care at birth important?

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.**

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

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

Preparation for a delivery – temperature

The recommended temperature for the delivery room is 25°C. 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. To prevent drafts of air, shut all windows and switch off fan before the 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

Preparation for a delivery – 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.

Preparation for a delivery – equipment

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

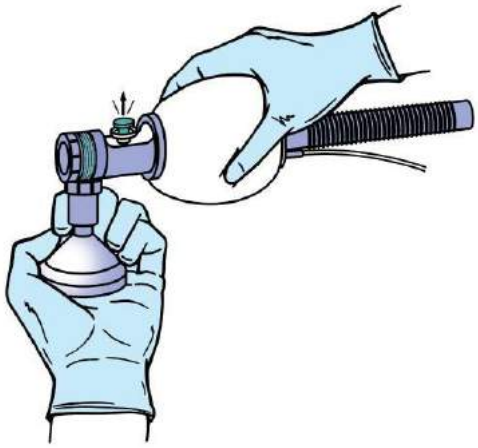
- DRY warm cloths x 2

(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)

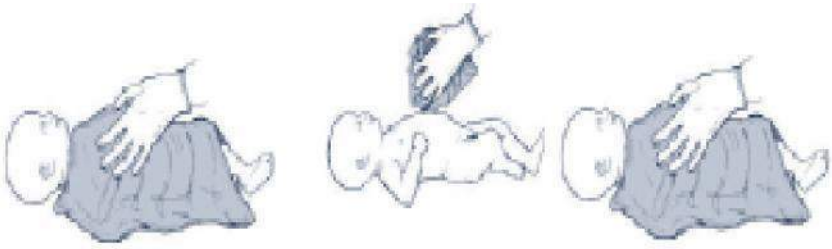
Test the equipment required to provide newborn resuscitation

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.

	
Check the bag against your hand	**…before using it on a 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.
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 or rubbing the hands or feet between your fingers with gentle pressure

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.**

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.

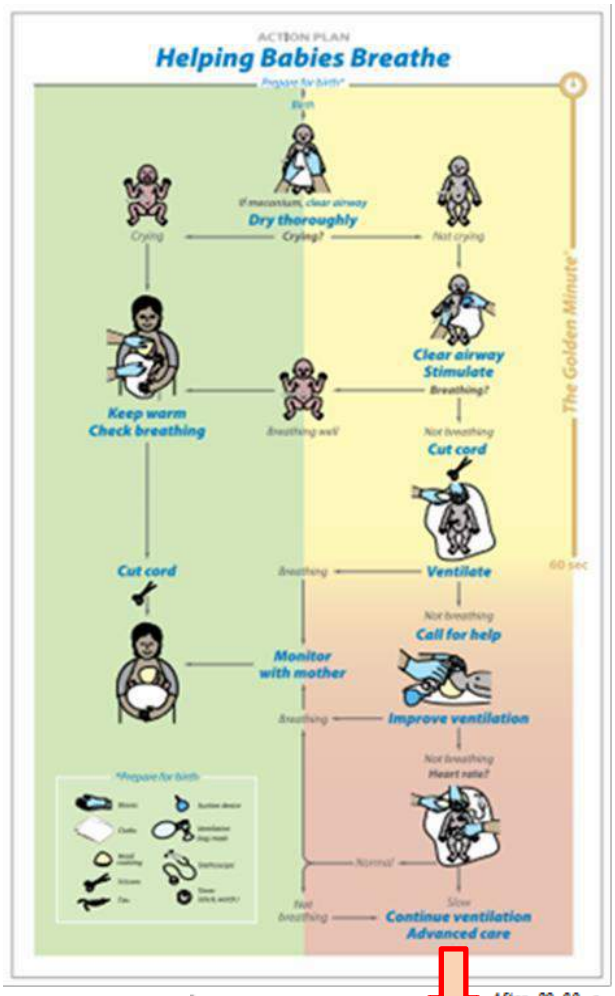
If the baby requires resuscitation provide warmth

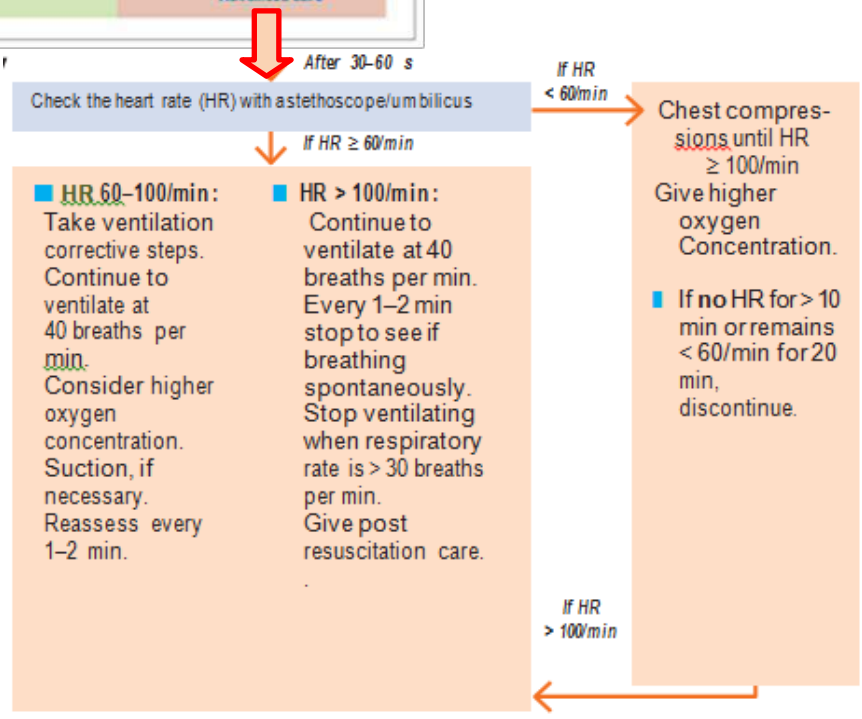
- If the baby requires resuscitation s/he should be placed on a resuscitaire or under a radiant warmer so that the resuscitation team has easy access to the baby and the radiant heat helps reduce heat loss.
- Further drying will also provide stimulation and prevent heat loss.
- Leave the baby uncovered 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.

Position yourself at the bedside

- You will need to position yourself at the baby's head to use a resuscitation device effectively.
- This position leaves the baby's chest and abdomen unobstructed for visual monitoring and for chest compressions should these procedures become necessary

Resuscitation of the Newborn - Help Babies Breathe and WHO Guidelines (1,4)





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

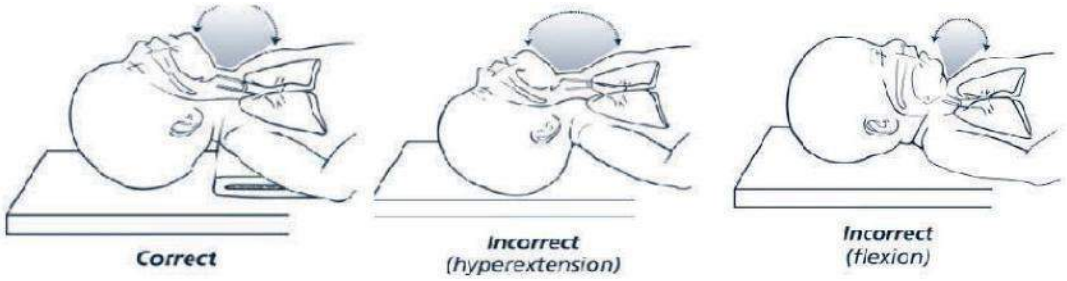
Ensure that the **Airway** is open and clear

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

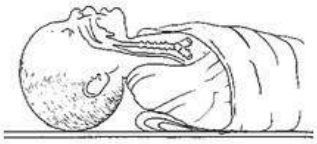
Make certain that there is adequate **Circulation** of oxygenated blood.

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?

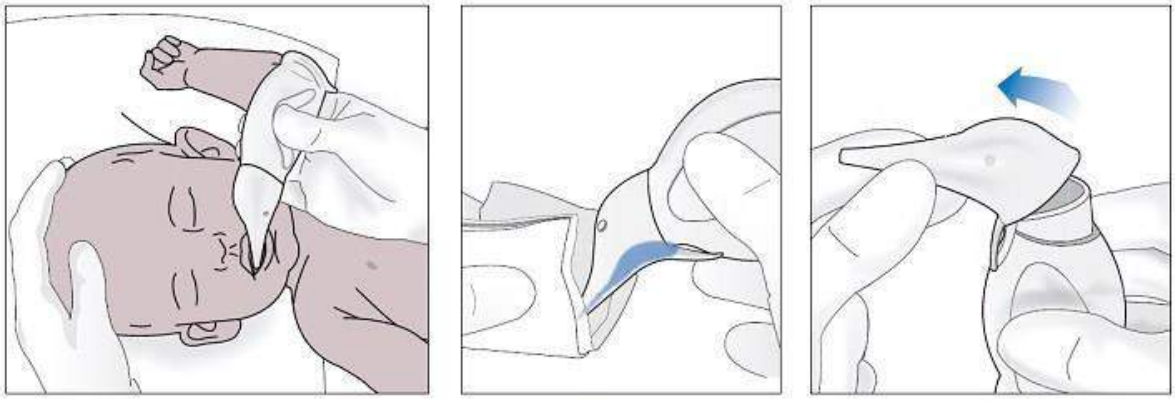
Secretions may be removed from the airway by wiping the nose and mouth with a towel or by suctioning with a bulb syringe or suction catheter. If the newborn has copious secretions coming from the mouth, turn the head to the side. This will allow secretions to collect in the cheek where they can be removed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



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

- **Colour;** the baby should have pink lips and trunk. There should be no central cyanosis once the baby has good respiration and heartbeat. NOTE: peripheral cyanosis can persist for a few hours

