THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF HEALTH COMMUNITY DEVELOPMENT GENDER

ELDERLY AND CHILDREN

NATIONAL GUIDELINE FOR NEONATAL CARE AND ESTABLISHMENT OF NEONATAL CARE UNIT

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First Edition

Reproductive and Child Health Section

P.O Box 743

Dodoma

ABBREVIATIONS & DEFINITIONS

ACTH	Adrenocorticotrophic Hormone
CBC	Complete Blood Count
CEmONC	Comprehensive Emergency Obstetric and Newborn Care
CHD	Congenital Heart Disease
CME	Continuous Medical Education
CNS	Central Nervous System
CPAP	Continuous Positive Airway Pressure
CRP	C-reactive Protein
CRT	Capillary Refill Time
CTC	Care and Treatment Clinic
DC	District Council
EBM	Expressed Breast Milk
ECG	Electrocardiograph
EEG	Electroencephalograph
ELBW	Extremely Low Birth Weight
ENC	Essential Newborn Care
FBP	Full Blood Picture
GA	Gestational Age
GH	Growth Hormone
Hb	Haemoglobin
HDU	High Dependency Unit
HEI	HIV Exposed Infant
HIE	Hypoxic Ischaemic Encephalopathy
HLD	High Level Disinfection
HR	Heart Rate
IM	Intramuscular
IMCI	Integrated Management of Childhood Illnesses

INR	International Normalized ratio
IPC	Infection Prevention Control
IPT	Intermittent Presumptive Treatment
IU	International Units
IUGR	Intrauterine Growth Restriction
IV	Intravenous
IVH	Intraventricular Haemorrhage
KMC	Kangaroo Mother Care
LBW	Low Birth Weight
LP	Lumbar Puncture
MDG	Millennium Development Goals
MEF	Minimal Enteral Feeds
NCU	Neonatal Care Unit
NEC	Necrotizing Enterocolitis
NGT	Nasogastric Tube
NICU	Neonatal Intensive Care Unit
NIDCAP	Newborn Individualized Developmental Care and Assessment Programme
NIPS	Neonatal Infant Pain Scale
NPO	Nil Per Oral
NTC	Newborn Triage Checklist
PDA	Patent Ductus Arteriosus
PIH	Pregnancy Induced Hypertension
PIPP	Premature Infant Pain Profile
PT	Prothrombin Time
PTT	Partial Thromboplastin Time
RBG	Random Blood Glucose
RCH	Reproductive and Child Health
RDS	Respiratory Distress Syndrome
ROP	Retinopathy of Prematurity

RR	Respiratory Rate
SC	Subcutaneous
SDG	Sustainable Development Goals
SGA	Small for Gestational Age
SpO_2	Oxygen saturation
STI	Sexually Transmitted Illnesses
TBA	Traditional Birth Attendants
USS	Ultra sonographic scan
UTI	Urinary Tract Infection
VLBW	Very Low Birth Weight
WHO	World Health Organisation

FIGURES

TABLES

PROBLEM SIGNS, DANGER SIGNS, EMERGENCY SIGNS

Problem signs and dangers signs are used in the concept of "helping newborns breathe" for assessment directly after birth within the Golden Minute and the Golden Hour. They differentiate the well newborn from the unwell newborn and enable a graded differentiation of next actions needed. In Tanzania, they are used with the Neonatal Triage Checklist for the first 24 to 48 hours of life.

In older neonates, where postnatal adaptation and stabilization has been accomplished, an emergency sign indicates urgent need for action.

	Description	**Contents**
Problem Sign	Problem signs are conditions or risk factors, that ***need special attention*** to help the newborn stay well	o Birth weight 1.500 – 1.800 g o APGAR 7 – 8 (at 5 minutes) o Temperature 36 °C – 36.5 °C o Maternal pyrexia
Danger Sign	Danger signs can be caused by infection or other serious conditions and indicate that a newborn may die. They ***require quick action and treatment***.	o Birth weight < 1.500 g o APGAR < 7 (at 5 minutes) o Temperature < 36.0°C or >37.5°C o Fast breathing > 60 /min o Difficulty in breathing o Cyanosis/pallor or jaundice o No movement o Convulsions o PROM > 18 hours
Emergency Sign	While problem and danger signs are for assessment directly after birth, emergency signs are used for older newborns. An emergency sign ***needs immediate treatment***	o Severe respiratory distress o Bleeding o Shock o Convulsion

FOREWORD

Unacceptable number of newborns around the world dies in the first week of life with the highest number dying within the first 24 hours of birth. Many of these deaths occur to newborns born too early and too small, or with infections, or to newborns asphyxiated around the time of delivery. Studies have shown that many newborn lives can be saved by the use of simple low technological interventions. The conditions causing newborn deaths can also result in severe and lifelong disability in newborns that survive. The main causes of neonatal mortality are intrinsically linked to the health of the mother and the care she receives before, during and immediately after giving birth.

Interventions such as ensuring good hygiene and cord care, providing adequate warmth, supporting breastfeeding, recognizing danger signs and providing prompt treatment and referral, giving extra care to small newborns and having skilled health workers to attend mothers and newborns during delivery and in the immediate post-partum period - can all increase chances of newborn survival. Establishing neonatal care units in health centres and hospitals will further ensure quality of care especially to seriously sick newborn, which will eventually enhance newborn survival.

The National Guideline for Neonatal Care and Establishment of Neonatal Care Unit aims to provide health workers with all basics and necessary knowledge and skills to provide appropriate care at the most vulnerable period in a newborn's life. This guideline will be available to all health facilities as a reference book for health workers. The book contains up-to-date evidence-based information and management of newborns with a range of needs in the initial newborn period.

It is the expectation of the Ministry of Health, Community Development, Gender, Elderly and Children, that health managers and service providers dealing with newborn care at all levels will use the Guideline to improve newborn care, and this will eventually improve health, survival and optimal development of newborns in Tanzania.

Dr Zainabu A.S Chaula

Permanent Secretary

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On behalf of the Ministry, I acknowledge the technical contribution of staff members from: Ministry of Health, Community Development, Gender, Elderly and Children's Department of Preventive Services; Reproductive and Child Health Section; Newborn and Child Health Unit; World Health Organization; UNICEF; Muhimbili National Hospital; Muhimbili University of Health and Allied Health Sciences, University of Dodoma, Pediatric Association of Tanzania, Mbeya Regional Referral Hospital, Mbeya Zonal Referral Hospital, Singida Regional Referral Hospital, Dodoma Regional Hospital, KCMC Hospital, CCBRT Dar es Salaam, Ndanda Hospital, Busega DC, Mbarali DC, Monduli DC and Kibaha DC, GIZ and Jhpiego.

Lastly, the Ministry would like to acknowledge technical and financial support provided from GIZ Tanzania during the development of this guideline.

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IMPLEMENTATION OF THE GUIDE

I ESSENTIAL NEWBORN CARE

PREAMBLE

Globally, newborn deaths (within the first 28 days of life) account for 46 percent of all under-five deaths. This translates to about 2.6 million newborn deaths in the first month of life, with about one million deaths in the first 24 hours of life and close to one million deaths within the next 6 days of life.

In Tanzania newborn deaths account for 40 percent of all under-five deaths, with 75 percent of these deaths occurring within the first 7 days of life. Neonatal mortality is closely related to quality of care during pregnancy, labour and delivery and immediately post-delivery.

This chapter aims to ensure health workers have the knowledge to provide appropriate care at the most vulnerable period in a newborn's life. Health care workers are encouraged to use this chapter with its up-to-date evidence-based information in management of newborns. **Thus, this chapter focuses on caretaking of every newborn within the first hours of life and decision making on the continuation of care.**

Essential newborn care should be practiced at all levels of health care by all health care providers

I.1 Infection prevention and control (IPC)

In all health care facilities and whenever care is given, Infection Prevention and Control (IPC) must be followed to protect the mother, newborn, and the health workers from infections with bacteria and viruses, including HIV. Providing protection needs planning and preparation BEFORE care is given. IPC helps to save lives and health workers must be familiar with it and use it in their daily work. It has two primary objectives:

- To prevent infections when providing services
- To minimize the risk of transmitting serious infections such as hepatitis B and HIV to the mother and her newborn and to the health worker

I.1.1 Chain of infection

- The chain of infection is how infection can be transmitted from one person to another.
- Transmission of infection occurs when the agent (e.g. bacteria) leaves its reservoir or host through a portal of exit, is conveyed by some mode of transmission, and enters through an appropriate portal of entry to infect a susceptible host.
- Each link in the chain of infection must be connected for infection to be transmitted.
- Breaking any link of the chain (e.g. hand washing) can stop the transmission of infection.

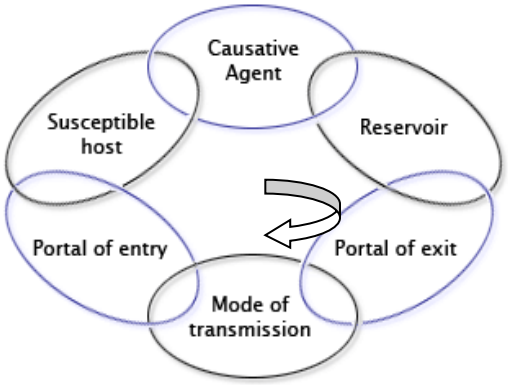


Fig. 1 Chain of infection

Infection prevention are a set of infection control practices used to prevent transmission of diseases that can be acquired by contact with blood, body fluids, non-intact skin (including rashes), and mucous membranes. Even contact with intact skin can lead to spreading of infectious agents and therefore has to be prevented.

Infection prevention includes:

- Hand washing and hand rub
- Wearing gloves
- Protecting yourself from blood and other body fluids during deliveries
- Practicing safe disposal of sharps
- Practicing safe waste disposal
- Dealing with contaminated laundry
- Cleaning and sterilizing contaminated equipment

I.1.2 Hand washing

Hand washing is of particular importance for all health workers. It is essential to wash hands before and after contact with the mother/newborn or carrying out any new tasks. Hand washing is very effective if done properly. Remember to take off rings, jewellery and watches. Keep finger nails short and remove nail polish. This helps to protect mother, newborn and health worker against infection. See figures below for proper technique of handwash and handrub respectively.

Handwashing should take 40 – 60 seconds

NOTE: Infection prevention is observed at all times, including hand hygiene with soap and water or alcohol-based hand rub before and after examining patients or neonate and appropriate use of gloves, safe storage and disposal of infectious waste and sharps, safe handling of equipment for patient care, soiled linen, sterilization and disinfection of used

instruments. **Refer National IPC guideline for more details of infection prevention and control.**

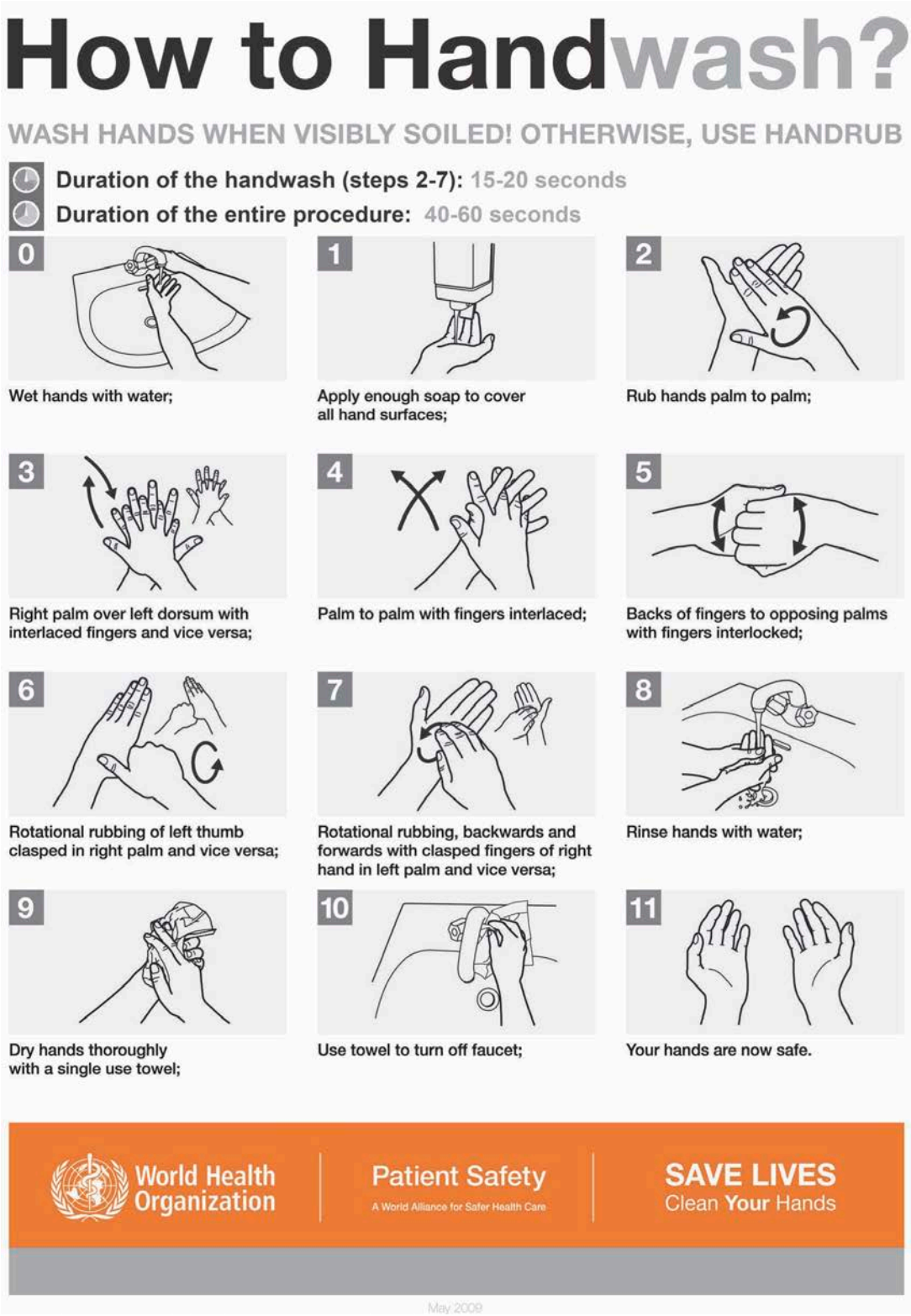


Fig. 2: Steps for Handwashing

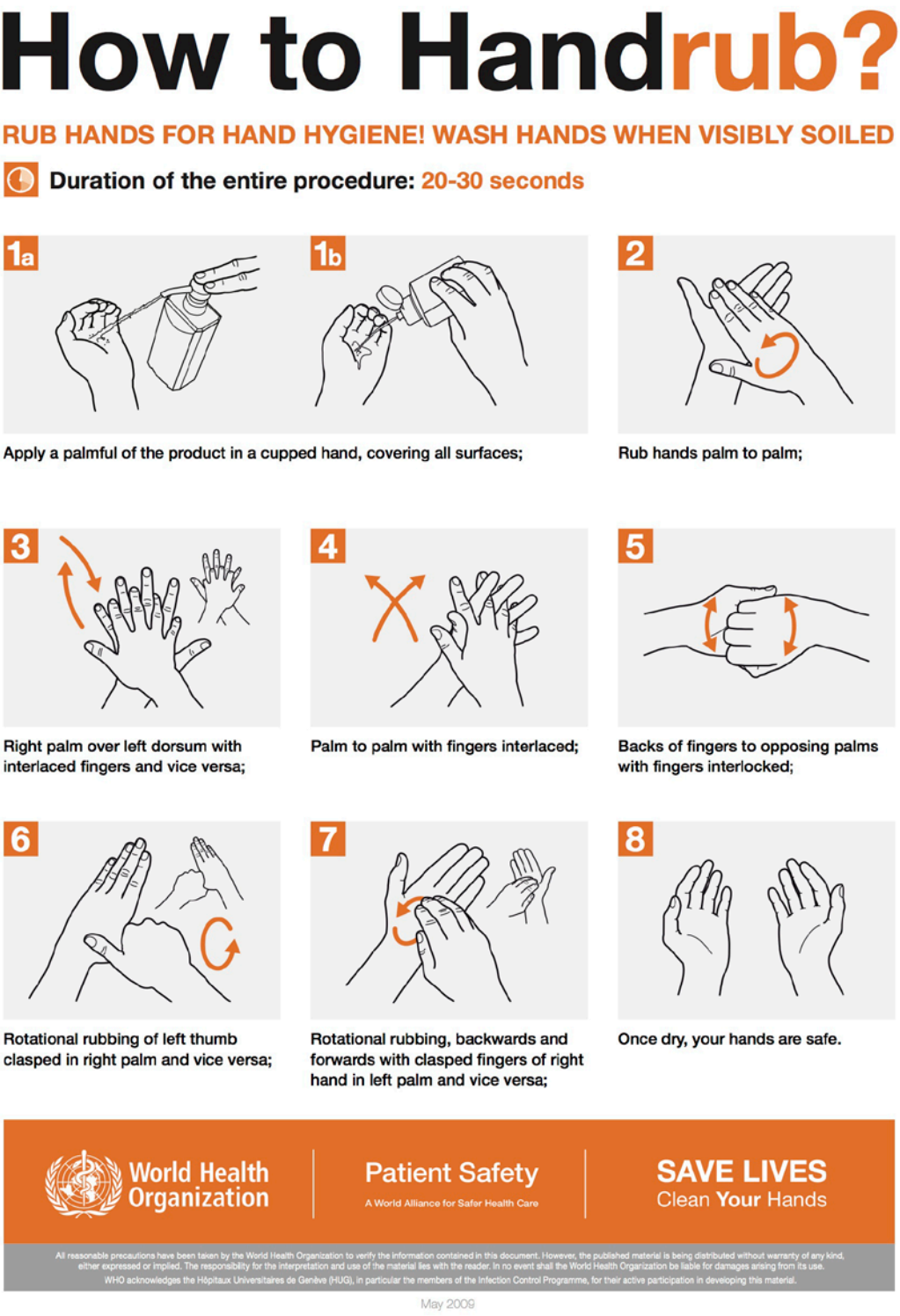


Fig. 3: Steps for Handrub

I.1.3 Processing of equipment

It is vital to do cleaning and sterilization of equipment and to keep the environment safe for patient care. This is especially important for newborns who, due to their low immunity, are more susceptible to infections.

- Do decontamination (3 buckets) and then sterilization for metal equipment

Figure X

- Do High Level Disinfection (HLD) for equipment that cannot be sterilized (e.g. plastic instruments)

The 5 Bucket Method for High Level Disinfection

For all rubber/plastic materials which can't be autoclaved

1st bucket:	Chlorine 0.5 % (Jik):	Soak for 10 minutes and brush dirty parts
2nd bucket:	Soap water:	Rinse
3rd bucket:	Clean water:	Rinse
4th bucket:	Chlorine 0.5 % (Jik):	Soak for 20 minutes (then use sterile gloves to remove equipment)
5th bucket:	Sterile (boiled and cooled) water:	Rinse (use sterile gloves)

➔ Put items into sterile and covered container and let them air dry.

NB: Make sure all items are completely immersed in Chlorine solution.
Dismantle pieces as required.
Change all solutions after every 24 hours.

Figure X

- Other equipment which is used on the patient has to be disinfected after each patient with disinfectant (e.g. stethoscope, thermometer)
- Patient beds, radiant infant warmer and resuscitation tables have to be wiped with chlorine daily and after each use

For procedures follow these instructions:

- Always follow aseptic technique when doing procedures and dealing with sterile equipment
- Drugs and IV fluids are not allowed to be used more than 24 hours after opening (follow the manufacturer's instructions). Document the date and time of opening on the bottle.
- Cannulas have to be changed every 3 days. In case of any sign of infection and if no longer in use remove the cannula. Label cannula with date of insertion.
- Nasogastric tubes have to be changed latest after 1 week.

I.2 Preparation for birth

It is very important for health care workers to prepare and be ready for each and every delivery. Birth preparation improves quality of care offered to the mother and her soon to be born newborn. It also maximizes ability to intervene whenever an emergency arises, be it to the mother or her newborn.

I.2.1 Establish hygiene

It is important to establish hygiene to minimize the risk of transmitting infections (e.g. bacteria, hepatitis B and C and HIV) from the mother to the newborn or health care providers and vice versa. Strict aseptic techniques should be followed as outlined below:

- By washing hands frequently and when required.
- By practicing 3 cleans.
    - Clean surface.
    - Clean hands.
    - Clean cord cutting
- Perform per vaginal examination 4 hourly or when necessary

Health care providers should use protective gears during provision of care

- Goggles
- Face mask
- Gloves
- Apron
- Boots

I.2.2 Establish safety disposal of used equipment

- Decontamination of used equipment
- Waste disposal (consider waste segregation)
- Appropriate use of prophylactic or therapeutic antibiotics when indicated

I.2.3 Prepare an area for delivery

It is important to consider the following when preparing an area for delivery:

- Adequate space with enough light
- Delivery room should be clean, dry and warm (25 – 28 °C), free from draught (close the windows especially at the time of delivery)
- Comfortable delivery bed with possible positional adjustment
- Prepare a warm, dry, flat, and safe space for the newborn to receive ventilation if needed (resuscitation table or radiant warmer)
- Prepare equipment needed and skilled personnel (2 skilled personnel or 1 skilled with a helper)
- Ensure all delivery equipment and supplies including neonatal resuscitation equipment are readily available and functioning

- **Complete sterile delivery set**
    - 2 artery forceps
    - Sponge holder
    - 2 Scissors: one for cutting the cord and one for episiotomy
    - Cotton balls
    - Gauze pieces

- 2 drapers
- 2 kidney dishes/receivers
- Galipot for cleaning solution
- Needle holder

- **Newborn Resuscitation Equipment**
  - Bag (new born size) with mask size 0 and 1
  - Suction device (e.g. Penguin)
  - Paediatric stethoscope
  - Head covers
  - 2 Newborn cloths (khanga/kitenge)
  - Cord ties/clamps
  - Timer
- **Other requirements**
  - Apron
  - Gloves
  - Mask for staff

I.2.4 Identify risk factors during labour and delivery

It is important for health care workers to anticipate problems before delivery. This will make the health care worker much more prepared to manage the complications once they arise. All women should be screened/assessed for danger signs during admission to the labour ward. Furthermore, all high-risk pregnancies should be immediately identified during admission. The following table highlights high risk conditions which should be identified for closer attention during labour and possible preparation for managing of anticipated complications.

Table 1: Common conditions/risk factors during labour and delivery

CONDITION/DIAGNOSIS	ANTICIPATED PROBLEM(S)	
	--Mother's Side--	**--Newborn's Side--**
PREMATURE LABOR		Preterm/small newborn with complications (e.g. RDS)
PREMATURE RUPTURE OF MEMBRANES	Infection	Infection
PREGNANCY INDUCED HYPERTENSION	Pre-/Eclampsia	Intrapartum hypoxia Preterm/small newborn
MULTIPLE PREGNANCY	Obstructed labour Post-partum haemorrhage (PPH)	Intrapartum hypoxia Small newborn/premature Twin to twin transfusion
ANTEPARTUM HAEMORRHAGE	Shock	Intrapartum hypoxia Fresh stillbirth
BAD OBSTETRIC HISTORY		Fresh/macerated stillbirth
HIGH PARITY	PPH Uterine rupture	Premature/small newborn
CERVICAL INCOMPETENCE		Premature/small newborn
POLYHYDRAMNIOS/ OLIGOHYDRAMNIOS		Congenital abnormalities
RUPTURED UTERUS	PPH Shock	Fresh stillbirth Intrapartum hypoxia
MALPRESENTATION	Obstructed labour	Intrapartum hypoxia Fresh stillbirth
DIABETES		Large for gestational age Intrapartum hypoxia Hypoglycaemia Congenital malformations

I.3 Overview of Essential Newborn Care in the first 24 hours

The following figure illustrates essential care for newborn from birth until discharge from the facility. If during one of the assessments the newborn is not normal move to “Decision to treat/refer”

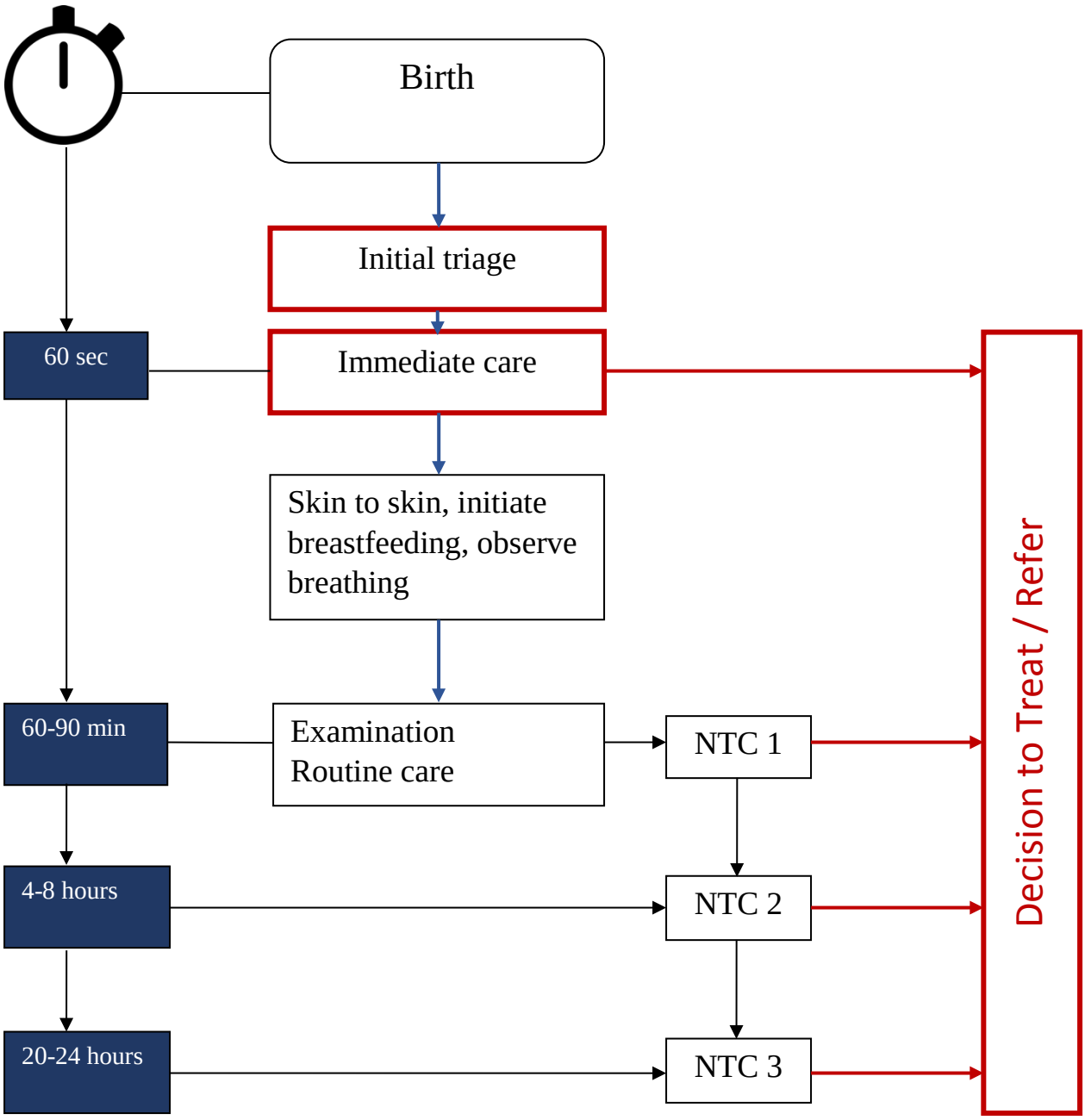


Fig. 4: Overview of essential newborn care in the first 24 hours

I.4 Immediate care after birth

Immediately after birth, the newborn has to adapt to a significant change of environment compared to the inside of the womb. The circulation has to switch from fetal to adult circulation. This is induced by ventilating the lungs, leading to pressure changes and dilation of the pulmonary vessels.

To ventilate the lungs, the newborn needs a high pressure to remove the amniotic fluid. The first cry helps to establish this pressure. About 1 in 10 newborns will need help to breathe. If a newborn is unable to cry at first, often stimulation and clearing the airway if needed, will be enough to open the lungs. However, few newborns will not breathe even after stimulation and suction, and therefore, they will need to be ventilated.

I.4.1 Action plan for the Golden Minute

The first minute (Golden Minute) is the essential window of opportunity to save lives of newborn and oxygenation should be established within that time, either via breathing or via ventilation. Rapid assessment after drying at birth is the best way to know if a newborn needs help to breathe.

The following steps have proven to be efficient in helping newborns breathe.

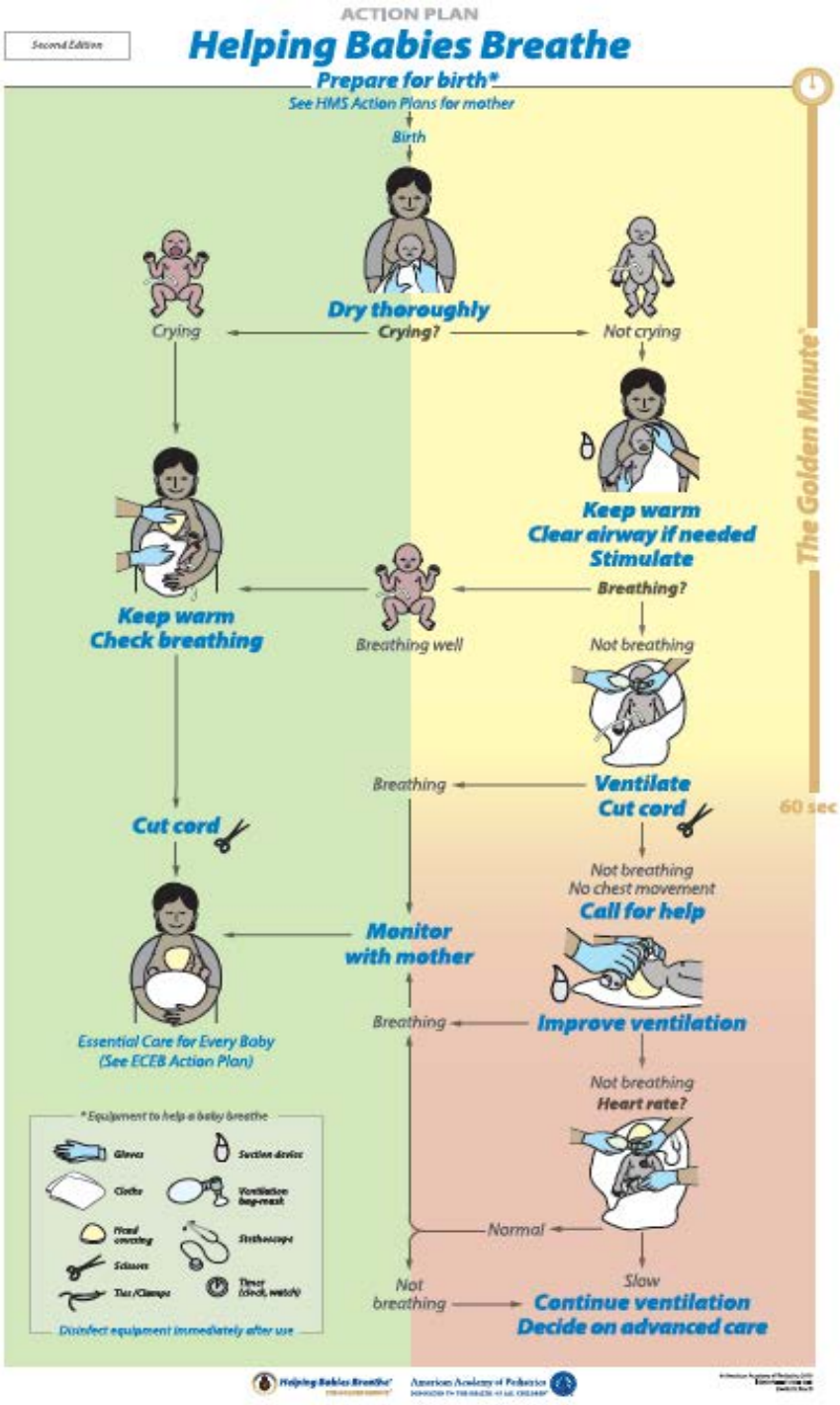


Fig. 5: Helping Newborns Breathe Algorithm

I.4.2 Assessment using the Apgar score

The Apgar score is a widely used tool to assess a newborn directly after birth. It is assessed at 1-minute and 5-minute. In clinical practice, the assessment is integrated in the care – taking the score at the 1-minute and 5-minute, and recording the score after the newborn has been stabilized.

Note:
Don't delay decisions or resuscitation by directly noting down Apgar score, but be aware of the classification at the different points in time while taking care of the newborn.
The Apgar score is not used to determine the need for resuscitation.

Table 2: Apgar Score (for Kiswahili version see Annex 1)

	2 points	**1** point	**0** points
Appearance (colour)	completely pink body and extremities	body pink, extremities blue	pale or blue
Pulse (heart rate)	> 100 bpm	< 100 bpm	no heartbeat
Grimace (reflex to stimulation)	crying, coughing or sneezing	grimace or puckering of face	no response
Activity (muscle tone)	active movements, waving arms and legs, flexion	some movements, some flexion	limp arms and legs, no flexion, no movement
Respiration (breathing)	strong cry, regular breathing	slow/irregular breathing or chest indrawing or grunting	no breathing

I.4.3 If a newborn is crying – Routine care

Crying means a newborn is breathing well and can receive routine care. Crying is possible when large amounts of air move in and out of the lungs. The crying newborn usually moves his or her arms and legs and has good muscle tone. After crying for some time, a newborn may stop crying and begin to breathe quietly and regularly.

Keep warm and Initiate breastfeeding

- Dry the newborn thoroughly with a clean, dry and warm cloth.
- Position the newborn skin-to-skin with the mother. The warmth from the mother's body is one of the best ways to keep a newborn warm.
- Discard the wet cloth and cover the newborn with a warm, dry cloth and a cap or other head covering. Otherwise, cover the newborn with part of the mother's clothing.
- Initiate breastfeeding within first hour of delivery.
- Postpone bathing and weighing and keep the area warm.

Check Breathing

- Check positioning of the newborn – neck slightly extended
- Listen to breathing sounds
- Look if the chest is moving

Continue to assess the newborn's breathing every 15 minutes within the first hour. Listen to the breathing sounds and look at or feel the movement of the chest. Check that the newborn is breathing quietly and easily or crying. Make sure that the neck is slightly extended and air can pass freely through the newborn's nose. Be sure that mother and newborn are not alone during the first hour after birth.

Cut the cord

- Wait 1 – 3 minutes before cutting the cord
- Use clamp or tie
- Cut between the clamps/ties, dry the edges

Wait at least 1 minute – and up to 3 minutes – to clamp or tie and cut the cord if the newborn is receiving routine care. The newborn receives needed blood from the placenta in the first minutes after birth. **Attention: in case the newborn needs ventilation, cut the cord in less than 1 minute and start ventilation.**

Place two clamps or ties around the cord. Place the first clamp about 2 fingerbreadths from the newborn's abdomen. Place another clamp about 5 fingerbreadths from the abdomen. Cut between the clamps or ties with a disinfected scissors or blade. Look for any bleeding or oozing of blood. If bleeding occurs, place a second clamp or tie between the first one and the newborn's skin. Leave the cut end of the cord open to the air to dry and do not apply anything on the stump. Everything that touches the umbilical cord should be clean to avoid infection. Wear sterile gloves when clamping or tying and cutting the cord.

I.4.4 If a newborn is not crying - Neonatal Resuscitation

If the newborn is not crying after drying, you will need to help the newborn breathe by starting neonatal resuscitation. Neonatal resuscitation is a set of interventions after a newborn is born to assist breathing and circulation.

It is very important to have emergency equipment ready for use at all times.

Searching for equipment at the time of need will make you miss the Golden Minute.

Often just stimulating the back helps the newborn to start breathing. If the newborn does not start breathing after that, manual ventilation is needed. Often several initial ventilations are sufficient to help the newborn open up the lungs.

Resuscitation always follows the ABC principle, which means A=Airway, B=Breathing, C=Circulation.

Overview: Steps of Resuscitation

Keep warm
Check and clear airway if needed
Stimulate
Ventilate

Details

Keep warm

Keep the newborn skin-to-skin on the mother's chest/abdomen all the time. If that is not possible, place the newborn on a warm, dry blanket beside the mother.

Ask your helper to cover the head.

