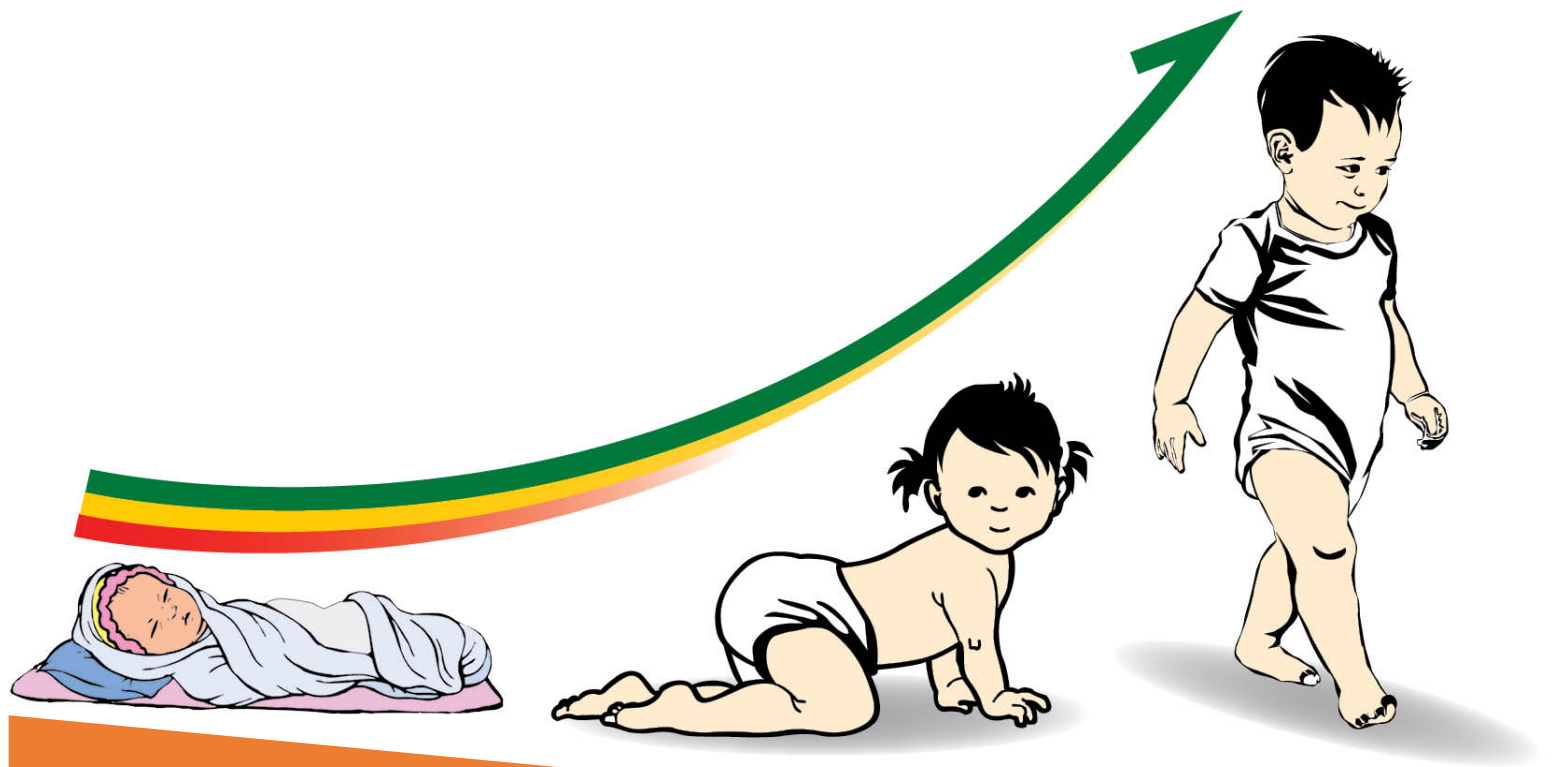


Facility Based Integrated Management of Neonatal and Childhood Illness (FB-IMNCI)



Participant Handbook (Medical Officer)



Government of Nepal
Ministry of Health
Department of Health Services
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IMNCI Section
2074



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**Government of Nepal
Ministry of Health
Department of Health Services
Child Health Division**

**Teku
Kathmandu, Nepal**

Date:

Way Forward

Nepal has achieved remarkable progress in reducing preventable childhood mortality and morbidity in the recent decade. With the remarkable progress in child survival, Nepal has been able to achieve Millennium Development Goals of reducing under-five mortality in the country. Acceleration in reduction of under-five and neonatal mortalities calls for extra efforts in overcoming existing barriers. One of the barriers in improved under-five and neonatal health outcome is timely management of referral cases from peripheral health facilities to district hospitals.

Child Health Division has developed this Facility Based IMNCI package to enable team of district level health workers to manage childhood cases referred from lower level health institutions. The package has been developed through wider consultation with concerned health workers. The package is linked strongly with the on-going Community Based Integrated Management of Childhood Illness (CB-IMNCI).

I would like to thank Mr. Parashuram Shrestha, IMNCI section chief, for taking this initiation. I am thankful to WHO for financial and technical support to develop this package according to Nepalese Context. I would also like to thank all the partners, academia and professional bodies for their valuable inputs in the course of this package development.

Lastly, I heartily request our partners to extend their support for effective implementation of FB-IMNCI for better outcomes in childhood and newborn survival.

***Dr. Bikash Lamichhane
Director,
Child Health Division***



Government of Nepal
Ministry of Health
Department of Health Services

Teku
Kathmandu, Nepal

Date:

Foreword

The progress made by Nepal in reducing Under-five morbidity and mortality has been appreciated by international community. Efforts made in the past through Community Based Integrated Management of Childhood Illness (CB-IMNCI), National Immunization Program, Nutrition program and Safe Motherhood program have contributed to achieve this result. However, the result we have achieved is not yet satisfactory. There is still much to do in order to further reduce Under five and neonatal mortality in the country. Newborn health and still birth remain a major challenge in developing countries like Nepal. Since a large proportion of Under-five mortalities is still occupied by newborn deaths, increasing investment for improving the survival of newborns through universal access to evidence-based intervention is vital.

It gives me an immense pleasure to know that Child Health Division has developed this Facility Based Integrated Management of Neonatal and Childhood Illness (CB-IMNCI) package. The package will be crucial in bridging the existing gap in management of complicated neonatal and childhood illnesses and conditions. With the gradual implementation of this package, further improvement in neonatal and child health can be expected.

I would like to thank Child Health Division and all the stakeholders who are involved in developing this package. I hope it will prove itself to be an important milestone for further improvement in childhood survival in Nepal.

I would like to call upon all the partners, managers and health service providers for the effective implementation of this package.

Dr. Rajendra Panta
Director General,
Department of Health Services

Introduction of Facility Based IMNCI

The Facility Based Integrated Management of Neonatal and Childhood Illness (FB-IMNCI) package includes appropriate management of major causes of childhood and neonatal mortality. The package has been designed specially to address childhood cases referred from peripheral level health institutions to higher institutions. As such, the package is expected to bridge the current gap in appropriate and timely management of childhood cases. The Facility Based IMNCI package has been designed to address the major causes of childhood illnesses especially infection, birth asphyxia, prematurity, low birth weight, pneumonia, diarrhoea, malaria, meningitis, severe malnutrition, severe malnutrition among children.

The interventions in the training manuals are based on the latest available scientific evidence; and the manuals also complement standard comprehensive pediatric textbooks, which should be consulted for management of complications or rare conditions.

About FB-IMNCI training package

Objectives of training:

- To capacitate team of health workers at district hospital with required knowledge and skills to manage complicated under-five and neonatal cases.
- To ensure timely and effective management of referral cases.

Sections:

The Facility Based IMNCI training package consists of following major sections

- a. IMNCI approach
- b. Emergency Triage Assessment and Treatment (ETAT)
- c. Newborn Care
- d. Cough
- e. Diarrhoea
- f. Fever
- g. Malnutrition and Anemia
- h. Other Problems

Participants: Medical Officers, nursing staffs and paramedics from district, zonal, sub- regional and regional hospitals.

Number of participants: 16 per batch

Number of facilitators: 4 per batch

Methods: The methods used for learning will be self-reading, discussion, demonstration, exercise, wall chart presentations, case studies, skill stations and clinical sessions

Total duration: 7 days (5 days' classroom and 2 days' clinical session)

Venue: As decided by Child Health Division

Evaluation:

The participants will be evaluated in terms of knowledge and skills during the training sessions. The knowledge of participants will be evaluated using pre-and post test questionnaire. The skills will be assessed using standard checklist during practical sessions through skill stations and clinical sessions.

Table of Contents

SN	Contents	Page No.
1.	Section 1: General Principles for Management of Sick Children	1 - 1
	Chapter 1: Linkage of CB-IMNCI with FB-IMNCI	1 - 1
	Chapter 2: Integrated Approach to management of Sick Children	1 - 5
	Chapter 3: Communication Skills	1- 16
	Chapter 4: Infection Prevention	1- 19
2.	Section 2: Emergency Triage Assessment and Treatment (ETAT)	2 - 1
	Chapter 1: Introduction to Triage	2 - 1
	Chapter 2: Airway and Breathing	2 - 9
	Chapter 3: Circulation	2 - 26
	Chapter 4: Coma and Convulsion	2 - 36
	Chapter 5: Dehydration	2- 49
	Chapter 6: Basic Life Support	2 - 56
3.	Section 3: Newborn Care	3 - 1
	3.1. Care of normal newborn at birth	3 - 1
	3.2. Breastfeeding	3 - 2
	3.3. Examination of Newborn	3 - 5
	3.4. Criteria for admission to SNCU and transfer to step-down unit and discharge	3 - 7
	3.5. Management of preterm and low birth weight babies	3 - 9
	3.6. Assisted feeding of low birth weight neonates	3 - 15
	3.7. Grading and management of hypothermia	3 - 17
	3.8. Management of Hypoglycemia	3 - 18
	3.9. Intravenous fluid therapy	3 - 22
	3.10. Assessment and management of Jaundice	3 - 24
	3.11. Assessment and management of respiratory distress	3 - 27
	3.12. Assessment and management of neonatal sepsis	3 - 28
	3.13. Resuscitation of asphyxiated newborn	3 - 31
	3.14. Management of newborn with seizure	3 - 32
	3.15. Management of a newborn with hemodynamic compromise	3 - 36
	3.16. Checklist for assessment and management of newborn requiring special care.	3 - 38
4.	Section 4 : Approach to a child with Cough of Difficulty in Breathing	4 - 1
	4.1. Introduction	4 - 1
	4.2. Classification of Children with Cough/ Difficulty in Breathing	4 - 3
	4.3. Cough/Difficulty Breathing of <14 days Children	4 - 4
	4.4. Severe Pneumonia	4 - 6
	4.5. Pneumonia	4 - 12
	4.6. Complications of Pneumonia	4 - 15

SN	Contents	Page No.
	4.7. Upper Respiratory Infection	4 – 17
	4.8. Child Presenting with Wheeze	4 – 18
	4.9. Bronchiolitis	4 – 21
	4.10. Bronchial Asthma	4 – 23
	4.11. Conditions presenting with Stridor	4 – 28
	4.12. Conditions presenting with Chronic Cough	4 – 32
5.	Section 5: Approach to a child presenting with Diarrhoea	5 – 1
	5.1. Diarrhoea	5 – 1
	5.2. Types of Diarrhoea	5 – 1
	5.3. Approach to a child presenting with Diarrhoea	5 – 2
	5.4. Assessing Dehydration	5 – 3
	5.5. Management of Children with Dehydration	5 – 5
	5.6. Dysentery	5 – 10
	5.7. Persistent Diarrhoea	5 – 11
	5.8. ORT Corner	5 – 15
6.	Section 6: Case Management of Children presenting with Fever	6 – 1
	6.1. Introduction	6 – 1
	6.2. Differential Diagnosis	6 – 2
	6.3. Meningitis	6 – 6
	6.4. Septicemia	6 – 9
	6.5. Typhoid Fever	6 – 10
	6.6. Urinary Tract Infection (UTI)	6 – 11
	6.7. Measles	6 – 12
	6.8. Mastoiditis	6 – 17
	6.9. Acute Otitis Media	6 – 18
	6.10. Chronic Otitis Media	6 – 19
	6.11. Malaria	6 – 20
	6.12. Dengue	6 – 28
	6.13. Kalazar	6 – 35
7.	Section 7: Assessment and Management of Malnutrition and Anemia	7 – 1
	7.1. Assessment of Child's Nutritional Status	7 – 3
	7.2. Management of SAM	7 – 10
	7.3. Inpatient Therapeutic Care of Children 6-59 months	7 – 10
	7.4. Outpatient Therapeutic Care	7 – 25
	7.5. Management of SAM in infants <6 months	7 – 28
	7.6. Management of SAM	7 – 31
	7.7. Management of Anemia	7 – 37
	7.8. Blood Transfusion	7 – 40
8.	Section 8: Other Problems	8 – 1
	8.1. Tuberculosis in Children	8 – 1