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

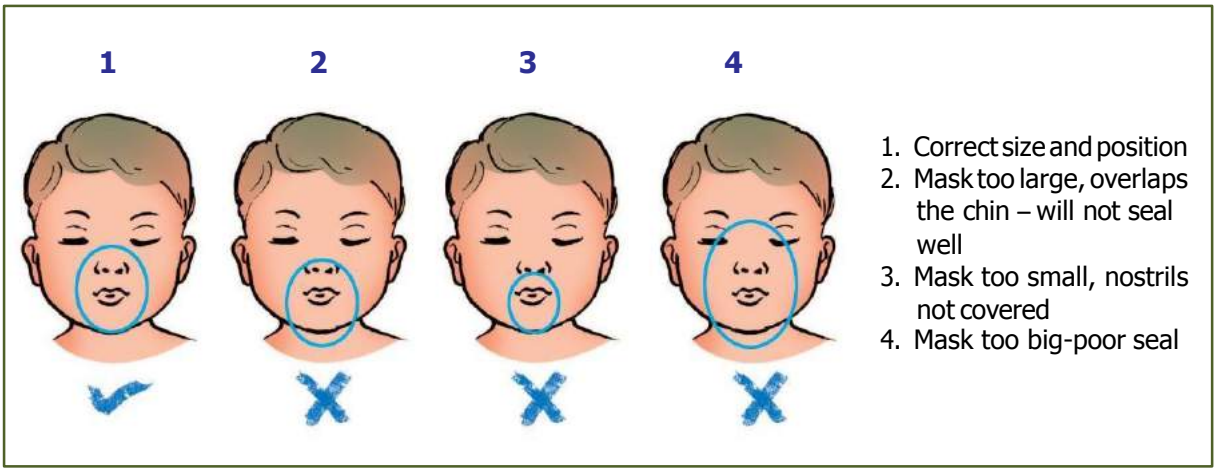
A variety of mask sizes, appropriate for babies of different sizes, should be available at every delivery, since it may be difficult to determine the appropriate size before birth. For the mask to be of the correct size, the rim will cover the tip of the chin, the mouth, and the nose but not the eyes.

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

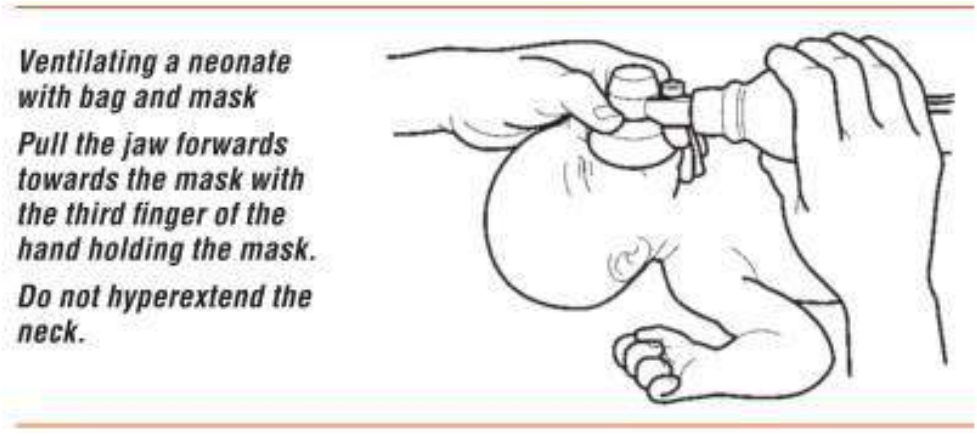
Masks come in two shapes: round and anatomically shaped. Anatomically shaped masks are shaped to fit the contours of the face. They are made to be placed on the face with the most pointed part of the mask fitting over the nose.



How to 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.

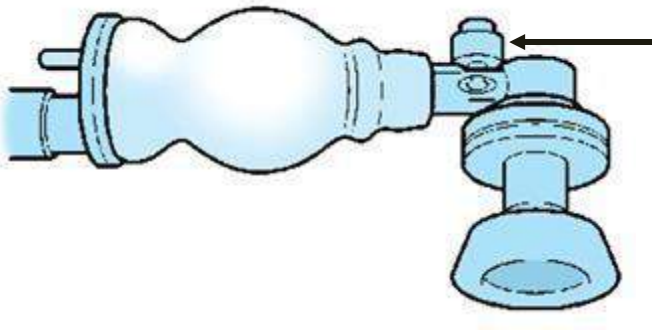


Safety features

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 H2O. If a peak inspiratory pressure greater than 30 to 40 cm H2O 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.



The self-inflating bag

The pop off valve (which can be held to increase pressures if needed, but after other manoeuvers have been tried)

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:

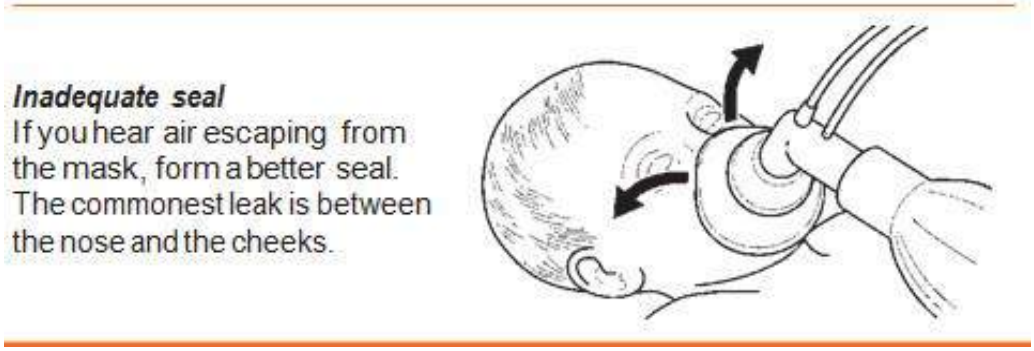
1. The seal is inadequate
2. The airway is blocked
3. Not enough pressure is being used to inflate the lungs

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.



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 Guedel airway to help keep the airway open.

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 manoeuvers do not help place an airway
Pressure increase	Gradually increase the pressure every few breaths, until there are visible movements with each breath.

What else is necessary if BMV is exceeding 2 min?

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.)

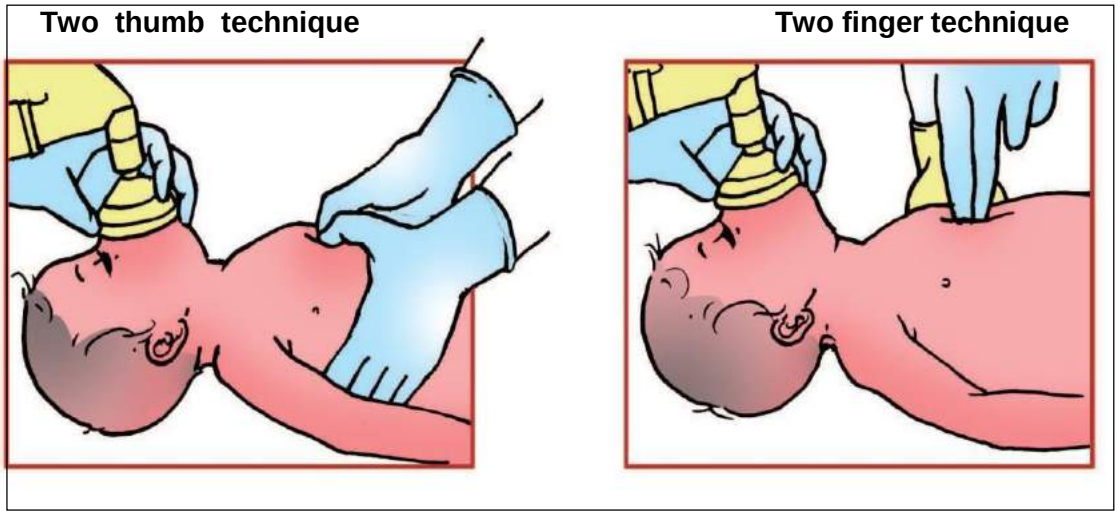
How many people are needed to administer chest compressions, and where should they stand?

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).



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.

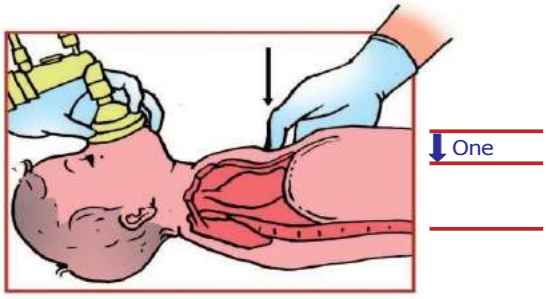
Where on the chest should you position your thumbs or fingers?

Hands should be positioned on the lower third of the sternum, half way between the xiphoid 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 xiphoid.

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?

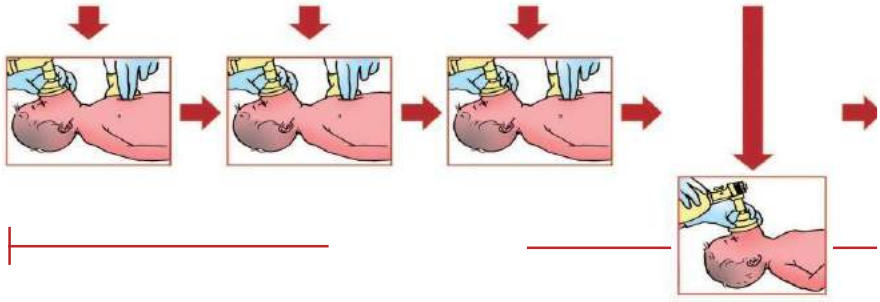
Chest compressions can cause trauma to the baby.

Two vital organs lie within the rib cage; 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 cycle will consist of 3 compressions plus one ventilation.
There should be approximately 30 breaths and 90 compressions per 60 seconds

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 100bpm 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
- If no spontaneous breathing and heart rate remains below 60/min after 20 min of effective 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.

Session 4 Breathing difficulties in the newborn

Learning objectives

After completion of this session participants should be able to:

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

Why are breathing difficulties in the new-born 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.