Check airway

Position the head. Position the neck slightly extended to keep the airway open. The nose will be as far forward as possible. If the neck is flexed or extended too far, air may not enter freely. If secretions are not seen and there is no meconium, move directly to stimulate breathing.

Remove secretions from the airway

Remove secretions from the airway ONLY:
If they are blocking the mouth or nose
OR
If there is meconium in the amniotic fluid AND the newborn is not breathing

Remove secretions by using a cloth for wiping, a penguin sucker or a suction tube. Stop suctioning when secretions are cleared, even if the newborn does not breathe. Suctioning too long, too vigorously, too deeply, or too often can cause injury, slow down heart rate and prevent breathing (by stimulating the vagal reflex on the upper back of the pharynx).

Stimulate

- Stimulate the newborn by rubbing the back 2-3 times, gently but firmly. If the newborn still does not start breathing, manual ventilation is needed.
- Call for help
- Cut the cord and start ventilation
- Preferably the cord should be cut before starting ventilation. But cutting the cord should not delay ventilation, so it depends on the number of health workers and preparation of equipment. Change gloves before cutting the cord.

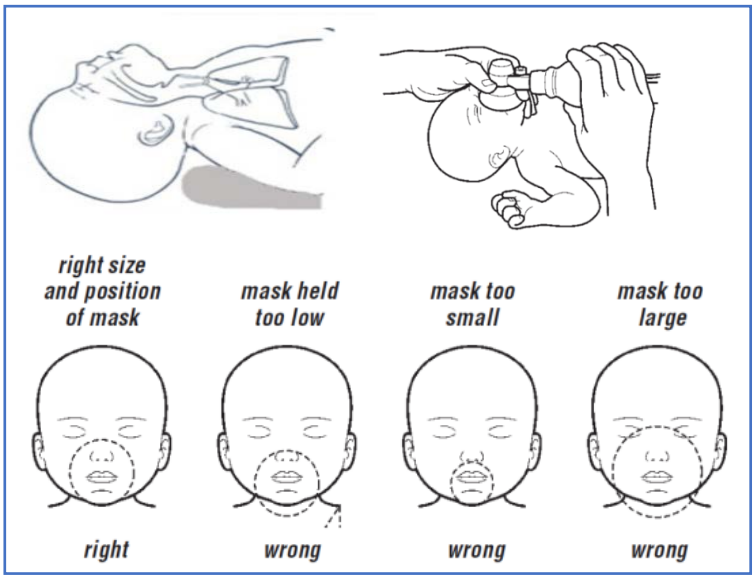


Fig. 6: Neonatal Resuscitation

Perform ventilation

- Position the newborn on the table, head slightly extended to open airway
- Stand by the newborn's head
- Check mask size and positioning, use the C-grip to hold the mask and seal it well over mouth and nose of the newborn (see figure 6)
- Give 30-60 ventilation breaths per minute, give just enough volume to see the chest rising
- Continuously evaluate newborn during ventilation: chest movement? Breathing?
- Improve ventilation if chest is not moving well (Mask leak? Head position? Suction needed?)
- Check pulse using stethoscope or by feeling for cord pulsation
    - If the pulse is above 60 beats /minute:
      Continue ventilation until newborn starts breathing
    - If the pulse is below 60 beats /minute persistently after adequate ventilation

- Seek for advanced life support which includes:
    - Chest compression
    - Oxygen (connect oxygen machine to the ventilation bag)
    - Adrenaline
    - Intubation and mechanical ventilation

Advanced life support

This is applicable in a setting where there is staff with enough knowledge, skills and experience to provide advanced life support to newborn babies. At least three skilled people are required. Also supplies like oxygen and adrenaline have to available.

Advanced life support is required in very rare cases only and is started if a baby after effective ventilation still has a heartbeat < 60 beats /minute.

If the heart rate is slow (< 60 beats /minute) and the baby does not breathe spontaneously after 20 minutes of effective ventilation it will probably require intensive care if it survives. If such care is available, the ventilation could continue for 30 minutes while admission to the intensive care unit is being arranged. If such care is not available (i.e. in most circumstances) ventilation can be discontinued.

If the newborn has no heart rate and no breathing after giving effective ventilation for 10 minutes, Stop ventilation.

I.4.5 After successful resuscitation

A newborn, who responded to ventilation, needs continued monitoring of breathing, heart rate, colour, and temperature. Assess the newborn for abnormal breathing or other danger signs that require care. Continue with routine care.

- Make a note of care provided in the clinical record
- Counsel the family, explain why and what you did
- Clean used equipment immediately and make sure it is ready for the next patient
- Refill used supplies and drugs in the emergency box

I.4.6 Care for newborns delivered outside the health facility

WHO recommends health facility delivery. If the newborn has been born before arrival to the health facility the following should be done on reaching the facility:

- Maintain hygiene, e.g. hand washing with running water and soap.
- Keep the newborn warm by keeping the newborn skin-to-skin with the mother.
- Re-clamp the cord.
- Don't apply anything on the cord.
- Dry the newborn with a clean, dry cloth.
- Wrap the newborn with another clean, dry cloth
- Initiate breastfeeding as soon as possible
- Take care of the mother, e.g. complete placenta delivery and keep the mother clean
- Observe for at least 24 hours

I.5 Essential care for every newborn

Continuous care of mother and newborn after delivery is another crucial step for survival, future health and wellbeing. High quality care provided by the health workers will prevent complications. All newborns delivered should receive essential and basic care within the first 90 minutes.

I.5.1 Care of the newborn within the first hour after birth

I.5.1.1 Continue skin-to-skin contact

Skin-to-skin contact which was initiated immediately after delivery should continue as long as there are no any contraindications. Ensure the mother's skin is in contact with the newborn's skin. The mother-newborn pair should be well covered with dry, warm khanga/kitenge or hospital linen.

I.5.1.2 Initiate breastfeeding

All newborns should be initiated breastfeeding within 1 hour after birth. While the newborn is on skin-to-skin with the mother, help the mother to place the newborn to her breast when the newborn seems to be ready, usually within the first hour. Signs of readiness to breastfeed are:

- Newborn looking around/moving
- Mouth open
- Searching
- Suckling lips

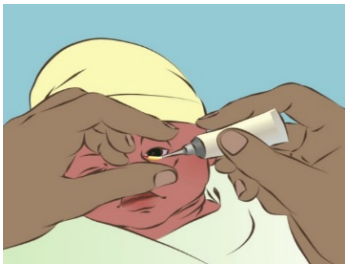
I.5.2 Care of the newborn within the 60 – 90 minutes after birth

I.5.2.1 Prevent diseases

Providing protection from infection, assessment and classification of the newborn are important steps for early detection of danger signs. All newborns should be adequately assessed, classified and managed or referred within 90 minutes of birth.

I.5.2.1.1 Eye care

Early eye care can prevent serious infections and blindness. All newborns should receive eye ointment for prevention of eye infection as follows:



- Pull down the lower lid of the eye
- Place a portion (usually about 1 cm long) of 1 % Tetracycline eye ointment inside the length of the lower lid beginning with the side closest to the nose and extending to the opposite side of the lid
- Repeat for the other eye

I.5.2.1.2 Cord care

Proper care of the umbilical cord can prevent serious infections

- Leave the cord stump uncovered
- Nothing should be placed on the cord
- If the stump is soiled, wash it with clean and safe water and dry it with a clean cloth
- If bleeding, put an extra tie tightly around the cord below the clamp
- Keep the cord area dry
- Give sponge baths only before the cord drops off
- Allow the cord to heal naturally

I.5.2.1.3 Vitamin K

Newborns are normally deficient of vitamin K which can cause severe bleeding during the first week of life. Vitamin K injection should be administered to all newborn without exception.

- Give Vitamin K by intramuscular (IM) injection 1 mg (0.5 mg for < 1500 g)
- Draw up 1 (0.5) mg Vitamin K into a 1 ml syringe
- Inject on the front, outside of mid-thigh

I.5.2.2 Weigh and measure the newborn

Weighing helps identify newborns at a higher risk of death and provides essential data to assess growth and development in the first year of life.

- Put a clean towel on the scale and tare the scale.
- Place the newborn on the scale naked (no diaper, no clothing, no blanket), try to keep the newborn naked as short as possible.

  < 2500 g counsel on skin-to-skin care at facility and home (KMC)
  < 2000 g should receive prolonged skin-to-skin care at health facility (KMC)
  < 1500 g should receive prolonged skin-to-skin care at health facility (KMC) with close monitoring

Measure length and head circumference (for details see chapter 4, Care for Child Growth).

I.5.2.3 Normal findings of a newborn

- Passes urine within the first 24 hours.
- Passes meconium within the first 24 hours.
- After initial meconium stool, passes six to eight soft stools a day.
- Female newborns may have some vaginal bleeding and discharge.
- Both female and male newborns may have breast enlargement during the first weeks after birth (sometimes including milk production).

I.5.2.4 Full Examination and Classification at 60 – 90 min after birth

After preventive measures and assessment of the child, the newborn should be classified within the first 90 minutes of life based on exam, temperature and weight to define future care. The classification uses a triage system, separating newborns into normal, having a problem and needing advanced care. If the newborn has any problem he needs to be managed accordingly (details see chapter 3 on sick newborns). The next examination will be at 4-8 hours and again at 20-24 hours after birth.

I.5.2.5 Examination of the newborn

The examination process must be thorough and systematic. The newborn must be examined from head to toe including the newborn's back. A focus should always be put on identifying signs and symptoms that are life threatening (danger signs)**.**

I.5.2.5.1 Danger signs in the first 24 hours of life

- **Not feeding *(after 6 hours of age)***
- **Vomiting everything**
- **Body weight < 1500 g**
- **Fever 37.5 °C / hypothermia < 36 °C**
- **Jaundice before 24 hours of life or jaundice involving palms and soles or any jaundice in preterm**
- **Difficulty in breathing (chest indrawing, grunting), > 60 /min, < 30 /min**
- **Convulsions**
- **Reduced or no movements (lethargy)**
- **Bleeding**
- **Cyanosis**

When examining a newborn follow these key steps:

- Assess / Examine
- Classify
- Treat or advice
- Record the findings

Inform the mother regarding the procedure you are about to undertake (exam)

I.5.2.5.2 Examination – Look – Listen – Feel

Look: Carrying out a 'visual examination' of the newborn, BEFORE touching.

- Observe for any swellings on the head, colour, spontaneous movements and malformations
- Count respiratory rate, it should be between 30-60 breaths /minute
- Observe for chest indrawing
- Look for malformations
- Examine the cord for any discharge, reddish base, bleeding or swellings
- Observe for yellowish skin (jaundice)
- Observe for signs of convulsions

***Listen**: Listening to the newborn, particularly breathing sounds - grunting, crying*

***Feel**: Feeling the newborn for muscle tone (floppy, stiff, variable).*

- Measure temperature every 15 minutes in the first 1 hour using a thermometer

Newborn Body Temperature

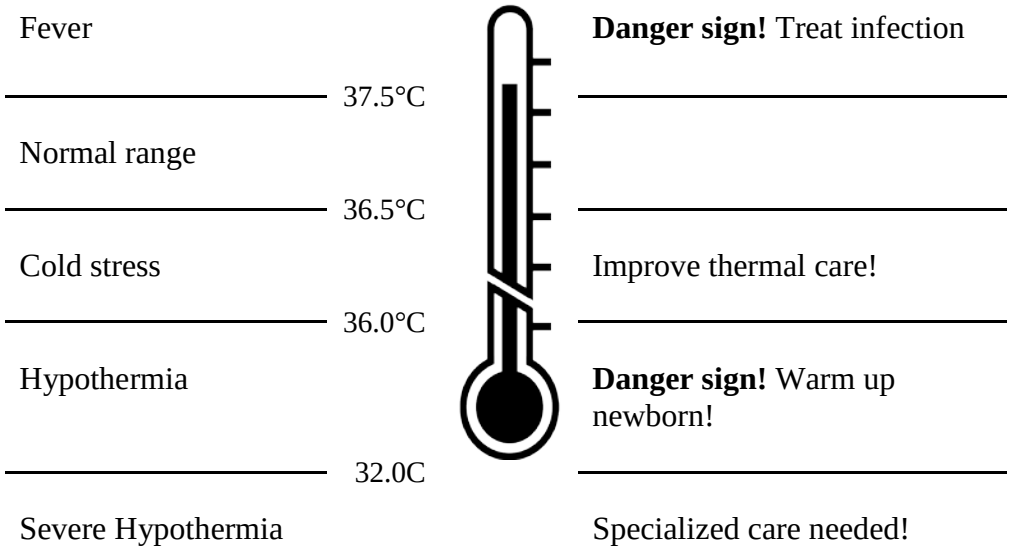


Figure X

I.5.2.5.3 Classification of the newborn

Normal newborns

- Weigh 2500 g and above
- Breathe normally (30 – 60 breaths /min)
- Have a normal temperature (36.5 °C – 37.5 °C)
- 5-minute APGAR score 9 or 10

NOTE: Newborns without any other problem weighing between 1800 and < 2500 g are called "well small newborns" and need special treatment with additional feeding and thermal care. More details can be found in Chapter 2.

Newborns at risk show one or more of the following

- Weight between 1800 and < 2500 g
- Weight > 4000 g
- 5-minute APGAR score 7 – 8
- Slightly decreased body temperature (36.0 – 36.4 °C)

Newborns who need advanced care (high risk) do have

- Birth weight < 1800 g
- 5-minute APGAR score < 7
- Maternal pyrexia > 38 °C, foul smelling amniotic fluid or PROM > 18 hours
- One or more danger signs
- Congenital malformations

Newborn Triage Checklist (NTC) is a tool to triage and classify every newborn into these three categories on the first day of life which is explained below.

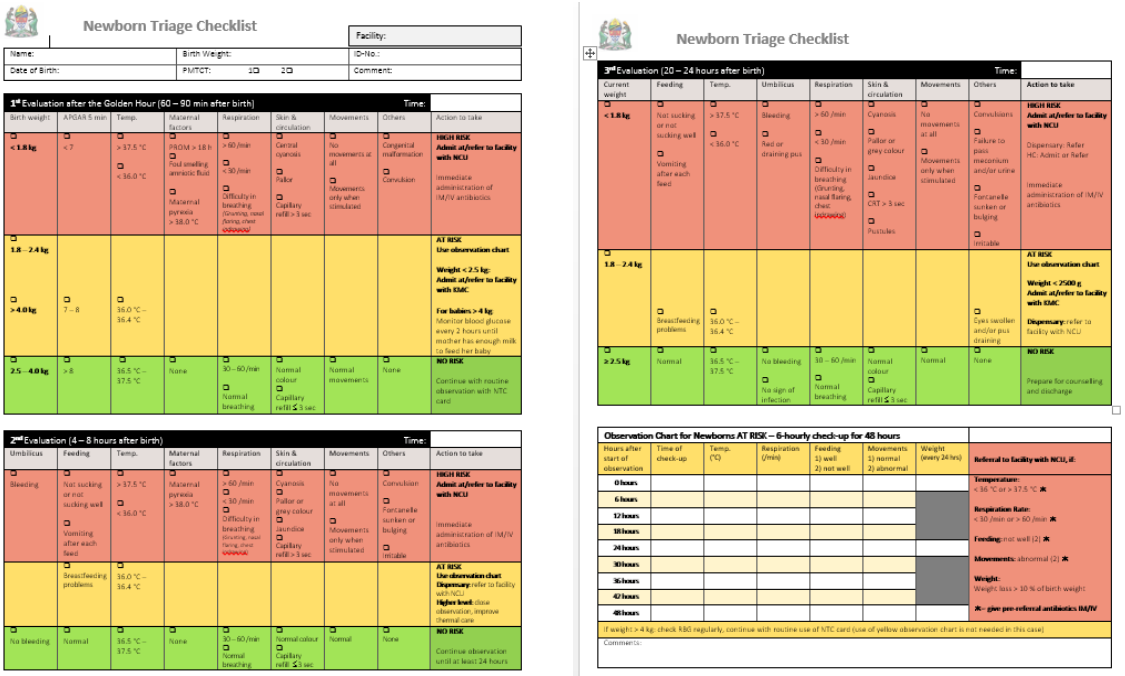


Figure X

I.5.2.6 Newborn Triage Checklist (refer to annex 2)

The Newborn Triage Checklist (NTC) is a tool for assessing, surveying and classifying newborns within the first 24 (to 48 hours) of life. The concept is simple, yet effective. At three time points (60 – 90 min, 4 – 8 hours and 20 – 24 hours after birth) the newborn has to be assessed in different categories, like weight, temperature, respiration, skin/capillary refill time (CRT), feeding, movements, umbilicus and miscellaneous. Depending on the answers given, the newborn is being categorized into three risk groups. Depending on the level of the facility you are working, the NTC card shall be used to decide on referral or transfer to Neonatal Care Unit (NCU).

Ticks in the green area: No risk. Continue observation for the first 24 hours.
Tick in the yellow area: At risk. Refer to a facility with NCU if at dispensary. On higher level do close observation with controls every 6 hours for a total of 48 hours using the observation chart on the NTC card. Refer to NCU if problems are detected during observation period.
Tick in the red area: High risk. Refer to a facility with neonatal care unit or transfer to neonatal care unit (NCU). Start administration of antibiotics and/or other required management.

I.5.3 Referral management

The following steps should be considered for effective referral management:

1. Give pre-referral antibiotics to newborns who have an infection or high risk of infection.
2. Explain situation to the mother.
3. Inform the hospital you are sending the patient to.
4. Transport the newborn with the mother on KMC position.

5. Prepare referral documents:
    - Newborn Triage Checklist.
      Check: name, date of birth, birth weight, APGAR, PMTCT status, reasons for referral.
    - Referral letter, also document the pre-referral treatment given.

For further details on referral of the sick child see chapter 5.

I.5.4 Breastfeeding

Getting breastfeeding right and established effectively before a mother leaves hospital will help her succeed in maintaining exclusive breastfeeding for the first 6 months.
Health professionals have a very important role in helping mothers establish good breastfeeding practices from the time of birth.

I.5.4.1 Support Breastfeeding

Keep mother and newborn together unless it is absolutely necessary to separate them. Encourage breastfeeding whenever the newborn shows signs of readiness.

Positioning and attachment

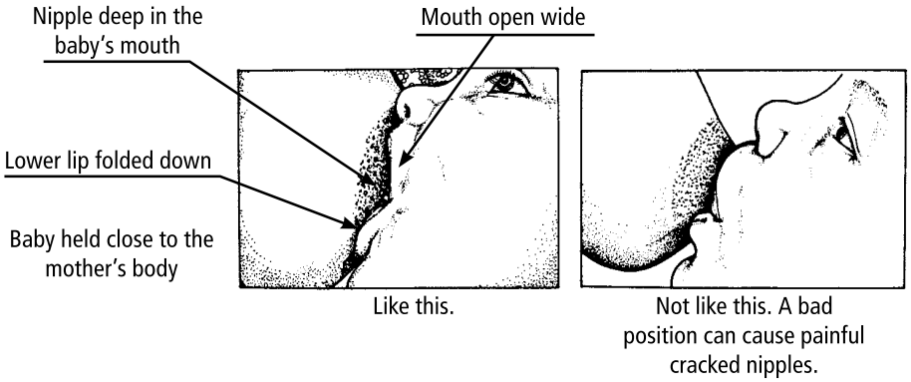
A mother must be comfortable when she holds her newborn. This will help maintain attachment to the breast for the duration of the breastfeeding. However, there is ‘‘NO’’ one ‘correct’ position for breastfeeding. We must not be rigid about positioning. If a newborn is gaining weight, growing well and is healthy, the mother and newborn should continue to feed in a way which is comfortable for both of them and which maintains good attachment.

Assist mother with positioning for breastfeeding

- Head and body in a straight line
- Face opposite the nipples
- Neck not flexed
- Whole body supported very close to mother’s body

Advise on good attachment

Good attachment is important for efficient sucking and drinking. The newborn will be able to suck longer without getting exhausted. Good attachment also prevents cracked nipples.



Like this.

Not like this. A bad position can cause painful cracked nipples.

I.5.4.2 Advise about breastfeeding problems

A mother may have **full** breasts in the first two or three days after delivery, when her milk supply is increasing. This is **NORMAL,** her milk will continue to flow without difficulty and the newborn can breastfeed without difficulty.

- She should feed whenever her newborn wants to be fed (on demand).
- She should not restrict the length of time the newborn spends at the breast.
- If she becomes uncomfortably full she should offer to feed her newborn more often. (The mother needs to be reassured that this 'condition' is normal and lasts for 36 to 72 hours).

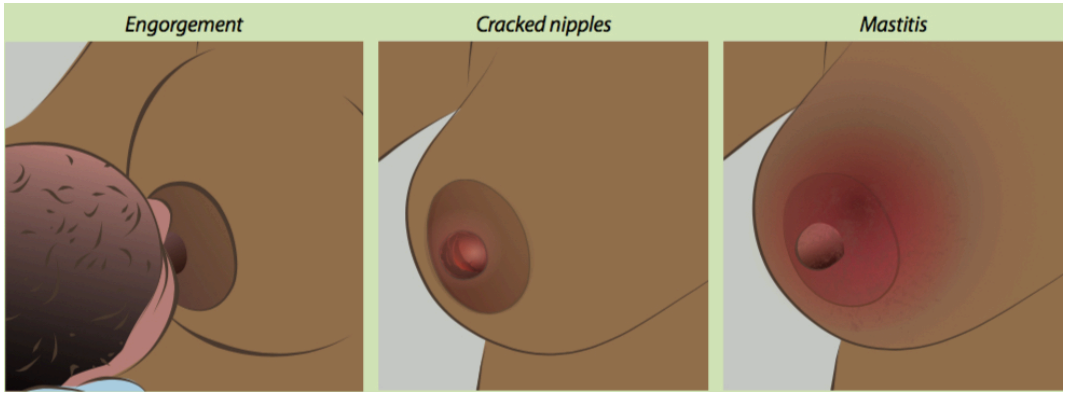


Figure X

Breast engorgement

- Swelling and shininess of both breasts
- No tenderness or redness
- Feed often, express milk

Sore or cracked nipples

- Nipple tenderness and pain during breastfeeding
- Cracks or fissures may be visible
- Ensure good attachment
- Avoid irritation from clothing

Mastitis

- Painful, red and firm area, usually in one breast only
- Ill feeling, often with fever
- Feed frequently or express breast milk to ensure emptying
- Treatment:
    - Give the mother **Ampicillin-Cloxacillin (Ampiclox)** 500 mg orally 6 hourly for 10 days.

- If in severe pain give **Paracetamol** 1000 mg 6 hourly as she may feel as if she has 'flu' or have a high fever.

I.5.4.3 Breastfeeding of the HIV-exposed newborn

Whether a mother is HIV positive or not, universal precautions must always be adhered to when delivering a newborn. Care of the newborn at delivery should not be different to the care already described.

The mother has to choose feeding option, however exclusive breastfeeding for six months without giving anything else is recommended (except for oral immunisations).

- If the mother has decided to breastfeed she should begin to breastfeed her newborn within the first hour of delivery.
- If the mother has decided not to breastfeed but has chosen replacement feeding the first feed should be prepared by health care provider in her presence for instruction purposes. These feeds should be given by cup, **NOT** bottle.
- Provide prophylaxis for HIV exposed infants according to National Guideline for Management of HIV and AIDS.

I.5.5 Feeding problems and thermoregulation

Apart from danger signs, newborns often show problems in feeding and thermoregulation. Establishing a stable fluid balance with sufficient breast milk and a stable body temperature is an essential part of newborn care.

I.5.5.1 Abnormal Feeding

The reasons for abnormal feeding can be due to neurological problems after asphyxia, exhaustion after prolonged labour, weakness due to low birth weight or sepsis and convulsions. Alternative feeding methods can be used when a mother is too ill to breastfeed. The signs of feeding problems include **poor suckling, no weight gain, weight loss, coughing while drinking, not swallowing.**

Breast milk is the best food available for a new born and engage with the mother to express breast milk. The expressed breast milk can be given to the newborn via cup or nasogastric tube (NGT). Take good care of the amount of fluid intake per day.

Use the newborn's birth weight as a basis for calculation, until the actual weight exceeds the birth weight. Give 8 – 12 feeds per 24 hours.

Table 3: Feeding charts for newborns (normal and LBW)

	Birth weight < **2500 g**	Birth weight ≥ **2500 g**
Day 1	**80 ml**/kg/day	**60 ml**/kg/day
Day 2	**90 ml**/kg/day	**80 ml**/kg/day
Day 3	**100 ml**/kg/day	**100 ml**/kg/day
Day 4	**120 ml**/kg/day	**120 ml**/kg/day
Day 5	**140 ml**/kg/day	**140 ml**/kg/day
Day 6	**160 ml**/kg/day	**160 ml**/kg/day
Day 7	**160 ml**/kg/day	**160 ml**/kg/day
≥ Day 8	**160-180 ml** /kg/day Maximum 200 ml/kg/day	**160 ml**/kg/day Maximum 180 ml/kg/day

Note: More details on alternative feeding methods and thermoregulation can be found in chapter 2

I.5.5.2 Abnormal temperature and thermoregulation

All small Newborns need attention to basic thermal care to prevent them from becoming cold. Newborns with birth weight below 2000 g are more at risk as they can have low body temperature **even when they have no other medical problem**; this is due to their limited ability to maintain normal temperature.

Abnormal low body temperature is less than 36.0 °C. A hypothermic newborn has an increased risk of becoming hypoglycaemic and death. Being too cold means the newborn is in constant stress and has to use a lot of energy to keep warm. **A cold newborn cannot get warm by itself once it has become cold!**

A cold newborn:

- is less active
- does not breastfeed well
- has a weak cry
- has respiratory distress

Prevent heat loss by not bathing the newborn within the first 24 hours of life, avoiding draughts and contact with wet or cold surfaces and continuing skin-to-skin care.

Skin-to-Skin Care

Assist mothers to provide skin-to-skin care **in the first 24 hours after birth**.

- Dry the newborn thoroughly at birth, cover the head and feet, and place the newborn skin-to-skin with the mother.
- Keep mother and newborn together for care and examination.
- Put on a diaper and dry head covering.
- Place the newborn upright on the chest between the breasts.
- Position the newborn with arms and legs flexed, head turned.
- Secure comfortably with a cloth or binder pulled up to the ear to support the head.
- Close mother's garment over the binder.

Continuous Assessment

The small newborn has to be assessed continuously during skin-to-skin care. Furthermore, teach the mother to observe and report concerns about

- **A**ctivity – normal versus low or convulsions
- **B**reathing - comfortable versus fast, chest indrawing or pauses > 20 seconds (apnoea)
- **C**olour – pink versus blue, pale, or yellow
- **T**emperature – normal versus hot or cold. Check with thermometer regularly.

I.5.6 Home care guidance

Parents will continue essential newborn care at home. They must

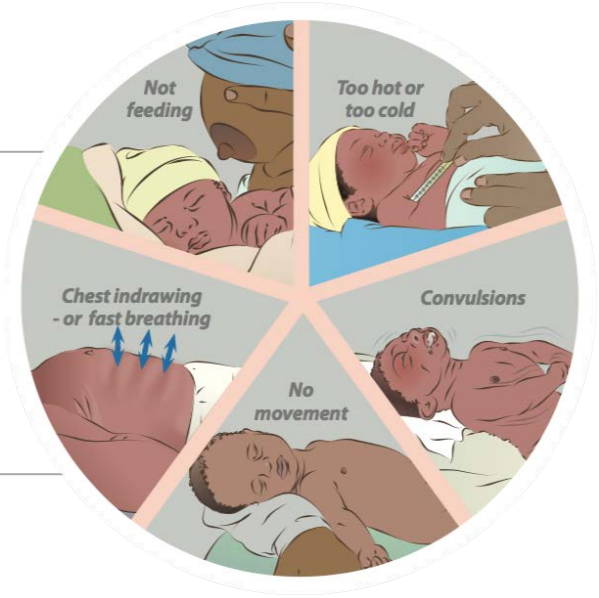
- Understand how to keep a newborn warm and healthy
- Be able to recognize problems and danger signs
- Know when to seek immediate care for danger signs and other serious medical problems

Discuss with the family the following key messages

- Exclusive breastfeeding
- Management of common breast problems
- Wash hands before touching the newborn
- Cord care:
    - Keep the cord area dry and put nothing on it
    - Keep the cord outside the diaper
    - Give sponge baths only before the cord drops off
    - Allow the cord to heal naturally
- Complete immunizations
- Seek immediate care for danger signs or severe jaundice
- Go through all danger signs with the family for repetition.

Danger signs of Homecare:

Not Feeding
Temperature (< 36.0 °C or > 37.5 °C)
Convulsions
Reduced Movements
Fast Breathing or Chest Indrawing



Prior to taking the newborn home, parents should be able to demonstrate knowledge about their responsibilities.

I.5.7 Follow-Up

Mother and newborn should attend at least 4 visits after discharge at the following times, which should be recorded for the mother on antenatal card no 4 (RCH 4) and for the baby on RCH card no 1 (see also in Chapter 4 on growth monitoring).
Note: The follow-up routine of LBW newborns differs from this schedule. See Chapter 2 for details.

2 days	Within 48 hours after birth
1 week	Between day 3 – 7
1 month	Between day 8 – 28
1 ½ month	Between day 29 – 42

During each of these visits, the health care worker is advised to assess:

- Danger signs
- Feeding
- Weight gain (recommended weight gain is 15 – 30 g/day)
- Stool and urine

- Temperature instability
- History of convulsions
- Jaundice
- State of the cord
- Immunization status

Also take care of the mother's health. Ask the mother if she has any specific problems before enquiring on the following:

- Micturition and urinary incontinence
- Bowel function
- Healing of perineal/Caesarean section wound
- Headache and fatigue
- Back pain
- Perineal pain and perineal hygiene
- Breast pain
- Uterine tenderness and lochia

I.5.8 Referral/Transfer

It is very important to refer a sick newborn at the right time. Therefore, it is important to know who needs referral at what time.

Identifying a newborn to refer (Consider danger signs above)

- Newborns with risk of infection (e.g. PROM > 18 hours, infected liquor, maternal infection)
- Preterm/LBW:
    - < 37 weeks gestational of age
    - in facilities with neonatal stabilization unit below 1.8 kg and all unstable LBW

Stabilization before transfer

- Stabilize breathing
- Stabilize temperature
- Correct hypoglycaemia
- Give necessary treatment before transfer

Communication

- Explain reasons for referral and counsel the parents and family before transport
- Inform the referral facility
- Referral notes to the referral hospital

Transport

- Prepare well before transportation

- Refer chapter V (referral transfer) for further details

Feedback

- Communicate with team at referring facility to know:
    - Condition of the newborn at arrival
    - Management given
    - Outcome of the newborn
    - Post-discharge plan and follow-up

Notes:

INTRODUCTION

Low birth weight (LBW) has been defined by the World Health Organization (WHO) as weight at birth less than 2500 g. The global prevalence of LBW is 16 percent, which means that about 22 million such infants are born each year.

Low Birth Weight can be a consequence of preterm birth (defined as birth before 37 completed weeks of gestation), or due to small size for gestational age (SGA, defined as weight for gestation < 10^{th} percentile), or both. Preterm newborns tend to have more problems than term newborns who are small (less than 2500 g at birth). However, because the newborn's gestational age is not always known, this guide refers preterm newborns and SGA newborns collectively as LBW.

LBW infants are at higher risk of early growth retardation, infectious diseases, developmental delay, impaired respiration, difficulty in feeding, poor body temperature regulation and death during infancy and childhood.

Global experience has clearly shown that appropriate care of LBW infants, including feeding, temperature maintenance, cord and skin care, and early detection and treatment of complications, can substantially reduce mortality in this highly vulnerable group.

II.1 Prevention and Management of LBW

II.1.1 Classification of LBW

LBW infants are classified based on weight:

Low birth weight (LBW) – 1500 g - 2500 g
Very low birth weight (VLBW) – 1000 g - 1500 g
Extremely low birth weight (ELBW) – below 1000 g

Preterm newborns of less than 32 weeks gestational age are at greatest mortality risk. The lower the gestation age the higher the risk especially if it is coupled with small for gestational age (SGA) entity.

II.1.2 Risk factors for premature labour and low-birth-weight delivery

There are two main reasons for newborns to be born with LBW:

- **Poor intrauterine growth** – these newborns are born at term but they are small for gestational age (SGA)
- **Preterm delivery** – newborns who are born before 37 completed weeks.

A number of factors contribute to low birth weight and put pregnant woman at higher risk for having premature labour and delivery. Below are some of the most common causes and risk factors of LBW.

- History of LBW or premature delivery
- Infection (e.g. untreated urinary tract infections, bacterial vaginosis)
- Hypertensive disorders (Pre-eclampsia, eclampsia)
- Antepartum haemorrhage
- Cervical incompetence
- Premature rupture of membranes
- Placental dysfunction
- Polyhydramnios
- Trauma
- Chronic medical illness (e.g. diabetes)
- Anaemia
- Uterine anomalies e.g. fibroids
- Maternal undernutrition
- Circumstances of life:
  - stressful work habits
  - drug abuse, e.g. smoking, alcohol, other drugs
  - age below 20 years or above 40 years
- Multiple pregnancy
- Congenital abnormalities

II.1.3 Intervention to improve the outcome of preterm newborns

Antenatal care

All pregnant women should book early before 12 weeks and attend regular antenatal clinic. During the antenatal visits, patient education, case management (PIH, eclampsia), and nutritional counselling have appeared to be effective in reducing preterm births.

Nutrition

Women with adequate nutritional status have much better pregnancy outcomes. There is no single nutritional supplement that has been shown to decrease premature birth, however, iron supplements, folic acid and zinc supplementation in women with deficiencies have shown to be effective.

Management of infection during pregnancy

Up to 80 percent of early preterm births are associated with an intrauterine infection that precedes the rupture of membranes. Untreated urinary tract infection (both symptomatic and asymptomatic) and malaria have been shown to increase risk of premature delivery. Anthelminthic drugs are also

recommended for preventing anaemia. Therefore, active screening for infections and treatment during antenatal visits are important for preventing preterm birth.

Intermittent presumptive treatment (IPT) for Malaria
In Tanzania, all women should be given IPT for Malaria starting at 14th week and thereafter, every 4 weeks until they complete 4 doses. In addition to this, all pregnant women should sleep under insecticide treated nets which are provided during the first visit to antenatal care.

Urinary tract infection (UTI)
Screening for urinary tract infections should be done during the first antenatal visit even if a woman does not have symptoms. Thereafter, routine urine should also be repeated especially during the 3rd trimester.

Anthelminthic
All women attending antenatal clinic should be dewormed after the 1st trimester.

Proper management of chronic maternal illness
Chronic maternal illnesses such as hypertension, cardiac conditions, sickle cell disease should be well controlled before a woman decides to conceive.

Early identification of preterm labour
During antenatal visits, women must be educated on the signs of early premature labour such as pelvic pressure, vaginal discharge, back pain and premature rupture of membranes. Once these signs are suspected, women must go immediately to the health facility for further care.

Tocolytic drugs (Drugs to prevent/reduce contractions)
Tocolytic drugs interrupt or stop uterine contractions. They can prolong pregnancy for up to 48 hours. A combination of tocolytics and other interventions given to the mother, such as antenatal dexamethasone and maternal antibiotics, have shown to decrease morbidity and mortality of premature newborns.

Concepts of care to improve the outcome of preterm birth
Once premature labour is suspected or it has already started, it is important to try to prolong labour so that a woman can receive interventions that will increase the chances of her newborn to survive. The following are important interventions to consider.

II.1.3.1 Interventions to Mother

Place of delivery
Ideally, all preterm newborns should be delivered in a health facility with newborn intensive care unit with appropriate trained personnel.

Antenatal dexamethasone

Dexamethasone helps fetal lung maturation and significantly decreases the risk of respiratory distress syndrome and intracranial haemorrhage. Dexamethasone should be given to all women at risk of delivering a premature newborn before 34 weeks gestational age. Dexamethasone is given as an intramuscular injection at a dose of 6 mg 12 hourly for 48 hours.

Prevention of RDS:
Dexamethasone 6 mg IM – every 12 hours – 4 times
Every mother at risk with GA < 34 weeks

Magnesium Sulphate

Magnesium sulphate has been established as a possible neuroprotective agent for premature newborns born before 32nd week gestational age. Prenatal application has been shown to reduce neurologic damage in preterm birth significantly. Several treatment regimens exist, but there was insufficient evidence to recommend one specific regime. Due to practical reasons, we recommend to give 4 g of magnesium sulphate as a single dose IV.