SN	Contents	Page No.
	8.2. HIV/AIDS in Children	8 – 7
	8.3. Approach to a child with suspected poisoning	8 – 16
	8.4. Developmental delay in Children	8 – 25
	8.5. Common Surgical Problems	8 – 29
9.	Appendix	Appendix – 1
	Appendix 1: Normal Laboratory Values	Appendix – 2
	Appendix 2: Modified Ballard Chart	Appendix – 1
	Appendix 3: Developmental milestones	Appendix – 3
	Appendix 4: Vital Parameters	Appendix – 4
	Appendix 5: Appropriate Sizes of Pediatric Equipment according to age (weight) of child	Appendix – 6
	Appendix 6: Growth Chart	Appendix – 7
10.	References	

SECTION 1

GENERAL PRINCIPLES FOR MANAGEMENT OF SICK CHILDREN

CHAPTER 1: LINKAGE OF CB-IMNCI WITH FB-IMNCI

1.1.1. Causes of child mortality in Nepal

Every year more than 10 million children die in developing countries before they reach their fifth birthday. In Nepal, the under-five mortality rate is 39 per 1000 live births. (NDHS 2016) Majority of these deaths occur within the neonatal period. The neonatal mortality rate is 21 per 1000 live births and infant mortality rate is 32 per 1000 live births. Though Nepal met its Millennium Development Goal target of reducing under-5 mortality to 54 deaths per 1,000 live births by 2015, it has a long way to go to meet the Sustainable Development Goal target of reducing under-five mortality to 28 deaths per 1,000 live births. More challenging is the goal of reducing neonatal mortality rate below 12 per 1000 live births.

The most common causes of infant and child mortality in developing countries including Nepal are perinatal conditions, pneumonia, diarrhoea, malaria, measles and malnutrition (*Figure 1.1*). These are also the commonest causes of morbidity in young children. Many of these deaths may be prevented by early referral of sick children to health facility and providing appropriate treatment.

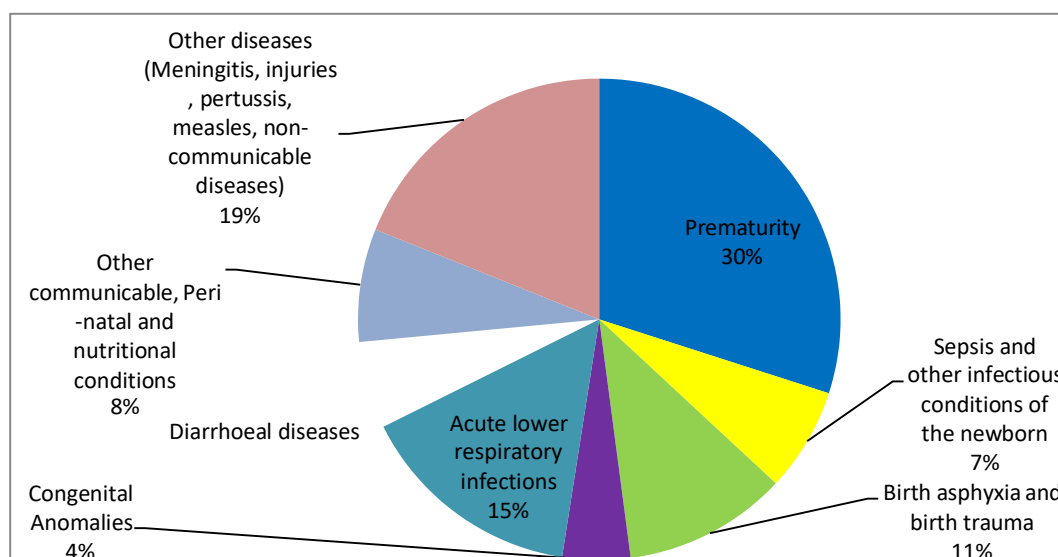


Fig 1.2 Causes of Under Five Child Mortality Estimates of Nepal

Data source: Inter-agency Group for Child Mortality Estimation, 2014 www.childmortality.org

1.1.2. Linkage of CB-IMNCI Programme with FB-IMNCI Programme

Community based Integrated Management of Childhood Illnesses (IMCI) programme was started in 1997 AD and was scaled up to all 75 districts by 2009 as a priority one public health programme of Government of Nepal. To address the burning need to reduce the high neonatal mortality rate, community based Newborn Care Package (NCP) was piloted to 10 districts in 2008 and rapidly scaled up to 41 districts by 2011. However, the assessment of CB-NCP programme in pilot districts in 2012 revealed serious issues, primarily related to coverage and quality of care by FCHVs and the NMR remained stagnant at 33 per 1000 live births, as shown by NDHS 2011. In addition, there was shifting of care seeking behavior of mothers/families towards trained health workers (e.g. substantial increase in institutional delivery). While serious discussions were going on about most cost-effective interventions to reduce neonatal death rates, WHO published the revised generic version of IMCI protocol in 2014, with major changes in classification and treatment of pneumonia and emphasis on illnesses of young infants under 2 months of age. As almost 60% contents of CB-IMCI and CB-NCP programmes were same, there was duplication of resources. In this background, Nepal Government, MoHP Policy level decision was made to merge the two programs (CB-IMCI and CB-NCP) into a single CB-IMNCI Program in 2014 (2071/06/28), along with national adaptation of new WHO IMCI protocol and limiting the role of FCHVs to promotive and preventive health services only.

While CB-IMNCI programme was scaled up to all 75 districts in a phase wise manner, the need for facility based IMNCI programme, focusing on newborn care, was realized, in order

to further reduce the under-five mortality rate, along with neonatal mortality rate. This demanded a referral protocol for the care of sick children referred from the primary care health facilities who used CB-IMNCI protocol. Thus, this programme links to CB-IMNCI programme by focusing on major killer diseases or conditions that were recommended to be referred to higher facility after pre-referral treatment, as per RED classification.

Table 1.1: Linkage of CB-IMNCI with FB-IMNCI Protocol

Disease/Problem addressed	CB-IMNCI Protocol Classifications	FB-IMNCI Protocol Diagnosis
Emergency Conditions	Very Severe Disease (when 1 of 4 General Danger Signs present) <ul style="list-style-type: none"> • Convulsion • Vomits everything • Lethargic or Unconscious • Unable to suck or feed 	Emergency Triage Assessment and Treatment (ETAT)-ABCD approach <ul style="list-style-type: none"> • Airway and Breathing Problem • Shock (Circulation) • Coma and Convulsion • Dehydration (severe)
Cough or Difficulty Breathing	<ul style="list-style-type: none"> • Red: Severe Pneumonia or Very Severe Disease • Yellow: Pneumonia • Green: Cough and Cold 	<ul style="list-style-type: none"> • Pneumonia and its complications • Upper Respiratory Infection • Bronchiolitis • Bronchial Asthma • Croup
Diarrhoea	Acute Diarrhoea <ul style="list-style-type: none"> • Red: Severe Dehydration • Yellow: Some Dehydration • Green: No Dehydration Severe Persistent Diarrhoea Persistent Diarrhoea Dysentery	Acute watery diarrhoea Cholera Dysentery Persistent Diarrhoea
Fever and Ear Problems	Red: Very Severe Febrile Disease or Severe Malaria or Severe Complicated Measles Yellow: Malaria or Measles with mouth or eye complications Green: Measles or Fever	Meningitis Septicemia Typhoid fever UTI Measles Mastoiditis Acute Otitis Media

	<p>Red: Mastoiditis</p> <p>Yellow: Acute or Chronic Ear Infection</p> <p>Green: No ear infection</p>	<p>Chronic Otitis Media</p> <p>Malaria</p> <p>Dengue</p> <p>Kala-azar</p>
Malnutrition and Anemia	<p>Red: Severe Acute Malnutrition, Severe Anemia</p> <p>Yellow: Moderate Acute Malnutrition, Anemia</p> <p>Green: No malnutrition, No anemia</p>	<p>SAM (6 months to 5 years)</p> <p>SAM (< 6 months)</p> <p>MAM</p> <p>Nutritional Anemia</p>
Others	<p>Red: HIV Infected</p> <p>Yellow: HIV Exposed</p> <p>Green: No HIV Infection</p>	<p>TB</p> <p>HIV/AIDS</p> <p>Suspected poisoning</p> <p>Developmental delay</p> <p>Common surgical problems</p>
Newborn Care	<p>Essential Newborn Care</p> <p>Management of asphyxiated newborn</p> <p>Examination of Newborn</p> <p>Red: Possible Serious Bacterial Infection, Severe Jaundice, Severe Hypothermia</p> <p>Yellow: Local Bacterial Infection, Jaundice, Hypothermia</p> <p>Green: No Infection</p> <p>Red: Severe dehydration, Severe Persistent Diarrhoea, Dysentery</p> <p>Yellow: Some dehydration</p> <p>Green: No dehydration</p> <p>Yellow: Breastfeeding Problem or LBW</p> <p>Green: No breastfeeding Problem</p>	<p>Care of normal newborn at birth</p> <p>Examination of newborn</p> <p>Breast feeding and assisted feeding</p> <p>SNCU admission and discharge criteria</p> <p>Preterm and LBW</p> <p>Hypothermia</p> <p>Hypoglycemia</p> <p>Jaundice</p> <p>Respiratory distress</p> <p>Neonatal Sepsis</p> <p>Management of asphyxiated newborn</p> <p>Neonatal seizure</p> <p>Hemodynamic compromise (shock)</p> <p>Assessment and management of newborn requiring special care</p>