Newborns at risk of developing breathing problems

- Preterm infants
- Infants born to mothers with fever, prolonged rupture of membranes, 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
- Congenital abnormalities

Signs and symptoms

- Grunting
- Nasal flaring
- Cyanosis
- Fast breathing- respiratory rate of more than 60bpm.
- 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)
- PPHN: persistent pulmonary hypertension of the newborn
- Pneumonia
- Meconium aspiration (Note: not born with meconium but born with meconium *and* has respiratory distress)

Respiratory Distress Syndrome

- RDS occurs primarily in premature infants; its incidence is inversely related to gestational age and birthweight.
- It occurs in 60–80% of infants less than 28 weeks, 15–30% of those between 32 and 36 weeks, about 5% beyond 37 weeks, and rarely at term.
- Surfactant deficiency is the primary cause of RDS.
- Increased risk in maternal diabetes, multiple births, Caesarian Section, precipitous delivery, asphyxia, cold stress, and a history of previously affected infants.
- Reduced risk with antenatal steroid use.
- Management : oxygen, CPAP, ventilation, antibiotics, NGT

Management of breathing difficulties in the newborn

- Clear airway if necessary,
- Put the baby in neutral (sniffing) position
- Give oxygen via nasal cannula 0.5-1 litre per minute. (escalate – see session 8)
- 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 NGT if the baby is in severe respiratory distress.

Consider CPAP if the newborn condition does not improve (see chapter 20).

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).

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 – AFTER clinical examination

Blood sugar
Temperature
Packed cell
volume
Sepsis work-up (blood culture, urine culture, LP, CXR

Consider the possibility that the baby could be having a seizure:
If mobile ultrasound is available, perform cranial ultrasound to look for brain bleeds.

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) over
20 min 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

The gestational age >37 weeks (or weight of > 2500 g if gestational age is not known)

Or
The infant has been apnoea-free for 7 days.

Session 5 Birth asphyxia

Learning objectives

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

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

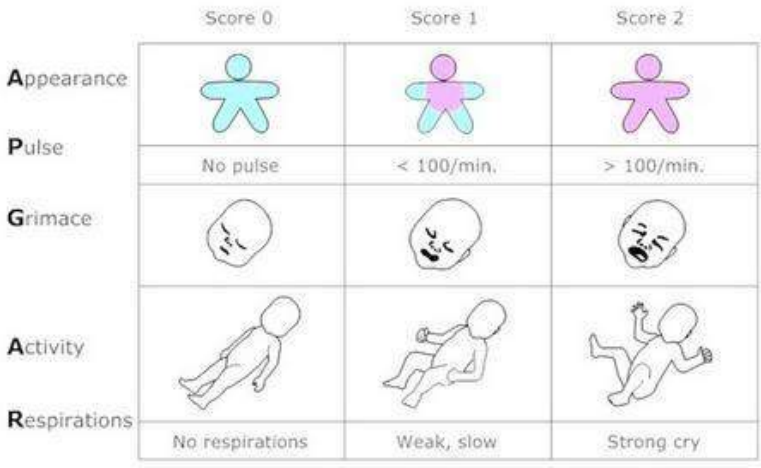
Lack of oxygen supply to organs before, during or immediately after birth results in asphyxia which is recognized by either delayed onset of breathing/cry with/without need for assisted ventilation.

Clinical features that these babies evolve over **the first 2-3 days of life** include irritability or coma, hypotonia or hypertonia, convulsions, apnea, poor suck and feeding difficulty. The diagnosis in preterm infants is difficult, as they may be hypotonic because of prematurity.

Suspect birth asphyxia in a baby with some/all of the following

- Foetal bradycardia
- Prolonged of second stage labour
- Required bag and mask ventilation > 5 min
- Required cardiac massage
- APGAR scores <7
- Irritable, hypotonic, seizures, poor suck, poor colour
- High lactate on cord blood

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



Classification of Hypoxic Ischemic Encephalopathy (HIE)

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 generally 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.

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

Key facts for provider's - supportive management of birth asphyxia

Check for emergency signs ABC and provide emergency care

Place these babies under radiant warmer to **maintain normal temperature but prevent hyperthermia**

Check blood glucose and if hypoglycaemia is detected. Treat if not hypoglycaemic check blood glucose every 12 hrs.

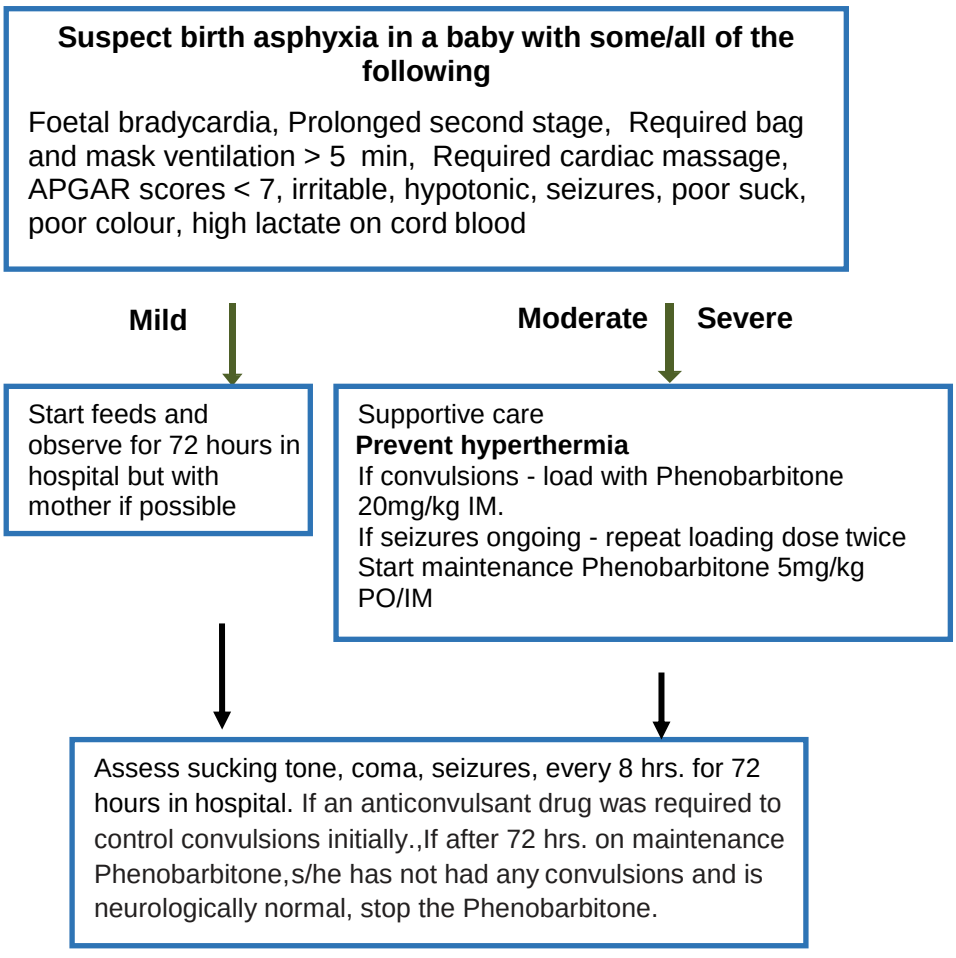
Fluids: In a baby with emergency signs (breathing difficulty, shock, coma or convulsions), provide maintenance intravenous fluids using wall charts and according to age after initial stabilisation of emergency signs.

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.

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	Not associated with eye movements or autonomic changes

Management of Birth Asphyxia



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

If severe arrange follow up at six months - focus on head growth, general health and motor neurodevelopment. Assessments at 12 to 24 months focus on cognitive skills and language development.

Day 2

Session 6 Temperature control in NYI

Learning objectives

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

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

The N Y I 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).

Assessment of temperature by touch

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.

Classification of hypothermia

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

Classification	Temperature
Mild	36.0-36.4°C
Moderate	32.0-35.9°C
Severe	< 32.0°C

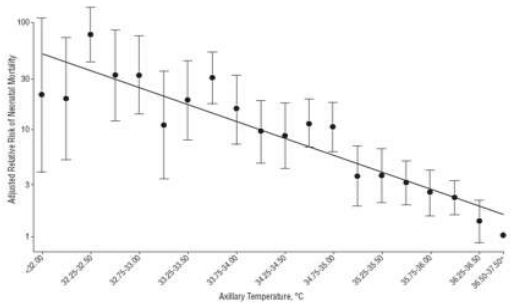


Figure. Association between first temperature observed and mortality, adjusted for age and ambient temperature at measurement. Error bars indicate 95% confidence interval; *normal temperature.

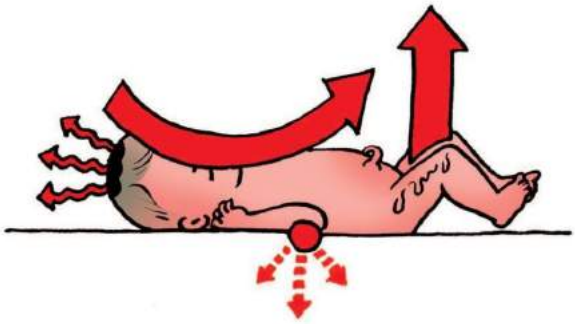
(5)

A community-based study in Nepal, found that mortality increased by approximately 80% for every degree Celsius decrease in first observed axillary temperature and that relative risk of death ranged from 2 to 30 times **for moderate hypothermia,** increasing with greater severity of hypothermia (5).
A study in India that included only hypothermic babies on admission found mortality ranged from 39.3% for mild hypothermia, 51% for moderate hypothermia to 80% for severe hypothermia. Moderate hypothermia has a much worse outcome when associated with other newborn problems and fatality rates increase to 71% when the baby is also hypoglycemic, 83% when hypoxic and 90% when shocked (6).

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 25ºC

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 minimise heat loss in all newborn.

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 resuscitation
9. Warm transportation
10. Training and awareness raising

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 mother's 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 post-natal 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. Check the baby's temperature after an hour in the cot, and if the baby's temperature increases, turn off two bulbs to avoid over heating the baby and recheck the babies temperature regularly.

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 and has a weak cry
- Has respiratory distress

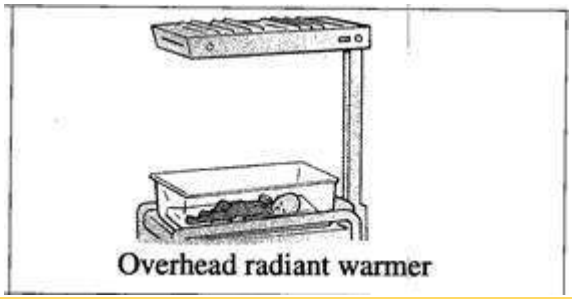
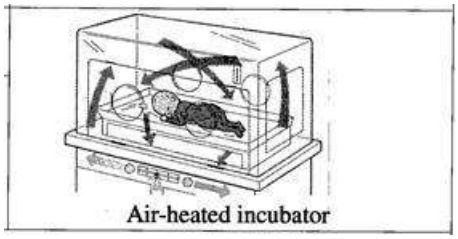
Treatment of established hypothermia in the NYI

The NYI should be quickly re-warmed. The method selected for re-warming 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

 Overhead radiant warmer	**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 re-warming process in an air-controlled incubator should be monitored to avoid overheating.	 Air-heated incubator

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.