Maternal antibiotics

In case of premature rupture of membrane, antibiotics should be given. It is recommended to give erythromycin 250 mg 6 hourly for 10 days and if not available oral amoxicillin 500 mg 8 hourly for 10 days. **Antibiotics are not recommended for women in preterm labour with intact membranes.**

Preparation of specialized care after delivery

Whenever a preterm birth is anticipated, preparation for resuscitation should be done including having a ventilation bag with an appropriate mask (size zero). This is because even in the absence of prolonged labour, preterm newborns may fail to breathe spontaneously after birth or they may initiate breathing for few minutes and then stop.

II.1.3.2 Interventions to Newborn

Antibiotics to the newborn

Newborns delivered to women who had premature labour are at increased risk of early onset neonatal sepsis.

- Antibiotic prophylaxis to all premature below 34 weeks (< 2000 g) is recommended for at least 48 hours.
- A full course of antibiotics should be given to premature infants with signs of sepsis or born to mothers with risk factors of infection:
    - fever > 38 °C
    - membrane ruptured > 18 hours before birth
    - foul smelling or purulent amniotic fluid

- Antibiotics used are Ampicillin (50 mg/kg/dose 12 hourly) and Gentamcin (3 mg/kg/dose 24 hourly for babies with weight < 2.5 kg). Efforts to exclude early onset sepsis should be done.

Temperature control

It is important to recognize early the need to maintain warm chain once delivery of a premature newborn is imminent. Hypothermia has been associated with increased risk of poor outcome (for details see section on hypothermia).

Oxygen therapy and continuous positive airway pressure (CPAP)

Due to immature lungs, preterm newborns often struggle with sufficient breathing. Preterm infants should be offered oxygen therapy, whereas a constant monitoring of oxygen levels is recommended. CPAP is highly recommended for the treatment of RDS.

Give oxygen if oxygen saturation < 90 %
Oxygen saturation in preterms under oxygen therapy:
88 – 95 %

Surfactant therapy

Exogenous surfactant given through endotracheal tube has been shown to significantly reduce respiratory distress syndrome in premature newborns. Surfactant is recommended for intubated and ventilated newborns with RDS.

II.1.3.3 Guidance for community and facility management of LBW

At home, the community, families and traditional birth attendants (TBA's) may not be aware of the importance of caring for the LBW infants. Due to their special needs, LBW infants should be delivered at a facility capable of providing appropriate care to them. Therefore, **any woman who has been identified with a risk of delivering a LBW infant or presents with an early onset of labour, should be referred to the higher level facility for further care.**

There will be a situation where a mother will deliver a LBW infant in the community or at lower level facility which have no capacity to take care LBW infants.

Referral of LBW

Referral of LBW infants should follow the standard referral procedures (Chapter 5). However, the following should be considered specifically for LBW:

- LBW should be referred in stable condition (feeding, thermal protection, oxygen therapy if available and required)
- Counsel the mother and the family that LBW infants need advanced care such as:
  - Kangaroo mother care
  - Specialized neonatal care
- LBW infant should always be in skin-to-skin position during transfer
- Mother and relatives should be briefly reassured

The following chart will guide health care workers, community health care workers or individuals on the action to follow when referring LBW newborns.

Location	Intervention	Referral
Home	1. All newborns should be dried with a clean warm dry cloth e.g. khanga 2. Start skin-to-skin immediately 3. Cord should be tied well, do not apply anything 4. Avoid bathing 5. Rush to the nearby health facility	1. All newborns who are born at home should be referred to a nearby health facility immediately 2. During transfer maintain skin-to-skin contact
Dispensary	1. Follow ENC routine care during labour and delivery 2. Initiate and maintain skin-to-skin 3. Start breastfeeding **Use expressed breast milk if unable to suck** 4. For home deliveries, do quick assessment, re-clamp the cord stump, start and maintain skin-to-skin contact	1. All LBW **below 1800 g** should be referred to the next facility with NCU 2. All newborns **1800 – 2500 g** should be referred to a facility with KMC/NCU 3. All newborns with **danger signs** need urgent referral to a facility with NCU 4. During transfer maintain skin-to-skin contact
Health Centre	1. Follow ENC routine care during labour and delivery 2. Admit **all LBW <1800 if the facility can provide NCU care** 3. Admit **all well LBW 1800 – 2500 g** in KMC ward and follow KMC guideline 3. For home deliveries and referrals do quick assessment, re-clamp the cord, start and/or maintain skin-to-skin contact	1. Refer all newborns **below <1800 g if facility cannot provide NCU services** 2. Refer all LBW 1800-2500g if no KMC unit is available) 3. All newborns who cannot be managed in the facility should be referred
Hospital / Tertiary	1. Follow ENC routine care during labour and delivery 2. For home deliveries and referrals do quick assessment, re-clamp the cord, start and/or maintain skin-to-skin contact and initiate breastfeeding or alternative feeding and initiate treatment as required 3. After stabilization review all referred LBW newborns and decide on advanced care in NCU	Refer if advanced care is needed which is not provided by the hospital (e.g. advanced diagnostics, therapy of congenital malformations, paediatric surgery)

Fig. 7: Referral algorithm

II.2 Care of Low Birth Weight Newborns

LBW newborns have a number of needs and problems, which will need immediate care soon after delivery. Delaying taking actions might lead to serious complications and even death. The management of LBW newborns should start during labour and delivery.

II.2.1 Preparation and delivery of LBW newborns

Before delivering a LBW infant, the health provider should ensure the environment is clean and warm, free from draught. Preparation of resuscitation area and equipment, warm clothes (khanga/kitenge, hat, socks) for keeping newborn warm should be done. Majority of LBW infants will establish spontaneous respiration immediately after birth. For newborns who do not start breathing after thorough drying and stimulation, ventilation using bag and mask should be initiated. **Refer to chapter 1 on essential newborn care (ENC) for details of labour, delivery and initial care of LBW.**

II.2.2 Monitoring of LBW infants

LBW infants are high risk patients and have special needs that require active monitoring to ensure their survival. **The following observations are specific for LBW infants < 2500 g**.

- **Temperature:**
  1500-2500 g: every hour for the first 8 hours, then at least twice daily
  < 1500 g: every 30 min for the first 4 hours, then hourly for 24 hours, then at least twice daily

- **Breathing:**
  Breathing should be monitored by counting respiratory rate for one complete minute. A rate of > 60 breaths /minute and < 30 breaths /minute is termed fast breathing and slow breathing respectively and these are danger signs. Breathing should be monitored and recorded every 4 hours.

- **Oxygen saturation:**
  Use pulse oximetry to measure oxygen saturation of the LBW infant every 4 hours. Oxygen saturation in preterm babies under oxygen therapy should be in the range between 88-95%.

- **Heart rate:**
  Count the heart rate using a stop watch for one minute. A heart rate above > 160 beats /minute in a resting newborn is high and suggests a newborn is not comfortable or is distressed. A heart rate below 100 /min is seen as pathologic and needs further assessment. Heart rate should be counted and recorded every 4 hours.

- **Blood glucose:**
  Measure blood glucose within 2 hours of delivery and thereafter, 6 hourly until the infant is getting adequate feeds. Refer management of hypoglycaemia for newborns with hypoglycaemia.

II.2.3 Feeding and Fluid Management

II.2.3.1 General principles

LBW newborns often have difficulty feeding, simply because they are not mature enough to suck well. Good suckling ability usually is established by 34 to 35 weeks of gestational age. Substantial effort may be needed to ensure adequate feeding. Provide adequate support to the mother during this difficult period. Optimal nutrition will improve growth and neurological outcome.

Mother should be explained that:

- Her breast milk is the best food for the LBW infant
- Breast milk is especially important for a LBW infant
- It may take longer for a LBW infant to establish breastfeeding

Inform the mother that her LBW infant may:

- Tire easily and suckle weakly
- Pause for long periods between suckling
- Fall asleep during feeding
- Not cry when hungry

Nevertheless, the mother should continue to feed her baby frequently as advised

Low birth weight newborns should be fed every 2-3 hours:

- 1250 g – 2500 g: feed the newborn at least eight times in 24 hours (i.e. every 3 hours)
- Below 1250 g: feed the newborn at least 12 times in 24 hours (i.e. every 2 hours)
- Monitor blood glucose every 6 hours and if clinical signs indicate
- Mother should express breast milk for feeding (cup feeding, tube feeding)

II.2.3.2 Feeds and Fluid volumes for LBW newborns

LBW newborns require different feed methods based on their condition and weight. See table number 4 below to determine the appropriate feeding method for different weight categories of LBW infants. Refer table number 3 for fluid and feed volumes in Chapter I

Table 4: LBW Feeding Management

	Weight	Treatment
Well Newborns	1750g – 2500g	Allow the infant to begin **breastfeeding** and/or **expressed breast milk**.
	1500g – 1749g	**Expressed breast milk** should be offered until the newborn is able to breastfeed.
	1250g – 1499g	Expressed breast milk should be offered by **gastric tube** every 3 hours Progress to feeding by cup/spoon as soon as the newborn can swallow without coughing or spitting.
	< 1250g	Establish an IV line and give **IV fluid** **Start enteral feeds** (expressed breast milk) on 1st day of life at a rate of 10ml/kg divided into 12 meals/24 hours with the remaining fluid requirement met by intravenous fluids.
Sick Newborns	1750g – 2500g	If the LBW infant does not initially require IV fluid (according to the newborn's problem), allow the infant to **begin breastfeeding as well as EBM**. If the newborn cannot be breastfed, expressed breast milk should be offered according to age and weight. If the newborn requires additional IV fluids, establish an IV line, and give IV fluid accordingly.
	1250 -1749g	**These newborns will need to have both IV fluids and oral feeds at the same time.** An IV line should be established and IV fluids should be given. **Start enteral feeds on 1st day of life unless contraindicated** (expressed breast milk) at a rate of 10 ml/kg divided into 8 meals/24 hours with the remaining fluid requirement met by intravenous fluids. When newborn is tolerating feeds, advance feeds slowly (if possible add 20 – 30 ml/kg/day) while decreasing the volume of IV fluids. Progress to feeding by cup as soon as the newborn can swallow without coughing or spitting.
	< 1250g	Establish an IV line, and give IV fluids as described for a well newborn below 1250 g. Start enteral feeds unless contraindicated (expressed breast milk) on 1st day of life at a rate of 10 ml/kg divided into 12 meals/24 hours with the remaining fluid requirement met by intravenous fluids.

II.2.3.3 Feeding practicalities for a LBW infant

It is normal for newborns to lose weight during the first 7 days of life. Birth weight is usually regained latest by 14 days of life. Birth weight should be used for calculations of feeding volumes until the newborn exceeds birth weight.

- Assess the newborn daily to ensure that the newborn is gaining weight adequately
- **Newborn should not loose in excess of 10 percent of birth weight**
- If the baby has already reached full feeds (160 – 180 ml/kg/day) and still weight gain is inadequate (less than 15 g per day over three days):
    - Increase the volume of milk to 200 ml/kg per day
    - If weight gain is inadequate for more than one week and the newborn has been taking 200 ml/kg breast milk per day, investigate possible underlying conditions.
- If a newborn cannot receive enteral feeds (e.g. NPO due to extremely LBW on day 1, severe asphyxia on day 1, surgical conditions) he should be given colostrum swabs starting from delivery. Colostrum, the very first breast milk, is very rich in protective factors and therefore especially important for critically ill neonates. A small amount of colostrum is placed directly onto the mucosa in the cheeks for absorption and will not be swallowed. It is done 2 – 3 hourly with about 0.1 ml colostrum in each cheek, given by 2 cc syringe or a sterile cotton swab.
- If feeding of full amounts of breast milk is delayed in preterm or sick newborns Minimal Enteral Feeds (MEF) (=trophic feeds) help to avoid atrophy of the intestinal mucosa, bacterial overgrowth and other associated problems.
  Start with breast milk 10 ml/kg/day 2 – 3 hourly on day one and advance the amount daily by 20 – 30 ml/kg/day according to feed tolerance and haemodynamic stability. In the first days this must be combined with IV fluids to meet the total fluid requirement per day (details see below).
- For newborns who are fed by gastric tube the mother should be advised to do lip and mouth care with breast milk each time before feeding via NGT (by swabbing lips and mouth with a small amount of milk by using her clean index finger). It supports the early sensory development and prevents dry mucous membranes.

Table 5: Example of LBW feeding amount according to weight and age

LBW Fluids table – recommended amounts per day and per feeding						
Birth weight		**1000 g**	**1250 g**	**1500 g**	**1750 g**	**2000 g**
Number of feeds in		***12***	***12***	***8***	***8***	***8***

24 hours						
Age	**Amount in 24 hours (ml/kg)**	**ml/feed**	**ml/feed**	**ml/feed**	**ml/feed**	**ml/feed**
Day 1	**80**	7	8	15	18	20
Day 2	**90**	8	9	17	20	23
Day 3	**100**	8	10	19	22	25
Day 4	**120**	10	12	23	26	30
Day 5	**140**	12	14	26	30	35
Day 6	**160**	13	17	30	35	40
Day 7	**160**	13	17	30	35	40
≥ Day 8	**160-180**	13-15	17-19	30-34	35 -40	40-45

This table shows the fluid requirements applied to the newborn's weight.
Use birth weight until exceeded by actual weight.
The total amount can be a combination of IV and oral intake. The duration of IV fluid therapy should be limited to the shortest possible time.
After two days of IV fluids with Dextrose 10 %, add electrolytes. Take 4 parts of Dextrose 10 % and add 1 part of Ringer Lactate (or Normal Saline) to obtain Dextrose with 1/5 RL or NS (e.g. D 10 % 80 ml plus RL 20 ml)

The aim of feeding therapy is to increase the oral portion. While doing the changeover from IV to oral fluid, one has to consider the continuous increase of total amount of fluid.

For premature babies with birth weight < 1250 g starting from day 2 advance the amount daily by 20-30 ml/kg/day, according to feed tolerance and haemodynamic stability. Give this enteral portion via NGT. For this calculate the total amount first, check how much milk the baby can already tolerate and add the remaining amount as IV fluids over 24 hours. The IV fluid is Dextrose 10 % on day one and two, from day 3 it is Dextrose 10 % (80 % of the full amount) with NS or RL (20% of the full amount).

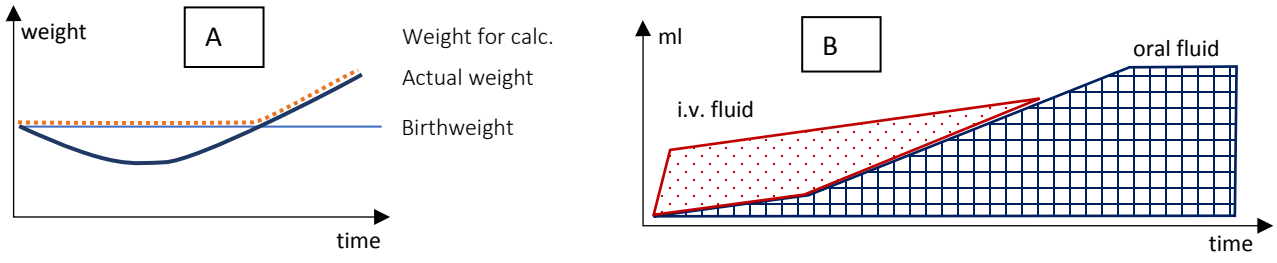


Fig.8: Graph A shows weight changes of a premature infant. Graph B shows weaning of IV fluids while increasing oral feeds.

II.2.4 Thermal protection

Thermal protection of the newborn is the series of measures taken at birth and during the first days of life to ensure that the newborn does not become either cold (hypothermia) or hot (hyperthermia) and maintains a normal body temperature of 36.5 °C – 37.5 °C.

II.2.4.1 Hypothermia

The newborn infant regulates body temperature much less efficiently and loses heat more easily. The smaller and more premature the newborn, the greater the risk. After birth, the newborn immediately starts losing heat and unless heat loss is prevented, hypothermia will develop. LBW or sick newborns are most vulnerable to hypothermia. Methods to keep these high risk newborns warm include kangaroo mother care (round-the-clock skin-to-skin), warm rooms, radiant heaters, and incubators).

Hypothermia occurs when the newborn's temperature drops below 36.5 °C. 36.0 – 36.4 °C is mild hypothermia (cold stress), 32 – 35.9 °C is moderate hypothermia, less than 32 °C is severe hypothermia.

Preventive actions should be taken by reducing heat loss and/or providing warmth using external heat sources. Preventive measures include:

- A warm delivery room
- Drying the newborn immediately after birth
- Skin-to-skin contact (do not separate mother and newborn unless newborn is not stable)
- Early initiation of breastfeeding
- Postpone bathing (for at least 24 hours after birth) and weighing (60 – 90 minutes)
- Provide appropriate clothing and bed linen
- Warm transportation (skin-to-skin)
- Warm resuscitation area

II.2.4.2 Hyperthermia

Hyperthermia is as dangerous to the newborn as hypothermia and can occur just as easily. The temperature of the newborn and its surroundings (especially incubators) should be monitored frequently.

Hyperthermia should not be confused with fever, since it is not related to infection or other source of inflammation. However, it is not possible to distinguish between fever and hyperthermia by clinical signs or just measuring body temperature. When the newborn has a raised temperature, it is important to consider both causes. Infections should always be suspected first, unless there are very obvious external reasons for the newborn becoming overheated.

Prevention of hyperthermia can be achieved by:

- Avoid direct sunlight to the newborn and to equipment such as incubators and radiant warmers
- Monitor newborn's temperature frequently if kept in warmer, incubators or heated rooms

II.2.4.3 Kangaroo Mother Care

Kangaroo mother care (KMC) is a care of a small newborn who is continuously carried in skin-to-skin contact with the mother, father or any other member of the family and exclusively fed by breast milk. It is the best way to keep the newborn warm and it also helps to establish breastfeeding. KMC can be started at the facility as soon as newborn's condition permits (i.e. newborn does not require special treatment such as oxygen or IV fluids)

Effective KMC relies on the following:

- Ensure that the mother is fully recovered from any childbirth complications before she begins KMC
- Ensure that the mother has support from her family to stay at the facility or return when the newborn is ready for KMC
- Discuss with the family and explain the support that mother needs from them
- Explain to the mother that KMC is the best way of care to her newborn once condition permits and the benefits are:
  - newborn will be kept warm
  - will feed more easily
  - episodes of apnoea will be less frequent
  - newborn will be prevented from acquiring infection
  - increase bonding between her and her newborn
- Skin-to-skin care may be interrupted when changing napkins (diaper), bathing the newborn or during clinical assessment
- KMC should continue until the newborn is about 2500 g

Beginning KMC

- Ensure that the room temperature is at least 25 – 28 °C
- Arrange with the mother at a time that is convenient to her
- Ask her to wear loose clothing that is comfortable in an ambient temperature
- Provide the clothing that can accommodate the newborn while the mother is holding the newborn
- Describe to her each step of KMC, demonstrate them and then allow her to go through the steps herself
- Dress the newborn with a pre-warmed shirt open at the front, a nappy or diaper, a hat and socks
- Place the newborn on the mother's chest
- Place the newborn in an upright position directly against the mother's skin

- Ensure that newborn's hips and elbows are flexed into frog-like position and the newborn's head and chest are on the mother's chest, with the head in a slightly extended position
- Cover the newborn with pre-warmed cloth/blanket
- Special garments are not needed as long as the mother's clothes keep the newborn firmly and comfortably in contact with her skin
- Use soft piece of fabric folded diagonally in two and secured with a knot
- Make sure it is tied firmly enough to prevent the newborn from sliding out if the mother stands, but not so tightly that it obstructs the newborn's breathing or movement
- After positioning the newborn, allow the mother to rest with her newborn and encourage her to move around when she is ready

Breastfeeding

- Help the mother to breastfeed
- Have the mother sit comfortably and help her with correct position and attachment

Daily life for the mother

- Emphasize to the mother the importance of hand hygiene
- Let the mother be comfortable, she can walk, stand, sit, or lie down while doing KMC
- The best sleeping position for the mother during KMC is a reclining (lying on the bed in semi-upright position)
- If the mother's bed is not adjustable, she can use several pillows to prop herself up. She may also sleep on her side
- When the mother needs time away from the newborn for hygiene or for any other reason:
  - have a family member carry the newborn skin-to-skin while the mother is unavailable, or
  - dress the newborn, place in a warm bed and cover until the mother or the family member is available to continue skin-to-skin contact

Monitoring the newborn's condition

- Measure the newborn's temperature twice daily if the newborn is in continuous KMC
- Teach the mother to observe the newborn's breathing pattern and explain the normal variations
- Explain to the mother that whenever there is an abnormal breathing pattern, she should report immediately to the health care worker
- If the newborn does not begin to breath immediately resuscitate the newborn using a bag and mask
- Teach the mother to recognize the danger signs (apnoea, decreased movement, lethargy or poor feeding)
- Respond to any concern the mother may have. If the newborn is feeding poorly, determine if the mother's technique is incorrect, newborn is still too immature or the newborn is becoming ill (repeat examination if necessary)

- **Bath the newborn after 24 hours especially when condition allows.** A newborn should not be immersed in water until after the umbilical cord has fallen off and healed. Until then, it is good to give the newborn a sponge bath.

II.2.5 Management of common complications of LBW

Low birth weight and premature newborns may have a number of complications, which can be divided into short term and long term complications:

Short term complications	Long term complications
Hypothermia and Hyperthermia	Developmental delay
Hypoglycaemia and Hyperglycaemia	Late anaemia of prematurity
Respiratory distress syndrome	Retinopathy of prematurity
Apnoea of prematurity	
Early anaemia of prematurity	
Infections	
Hyperbilirubinaemia (refer chapter 3)	
Bleeding disorders (vitamin K deficiency)	
Patent ductus arteriosus	

The following sections will focus only on special considerations for management of premature and low-birth weight newborns.

II.2.5.1 Hypothermia

Hypothermia occurs when the newborn's temperature drops below 36.5 °C: 36.0°C – 36.4°C is mild hypothermia (cold stress); 32.0°C – 35.9°C is moderate hypothermia; less than 32°C is severe hypothermia.

Causes and risk factors of hypothermia

Incorrect care of the newborn is the most important factor influencing occurrence of hypothermia. The following are the most common causes of hypothermia in newborns and LBW newborns:

- Cold delivery room
- Newborn left wet and uncovered until delivery of the placenta
- Weighing on cold surface (weighing scale) and washed soon after birth
- Delaying to initiate breastfeeding
- Separation of the newborn from the mother

Hypothermia may also be caused by:

- Environmental factors (Cold season)
- Disorders that impair thermoregulation (e.g., sepsis, intracranial haemorrhage)
- Asphyxia

Signs and symptoms of Hypothermia

- Initially hypothermia may be asymptomatic, and the newborn may appear asleep. The newborn may have the following symptoms:
  - cold feet
  - cold skin all over the body
  - newborn will be less active, suckles poorly and has a weak cry

- In severe hypothermia, newborn will present with:
  - lethargy
  - apnoea
  - bradycardia
  - central cyanosis
  - coagulation abnormalities
  - hypoglycaemia
  - hypotension
  - poor perfusion
  - hypotonia
  - feeding intolerance (abdominal distension, emesis, gastric residuals)

- Preventing low body temperature at birth in LBW infant is important for survival and long term outcome.

Management of hypothermia

LBW infants found to be hypothermic must be **re-warmed** as soon as possible. The following is the process of re-warming a newborn with hypothermia:

- The temperature of the room where the re-warming takes place should be at least 25 °C.
- Remove the newborn's cold clothing
- Place the newborn skin-to-skin on the mother's chest dressed in a pre-warmed shirt open at the front, a nappy (diaper), a hat and socks
- Cover the newborn on the mother's chest with her clothes and an additional (pre-warmed) blanket
- Check the temperature every hour until normal
- Keep the newborn with the mother until the newborn's body temperature is in a normal range
- If the newborn is small, encourage the mother to keep the newborn in skin-to-skin contact for as long as possible, day and night.

- If the newborn's temperature does not reach 36.5 °C or more after 2 hour of re-warming, re-assess.
- If referral needed, keep the newborn in skin-to-skin position with the mother or other person accompanying the newborn
- If the mother and newborn must be separated, ensure the newborn is dressed or wrapped and covered with a blanket
- Assess warmth every 4 hours with a thermometer or by touching the newborn's feet: if newborn is cold use skin-to-skin contact, add extra blanket and re-assess
- Keep the room for the mother and newborn warm, if the room is not warm enough, always use skin-to-skin contact and/or cover the newborn with a blanket
- If the health facility has equipment, the newborn maybe re-warmed by:
  - Room heated by dry heaters
  - Radiant warmer
  - Incubators
- Make sure the newborn is not overheated
- Hypothermia may also occur at home. Before discharge, explain to the mother procedures for re-warming the newborn at home:
  - Newborns need one or more layers of clothes than other children
  - Keep the room or part of the room warm (at least 25 °C) especially in a cold climate
  - Continue skin-to-skin at home. If the newborn still has cold feet, report back to the nearby health facility

II.2.5.2 Hyperthermia

This is defined as temperature equal to or above 37.5 °C (axillary)

Causes of hyperthermia

- Wrapping a newborn in too many layers of clothes, especially in a hot, humid climate
- Leaving a newborn in a direct sunlight
- Putting a newborn too close to a fire or heater
- Putting a newborn close to a hot water bottle
- Leaving the newborn under radiant warmer or in an incubator that is not functioning properly

Signs and symptoms of hyperthermia

- Hyperthermia increases the metabolic rate and rate of water loss by evaporation, which can cause dehydration
- A core temperature above 42 °C can lead to neurological damage
- Signs of hyperthermia include:
  - rapid breathing

- increased heart rate
- hot skin
- red extremities due to vasodilation
- flushed face
- restless and lethargic
- in severe hyperthermia shock, convulsions and coma may occur

Management of hyperthermia

Never give antipyretic drugs (e.g. paracetamol, ibuprofen) to reduce neonates' body temperature.
Instead expose the newborn.

- The newborn should be moved away from the source of heat and undressed partially or fully if necessary (exposed)
- If the newborn is in incubator, the air temperature should be lowered
- It is important that the newborn be breastfed frequently to replace fluids
- Every hyperthermic newborn should be examined for infection
- Check temperature every 30 min after exposing the child and react timely once temperature approaches normal range (avoid hypothermia)

II.2.5.3 Hypoglycaemia

Hypoglycaemia continues to represent a common metabolic problem facing the LBW infants. Both well and sick infants can be affected by hypoglycaemia during the first days of life.

Risk factors for hypoglycaemia are:

- Prematurity
- Asphyxia
- Small for gestational age
- Infant of diabetic mothers

Signs and symptoms:

Signs of hypoglycaemia may not be obvious. They may include:

- Tremors, jitteriness, irritability or sweating
- Week cry or high-pitched cry
- Poor feeding
- Seizures
- Apnoea

RBG below 2.6 mmol/l needs immediate action

Management:

Asymptomatic versus symptomatic neonates are managed differently:
For symptomatic newborns

- For blood glucose < 2.6 mmol/l, give a bolus of dextrose 10% 2 ml/kg IV stat. Re-check RBG after 30 minutes while the newborn is on maintenance fluids appropriate for age
- For glucose ≥ 2.6 mmol/l and the newborn is stable, give EBM or dextrose 10% 2 ml/kg orally

For asymptomatic newborns

- Give expressed breast milk according to body weight and age. Re-check blood glucose while IV access is being obtained.
- If the newborn has persistent hypoglycaemia, refer to the next level facility

Non-responsive hypoglycaemia (tertiary level)

In case of severe symptomatic hypoglycaemia that is not responding to dextrose 10% or for symptomatic hypoglycaemic newborns without IV line, glucagon is a therapeutic option (if available).

- Give glucagon (IM/SC or slow IV 20 – 50 mcg/kg/dose, max. dose of 1 mg for 24 hrs)

II.2.5.4 Hyperglycaemia

Refer to chapter 3

II.2.5.5 Respiratory Distress Syndrome (RDS)

This is a disease of the immature lungs, characterized by lack of pulmonary surfactant and alveolar collapse. This leads to failure of oxygenation with significant intercostal retractions and progressive lung injury. It is primarily observed in premature infants born less than 34 weeks gestational age. LBW newborns may develop respiratory distress immediate after birth (mostly within 1 hour of delivery). If not treated properly, a newborn will end up in respiratory failure due to fatigue and may die. Most newborns with RDS will improve within 72 hours of life.

Clinical features of RDS include:

- Fast breathing (> 60 breaths/minute), severe chest wall indrawing, intercostal retractions, grunting
- Diminished breath sounds
- Cyanosis

Management of RDS

Dispensary and Health centre level

If the mother has already given birth to LBW at this level, stabilize the newborn, start skin-to-skin and refer to next level facility.

Hospital and Referral hospitals
Maintain normal temperature and normal blood glucose
Start the newborn on Continuous Positive Airway Pressure (CPAP) if is available
Start oxygen therapy if CPAP is not available
If available surfactant should be administered as early as possible
Monitor oxygen saturation, keep it above 88 % but it should not exceed 95 %

Oxygen administration:

- Give oxygen when saturation is below 88 %
  - Use nasal prongs as a preferred method to administer oxygen
  - Flow rate 0.5 – 1 l/min, titrate depending on oxygen saturation
- The preterm might require regular clearing of the nasal secretions
- Oxygen should be weaned when the general condition improves:
  - Oxygen saturation is 95 – 100 %
  - Breathing well and no signs of distress (normal respiratory rate, no chest in drawing and intercostal recession)
- Document: Oxygen flow rate, heart rate, respiratory rate, oxygen saturation

II.2.5.6 Apnoea of Prematurity

Apnoea is a cessation of breathing for more than 20 seconds, or a shorter absence of breathing (> 10 seconds) associated with bradycardia (< 100 beats/minute) or cyanosis (oxygen desaturation). It poses a significant risk if not detected and treated.

Causes and Risk factors for Apnoea of prematurity

Any newborn born less than 34 weeks gestational age has a risk of getting apnoea. Infection (sepsis) is the most common cause of apnoea in a newborn who was previously stable.

Clinical presentation

- Periodic cessation of breathing > 20 seconds
- Periodic cessation of breathing > 10 seconds with cyanosis or bradycardia

Investigation

- Screen for anaemia
- Random blood glucose
- Evaluate for sepsis (complete blood count, C-reactive Protein, +/- lumbar puncture, blood cultures)

Management

Dispensary/Health centre level

- Physical stimulation/tactile stimulation (gentle taps to the sole of the foot or rubbing the back)
- If the LBW infant was previously stable, suspect infection, give pre-referral antibiotics
- Make sure the newborn is on skin-to-skin
- Refer the patient to higher level facility

Hospital and referral/tertiary level

- In addition to the above management, give IV or PO aminophylline loading dose 5 mg/kg over 10 minutes followed by starting maintenance dose 12 hours later (1 – 3 mg/kg/dose IV or PO given 12 hourly)
- Or: Give loading dose of caffeine citrate IV 20 mg stat, then 2.5 mg/kg 12 hourly for 24 hrs
- Start CPAP or high flow oxygen if available
- Use an apnoea monitor if available, if not available a pulse oximeter should be used

II.2.5.7 Bleeding Disorder

Bleeding in newborns is a life threatening condition that needs urgent attention. Bleeding can occur at any time (immediately after birth or even days after).

Aetiology/Risk factors

- Vitamin K deficiency – most common especially in preterm newborns
- Platelet disorders
- Bleeding from the umbilicus
- Disseminated intravascular coagulopathy (DIC)

Signs and Symptoms

- Cord bleeding, bloody stools, bloody vomitus and bleeding from punctured sites
- Intracranial bleeding
- Hypovolaemia, hypotension, pallor, tachycardia, poor capillary refill

Management

- Provide prophylactic vitamin K1 at the time of delivery
- Suspected deficiency (newborn is already bleeding): vitamin K 2mg IV 24 hourly for 72 hours
- If newborn continues to bleed, refer to the next level facility for further management

II.2.5.8 Intraventricular Haemorrhage (IVH)

This is bleeding inside or around the ventricles in the brain due to fragile blood vessels and disturbance of cerebral blood flow. It is most common in premature newborns < 32 weeks gestational age and rare in term newborns. Severe bleeding is associated with high mortality.

Risk factors

- Severe prematurity (the more premature the newborn, the higher the risk)
- Severe SGA
- Unstable BP
- Hypoxia or hyperoxia (high SpO_2) and frequent changes in SpO_2
- Perinatal infection
- Vitamin K deficiency
- Thrombocytopenia or other coagulation disorders

Protective factors

- Antenatal steroids
- Higher gestational age

Clinical presentation

IVH usually happens within the first 3 days of life. It can be symptomatic or asymptomatic (if less severe).

- Restlessness or lethargy
- More frequent desaturations or bradycardias
- Decrease of Haemoglobin (Hb)
- Convulsions or other neurological symptoms

Investigations

- Ultrasound of the brain
- Hb
- Others according to clinical presentation

Management

- No specific treatment available
- Symptomatic treatment to avoid further damage
- Gentle care to avoid further damage
- Prevention of above mentioned risk factors (during pre- and perinatal period)

Complications

- Progressive dilatation of intracranial ventricles, which can lead to post-haemorrhagic hydrocephalus as manifested by increasing head circumference
- Impaired neurological development

II.2.5.9 Early Anaemia of Prematurity

This type of anaemia is normocytic, normochromic, characterized by low serum erythropoietin level. It is sometimes called physiologic anaemia, exacerbated by smaller fetal iron stores and greater expansion of blood volume from rapid growth of LBW newborns. Anaemia is the most common haematological abnormality during the neonatal period.

Aetiology/Risk factors

- acute blood loss (haemorrhagic)
- haemolysis
- frequent blood sampling
- infection
- prematurity (reduced 3rd trimester maternal iron transfer across placenta)

Clinical presentation

- Pallor
- Poor weight gain
- Increased apnoea or bradycardia
- Persistent tachycardia (HR > 160 /minute)
- Tachypnoea, increased oxygen requirement
- Features of heart failure
- Decrease activity

Investigation

- Measure Hb level
- Complete blood count
- Blood grouping and cross matching

- Coombs test
- Reticulocyte count
- Septic screening (CBC, CRP, urine analysis, LP, blood cultures)

Treatment

Dispensary and health centres

- If Hb is less than 10 g/dl during neonatal period, refer to the next level facility for further evaluation
- Give Haematinics (Folic acid and ferrous sulphate) from 2nd week of life, once enteral feedings are established

Hospital/Tertiary hospital

Transfuse LBW infants demonstrating symptoms of anaemia according to Hb and age of the baby (see table X)

Week of life	Severe disease	Mild to moderate disease
1st week	< 10.0 g/dl	< 10 g/dl
2nd week	< 10.0 g/dl	< 8.5 g/dl
≥ 3rd week	< 8.5 g/dl	< 7.5 g/dl

Table X

Definition of severe disease (see table): If one or more of the following is present:

- Need of oxygen
- Lethargic
- Irritable
- Fever > 39.0 °C
- Feeding problems
- No weight gain
- Jaundice

Blood transfusion should preferably be done with packed cells (10 ml/kg), if packed cells are not available whole blood (20 ml/kg) can be given. Furosemide is not given routinely.

II.2.5.10 Late Anaemia of Prematurity

Late anaemia of prematurity commences from 4th month of life. This is due to smaller initial iron stores, more rapid growth and a prolonged pure milk diet without haematinics supplements.

Management is similar to early anaemia.

II.2.5.11 Necrotizing Enterocolitis (NEC)

It is an ischaemic and inflammatory necrosis of the bowel, primarily affecting the premature neonate after initiation of enteral feeding. It is characterized by variable damage to intestinal tract from mucosal injury to full thickness necrosis and perforation.

Aetiology/Risk factors

- Prematurity
- Early formula feeding
- Birth asphyxia
- Congenital heart disease affecting mesenteric blood flow

Clinical presentation

- Abdominal distention
- Feeding intolerance, increasing gastric residuals (bilious)
- Vomiting
- Occult or gross blood in stool
- Abdominal tenderness
- Apnoea, bradycardia, temperature instability

If not treated, NEC may progress into peritonitis and intestinal bowel perforation with a likely lethal outcome.

Investigation

- FBP (thrombocytopenia is often present)
- Blood culture and sensitivity
- CRP
- Serum electrolytes
- Arterial blood gas analysis
- Abdominal X-ray (AP and lateral decubitus view) and abdominal ultrasound — pneumatosis intestinalis (intramural gas) is pathognomonic. These investigations may also show portal venous gas (PVT) or pneumoperitoneum (free air in peritoneum due to bowel perforation).