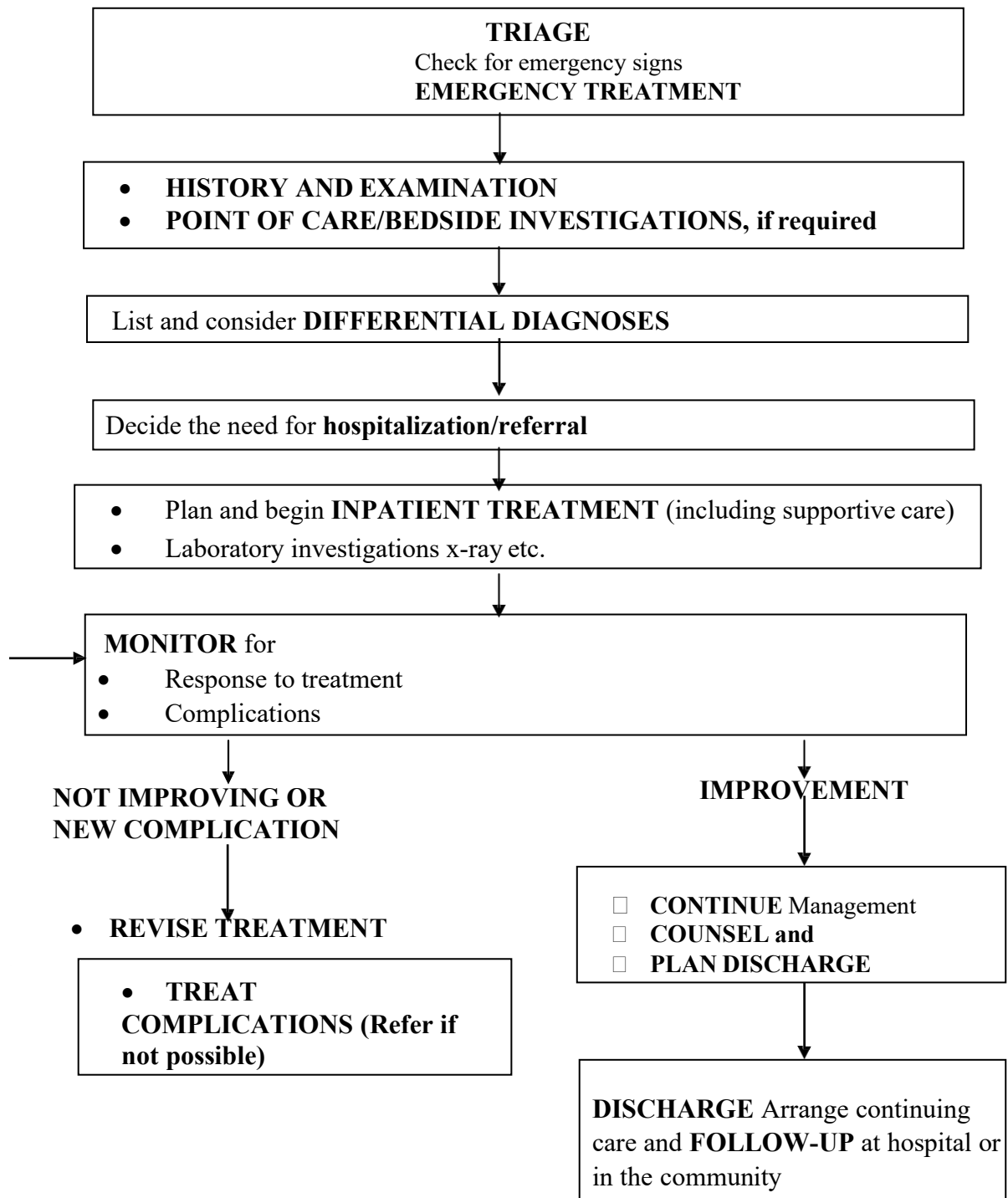
CHAPTER 2: INTEGRATED APPROACH TO MANAGEMENT OF SICK CHILDREN

1.2.1. Introduction

IMNCI referral protocol for secondary level of care (District Hospitals) is symptom-based in its approach, with the symptoms following the sequence of the IMNCI guidelines: cough, diarrhoea, fever. The diagnoses also closely match the CB-IMNCI classifications, except that the expertise and investigative capabilities that are available in a hospital setting allow classifications like “very severe disease” or “very severe febrile disease” to be defined more precisely, making possible such diagnoses as very severe pneumonia, severe malaria, and meningitis. Classifications for conditions such as pneumonia and dehydration follow the same principles as the CB-IMNCI. The severely malnourished child is considered separately (see section 7), because these children require special attention and treatment if the high mortality is to be reduced.

The following algorithm shows the steps to be followed when any sick child presents to the hospital. First step is triage and providing treatment to children with emergency signs, which is described in section 2.

Chart 1.1: Steps in the management of children brought to hospital



First step is triage and providing treatment to children with emergency signs, which is described in section 2.

1.2.2: Taking history in children

History taking generally starts with understanding the presenting complaint. Record what the mother/ caregiver tells you about the child's problems. Use good communication skills (given in section 1.10) when interacting with mother.

- Greet the mother appropriately and offer her a seat to sit with her child
- Ask the mother - what the child's problem is?
- Use words that mother understands
- Listen carefully to what she tells you
- Give her time to answer the questions
- Ask additional questions when she is not sure about the answer.

Take history of the present illness. You will learn more about the symptom-specific history in subsequent sections. The feeding history of infants and younger children is essential, as this is the age when malnutrition begins. For children, birth history, information on immunization and development milestone is also important. The history is obtained from a parent or caretaker in younger children.

1.2.3: Physical examination

- All children must be examined thoroughly, so that important signs are not missed.
- In contrast to the systematic approach for adults, examination of a child should be organized in a way that does not upset the child. The approach to examine children should be flexible. General principles of examination is:
 - Do not upset the child unnecessarily.
 - Let the child be with mother or care giver.
- Observe as many signs as possible before touching the child:
 - Does the child speak, cry or make any sound?
 - Is the child alert, interested and looking around?
 - Does the child appear irritable or drowsy or having a seizure?
 - Is the child vomiting?
 - Is the child able to feed?

- Is the child cyanosed or pale?
- Does the child show signs of respiratory distress?

These signs should be recorded before the child is disturbed. You might ask the mother or caretaker to cautiously reveal part of the chest to look for lower chest wall in drawing or to count the respiratory rate. If the child is distressed or crying, he or she might have to be left for a brief time with his/her mother in order to settle, or the mother could be asked to breastfeed, before key signs such as respiratory rate can be measured. Then proceed to signs that require touching the child but are minimally disturbing, such as feeling the pulse or listening to the chest or heart. You obtain limited useful information if you listen to the chest of a crying child. Signs that involve interfering with the child, such as recording the temperature, testing for skin turgor, capillary refill time, blood pressure or looking at the child's throat or ears should be done at last.

1.2.4: Point of care/bedside investigations

Perform investigations relevant to history and examination findings. Some of the tests may be easily performed at the bedside (so called as point of care tests). Important investigations relevant to sick children include complete blood count, blood sugar, routine urine examination, and rapid diagnostic tests for malaria. In addition, other investigations may be needed in hospitalized patients.

1.2.5: Differential diagnosis

After the assessment has been completed, consider the various conditions that could cause the illness in the child and make a list of possible differential diagnoses. This helps to ensure that wrong assumptions are not made, a wrong diagnosis is not chosen, and rare problems are not missed.

Remember that a sick child might have more than one clinical problem requiring treatment.

1.2.6: Decide need for admission (Hospitalization) or referral

Children need hospitalization if they have emergency signs or priority signs for which they need investigations or if they need work-up for underlying conditions. Examples of common

conditions for which children need investigations are:

- Fever lasting more than 7 days
- Generalized swelling
- Severe pallor/anemia
- Poor growth/weight gain in spite of dietary counseling
- Persistent diarrhoea

If child needs some special treatment and referral, give pre-referral treatment before sending.

Any newborn with following criteria should be immediately admitted to the SNCU:

1. Birth weight <1800 gm or gestation <34 weeks)
2. Large baby (4 kg or more)
3. Perinatal asphyxia
4. Apnea or gasping
5. Refusal to feed
6. Respiratory distress (Rate 60 or more/min or grunt/retractions)
7. Severe jaundice (Appears<24 hrs/stains palms & soles/lasts>2 weeks)
8. Hypothermia less than 36°C (96.8°F), or hyperthermia ($\geq 37.5^{\circ}\text{C}$, $\geq 99.5^{\circ}\text{F}$)
9. Central cyanosis
10. Shock (cold periphery with CRT>3 seconds and weak & fast pulse)
11. Coma, convulsions or encephalopathy
12. Abdominal distension
13. Diarrhoea/dysentery
14. Bleeding
15. Major malformations

1.2.7: Inpatient Care

All admitted children should receive appropriate treatment for the most probable diagnosis and supportive therapy.

Diagnosis

Depending on the availability of laboratory and imaging services in the hospital, investigations should be done to help confirm or refute the diagnosis.

Specific treatment:

Specific treatment is provided to the patient according to the diagnosis. However, empirical treatment is started based on possible differential diagnosis.

Supportive care

1. Oxygen therapy (see section 2.2.7)
2. Fluid therapy (see section 2.3.9)
3. Management of fever (see section 6)
4. Pain control (see 8.5.5)
5. Play therapy and distraction

Monitoring

Monitoring is a critical component, which is often neglected in inpatient care. Many conditions are dynamic and may be apparent on subsequent examinations.

Key aspects in monitoring the progress of sick children are:

- Making a plan to monitor the child regularly.
- The frequency of monitoring, which will depend on the nature and severity of the child's clinical condition.
- Using a standard chart to record essential information to facilitate prompt identification of any problems that require change in treatment.
- Bringing these problems to the attention of the doctors who may decide for change of management if necessary.

Chart 1.2 The sample monitoring chart for a sick child is given below.

Parameter/ time	Adm	Hours											
		2	4	6	8	10	12	16	20	24	28	32	36
Temp													
HR													
RR													
SpO ₂													
BP													
Urine output 8 hourly (ml/kg/hr)													
Blood glucose													
Electrolytes													
BUN													

1.2.8: Discharge and follow up

Careful monitoring of the child's overall response to treatment and correct planning of discharge from the hospital are just as important as making the diagnosis and initiating the treatment. The discharge process for all sick children should include:

- Counseling the mother on correct treatment and feeding of the child at home.
- Ensure age appropriate immunization before discharge and remind the mother about the date and place of child's immunization visit.
- Communicating with the health personnel who referred the child or who will be responsible for follow-up care. Provide discharge card or a referral not as this will lead to more appropriate referrals to hospital and better relationship between hospital and community health workers.
- Instructing mother on when to return for follow-up care and looking for signs indicating the need to return immediately.
- Assisting the family with special support (eg. providing equipment for a child with disability)
- Children who are discharged from the hospital should return for follow-up care to the hospital or if this is not possible then to a first level referral facility for checking the child's condition in relation to the present problem. Services of community health workers should be utilized wherever available.
- Advise mothers to return immediately if the child develops any of the danger signs (Box 1.1.)

Box 1.1: When to Return Immediately

- Not breastfeeding or drinking poorly.
- Becomes sicker.
- Develops a fever or feels cold to touch.
- Fast breathing.
- Difficult breathing.
- Diarrhoea with blood in stool.

1.2.9. Safe Transport of sick children including newborn

Introduction

From the moment a perinatal problem is recognized to the point of its resolution, there is a continuum of care. A common feature of disease in the neonatal period is a rapidly progressive course. Use of special centers for the treatment of the sick newborn has been accompanied by improvement in survival, and the safe transfer of these infants to the center is an important part of their overall care. Appropriate stabilization, initiated on recognition of a problem, is necessary throughout the transfer process.

Constraints in transport of sick children

In developing countries, the problem of transporting small and sick neonates is compounded by several practical constraints like:

- Facilities are scarce and not easily available
- Families have poor resources
- Organized transport services are not available. At times the baby may have to be transported on foot or on bullock cart.
- No health provider is available to accompany the baby
- Facilities are not fully geared up to receive sick neonates
- Communication systems are non-existent or inefficient

Preparation before transport

- Stabilize before transport

1. Assess

Make careful assessment of the baby. Make sure that there is a genuine indication for referral.

2. Correct hypothermia

Normalize the temperature before commencing the transportation.

3. Write a note

Write a precise note for the providers at the referral facility

- Details of the baby's condition
- Need for referral
- Treatment given to the baby.

4. Encourage mother to accompany

- Mother should accompany the baby for breast feeding and for providing supportive care to the baby on the way and in the hospital

5. Arrange a provider to accompany

- If feasible doctor/nurse/health worker should accompany the baby

6. Communication

- Explain the condition, the prognosis and the reasons for referral of the baby to the family

- Explain where to go and indicate whom to contact.
- Inform the referral facility beforehand, if possible

Assess and Stabilize

It is of utmost importance that a neonate is stabilized before the transport is begun, as an unstable neonate is going to deteriorate on the way and may reach the referral facility in a moribund state defeating the very purpose.

i). Temperature:

Assess temperature by touch or by using a thermometer.

- Hypothermia (Warmed either under a warmer or by providing KMC).

ii). Airway:

Assess the airway for patency

- Position of the neck
 - correct position putting shoulder roll
- Secretions in mouth/nose
 - Suction
- Chest movements

iii). Breathing:

Assess the baby for breathing efforts

- Tactile stimulation
- Ventilation using a bag and mask with 100% oxygen

iv). Circulation:

Assess the status of circulation

- pulse volume and capillary refilling time
 - CRT > 3 seconds and/or peripheral pulses are poor with normal temperature
 - Fluid bolus of 10ml/kg normal saline or Ringer lactate should be provided over 20-30 minutes (in neonates)
 - Reassess for need of further boluses.

v). Fluids:

If the neonate to be transported is sick and cannot be fed

- Maintenance fluid based on birth weight and day of life
- Presence or absence of abnormal losses needs to be calculated and started

vi). Medications:

Assess the need for antibiotics, anticonvulsants vitamin K

vii). Feeding:

Assess the baby for feeding using

- Cup or gavages
- Directly at the breast.
- If the neonate can be fed, he should be fed enterally.