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°

Session 7 How to manage hypoglycaemia in NYI

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

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.

COIN defines hypoglycaemia as **< 45mg/dl (2.5 mmol/L)** for NYI.

Chart A - Identify a NYI with hypoglycaemia

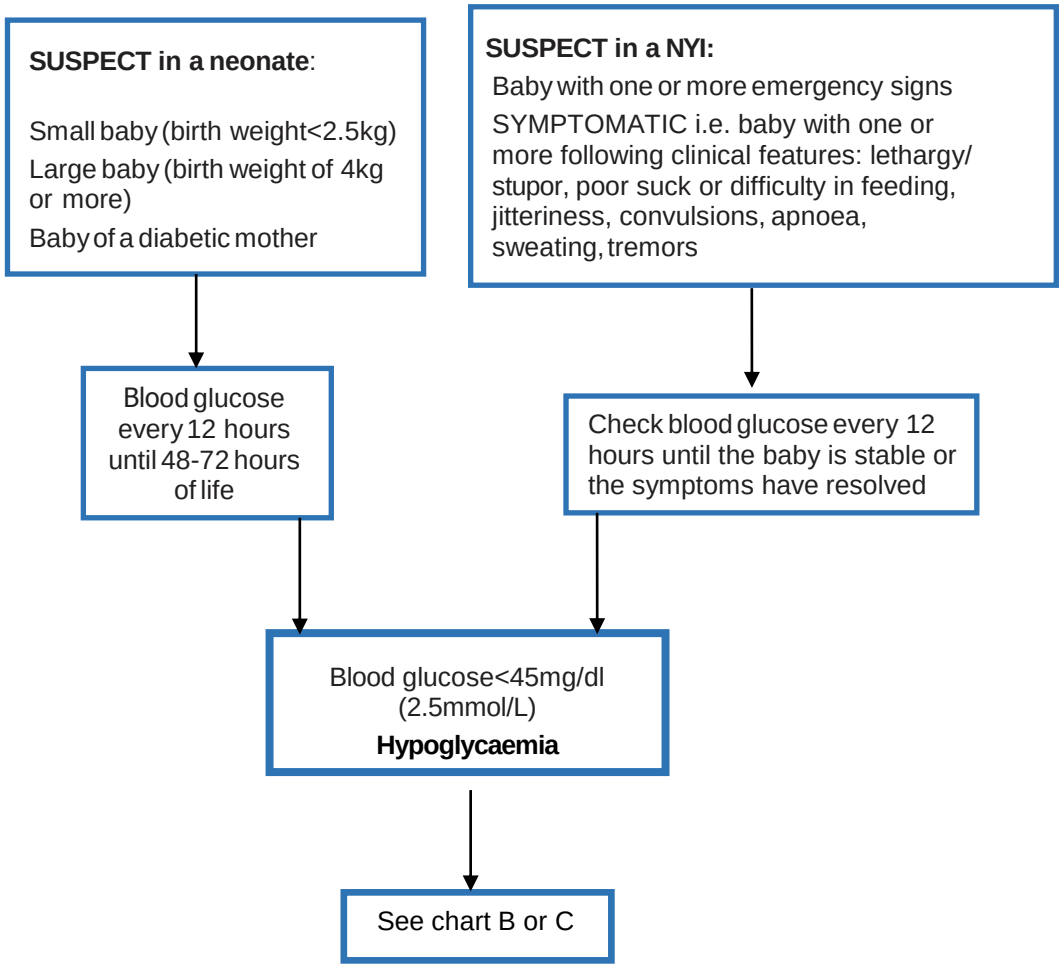


Chart B

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

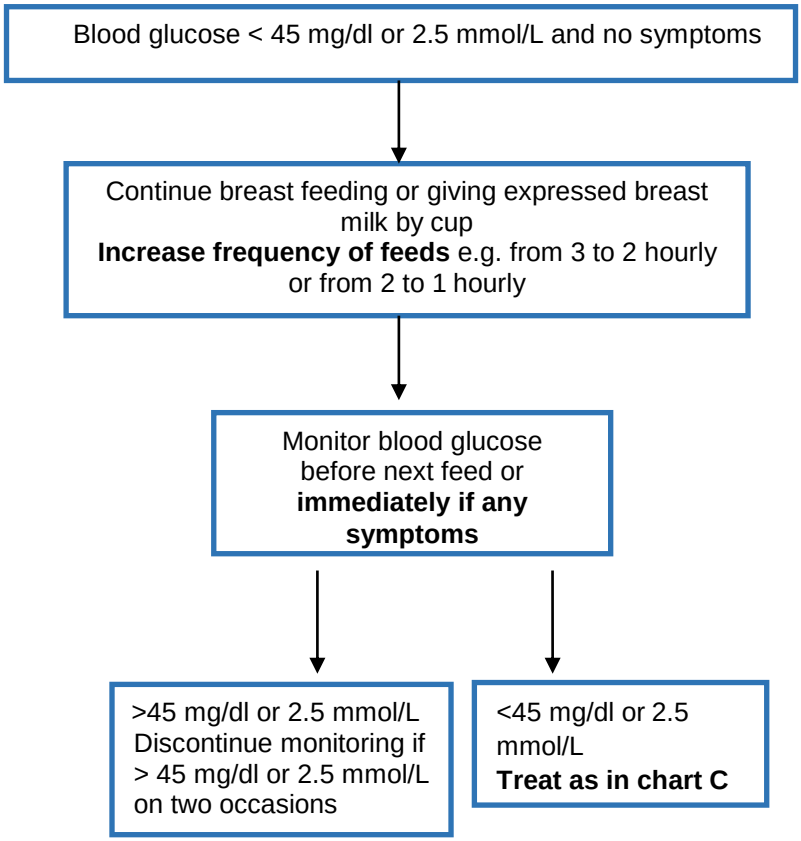
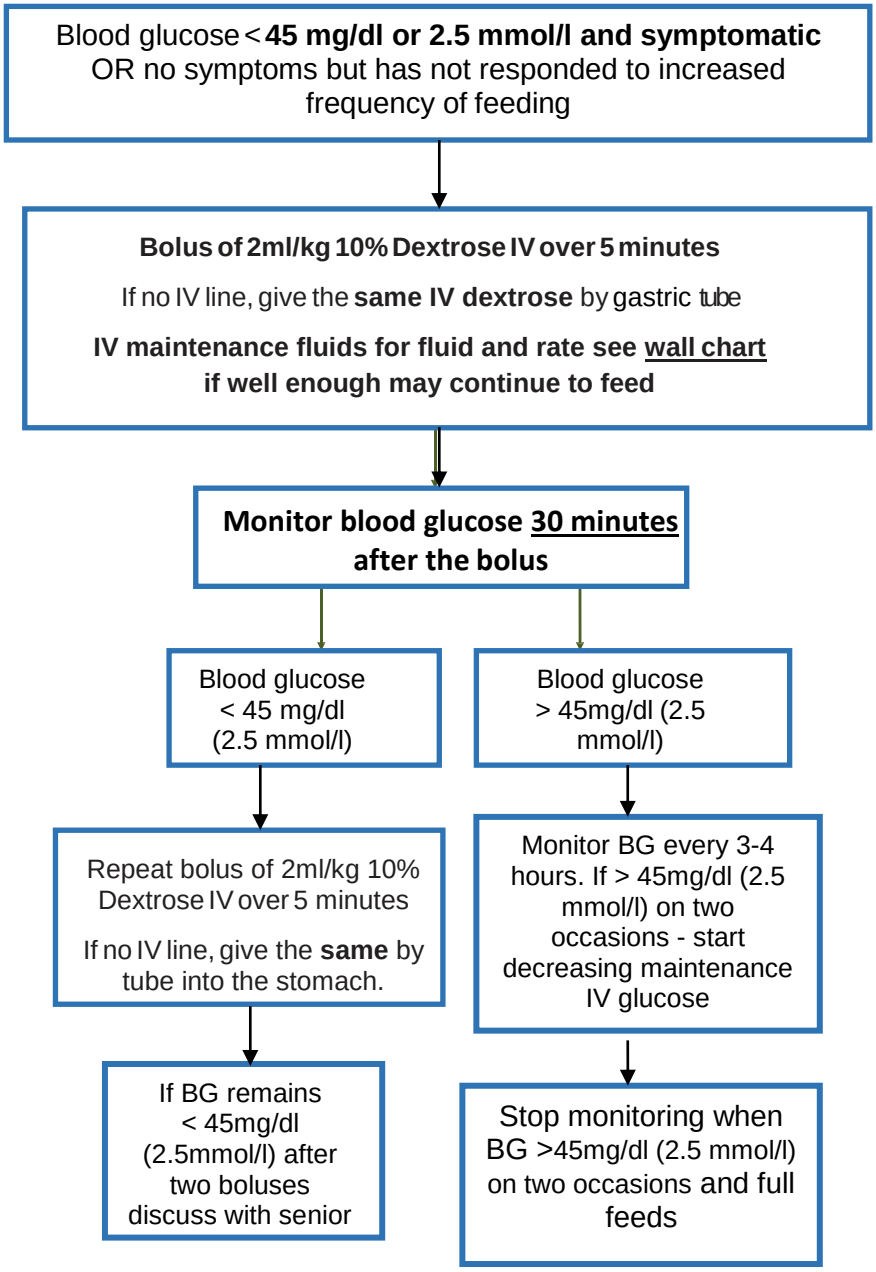


Chart C

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



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
	4 parts	**1 part**
5 ml syringe	**4mls**	**1ml**
10 ml syringe	**8mls**	**2mls**
20 ml syringe	**16mls**	**4mls**
50 ml syringe	**40mls**	**10mls**
100 ml burette	**80mls**	**20mls**
200 ml bag	**160mls**	**40mls**

To make up a bag of fluids - empty fluid out of a litre bag of fluids 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.