Treatment

Lower levels: Refer to District Hospital

- Nil per oral
- Put NGT and leave open for decompression
- Give IV fluids/total parenteral nutrition based on the weight and age of the newborn
- Monitor fluid input and output
- Ceftriaxone 80 mg/kg IV once a day for 14 days

- Metronidazole 7.5 mg/kg IV 8 hourly for 14 days
- Give Ranitidine (1-2mg/kg, Q8 hourly) and vitamin K when suspecting GIT bleeding
- Surgical consultations in case of peritonitis following bowel perforation

II.2.5.12 Retinopathy of Prematurity (ROP)

This is a disease affecting premature newborns generally having received intensive neonatal care in which prolonged use of oxygen leads to adverse effects, the most adverse being blindness.

The newborn will present with:

- Scaring of the retina, retinal detachment
- Vitreous haemorrhage (Bleeding inside the eye)
- Cataracts
- Blindness

Management

Surgery: The goal of surgery (laser treatment and cryotherapy) is to stop the progression of the disease and prevent blindness. (Although ROP surgery has a good success rate, not all newborns respond to treatment. Up to 25 % of the newborns might still lose some or all vision).

Prevention

The oxygen therapy should be maintained at the saturation of 88 – 95 % and it should not exceed 95 %.

II.2.5.13Neurodevelopmental Delays

In recent years, with advances in prenatal care and starting neonatal intensive care units, the survival rate of premature newborns of low and very low birth weight (VLBW) has increased significantly. However, the increased survival rate of premature newborn was associated with complications and those newborns who survived suffered more intensely from severe disabilities, intellectual disability, cerebral palsy, hearing and visual impairments.

The main disorders associated with prematurity and LBW include:

- Cerebral palsy, especially spastic diplegia/quadriplegia
- Intellectual disability/mental retardation
- Hearing impairment
- Visual impairment associated with retinopathy of prematurity
- Hydrocephalus due to intracerebral haemorrhage

These impairments can occur together or separately during developmental periods, and they are sometimes complicated by progressive hydrocephalus or chronic seizures. They are usually symptomatic in the first two years of life; and their degree of severity may vary from mild to severe.

Management

LBW newborns should be followed over a period of at least 1 year
Management of neurodevelopmental problems is complex and needs multi-disciplinary approach. The access to specialized facilities is still limited. Refer such patients to hospital or tertiary hospital for further management and evaluation.

II.2.5.14 Patent Ductus Arteriosus (PDA)

Patent ductus arteriosus (PDA) is a condition wherein the ductus arteriosus fails to close after birth. In early days condition is asymptomatic. Clinically it is picked during auscultation of the heart. The preterm will be investigated by doing:

- Chest X-ray
- Echocardiography
- Other tests based on co-existing condition

Supportive treatment:

- Oxygen therapy
- Mild fluid restriction of 20% if symptomatic (until closure)
- Diuretics to be given when in heart failure
    - oral frusemide 1 – 2 mg/kg/day
    - oral spironolactone 1 – 2 mg/kg/day
- Nurse in cardiac/prop-up position when necessary
- Closure of PDA can be attempted pharmacologically by using"
    - Paracetamol
    - Ibuprofen
- Definitive treatment: Surgical closure of PDA

II.3 Discharge and Follow-up

When a LBW infant is feeding well and there are no other problems requiring hospitalization (fever, rash, unstable temperature regulation), discharge the newborn. This may be in a few days to weeks, depending on the initial size of LBW infant and other problems the infant may have. Ensure that the mother is comfortable with her ability to care for the LBW infant at home and is able to come regularly for follow-up visits.

- All LBW infants should be given vitamin D supplements at a dose ranging from 400 IU to 1000 IU per day until six months of age.
- LBW infants who are fed mother's milk should be given daily calcium (120 – 140 mg/kg/day) and phosphorous (60 – 90 mg/kg/day) supplementation during the first months of life. Always give in combination, do not give only one of the two minerals.
- LBW infants who are fed mother's own milk should be given 2 – 4 mg/kg/day iron supplementation starting at two weeks until six months of age (check Hb at every visit).

During the first week after discharge from the hospital, mother and newborn should make follow-up visits as below:

LBW Follow-Up	
weight < 2500 g	1 visit/week until reaching 2500 g
weight > 2500 g	**1 visit/month**
Development check-ups:	**(corrected) age of 3 months**
	(corrected) age of 6 months
	(corrected) age of 9 months
	(corrected) age of 12 months
Corrected age: calculated from the estimated date of birth **Actual age:** calculated from actual date of birth *e.g.: newborn born at 5.10.2018 at GA 33+1, EDD 22.11.2018.* *At 5.12.2018, actual age is 2 months, but corrected age is 13 days.* **Attention: for percentile measurement use corrected age**	

The following should be checked routinely at every follow-up visit:

- Weight gain of at least 15 – 30 g/kg/day
- Draw weight and height development in the percentiles (with corrected age)
- KMC practice
- Feeding
- Illness
- Immunization – make sure all newborns with LBW are immunized the same way as term newborns
- Follow-up on bathing of the newborn

Next follow-up visit:
Continue with KMC until the newborn reaches term (gestation age around 40 weeks and 2500 g) or when the newborn is uncomfortable with KMC position
Once the newborn is weaned from KMC, continue with monthly follow-up to monitor feeding, growth and development, and immunization as per well baby follow-up clinic.

Weight gain and height development are the best indicators for assessing health and development of a preterm

III.1 What to do when you receive a sick newborn

When a health care provider receives a sick newborn, there is a need to follow some basic steps of triaging the newborn and categorize into: newborn in a serious, life-threating or stable condition and therefore decide on the further steps to take. On arrival every newborn has to be assessed first and quickly for emergency signs, if present, treat the newborn immediately. The detailed assessment including history taking, investigations, treatment of the newborn's specific condition and diagnosis follows later after quick assessment and triaging.

Assess – Classify – Manage

- Assess every newborn for emergency signs (and treat)
- Assess in detailed examination
- Classify the findings, determine diagnosis
- Manage further treatment (out-patient, in-patient, referral)

III.2 Assessment for Emergency Signs and Management

This section provides initial management of emergency signs. Details of specific conditions will be explained in other sections within this chapter.

Emergency signs

Severe respiratory distress
Bleeding
Shock
Convulsion

III.2.1 Severe Respiratory Distress

Clinical features:

- Grunting
- Chest wall indrawing
- Fast breathing (> 60 breaths per minute)
- Respiratory rate less than 30 breaths per minute
- Gasping, central cyanosis, and apnoea

Immediate management

- Place the newborn on a warm surface and under good light.
- Position the newborn to open airway and put the newborn in a neutral position
- Resuscitate the newborn using a bag and mask if there is insufficient breathing
- Give oxygen (refer to chapter 2 on details of oxygen therapy)

III.2.2 Bleeding

Bleeding can be visible (external bleeding) or non-visible (internal bleeding). It is important to find the source of bleeding and to stop it immediately. Assess if replacement of blood is needed.

Immediate management

- Stop visible bleeding:
  - If the bleeding is from the umbilicus, re-clamp or re-tie the umbilical stump
  - If the bleeding is from a wound/cut site, compress the bleeding site with a sterile gauze
- Give vitamin K1 (phytomenadione) 2 mg IV stat (continue for 3 days if bleeding continues)
- Take a blood sample for grouping and cross-match and bleeding indices
- Review section on haemorrhage for more details

III.2.3 Shock

Can present with pallor, cold extremities, weak and fast pulse rate, extremely lethargic or unconscious, prolonged capillary refill time (CRT).

Immediate management

- Follow ABC of resuscitation
- Give oxygen
- Keep the newborn warm
- Establish IV or intraosseous access (use intraosseous if IV is not available within very short time)
- Infuse Normal saline or Ringer's lactate 10 ml/kg body weight over 10 minutes and repeat once after 20 minutes if signs of shock persist
- Infuse 10 % glucose at maintenance volume according to the newborn's age if blood glucose level less than 2.6 mmol/l or glucose level not known
- If there is obvious bleeding, immediately give blood transfusion (whole blood 20 ml/kg) according to the newborn's blood group.

III.2.4 Convulsion (convulsing now)

Convulsion in newborns can be subtle, consisting of autonomic changes (increase heart rate, blood pressure), apnoea and bradycardia.

Immediate management

- Protect from aspiration
- Measure random blood glucose
- Provide 10 % Dextrose 2 ml/kg IV if glucose level is less than 2.6 mmol/l or unable to measure blood glucose level
- Then provide Phenobarbitone 20 mg/kg IV slowly over five minutes or IM injection

Caution

Do not use diazepam for convulsions in newborns.
Diazepam can cause respiratory depression.

III.3 Further Assessment and Management

After assessment for emergency signs and providing immediate management, continue to assess the newborn for the priority signs and write down the findings.

- Obtain the history of the newborn and the mother
- Examine the newborn thoroughly
- Use the findings from the history and examination for correct provisional diagnosis and choose the most appropriate management
- Determine the required investigations as per findings
- Record all information in patient's file

III.3.1 History taking

History taking is an essential part and always reveals significant information for further decision making and management.

- Take a detailed current history of the newborn from the mother/care giver
- Take antenatal, delivery and postnatal history
- Take family history
- Review referral notes, birth records from ANC card and other documents available

If the mother is not present, make sure all information is available from another reliable source.
A standardized admission form can help not to forget important details and can also be used to document findings from physical examination and further management (see Annex 3).

III.3.2 Examination

Continue any immediate management that was started for an emergency sign. If the newborn develops an emergency sign during the examination, or abnormal vital signs, treat first and then proceed with the examination once the newborn's condition is stable:

- Examine the newborn under a radiant warmer unless it is clear that the newborn has fever
- Allow the mother/care giver to be present during the examination
- Weigh the newborn and record the weight
- Observe the newborn for:
  - Colour

- Posture
- Movement
- Reaction to stimuli

- Take vital signs:
  - Respiratory rate
  - Temperature
  - Heart rate
  - Oxygen saturation (SpO_2)

As you proceed in the complete head-to-toe examination, explain the findings to the mother in simple terms and point out abnormalities. Obtain informed consent before performing an invasive procedure.

III.3.3 Compiling the findings

Once the examination is complete

- **Determine the most likely diagnosis**
- Investigate according to your diagnosis (e.g. laboratory, radiology)
- Determine the proper management out of the following:
  - Outpatient treatment
  - Admission of the sick newborn at Neonatal Care Unit (NCU)
  - Refer the newborn to a higher level facility
- Remember to document everything
- Explain to the mother your findings and plan of management

Keep in mind that you may have to treat multiple problems at the same time. The mother/care giver, who is constantly with the newborn, may notice subtle changes in the newborn's condition. Encourage her to report changes immediately, listen to her comments and re-examine the newborn at any time if there is concern.

III.4 Outpatient management

If the newborn does not need admission or referral, counsel the mother and manage the baby as outpatient. Outpatient management can be given to a newborn who presented to health care provider with no danger signs.

Some of the management of a neonate as outpatient through IMCI concepts is summarized in the following table.

Table X

SIGNS AND SYMPTOMS	CLASSIFICATION	TREATMENT
• None of the signs of very severe disease or local bacterial infection	SEVERE DISEASE OR LOCAL INFECTION UNLIKELY	Advise mother to give home care. • Keep the baby warm • Breastfeeding

		• Tell when to return to hospital (if the baby has any of these signs) - Breastfeeding poorly - Reduced activity - Becomes sicker - Develops a fever - Feels unusually cold - Fast breathing - Difficulty in breathing - Palms and soles appear yellow
• Umbilical redness • Skin pustules (only if few pustules)	LOCAL BACTERIAL INFECTION	• Following sterile procedure wash umbilicus with normal saline • Give antibiotics (Ampiclox 50 mg/kg BD for 5 days) • To come again to the facility for follow up after 2 days
Two of the following signs: • Restless and irritable • Sunken eyes • Skin pinch goes back slowly	SOME DEHYDRATION	• Give fluid and breast milk for some dehydration (Plan B) • Advise mother when to return immediately (if neonate has any of following): - Blood in stool - Drinking poorly • Follow-up in 2 days if not improving
Not enough signs to classify as some or severe dehydration.	NO DEHYDRATION	• Give fluids to treat diarrhoea at home and continue breastfeeding (Plan A) • Advise mother when to return immediately (if

		neonate has any of the following) - Blood in stool - Drinking poorly • Follow-up in 2 days if not improving
• Jaundice appearing after 24 hours of age and level above the umbilicus	JAUNDICE	• Advise the mother to breastfeed more frequently day and night • Advise mother to return immediately if yellow discolouration starts below umbilicus • If jaundice persists more than 14 days, refer to a facility with NCU • Follow-up in 2 days
• Eyes discharging some pus	EYE INFECTION	• Soak clean cloth in boiled cool water and clean the affected eye • Tetracycline ointment 6 hourly for 7 days

For details on outpatient management, refer to IMCI Chartbook

III.5 Admission and Referral Management

III.5.1 Admitting the newborn to the health care facility

If the newborn has danger signs he requires admission. When admitting the newborn to a health facility, ensure the following:

- Explain the newborn's condition to the mother and the reason(s) why the newborn needs to be admitted. Answer any questions she may have
- Check that the newborn is properly identified with a name tag on the wrist or ankle
- Carry out necessary administrative procedures (e.g. record keeping)
- Care for the newborn in the appropriate room in the newborn care unit

If a **newborn care unit is not available**, keep the newborn with the mother under close observation, give required pre-referral treatment and arrange for referral.

III.5.2 Refer the newborn urgently to a health facility with neonatal care unit

- After emergency treatment and stabilization of the newborn, explain the need for referral to the mother/father/care giver
- Organize safe transportation
- See chapter 5 for more details on referral

III.6 General Considerations

While managing sick newborns it is very important to prevent hypoxia and minimize pain. These general considerations are explained in the following sections.

III.6.1 Oxygen Therapy

A low oxygen level in the blood (hypoxaemia) is a life-threatening condition that occurs frequently in different neonatal conditions. The best way to detect and monitor hypoxaemia is with pulse oximetry. Hypoxaemia can be treated by giving oxygen. How to safely give oxygen to the patient is explained in this section.

All patients' oxygen saturation should be checked:

- On admission
- During ward round and nursing observations
- If there is visible cyanosis
- If there is any sign of difficulty in breathing
- If the newborn is very sick
- If the newborn is drowsy/unconscious

Normal oxygen saturation (SpO_2): 95 – 100 %

- Give oxygen therapy if SpO_2 is below 90 %
- Use nasal prongs to administer oxygen
- Use the appropriate size of prongs to avoid damage of the nose
- Start with an oxygen flow rate of 0.5 – 1 l/min for preterm infants and 1 – 2 l/min for term newborns, titrate immediately depending on SpO_2 (as follows)
    - keep $SpO_2 \geq 88$ % for preterm infants
    - Keep $SpO_2 \geq 90$ % for term newborns,

    - Do not exceed SpO_2 > 95 % (while on oxygen)
- Try to wean the newborn from oxygen once it has stable respiration and SpO_2 is in the above mentioned range by reducing oxygen flow rate slowly while monitoring SpO_2. Make sure to observe the newborn for around 15 minutes when reducing oxygen flow rate, as SpO_2 measure adjusts slowly and can still drop after some time
- Nasal suctioning and daily cleaning of prongs might be required
- Document: Oxygen flow rate, respiratory rate, SpO_2, heart rate

III.6.2 Pain in Newborns

Newborns from around 20 weeks gestational age can feel pain, though it is not always expressed. Many newborns are routinely exposed to pain from procedures and many do not receive pain reduction interventions. Repeated painful stimuli can have short and long-term consequences for the child including impaired neurologic and behavioral development. Pain relief is a basic human right.

Causes of pain

- Painful procedures
    - Inserting cannula, taking blood sample, immunisations
    - Inserting NGT
    - Removal of plaster
    - Many other procedures
- Underlying disease
- Postoperative pain
- Ungentle handling of the newborn
- Slapping/pinching to stimulate or wake up the newborn

Consequences of pain in a new-born

Repeated painful procedures can have long-term consequences for the child such as:

- Increased sensitivity to further painful procedures
- Increased anticipatory distress for further procedures

Assessing pain in a newborn

There are several tools to assess pain, e.g. premature infant pain profile (PIPP), neonatal infant pain scale (NIPS).

Every assessment relies mostly on observing behaviour:

- Facial expressions (e.g. eyes tightly closed, brows drawn together, bulge on forehead between the brows, cheeks raised, nose broadened and bulging, mouth stretched open)
- Movements of extremities

- Crying (different from cry due to e.g. hunger)
- Changes in feeding behaviour
- Changes in sleeping behaviour

Additional physiological measures are blood pressure, respiratory rate, heart rate, oxygen consumption, temperature.

Premature or very sick newborns may not cry at all or may not move in response to pain.

Management

Avoid painful procedures as much as possible and do active pain management to minimize pain where pain is unavoidable. The mentioned methods can be combined for added effect (e.g. dextrose with non-nutritive sucking).

- **Psychological**
  - Allow mother to be present
  - Distraction with singing or gentle touch

- **Physical**
  - Breastfeeding
  - Skin-to-skin contact
  - Facilitated tucking (holding the newborn with flexed arms and legs) or swaddling (wrapping the newborn firmly in a khanga with flexed arms and legs. The hands are out of the khanga and close to the mouth to encourage self-settling)
  - Non-nutritive sucking (sucking without fluid intake, e.g. on the newborn's own fingers or the mother's finger. It is a self-soothing behaviour.)

Facilitated tucking

Swaddling

- **Pharmacological**
  - Topical anaesthetics (e.g. cream of 2.5 % lidocaine)

- Paracetamol (10 mg/kg/dose orally, max. 6 hourly. Slower clearance in neonates, therefore don't give frequently)
- Local anaesthetics (e.g. lidocaine 0.5 % injection, 3 – 5 mg/kg/dose SC)
- Deep sedation (e.g. morphine 0.05 – 0.1 mg/kg/dose IV, fentanyl 0.5 – 1 microgram/kg/dose IV or IM or ketamine (procedural sedation: 0.5 – 2 mg/kg/dose IV or IM))

III.7 Management of Specific Conditions

Neonatal emergency conditions

An emergency is a situation whereby if immediate measures are not taken; it can endanger patient's survival. The following are some of the conditions that need to be attended to immediately or without delay.

Hypoglycaemia
Hyperglycaemia
Haemorrhage
Convulsions
Hyperthermia
Hypothermia
Electrolyte imbalances (Potassium, sodium, calcium)
Shock
Asphyxia
Jaundice
Infections

III.7.1 Hypoglycaemia

Level of blood glucose below 2.6 mmol/l.

Clinical features can also be used to suspect hypoglycaemia. Low blood glucose levels can occur in the first hours after birth as newborns transition from maternal continuous glucose delivery to an intermittent supply of glucose from breastfeeding.

Aetiology and Risk Factors

- Limited glycogen stores (e.g. prematurity, intrauterine growth retardation)
- Increased glucose consumption (e.g. hyperthermia, sepsis)
- Decreased glycogenolysis, gluconeogenesis or use of alternative fuels (e.g. inborn errors of metabolism, adrenal insufficiency)
- Amino acid and organic acid disorders (e.g. marple syrup urine disease)
- Liver disease

Clinical presentation

Neonatal hypoglycaemia is often asymptomatic and picked up incidentally on routine blood glucose testing, as a part of work up of a sick newborn.
It can also present as:

- Tremors, jitteriness, irritability or sweating
- Weak cry or high-pitched crying
- Poor feeding
- Seizures
- Apnoea or breathing problems
- Exaggerated reflexes

Investigations

For persistent hypoglycaemia: cortisol levels, growth hormone, ACTH, C-peptide

Management

Asymptomatic and symptomatic neonates are managed differently:

For **symptomatic** newborns:

- For RBG < 2.6 mmol/l, give a bolus of Dextrose 10 % 2 ml/kg stat IV, recheck RBG after 30 mins while the newborn is breastfeeding or receiving IV fluids appropriate for age and weight.
- For RBG > 2.6 mmol/l, and the newborn is stable, give EBM or Dextrose 10 % 2ml/kg orally.

For **asymptomatic** stable newborns:
Advise the mother to exclusively breastfeed the newborn and if the newborn can't breastfeed give expressed breast milk according to weight and age of the newborn. Recheck RBG 1 hour after feeding and again before next feeding. Ensure more frequently feeding to prevent hypoglycaemic episodes.

If the newborn presents with feeding intolerance or breast milk is not readily available, give a bolus of D 10 % 2 ml/kg stat IV, recheck RBG after 30 minutes while the newborn is receiving IV fluids appropriate for age and weight.

Note:

- EBM can always be given via NGT while IV access is being obtained in a symptomatic neonate with hypoglycaemia.
- Once blood glucose is stable, reduce IV infusion and increase enteral feedings
- Do not stop IV infusion abruptly
- If after 1 hour the newborn still has hypoglycaemia, consider further investigations including sepsis screening, cortisol levels, GH, ACTH, C-peptide
- Exclude maternal diabetes if the newborn has persistent hypoglycaemia

III.7.2 Hyperglycaemia

Definition

This is random blood glucose level > 7 mmol/l, however, consideration for treatment should only begin when glucose levels are persistently > 11 mmol/l with two reliable measurements 4 hours apart

Aetiology and risk factors

- Iatrogenic: excessive glucose load from IV fluids
- Failure of glucose autoregulation from hepatic and pancreatic immaturity: low birth weight, extreme prematurity, intrauterine growth restriction (IUGR)/small for gestational age.
- Stress: e.g. sepsis, recent surgery, recent anaesthesia or necrotizing enterocolitis (NEC)
- Side effects of medications such as corticosteroids, caffeine
- Transient and permanent neonatal diabetes mellitus

Clinical presentation

- Often asymptomatic
- High urine output leading to dehydration

Investigations

- Confirm hyperglycaemia with repeated measurements
- Investigate for sepsis
- Obtain drug history (use of corticosteroids can induce hyperglycaemia)
- For persistent hyperglycaemia: serum glucose, insulin, C-peptide, ketone bodies (measured from the same sample), urine glucose and ketones

Management

- Consider initial hyperglycaemia as iatrogenic. Stop dextrose infusion and continue to monitor RBG hourly until glucose falls to < 11 mmol/l
- Continue with regular feeding. Even minimal enteral feeds (MEF) induce insulin secretion
- Treat underlying cause, e.g. sepsis
- If despite stopping Dextrose 10 %, after 4 hours glucose is still > 11 mmol/l, consider giving insulin at a dose of 0.05 – 0.15 units/kg IV/subcutaneously every 4 – 6 hours (bolus) or 0.05 units/kg/hour (continuously). Dosage may be altered depending on the response. (Dilute 0.5mls equivalent to 50IU of Insulin with 49.5mls of dextrose 5% to make a solution of 1.0IU per 1ml)

- Check BG 30 mins after giving insulin and then continue with hourly monitoring. Monitoring can be stopped after having 3 consecutive normal readings of blood glucose before feeding.

NOTE:

- Extremely low birth weight newborns (< 1000 g) may have increased sensitivity to insulin. Start at lowest dose initially.
- If hypoglycaemia occurs, stop insulin infusion and administer Dextrose 10 % (2 ml/kg) IV bolus and then continue with maintenance fluid appropriate for weight and age.
- For permanent and transient diabetes, long-term insulin use may be required and the newborn should be referred to a specialised facility.
- Counsel the parents on the infant's condition

III.7.3 Bleeding Disorder (Haemorrhage)

Haemorrhage is a significant loss of blood, which can be internal or external, and can compromise organ or tissue perfusion and can be life threatening.

Aetiology and risk factors

- Vitamin K Deficiency Bleeding (most common cause)
- Premature newborn (intraventricular haemorrhage)
- Disseminated intravascular coagulopathy (sepsis, severe birth asphyxia)
- Thrombocytopenia, congenital platelet dysfunction
- Liver failure
- Haemophilia and congenital bleeding disorders

Clinical presentation

- Active bleeding e.g. cord bleeding, bloody stools, bloody vomitus and bleeding from punctured sites
- History of bleeding
- Pallor, hypotension, tachycardia, poor capillary refill
- Features of intracranial bleeding e.g. bulging anterior fontanelle, altered level of consciousness, bradycardia, irregular respirations, hypoventilation, apnoea, seizures, fixed pupils

Investigations

- Full blood picture
- Blood group and cross matching
- Bleeding indices i.e., PT, PTT, INR
- Sepsis screening
- Cranial ultrasound

Management

- Stop visible bleeding
- If there are signs of shock, give normal saline or Ringer's lactate 10 ml/kg body weight over 10 minutes and repeat once after 10 minutes.
- Immediately do blood group and cross matching; transfuse whole blood 20 ml/kg
- Give vitamin K1 (phytomenadione) 2 mg IV once per day for 3 days
- Give oxygen
- Take proper history
    - Is there bloody stool or urine?
    - Family history of bleeding?
    - History of bleeding from umbilical cord?
    - Bloody vomitus?
- Ensure warmth and continue feeding
- Ranitidine 1 – 2 mg/kg/day in 3 divided doses if upper GI bleeding

III.7.4 Convulsions

Always rule out hypoglycaemia as a possible cause for convulsion

Definition

A sudden, irregular movement of the body caused by involuntary contraction of muscles e.g. lip smacking, cycling, abnormal blinking or deviation of the eyes, tonic posturing, high pitched cry. Convulsions (seizures) may also be subtle, consisting of autonomic changes, apnoea and bradycardia.

Risk factors

- Hypoglycaemia
- Birth asphyxia
- Structural brain lesions (congenital anomaly, haemorrhage, infarction, stroke, congenital CNS infections)
- Post-natal CNS infections (e.g. bacterial or viral meningitis)
- Electrolyte imbalance (hypocalcaemia, hypomagnesaemia, hyponatraemia)
- Drug withdrawal syndrome/neonatal abstinence syndrome (maternal abuse of opioids, benzodiazepines or other drugs)
- Inborn errors of metabolism
- Bilirubin encephalopathy

Investigations

- Random blood glucose
- Septic screening (FBP, blood culture and sensitivity, urine analysis)
- Lumbar puncture
- Cranial ultrasound (if suspecting intracranial bleeding)
- EEG

Management

Caution
Do not use **diazepam** for convulsions during neonatal period**.**
It increases the risk of respiratory depression.

Table 6: Pharmacological management of convulsions in newborns

Drug	Loading Dose	Maintenance & Comments
Phenobarbitone	• 20 mg/kg IV (IM) • after 30 min: 10 mg/kg IV (IM) • after 30 min: 10 mg/kg IV (IM) ⇨ *Still convulsing? go for 2nd line*	• 5 mg/kg/day (OD or in 2 divided doses) • Start maintenance 24 hours after loading • End with tapering over 1-2 days
Levetiracetam	• 15-20 mg/kg IV over 15-20 min ⇨ *Still convulsing? go for 3rd line*	• Start 10 mg/kg/day in 2 divided doses (via NGT possible) • Weekly increase by 5-10 mg/kg/day • Typical maintenance dose 30-40 mg/kg/day • Maximum dose: 60 mg/kg/day • Start maintenance 24 hours after loading
Phenytoin	• 20 mg/kg IV slowly • Caution: cardiac monitoring!	• 2-4 mg/kg/day in 2 doses • Start maintenance 12 hours after loading
Midazolam	• 0.05 – 0.2 mg/kg IV slowly • **Caution: respiratory depression!**	• Use only under continuous observation of respiration and SpO_2

Current convulsions (or within the last hour) are an emergency.

- Correct hypoglycaemia if glucose is below 2.6 mmol/l.
- **Give Phenobarbitone 20 mg/kg IV** slowly over five minutes (if no IV line, give IM)
- If convulsions do not stop within 30 minutes:
  give phenobarbitone 10 mg/kg IV (IM) slowly over five minutes
- If still convulsing after 30 minutes repeat phenobarbitone 10 mg/kg IV one more time (maximum 40 mg/kg on day 1. If convulsions stopped continue with maintenance dose the next day.)
- **If convulsions continue or recur within six hours:**
  Give levetiracetam loading 15 – 20 mg/kg IV over 15 – 20 min
- Alternatively give phenytoin 20 mg/kg slowly IV

If the newborn has low oxygen saturation, central cyanosis or other signs of breathing difficulty, give oxygen at a moderate flow rate and monitor the patient with pulse oximeter. Take proper history to determine underlying condition (history and details of the first seizure are crucial for further diagnostic action).

Begin maintenance therapy according to Table 7. Keep the child in a safe environment, protect from aspiration.

When seizures occurs while the newborn is on phenobarbitone maintenance therapy, give phenytoin 20 mg/kg loading dose, followed by maintenance dose of 2 – 4 mg/kg BD, starting 12 hours after loading dose administration**.**

Stopping treatment

If an infant has had no seizures for more than 48 hours consider weaning them gradually off their anticonvulsant medications. Remove the most recently added anticonvulsant first and taper doses gradually over the subsequent week.

For infants with underlying brain lesions, treatment may be prolonged due to prolonged convulsions.

Differential diagnosis for convulsion

Table X

Probable diagnosis	Timing and History	Clinical Findings
Hypoglycaemia	• Timing: any time • History of maternal diabetes • Poor or no feeding	• Convulsions, jitteriness, lethargy, or unconsciousness • Small newborn (< 2.500 g, < 37 GA) • Large newborn (> 4000 g at birth) • ***Blood glucose less than 2.6 mmol/l***

Asphyxia or other brain injury	• Timing: within 24 hours of birth • Problems during labour/birth • Failure to breathe after birth • Resuscitation at birth	• Convulsions or unconsciousness • Lethargy or floppiness • Breathing difficulty • Abnormal body temperature • Reduced activity or irritability
Intraventricular haemorrhage	• Timing: day 1 to 7 (and beyond) • Sudden deterioration of condition • Sudden pallor	• Convulsions or unconsciousness • LBW or premature (< 2.500 g, < 37 GA) • Breathing difficulty
Meningitis	• Timing: day 2 or later	• Convulsions or unconsciousness • Lethargy • Signs of sepsis • Bulging anterior fontanelle
Bilirubin encephalopathy (kernicterus)	• Timing: day 3 to 7 • Deep jaundice • No or delayed initial jaundice treatment	• Convulsions • Opisthotonus • Poor or no feeding • Lethargy or floppiness • Positive Coombs test
Tetanus	• Timing: day 3 to 14 • Change in feeding to poor feeding • Unclean birth • Application of unclean or harmful substances to umbilicus	• Spasms • Infection of umbilicus

Convulsion treatment:

1st line: Phenobarbitone (20 – 10 – 10 mg/kg)
2nd line: Levetiracetam (15 – 20 mg/kg)
3rd line: Phenytoin (20 mg/kg)
4th line: Midazolam (0.05 – 0.2 mg/kg)

III.7.5 Hypothermia

Hypothermia is defined as temperature below 36.5 °C.
It is a serious condition commonly encountered in premature newborns and can cause death.
Refer to Chapter 2 for more details.

III.7.6 Hyperthermia

This is body temperature above 37.5 °C (axillary).
Refer to chapter 2 for signs, symptoms and management

III.7.7 Electrolyte imbalance

This section will be more significant to those facilities where electrolytes can be measured. Thus, only a summary of clinical features and treatment has been added to this guideline.

Table 7: Management of electrolyte imbalances

	Definition	**Aetiology / presentation**	**Investigation & treatment**
K^+⇩ Hypokalaemia	**K^+ < 3.5 mmol/l** **Mild** 3.0 – 3.4 **Moderate** 2.5 – 2.9 **Severe** <2.5	• Severe vomiting • Diarrhoea • NGT suctioning • Renal loss *(diuretics)* • Respiratory alkalosis • Hypothermia • Prolonged parenteral feeding • **Pseudohypokalaemia** *(error in measuring)*	Treat only if severe or symptomatic with arrhythmia. Treat orally if possible. If symptomatic give **KCl 0.5 mmol/kg slowly IV over 1 hour carefully.** Repeat as necessary. Solution must be diluted to 1 mmol/25 ml if given peripherally and 1 mmol/12.5 ml if given centrally
	Comment: In NICU settings, use of diuretics and other medications are common causes of hypokalaemia		
K^+⇧ Hyperkalaemia	**K^+ > 6 mmol/l**	• Extreme prematurity • Acute renal failure • Pathologic haemolysis of RBCs • Metabolic acidosis • Tissue damage/necrosis *(NEC, birth trauma, hypothermia)* • Haemolysed blood sample • Iatrogenic *(K+ substitution)* • Hormonal imbalance ⇨ **Dysrhythmias**	Extended laboratory investigations (Electrolytes, FBP, RBG) and imaging (USS abdomen for NEC, kidneys, renal Doppler, ECG) **Stop potassium infusion** Treat underlying problem Correct acidosis, if present.
	Comment: Hyperkalaemia is common in VLBW. It is the most serious electrolyte abnormality in newborns, because of fatal arrhythmias. Early introduction of feeds may be protective. *ECG: tall, peaked, tented T-waves on ECG, loss of P wave, widening QRS, ST-segment depression*		
	K^+ > 7 mmol/l or ECG changes	• **Salbutamol nebulisation** 2.5 mg every 2 – 6 hours, as needed. • **Dextrose 10 % 5 ml/kg** equivalent to 0.5 g/kg/hour dextrose • **Insulin 0.2 units/kg/hour** • Adjust rates based on Glucose and K^+, monitor for hypoglycaemia. • If myocardial excitability, give 10 % calcium gluconate solution 0.5 ml/kg IV carefully over 10 min (via central line), monitor ECG	

Na^+ ⇩ Hyponatraemia	**Na^+ < 130 mmol/l**	• Renal/hormonal immaturity • Increased renal Na^+ excretion • Volume overload ⇨ **Apnoea, irritability, lethargy**	**Volume overload:** Careful fluid restriction **Inadequate sodium intake:** Change nutrition **Sodium loss:** Check urine. **Neurologic findings:** 3 % NaCl at 1-3 ml/kg over 15 min or: 3 % NaCl slowly at 2 ml/kg/hour Add furosemide 1 mg/kg IV (Na^+⇧ by 2 mmol/l/hour).
Na^+ ⇧ Hypernatraemia	**Na^+ > 150 mmol/l**	• Usually water balance disorder • Water loss (urine, guts) • Insufficient fluid intake ⇨ **Dehydration, irritability, tachypnoea ⇨ high-pitched cry, seizures**	Check blood osmolality and urine **Correct dehydration carefully with normal saline**
Ca^{2+} ⇩Hypocalcaemia	**Term:** **Ca^{2+} < 2.0 mmol/l** Ca^{2+} < 8.0 mg/dl **Preterm:** **Ca^{2+} < 1.75 mmol/l** Ca^{2+} < 7.0 mmol/l	• Preterm/sick infants • Perinatal asphyxia • Diabetic mother Late: after blood transfusion ⇨ **neuromuscular excitability (tremors)** ⇨ **severe: tetany, stridor** ⇨ **cardiac (tachycardia, arrhythmia, decreased contractility)**	Laboratory investigations (Ca, P, Mg, AP, albumin, Crea, Parathyroid, Vit. D) Mild: oral substitution symptomatic: **give 5 % Ca-Gluconate** (diluted) **100 mg/kg or 2 ml/kg IV slowly** Or Ca chloride (20 mg/kg) **over 5-10 min**
	Ionized calcium (iCa) <1.0 mmol/l (< 4 mg/dl) is considered hypocalcaemic in both preterm and term infants.		

III.7.8 Shock

Shock is a complex clinical syndrome caused by an acute failure of circulatory function and is characterized by inadequate tissue and organ perfusion. Many conditions can lead to shock in newborn, ranging from acute blood or fluid loss (haemorrhagic/hypovolaemic shock) to sepsis (septic shock). It is more common in very low birth weight neonates and it is often fatal. Immediate management and active monitoring is crucial.

Clinical presentation

- Pallor and mottling of the skin
- Cold extremities, prolonged capillary refill time,
- Tachycardia, weak and fast pulse rate
- Tachypnoea
- Extreme lethargy, irritability or loss of consciousness

- Decreased urine output

Investigations

- Full blood picture (FBP)
- Blood group and cross matching
- Bleeding indices
- Blood Urea Nitrogen (BUN)
- Blood gas analysis
- Septic screening

Management

If bleeding is the likely cause of shock:

- Infuse Normal saline or Ringer's lactate 10 ml/kg body weight over 10 minutes and repeat once after 10 minutes if signs of shock continue.
- Immediately give a blood transfusion according to newborn's blood group
- Give oxygen
- Ensure warmth

If bleeding is not the likely cause of shock:

- Infuse Normal saline or Ringer's lactate 10 ml/kg body weight over 10 minutes and repeat once after 10 minutes if signs of shock continue.
- Treat specific condition e.g. sepsis, cardiac problems
- Ensure warmth

III.7.9 Perinatal asphyxia and HIE (hypoxic ischaemic encephalopathy)

Perinatal asphyxia is caused by **oxygen deprivation of the newborn before, during and/or after birth**, which can lead to brain injury. The complex clinical presentation of this brain injury is called Hypoxic Ischaemic Encephalopathy, HIE. In this guideline, the term "*birth asphyxia*" is used to cover both the pathophysiological and clinical aspects.