Care during transport

The accompanying person should be explained to ensure the following:

- 1. No Noxious stimuli**
- 2. Emergent**
 - a. Stabilize and arrange for early referral
- 3. No sepsis**
 - a. Infection control practices during transport with minimal handling
- 4. Stabilize prior to transport**
- 5. Maintenance of warm chain while transport of neonate**
 - a. KMC
 - b. Properly covered in cotton or cloth
 - c. Improvised containers
 - d. Transport incubator
- 6. Prevention of hypoglycaemia**
 - a. Provide feeds**
 - i. If baby is in a position to suck on the breast, he should be offered breast feeds.
 - ii. If he can take spoon feeding, expressed breast milk can be provided carefully.
 - iii. If the distance is long, a nasogastric catheter may be inserted and gavage feeding given
- 7. Maintenance of airway and breathing**
 - a. Keep the neck of the baby in slight extension
 - b. Do not cover the baby's mouth and nose
 - c. Gently wipe the secretions from the nose and the mouth with a cotton or cloth covered finger.
 - d. Check breathing
 - i. Watch baby's breathing
 - ii. If the baby stops breathing, provide tactile stimulation to the soles to restore it.
- 8. Educate the parents about danger sign while transport**
- 9. Triage of sick newborn and children**

Triage is sorting of neonates to rapidly screen sick babies for prioritizing management

Checklist 1.1 Transfer Checklist

Name: _____ **Age:** _____ **Sex:** _____ **Hospital number:** _____
Date of transfer: _____ **Time of transfer:** _____ **Reason for transfer:** _____
Transfer from: _____ **Transfer to:** _____

Doctor/ health worker accompanying the patient: _____

When potential transfer is identified	Check
• Identify the problem and the reason for transfer	
• Inform the doctor/ senior health worker on call	
• Inform parents	
• Ensure that the problems of the patient is communicated to the receiving unit	
• Ensure the receiving unit is happy about the transfer and bed is available	
• Identify transfer 'team'	
• Evaluate urgency of transfer	
• Prepare equipments for transfer	
• Book ambulance (with oxygen) and ensure that the ambulance will take the transfer team back to our hospital	
Patient preparation	
• Patient must have a 'definitive' airway. If in doubt, continue bag and mask throughout the way	
• Ensure normal blood glucose and counsel on how to prevent low blood sugar	
• At least one reliable intravenous access should be obtained	
• For short transfers and/ or for older children, maintenance fluid may sometimes be omitted but must be carried in case of unexpected delays	
• For neonates, intravenous fluid should be continued viaburette set	
• Ensure patient is wrapped properly to prevent hypothermia	
Equipment preparation	
• Resuscitation box – Bag and mask, normal saline, epinephrine, syringes	
• Portable pulse oximeter if available	
• Full portable oxygen and spare if long distance	
• Patient's transfer notes, x-rays, investigation reports	
• Ensure the transfer team has a mobile phone, the receiving unit's contact number and the contact number of a doctor on call	
• Money for emergency	
• Confirm route to receiving hospital	

Time of leaving the referral unit:

Vital signs on leaving the referral unit

- Temperature:
- Heart rate:
- Respiratory rate:
- CRT:
- SpO2:

Time of arrival at the receiving unit:

Vital signs on arrival at the receiving unit:

- Temperature:
- Heart rate:
- Respiratory rate:
- CRT:
- SpO2:

Adverse events during transfer (if any):

Name and signature of the doctor/ health worker

.....

Chart 1.3: Sample referral note- neonate

Date _____ Time _____

Address _____

Name _____ Mother's name _____ Father's name _____

Date and Time of Birth _____ Sex _____ Mother's Blood GP: _____

Birth Details

Mode of Delivery _____ Place of Delivery _____

Time of 1st Cry _____ Apgar 1 min _____ 5 min _____ 10 min _____

Resuscitation details Initial steps/Free flow oxygen/Bag and Mask Ventilation / Chest compressions/ Medications

Birth weight _____ grams

Clinical course

Feeding well Yes/No, Breast feeds Yes/No, Spoon Feeds Yes /
No

Type of feeds EBM / Formula / Any other milk Diluted Milk Yes / No

Passage of Urine Yes / No Stool Yes / No

Reason for transfer LBW / Respiratory distress / Not feeding well / Convulsions / Jaundice / Malformation / Birth asphyxia / Any other

Examination Findings

Jaundice Yes / No Any congenital malformation _____

Soles Warm/Cold, Trunk Warm/Cold, Temperature _____ °C

Heart Rate _____/min Resp Rate _____/min Chest Retractions Yes/No

Central Cyanosis Yes / No CRT < 3 sec / > 3 sec

Receiving oxygen Yes / No With Nasal Cannula / Face mask / Hoodbox

SpO₂ _____% Blood sugar _____ mg%

Time of last feed _____ am/pm

Investigations with date

Treatment given

Place to which being referred _____

Mode of transport _____ Accompanying person _____

Name and Phone Number of person at Referral Hospital _____

Signatures, Name, Date and Time

Chart 1.4: Sample referral note- Child beyond neonatal period

Date _____ Time _____

Address _____

Name _____ Mother's name _____ Father's name _____

Age _____ Sex _____ Mother's Blood GP: _____

Relevant history:

Relevant findings:

Vitals- HR- /min	RR- /min	Temperature- deg C	SpO2- %	BP- mm of Hg
Dextrostix- mg/dl	Receiving oxygen- Yes/No			
Receiving IVF-Yes/No	Fluid- Rate-			
Feeding- Yes/No	Type-	Time of last feed-		
Pallor-	Icterus-	Cyanosis-	Lymphadenopathy-	Edema-
Nutritional status- (Z score)	Wt for age-	Ht for age-	Wt for ht-	

Systemic Examination-

CVS-

Chest-

Per abdomen-

CNS-

Reason for transfer:

Relevant Investigations with date

Treatment given

Place to which being referred _____

Mode of transport _____ Accompanying person _____

Referral Hospital-

Name-

Phone No.-

Referring Hospital-

Signatures-

Name-

Date-

Time-

Phone no.

1.3. Provide effective and empathetic counseling

Good communication skills are essentially the techniques you can use to show the mother or family that you care and respect them and that you want to help. Good communication skills also involve body language; every gesture or action you make should be culturally appropriate.

1.3.1 The good communication skills include;

a. Showing respect

- Greet mother appropriately and ask her to sit with her baby
- Treat the mother as someone who can understand her baby's health problems and can make good decisions about care

b. Not being judgmental

- Never blame a mother/caregiver for the baby's problem, cultural practices, or past decisions she has made.

c. Speaking clearly and using words the mother understands

- Communication should be understood by both the health worker and the mother. If possible, speak with the woman in the language with which she is most comfortable.

d. Listening actively

- Listen to what the mother says and how she says it
- Maintain silence for some time. Give the mother time to think, ask questions, and talk.
- Offer feedback to encourage the mother to continue.
- Summarize what the mother has said.
- Provide praise and encouragement for positive behavior or practices

e. Use body language

- Smile.
- Maintain eye contact while talking and listening.
- Speak gently.
- If culturally suitable and acceptable, touch the mother gently on her arm or shoulder.

f. Encouraging the woman to voice her concerns and ask questions

- Answer her questions honestly

g. Respecting the mother's right to make decisions about her own health care and that of her baby

- It is your responsibility to give the woman all the information she needs to make a decision, not to make the decision for her

h. Listening to what the mother has to say

- Give her enough time to tell you what she thinks is important.

1.3.2 Types of information to be provided during hospitalization

Communication begins right at the time of admission of the child to the hospital till the time child is discharged or referred to higher center and during follow up visit. Parents need to be informed at each step of the patient care which includes

- The reasons for admission
- Initial diagnosis of the patient at the time of admission
- Outline management plan
- Initial/current prognosis
- Daily progression
- Changing clinical course /adverse event
- Information and consent regarding any intervention/procedure
- Reasons for referral and care during transport in case of emergency referral to higher centers
- Follow up information in case of discharge

Remember information provided should be

- Practical and in simple language easily understood by the parents/relatives
- Should be of immediate relevance
- Do not flood the parents with too much information at a single contact

- Avoid use of technical words
- Information provided may require repetition for the parents to understand it
- Timing of providing information is crucial. Fix up a specific time daily
- Discussion should be unhurried and relaxed
- Preferably provide bedside information so that the parents are oriented to the current situation of the baby
- Any bad news/adverse event should be disclosed in a quiet and private setting
- Documentation of the information provided to the parents is important. Hence document and put the signature of parents especially after explaining poor prognosis/adverse events.

1.3.3 Levels of communication

i. Communication at the time of admission

Discussion should be done after stabilization of the child. Give honest opinion about the condition of the baby.

ii. Communication during stay

Communicate with the parents about the condition, treatment plan of patient every morning and evening and clear their doubts and queries about the condition of the child more frequently if required. Mother should also be involved in the care of the child whenever possible.

iii. Communication in case of death

If the child is critically ill, the family members should have been prepared for any eventuality. As soon as possible sit down with the parents to tell them about the condition of the child. The exact cause of death should be informed to the parents in the simple language.

iv. Communication on discharge

Give standardized information to ensure that every family member receives uniform information. The family may be counseled regarding care, nutrition, immunization and follow up. Parents should be encouraged to contact the hospital for any queries and write contact number in discharge sheet. Communication at the time of referral to a higher center.

Explain clearly to the parents about clinical condition and reasons why the child needs referral. Explain where to go, how to go and whom to contact on reaching. Explain the care that baby requires during transport.

1.3.4. Counseling

Good communication skills are a significant part of counseling. When you counsel, you talk person-to-person to help someone. If you use good communication skills, your counseling will be more effective.

CHAPTER 4: INFECTION PREVENTION

Infection is a leading cause of death in neonates and children. The neonatal sepsis accounts for one thirds of neonatal death. A good antenatal care with immunization against tetanus, adequate treatment of infections in mother decreases the incidence of infection in the newborn babies. Along with antenatal preventive care, the simple infection preventive steps at home and health care facility adds on to reduces the chances of newborn and children getting infected as well as reducing the risk of health care worker getting exposed to infected persons. Every hospital should have written policies of infection prevention. Prevention of infection is more cost effective than treating infection.

1.4.1 Sources of infection in newborn and sick babies

Newborn with immature immune system, sick babies, premature and low birth weight babies are always at high risk of developing infection. The infection is spread or caused by;

- Touching
 - Touching an object that is dirty or contaminated spreads germs and contaminates the hands.
- Blood and body secretion
 - By a mother to her baby during pregnancy, birth, or with breastfeeding.
 - By contact with blood or amniotic fluid from an infected person.
- Air
 - Infectious germs coughed into the air by an infected person and passed to others who breathe in the air.
- Food and water
 - Contaminated food and water (bottle feeding).

1.4.2 Common precautions for infection prevention to be taken during inpatient care of children:

While caring for the sick children, certain precaution needs to be taken routinely to protect both health care workers and patients from contact with infectious materials and prevent infection.

These are as follows:

- Follow universal precautions
 - o Consider every person as potentially infectious
 - o Wash hand and wear gloves before every procedure
 - o Wear protective clothing.
 - o Use aseptic technique.
 - o Protect yourself from blood and other body fluids during deliveries and procedures.
 - o Practice safe waste disposal.
 - o Prevent injuries with sharps.
- Use clean clothes
- Keep the newborn unit/patient care room clean.
- Isolate babies with infection to prevent nosocomial infections.
- Keep separate spirit and povidone iodine swab containers, stethoscope, measuring tape and thermometer for each baby.
- Change IV set daily (as per feasibility).
- Use syringe, suction catheter once only
- Feeding tubes can be left alone as long as baby can keep (maximum upto 7 days)
- Do not keep fomites on the baby cot.
- Change the solution in suction bottles and sterile water in oxygen chamber every day and sterilize the bottle daily by dipping in 2% gluteraldehyde for 4-6 hrs.
- Do not use a single dextrose/saline bottle for >24 hours.
- There should be a separate IV fluid bottle for each baby.
- Label the bottle with date and time of opening.
- Use syrup within 1 week of opening.
- Antibiotics vials to be changed after 24 hours.
- Use separate IV set for giving antibiotics.