250mls in a litre bag	**200mls**	**50mls**

Session 8 How to deliver oxygen to a NYI

Learning objectives

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

- 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.

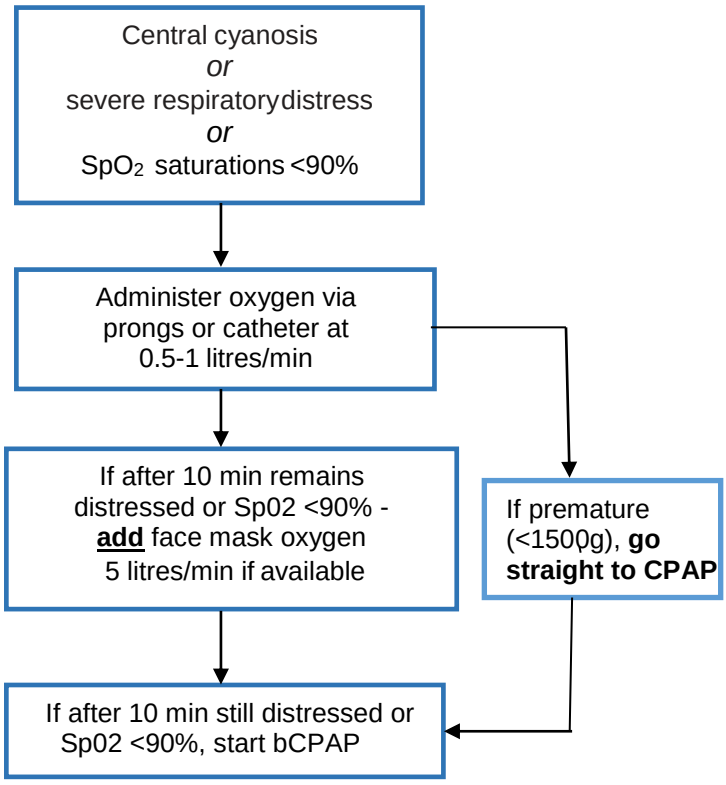
If the baby's breathing difficulty does not improve on prongs or catheter oxygen, despite increasing the flow:

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
5. Increased respiratory distress

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, rule out a pneumothorax with a chest x-ray if available. Discuss with senior colleague.

When and how to stop oxygen therapy

Continue giving oxygen until the infant is able to maintain a SaO2 >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 oxymetry 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 SpO2 >95% in premature newborn infants.

Sources and delivery methods of oxygen

The source of oxygen is generally the oxygen concentrator. These usually deliver 5 -10 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 week 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.

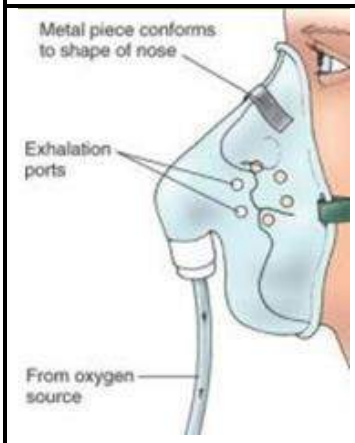
A flow rate of 0.5-1 litres/min will deliver 30-35% oxygen concentration in the inspired air.

Aim for oxygen saturations >90%.

Nasal tube or catheter: Use 8 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%.



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 mask with a reservoir attached will deliver 100% oxygen. It 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 NYIs require oxygen at the same time.

Aim for oxygen saturations >90%.

Session 9 Fluid management in a NYI

Learning objectives

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 nutrition and protection from disease whilst promoting growth and development. Term infants that are well 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.**

During the first few days of life, feeds are given in smaller amount and gradually increased.

THE CALCULATION OF MAINTENANCE FLUIDS FOR NYI

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.

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 or occasionally every hour.

See wall charts for the volume of feeds to give NYI depending on their age, maturity and the planned frequency of their feeding.

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.

Possible reasons for not feeding by mouth or gastric tube

Medical	Surgical
Severe or recurrent apnoea Severe respiratory distress Frequent convulsions Unconscious	Bowel obstruction Necrotizing enterocolitis Abdominal wall defects (relative)

Which fluid?

The choice of fluid depends on the age of the NYI. 10% dextrose is used for the first two days of life, because the baby's kidney is immature. (If 10% dextrose not available, use Ringers Lactate or Normal Saline). On the third day if not already on Ringers Lactate or Normal Saline, change to it and add glucose to make it up to 10% dextrose (1).

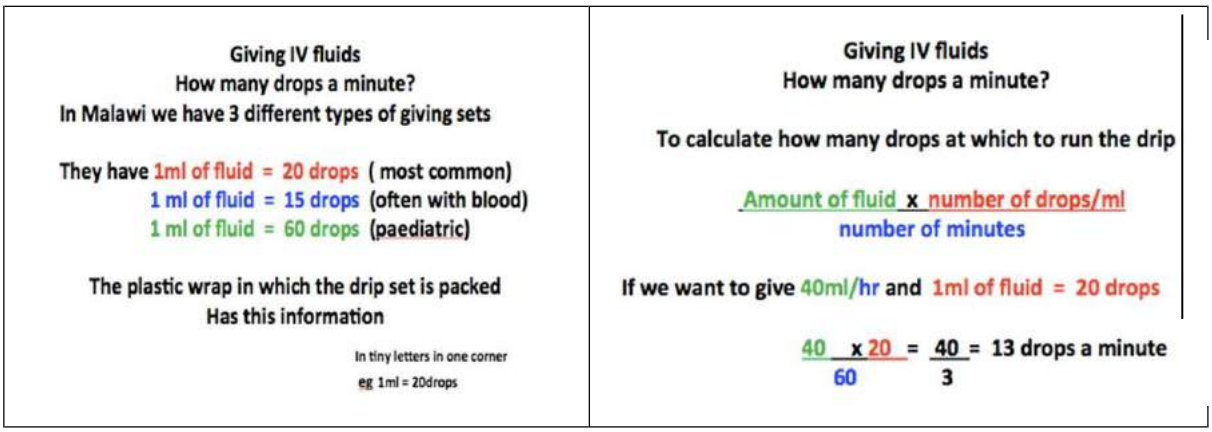
What volume?

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

Generally, we 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.

How to calculate the rate of IV fluids



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**
Start enteral feeds 10mlsl/kg/day Measure the residual volume before the next feed by aspirating the stomach. (If >25% of total feed and/or there is abdominal distension do not increase the volume.) If the feed is tolerated, slowly increase the enteral feeds and wean and stop the IV fluids when the baby is on 2/3rds maintenance. If there is vomiting, consider restarting IV fluids and stopping enteral feeds.	Continue IV fluids according to age Do not increase fluids and consider restricting fluids **if** there is • weight gain • tachycardia • fast breathing • oedema • puffy eyes

Session 10 Jaundice

Learning objectives

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 of jaundiced NYI

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.

Physiological	Pathological	Prolonged/ pathological
Appears after 48 hours Maximum by 4^{th} and 5^{th} day in term and 7^{th} day in preterm Generally, disappears without any treatment but some NYI will require phototherapy for physiological jaundice.	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
	Possible causes Haemolysis Congenital Infection Neonatal sepsis	**Possible causes** Hypothyroidism Neonatal Hepatitis Biliary atresia

Evaluation for aetiology on history

Birth weight, gestation and postnatal age	Consider jaundice of prematurity
Assess clinical condition (well or ill) lethargy, poor feeding, sepsis, urinary tract infection, foul smelling amniotic fluid, maternal fever	Sepsis often causes jaundice
Birth asphyxia (5 min Apgar of 7 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 total serum bilirubin (TSB)	Incompatibility between mothers and babies blood, may cause severe haemoglobinopathy

Evaluation for aetiology on examination

Prematurity	Jaundice of prematurity
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.

Investigations

Infection screen – infection must be excluded in any baby who is unwell and jaundiced or has risk factors for sepsis do LP, blood culture, urinalysis

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

Treatment

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

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

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

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**. (See wall chart)

Prolonged Jaundice

Jaundice lasting longer than 14 days in term or 21 days in preterm infants is abnormally prolonged.

If the baby's **stools are pale or the urine is dark**, refer the baby to a central hospital for further management including doing both direct and indirect serum bilirubin level, ultrasound and thyroid function tests

Session 11 Triage of the sick infant

Learning objectives

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' means 'sorting'

- 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 ABCCCD 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, BMV
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. 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

Learning objectives

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

- Demonstrate the resuscitation of a sick 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.

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

First make sure baby is warm and blood 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 25ºC). 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 "**ABCCCD**" 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?

A

Neutral position to open the airway in an infant

Head tilt-chin lift maneuver for opening airway

The neck is slightly extended and the head is tilted by placing one hand onto the child's forehead.

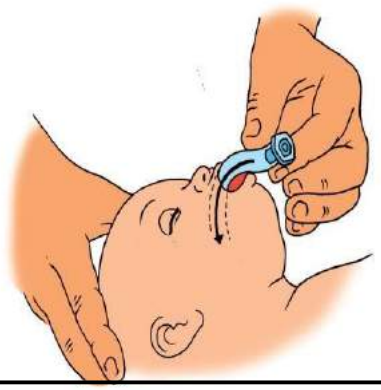
Lift the mandible up and outward by placing the fingertips of the other hand under the chin.

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



Select an appropriate sized airway

Position the child to open the airway

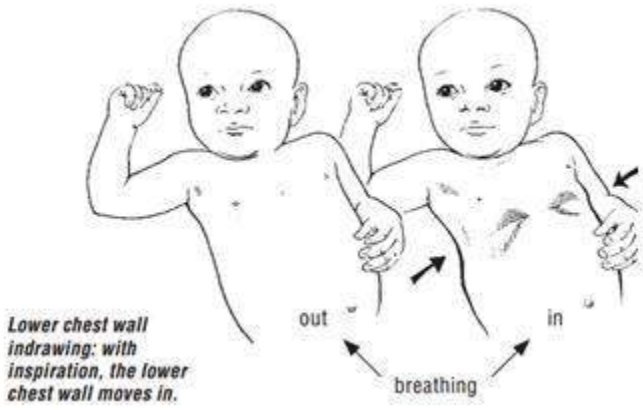
Insert the oropharyngeal airway the convex side up.

Re-check airway opening.

Use a different sized airway or reposition if necessary.

B

Does the child have Severe Respiratory Distress?