Definition of birth asphyxia:

Failure to establish spontaneous breathing after delivery
and/or
5-Minute Apgar Score < 7

Clinical features and presentation

- CNS – seizures, apnoea, abnormal posture, decreased tone, impaired primitive reflexes, bulging fontanelle, irritability or loss of consciousness

- CVS – shock/hypotension, myocardial dysfunction
- Respiration – Respiratory distress, pulmonary haemorrhage, pulmonary oedema
- Renal – oliguria/anuria, renal failure
- GI – paralytic ileus, bloody stools, necrotizing enterocolitis
- Hepatic – Liver enzymes elevation, impaired coagulation of blood
- Haematology – thrombocytopenia, DIC
- Metabolic – acidosis, hypoglycaemia, hypocalcaemia

Assessment

Use the HIE-Score (e.g. Thompson score, see annex 9) to assess daily for the first 7 days of life.

Investigations

- Baseline investigation: FBP, RBG, Electrolytes, Liver enzymes, renal function, calcium
- If possible: blood gas analysis to see severity of hypoxia via pH and serum electrolytes

Acute management

Once a newborn was affected by asphyxia, there is no curative treatment for the brain damage. Depending on the severity and duration of hypoxia, other affected organs may recover. **The basic concept of treatment focuses on supportive care and avoiding further damage** by keeping body functions in physiological levels (temperature, blood sugar, oxygen saturation) and treat complications (e.g. convulsions, infections).

- Feeding and fluids:
  - **Moderate and severe HIE: Do not feed orally on day 1**, but swab the mouth with breast milk (colostrum swabs, refer to chapter 2 for more details). Start Dextrose 10 % IV. Restrict the volume of fluid to 60 ml/kg body weight for the first three days, and monitor urine output. This applies for preterm and term babies.
  - **Mild HIE:** Assess ability to feed and only give oral feeds if there is suckling reflex. Amount of oral feeds should be adjusted according to the condition and ability to tolerate, and the deficit should be given as IV fluids (to a total of 60 ml/kg on day 1)
  - For the following days, refer feeding/fluid requirement Table 4, chapter 2.
  - If the newborn **cannot be breastfed**, give expressed breast milk using an alternative feeding method (cup feeding, NGT)
    - If having significant emesis or high residual amounts, consider nil per oral (NPO) for 24 hours, evaluate for NEC. If stable 24 hours later, resume feeds at 50% the amount was previously being given, and advance gradually.

- Check glucose levels
- Give oxygen to maintain SpO_2 target range
  - Term newborns: 90 % - 95%
  - Preterm infants: 88 % - 95%

- Check urine

- **If the newborn urinates less than six times daily or produces no urine:**
  - Do not increase the volume of fluid on the next day
  - When the amount of urine begins to increase, increase the volume of IV fluid daily according to the progression of fluid volumes, regardless of the newborn's day of age (i.e. for a four days old newborn, progress from 60 ml/kg to 80 ml/kg to 100 ml/kg, etc.; do not go directly to 120 ml/kg on the first day)

- Give antibiotics
  - Antibiotics should be given for severe HIE or evidence of existing sepsis or concern for maternal chorioamnionitis. Use recommended combination of ampicillin and gentamicin for 7 days.

Ongoing care

Assess the newborn every two hours:

- Maintain normal temperature (36.5 – 37.5 °C)
- Treat convulsions if necessary (see section on convulsion management)

Decision to discharge

- Requirements for discharge:
  - No convulsions for three days after discontinuing anticonvulsant drugs
  - Mother is able to feed the newborn
  - No other problems requiring hospitalization
- Help the mother find the best method to feed the newborn if the newborn is not breastfeeding well. If the newborn is feeding slowly, have the mother feed more frequently
- Discuss with the mother the newborn's prognosis and how to deal with the problems the newborn may have in future
- Follow up in one week, or earlier if the mother notices danger signs

III.7.10 Neonatal jaundice

Jaundice is the yellow discolouration of the sclera, skin and mucous membranes. It is caused by hyperbilirubinaemia, an increased level of (unconjugated) bilirubin in the blood and can be normal (physiological) and severe or prolonged (pathological).

Types and Grades of Jaundice

Table X

Physiological jaundice	Pathological jaundice
After 2 days of life (term newborns) Mild jaundice (grade 1 – 4) Self-limiting Can turn into pathological jaundice	Within first 2 days of life (term newborns) All prematures with jaundice High bilirubin level (grade 5) Anaemia with jaundice Prolonged > 14 days

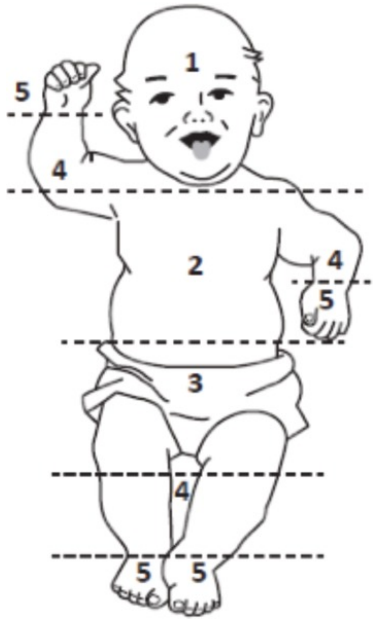
Kramer's Rule	Progress of skin discolouration total serum bilirubin	Treat, if
	**Grade 1:** Head and neck only: **4 – 8 mg/dl** (68 – 133 µmol/l)	**Premature** or **Age < 3 days** or **Anaemia**
	Grade 2: Upper trunk up to umbilicus: **5 – 12 mg/dl** (85 – 204 µmol/l)	
	Grade 3: Lower trunk below umbilicus to knee **8 – 16 mg/dl** (136 – 272 µmol/l)	
	Grade 4: Arms and lower legs below knee **11 – 18 mg/dl** (187 – 306 µmol/l)	
	Grade 5: Palms and soles **>18 mg/dl** (> 306 µmol/l)	**Always**

Fig. 9: Estimating bilirubin levels using Kramer's rule

Neurologic signs of hyperbilirubinaemia (term infants)

- **Initial phase:**
  Lethargy, poor feeding, hypotonia, increased sleepiness
- **Intermediate phase:**
  Irritability, increased tone, backward arching of neck (retrocollis) or back (opisthotonus).
- **Advanced phase:**
  Stupor or coma, inability to feed, cardiovascular instability, persistent seizures. Neurologic damage is usually irreversible at this point.

In preterm neonates, signs of acute bilirubin induced neurologic dysfunction (BIND) may be subtle or absent, compared to term infants. **Phototherapy is always initiated for lower levels of jaundice in preterm newborns**, given increased risk of bilirubin associated neurologic injury.

Investigations

- FBC
- Blood group and cross match
- Blood group of the mother (Rh incompatibility, AB0 incompatibility)
- Serum bilirubin (total and indirect) or transcutaneous bilirubin
- Additional investigations depending on the cause
    - Direct Coombs test
    - TORCHES (if associated rash, microcephaly, or others, e.g. persistent jaundice)
    - Septic screening (CRP, cultures)
    - Thyroid panel (persistent jaundice)
    - Imaging (for obstructive jaundice)

Treatment

Phototherapy

Start continuous phototherapy based on the bilirubin levels using bilirubin chart below.

In case the laboratory results are not available **Kramer's rule** can be applied.

Table 8: Cut-off levels of serum hyperbilirubinemia

Age	Bilirubin Chart for Newborns (WHO pocket book)							
	Phototherapy				Exchange Transfusion			
	Newborns ≥ 35 GA		**Newborns** < 35 GA		**Newborns** ≥ 35 GA		**Newborns** < 35 GA	
	[mg/dl]	[µmol/l]	[mg/dl]	[µmol/l]	[mg/dl]	[µmol/l]	[mg/dl]	[µmol/l]
Day 1	Any visible jaundice				15	260	10	220
Day 2	15	260	10	170	25	425	15	260
≥ Day 3	18	310	15	250	25	425	20	340

Technical considerations for phototherapy

- During phototherapy the newborn is undressed, wearing only a small diaper (as much skin as possible must be exposed)
- Ensure good eye protection during phototherapy
- The phototherapy lamp should be 30 – 40 cm from the newborn
- Change the newborn's position regularly
- Interrupt phototherapy only for feeding. If total bilirubin is rapidly rising or close to exchange, give EBM via NGT while patient is under phototherapy to minimize time without therapy
- Increase the newborn's total fluid amount by 10-20 ml/kg/d only if the baby is dehydrated
- Monitor the newborn's temperature at least every 4 hours

- Continue phototherapy until bilirubin is below phototherapy level, or continue for 3 days if bilirubin testing in laboratory is not available
- If the child is also anaemic give blood transfusion according to transfusion guideline (see chapter 2, table X).
- If the newborn does not improve on phototherapy, consider exchange transfusion at a higher level facility.

Complications of phototherapy

- Dehydration
- Overheating/hyperthermia
- Eye injury – retinal damage if proper shielding not done.
- Bronze discolouration (if direct hyperbilirubinaemia, mistakenly treated with phototherapy)

Parenteral antibiotics

Give antibiotics only to those with signs of sepsis. Avoid ceftriaxone because it increases the risk of bilirubin encephalopathy and kernicterus.

Counselling to parents

The parents should be informed about the reason for jaundice. If the reason is Rhesus incompatibility the mother needs to get Rhesus immunoglobulin.
Their newborns need to be followed up for neurodevelopment.
For subsequent pregnancies, parents should inform the obstetrician and paediatrician on the history of jaundice in their previous newborn.

III.7.11 Neonatal infections

Neonatal infections are infections acquired during prenatal development or in the first four weeks of life. Infection can be contracted by mother to child transmission, during child birth or after birth. These infections can be viral, bacterial, protozoa etc.

III.7.11.1 Neonatal sepsis

Neonatal sepsis is defined as a clinical syndrome of bacteraemia with systemic signs and symptoms of infection in the first 4 weeks of life.
Neonatal sepsis can be differentiated in early-onset and late-onset sepsis, with manifestation within the first 7 days of life or after 7 days of life respectively. Early-onset sepsis is in most cases caused by an ascending infection of the amniotic fluid. Late-onset sepsis is often caused by maternal bacteria, but can also be a nosocomial infection.

Risk factors

- Premature labour
- Premature rupture of membranes
- Rupture of membranes > 18 hours before delivery
- Maternal peripartum infection (fever > 38 °C or evidence of infection)

- Chorioamnionitis
- Intrapartum fetal distress (tachycardia, meconium, severe birth depression)

Clinical presentation

The presence of two or more of the following criteria can be used for presumptive diagnosis:

- Fast breathing (> 60 breaths /min)
- Grunting
- Severe lower chest wall indrawing
- Cyanosis
- Temperature > 37.5 °C
- Hypothermia < 36.0 °C
- Prolonged capillary refill time (CRT)
- Not feeding well
- Convulsions
- Drowsiness or unconsciousness
- Movements only when stimulated or no movements at all

Note: The symptoms are non-specific hence clinical features and thorough history will assist to make the diagnosis. ELBW/VLBW and early preterm neonates may have similar symptoms of respiratory distress syndrome and poor feeding for reasons of prematurity.

Investigations

- Blood culture and sensitivity
- FBP
- Serial CRPs
- RBG
- Blood gas analysis
- Consider lumbar puncture (CSF for microscopy, biochemistry and cell count)
- Urine culture (older neonate)
- Chest X-ray (in case of respiratory symptoms)

Attention:
Antibiotic treatment should NEVER be delayed
for investigations or waiting for results

Management

- As the infection can spread very fast all over the body, immediate start of treatment is crucial
- Give antibiotics:
    - Always give a combination therapy of at least 2 antibiotics, better is a combination of 3 antibiotics (Ampicillin 50 mg/kg BD, gentamicin 5 mg/kg OD (or 3 mg/kg OD for LBW newborns), cloxacillin 50 mg/kg BD)

    - Give 7 – 10 days according to the condition of the baby
    - Always give intravenous (or intramuscular until a venous access is established (Refer to Annex 5)
- In haemodynamically unstable newborns, start fluid resuscitation immediately: Infuse Normal saline or Ringer's lactate 10 ml/kg body weight over 10 minutes and repeat once after 10 minutes if signs of shock continue
- Encourage breastfeeding, if not possible give expressed breast milk via cup feeding or NGT
- If enteral feeding is not possible give IV fluid at maintenance volume according to weight age (see chapter 2) until the newborn is stable to receive breast milk
- Maintain blood glucose in normal range
- Maintain temperature in normal range (by exposing or covering the newborn)

Prophylaxis

- Intrapartum antibiotics given to mothers with risk factors (see maternal factors above)
- Strict implementation of IPC

III.7.11.2 Neonatal meningitis

Meningitis is an inflammation of the meninges (the protective membranes of the central nervous system). The presentation can be very similar to neonatal sepsis and differentiation is difficult.

Risk factors

As for neonatal sepsis

Clinical presentation

As for neonatal sepsis, though can be more focussed on neurological signs like:

- Irritability or lethargy
- Hypotonia
- Convulsions
- Bulging of anterior fontanelle
- Feeding difficulties
- Vomiting
- Apnoea
- Bradycardia

Investigations

- As in neonatal sepsis

Note: Antibiotic treatment should never be delayed for investigations or results

Management

- Perform lumbar puncture, send CSF to laboratory immediately (but don't delay antibiotic treatment because of waiting for lumbar puncture to be done)
    - Give ampicillin IV (in double dose) and gentamicin IV immediately according to the newborn's age and weight for 14 days (Refer to Annex 5).
- Further management see neonatal sepsis
- Confirm the diagnosis of meningitis if:
    - White blood cell count in the cerebrospinal fluid (CSF) is ≥ 20 /mm^3 if the newborn is less than seven days old
    - White blood cell count in the cerebrospinal fluid (CSF) is ≥10 /mm^3 if the newborn is seven days or older
    - Culture or gram stain of the CSF is positive
- Manage convulsions, if present
- If the newborn's condition is not improving after 48 hours of treatment with antibiotics, discontinue gentamicin. Give ceftriaxone or cefotaxime (in meningitis dose) IV according to the newborn's age, in addition to ampicillin for 14 days.
- Re-check haemoglobin if clinical signs of anaemia or low Hb in initial FBP
- Observe the newborn for 24 hours after discontinuing antibiotics and then discharge if well

Note that the dose of ampicillin given for meningitis is double the dose given for sepsis.

III.7.11.3 Neonatal pneumonia

Pneumonia is an inflammatory pulmonary process that may originate in the lung or be a focal complication of a systemic inflammatory process. The presentation can be very similar to neonatal sepsis and differentiation is difficult.

Risk factors

As for neonatal sepsis

Clinical presentation

As for neonatal sepsis, however chest symptoms predominate and these include:

- Respiratory rate > 60 breaths /min (persisting longer than expected in transient tachypnoea of the newborn)
- Grunting, nasal flaring and severe chest indrawing
- Cyanosis (low oxygen saturation)
- On auscultation asymmetrically decreased breath sounds, crackles, rhonchi are possible but not specific

Investigations

- SpO_2 (Pulse oximetry)
- FBP
- Serial CRPs
- RBG
- Blood gas analysis
- Blood culture and sensitivity
- Chest X-ray

Antibiotic treatment should never be delayed for investigations or waiting for results

Management

- Give antibiotics:
    - Always give a combination therapy of 3 antibiotics (ampicillin 50 mg/kg BD, gentamicin 5 mg/kg OD (or 3 mg/kg OD for LBW), cloxacillin 50 mg/kg BD)
    - Duration 7 - 10
    - Always give intravenous (or intramuscular until a venous access is established)
- Give oxygen according to oxygen saturation (Refer on oxygen therapy chapter 3).
- Position in semi-upright position and change position frequently
- Suction as required
- In severe respiratory distress think of CPAP therapy
- Further management see neonatal sepsis

III.7.11.4 Umbilical infection (Omphalitis)

Umbilical infection is the inflammation of the umbilical cord stump, most commonly due to bacterial infection. The umbilicus usually separates around one week after birth and the wound heals within 15 days. Until the wound is healed, this is an important entry point for infection, which can quickly lead to sepsis. Early recognition and treatment of an infected umbilicus are essential to prevent sepsis.

Risk factors

- Unclean delivery and cord cutting
- Application of unclean or harmful substances (e.g. animal dung) to umbilicus
- Unhygienic cord care (e.g. covered by diapers or unclean clothes)

Hand washing/disinfection before handling the cord is essential for cord sepsis prevention

Classification of severity and clinical presentation

Local infection of umbilicus (mild infection)

- Umbilicus red and swollen
- Redness and swelling of skin extending less than 1 cm beyond umbilicus

There should not be any sign or symptom of sepsis

Management

- Give oral ampiclox syrup (50 mg/kg 8 hourly for 5 days)
- Wear clean examination gloves and wash the umbilicus using an antiseptic solution and clean gauze
- Swab the umbilicus and the area around it with 0.5 % gentian violet four times daily until there is no more pus coming from the umbilicus.
- Teach the mother to care for the umbilicus at home and have the mother do this (insist hygiene especially hand washing before and after procedure)
- Ask the mother to come for follow-up after 2 days

Severe infection of umbilicus

- Umbilicus red and swollen
- Umbilicus draining pus
- Foul-smelling umbilicus
- Skin around umbilicus is red, hardened and/or swollen
- Abdominal distension

Plus or minus any unspecific sign or symptom of sepsis as described above

Management

- Give ampicillin, cloxacillin and gentamicin IV according to age and weight (Refer to Annex 5)
- Wear clean gloves and swab the umbilicus using an antiseptic solution and clean gauze
- Swab the umbilicus and the area around it with 0.5 % gentian violet four times daily until there is no more pus coming from the umbilicus (insist on hygiene especially hand washing before and after procedure)
- Further management as in neonatal sepsis

III.7.11.5 Ophthalmia neonatorum

This is acute inflammation of the eyes that affects newborns during the first 28 days of life (also called neonatal conjunctivitis). The cause can be chemical, viral or (most common) bacterial. It can be caused by different bacteria, e.g. Neisseria gonorrhoeae, Chlamydia trachomatis and Staphylococcus spp. The eye infection can lead to serious complications, e.g. blindness.

Risk factors

- Newborns delivered by mothers with untreated STIs like gonorrhoea or chlamydia infection

Prophylaxis

- Screening for STIs during pregnancy and management according to findings (including the partner)
- Give 1 % tetracycline eye ointment to all newborns after delivery

Clinical presentation

- Mild-moderate conjunctivitis
    - Reddish conjunctiva
    - Eyes swollen or draining some pus
- Severe conjunctivitis
    - Purulent and copious discharge from the eyes
    - Massive oedema and redness of eyelids
- Gonococcal infection often becomes symptomatic within the first 5 days of life, chlamydial infection takes longer to become symptomatic (usually 5 days to 2 weeks). But still differentiation is difficult without microbiologic evaluation

Investigation

- Eye swab for gram stain, culture and sensitivity

Management

General management

- Wash hands before and after the procedure and instruct the mother to do the same
- Irrigate eyes with normal saline or boiled water 1-2 hourly until discharge is cleared
- Show the mother how to irrigate the eyes
- If ointment will be prescribed; show the mother how to put in eye ointment
- Check mother and her partner for gonorrhoea or chlamydia infection and treat accordingly
- Review all patients after 3 days, no matter what specific treatment they receive. If no more discharge on 3rd day stop systemic treatment (erythromycin).

Specific management

- Bilateral or unilateral reddish and swollen eyelids with purulent discharge (and no microbiology results available):
    - As clinical manifestations and possible complications of gonococcal and chlamydial infections are similar, in settings where it is impossible to differentiate the two infections, treatment should be provided to cover both infections (ceftriaxone and erythromycin, details see below)
- Known maternal **gonococcal** infection or **Gram-negative intracellular diplococci** identified in conjunctival swab of the newborn:
    - Ceftriaxone 50 mg/kg IM as a single dose, to a maximum of 125 mg (not indicated in case of jaundice)

(Alternatives if ceftriaxone is not available: kanamycin IM or spectinomycin IM)

- Addition of tetracycline eye ointment to these regimens is of no documented benefit

- **Chlamydial** ophthalmia:
  - Erythromycin syrup 50 mg/kg/day orally, in 4 divided doses for 14 days (Alternative: trimethoprim 40 mg with sulfamethoxazole 200 mg orally, twice daily for 14 days)
  - Addition of tetracycline eye ointment to this regimen is of no documented benefit

Conjunctivitis due to **other bacteria** usually responds to topical ointments like tetracycline, erythromycin or chloramphenicol (give at least 4 times /day in both eyes, for 7-14 days)

III.7.12 Skin and mucous membrane problems

Newborn skin is fragile and more susceptible to infections that are extremely contagious and therefore all health care workers and all those handling the newborn must observe strict infection prevention and control practices at all times so as to prevent spreading infections.

Look for the following problems on the newborn's skin or soft tissues:

- Redness or swelling
- Pustules or blisters
- White patches on the tongue or inside the mouth (oral thrush)

Common neonatal skin infections

- Skin pustules
- Cellulitis/abscess
- Thrush in diaper area
- Thrush in mouth

Table 9: Differential diagnoses of skin conditions

Findings		Probable diagnosis
History	Examination	
• Time of onset: day 1 or later • Lesions solitary at first, then spreading to other areas	• Pustules or blisters • Lesions prevalent on head, back of hands, around neck, in axillae, around umbilicus and groin	**Bacterial skin infection**
Time of onset: day 3 or later	• Red skin and swollen subcutaneous tissue anywhere on body (cellulitis) • Tender and/or fluctuant swelling (abscess)	**Cellulitis/abscess**

Time of onset: day 3 or later	Bright red patches in diaper area with slightly raised border, often with scaly areas	**Thrush in diaper area**
Time of onset: day 3 or later	Thick white patches on tongue/mucous membranes of the mouth (not easy to wipe off)	**Oral thrush**
• Time of onset at birth *(or symptomatic any time later)* • Mother had positive syphilis test during pregnancy • Mother not treated or treated inadequately for syphilis	• Red rash, grey patches, blisters or skin peeling on palms and soles • Profuse nasal discharge ("snuffles") • More details see section on Syphilis	**Congenital syphilis**

III.7.12.1 Bacterial skin infection

Is a skin infection characterized by skin lesions containing pus and predominately caused by staphylococcus. This is a contagious condition, IPC guideline has to be followed strictly.
The lesions are prevalent on head, back of hands, around neck, in axillae, around umbilicus and groin.

Management

- Wear clean examination gloves:
    - Wash the affected area using an antiseptic solution and clean gauze
    - Swab the pustules with 0.5 % gentian violet solution
    - Repeat four times daily until the pustules are gone. Have the mother do this whenever possible
- Observe for signs of sepsis (e.g. poor feeding, vomiting, breathing difficulties) and admit the newborn and treat for sepsis if found
- The newborn has to be admitted in the isolation room of NCU (or cohort isolation with other newborns with bacterial skin infection)

Antibiotic treatment

IV Ampicillin & cloxacillin and gentamicin for 7 days.

III.7.12.2 Cellulitis/Abscess

Management

- If there is fluctuant swelling, incise and drain the abscess
- Give antibiotics IV as for skin pustules

III.7.12.3 Thrush in diaper area

It can co-exist with oral thrush and is caused by a fungal infection (candida).

Management

- Counsel the mother not to apply powder on newborn's perineal area
- Ensure that the diaper is changed whenever it is wet or soiled
- Apply antifungal cream (e.g. miconazole, clotrimazole) twice daily for 14 days

III.7.12.4 Oral thrush

It can co-exist with thrush in diaper area and is caused by a fungal infection (candida).

Management

- Swab the mouth with nystatin oral suspension 100,000 IU 6 hourly or miconazole oral gel 6 hourly (given before breastfeeding), continuing for two days after the lesions have healed
- Have the mother put nystatin or miconazole gel on her breasts after breastfeeding for as long as the newborn is being treated.

III.7.13 Neonatal tetanus

Neonatal tetanus is an acute and potentially lethal disease of the nervous system caused by a toxin produced by the bacterium *Clostridium tetani*. In neonates initial symptoms appear within 3 to 14 days of birth.

Risk factors

- Inadequate immunisation of the mother
- Unsterile cutting or care of the umbilicus
- Application of foreign material on umbilicus, e.g. animal dung

Clinical presentation

- Poor sucking (rigidity of lips), difficulty in swallowing, then followed by
- Generalized muscle rigidity and painful spasm (e.g. opisthotonus position, stiffness of the jaw, laryngospasm)
- Risus sardonicus (sardonic smile due to spasms of facial muscles)
- Restlessness, irritability
- Weak cry
- Difficulty in breathing, fast breathing, apnoea, cyanosis

Note: spasms can be set off by slight disturbances such as noises, light and touch.

Management

Initiate intensive nursing care in a quiet and dark room

Wound management:

Clean and disinfect the umbilicus (or any other wound which was the entry point for tetanus)

Immunisation:

- Passive immunisation to neutralize unbound toxin: give human anti-tetanus immunoglobulin 500 IU IM single dose
- Active immunisation: give tetanus vaccine (tetanus toxoid) 0.5 ml IM at a different site from the immunoglobulin (don't forget subsequent tetanus doses later)

Control of muscle spasms/sedation: (muscle spasms are life threatening since they can cause respiratory failure, aspiration and generalized exhaustion).

- Drugs to control spasms (diazepam, see below)
- Control of light or noise in the room to avoid provoking spasms

Diazepam dosage:
Risk of respiratory depression! Constant and close monitoring of the patient's respiratory rate (RR) and oxygen saturation (SpO_2) is essential, also availability of ventilation bag, face mask and suction at the bed side.

- 0.1 to 0.3 mg/kg by slow IV injection (over 3 to 5 minutes) every 1 to 4 hours depending on the severity and the persistence of the spasms (as long as respiratory rate is ≥ 30 /min).
- If despite hourly diazepam the spasms persist, start a continuous infusion of diazepam with a syringe pump: 0.1 to 0.5 mg/kg/hour (total of 2.4 to 12 mg/kg in 24 hours). Start with 0.1 mg/kg/hour and if symptoms persist, increase by 0.1 mg/kg/hour as long as respiratory rate is ≥ 30 /min.
- If a syringe pump is not available, diluting the diazepam in an IV solution bottle for continuous infusion may be considered. Weigh the risks associated with this mode of administration (accidental bolus or insufficient dose). The infusion should be monitored closely to avoid any change, however small, of the prescribed rate.
- When spasms have decreased, start weaning the diazepam (gradually decrease the rate of infusion):
  – Calculate the total daily dose of IV diazepam and administer this amount orally in 4 divided doses via nasogastric tube.
  – Give first oral dose and decrease rate of IV infusion by 50%
  – Give second oral dose and stop IV diazepam infusion
  – If withdrawal signs appear, wean more slowly
- Wean oral diazepam by 10 to 20 % of the original dose daily
- When reached a dose of 0.05 mg/kg every 6 hours, increase the interval from every 6 hours to every 8 hours to every 12 hours and then to every 24 hours before stopping the diazepam.
  – Each step should be for 24 hours or more if withdrawal signs appear.
- Do not stop treatment abruptly, an abrupt stop can cause spasms

Supportive care:

- Give IV fluids at maintenance volume according to weight and age (refer to chapter 2) until the newborn is stable to receive breast milk
- Give intravenous penicillin and metronidazole, avoid IM injections
- Insert a nasogastric tube for feeding and oral medication
- Start slowly, increasing amount of expressed breast milk every 3 hours according to feeding calculations (refer chapter 2) while reducing IV fluids accordingly
- Give oxygen if SpO_2 is < 90 % (titrate the flow so that saturation is 90 – 95 %)
- Handle the patient carefully and as little as possible; change position every 3 to 4 hours to avoid bedsores; suction only gently and if needed
- Cover the newborn's eyes with a cloth bandage
- Teach family the danger signs and instruct them to call the nurse for the slightest respiratory symptom (cough, difficulty breathing, apnoea, excessive secretions, cyanosis, etc.)
- Start physiotherapy after cessation of spasms
- Give the mother tetanus vaccine (tetanus toxoid) 0.5 ml (to protect her and any newborn she may have in the future) and give her appointments for further doses.

III.8 Newborns delivered by a mother with infection

III.8.1 Human immunodeficiency virus (HIV) infection

An exposed newborn is an infant born to a HIV positive mother. The risk of transmission is during pregnancy 10-15 %, during labour and delivery 10-15 % and during breastfeeding 5-20 %.

Management

Prophylaxis for HIV exposed infants: (follow National Guidelines for HEI)

- Nevirapine (NVP) syrup immediately after birth to all HIV exposed newborns for the first 6 weeks of life
- In high risk infants, **additional** AZT syrup should be given for the first 6 weeks of life. After 6 weeks continue with daily NVP alone up to 12 weeks of life.

High risk infants are

  - Born to a mother with established HIV infections who has received less than four weeks of ART at the time of delivery
  - Born to a mother with established HIV infection with viral load > 1000 copies/ml in the four weeks before delivery
  - Born to a mother with incident HIV infection during pregnancy or breast-feeding
  - Identified for the first time during the postpartum period, with or without a negative HIV test prenatally

- Infant prophylaxis is most effective when given as soon as possible after birth, preferably within 6 to 12 hours
- Infants identified beyond the age of four weeks should not be given ARV prophylaxis
- Regular follow up at RCH or CTC according to national guideline on HIV

- Do DBS (dried blood spot) collection at 6 weeks for DNA PCR (polymerase chain reaction) and again six weeks after complete cessation of breastfeeding
- From 6 weeks of age until HIV infection is excluded: give cotrimoxazole syrup 6 – 8 mg/kg
- Give immunizations according to standard for all newborns

Table X: Infant NVP dosing recommendations

From birth to 6 weeks	NVP
Premature/LBW infants < 2000 g	2 mg/kg once daily
Birth weight 2000 – 2499 g	10 mg once daily
Birth weight ≥ 2500 g	15 mg once daily

Table X: Infant Zidovudine (AZT) dosing recommendations

From birth to 6 weeks	AZT
Premature/LBW infants < 2000 g	4 mg/kg twice daily
Birth weight 2000 – 2499 g	10 mg twice daily
Birth weight ≥ 2500 g	15 mg twice daily

If AZT syrup is not available use fixed combination (Combivir, combination of Lamuvidin and Zidovudin)).

Table X

Dosage form	Dose 0-6 weeks AZT and NVP	Dose 6-12 weeks NVP only
Fixed dose combination	Combivir ¼ tab twice daily plus NVP syrup according to weight	NVP syrup 15 mg OD

Feeding

Women living with HIV are advised to exclusively breastfeed their newborn first 6 months of the life. Although not recommended, replacement feeding with commercial infant formula can be used if it is acceptable, feasible, affordable, sustainable and safe (AFASS).
Inform the mother accordingly so that she can choose from these two options, best if decision was already taken before delivery.

III.8.2 Tuberculosis

If a pregnant woman is suffering from tuberculosis, the aim is to ensure TB free survival of her newborn. TB can be transmitted in utero, during delivery or the newborn can be infected after birth (due to exposure to an infectious case of TB, usually the mother or another close contact person).

Clinical presentation of neonatal TB

Can be asymptomatic or symptomatic
Usually non-specific signs and symptoms like:

- Lethargy
- Low birth weight and poor weight gain
- Poor feeding
- Respiratory distress
- Non-resolving pneumonia
- Hepatosplenomegaly
- Lymphadenopathy
- Abdominal distension with ascites
- Clinical picture of “neonatal sepsis” with disseminated TB

Do think of congenital/neonatal TB if:

- Maternal history of TB or TB/HIV co-infection
- Chronic neonatal infection with poor response to antibiotics and atypical pneumonia

Investigations

- Chest X-ray
- Lumbar puncture
- Blood, CSF and gastric aspirate cultures, performed promptly
- Examination of placenta histologically for granulomata and AFB, and culture for mycobacteria

Management of newborns exposed to TB

If findings suggest neonatal TB (see above):

- Start anti-TB treatment according to National guideline.
- Give BCG vaccination 2 weeks after treatment is completed

If no findings are suggestive of neonatal TB:

- Give prophylactic Isoniazid 10 mg/kg orally once daily for 6 months

- If the infant remains asymptomatic and is HIV negative at the end of 6 months of prophylactic Isoniazid, give BCG vaccination 2 weeks after completing Isoniazid
- Reassure the mother that it is safe for her to breastfeed her infant (except multidrug-resistant TB, see below)
- Re-evaluate the newborn every 4 weeks or in case of adverse effects or in case of TB symptoms

If the mother has multidrug-resistant TB (untreated or still smear-positive), the newborn should be separated from the mother until she is no longer contagious. Advise the mother to use formula milk to avoid possible adverse effects, because most second-line TB medications are excreted in breast milk.

III.8.3 Hepatitis B

All newborns delivered by a mother with Hepatitis B virus (HBV), are at risk to be infected with hepatitis B. The majority of mothers though don't know their hepatitis B status.

Investigation of the mother during pregnancy

- Serum for hepatitis B surface antigen (HBsAg)

Management

All newborns of HBsAg positive mothers should receive:

- Hepatitis B immunoglobulin (HBIG): 0.5 ml intramuscularly (in the thigh) in the first 12 hours of life

AND

- Hepatitis B vaccine: first dose is given at birth (preferably within 24 hours after birth, definitely within 7 days) together with HBIG (in the contralateral thigh), and the remaining two doses will be given with the normal immunization schedule

Follow-up

Test the newborn between 12 – 15 months for hepatitis B. If found positive start on antiviral treatment according to guideline.

III.8.4 Syphilis

Congenital syphilis occurs when a mother's syphilis goes untreated during pregnancy and is passed to the newborn through the placenta.

Clinical presentation

Risk of stillbirth and neonatal death is increased
Can be asymptomatic (60 %) or symptomatic, symptoms develop over 2 months

- Low birth weight, failure to thrive
- Palms and soles: red rash, grey patches, blisters or skin peeling
- Snuffles: rhinitis (which is highly infectious and can be blood-stained) with nasal obstruction
- Perioral fissures
- Abdominal distension due to big liver and spleen
- Jaundice
- Anaemia
- Signs of severe sepsis: lethargy, respiratory distress, petechiae or other bleeding

Investigation of the mother during pregnancy

- VDRL or RPR screening at first antenatal visit

Investigations of the newborn

- VDRL or RPR
- FBP
- Darkfield microscopy of skin lesions

Management

- Newborns with confirmed congenital syphilis
    - Benzyl penicillin 50.000 U/kg IV 12 hourly for 14 days,

  OR
    - Procaine penicillin 50.000 U/kg/day IM once daily for 10–15 days

  If ≥ 1 day of therapy is missed, the entire course must be repeated

- Newborns who are clinically normal and whose mothers had syphilis that was adequately treated with no signs of re-infection

    - Close monitoring of the newborn
    - Benzathine penicillin G 50.000 U/kg as a single IM injection might be considered, particularly if follow-up is uncertain

Follow-up

All seropositive infants and those whose mothers were seropositive should have VDRL or RPR titres every 2-3 months until the test is non-reactive or the titre has decreased 4-fold. If treatment is successful, antibody titres are usually non-reactive by 6-12 months.

If VDRL or RPR remain reactive past 6-12 months of age or titres increase, the infant should be re-evaluated (including lumbar puncture for CSF analysis, FBP with platelet count, long-bone x-rays and other tests as clinically indicated) and treated accordingly.

III.9 Birth injuries

Birth injuries may occur during labour, delivery or after delivery, especially in neonates who require resuscitation. There is a wide spectrum of birth injuries ranging from minor and self-limiting problems (e.g. laceration or bruising) to severe injuries.

Risk factors

- Fetal factors:
  - Fetal size (birth weight > 4000 g)
  - Prematurity
  - Abnormal fetal presentations
  - Congenital anomalies

- Maternal factors
  - Maternal short stature
  - Pelvic anomalies
  - Prolonged labour
  - Precipitated labour
  - Oligohydramnios
  - Maternal obesity

- Delivery procedure
  - Assisted delivery (vacuum and forceps)

III.9.1 Soft tissue injuries

These are birth injuries on the soft tissue like bruising, petechiae and lacerations.

Bruising and petechiae

Bruising and petechiae (pinpoint size bleeding spots) are usually self-limiting and are often seen on the presenting part of the newborn's body.

- Bruising and oedema of the genitals are common findings in infants delivered from breech position.
- Petechiae of head and face are often seen after delivery from vertex position, especially with face presentation. Most often, petechiae are present at birth, do not progress, and are not associated with other bleeding. A platelet count should be obtained to rule out thrombocytopenia if petechiae continue to develop or if other bleeding is present.
- Significant bruising is a major risk factor for severe jaundice, therefore follow-up within two days after discharge is recommended for newborns with significant bruising.