1.4.2 Basic requirements to follow infection prevention:

- Running water supply.
- Soap.
- Elbow or foot operated taps.
- Strict hand washing practice
- Adequate amount of disposables, such as; sterile gloves, needle and syringe,

- Disinfectant/antiseptic solutions.
- Instrument decontamination with 0.5% chlorine solution (virex) for 10 minutes
- Strict adherence to asepsis routines and good housekeeping.
- Rational use of antibiotics.

1.4.3 Common infection preventive procedure

A. Hand washing

- It is the single most important means of preventing nosocomial infections.
- It is very SIMPLE and CHEAP.
- 2 minutes hand washing to be done before entering the unit.
- 20 seconds hand washing to be done before and after touching babies.
- Wash hands with soap and water.
 - Before and after caring/touching for newborn and before any treatment procedure
 - Whenever hands (or any other skin area) are contaminated with blood or other body fluids
 - After removing gloves, because they may have holes
 - After changing soiled napkins or clothing
 - Keep nails short and do not apply nail polish

Preparing for hand washing:

- Remove jewelry (rings, bracelets) and watches before washing hands
- Ensure that the nails are clipped short
- Roll the sleeves up to the elbow.

Steps of Hand washing

- Wet the hands and wrists, keeping hands and wrists lower than the elbows (permit the water to flow to the fingertips, avoiding arm contamination).
- Apply soap and lather thoroughly.

- Palms and fingers and web spaces by putting right palm over the left and then left over the right
- Palm to palm and finger interlaced
- Back of the finger to opposing finger over-locked
- Rotational rubbing of right thumb clasped in left palm and vice versa
- Rotational rubbing backwards and forwards with tops of the fingers and thumb of right hand in left and vice versa
- Wash wrist and forearm up to elbow
- Do not lower hand i.e. keep hand folded at elbow
- Close tap with elbow
- Dry hand using sterile cloth / or dry hand in air
- Hand rinsing with alcohol is not a substitute for proper hand washing.
- If running water is not available, use a bucket and pitcher. Do not dip your hands into a bowl to rinse, as this re-contaminates them.



Palm to palm



right palm over left and vice versa



Palm to palm, finger interlaced



Back of fingers to opposing
finger interlocked



Rotational rubbing of right thumb
clasped in left palm



Rotational rubbing of tips of
right fingers and thumb over
left palm and vice versa

Figure 1.3: Hand washing technique

B. Wearing sterile gloves

Indication for wearing sterile gloves

- Wear sterile gloves
 - Receiving baby at delivery
 - Cutting cord and applying 4% chlorhexidine gel
 - Eye care
 - Invasive procedure
 - Blood sampling
 - Venous/umbilical catheterization
 - Urethral catheterization or supra-pubic tap for urine collection
 - Starting IV lines and giving IV/IM injections
 - Giving skin, umbilical or eye care when infected

Procedure for wearing sterile gloves

- Scrub hands thoroughly with soap and water.
- Dry them completely
- Open the glove packet carefully without touching the gloves or the inside surface of the packaging material (The cuffed gloves should be with the palms up)
- Pick up the first glove by the cuff, touching only the inside portion of the cuff (the inside is the side that will be touching your skin when the glove is on).
- While holding the cuff, slip your other hand into the glove (Pointing the fingers of the glove toward the floor will keep the fingers open)
- Be careful not to touch anything, and hold the gloves above your waist level.
- Pick up second glove by sliding fingers of the gloved hand under the cuff of the second glove.
- Be careful not to contaminate gloved hand with ungloved hand as the second glove is being put on
- Put second glove on ungloved hand by maintaining a steady pull through the cuff
- Roll back cuffs (unfold them).

- Adjust the glove fingers until the gloves fit comfortably
- Once sterile gloves are on, hold your hands up and away from your body and always above your waist.
- After a procedure, rinse gloves in chlorine solution while still on hands, including disposables
- After the procedure, always wash gloved hands to remove the blood stains and secretions and rinse gloves in chlorine solution while still on hands, including disposables
- Turn gloves inside out as you take them off and put into 0.5% chlorine solution
- Wash hands again with soap and water.

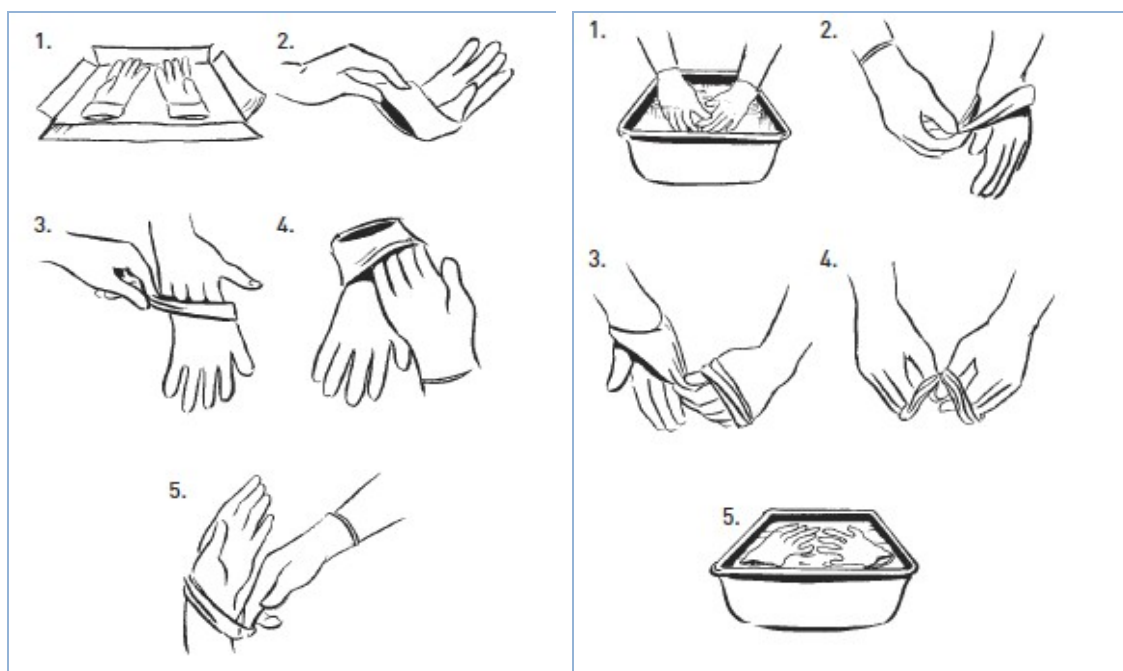


Figure 1.4: proper technique to wearing and removing sterile gloves

C. Skin preparation

Indication

- Before IV cannulation or IM injection.
- For collection of blood samples for culture sensitivity and other investigations.

Steps of venipuncture

- Wash and dry hands.
- Wear sterile glove.
- Prepare skin site, confine to smallest area (5 cm) of skin.
- Swab with alcohol first, allow it to dry.
- Swab with iodine on site and allow it to dry.
- Swab again with alcohol to wipe off iodine.
- Skin is now ready for puncture or prick.

D. Safe disposal of waste

The proper disposal of hospital waste is very important to prevent spread of infection in hospital to other patients, health care workers and prevent the community from contracting infection from hospital waste.

- Needle and syringe
 - Burn needle with needle burner and cut the hub of the syringe with hub cutter
 - Put these in a separate disposable box (Puncture-proof container)
 - Send for incineration when box is three-quarter full
- Blood and body tissue
 - Burn or bury solid waste
 - Send for incineration in leak proof plastic bags
 - Liquid waste into flushable drain if drainage system does not mix with stream
- Contaminated laundry
 - Rinse off contaminated clothes with gloved hand.
 - Do not mix with others
 - Wash with soap

E. Terminal Disinfection

- Terminal disinfection is done after transferring out, discharge or death of a baby
- Preferably all items of the baby to be kept in the incubator Otherwise one can just do routine cleaning thoroughly
 - Cleaning of bed:
 - Clean the radiant warmer with soap water 2% (Disinfectant solution such as bacillocid)
 - Use autoclaved linen
 - Put all the contaminated instruments in 0.5% virex for 10 minutes for decontamination




Table 1.2: Methods of cleaning different equipment






Articles	Methods	Frequency
Feeding utensils	Wash with soap and water and then boil for 10 mins	Before each use
Swab container, injection & medicine tray	Wash with soap and water and autoclave	Daily morning
Oxygen hood	Soap and water	Daily
Weighing scale	2% Disinfectant solution (such as bacillocid)	Daily
Stethoscope	Spirit swab	Daily
Body Linen	Wash and autoclave	Every use
Cotton gauze	Autoclave	As required
Procedures sets	Autoclave	Every use
Incubator	Soap water/ 2% Disinfectant solution (such as *bacillocid - not occupied)	Daily
Cheattle forceps	Autoclave	Daily
Resuscitation bag and reservoirs, oxygen tubing, bottle and tubing of suction machine	Soap and water. Immerse in gluteraldehyde for 4-6 hrs. Rinse in distilled water	Weekly for resuscitation bag and reservoir. Daily for others.

Articles	Methods	Frequency
Face mask	Clean with soap and water, immerse in 2% glutaraldehyde for 20 mins, rinse in distilled water, dry and wrap with autoclaved linen	Daily and after each use
Laryngoscope	Clean with spirit swabs thoroughly daily and after each use. Wrap in autoclaved cloth.	If used in infected baby, wash with soap and water. Put the blade in 2% glutaraldehyde after removing the bulb.

* **Bacillocid (each 100-gm composed—1,6, dihydroxy2,5 Dioxy hexane11.2 gm, Glutaraldehyde 5.0 gm, Benzylkonium chloride 5.0gm, Alkyl urea derivatives 3.0gm)**

Table 1.3: Recommended color-code for the container, labeling and international signs for segregation of Health Care Waste

Waste category, symbol and labeling		Color code for container	Examples of wastes
Non-risk health care waste	Non-risk waste Biodegradables	Green	Left over stuff foods, gardens, fruits peels, flowers, etc.
	Non-risk waste recyclable 	Dark blue	Non-biodegradable, which can be recycled: plastic bottles, cans, metals, glass, plastics, papers, rubber, etc.
	Other non-risk health care waste	Light blue	Other health care waste that do not belong to bio-degradable and recyclable.
HCW requiring special attention	Pathological waste 	Red	Human body parts, organs
	Hazardous sharps 	Red	Needles, glass syringes with fixed needles, scalpels, blades, glass, etc. which may cause puncture and cuts
	Pharmaceuticals	Red	Unused and date expired drugs
	Cytotoxic	Red	Waste with anti-neoplastic effect

	pharmaceutical waste 		such as: alkylated substances, anti-metabolites, antibiotics, plant alkaloids, hormones, etc.
Infectious and Highly infectious waste	Hazardous infectious waste 	Brown	Discarded items contaminated with blood and body fluids from clinically confirmed infected patients including cotton, dressing materials, soiled plaster, linen, bedding, swabs, gloves, syringes without needle, infusion equipment without spike, bandages, other materials contaminated with blood, dialysis equipment, blood from patients infected with HIV, viral hepatitis, brucellosis, respiratory tract secretion from patients infected with TB, anthrax, rabies.
	Highly infectious waste 	Brown	Waste generated from the microbiological cultures, laboratory waste, such as sputum cultures of TB laboratories, highly concentrated microbiological cultures
Other hazardous waste	To be discarded by authorized staff only 	Yellow	Waste with high content of heavy metals, such as batteries, pressurized container, organic and inorganic chemicals
Radioactive waste	Radioactive waste 	Black	Waste includes solid, liquid and gaseous waste contaminated with radionuclides such as Cobalt, Technetium, Iodine, Iridium, generated from in-vitro analysis of body tissue and fluid, in-vivo body organ imaging and tumor localization

SECTION 2

EMERGENCY TRIAGE ASSESSMENT AND TREATMENT

CHAPTER 1: INTRODUCTION TO TRIAGE

2.1.1. Case Scenario

A nine-month old baby boy is carried into the outpatient department of a district hospital in his mother's arms. He appears to be asleep. At the triage desk he is seen by a nurse and found to have lips and tongue that are grey/blue in color, and he is taken straight into the resuscitation room as an emergency.