Lower chest wall indrawing: with inspiration, the lower chest wall moves in.

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 >80/min
- Severe lower chest in-drawing
- Apnoeic spells
- Unable to feed due to respiratory distress
- Cyanosis

Giving oxygen to a baby with respiratory distress

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: add oxygen at a high flow rate via a face mask (5 litres/min), if available.

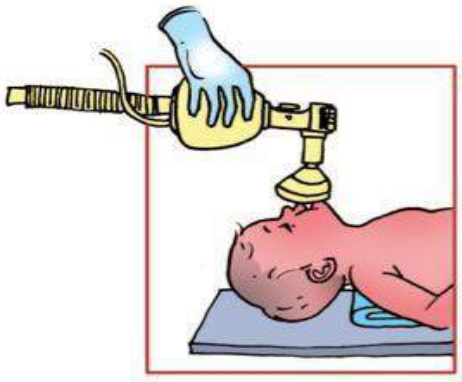
Management of airway in a child with gasping or who has just stopped breathing

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 manoeuvers 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.
nfants 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.



Bag and mask ventilation. Masks should be available in several sizes (size 0, 1)

Padding for an infant to maintain a patent airway

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.

C
Chest compressions (as in a neonate)

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.

Emergency assessment and management of NYI airway and breathing

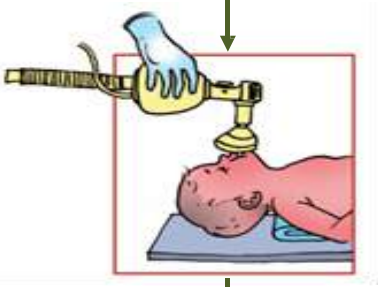
ASSESS AIRWAY AND BREATHING

Not breathing or gasping
Central cyanosis or severe respiratory distress

Manage The airway

Escalate oxygen as indicated by clinical status and O2 saturations

Not breathing or gasping



5 rescue breaths – check femoral pulse
If pulse absent or <60 start CPR

Central cyanosis
or
severe respiratory distress
or
O_2 saturations <90%

Administer oxygen via prongs or catheter at 0.5-1 litres/min

If after 10 minutes still distressed - face mask oxygen 5-10 litres/min if available

If after 10 minutes still distressed - bCPAP

Day 3
Session 13 Breathing difficulties in the young infant

Learning objectives

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

YIs 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
- Pneumocystis jiroveci 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 therapy- escalate stepwise

Administer oxygen via nasal prongs or nasal catheter, start with 0.5 litres/minute and escalate quickly if O_2 saturations remain <90%.

Specific treatment

Treat with IV antibiotics if pneumonia is suspected (fever, crepitation's 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

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

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.

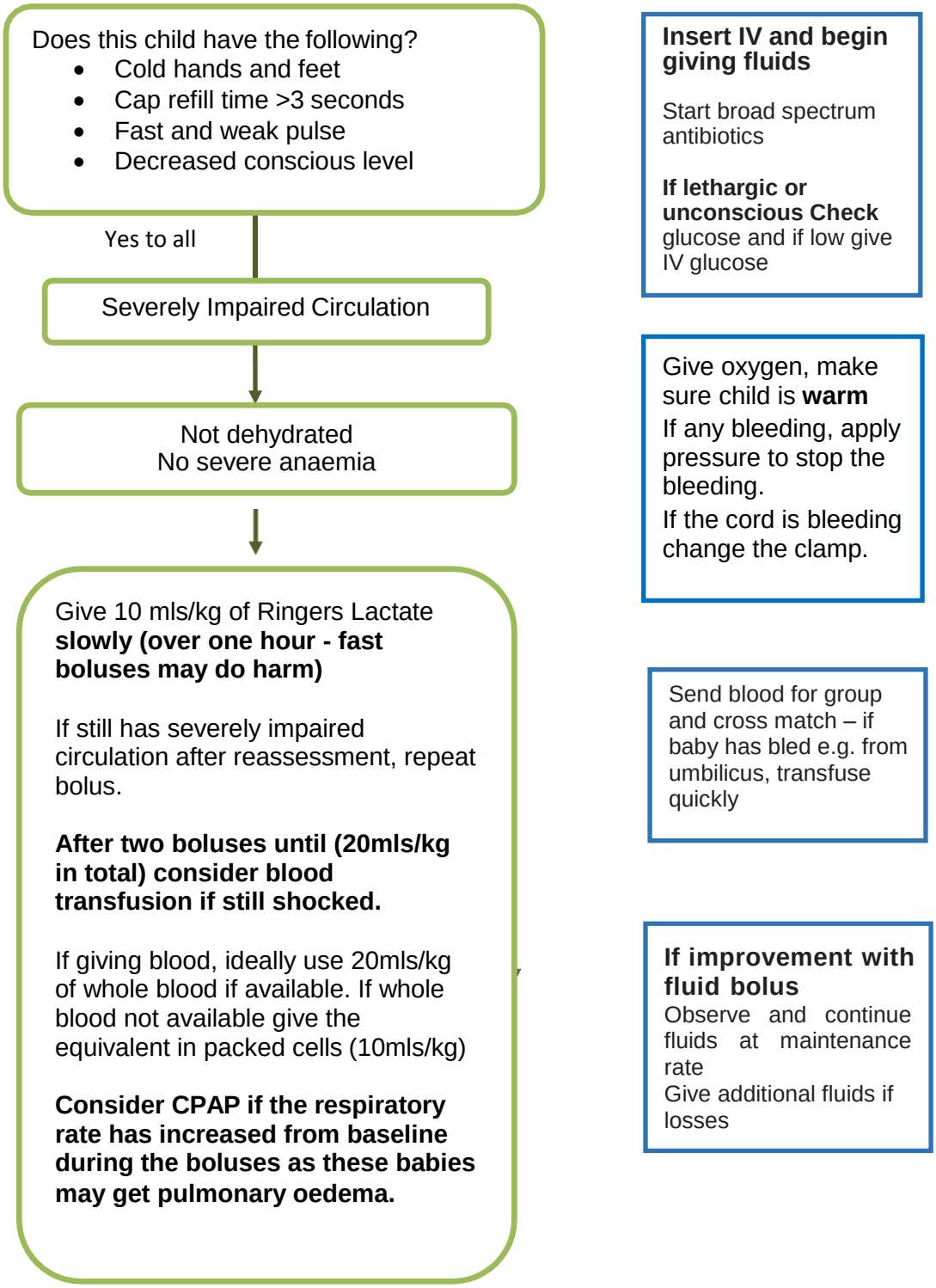
Is the pulse weak and fast?

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

Learning objectives

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
- Describe the management of sepsis in a 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.

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.

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

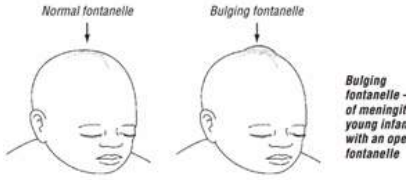
Give flu/cloxacillin (if available) instead of penicillin if extensive skin pustules or abscess as these may be indications of staphylococcus infection.

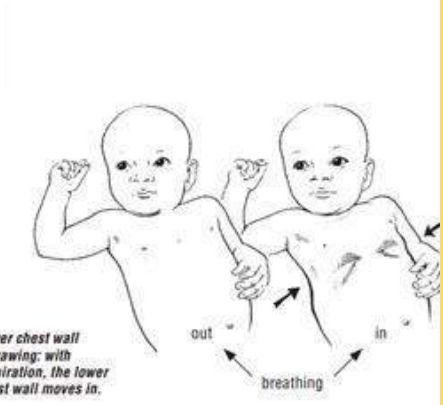
Symptoms and signs of sepsis in a NYI

Symptoms	Lethargic, decreased movement

Axillary temperature 37.5°C or above (or feels hot to touch) or temperature < 35.5°C

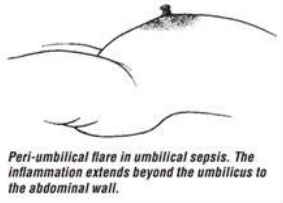
Bulging fontanelle





Lower chest wall indrawing: with inspiration, the lower chest wall moves in.

Grunting, nasal flaring, fast breathing, chest in drawing, crepitation's in the lungs


Peri-umbilical flare in umbilical sepsis. The inflammation extends beyond the umbilicus to the abdominal wall.

Umbilical redness extending to the periumbilical skin or umbilicus draining pus

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 cells/mcl (age >72 hrs)
Lumbar puncture if available, before IV antibiotics
Blood culture, if available, before IV antibiotics
Urine culture if available, before IV antibiotics

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 warmth

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

Respiratory support with oxygen or CPAP if there is severe respiratory distress or apnoeas.

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 antibiotics 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.

If there is no blood culture or the blood culture is negative and even if the baby is well 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 from the first line (penicillin and gentamicin to second line, which is often ceftriaxone but this depends where you work).

Session 16 Coma and Convulsion

Learning objectives

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

C represents "**Coma and Convulsion**". In the ABCCCD system

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 the history from the parent. Children who have a history of convulsion, but are alert and not currently convulsing, need a complete clinical history and investigation, but no emergency treatment for convulsions. Sometimes, in infants, the seizures are subtle, jerky movements may be absent, but there may be twitching (abnormal facial movements), apnoea, lip smacking or abnormal movements of the eyes, hands or feet.

Among neonates with seizures, the reported ranges of median prevalence are the following: hypoxic-ischaemic encephalopathy (HIE): 38-48%; hypoglycaemia: 3-7.5%;hypocalcaemia: 2.3-9%; central nervous system (CNS) infections: 5.5-10.3% (7).

Initial management of coma and convulsions

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

You have to observe the infant carefully.

Comparing tetanus and convulsions

Tetanus	Convulsions
Conscious	Unconscious
Increases with tactile stimulation, wind, light and noise	Does not change in response to stimulation

Treatment of coma and convulsion

Treatment of coma and convulsion 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.

Algorithms for managing convulsions < 2 weeks and > 2 weeks - see wall charts

Key fact for providers

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 1 or 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 NYI'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 Dosage

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 0.8mls 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

Learning objectives

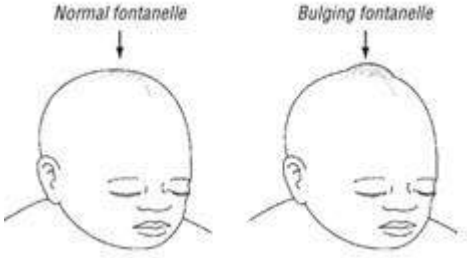
After completion of this session the participant should be able to:

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

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.