Lacerations

- Lacerations are the most common birth injury associated with caesarean section delivery (mostly on presenting part, typically scalp and face)

- If mild repair with sterile plaster strips only.
- If moderate or severe, located on the face or ocular area, may require surgery for repair. Refer to facility with expertise.

III.9.2 Congenital muscular torticollis

Haematoma of the sternocleidomastoid muscle, usually caused by a difficult delivery (e.g. breech). If the sternocleidomastoid muscle is stretched during delivery it may tear, causing bleeding and bruising within the muscle. Within the first few weeks fibrosis develops and causes the muscle to shorten and tighten, pulling the newborn's head to one side.

Clinical presentation

- Tilting of the head to one side
- Chin turning toward the opposite side
- Firm, small mass in the middle of the sternocleidomastoid muscle

Management

- Physiotherapy with gentle stretching exercises (to help relieve the tension and lengthen the sternocleidomastoid muscle) and massage
- Surgery (in rare cases if no improvement under physiotherapy)

Aim: to prevent development of further deformities of head, neck and back.

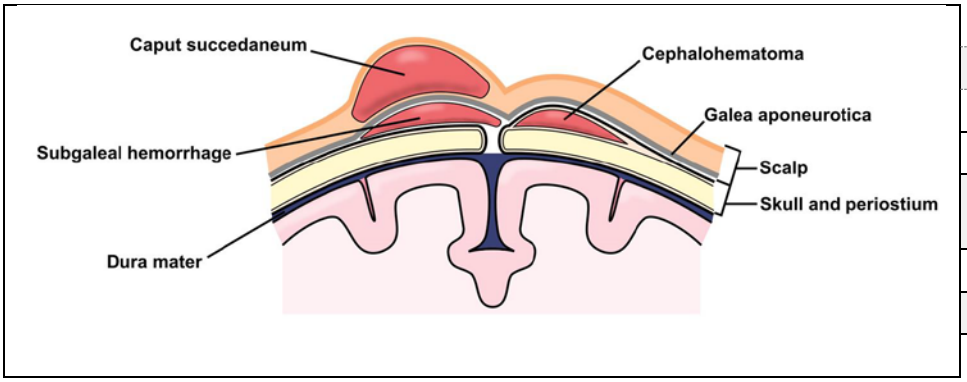
III.9.3 Extracranial injuries

Extracranial injuries can present as oedema or bleeding into various locations within the scalp and skull.

Table 10: Differential diagnoses of extracranial injuries

	TIMING & HISTORY	CLINICAL FINDINGS
CAPUT SUCCEDANEUM	• Apparent at birth • Disappears within 48-72 hours • Caused by prolonged engagement of head in birth canal or vacuum delivery	• **Oedematous swelling within the scalp** • Can be haemorrhagic • **Swelling <u>not limited</u> by sutures** • Firm, not fluctuant • Newborn looks otherwise well
	Treatment: Not required **Complications**: Rarely superinfection leading to sepsis	
CEPHALOHAEMATOMA	• Apparent within four hours after birth • Disappears within a few weeks to months	• Subperiosteal haematoma • **Rounded swelling, <u>limited</u> by suture lines** • Fluctuant swelling • Newborn looks otherwise well

	• Caused by rupture of subperiosteal vessels during birth	
	Treatment: Not required **Complications**: Calcification persisting over months; jaundice, superinfection, sepsis, osteomyelitis.	
SUBAPONEUROTIC (SUBGALEAL) HAEMORRHAGE	• Apparent at birth or within two hours, expanding over up to several days • Caused by rupture of blood vessels below the aponeurosis above the periosteum, e.g. by vacuum delivery	• Swelling under entire scalp • Spongy feeling of scalp • Very painful • Pallor and tachycardia due to blood loss • Increasing head circumference ⇨ **FBP, bleeding indices**
	Treatment: May require blood transfusion	



Scalp
- *Caput succedaneum*
Scalp
Galea
- *Subgaleal/subaponeurotic haematoma*
Periostium
- *Cephalohaematoma*
Scull

Fig. 10: Anatomical illustration of extracranial injuries

III.9.4 Facial injuries

Ocular injuries

Minor ocular trauma, such as retinal and subconjunctival haemorrhages and lid oedema are common and resolve spontaneously without affecting the infant.

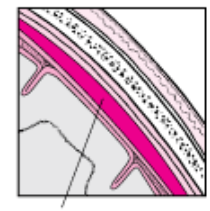
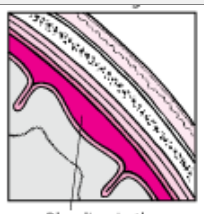
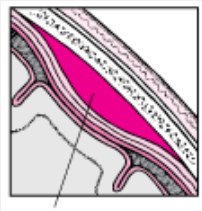
Management

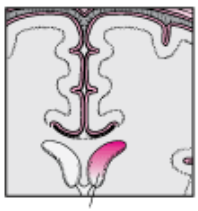
No treatment required. Retinal haemorrhage resolves by 5th day and subconjunctival haemorrhage within one to two weeks.

III.9.5 Intracranial Haemorrhage

This includes subdural, subarachnoid, epidural and intraventricular haemorrhages, intracerebral and intracerebellar haemorrhages.

Table 11: Differential diagnoses of intracranial injuries

	CLINICAL FINDINGS	INVESTIGATIONS	LOCATION OF BLEEDING
SUBDURAL HAEMORRHAGE **(BETWEEN DURA MATER AND ARACHNOID MEMBRANE)**	Small SDH: can be asymptomatic Symptomatic SDH: presents within 24-48 hours; possibly lethal • Respiratory depression, apnoea • Bradycardia • Irritability, seizures, altered level of consciousness to coma • Altered tone, lethargy • Increased head circumference, tense fontanelle	• Serial FBP to assess ongoing blood loss • Bleeding indices • Cranial ultrasound (small bleeding might not be visible) • Cranial CT	 Bleeding between the arachnoid mater and the dura mater
	Treatment: Conservative, in more severe cases neurosurgery might be required		
SUBARACHNOID HAEMORRHAGE **(RUPTURE OF BRIDGE VEINS IN SUBARACHNOID SPACE)**	Often asymptomatic If symptomatic: • Seizures in otherwise asymptomatic newborn	• Cranial CT or MRI (cranial ultrasound not ideal method) • CSF (shows bloody)	 Bleeding in the subarachnoid space
	Treatment: Usually conservative		
EPIDURAL HAEMORRHAGE (BETWEEN DURA AND INNER TABLE OF SKULL)	• Often accompanied by a linear skull fracture and cephalohaematoma • Seizures, altered level of consciousness. • Apnoea • Hypotonia • Bulging fontanelle	• Cranial ultrasound • Cranial CT	 Bleeding between the dura mater and the skull
	Treatment: • Surgical evacuation is necessary when there is evidence of increased intracranial pressure and/or the EDH is large. • Symptomatic treatment (e.g. anticonvulsants)		
INTRAVENTRICULAR HAEMORRHAGE	Usually associated with prematurity. In term newborns it can be due to traumatic delivery, asphyxia or coagulation disorders	• Hb • Cranial ultrasound	

<table>
<tr><td rowspan="2"></td><td>Small bleedings can be asymptomatic
For prematurity: refer chapter 2</td><td></td><td rowspan="2"> 
Bleeding into the normal fluid-filled spaces (ventricles) of the brain</td></tr>
<tr><td colspan="2">Treatment: Small IVH in term newborns will resolve spontaneously with no long-term sequelae.
No specific treatment</td></tr>
<tr><td rowspan="2">INTRACEREBRAL HAEMORRHAGE</td><td>Usually associated with prematurity, less likely with traumatic delivery, asphyxia, infection or coagulation disorders
Small bleedings can be asymptomatic
Larger bleedings: apnoea, pallor</td><td>Cranial ultrasound
Cranial CT
Hb</td><td rowspan="2"> 
Bleeding inside the brain</td></tr>
<tr><td colspan="2">Treatment: Symptomatic
Prognosis: Good in small bleedings, poor in large bleedings</td></tr>
</table>

III.9.6 Fractures

III.9.6.1 Clavicle

Clavicular fractures are the most common fractures in neonates. Timing of diagnosis of neonatal clavicular fractures is dependent on whether the fracture is displaced or non-displaced.

Clinical presentation

Displaced fracture:

- Crepitus and asymmetrical bone contour
- Lack of movement of the affected extremity
- Painful passive movement
- Asymmetric Moro reflex

Non-displaced fracture:

- Usually asymptomatic or painful on touch
- Visible or palpable callous after around one week

Investigation

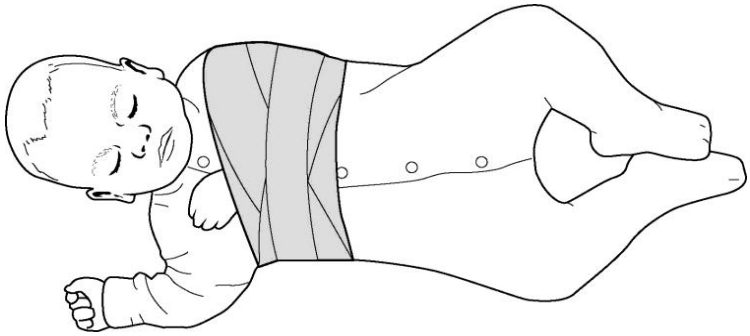
- Radiograph of the clavicle

Management

Usually spontaneous healing.

- Gentle handling
- Fixing the arm on the chest with the elbow at 90 degrees of flexion (e.g. by pinning the sleeve to the front of the clothes)

- Reassurance of parents



III.9.6.2 Humerus

Most fractures occur at the proximal third of the humerus and are transverse and complete.

Clinical presentation

- Decreased movement of the affected arm and asymmetric Moro reflex
- Localized swelling and crepitation
- Increased pain response with palpation and movement of the arm

Investigations

- Plain radiograph of the arm

Management

- Gentle handling
- Fixing the arm on the chest with the elbow at 90 degrees of flexion (e.g. by pinning the sleeve to the front of the clothes)

III.9.6.3 Femur

Fractures of the femur as a result of birth trauma are rare. The fracture is typically spiral and involves the proximal half of the femur.

Clinical presentation

- Pain response upon manipulation of the affected extremity
- A "pop" or "snap" upon delivery of the legs
- Swelling of the affected leg may be present

Investigation

- Plain radiograph of the leg

Management

- Bryant traction

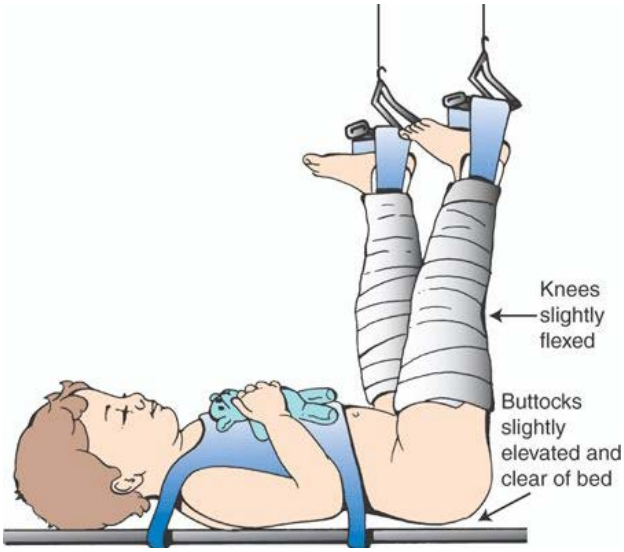


Figure X

III.9.6.4 Skull

Skull fractures as a result of birth trauma include linear and depressed skull fractures, the later is often due to forceps delivery.

Clinical presentation

- No specific clinical features for linear fracture
- Palpable bony defect, sometimes accompanied by neurologic complications for depressed fracture
- Findings should alert to look for more serious intracranial trauma

Investigation

- Plain radiograph of the head
- Cranial CT scan

Management

- Observation if linear fracture
- Neurosurgery might be needed for some cases of depressed fracture

III.9.7 Dislocations

Dislocations caused by birth trauma are rare. In many cases, the dislocations, especially of the hip and knee, are due to intrauterine positional deformities or congenital malformations.
One example is the genu recurvatum.

Genu recurvatum
Unilateral or bilateral backward bending of the knee (without dislocation, with subluxation or with complete dislocation). It can be an isolated deformity or part of a syndrome.

Management

Depending on severity: serial casting or surgical treatment by orthopaedic surgeon
Start treatment within the first week of life.
Aim: to bring the leg back into its normal axis.
Follow-up is needed at least until the child is walking.

III.9.8 Nerve injuries

Clinical presentations

- Weakness in the innervated area of the affected nerve
- Signs of the injury that led to the nerve injury (e.g. swelling, fracture, pain)

Nerve injuries			
	History	Clinical findings	
ARM PALSY (ERB OR KLUMPKE)	Difficult delivery (e.g. breech delivery, large newborn, shoulder dystocia)	• Arm and hand lying limply by the newborn's side • No spontaneous arm movement on one side • Asymmetric Moro reflex	

		• Grasping reflex present in Erb palsy, not present in Klumpke palsy • Klumpke palsy can be associated with ptosis, miosis and enophthalmos (=Horner syndrome)	
	Treatment: Fixing the arm on the chest with the elbow at 90 degrees of flexion for one week (explain to care giver), then gentle physiotherapy **Follow-up**: Weekly, then 2-weekly **Prognosis**: Mostly complete healing within 3-9 months. If still not much improvement after 3 months refer to neurosurgery		
FACIAL PALSY	Difficult delivery Facial trauma e.g. due to forceps delivery	• Unable to wrinkle forehead • Unable to close eye of the affected side • Angle of the mouth pulled to not-affected side • Dribbling milk while suckling	
	Treatment: Artificial tears four times daily to keep eye moist until newborn can close the eye. Support mother with feeding, alternative feeding methods if required **Follow-up:** Weekly **Prognosis:** Usually resolves spontaneously within 2 weeks		

Table X

III.10 Congenital anomalies

A congenital anomaly occurs when a newborn is developing in utero (in the womb). The problem can be minor or severe, it can be structural (e.g. malformations) or functional (e.g. metabolic disorder). The cause is often unknown, however, these are some possible factors contributing to congenital anomalies:

- Genetics
- Consanguinity
- Lifestyle choices and behaviours (e.g. alcohol, tobacco)
- Exposure to certain medications and chemicals
- Infections during pregnancy (e.g. syphilis, rubella)
- A combination of these factors

Prevention

Some congenital anomalies can be prevented. Vaccination, adequate intake of folic acid before conception and during first trimester, adequate intake of iodine and adequate antenatal care are some examples of prevention of some minor and major congenital anomalies.

III.10.1 Birth marks

Assure the mother that most birth marks (e.g. Mongolian blue spot, stork bite (= naevus flammeus)) require no special care and may disappear as the newborn gets older. This also applies for many haemangioma, though not all.

III.10.1.1 Haemangioma

Benign vascular tumours of skin and (rarely) inner organs

Clinical presentation

- Manifesting during first days to months of life
- Progressive presentation within the beginning fine telangiectasias, then red painless spots which can be under the skin or superficial to raised above skin level.
- Usually spontaneous resolution after some months to years occurs

Management

Most haemangioma do not need treatment and resolve spontaneously.
Indication for treatment:

- Life-threatening location (e.g. obstruction of airway)
- Threatening organ function (e.g. haemangioma around the eye can block vision)
- Ulcerating haemangioma
- Haemangioma with impending scar or aesthetical deformity

Treatment options:

Propranolol is for most cases the treatment of choice, start of therapy is from 5th week of life. If no improvement under propranolol surgical removal or laser therapy.

Side effects: (low BP).

- Do ultrasound of the haemangioma (size, depth) and ECG before starting propranolol
- Start propranolol with 0.5 mg/kg twice daily orally, increase to 1 mg/kg twice daily if newborn is stable (RBG and BP)
- Highest risk for side-effects occurs during initiation of treatment, start treatment as inpatient.
- Give together with food, don’t give if newborn is not feeding well
- Monitor blood pressure 3 times per day plus 30 min after propranolol was given
- Monitor heart rate continuously

- Check RBG 2-3 hours after propranolol was given and give extra feeds if RBG is low
- Follow-up:
    - 7-10 days after discharge (clinical examination, weight, blood pressure, heart rate, RBG, measurement of haemangioma)
    - Then follow up size of haemangioma and adapt propranolol dose to the patient's weight (1 mg/kg twice daily)
- Duration of therapy up to 6-12 months, depending on effect. Propranolol should be weaned over 2 weeks

III.10.2 Skin tags and extra fingers or toes (polydactyly)

- Simple skin tags and small extra digits (connected to the finger with a very thin, threadlike base) without a bony attachment can be tied off (ligation) within the first days of life. Though surgical removal under local anaesthesia is the preferred method for all.
- If the extra digits have a bony attachment or a broad skinny attachment to the finger, surgical removal under local anaesthesia is required. Refer to a higher facility with expertise for surgery at the age of some months to one year.

III.10.3 Cleft lip and palate

A cleft lip is a split in the lip, cleft palate is a split or opening in the roof of the mouth. It can involve the hard palate and/or the soft palate. Cleft lip and cleft palate can occur on one or both sides of the mouth.

- Provide emotional support and reassurance to the mother/care giver, explain about very good prognosis.
- Explain that the most important thing at this time is to feed the newborn to ensure adequate weight gain until surgery can be performed.
- If the newborn has a cleft lip but the palate is intact, allow the newborn to attempt to breastfeed
- If the newborn breastfeeds successfully and there are no other problems requiring hospitalization, discharge the newborn. Follow up in one week to check weight gain.
- If the newborn (with cleft lip and/or cleft palate) cannot breastfeed well, give expressed breast milk using an alternative feeding method (cup feeding or NGT)
- Once the newborn is feeding well and gaining weight, refer the newborn to a higher facility with expertise for surgery to repair the cleft. Lip closure is usually done with 3-6 months, palate closure with 9-12 months. Timing of the operations can also depend on the weight of the newborn, a weight of > 5 kg is preferred for safe anaesthesia.

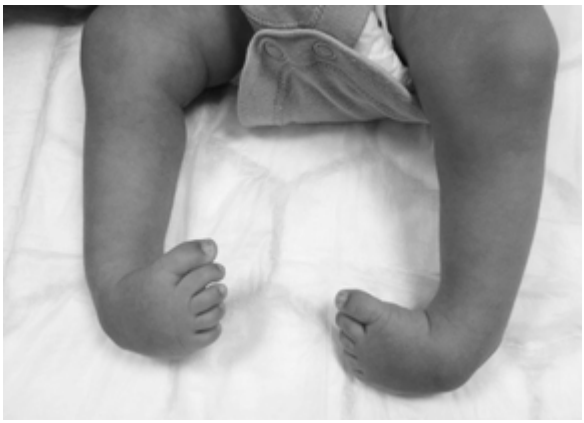
III.10.4 Club foot (talipes equinovarus)

Club foot is a congenital deformity in which the affected foot is rotated internally, points downward and inward.

- Provide emotional support and reassurance to the mother/care giver, explain about good prognosis with early and consequent treatment.
- Refer the newborn to start treatment within the first week of life to a higher facility where there is expertise for correction of the club foot.

Management

Ponseti technique with gentle positioning of the foot and fixing the improved position in a cast. Casting is usually done weekly for 5-6 weeks. Often a percutaneous surgical release of the Achilles tendon is required. Then recurrence prevention is done with a brace (foot orthosis), usually worn continuously for 3 months, then only at night for 3-4 years.



III.10.5 Spina bifida

Incomplete closing of the backbone and membranes around the spinal cord, usually located at the lower back. There are three main types:

- Spina bifida occulta (mildest type; only a gap in the spine without opening in the back; the only sign can be a hairy patch or dark spot over the spine)
- Meningocele (protruding sac of meninges, but spinal cord is not in this sac)
- Myelomeningocele (most serious type; protruding sac with part of the spinal cord and nerves in it, which are damaged)

Management

- Provide emotional support and reassurance to the mother/care giver
- If the defect is not covered by skin:
    - Directly after delivery cover with sterile gauze soaked in pre-warmed sterile normal saline
    - Avoid unnecessary touch and handle the area only with sterile gloves
    - Keep gauze moist at all times and ensure that the newborn is kept warm
- Keep the newborn in lateral position to avoid pressure on the area
- Start antibiotic prophylaxis with ampicillin and gentamicin

- Make sure the newborn is breastfeeding or provide alternative feeding method
- Check for additional malformations (e.g. club feet, hydrocephalus)
- Organize immediate referral to a higher facility with neurosurgical expertise (the earlier specialized treatment starts the better the prognosis)
- Parents should be counselled on the benefits of folic acid supplementation before and during next pregnancy

III.10.6 Hydrocephalus

Excessive cerebrospinal fluid (CSF) accumulating within the brain.

Hydrocephalus present at birth or shortly after may occur because of any of the following:

- Abnormal development of the central nervous system that can obstruct the flow of CSF
- Bleeding within the ventricles (e.g. as complication of premature birth)
- Infection during pregnancy (e.g. rubella, syphilis)

Clinical presentation

- Large head (according to head circumference-for-age chart) or a head that's growing very quickly
- Downward deviation of the eyes (sunset eyes)
- Bulging fontanelle, separated sutures (widened fontanelle)
- Irritability
- Seizures
- Sleepiness to coma
- Vomiting

Investigations

Prenatal diagnosis: Can be detected as early as the third or fourth month of pregnancy by ultrasound
Postnatal Diagnosis: Clinically, head circumference-for-age chart, ultrasound

Management

- Provide emotional support and reassurance to the parents/mother/care giver
- Manage seizures if present and other symptoms requiring treatment
- Refer the newborn to a facility where a ventricular shunt can be inserted or management according to the underlying problem can be done.
- Immediate referral if need for treatment is obvious, later and planned referral if newborn is stable but shows continuously growing head circumference

III.10.7 Anencephaly

Absence of a major portion of the brain, skull, and scalp that occurs during embryonic development. There is no treatment for anencephaly. Almost all newborns with anencephaly will die shortly after birth. If a newborn with anencephaly survives for some time he can be offered hydration, nutrition and comfort measures.

Counselling and emotional support for the parents is most important.

Referral of a newborn with anencephaly to a higher level is not required as there is no treatment for this condition.

Prophylaxis: Folic acid before conception and during early pregnancy can help prevent neural tube defects.

III.10.8 Gastrointestinal malformations

Conditions range from mild to severe and can occur anywhere from oesophagus to anus, e.g. oesophageal atresia, intestinal atresias/stenosis, malrotation with volvulus, abdominal wall defects, Hirschsprung's disease, imperforate anus or other anorectal malformations. Surgery is the required treatment. If a newborn with such a condition is born in a facility without paediatric surgery, immediate pre-referral management and referral is needed.

III.10.8.1 Oesophageal atresia

Oesophagus ends in a blind-ended pouch instead of connecting to the stomach. It is often associated with tracheo-oesophageal fistula of different types.

Clinical presentation

- History of polyhydramnios
- Drooling of frothy saliva
- Coughing, gagging or choking while feeding
- Cyanosis while feeding
- Poor feeding

Investigations

- Insert NGT and check if it is passing into the stomach (should be done to all newborns whose mothers had history of polyhydramnios)
- Chest X-ray with inserted NGT:
    - NGT will appear coiled in the upper oesophagus
    - Stomach can be air-filled or not, depending on the type of fistula
- Check for associated malformations, including congenital heart disease

Management

- Position the newborn in propped-up position to reduce risk of aspiration
- Do continuous (or frequent) gentle suction
- Ensure that the newborn does not receive anything by mouth
- Give IV fluid according to weight and age
- Start antibiotic prophylaxis with ampicillin and gentamicin
- Organize referral urgently to a facility with expertise in paediatric surgery
- Provide emotional support and reassurance to the mother/care giver

III.10.8.2 Intestinal atresias and stenosis

Malformations of the intestines in which a segment of bowel is very narrow (stenosis) or is disconnected (atresia) from the rest of the gastrointestinal tract. Most commonly, these occur in the duodenum, just below the stomach. Less common is the jejunal atresia.

Newborns with intestinal atresias are often small for gestational age and some have associated problems (e.g. Down syndrome). The typical symptom is vomiting, without or with bile, depending on the exact location.

III.10.8.2.1 Duodenal atresia

Clinical presentation

- Full epigastrium and sunken lower abdomen
- Feeding difficulties
- Early (24-48 hours) and ongoing vomiting (with or without bile, depending on location of the obstruction)
- Reduced urine output after first few voidings
- No more stool after first few meconium stools

Investigations

- Ultrasound shows “double bubble-sign” (fluid in dilated stomach and in dilated proximal duodenum)
- Plain abdominal X-ray will show “double bubble-sign” (air filled stomach and dilated proximal duodenum) and lack of gas in bowel behind the obstruction
- Upper GI contrast study if partial obstruction is suspected
- Check for associated malformations, including CHD

Management

- Position the newborn in propped-up position to reduce risk of aspiration
- Insert an open nasogastric tube for decompression
- Keep nil per oral (NPO)
- Give IV fluid according to weight and age
- correct dehydration and electrolyte imbalances if present
- Give antibiotics (ampicillin and gentamicin) in case of aspiration
- Organize referral urgently to a facility with expertise in paediatric surgery
- Provide emotional support and reassurance to the mother/care giver

III.10.8.2.2 Jejunal atresia

This is less common than duodenal atresia. The presentation is similar, but the vomit is regularly containing bile. Also investigations and management don’t differ from management of duodenal atresia.

III.10.8.3 Gastroschisis and Omphalocele

Abdominal wall defects

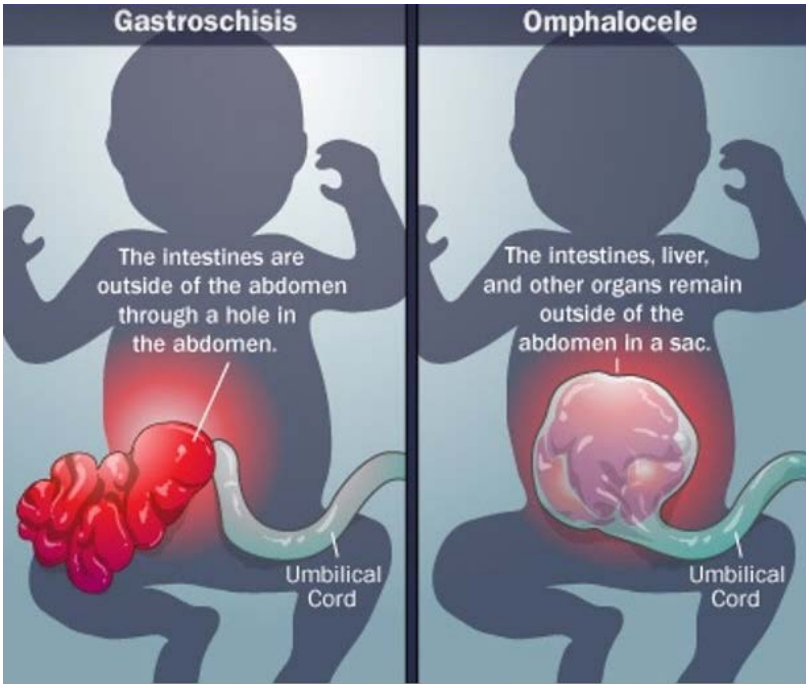


Fig.11: Illustration of Gastroschisis and Omphalocoele (Exomphalos)

Gastroschisis:

Intestines protrude through a defect of the abdominal wall (usually to the right of the umbilicus). Also other organs like stomach and liver can be outside. The organs are not covered by any membrane.

Omphalocele:

Intestines, liver and other organs protrude through the abdominal wall defect into the umbilical cord and are covered by membranes of the umbilical cord.

Management

Gastroschisis

Directly after delivery cover with sterile gauze soaked in pre-warmed sterile normal saline and cover with sterile plastic bag (to reduce evaporative water losses)

- Keep gauze moist at all times and ensure that the newborn is kept warm
- Position the newborn on his right side to avoid kinking of the mesentery
- Insert an open nasogastric tube for decompression
- Keep nil per oral (NPO)

- Give IV fluid according to weight and age
- Start antibiotic prophylaxis with ampicillin and gentamicin
- Check for other malformations
- Organize referral urgently to a facility with expertise in paediatric surgery
- Provide emotional support and reassurance to the mother/care giver

Omphalocele

- Directly after delivery cover with sterile gauze soaked in pre-warmed sterile normal saline and cover with sterile plastic bag (to reduce evaporative water losses)
- Keep gauze moist at all times and ensure that the newborn is kept warm
- Insert an open nasogastric tube for decompression
- Keep nil per oral (NPO)
- Give IV fluid according to weight and age
- Start antibiotic prophylaxis with ampicillin and gentamicin
- Check for other malformations
- Organize referral urgently to a facility with expertise in paediatric surgery (though if surgery is not possible conservative management of dressing with gradual epithelialization of the sac is possible and operation of the remaining hernia will be done when the newborn is stable)
- Provide emotional support and reassurance to the mother/care giver

III.10.8.4 Imperforate anus

Clinical presentation

- No visible anal opening or anal opening in a wrong position
- No passage of stool after more than 24 hours or passing stool through another opening (e.g. urethra in boys, vagina in girls)
- Abdominal distension

Management

- Insert an open nasogastric tube for decompression
- Keep nil per oral (NPO)
- Give IV fluid according to weight and age
- Organize referral to a facility with expertise in paediatric surgery to do colostomy within 48 hours after delivery and later corrective surgery according to findings of more detailed investigations
- Provide emotional support and reassurance to the mother

III.10.9 Hypertrophic pyloric stenosis

It is characterized by enlarged pyloric musculature leading to gastric outlet obstruction. It develops gradually, symptoms usually start at 4 weeks of age (2 – 8 weeks of age).

Clinical presentation

- Progressive projectile non-bilious vomiting is the most typical presentation
- Visible intestinal peristalsis
- Palpable epigastric tumour
- Dehydration, failure to thrive despite sucking hungrily, weight loss
- Electrolyte imbalance and metabolic alkalosis

Investigations

- Abdominal ultrasound
- Electrolytes and blood gas analysis

Management

Definitive treatment is surgery (pyloromyotomy). If surgery is not possible and pyloric stenosis is not severe conservative treatment with frequent small meals and positioning the newborn in propped-up position can be tried.

Stabilize the newborn before surgery:

- Insert an open nasogastric tube for decompression and stop enteral feeding
- Correct dehydration and electrolyte imbalance
- Give IV fluids according to weight and age
- Organize referral to a facility with expertise in paediatric surgery
- Provide emotional support and reassurance to the mother/care giver

III.10.10 Chromosomal aberrations

The risk for chromosomal aberrations increases with maternal age, examples are trisomy 13 (Patau syndrome), trisomy 18 (Edwards syndrome) and more often trisomy 21 (Down syndrome). Each condition has characteristic features which are usually visible at birth and malformations of internal organs like congenital heart defects.

Turner syndrome (female with missing X chromosome, 45,X0) and Klinefelter syndrome (male with additional X chromosome, 47,XXY) are characterized by impaired development of secondary sexual characteristics and infertility.

Clinical presentation

See table for some specific conditions

Investigations

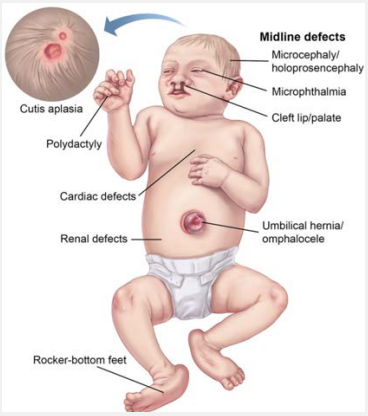
- Thorough physical examination to detect associated malformations

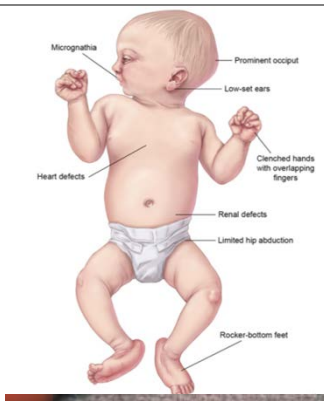
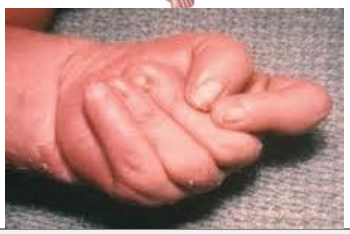
- Further investigations according to clinical findings, e.g. echocardiography
- Karyotype test and genetic counselling of the parents

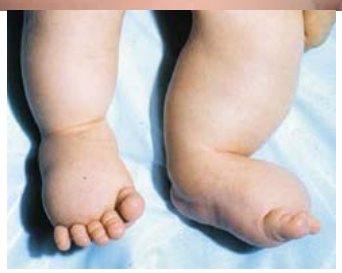
Management (general considerations)

Advise the parents about the short-term and long-term prognosis. If there is very poor prognosis with expected survival of only few days the newborn does not need to be referred but can remain at any facility close with the family for supportive care. For newborns with better prognosis concerning survival refer to a specialized centre for developmental evaluation and follow-up.

Table 12: Common chromosomal disorders

	POSSIBLE CLINICAL FEATURES	MANAGEMENT	IMAGES
TRISOMY 13 (PATAU SYNDROME)	• Microcephaly, • Dysmorphic face (e.g. cleft lip and palate, small chin, malformed eyes, ears and nose) • Scalp lesions • Polydactyly and flexed fingers • Congenital heart defects (VSD, PDA) • Anomalies of kidneys	• Symptomatic and supportive treatment • Provide counselling, emotional support (poor prognosis)	
	Prognosis: Only 5 % of newborns survive past 6 months of age. Survivors show severe intellectual impairment		
TRISOMY 18 (EDWARDS SYNDROME)	• Microcephaly with prominent occiput • Low-set ears, micrognathia • Short sternum • Clenched fists with flexion contraction of fingers • Rocker-bottom feet • Congenital heart defects • Anomalies of kidneys	• Symptomatic and supportive treatment • Provide counselling, emotional support (poor prognosis)	

	• Oesophageal atresia • Omphalocele		 
	Prognosis: Only 5–10 % survive past 12 months of age. Survivors show severe intellectual impairment		
TRISOMY 21 (DOWN SYNDROME)	• Typical facial features (e.g. upward slanting of the eyes, epicanthus, small oral cavity with large tongue, flat nose) • Transverse palmar crease on hands • Sandal gap between first two toes • Organ malformations (e.g. heart defects, duodenal stenosis, oesophageal atresia) • Intellectual impairment of varying severity • Delayed motor development	• Symptomatic • Surgery of malformations as required (cardiac) • Early targeted intervention programmes and support (e.g. physiotherapy, occupational therapy, speech therapy) • Provide counselling, emotional support and reassurance to the parents and encourage them to support the child	  
	Prognosis: Decreased life expectancy, mostly due to organ malformations (especially cardiac) and high susceptibility to infections. Life expectancy is much depending on intensity of supportive care.		

TURNER SYNDROME	• Webbed neck and low posterior hairline • Puffiness/swelling of hands and feet • Broad chest and widely spaced nipples • Anomalies of kidneys • Congenital heart defects • Mostly normal intelligence • Short stature	• Symptomatic • Surgery of malformations as required (cardiac) • Provide counselling to the parents	 
	Prognosis: good		

III.10.11 Disorders of sex differentiation (DSDs)

DSDs (formerly called "ambiguous genitalia") are defined as congenital conditions in which development of chromosomal, gonadal or anatomical sex is atypical. The newborn is usually detected with ambiguous external genitalia, but they also may be diagnosed later with virilisation, delayed puberty, infertility or other problems.

Management

- Provide emotional support and reassurance to the parents/care givers
- Don't assign a gender to the newborn but explain to the parents that it needs further investigation to know if the newborn is female or male
- Organize referral to a facility with further expertise (e.g. genetics, endocrinology, psychology)

III.10.12 Undescended testes (cryptorchism)

Usually the testes descend during fetal period into the scrotum, for some boys (5 % of term and up to 30 % of preterm male newborns) one or both testes are still not descended at the time of birth. Undescended testes are a risk for infertility and testicular malignancy later in life.

Management

- Observation for spontaneous descent until age of 6 months

- If testis/testes failed to descend by 6 months refer the child for hormonal therapy or surgery (orchidopexy)
- By latest 12 months the testes should be in the scrotum

III.10.13 Teratogenic effects

Some agents or factors, called teratogens, can cause malformations of the embryo, especially in the early weeks of pregnancy. The effects are very variable and depend on time of exposure, duration and dose of the teratogen. The brain is most vulnerable to teratogens.