In the resuscitation room he is given oxygen from an oxygen concentrator. He is noted to be grunting and breathing very fast. His hands are cold to touch and the capillary refill time is prolonged to four seconds. An intravenous cannula is placed. Blood sample is taken at the same time for blood glucose, hematocrit and other investigations. A normal saline is started at 20ml/kg to run as fast as it can go.

Other treatments are given, depending on the result of the investigations and the response to the treatment he receives. It is now 18 minutes since the baby came through the outpatient department's door, and his situation is stable. It is now time to take a full history and carry out a full examination to make a definitive diagnosis. He is diagnosed as having severe pneumonia, and receives specific treatment for this. However, before coming to this diagnosis, no time was wasted; his status was stabilized, based on a few leading signs and symptoms, even when the medical staff did not know exactly what was wrong with him.

This was good triage and emergency management.

Would it have happened like this in your hospital?

2.1.2 Introduction

Deaths in hospital often occur within 24 hours of admission. Many of these deaths could be prevented if very sick children are identified soon after their arrival in the health facility, and treatment is started immediately. This can be facilitated by rapid triage for all children presenting to hospital to identify those needing immediate emergency care. The Emergency Triage Assessment and Treatment (ETAT) guidelines provide guidance on the most common emergency conditions in children presenting at the health facility.

Therefore, a process of rapid triage for all children presenting to hospital needs to be put in place, to determine whether any emergency or priority signs are present. Triage may be done in 15-20 seconds by medical staff, as soon as the child arrives, and no special equipment is needed for this. Once emergency

signs are identified, prompt emergency treatment needs to be given to stabilize the condition of the child.

2.1.3: Triage

TRIAGE is the sorting of patients into priority groups according to their need and the resources available. Pediatric triage is the process of rapidly screening all sick children on their arrival in hospital in order to place them in one of the following categories:

E	Emergency
P	Priority
Q	Queue (non-urgent)

Colors can also be used for differentiating the three groups, giving a

- RED sticker to Emergency cases,
- YELLOW for Priority
- GREEN for the Queue.

2.1.4 Triage Process

All children should be checked on their arrival in hospital by a person who is trained to assess how ill they are. This person decides whether the patient will be seen immediately and will receive life-saving treatment, or will be seen soon, or can safely wait his/her turn to be examined.

Triage should be quick and you must learn to assess several signs at the same time.

Emergency signs can be identified on an average in twenty seconds.

Those with **EMERGENCY SIGNS** require immediate emergency treatment.

- Call for help from more experienced health worker, if available, but do not delay starting treatment.
- Stay calm and work with other health workers who may be required to give the treatment, because a very sick child may need several treatments at once.
- The most experienced health worker should continue assessing the child to identify all underlying problems and prepare a treatment plan.
- Ask about head or neck trauma before providing treatment
- Take careful note if the child is severely malnourished, because this will affect the treatment of shock and dehydration caused by diarrhoea.
- Carry out point of care emergency investigations (eg, blood glucose, hemoglobin, blood grouping and cross-matching- if the child appears to be severely anemic or is

bleeding significantly.)

- After giving emergency treatment, proceed immediately to assess, diagnose and treat the underlying condition. All these children should be hospitalized and observed till stabilization.

Those with **PRIORITY SIGNS** should be given priority in the queue, so that they can rapidly be assessed and treated without delay.

Those who have no emergency or priority signs are **NON-URGENT** cases. These children can wait their turn in the queue for assessment and treatment. The majority of sick children will be non-urgent and will not require emergency treatment.

After these steps are completed, proceed with general assessment and further treatment according to the child's priority.

2.1.5 The triage process: What, When, Who?

Triage should be carried out as soon as a sick child arrives in the hospital, well before any administrative procedure such as registration. This may require reorganizing the flow of patients in hospital. Triage can be carried out in different locations – e.g. in the outpatient queue, in the emergency room, or in a ward if the child has been brought directly to the ward. If a child with emergency signs is identified in the outpatient queue, he/she must quickly be taken to a place where treatment can be provided immediately, e.g. the emergency room or ward.

All medical and other health worker involved in the patient care can perform triage if properly trained and they should also be able to give the initial emergency treatment.

2.1.6: ASSESSING EMERGENCY SIGNS: The ABCD concept

To quickly assess the patient for serious illness or injury, assess emergency signs **which can be easily remembered as**

A:	Airway
B:	Breathing
C:	Circulation/Convulsions/Consciousness
D:	Dehydration

If the child has any emergency sign of the ABCD, it means the child has an emergency “E” sign and emergency treatment should be started immediately.

A and B: Check whether there is any airway or breathing problem.

- Is the child breathing? Look, listen and feel for air movement.
- Is the airway obstructed? (due to tongue fall, foreign body, croup or neck swelling)
- Is the child blue (centrally cyanosed)?
- Does the child have severe respiratory distress? (Is the child having trouble getting breath so that it is difficult to talk, eat or breastfeed? Is he breathing very fast and getting tired, does he have severe chest indrawing or is he using accessory respiratory muscles?)

C: Quickly check circulation and decide whether the child is in shock or has impaired circulation.

- Does the child have cold hands?
- Is the capillary refill time longer than 3 seconds?
- Is the pulse weak and fast? Check radial pulse. May check brachial or femoral pulse in infant.

Then, quickly determine whether the child is **unconscious**. A rapid assessment of conscious level can be made by assigning the patient to one of the AVPU categories:

- Alert
- V- responds to Voice (lethargic)
- P- responds to Pain (coma)
- U- Unresponsive (coma)

And ask and look for convulsion. If the **child is convulsing** when brought to hospital or during examination, this is an emergency, requiring immediate treatment.

D: Ask whether the child is having diarrhoea. If yes, assess for signs of severe dehydration

- ✓ If the child is lethargic or unconscious
- ✓ If the child has sunken eyes
- ✓ If the skin pinch goes back very slowly

The Need for Frequent reassessment

During and after providing emergency treatment, the child should be re-assessed using the complete ABCD sequence. The disease course is dynamic and there could be new developments within a short time. Reassessment should begin with assessment of the airway and through the ABCD sequence.

2.1.7: Assessing Priority Signs

Priority signs

If no emergency signs are found, check for priority signs (*Box 2.1*). These **can be remembered from the mnemonic 3TPR-MB**. These children need prompt assessment (no waiting in the queue) to determine what further treatment is needed. Move a child with any priority sign to the front of the queue to be assessed next.

Box 2.1: Priority signs

1. **Tiny baby:** Any sick child aged < 2 months is more likely to deteriorate quickly, has higher chances of infection and is more difficult to assess
2. **Temperature:** A child that feels very hot may have high fever, needs to check temperature by thermometer, give an antipyretic, or do investigations like a blood film for malaria.
3. **Trauma or other urgent surgical condition:** May require specialist consultation or care for acute abdomen, head injury or fractures.
4. **Pallor (severe):** Compare the child's palm with your's. If it is very pale, including the creases, the child may have severe anemia requiring urgent blood transfusion.
5. **Poisoning:** A child with history of swallowing drug/poisonous substance or stings/bites may deteriorate quickly and may need specific treatments like antidotes or anti-venoms urgently.
6. **Pain (severe):** If the child has severe pain, it may be due to serious conditions and may need early assessment and pain relief.
7. **Respiratory distress (not severe):** Chest indrawing, tachypnea or difficulty breathing may be signs of respiratory distress, but not severe enough to require emergency treatment. However, if in doubt, initiate treatment immediately.
8. **Restless, continuously irritable, or lethargic:** A lethargic child responds to voice but is drowsy and uninterested (V in the AVPU scale). The continuously irritable or restless child is conscious but cries constantly and will not settle. The causes for this may be serious, such as meningitis, cerebral malaria etc.
9. **Referral (urgent):** Ask the mother if she was referred from another facility and for any note that may have indicated referral for urgent problem.
10. **Malnutrition (severe acute):** A child with visible severe wasting or oedema of both feet may have severe acute malnutrition, which requires specific management approach.
11. **Burns (major):** Burns are extremely painful and children who seem quite well can deteriorate rapidly. Get surgical help or follow surgical guidelines and appropriate fluid resuscitation protocol.

Chart 2.1: Triage of all sick children

TREAT

Do not move neck if cervical spine injury possible
Keep the child warm

AIRWAY AND BREATHING

- Obstructed breathing or
- Central cyanosis, or
- Severe respiratory distress

ANY SIGN POSITIVE

- IF NOT BREATHING OR GASPING
 - Rule out neck trauma
 - Manage airway
 - Start basic life support
- IF FOREIGN BODY ASPIRATION
 - Manage airway in choking child
- IF NO FOREIGN BODY ASPIRATION
 - Manage airway
 - Give oxygen
 - Make sure child is warm

CIRCULATION

- Cold hands with:
 - Capillary refill longer than 3 seconds, and
 - Weak and fast pulse

IF POSITIVE

- If the child has any bleeding, apply pressure to stop the bleeding. Do not use a tourniquet.
- Give oxygen
- Make sure child is warm

- IF NO SEVERE ACUTE MALNUTRITION:
 - Insert IV* and begin giving fluids rapidly
 - IF SEVERE ACUTE MALNUTRITION If lethargic or unconscious:
 - Insert IV line and give fluids
 - Give IV glucose
 - If not lethargic or unconscious:
 - Give glucose orally or by NG tube
 - Proceed immediately to full assessment and treatment. (see chapter on SAM)

COMA/ CONVULSING

- Coma or
- Convulsing (now)

IF COMA OR CONVULSING

- Manage airway
- Position the unconscious child (if head or neck trauma is suspected, stabilize the neck first)
- Give oxygen
- Check and correct hypoglycemia
- Give IV calcium if infant <3 months
- If convulsion continue give anti-convulsant
- Make sure child is warm

SEVERE DEHYDRATION (ONLY IN CHILD WITH DIARRHOEA)

- Diarrhoea plus any two of these:
 - Lethargy
 - Sunken eyes
 - Very slow skin pinch

DIARRHOEA plus TWO SIGNS POSITIVE

- IF NO SEVERE ACUTE MALNUTRITION:
 - Insert IV line and begin giving fluid(NS/RL) rapidly

- IF SEVERE ACUTE MALNUTRITION:
 - o Do not give IV fluids, give ORS#(ReSoMal)
 - o Proceed immediately to full assessment and treatment

Check for severe acute malnutrition

IF THERE ARE NO EMERGENCY SIGNS LOOK FOR PRIORITY SIGNS:
These children need prompt assessment and treatment

PRIORITY SIGNS

- | | |
|--|---|
| <input type="checkbox"/> Tiny baby (<2 months) | <input type="checkbox"/> Restless, continuously |
| <input type="checkbox"/> Temperature very high | <input type="checkbox"/> irritable, or lethargic |
| <input type="checkbox"/> Trauma or other urgent surgical condition | <input type="checkbox"/> Referral (urgent) |
| <input type="checkbox"/> Pallor (severe) | <input type="checkbox"/> Malnutrition: Visible severe wasting |
| <input type="checkbox"/> Poisoning | <input type="checkbox"/> Oedema of both feet |
| <input type="checkbox"/> Pain (severe) | <input type="checkbox"/> Burns (major) |
| <input type="checkbox"/> Respiratory distress | |

* If not able to insert peripheral IV, insert an external jugular or intraosseous line.
5 ml/kg every 30 mins for 2 hours

Note: If a child has trauma or other surgical problems, get surgical help or follow surgical guidelines

NON-URGENT: Proceed with assessment and further treatment according to the child's priority