Symptoms and signs

Drowsy, lethargy or unconscious
Persistent irritability
High pitched cry
Apnoeic episodes
Convulsion
Bulging fontanelle



Investigations

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

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

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 apnoiec, 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)

If the organism is not known, but it is known the baby had meningitis then the safest duration is to give 3 weeks to cover for the possibility of gram negative bacteria causing the meningitis.

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

Session 18 Diarrhoea and dehydration in NYI

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

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 diarrhoea or vomiting or due to poor feeding.

The normally frequent yellowish or slightly greenish loose seedy stools (like a pea soup) of about 6-8 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:

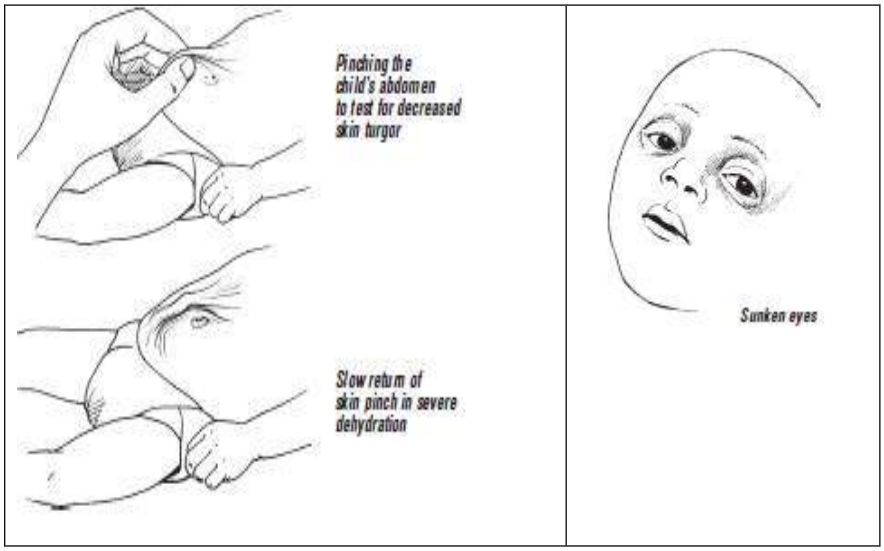
Ask:

- 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: • Unable to drink or drinking poorly • Lethargic or unconscious? • Sunken eyes? • Skin pinch goes back very slowly, • > 2 seconds	Manage severe dehydration: **Plan C** Admit or refer	**C**
Some dehydration	Does the child have at least 2 of the following signs: • Restless, irritable • Thirsty, drinking eagerly • Sunken eyes • Skin pinch goes back slowly • < 2 seconds	Manage some dehydration **Plan B** If signs of sepsis or low weight: Start antibiotics Admit or refer	**B**
No dehydration	Not enough signs to classify as severe or some dehydration Skin pinch goes back immediately	Manage with **Plan A** Home care Advise mother when to return immediately Follow up in 3 days Advise mum to return earlier if not improving	**A**

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

It is important also to note if the young infant has hypovolemic shock due to the diarrhoea. The diagnosis of severely impaired circulation due to diarrhoea (hypovolemic shock) is made:

- Not alert, AVPU <A
- Weak or absent peripheral pulse
- Cold periphery
- Capillary refill > 3 secs

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	Then give 70 ml/kg
0-2 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_2 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 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 but if he still has diarrhoea or is vomiting then s/he needs ORS after each loss to prevent dehydration, therefore move to Plan A.

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 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

Session 19 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

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
Stablilise 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 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

Day 4
Session 20 Continuous Positive Airway Pressure (CPAP)

Learning objectives

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

- List possible indications for bCPAP and conditions unlikely to benefit from bCPAP
- Describe how bCPAP works
- Demonstrate ability to place a baby on bCPAP
- Describe how to escalate bCPAP and wean bCPAP
- List possible complications of bCPAP

Definition:

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

Indication:

NYI presenting with severe respiratory distress primarily from a respiratory complication

Patients with the following conditions can benefit from bCPAP:

1. RDS: respiratory distress syndrome
2. TTN: transient tachypnea of the newborn
3. Pneumonia/sepsis
4. MAS: meconium aspiration syndrome
5. PPHN: persistent pulmonary hypertension of the newborn
6. Bronchiolitis
7. Upper airway obstruction
8. Apnea of prematurity

Babies unlikely to benefit from bCPAP

1. Newborn with stage III HIE
2. Newborn with cyanotic congenital heart disease

What is bCPAP?

- bCPAP stands for bubble continuous positive airway pressure.
- It is a constant pressure applied to the airway, generated by continuous, consistent flow of air with the aim of opening collapsed lung segments and maintaining patency in already opened air spaces.

How does bCPAP help?

- On inspiration, bCPAP drives air with additional pressure into collapsed alveoli and opens them. This process is sometimes called 'recruitment'.
- The pressure is maintained even when the patient breathes out, therefore the alveoli do not collapse at the end of expiration.
- The lung expands easily thus improving oxygenation and reduces the need for increased work of breathing.

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 escalate.

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.

Who to wean off bCPAP

1. Patient has been on bCPAP at least 24 hours
2. RR less than 60/minute for at least 6 hours (for neonates)
3. Oxygen saturation consistently > 90% for at least 6 hours
4. No significant grunting, recessions, nasal flaring, apnoea or bradycardia for at least 6 hours

How to wean off bCPAP

1. Reduce bCPAP pressure by 1 cm every 6 hours until 5 cm is reached
2. Once 5 cm is reached, start reducing oxygen flow by 0.5 L/min every 6 hours until 1 L/min is reached
3. After 6 hours on 1 L/min or less, and patient is stable, remove bCPAP and place patient on 2 L/min of oxygen
4. Once off bCPAP, review baby at 1 hour, then at 6 hours, then every 12 hours

Complications

- Blocked nostrils
- Nasal irritation and necrosis
- Distended abdomen
- Nose bleed
- Pneumothorax

Session 21 Essential Newborn and Young Infant equipment

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
- Describe the maintenance of essential equipment

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 Concentrator	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) Chlorhexidine gel (Single-day 7.1% CHX gel product) TEO	Intravenous fluids- Ringers Lactate or Normal Saline Intravenous dextrose

Session 22 Discharge from the hospital

Learning objectives

- 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, if feeding has not been established or body temperature cannot be maintained.

Counsel the mother on

- Correct treatment if the NYI is still on treatment.
- Exclusive breast feeding of the infant at home for six months.
- Keeping the NYI warm including KMC if < 2000g(3)
- 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 – write clearly the purpose of the follow up e.g. to do DNA PCR
- 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)

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Ministry of Health National Nursery Admission form

Name of facility_____District:_____Admission no_____

Reason for transfer/referral to nursery: _____ _____ Transferred/referred by:_____		Date of admission: _____ Time of Admission:_____ Readmission Y / N
D.O.B:	Birth Weight:	Time of birth:
Baby's Name:	Sex: Male / Female	Place of birth: Home / facility/ in transit
Age in hour_____ days _____	Birth Notification No:	

Admitted	LW / Theatre / PNW / KMC/ home
Referred Yes / No	If yes, name of referring facility:_____ Date and Time of Referral: Mode of transport:
Residential address:	
Mother's name:_____ Age of mother:_____	Marital status: Married / Divorced / Widowed / Single
Religion:	
Number of siblings: Alive: …… Healthy? Y / N If No Specify…….	Dead: …… Cause of death:

HIV test? Y / N	If yes when?: Result: NR / R	If Reactive; Mother on HAART? Y / N
If yes; How long on HAART before delivery? Before pregnancy/ 1st Trimester/2nd Trimester/ 3rd Trimester		
Baby given NVP Y / N/ NA	VDRL done: Y / N	If yes, when?_____ & result NR/R

Pregnancy and delivery

Medical conditions: STIs / Hypertension / Diabetes Mellitus / Thyroid disorders / Anaemia / Malaria / Heart disease			
Prophylaxis:1. Malaria: IPT 1 / IPT2/ IPT3 / none / Unknown 2. Tetanus toxoid: TTV1/ TTV2/ TTV3 /none/ Unknown			
Gestational age: _____Weeks	If premature labour, were steroids given? Y / N/ Unknown		
Duration between rupture of membranes (ROM) & birth: >18 hrs/ Unknown			
Pre-eclampsia/convulsion Y / N	Polyhydramnios Y / N	Oligohydramnios Y / N	
Duration of labour: hrs	Prolonged 2nd stage Y / N	Presentation: Vertex / Brow / Breech / face	
Mode of delivery:	Vaginal / Caesarian Section/Forceps Vacuum extraction Other	Why…… Why…… Why……	
Meconium present Y / N	If Yes, Thick / Thin		
Maternal analgesia Y / N	If Yes, which drug: ……..		
Anesthesia Y / N	If Yes, General / Spinal		
Apgar Scores:	1 min: / 10	5 min: / 10	10 min: / 10
Resuscitations measures: (please circle)	Stimulation/ Suctioning / Bag-Valve-Mask ventilation / Oxygen / CPR If BMV, how long? _____ minutes		
Risk Factors for neonatal sepsis?	Maternal fever in labor Y / N, PROM > 18hr Y / N, Offensive liquor Y / N Born before arrival Y / N , Prematurity < 37/40 Y / N		

Assessment in nursery	**Time received in nursery:**_____	
Temperature °C	Heart rate bpm	Respiratory bpm
Oxygen Saturation	in room air_____% on oxygen_____%	

The COIN Course

Blood Sugar (BS) mg/dl mmols/dl Weight on Admission:		
General appearance	Active/ lethargic and sick looking	
Signs of Respiratory distress: Y / N	Grunting / Chest in-drawings / Nasal flaring/ Stridor	
Skin colour: Pink / Pale / Cyanotic / Jaundiced	Abdomen: Normal / Distended	
Tone: Normal / Floppy	Sucking reflex: Y / N	Birth injuries: Y / N
Congenital abnormalities: Y / N	If yes, specify_____	

Provisional diagnosis:	
Initial Plan:	
Thermal support	Wrapped / KMC / Hot Cot / Resuscitaire / Incubator /
Respiratory support:	None / BMV/ Oxygen / Early CPAP
Feeding Method of feeding	EBM / Formula Breast / Cup / NGT / OGT if on CPAP
Lab investigations:	Glucose /FBC / Bili / Liver function
Treatment:	Vitamin K Y / N | TEO Y / N
	Antibiotics & dose 1) 2)
	Aminophylline Loading dose_____ Maintenance dose ____ Nevirapine OD 1ml/1.5 ml / NA IV 10% dextrose Y / N amount_____ duration:_____ Chlorhexidine for cord care Y / N other drugs (specify) _____-

-

Admitted by:_____ Signature_____

Date____/____/____ Time____:____

Queen Elizabeth Central Hospital
Paediatric Admission Sheet

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

HISTORY Further 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...