A detailed history on contact to/intake of substances with possible teratogenic effects during pregnancy is very important, especially for newborns with congenital anomalies.

Examples for teratogenic agents are:

- Alcohol, nicotine, cocaine
- Some anticonvulsants (e.g. valproic acid), some anticoagulants (e.g. warfarin), retinoids
- Ionising radiation
- Infections during pregnancy (e.g. rubella, CMV, varicella)
- Maternal diabetes (diabetic embryopathy)

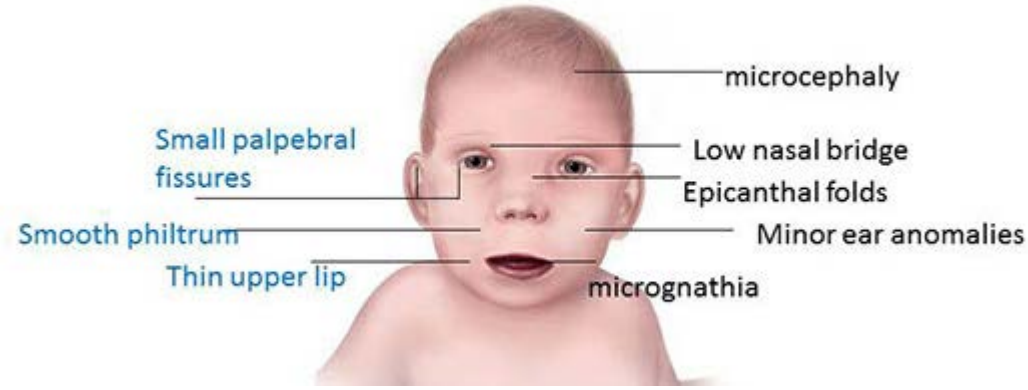
III.10.13.1 Fetal Alcohol Syndrome (FAS)

FAS describes effects which can occur in newborn due to intrauterine alcohol exposure.

Clinical presentation

The severity of FAS symptoms varies, and may include the following:

- Facial abnormalities: smooth philtrum (the area between nose and upper lip), thin upper lip, small palpebral fissures (the horizontal eye openings)
- Micrognathia
- Microcephaly
- Slow physical growth before and after birth (weight and height)
- Central nervous system abnormalities (structural, neurologic, functional)
- Congenital heart disease
- Vision difficulties
- Hearing problems
- Later in life: developmental, social, behavioural problems



Investigations

No specific investigations available
In general difficult to diagnose and often overlooked
Known history of alcohol consumption during pregnancy can give a hint, but is often well hidden by the mother.

Management

During neonatal period symptomatic treatment.
Later support by developmental services, educational interventions and others.

Prevention

Abstaining from alcohol during pregnancy (there is no known safe amount of alcohol to drink during pregnancy)

III.10.14 Congenital heart diseases

Congenital heart diseases are a group of conditions with structural problems of the heart present at birth. They are the most common types of congenital anomalies.

Clinical presentation

Some newborns are asymptomatic or show only mild symptoms. Some of the following clinical features are enough to think of a congenital heart disease.

- Cardiac murmur
- Signs of cardiac insufficiency:
  - Tachycardia
  - Rapid breathing, grunting
  - Fatigue during breastfeeding, sweating
  - Hepatomegaly
  - Poor blood circulation (e.g. greyish skin colour, prolonged capillary refill time)
  - Low urine output
  - Failure to thrive

- Cyanosis

Classification

A common criterion to classify congenital heart diseases is (based on oxygen saturation) in cyanotic and acyanotic heart diseases.

Cyanotic congenital heart disease

Present with cyanosis which does not improve with oxygen therapy

- Transposition of great arteries
- Tetralogy of Fallot
- Truncus arteriosus
- Hypoplastic left heart syndrome
- Tricuspid atresia
- Total anomalous pulmonary venous return

Acyanotic congenital heart disease

Infants will not present with cyanosis and achieve 100 % oxygen saturation, example

- Septal defects (Atrial Septal Defects, Ventricular Septal Defects)
- Patent ductus arteriosus
- Pulmonary stenosis
- Aortic stenosis
- Coarctation of aorta

Investigations

- Prenatal ultrasound can detect some congenital heart diseases
- Echocardiography
- Pulse oximetry
- Blood pressure at all 4 extremities
- Chest X-ray
- ECG
- Blood gases analysis
- Other tests based on the coexisting conditions

Management

- Stabilize the newborn as far as possible by giving supportive treatment:
    - Oxygen if needed
    - Diuretics (furosemide 1 mg/kg, spironolactone 1 mg/kg) if signs of heart failure
    - Nurse in propped-up position
- Close monitoring with pulse oximetry

- Feeding according to condition of the newborn, avoid fluid overload
- Organize referral to a facility with expertise in paediatric cardiology
- Provide emotional support and reassurance to the mother/care giver

Definitive treatment:

- Catheter based intervention
- Surgical intervention
- Pharmacotherapy (e.g. Ibuprofen for PDA)

Follow-up

- Progression of symptoms: e.g. signs of heart failure

Care for Child Development and Growth Monitoring

04

Nurturing care for early childhood development

Home Care for Child Development during pregnancy (Pre-natal Stimulation)

Home Care for Child Development after Delivery

Follow-Up Concepts for care for child development

…..

IV.1 Nurturing care for early childhood development

Poor development during childhood, unfortunately, is widespread. Globally over 200 million children do not reach their developmental potential in the first 5 years because they live in poverty, and have poor health services, nutrition and psycho-social care. These disadvantaged children do poorly in school and subsequently have low incomes, and provide poor care for their own children.

Development during the early years lays the critical foundations for health, learning and behavior across the life course, and it has an impact on health and well-being even of the next generation. In this period from pregnancy to age 3, children are most susceptible to environmental influences and experiences during the first years with their families and other caregivers greatly affect the child's whole life.

This chapter will focus on care for child development, including the sensory-motor, social/emotional and language/cognitive capacities, which are indivisible from the child survival, health and education agendas. It represents one of the important stages for breaking the intergenerational cycles of poverty and for promoting sustainable development.

In the international public health context, the term "**nurturing care**" refers to a more comprehensive coverage, including conditions created by public policies, programs and services. These conditions enable communities and caregivers to ensure children's good health and nutrition, and protect them from threats. Nurturing care is an essential part of the Global Strategy for Women's, Children's and Adolescents' Health at the heart of the Sustainable Development Goals.

The contents of this chapter take into account older children as a continuum of care from birth to 5 years

Good Health

Young children's good health can be promoted by monitoring children's physical and emotional conditions, giving affectionate and appropriate responses to children's daily needs, protecting them from household and environmental dangers, minimizing infections with hygiene practices, using promotive and preventive health services and seeking care for sick children. Take into consideration that these actions depend also on caregivers' physical and mental well-being.

Adequate Nutrition

Adequate nutrition covers the mother's nutrition during pregnancy, the endorsement of exclusive breastfeeding for 6 months, complementary food in addition to breast milk and food safety and food security.

Responsive Caregiving

Responsive caregiving includes observing and responding to children's movements, sounds and verbal request. It is the basis for recognizing and responding to illness and will be the focus of this chapter.

Opportunities for early learning

Learning is a built-in mechanism for human beings, ensuring our successful adaption to changing circumstances. In the earliest years, we acquire skills and capacities interpersonally, in relationship with other people, through smiling and eye contact, talking and singing, modelling, imitation and simple games. Without a playful environment, those skills are not able to flourish.

Security and Safety

Young children cannot protect themselves, and are vulnerable to unanticipated danger, physical pain and emotional stress. Pregnant women and young children are also most vulnerable to environmental risks, including air pollution and exposure to chemicals.

Fig. 12: Components of nurturing care

IV.2 Care for Child Development during Pregnancy

Pre-Natal-Stimulation: Nurturing care starts before birth.

Prenatal stimulation is a technique that uses various stimuli such as **sound** (especially musical sounds and a mother's voice) and **light** to communicate with the newborn before birth. The newborn learns to recognize and respond to the different stimuli, which encourages physical, mental, and sensory development. Valuable research has shown that stimuli such as stroking the fetus through the belly, soft and melodious sounds, the sound of the human voice, especially the mother's, as well as light and vibrations are pleasurable to the newborn.

When to start pre-natal stimulation

Newborns can benefit from stimulation as early as the third month of pregnancy. At this point, they begin to perceive spatial orientation and tactile stimuli. Newborns develop sensory and motor skills at different stages during pregnancy, so it is important to introduce stimuli only after the newborn has developed sufficiently to sense and respond.

In the second trimester a mother can:

- Stimulate the fetus' hearing, by talking or put a melodious music near her belly.
- She can communicate with her child through touch; whenever she feels a kick, she can touch the opposite side (this is the place where the head is) and caress the area while she is speaking.

This activity will allow the fetus to:

- Communicate with the parents through her/his movements
- Establish a relationship between certain stimuli and certain responses
- To recognize sounds and noises
- Learn to pay attention

In the third trimester

In the previous trimesters, it was the fetus who initiated communication with the "kicking game." In the third trimester the mother should initiate the dialogue with the fetus, teaching it to associate words with actions. The mother should keep her tone of voice enthusiastic, entertaining and patient. The activities will:

- Help the newborn communicate with the parents before birth
- Train the newborn to focus its attention
- Teach the newborn to differentiate the various sounds and noises that come from the womb and from the external world
- Show that sounds have meaning and can be used to communicate
- Begin the first steps toward developing language through associating words and meanings
- Teach the newborn the concept of rhythm
- Improve equilibrium
- Teach spatial relationships
- Develop and exercise memory

Maternal health is important

Effective stimulation depends on the mother's physical and mental well-being. The following problems should be prevented and therefore considered in every antenatal visit:

- Maternal perinatal mental disorders like depression, anxiety, adjustment disorders
- Unnecessary travel
- Violence in pregnancy
- Exposures to hazardous pollutants
- Smoking during pregnancy
- Alcohol consumption during pregnancy
- Unauthorized drug use

IV.3 Home Care for Child Development after Delivery

In the home environment the mother is not considered to be the only caregiver. Enabling playful and personal interactions with the spouse plays an important role in the early child development. The role of the health worker is to promote responsive caregiving and provide opportunities for early learning by:

- Observing how the caregiver comforts, responds and shows love (affection) to the child and guides its exploration. The health worker should take into consideration that mothers are often insecure and afraid of interacting with their child due to absent knowledge, missing experiences, cultural principles or perinatal mental disorders like depressive, anxiety and adjustment disorders.
- Use the information to praise the caregiver, build their confidence, get them to talk more to their child and identify enjoyable activities that the caregiver and child can do together at home – using household objects and homemade toys as well as talking and singing.
- Strengthen the quality of parent-child interactions with recommendations on play and communication
- Increase the amount of time parents spend with their children
- Educate on the risks and long-lasting negative implications of maltreatment

IV.3.1 From birth to one week

Play: At this age, learning is through seeing, hearing, feeling, smelling and moving. The child's face should not be covered for long periods of time because children need to see in order for their eyesight to develop. Newborns should not be tightly bound in clothing for long periods because they need to be able to move and touch people and things. Instead the service provider should encourage the mother and father to hold their child closely. They can gently stroke the child's skin. By gently soothing an upset child, they also help the child learn to soothe herself from birth – and even before birth.

Communicate*:* Encourage families to talk to their children from birth – even before. When a mother looks at her child's eyes and smiles in response to the child's reaction, the child learns to communicate. And the mother begins to see her child respond to her. Encourage the father also to communicate with the newborn.

- Children communicate their needs. They learn to trust that someone will pay attention to their movements, sounds, and cries. Breastfeeding on demand strengthens this interaction and the growing trust.
- Children show interest in breastfeeding by becoming fussy, sucking their hand, or moving their heads toward the breast. Using these clues, a mother can learn to recognize that a child is hungry before the child starts to cry.

IV.3.2 From one week to six months

Play*:* Infants at this age like to reach for and grab fingers and objects. They look at their hands and feet, as if they are just discovering them. They put things into their mouths because their mouths are sensitive. The mouth helps them learn warm and cool, and soft and hard, by taste and touch. Just make sure that what the child puts into his mouth is clean and is large enough that the child won't choke on it.

- Help the child follow an object. For example, ask the caregiver to show a colourful cup to the child, just out of reach. When she is sure the child sees the cup, ask her to move it slowly from one side to the other and up and down, in front of the child. Then, to move the cup closer. Encourage the child to reach for the cup and grab the handle.
- Clean, safe, and colourful things from the household, such as a wooden spoon or plastic bowl, can be given to the child to reach for and touch. A simple homemade toy, like a shaker rattle, can attract the child's interest by the sounds it makes.
- Children at this age also continue to love to see people and faces. Encourage family members to hold and carry the child.

Communicate*:* Children enjoy making new sounds, like squeals and laughs. They respond to someone's voice with more sounds, and they copy sounds they hear. They start to learn about how to make a conversation with another person before they can say words.

- All family members can smile, laugh, and talk to the child. They can "coo" and copy the child's sounds. Copying the child's sounds and movements helps the people who care for the child pay close attention to the child. They learn to understand what the child is communicating and respond to the interests and needs of the child.
- Be sensitive to the child's signs and responding appropriately to them. These caregiving skills help family members notice when the child is hungry, or sick, or unhappy, or at risk of getting hurt. They are better able to respond to the child's needs.
- For the child, this practice in communicating helps the child prepare for talking later. The family will also enjoy the reactions they get from the child and the attempts at communicating.

IV.4 Care for Child Development for the hospitalized newborn

IV.4.1 Handling and hazardous practices affecting child development

Frequent procedures, handling, and exposure to light and noise may cause physiological stress on newborns that increase their length of stay in the Neonatal Care Unit and ultimately decrease cognitive development. Not only does this environment directly affect the premature infant, but

these children are indirectly affected by the caregiver's stress and ability to provide adequate care. Quality and frequency of caregiver participation in the NCU can play an important role in the effectiveness of the parental care following discharge. Supportive roles played by nurses, doctors, and other professionals (e.g physiotherapists, occupational therapists) are also of great magnitude in the immediate days and months following birth.

Avoid:

- **Noise**
  - ⇨ Reduce noise as much as possible
- **Continuous bright light**
  - ⇨Try to reduce amount of light
  - ⇨ Set cyclic light exposure (day/night)
- **Artificial smells**
  - ⇨ Explain to mothers how to avoid
- **Shaking and abrupt movements**
  - ⇨ Implement minimal handling

Practice "Minimal Handling" and Newborn Individualized Developmental Care and Assessment Program (NIDCAP)

The sense of touch is one of the earliest to develop in early fetal development. In extremely small premature infants, their skin is very fragile requiring gentle care. Studies have indicated that for premature infants less than 30 weeks gestational age, touch may be more stressful rather than soothing. Infants of this young age are unable to regulate themselves and handle the same amount of stimuli as a full term infant. The preterm infant, once aroused, may have difficulty modulating his or her level of arousal even after the stimuli, such as feeding, changing nappies, and medical procedures are removed. Positioning and handling strategies include enhancing flexion in the arms and trunk and preventing flailing and extensions.

Every handling and treatment procedure on preterm and sick children causes distress and may lead to additional deterioration of the patient. The nursing concept of minimal handling by Myra Levine focuses on an environment, where the personal integrity of the patient is conserved. This concept was further developed into NIDCAP, standing for Newborn Individualized Developmental Care and Assessment Program, a relationship-based care for newborns. In Newborn Care Units, this implies a few considerations:

- Preterm and sick newborns have a right for a personal integrity and their private space
- Interventions should be minimized, enabling resting times without being touched
- Approach the newborn carefully before starting any examination or procedure
- Intermittently wrap the newborn tight in warm, clean kitenge to give a surrounding touch (swaddling). Check for wetness regularly

- Enable a caring environment with low noise and moderate light

Noise

The longer an infant's stay in the NCU, the more they are exposed to significant noise levels. Noise is one of the most significant contributors adversely affecting infants in the NCU. Studies reported sources of noise consist of:

- Staff talking and laughing,
- Telephone ringing,
- Placing of bowls and other equipment close to the newborn,
- Oxygen cylinder changing,
- Alarms and squeaking door hinges.
- Bed type and respiratory support systems were among the largest contributors of noise pollution.

Sudden and loud noise leads to physiological and behavioural disturbances including sleep disturbance, motor arousals, such as startles, crying, hypoxaemia, tachycardia, and increased intracranial pressure. Increased intracranial pressure can further contribute to intra-ventricular haemorrhage.

Staff behaviour has to be changed to accommodate noise recommendations. The following are recommended:

- Talking should be at a considerately low level
- LOUD laughing should be discouraged
- Equipment should not be placed close to the newborn
- Monitoring equipment should be minimal
- During the night a noise policy or "quiet period" should be applied

Light Exposure

Premature newborns react to continuous bright light exposure with distress leading to increased heart rate, respiratory rate and blood pressure. These changes may lead to de-oxygenation and increasing the risk of the patient deteriorating from moderate to severely ill. Exposure to sunlight (i.e. being nursed close to a window) is also a concern, increasing the risk for developing retinopathy of prematurity. The lighting situation should be moderate and direct light onto the newborn should be avoided or minimized.

If possible, a cyclic light exposure with 12 hours each for darkness and moderate light should be made possible, since it has shown significant positive effects on weight development, sleep cycle development and activity of premature newborns. For premature infants below gestational age of 32 weeks, covering of the bed is recommended but should only be done if sufficient monitoring is available.

Avoid exposing the child to artificial smells

Scents from various ointments, sprays or various chemicals used by breastfeeding mothers expose the infant to strange smell from what he/she is used to. Such chemicals include perfumes, body

sprays, soaps, shampoo, hair plaits, nail plaits, lip shiners, and body lotions. Despite inflammatory harm, such smells cause the child repel the mothers affection and bonding, frighten the neonate and lose infant's maternal recognition. The child may refuse breastfeeding from a breast with a different smell.

Avoid shaking the newborn

It is strongly recommended not to shake the child at any circumstance, even if there is an urge when the newborn does not stop crying. Many use this means of consoling the crying child and cherishing the child but this may cause serious problems to the child's brain.

Avoid abrupt lifting up the child

This is a common practice. Often health workers or caregivers abruptly lift up children even when the child is not alert, hence frightening the child. Teach the caregiver to gently lifting the child when needed. It should be turned to one side gently while starting the lifting process.

Do pain management

Pain management and avoidance of pain to the newborn is a big challenge. Many newborns are exposed to pain in various circumstances both in hospital setting and even at home. Some examples include venous puncture, intra muscular injections, incision and drainage without anaesthesia, and many others.
Also, some traditional practices exist, like circumcision and drawing birth marks on ears, nose, and face using sharp objects without anaesthesia. This pain infliction at neonatal period creates a psychological post-traumatic stress disorder which can last to adulthood.

Discuss with your team how to reduce pain in daily procedures and counsel parents on dangerous side-effects of pain inflicting traditions. For further information on pain management see Chapter III.

IV.4.2 Approach to a sick child

Play and communication is a crucial step also to hospitalized newborns. In fact, studies have shown that hospitalized children, who are stimulated, will improve more quickly than other children. Furthermore, the time children lose in the hospital without stimulation delays their development.

Approach to a sick child (covering the first year of life)

Care giver/health care giver should adopt ways to approach a sick child in a hospital bed so that the child will not get frightened. Consider that staff on the ward has been giving injections and in other ways have made the child uncomfortable. The child may be afraid of all strangers who approach. The service providers should:

- Move slowly and make sure that the child sees them.
- Observe whether the child is lethargic, interested or fearful.
- Sit down near the child, if the child is not fearful.

- Wait patiently for the child to recognize that you are not going to hurt him. If the child reaches towards you, respond by reaching towards the child. Wait for the child to touch you first. Do not move forcefully or quickly towards the child.

Get the child's attention

- Show the child a small item of interest, appropriate for the child's age. Move the item slowly in front of the child. See if the child grabs it. Give it to the child to hold.
- If the child is sleepy and unresponsive, touch the child with an item he can sense (e.g. a soft cloth, a dry sponge). If necessary, use a gentle "startle effect" or elicit a reflex to alert the child and draw the child's attention. Use toy items that are appropriate for the child's age and condition. For example, for a young child, make a soft, short noise with a rattle. For an older child, bang a spoon lightly against a metal pot.

Follow the child's lead, copy the child's sounds and gestures

- Make sure that you have the child's attention and that you are looking at each other.
- Wait until the child moves or makes a sound. If the child is sick, the child's first movements may be small, for example, only closing and opening the eyes. Then copy the child's movements with an exaggerated response. Copy sounds in a happy, playful way.
- Repeat until you get a responsive "conversation" going with sounds and gestures. Try to notice the rhythm – your copying comes after the child's response. You wait for the child to repeat it or make a new response, which you then copy again.

Play and communicate with the child, using activities and toy items appropriate for the child's age and condition.

Select a play activity that is appropriate for the child.

- A sick, lethargic child may begin with an activity for a child in a younger group.
- Put only one item in front of the child at a time. Engage the child in playing with the item, if possible, before adding more items.

A common mistake is to put several choices in front of the child. Multiple choices can overwhelm or distract the child from staying with a new activity until the child learns it.

- Increase the level of activity. For example, start with a small item. Add more items and ask the child to put the items into a bowl. Make a game of sorting the items and dropping them into the bowls to make a noise.
- Praise the child and show delight in the child's accomplishments.
- If the child loses interest, change the activity and toy items.
- Increase the child's level of activity and use of new skills
  - When the child becomes more active and can do the activity, then select another, more difficult play or communication activity**.**

- Assist the child in getting started. Observe how the child responds to the activity. Again, praise the child for what the child can do. Show your delight that the child is trying a new game.

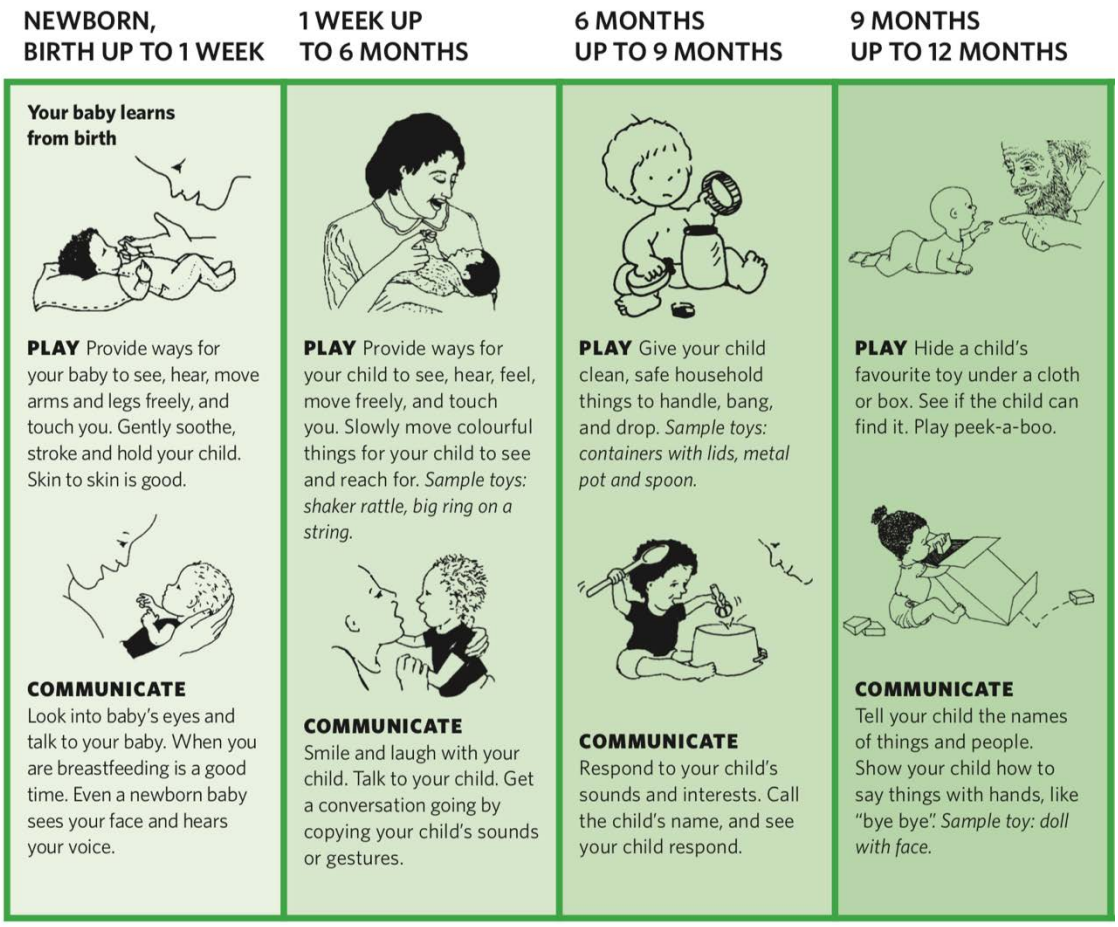


Fig. 13: Counselling Cards for Care for Child Development (WHO, UNICEF, 2012)

IV.5 Follow-Up Concepts for care for child development

While providing nurturing care and enabling children to develop to their full potential, not all children and families need the same intensity and range of interventions and services. All families need information, affirmation and encouragement. Due to the burden of low-income-environment, the postnatal check-up guidelines in Tanzania recommend 4 routine check-ups over a course of the first six weeks of life.

Some families and children need long-term intensive support and a prolonged follow-up concept with indicated support for those children with special needs is required. This applies for children with e.g. perinatal asphyxia, prematurity/LBW, newborns at risk with underlying conditions and congenital malformations. In those cases, a regular and adequate follow-up is directly linked with survival rate and quality of life.

Premature/LBW:

- Monitoring growth and weight gain to detect malnutrition and feeding problems as early as possible.
- Examine the child to check for other possible complications (anaemia, seeing or hearing impairment, development delay).
- Counsel the mother on being patient about the development of her child.

Birth Asphyxia:

- Monitoring neuromuscular development in the first months to detect abnormalities in movement and positioning
- Decide on necessary interventions (physiotherapy, speech therapy, hearing, cognition)
- Teach the parents on how to support the normal motor development of their child. This is extremely important, because patients with birth asphyxia are at high risk of developing versatile forms of cerebral palsy. Malpositioning can lead to fixed position and persistent muscle contractions.
- Counsel the family on the condition of the child.

Congenital malformations

- Regular follow-up for medication check,
- Post-operative follow-up and other procedures (like catheter-training for spina bifida patients).
- Depending on the level, the need for further referral to higher levels should be assessed.

GROWTH MONITORING

IV.5.1 Introduction

Around 53 % of under-five deaths are associated with malnutrition (UNICEF, 2006). The TDHS-MIS (2015 – 2016) also shows that 5 % of infants and young children are wasted and 1 % of them are severely wasted, 14 % are underweight and stunting is estimated to be 34 %. Micronutrient deficiencies are also common, prevalence of anaemia in under-five children (Hb < 11 g/dl) was 58 %, among them 30 % had moderate anaemia and 2 % had severe anaemia. The 2010 TDHS showed that prevalence of vitamin A deficiency in under-fives (indicated by Retinol Binding Protein < 0.825 µmol/L) was 33 %.

Monitoring of child growth in Tanzania started in 1972 by using Reproductive and Child Health card No. 1 (RCH-1). However the tool was capturing weight for age and vaccination schedule only. With weight for age alone, significant numbers of children, especially stunted, wasted and overweight children were missed. A multi country study that was conducted by WHO revealed that growth pattern and velocity between girls and boys was significantly different hence needed different assessment charts and hence the WHO growth standards were introduced. The Ministry

of Health, Community Development, Gender, Elderly and Children, adapted the WHO child growth assessment tools with charts for boys and girls to assess underweight, wasting and stunting. Besides it also assesses the milestones development.

A child grows bigger and develops new capabilities every day, which is why it's important to monitor his growth and development at each clinic visit to ensure that a baby is healthy and grows normally. Growth monitoring section describes how to determine a child's age, recognize clinical signs of certain serious problems of under nutrition, measure a child's weight and length or height. The child's age, sex, and measurements of weight and length or height will be used to calculate the following growth indicators.

- Length/height-for-age
- Weight-for-age
- Weight-for-length/height

The measurements described in this guide should be taken and recorded whenever an infant or child visits a health care provider, for example, for an immunization, a well-baby visit, or care during an illness. Recommended schedule of visits specifically for growth assessment from birth is at 24/48 hours, 7 days, 28 days and 42 days.

IV.5.2 Child Health Booklet

The book of child health contains the following parts:

A. Front page
B. Personal information of the child
C. Events and important information
D. Information of the mother
E. PMTCT services
F. Vaccine schedule
G. Vitamin A and anti-helminthes drugs schedule
H. Malaria prevention
I. Development and growth monitoring information
J. Charts of various parameters of growth
K. Chart to explore the stages of development and growth
L. Proposed nutrition and childcare
M. Highlights on HIV infection and child's nutrition
N. Hygiene and safety in food preparation
O. Key facts about pneumonia and tuberculosis
P. Highlight on upbringing and development of the child

Q. Important things about raising a child and protect him from accidents

R. Harassment and violence against child (child abuse)

S. Important information for treatment

IV.5.3 Use of the Growth Record

The Growth Record is a booklet that contains all of the charts needed to record and assess the growth of a child from birth up to 5 years of age. A different Growth Record is needed for boys and girls because boys and girls have different weights and lengths beginning at birth. Boys and girls need to be assessed by standards that reflect normal differences in their sizes.

A Growth Record should be started for each child and kept by the mother. When a child visits the health facility, ask the mother if the child has a Growth Record. If not, start a Growth Record.

If the child already has a Growth Record, obtain it from the mother and record today's visit.

If a child's Growth Record has been left at home, record information on whatever back-up register or record is available at the health facility, and update the child's Growth Record at the next visit.

If a child's Growth Record is lost or destroyed, replace it if supplies permit.

Praise the mother for having her child's growth assessed regularly.

IV.5.4 Areas where the child growth monitoring is done

- Labour ward – mother and baby information must be filled in the booklet immediately after delivery
- Postnatal – fill the services given to a baby e.g. vaccines
- RCH – fill and plot weight and height of the child in the growth chart provided (refer page 13-15 in the booklet)
- OPD – fill the information of sickness and management provided (refer 37-45)
- Paediatric ward – fill the information of sickness and management provided (refer 37-45)

IV.5.5 Preparations

- Weighing scale
- Length board
- Tape measure
- Growth Booklet

IV.5.6 Start a new Growth Record

Depending on the sex of the child, select a Boy's Growth Record or Girl's Growth Record. Show the Growth Record to the mother and explain the following points:

- This booklet will be your record of your child's growth and health
- Each time you visit, your child will be weighed and measured, and the measurements will be recorded in this booklet

- The booklet includes charts on which we will plot your child's measurements in order to assess his or her growth figure Xa & Xb
- It has a schedule of immunizations to show when your child needs and receives immunizations, anti-helminthes and vitamin A
- It has recommendations about feeding your child and important points about caring for your child at different ages. Keep this booklet in a safe place and bring it with you whenever you bring your child to a health facility.

IV.5.7 Personal Data

Child's personal information is available in two pages.
The front page specifies the name and registration number and page two has child's personal information.
Information relating to a child should be written as soon as possible after birth, before the mother is discharged home, and if the child is delivered on the way to hospital or home, his or her information must be written as soon as he arrives at the health facility.

<table>
<tr><td colspan="4">Child's name</td></tr>
<tr><td rowspan="3">Residence</td><td colspan="2">Street/hamlet</td><td>Name of the facility</td></tr>
<tr><td colspan="2">Place/village</td><td>Identification number</td></tr>
<tr><td colspan="3">District</td></tr>
<tr><td colspan="4">Name of street/hamlet leader</td></tr>
<tr><td colspan="4">Name of the mother/caregiver</td></tr>
<tr><td colspan="4">Name of the father/caregiver</td></tr>
<tr><td colspan="4">Date of birth</td></tr>
<tr><td colspan="4">Gestational age at birth</td></tr>
<tr><td rowspan="3">Measurements at birth:</td><td colspan="3">Weight (kg)</td></tr>
<tr><td colspan="3">Length (cm)</td></tr>
<tr><td colspan="3">Head circumference (cm)</td></tr>
<tr><td colspan="4">Single □ Multiple birth □</td></tr>
<tr><td colspan="4">Birth rank:</td></tr>
<tr><td colspan="4">Date of birth of previous sibling (born to mother)</td></tr>
</table>

Table X: Child's Personal Data

IV.5.7.1 Measurements

Health provider should measure a baby from labour ward as soon as he is stable (60 – 90 minutes after delivery)

- Weight
- Length
- Head circumference

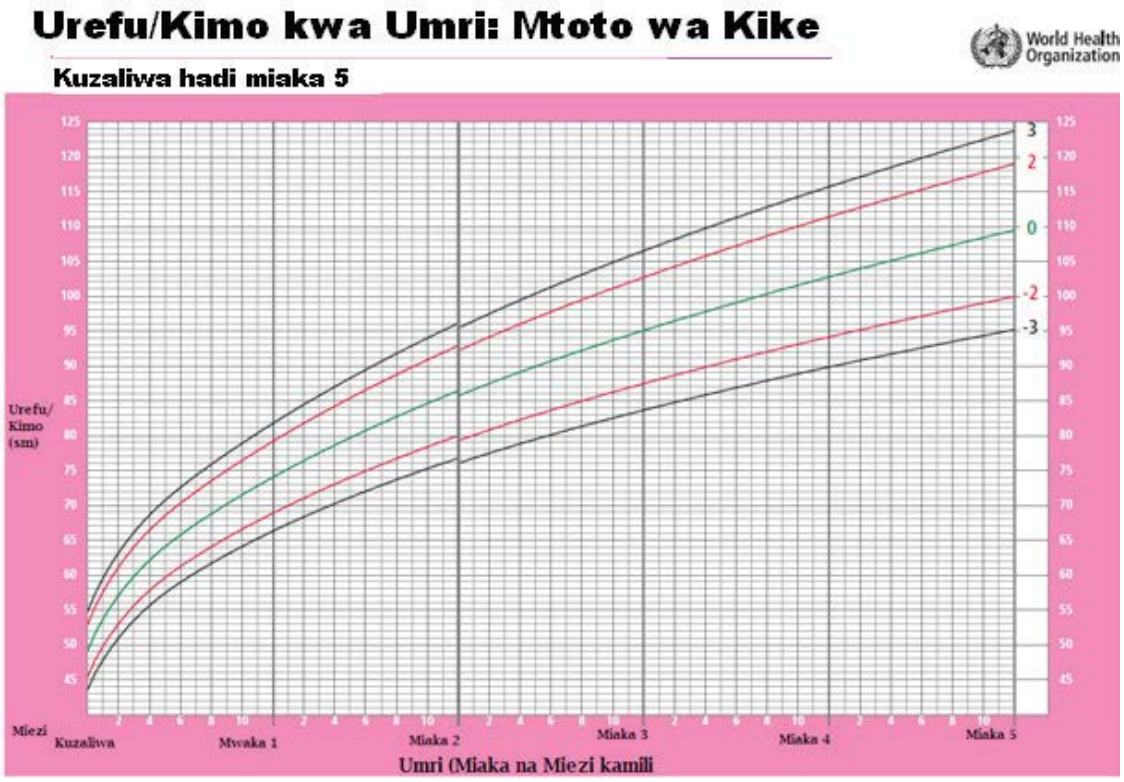


FIGURE Xa

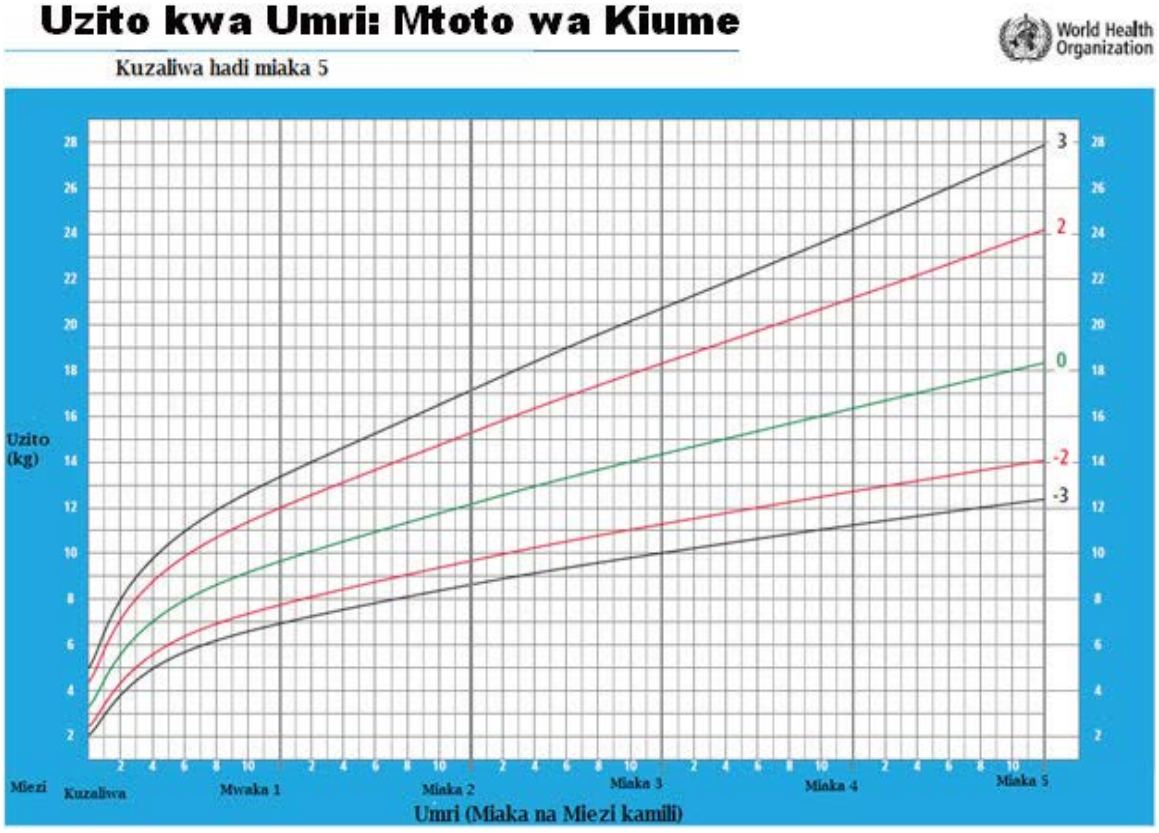


Figure Xb

IV.5.7.2 Interpretation

1. Assessment of nutritional status using patterns contained in the book of baby pp 13-15

2. Fill out and interpret these patterns (Refer to the manual monitoring of child growth and development, page 13-15)

3. Information obtained must be filled in register DHIS number 7.

Assessment of nutritional status as follows:

	Weight for Age	**Height/length for Age**	**Weight for Height**
Between line 2 and -2	Normal	Normal	Normal
Below line -2	underweight	Stunting	Wasting
Below line -3	severe underweight	Severe stunting	severe wasting
Above line 3	Overweight	Giant	Obesity

Figure X

IV.5.8 Counselling

IV.5.8.1 Nutritional counselling

- Breast milk is the only food that a child needs in this age for growth, health and child development.
- The baby should be breastfeed in the first hour from birth.
- Breastfeed the baby the colostrum, milk with yellow colour, as it contains nutrients and is essential to baby's health.
- Baby should breastfeed as often as possible, day and night, over 10 times per day.
- Do not give food or other drinks, even water. Mother's milk contains enough water to dry up the baby's thirst.