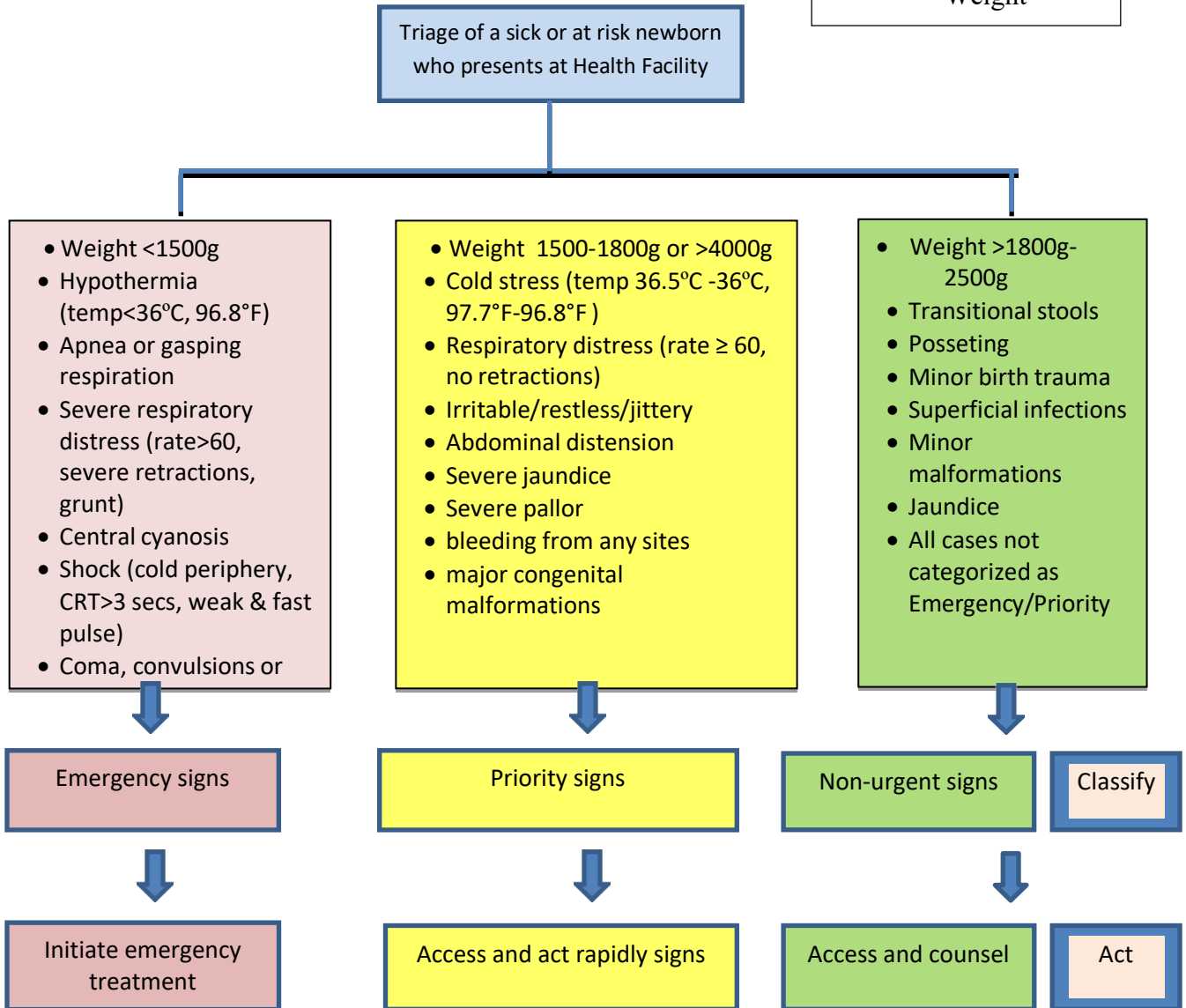
Chart 2.2. Triage of sick newborns

Triage of sick newborns

Triaging is sorting of neonates to rapidly screen sick neonates for prioritizing management

See for- Temperature
Airway
Breathing
Circulation





Coma/convulsion
Weight



*Newborns classified as "**emergency**" require urgent intervention and emergency measures. All such newborns will be admitted to SNCU after initial stabilization.

Newborns classified as "**Priority**" are sick and need rapid assessment and admission to SNCU. Newborns classified as non-urgent do not require urgent attention but require further assessment and counseling.

Chart 2.3. Assessment and treatment of newborns displaying emergency signs

ASSESS FOR EMERGENCY SIGNS (in all cases)		TREAT EMERGENCY SIGNS	
TEMPERATURE	Cold to touch (abdomen)	IF POSITIVE 	- warm hypothermic babies rapidly re-warm if there is severe hypothermia (<32°C, 89.6°F) up to 35°C, 95°F and then gradual re-warming Maintain the blood glucose Make sure young infant is warm
AIRWAY AND BREATHING	Not breathing or gasping or Central cyanosis or Severe respiratory distress ○ Respiratory rate >60/min ○ Severe lower chest in-drawing ○ Apneic spells ○ Grunting ○ Unable to feed	ANY SIGN POSITIVE 	Manage airway Provide tactile stimulation if apneic If still apneic or gasping – provide PPV Give oxygen Make sure neonate is warm
CIRCULATION	Capillary refill longer than 3 seconds and Weak and fast pulse (>160)	IF POSITIVE 	Give oxygen Insert IV line and give 10 ml/kg normal saline over 30 min Proceed immediately to full assessment and treatment Make sure neonate is warm
CONVULSIONS	Convulsions	IF CONVULSING 	Manage airway Check & correct hypoglycemia Give anticonvulsant Make sure neonate is warm

For all newborns displaying emergency signs:

- Provide the treatment as above
- Call for help
- Draw blood for emergency investigations (glucose, calcium, sepsis screening)

CHAPTER 2: AIRWAY AND BREATHING

The letters **A** and **B** in “ABCD” represent “**airway and breathing**”. Respiratory problems are common in infants and children and are the predominant cause of death in them. Assessment and treatment decisions must be made quickly to prevent respiratory failure and cardiopulmonary arrest.

2.2.1 Assessment of breathing

❖ *Is the Child Breathing?*

To assess whether the child is breathing there are three things you must do:

- Look:** If active, talking, or crying, the child is obviously breathing. If none of these is present, look again to see whether the chest is moving.
- Listen:** Listen for any abnormal breath sounds. Is there stridor, wheezing or grunting?
- Feel:** Can you feel the breath at the nose or mouth of the child?

❖ *Is the Airway Obstructed?*

If the child is not breathing, or if the child has severe respiratory distress, is there an obstruction to the flow of air?

❖ *Does the Child show Central Cyanosis?*

Cyanosis occurs when there is an abnormally low level of oxygen in the blood. This sign may be absent in a child who has severe anemia. To assess for central cyanosis, look at the mouth and tongue. A bluish or purplish discoloration of the tongue and the inside of the mouth indicates central cyanosis.

❖ *Does the Child have Severe Respiratory Distress?*

If the child is talking, drinking or feeding comfortably, or appears to be happy, there is no severe respiratory distress (or obstructed breathing). Observe whether the child has significant discomfort from not getting enough air into the lungs.

- Is the child's breathing laboured – i.e. needing much more effort to breathe than normal? Is the child exhausted (tired)?
- Is there difficulty in breathing while talking, eating or breastfeeding?
- Is the child breathing very fast, have severe lower chest wall in-drawing, or using the auxiliary muscles for breathing which cause the head to nod or bob with every inspiration? The latter is particularly seen in young infants.
- Is oxygen saturation SpO₂ less than 90%?

❖ *Abnormal breathing sounds*

Are there any noises heard when breathing in? A harsh noise on breathing in (inspiration) is called **stridor**, a short noise when breathing out (expiration) in young infants is called **grunting**. Both sounds are signs of severe respiratory problems.

Box 2.1: Signs of Severe Respiratory Distress

- Laboured or very fast breathing
- Severe chest indrawing
- Use of accessory muscles
- Head nodding
- Nasal flaring and Cyanosis
- Inability to feed because of respiratory problems
- Abnormal respiratory noises (stridor, grunting)
- SpO₂ (oxygen saturation) <90%.

If the child is breathing adequately, go to the next section to quickly continue the assessment for other emergency signs. If the child has an airway or breathing problem, you should initiate appropriate treatment and then quickly resume the assessment.

2.2.2. Positioning to Improve the Airway

Children are at higher risk of having respiratory obstruction and failure due to small size of upper airway, large size of tongue, smaller and compliant subglottic area, relatively compliant chest wall and limited oxygen reserve. To treat an airway or breathing problem you should first open the airway and then begin giving oxygen.

The drawings below show the chin lift (figure 2.1 & 2.2). This is a way of opening the airway in children who have not been subjected to trauma. The drawings illustrate two different positions. To do this safely you must know if the child has been subjected to any trauma. In such a case, it is important not to tilt the head or move the neck. It is also important to know the child's age because you will position an infant differently from a child.

Head tilt-chin lift manoeuvre

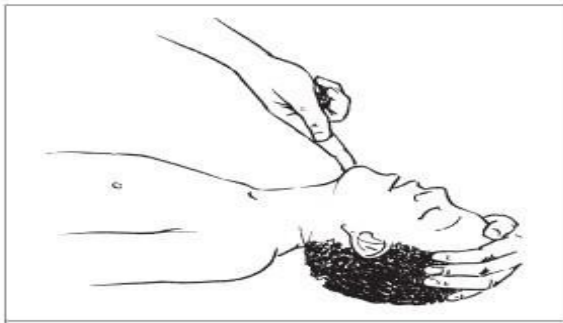
The neck is slightly extended and the head is tilted by placing one hand onto the child's forehead. Lift the mandible up and outward by placing the fingertips of other hand under the chin. In an infant a neutral position (nose up) (figure 2.1) and in a child a sniffing position (chin

up) is maintained (figure2.2).

Figure2.1: Neutral Position in an Infant



Figure 2.2: Sniffing Position to Open up Airway in a Child (Chin Up)

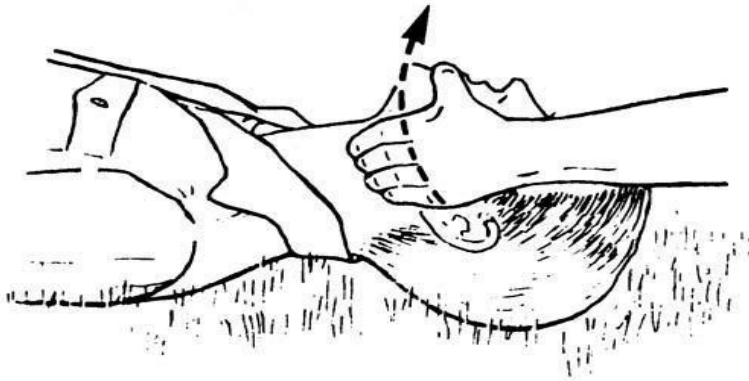


2.2.3 Is Trauma of the Neck a Possibility?

Always ask and check for head or neck trauma before treating, as this will determine how much a child can be moved. If a child has trauma you must avoid further injury during assessment or treatment.

If you suspect trauma, open airway with jaw thrust to limit the risk of aggravating a potential cervical spine injury while you immobilize the cervical spine. Jaw thrust is safe to use in cases of trauma for children of all ages. The jaw thrust is achieved by placing two or three fingers under the angle of the jaw on both sides, and lifting the jaw upwards and outward (figure2.3). The jaw thrust maneuver is also used to open the airway when bag-mask ventilation is performed.

Figure2.3: Jaw Thrust without Head Tilt



- ❖ Kneel behind the patient's head
- ❖ Rest your elbows on the surface on which the patient is lying
- ❖ Place one hand on each side of the patient's head.
- ❖ Place the tips of your index and middle fingers under the angles of the patient's jaw. (This is done on both sides)
- ❖ Place your thumbs on the patient's jaw just below the level of the teeth. The thumbs will keep the patient's head from turning or tilting during the lift.
- ❖ Lift the jaw upward with your fingertips. The mouth should not be closed as this could prevent air from entering the patient's airway. Use your thumb to retract the patient's lower lip if needed.
- ❖ If the lift does not open his airway (tongue is still blocking the airway), lift the jaw up a little further. If you are unable to obtain an airway with the jaw-thrust method, the head-tilt/chin-lift method should be used. The importance of maintaining a patent airway outweighs the risk of spinal damage.