BACKGROUND
Known Diagnoses...

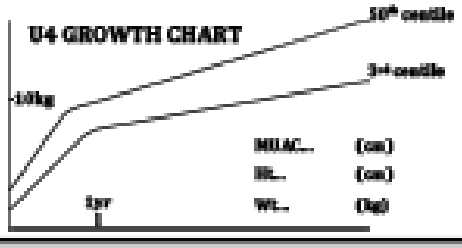
Previous Admissions...

Birth History...

Allergies Y/N; comment...
Transfusions Y/N; dates...
Vacc Complete Y/N; comment...
Recent Meds Y/N; list...

HIV

Child	R/NR/E/U	Mother	R/NR/U
	RDT/PCR/verbal		RDT/verbal
	Date...		Date...
COT	Y/N; Started...	COT	Y/N; Started...
ART	Y/N; Started...	ART	Y/N; Started...
PMTCT	Y/N; Comment...		



FAMILY HISTORY Details Please

TB contact	Y/N		Mother well	Y/N	
Epilepsy	Y/N		Father well	Y/N	
Diabetes	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

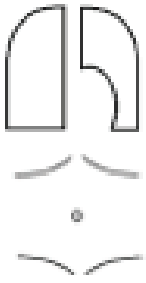
Pallor	0	+	++	+++
Jaundice	0	+	++	+++
Oedema	0	+	++	+++
Rash	0	+	++	+++
Dehydration	0	+	++	+++

Specify...

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...

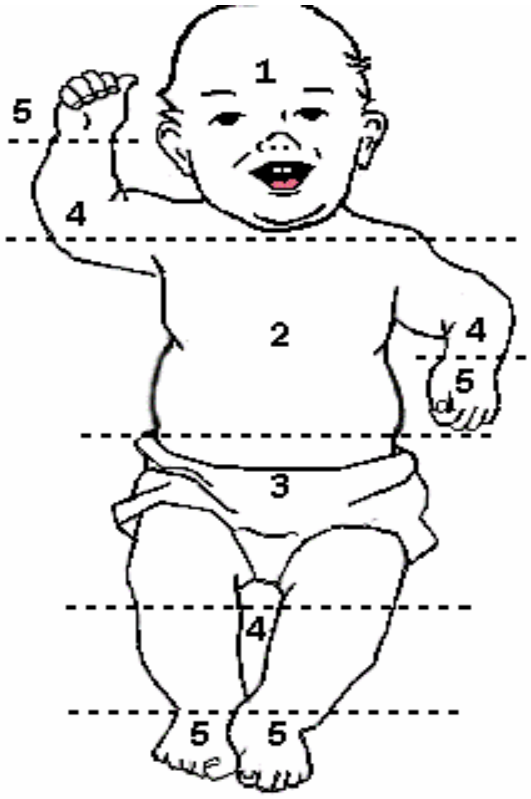
Signature...
Name...
Grade...

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			
Medications/Time (actual times Day 1)				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														

COIN Chart I
Jaundice

When to start phototherapy for jaundice

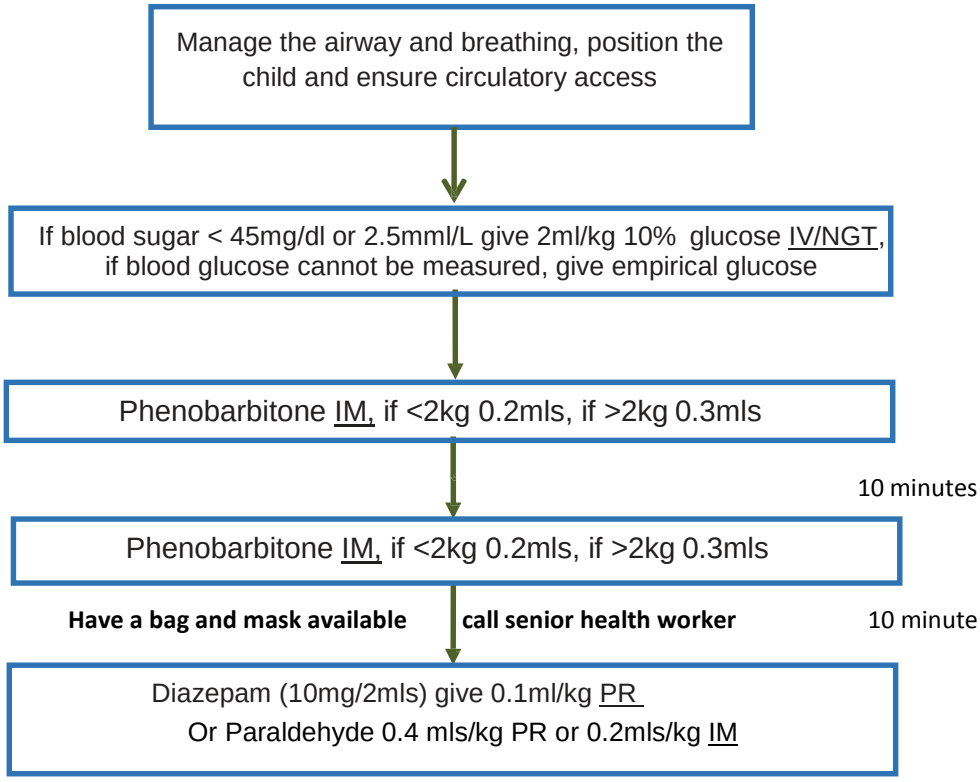
On all babies who are jaundiced in the first 24 hours of life

Start phototherapy		Areas where jaundice is visible
Area 1	If the jaundice is limited to area 1, then the serum bilirubin is likely in the range150-200 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	

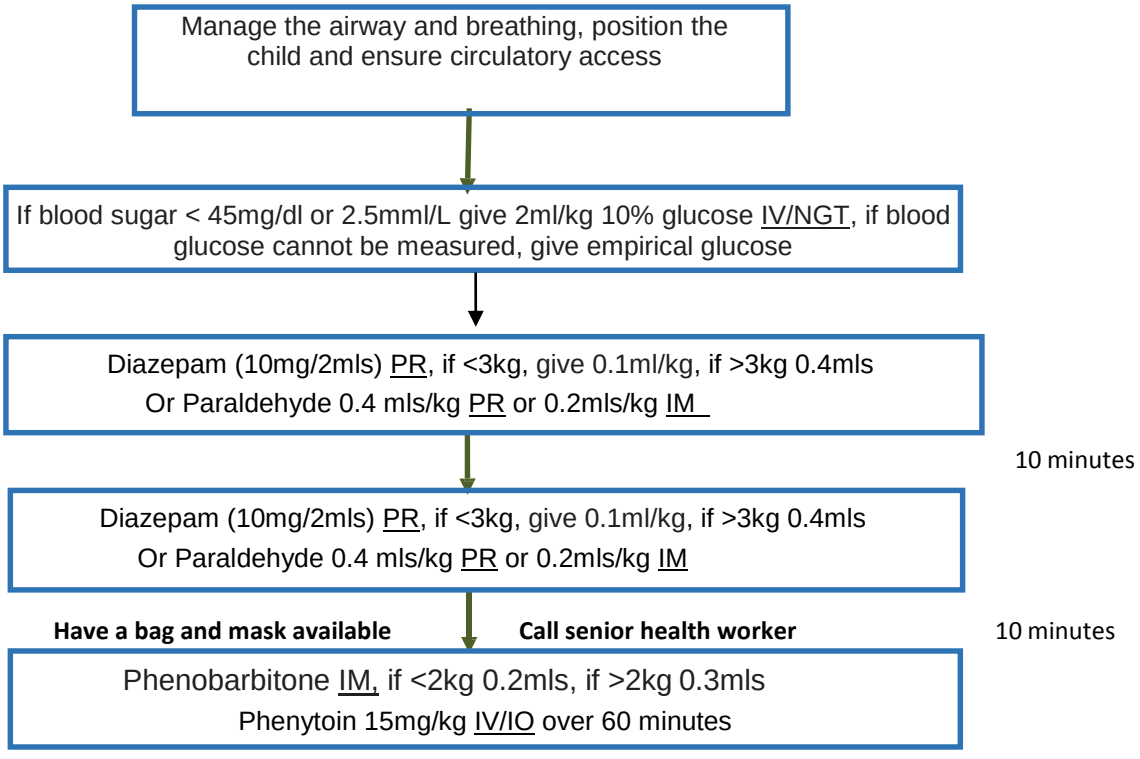
When to start phototherapy – serum bilirubin or transcutaneous bilirubin available

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 thereafter	20	340	17	290

Infant from birth up to 2 weeks of age with seizures



Managing seizures beyond 2 weeks of age



COIN
Wall chart
III **Fluids Tube and IV**

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 if 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**	

Maintenance IV 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** 100/kg/d mls/hr.
	10% dextrose		**10% dextrose (RL)**
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

COIN
Wall chart IV
Drug doses

Dose of antibiotics by weight band

Weight in kg	Penicillin 50,000iu/kg/dose **Sepsis** dose BD 1st week, QID week 2 onwards	Penicillin 100,000iu/kg/dose **Meningitis** dose BD 1st week, QID week 2 onwards	**Weight in kg**	Gentamicin 3mg/kg/ Dose OD **1st week** LBW	Gentamicin 5mg/kg/ Dose OD **1st week** Term	Gentamicin 7.5mg/kg Dose LBW & term **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

5mg/kg to load and 2.5mg/kg BD

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

High dose Co-trimoxazole and steroids for presumed PJP

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