IV.5.8.2 Hygiene

Proper care of the umbilical cord can prevent serious infections

- Leave the cord stump uncovered
- Nothing should be placed on the cord
- Keep the cord area dry

IV.5.8.3 When to return to hospital

Advice the mother to return to hospital when she sees danger signs (refer to chapter 1 (ENC)).

IV.5.9 Follow-up visit

During each of these visits, the health care worker is advised to assess:

- Danger signs
- Feeding:
  - Depending on the child's age, ask appropriate questions to determine whether the child is still breastfeeding – either exclusively or with other foods and fluids.
  - If other foods or fluids have been introduced, ask and record the age at which they were introduced.
  - If the child is no longer breastfeeding, ask and record the age at termination of breastfeeding.
- Weight gain (recommended weight gain is 15 – 30 g/day)
- Eye discharge
- Temperature instability
- History of convulsions
- Jaundice
- State of the cord

Date	Age	Body weight (kg)	Temperature (°C)	Blood level (Hb g/dl)	Umbilical discharge/redness	Skin rashes/ colour change	Eye discharge	Others	Advice	Date to return
	Day 7									
	Day 28									

Figure X: Areas for monitoring during follow-up visits from 0-28 days

Encourage the mother to attend follow up visits at 42 days, 10th, 14th week of life and other visits as schedule by RCH 1 booklet.

V ESTABLISHING A NEONATAL CARE UNIT

V.1 Introduction

At primary care facilities, where majority of sick neonates are first seen, neonatal care is mainly addressed using the guidelines of Essential Newborn Care (ENC) and Integrated Management of Childhood Illnesses (IMCI). The roll out of ENC and IMCI strategy leads to increased contact of neonates with formal health care system, where detection of seriously sick neonates, who need referral to higher level health facilities, takes place. Although due to various factors, acceptability of referral to higher level facility by caregivers is still a challenge, strengthening the referral system between these levels will result in an increased number of sick neonates presenting at referral facilities.

Therefore in many health facilities, there is need for a special ward for care of sick neonates, who need inpatient care. Such a ward is called Neonatal Care Unit (NCU) or Neonatal Intensive Care Unit (NICU) if more advanced care is provided (e.g. mechanical ventilation). If a facility does not have a NCU or NICU special services for sick neonates can't be provided. In such facilities sick neonates are either admitted in general paediatric wards or in postnatal wards, where there are no restrictions for entry of visitors, no proper thermal environment and no specialized staff to care for the sick neonate. Thus neonatal care according to standard cannot be provided.

This chapter provides guidelines on how to establish Neonatal Care Units (NCUs) aiming at supporting and facilitating the planning, establishment, operationalization and monitoring of NCUs at various levels of health facilities. It is mainly focusing on the requirements, specifications and processes related to establishment of NCUs.

In the overall planning for establishment of NCU, it is important that this process will be conducted in close collaboration and participation of the regional and district health management teams. The table below summarizes the required neonatal care at different levels. However, it is strongly recommended to conduct a facility readiness assessment prior to establishment of NCU (Refer to annex 6).

All District Hospitals and all higher level hospitals are required to have a NCU. To prioritize the health centres, where NCUs should be established first, the following criteria should be considered:

- Size of population served
- Number of dispensaries surrounding the health centre
- Distance and barriers to reach the higher level facility
- Annual number of deliveries performed
- Presence of the CEmONC services

Table 14: Neonatal care at different levels

Health Facility	Level of care
Dispensary	Stabilization, pre-referral medication and prompt referral
Health Centre	Basic inpatient care at NCU (general neonatal ward and KMC room) and outpatient care Pre-referral medication and prompt referral of serious cases
District Hospital	Inpatient and outpatient care at NCU (general neonatal ward, KMC and HDU) and appropriate referral
Regional Referral Hospital	Inpatient and outpatient care at NCU (including NICU) Appropriate referral
Tertiary Hospital	Inpatient and outpatient care at NCU (including NICU) Appropriate referral

V.2 Infrastructure of neonatal care units (NCUs)

The purpose of this section on infrastructure is to support the responsible persons at all levels in planning and designing for the NCU. General services like laboratory, blood bank, ultrasound and other radiology services are supporting high quality neonatal care services. These services should be neonatal friendly, however they are not described here.

According to policy inpatient neonatal care services should be provided from health centre level to tertiary level. The health centres will provide basic neonatal care, whereas the district hospitals and higher levels will provide specialized neonatal care.

V.2.1 Requirements for NCUs at Health Centre Level

In contrast to a hospital, health centres usually have a lower number of deliveries and also fewer staffs. Therefore, it is recommended for a health centre to concentrate on treatment of sick neonates, who are stable and to refer those, who are unstable. A stable premature weighing between 1.8 - 2.5 kg without additional problems, who only needs basic services like feeding and KMC, can be cared for at the health centre with adequate numbers of skilled staff and some basic infrastructure. This chapter explains the prerequisites for such a NCU for basic neonatal care at health centre level.

The NCU at health centre level is expected to **provide the following services:**

1. Essential newborn care at birth
2. Resuscitation
3. Care of sick, but stable neonates
4. Care and stimulation of stable LBW newborns between 1.8 – 2.5 kg

5. Initial stabilization and care of sick, unstable neonates before referral
6. Referral to higher level facilities

Note: Preterm infants with a body weight of >1.8 kg normally correspond to a gestational age of more than 32 weeks. As long as they are stable and do not have any additional complication, the majority of these newborns will not need oxygen therapy and is able to tolerate enteral feeds. Therefore, they can be managed at the health centre level.

Configuration and major equipment of the unit:

The NCU includes a general ward and a KMC room, which have to be located close to the labour ward/maternity unit

- Space requirement (refer to Design and Planning guide for NCU)
- Hand washing area
- Mothers' bathroom
- Staff areas
- Major equipment:
  - mothers' beds for General ward and KMC
  - resuscitation table
  - radiant warmer
  - oxygen concentrator (with dual outlet)
  - small oxygen cylinder for transport/referral
  - Pulse oximeter
  - Suction machine
  - Neonatal stethoscope
- Human resources:
  - At least one skilled nurse has to be available round-the-clock for neonatal care
  - One clinician, skilled in neonatal care, is required to oversee the clinical care
  - Doctors and nurses posted in maternity unit and NCU should be trained prior to starting the unit and then receive ongoing mentorship (see below)

V.2.2 Requirements for NCUs at District Hospital Level

The NCU at district hospital level is expected to **provide the following services:**

- Continued care after stabilization of the newborn in labour ward and transfer to NCU
- Triage and immediate emergency interventions
- Management of sick newborn
- Management of premature infants
- Specialized nursing care including care for child development and physiotherapy
- Referral to higher level facilities
- Follow-up after discharge of high risk neonates and premature newborns
- Continuous mentorship/CME for staff

Location and size of the unit:

Location

- The NCU has to be close to labour ward/maternity unit
- There has to be ambulance access for referrals
- No passages to other services through NCU

Size

- Minimum capacity should be 10 beds (considering economics of scale, technology and maintenance)
- Number of beds can be calculated using the following estimation:
    - 3-5 beds for every 1000 annual deliveries in the facility, then add 30 % of this estimate for referred-in patients
    - If a facility is already taking care of neonates, the annual number of neonatal admissions and the average length of hospital stay should be taken into consideration

Minimum space requirement

- Refer to Design and Planning guide for NCU

Configuration of the unit

- Provide constant surveillance of each bed from nurses' station
- Mosquito nets should be available for each bed and cot

Newborn care area

The newborn care area consists of the rooms needed for admitting the sick newborns. During admission the baby is triaged and will be admitted in the respective room depending on his condition.

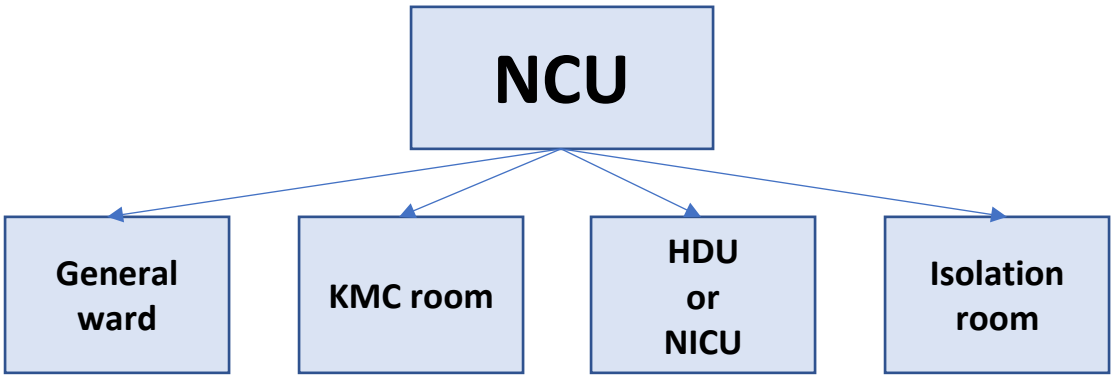


Figure X

- **Triage/admission room**
- **Neonatal High Dependency Unit (HDU):**
    - Room for newborns who need intensive care (e.g. severe birth asphyxia, small premature, respiratory distress)
    - Located within direct proximity to nurses' station
    - Glass partitioning between nurses' station and HDU for observation
    - Glass partitioning within HDU to create two areas with different temperatures:
        - Area for small preterm neonates: Temperature 30 – 34 °C (depending on humidity), no cross ventilation (newborns will only wear diapers)
        - Area for full-term neonates: Temperature 28 – 30 °C, no cross ventilation
    - Heating system with automated temperature control is required
    - Functional resuscitation area
    - Space for equipment and cupboard/tray for emergency supplies and drugs
    - Desk for documentation and patient files
    - 6-8 electrical sockets per bed

    Note: At a higher level facility with availability of advanced services like mechanical ventilation the HDU is called NICU (Neonatal **Intensive** Care Unit).

- **General ward for sick, but stable neonates:**
    - Separate area for neonates who are in stable condition, can stay with their mother and don't have a contagious disease
    - Room for mothers' beds and lockers (number depending on size of NCU)
    - Functional resuscitation area
    - Glass partitioning to nurses' station for observation
    - Desk for documentation and patient files
    - 1 electrical socket per bed
- **KMC room:**
    - Room for mothers' beds and lockers (number depending on size of NCU)
    - Temperature 25 – 28 °C with temperature monitoring, no cross ventilation
    - Functional resuscitation area
    - Glass partitioning to nurses' station for observation
    - Desk for documentation and patient files
    - 1 electrical socket per bed
- **Small isolation room for contagious diseases**
    - Room for 1 mother's bed and locker
    - Temperature 25 – 28 °C with temperature monitoring, no cross ventilation
- **Outpatient/Follow-up area**
    - Located close to the NCU, but outside to avoid contact with inpatients

Space for supplementary service:

- Gowning area:

    - Located at the entrance
    - Shoe rack for street shoes
    - Shoe rack with clean slippers/disposable shoes
    - Lockers
    - Hand washing area
- Hand washing stations:
    - Should be at least 1 m away from every neonate's bed and from clean supply storage
    - Should be a hands-free, elbow operated
    - Hand washing SOP should be provided above all sinks
    - Walls adjacent to the sink should be of non-porous and non-absorbent material to prevent growth of moulds (e.g. tiles)
    - Space for liquid soap and tissue dispenser
    - Space for disinfectant dispenser
    - Space for waste bin
- Admission area:
    - Including comfortable seating for mother and health care provider
    - Allowing complete visual and acoustic privacy
    - Counselling room
- Clean area with cupboard and desk to prepare drugs and IV fluids:
    - Cupboard for supplies and drugs, sorted and labelled
    - Desk to prepare drugs and IV fluids with easy to clean surface
- Sluice room:
    - Design according to specifications and requirements of IPC
    - Location should enable to remove soiled materials without passing through the newborn care area
- Room for nursing mothers (whose newborns are admitted in HDU)
    - Mothers' beds and lockers (number depending on size of NCU)
    - Within NCU or in close vicinity to NCU
- Toilets and bathrooms for mothers
    - Location should avoid passing through the newborn care area
    - Design according to specifications and requirements of IPC
- Nurses' station:
    - Desk for office tasks with computer(s), adequate lighting and power sockets
    - Lockable cupboard for files and office supplies
- Staff support space:
    - Should be within close proximity to the NCU
    - Staff Office
    - Changing rooms (male/female), staff toilets
- Visitors' area:

- Close to the NCU, but outside
- Comfortable benches
- Ward attendant desk
- Hand washing station

Electrical and mechanical requirements

Keep in mind: Safety, easy access and maintenance

- Electrical needs:
  - Power supply:
    - 24-hour uninterrupted stabilized power supply
    - Back-up power supply (generator and/or solar system)
  - Protective devices:
    - Voltage stabilizer for equipment (or central voltage stabilized electrical sockets)
    - UPS for essential equipment (e.g. oxygen concentrator)
  - Electrical sockets:
    - In HDU 6-8 sockets per bed
    - In KMC and general ward 1 socket per bed
- Mechanical needs:
  - Floor:
    - Easily cleanable, preferably vitrified tiles, avoid joints
  - Walls:
    - Easily cleanable and highly durable
    - Acoustical properties (should reduce noise)
    - Preferably: wall tiles up to a height of at least 150 cm
- Water supply:
  - 24-hour uninterrupted running water supply
  - Preferably: separate overhead tank
- Centralized oxygen and air supply:
  - Oxygen and air piping from central plant (if not available provide oxygen concentrator or oxygen cylinders)

Lighting

- Ambient lighting:
  - Should provide accurate skin-tone recognition
  - Should be free of glare or veiling reflections
  - Bed spaces should not be in direct light (neither electric nor sun light) to protect the neonates' retina and cornea

- Procedure lighting:
    - Most radiant warmers have inbuilt sufficient procedure lights
    - Mobile fibre optic lamp can be used additionally, but should be used temporarily only and should not be directed into the neonate's eyes
- Daylight:
    - At least one source of daylight (window) should be visible in each newborn care area
    - Newborn beds have to be at least 0.6 m away from a window (to minimize radiant heat loss or heat gain and to avoid glare)

Temperature and ventilation

- Air temperature in the general ward and KMC room should be 25 – 28 °C
- Air temperature in the HDU area for preterm neonates should be 30 – 34 °C (depending on humidity)
- Ventilation: minimize cross ventilation in the newborn care area (closed windows and doors, no AC, no fan; availability of air vents)

Acoustic environment

- Should favour uninterrupted sleep without acoustic distraction for the neonate
- Noise-generating activities or gadgets should be reduced as much as possible
- Should favour privacy for staff and caretakers

V.2.3 Requirements for NCU at regional level

For comprehensive specialized care the regional referral hospitals and higher levels are aiming at extending the NCU by building up a neonatal intensive care unit (NICU) with the option of mechanical ventilation and continuous monitoring by a cardiorespiratory and blood pressure monitor. This highly specialized intensive neonatal care unit will not be described in this guideline, instead hospital managers and decision makers should refer to design and planning guide for NICU.

V.2.4 Equipment for NCU

The health care providers in the newly established NCU will need instruction sessions on how to operate, clean and maintain the equipment. After these sessions operating manuals are to be available for easy reference. Schedules for planned preventive maintenance (PPM) of the equipment should be in place. Recruitment and training of biomedical technicians/engineers is crucial for smooth running/operation of equipment.

V.2.4.1 Essential Equipment for NCUs

This list looks at a recommended number of equipment required for providing high quality neonatal care at different facility levels.

SN	Category/Item	Quantity		
		Regional (calculated for an example of a RRH with **4000** deliveries/year)	**District** (calculated for an example of a DH with **4000** deliveries/year)	**Health Centre** (calculated for an example of a HC with **1000** deliveries/year)
1	Infant radiant warmer	3	2	1
2	Resuscitation table	4	3	2
3	Phototherapy machine	4	3	0
5	Suction machine	3	2	1
6	Oxygen concentrator with 2 outlets (flow splitter)	5	2	1
7	Oxygen cylinder (back up, with humidifier and flow splitters)	2	1	0
8	Oxygen cylinder (small for transport)	2	1	1
9	Patient monitor	2	1	0
10	Pulse oximeter	5	3	1
11	Ventilation bag and masks size 0 and 1	6	4	2
12	Penguin sucker	6	6	2
13	Digital thermometer	10	8	4
14	Neonatal stethoscope (each doctor to have his/her own)	5	3	1
15	Infusion/syringe pump	6	3	0
16	Newborn weighing scale (preferably digital)	6	3	1
17	CPAP machine (for neonates)	2	1	0

18	Ventilator (for neonates)	Optional	0	0
19	Measuring tape	5	3	1
20	Bedside lamp for procedure	4	3	1
21	Glucometer	6	4	2
22	Haemometer	1	1	0
23	Bilirubinometer (optional)	1	1	0
24	Emergency trolley	2	1	1
25	Ordinary trolley	3	2	1
26	Room thermometer	1 /room	1 /room	1 /room
27	Wall clock with seconds' hand	1 /room	1 /room	1 /room

V.2.5 Consumables

The following consumables have to be available in NCU at all times in sufficient numbers:

- IV cannulas (G24)
- Syringes (2, 5, 10 ml)
- IV fluid giving set
- Burette
- Blood giving set
- Feeding cups
- IV fluids (Dextrose 10 %, Dextrose 50 %, Normal Saline, Ringer Lactate, Dextrose saline; in units of 100 ml, 250 ml and 500 ml)
- Water for injection
- Nasogastric tubes (5, 6, 8 Fr)
- Nasal prongs for oxygen administration (neonatal size)
- Suction catheters (6, 8, 10 Fr)
- Endotracheal tubes – in tertiary hospitals
- Urinary catheters (5 Fr)
- Umbilical catheters (arterial and venous) and suture material, sterile cord ties, sterile drapes, sterile swabs, sterile forceps, sterile needle holder – in tertiary hospitals
- Cord clamps
- Glucose strips
- Lancets
- Blood sample tubes

- Plaster (transparent and hypoallergic)
- Disinfectants appropriate for neonates
- Liquid soap
- Diapers
- Bed sheets

V.2.6 Medicines

The following table shows the medicines that have to be available in NCU at all times in sufficient numbers. In higher level facilities some more specialized medicines should be provided.

Table 13 Required Medicine per facility level

Item	**Regional** and above	**District**	**Health Centre**
Antibiotics			
Ampicillin	✓	✓	✓
Gentamicin	✓	✓	✓
Cloxacillin or Ampiclox	✓	✓	✓
Ceftriaxone	✓	✓	✓
Cefotaxim	✓	✓	○
Metronidazole	✓	✓	✓
Vancomycin	✓	○	○
Imipenem	✓	○	○
Anticonvulsants			
Phenobarbitone	✓	✓	✓
Phenytoin	✓	✓	○
Levetiracetam	✓	✓	○
Midazolam	✓	○	○
Prophylaxis			
Nevirapine	✓	✓	✓
Zidovudine	✓	✓	✓
Vitamin K	✓	✓	✓

Tetracycline eye ointment	✓	✓	✓
Folic acid	✓	✓	✓
Iron	✓	✓	✓
ABIDEC Multivitamin drops	✓	✓	✓
Isoniazid	✓	✓	✓
Other medication			
Aminophylline IV	✓	✓	✓
Caffeine citrate IV/oral	✓	✓	○
Adrenaline IV	✓	✓	✓
Calcium gluconate IV	✓	✓	○
Ibuprofen IV/oral	✓	○	○

V.2.7 Neonatal emergency tray

To be able to react timely to a neonatal emergency it is vital to have all required equipment, supplies and drugs ready at all times. The emergency tray should be close to the resuscitation area.

- Ventilation bag
- Masks size 1 and 0
- Oxygen tube (connecting ventilation bag with oxygen source)
- Penguin sucker
- Suction tubes (6, 8 and 10 Fr)
- Cannula 24 G
- Syringes 2 cc, 5 cc, 10 cc
- Plaster
- Tourniquet
- Surgical blade
- Cord clamp
- Gauze/cotton wool
- Adrenaline
- Aminophylline
- Vitamin K
- Phenobarbitone
- Water for injection

- Dextrose 10 %
- Normal Saline

V.3 General Ward Rules

The NCU is a restricted ward because the neonates with their low immunity are susceptible to infections of any kind. Therefore, to reduce the risk of infection, only the following persons are allowed into the unit:

- The NCU personnel
- The consulted health personnel
- Mothers
- Fathers (during visiting hours and in emergency situations)

V.4 Human Resource for NCU on district hospital level and above

V.4.1 Staff

For a successful NCU, which provides quality services backed up by monitoring devices and equipment, availability of round-the-clock clinical expertise is very crucial. Well-trained nurses and doctors form the backbone of the service. Therefore, the unit should have the required number of appropriately trained and qualified nurses. There should be a designated consultant paediatrician/neonatologist responsible for the clinical standards of the care of neonates.

Available staffing level for NCU may differ from one hospital to another, but principally below are the staffs needed:

- At least two skilled nurses per shift are necessary.
- There should be an adequate number of clinicians to be able to do a ward round twice daily and to be on call round-the-clock.
- Support staff should be available to clean the ward at least once per shift or more depending on the need, to clean equipment, and to do other allocated duties depending on the need.

V.4.2 Training

Suggested training for medical staff working in an NCU is:

- An initial training programme for 3 days (refer to training manual)
- An attachment at a facility with a well-established NCU for at least two weeks
- Ongoing mentorship
- Regular CME on Neonatal care
- Structured introduction and orientation of new staff in the NCU (according to a written protocol)

V.5 Documentation

Proper documentation and record keeping is the cornerstone of all the hard work done.

Not Documented = Not Done

Thus, the below are the important information needed. It includes general data recording on the ward according to HMIS guideline (MTUHA) and recording of individual data in the patients' case notes. Every document has to be labelled with the patient's name and identification number.

V.5.1 Required Books and Forms

- Admission book MTUHA 14: To record data of all patients admitted on the ward, MTUHA 14 for inpatients is used, for use on NCU some adjustments are suggested:
  - Date of birth
  - Date and time of admission
  - Apgar Score
  - Birth weight
  - Weight on admission
  - Weight on discharge
  - Referral from/to
  - Outcome: discharged/death date and time
- KMC book/Follow up book: By recording all follow-up visits this book is used to document the progress of neonates after discharge
- Referral book
- Death register
- Case notes: (facilities should continue to use the available forms in their settings; for newly established NCUs see examples in the annexes)
  - Admission form (annex 3)
  - Continuation form
  - Discharge form (annex 7)
  - Referral form (annex 8)
  - Observation and treatment chart (Annex 4)
  - Thompson score for HIE (see annex 9)
  - Finnstroem/Ballard score (see annex 10)
  - Growth charts (see child growth booklets RCH card 1 and annex 11)
- Other forms:
  - Laboratory request form
  - Radiology request form
  - Death certificate

- Perinatal Death Review For
- Health insurance forms

V.5.2 Standard Operating Procedures

Standard operating procedures (SOPs) for the NCU have to be in place and easily accessible at all times. The management of the admitted neonates has to follow the SOPs.

V.5.3 Quality Improvement

To keep up the quality of care mentorship and on-job training should be an ongoing process.

To monitor ward performance the data should be evaluated monthly and be reported to the relevant bodies. Evaluating the trends of morbidity and mortality, case fatality rate or other indicators will help in improving quality of care.

V.5.4 Maternal and Perinatal Death Surveillance and Response (MPDSR)

A perinatal death is a death of a fetus from 28 weeks of gestation to 7 completed days of life including stillbirths. If death occurs it is important to discuss the reasons for death with the following objectives:

- To provide information, recommendations and actions taken to eliminate preventable perinatal deaths at health facilities
- To document perinatal deaths in order to understand and asses the true magnitude of the problem, and trends over time in order to assess the impact of various perinatal mortality reduction strategies

The goal is to generate information that can be used by health service providers, planners and managers to improve perinatal survival by improving the quality of care.
All deaths shall be notified and documented within 48 hours, the death review is done by the review team within 7 days according to the national MPDSR guideline.

V.6 Discharge Management, Follow-Up and Referral

V.6.1 Discharge Management

The discharge from the NCU should be prepared well and a written plan on discharge should be in place. Examine the newborn and confirm that the requirements for discharge are met.

V.6.1.1 Criteria for discharge

- Breathing without difficulties
- No other ongoing problems requiring inpatient management
- Temperature can be maintained between 36.5 °C and 37.5 °C

- Breastfeeding well or mother is confident in using an alternative feeding method
- Adequate weight gain
- Mother is confident in caring for her newborn and has a support system in place
- All required vaccinations are given
- Necessary medications are given/prescribed in sufficient amount (e.g. iron/folate)

V.6.1.2 Discharge process

On discharge of a patient the mother (and preferably father or other close family members) will be informed again in detail on the progress of the newborn. The conversation should take place in a quiet area with privacy, enough time should be available.

All necessary information on how to continue the care and treatment of the newborn at home is explained, this includes information on danger signs, what to do and where to go in case of any problem. Also information about prognosis and a date for the first follow-up visit is given. The family will be encouraged to ask questions.

V.6.1.3 Discharge documentation

The discharge will be documented in the patient's file and a completely filled discharge form will be given to the parents/feed-back form to the facility, which will continue to follow up the newborn.

V.6.2 Follow-up

Newborn who were admitted to NCU are generally at higher risk for long-term complications, growth faltering and developmental problems. The follow-up visits play a key part to ensure the best possible outcomes for these infants by taking preventive measures, identifying and addressing upcoming problems as early as possible, giving advice on support and stimulation of the newborn and by praising the parents in their efforts for their child.

V.6.2.1 Most common indications for follow-up visits

- Prematurity/low birth weight (LBW)
- Birth asphyxia
- Sepsis/meningitis
- Congenital malformations (depending on the management)
- Surgical cases
- Birth injuries

V.6.2.2 Location of follow-up visits

Follow-up clinic should be close to NCU or RCH

V.6.2.3 Timing of follow-up visits

Depending on the condition of the newborn at discharge the timing of follow-up visits will be planned. The first visit normally will not take place later than 7 days after discharge.

V.6.3 Referral/Transfer

It is very important to identify a newborn who needs to be referred to a higher level facility without delay in order to avoid complications.

When you are referring a patient you must consider the following:

Stabilization before transfer

- Correct hypoglycaemia (check blood glucose and give Dextrose 10 % if hypoglycaemia (details see chapter 3))
- Stabilize temperature
- Stabilize breathing (check oxygen saturation and give oxygen if required (details see chapter 3), put in propped-up position)
- Give necessary treatment before transfer according to the problem of the baby
  - Give pre-referral antibiotics to newborns who have an infection or high risk of infection (e.g. premature, PROM)
  - Give phenobarbitone 20 mg/kg IV stat if convulsing

Pre-Referral Antibiotic Treatment	
Ampicillin	50 mg/kg IV or IM
Gentamicin	5 mg/kg IV or IM for newborn ≥ 2.5 kg, 3 mg/kg IV or IM for < 2.5 kg

Communication

- Explain reasons for referral and counsel the parents and family before transport
- Inform the referral facility
- Write referral notes to the referral facility and document the management the baby received, attach other necessary notes (e.g. laboratory findings, NTC card)

Transport

Prepare well before transportation

- Re-assess the newborn before leaving
- Arrange a capable healthcare provider, mother and a relative to accompany
- The health care provider stays with the patient
- Make sure that the ambulance is fully equipped (refer annex 12)

During transportation

- Keep the newborn warm by using KMC method

- Open airway
- Monitor vital sign
- Continue with feeding, IV fluids and drugs as indicated

Feedback

Communicate with team at referring facility to know:

- Condition of the newborn at arrival
- Management given
- Outcome of the newborn
- Post-discharge plan and follow-up

VI Annex

VI.1 Annex 1- APGAR Score Kiswahili

	Alama 2	Alama 1	Alama 0
Muonekano Rangi ya ngozi	Rangi ya pinki mwili wote	Mikono na miguu ya bluu / kinywa na mwili pinki	Bluu au weupe
Pulse Mapigo ya moyo	Zaidi ya 100	Chini ya 100	Hakuna
Muitikio wa mshtuko	Anashtuka kawaida	Anashtuka kwa shida	Hashtuki
Kucheza kwa viungo	Kucheza kwa hakika	Anacheza kidogo	Hachezi
Upumuaji	Anapumua vizuri	Anapumua kwa shida	Hapumui

VI.2 Annex 2: Newborn Triage Checklist

VI.3 Annex 3: Neonatal Care Admission Form

VI.4 Annex 4: Observation and treatment chart

VI.5 Annex 5: Antibiotic protocol

General considerations

Antibiotics should be preserved for confirmed or presumptive treatment of sepsis and for newborns with risk of infection. It should be given for a minimum of seven days unless infection is ruled out.

Meningitis and severe pneumonia may require longer treatment durations, and gram-negative bacterial meningitis requires an antibiotic duration of 21 days.

Antibiotics for newborns should be given intravenously (or intramuscularly until IV line is established), oral antibiotics should only be given in exceptional cases of very mild infection and as outpatient.

FIRST LINE ANTIBIOTICS:

The recommended first line antibiotics are mentioned below. Always start with first line treatment if the patient didn't receive any antibiotics yet.

Triple therapy (see doses below)

Ampicillin, Cloxacillin and Gentamicin for 7 - 10 days

or

Ampiclox and Gentamicin for 7 – 10 days

SECOND LINE:

Use second line if the patient didn't respond to first line treatment after 72 hours.

Cefotaxime or Ceftriaxone with Ampicillin for 7 – 10 days

Antibiotics for other indications

- Metronidazole (anaerobic coverage in intra-abdominal infections, e.g. NEC)
- Ciprofloxacin (often effective against resistant gram-negative organisms)
- Meropenem (broad spectrum, aerobic gram-positive/negative and anaerobic coverage. Effective against most highly-resistant enteric gram-negative neonatal infections, such as *Klebsiella* spp., *E. coli*, *Enterobacter* and *Citrobacter* spp.)
- Vancomycin (gram-positive coverage only, e.g. in sepsis due to skin infection or cannula associated infection, resistant to Ampicillin/Cloxacillin/Gentamicin)

Oral Medication:

- Ampiclox Syrup
- Erythromycin (neonatal chlamydia conjunctivitis/pneumonia, pertussis),
- Cephalexin (staphylococcal pustulosis, bullous impetigo).

Dosages of some common antibiotics

AMPICILLIN:

Ampicillin 50 mg/kg IV 12 hourly if age ≤ 7 days
Ampicillin 50 mg/kg IV 8 hourly if age > 7 days

All suspected neonatal meningitis should be dosed at Ampicillin 100 mg/kg/dose, regardless of weight or age. Dosing interval remains the same.

AMPICLOX:

Ampiclox 100 mg/kg IV 12 hourly if age ≤ 7 days
Ampiclox 100 mg/kg IV 8 hourly if age > 7 days

(Dose increased to adjust for ampiclox being 50 % ampicillin and 50 % cloxacillin)

AZITHROMYCIN:

Azithromycin 10 mg/kg/dose every 24 hours for 5 days

CEFOTAXIME:

Cefotaxime 50 mg/kg IV 12 hourly if age ≤ 7 days
Cefotaxime 50 mg/kg IV 8 hourly if age > 7 days

CEFTRIAXONE:

Ceftriaxone 50 mg/kg once daily

In case of severe infection/meningitis 50 mg/kg twice daily

Note: Ceftriaxone may worsen neonatal jaundice by displacing bilirubin bound to serum albumin. Avoid giving to neonates with jaundice. Use cefotaxime when possible.

CEFUROXIME:

Cefuroxime 15 mg/kg IV 8 hourly for 7 days

Cefuroxime should be avoided when possible, due to poor CNS penetration and increased failure rates with gram negative sepsis

CEPHALEXIN:

Cephalexin is indicated for outpatient treatment with mild infection only

Neonates: 15 – 20 mg/kg 8 hourly.

CIPROFLOXACIN:

Ciprofloxacin 10 mg/kg IV every 12 hours.

Ciprofloxacin is not routinely used as first line sepsis therapy, but may be useful in severe neonatal sepsis that is failing gentamicin or cefotaxime/ceftriaxone. There is no evidence of ciprofloxacin harm to cartilage/joints in small infants.

CLOXACILLIN:

Cloxacillin 25 mg/kg IV every 12 hours if age ≤ 7 days
Cloxacillin 25 mg/kg IV 8 hourly if age > 7 days

(*Only use 50 mg/kg/dose* if suspecting staph meningitis in neonate > 7 days old and if used in combination as Ampiclox).

ERYTHROMYCIN:

Erythromycin is used for treatment of chlamydial conjunctivitis, chlamydial pneumonia, and pertussis. It should not be given to treat routine pneumonia or sepsis. Erythromycin is strongly associated with the development of infantile hypertrophic pyloric stenosis, especially when given to neonates.

Erythromycin 15 – 20 mg/kg orally every 8 hours

GENTAMICIN:

Gentamicin 5 mg/kg IV every 24 hours for newborn ≥ 2.5 kg

Gentamicin 3 mg/kg IV every 24 hours for newborn < 2.5 kg

MEROPENEM:

Age < 14 days: 20 mg/kg every 8 hours

Age 15 – 60 days: 30 mg/kg every 8 hours

For meningitis: 40 mg/kg IV every 8 hours

METRONIDAZOLE:

Metronidazole 7.5 mg/kg 8 hourly for 7 days

VI.6 Annex 6: Readiness Assessment tool

VI.7 Annex 7: Discharge and Feedback form

VI.8 Annex 8: Referral form

VI.9 Annex 9: Thompson HIE Score

VI.10 Annex 10: Finnstroem/Ballard score

VI.11 Annex 11: Preterm growth charts

VI.12 Annex 12: Equipment, supplies and drugs for transport of a newborn

VI.13 Annex 13: List of Participants

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