Cervical spine immobilization:

Cervical immobilization is needed to protect extension of an existing spinal cord injury following head and neck trauma. In a child with history of neck trauma the neck is immobilized with a cervical collar, and the body is placed on a spine board and secured with straps. Cervical collar should be rigid, appropriate sized and should not interfere with management of airway. The child should be adequately secured to a backboard in order to fully immobilize the cervical spine and body.

Care must be taken to avoid flexion or extension of the neck when the patient is placed on the backboard. Patient should be kept in neutral position to maximize cervical spine protection. The neutral position is defined as "the normal anatomic position of the head and body that one

assumes when standing and looking straight ahead”. Neutral positioning in children requires special precautions because of their relatively large head size and prominent occiput. The prominent occiput in children and infants forces the cervical spine into flexion when the child is supine. To prevent flexion the back can be elevated by the placement of padding under the shoulders. The approach to cervical spine stabilization depends upon the position in which the patient is found. Patients who are found in the prone position must be first log-rolled to the supine position for further evaluation and management. A rigid cervical collar should be applied before rolling the patient.

2.2.4 Ventilate with Bag and Mask (Also see checklist 2.1 and 2.2)

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

Before use, check the bag and valve by closing the patient’s connection with your thumb and attempt to expel air from the bag. If the bag and valve are in order, this will not be possible until you release your thumb. If either the bag or valve is faulty, the bag will empty easily. The essence of the technique is to roll the mask onto the face from the chin while avoiding the eyes, with a finger and thumb apply a strong even downward pressure to the top of the mask.

It is important for the mask to be the correct size for the child; it must completely cover the mouth and nose without covering the eyes or overlapping the chin. The correct size and position are shown in the figure 2.4.

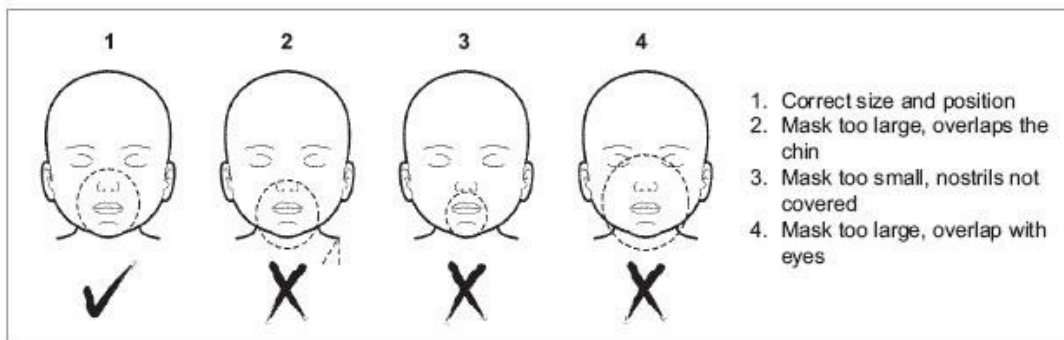


Figure2.4: Choosing the correct mask size

There are several sizes of mask, and a selection of these should be available. Self-inflating bags of minimum volume 450-500ml should be used.

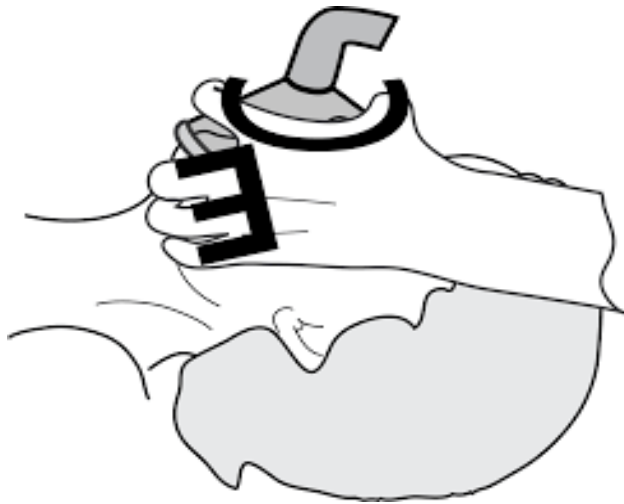
Use only the force and tidal volume necessary to cause the chest to rise visibly. Reservoir and oxygen (5-6L/min) should be connected to the self-inflating bag during resuscitation. If oxygen is not available, use room air for resuscitation. With room air 21% oxygen is delivered but by using oxygen source with reservoir 60% to 90% oxygen can be delivered.

Pop up valve



Figure2.5: Self Inflating Bag

Perform the bag and mask ventilation with E-C clamp technique (figure2.6). Position the thumb and index finger in a C shape over the mask and exert downward pressure on the mask to ensure proper air seal. Position the last 3 fingers under the angle of mandible to lift the jaw. If you are alone, maintain the E-C clamp with one hand and compress the bag with the other hand. More effective ventilation can be achieved when performed by 2 persons.



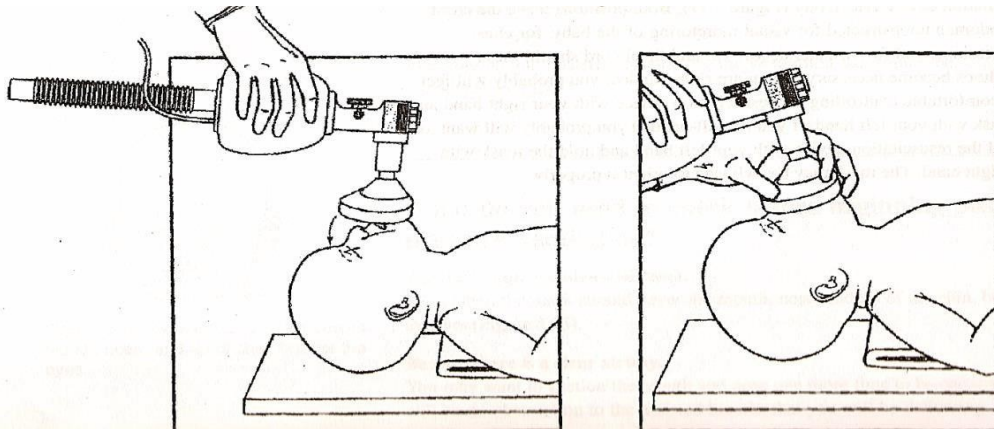


Figure2.6: Bag and Mask Ventilation E-C clamp technique

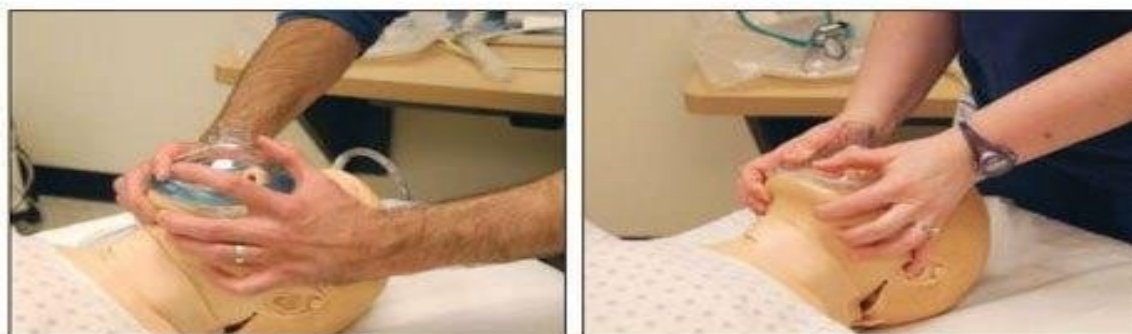
If effective ventilation is not achieved (i.e. the chest does not rise) perform the actions listed in Box2.2. If signs of circulation are present but spontaneous breathing is absent, continue bag and mask ventilation at a rate of 20 breaths/minute for a few minutes and see if child revives and starts to breathe spontaneously. If bag and mask ventilation is prolonged it can cause gastric inflation, which can be relieved by nasogastric tube.

Box 2.2: Actions to be taken if effective ventilation is not achieved (MRSOPA)

MR- Mask reposition and reposition of head
 SO- Suction mouth and nose and open mouth
 PA- Increase pressure and alternative airway

With the two-provider technique, one person should hold the mask with both hands, while the other person bags the patient.

An alternative method is for the mask holder to apply pressure to the mask while using fore finger to apply jaw lift



When two persons are available and only ventilation is required, use above mentioned method.

In spontaneous breathing patients, gentle positive-pressure breaths administered with bag and mask should be carefully timed to augment the child's effort. If not breathing adequately intubate/call help for intubation and provide tracheal tube ventilation to the child as it is the most effective and reliable method of assisted ventilation. Some of these children may additionally need chest compression.

Box 2.3: Rescue breathing for infants and children

Give 1 breath every 3 to 5 second (about 12 to 20 breaths/min)
Give each breath in 1 second
Each breath should result in visible chest rise
Check the pulse about every 2 minutes

2.2.5 Management of a Choking Child (who is conscious)

A child with a history of aspiration of a foreign body who shows increasing respiratory distress is in immediate danger of choking. Attempts to remove the foreign body should be made instantly. **Do not hesitate.**

Obstruction can occur at several levels. The tongue can fall back and obstruct the pharynx, or a foreign body (such as a piece of fruit) can lodge in the upper airway. Croup and epiglottitis can also cause upper airway obstruction. Coins and peanuts are notorious causes of aspiration and subsequent choking. Ask the child's caretaker explicitly for a history of choking. Foreign body should be suspected in cases of sudden respiratory distress associated with coughing, gagging, stridor, cyanosis, or wheezing. **Do not try to remove the foreign bodies in the upper airway by blind finger sweep, it may result in pushing back of foreign body into the airway or may cause serious bleeding.**

The treatment differs depending on whether there is a foreign body causing respiratory obstruction or some other cause for the obstruction or respiratory distress. If child is able to cough or cry it indicates partial obstruction, **consider referral where bronchoscopy facility is available.** If a foreign body is causing the obstruction it is life threatening and needs immediate interventions. Different methods are used for clearing up foreign body in infants and children.

Management of conscious infant

- Lay the infant on your arm or thigh in a head down position and support the head by firmly holding the jaw.
- Give 5 blows to the infant's back with heel of hand between the shoulder blades.
- If obstruction persists, turn infant over and give 5 chest thrusts with 2 fingers, one finger breadth below nipple level in midline
- If obstruction persists, check infant's mouth for any foreign body which can be removed
- If necessary, repeat sequence until the foreign body is expelled or the patient becomes unconscious. If he becomes unconscious start CPR.

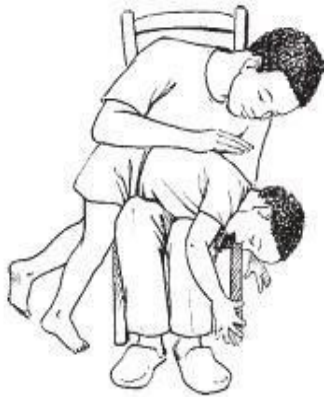


Figure 2.7: Slapping the back to clear airway obstruction in a choking infant

Management of conscious child: Abdominal thrusts (Heimlich maneuver) ≥ 1 year

- The child may be sitting or standing.
- Stand or kneel behind the child and encircle his torso by putting both arms directly under axillae.
- Place the thumb side of one fist against the victim's abdomen in the midline slightly above the navel and well below the tip of the xiphoid process.
- Place the other hand over the fist and pull upwards into the abdomen, repeat this
 - Heimlich maneuver 5 times.

- If the obstruction persists, check the child's mouth for any foreign body which can be removed.



Figure 2.8: Heimlich manoeuvre in a choking older child

If necessary, repeat this sequence until the foreign body is expelled or the patient becomes unconscious

After you have performed this procedure you should check inside the mouth for any foreign body. Obvious foreign bodies should be removed. Secretions should be cleared from the throat. The breathing should be checked again.

If necessary, repeat this sequence until the foreign body is expelled or the patient becomes unconscious

2.2.6: Management of a choking child (who is unconscious)

If you do not definitely feel a pulse, begin CPR starting with chest compressions (C-A-B sequence).

Chest Compressions (Also see checklist 2.3)

If you do not confidently detect a pulse or other signs of circulation or if heart rate is less than 60/min in an infant or child with signs of poor perfusion even after adequate oxygenation and ventilation, provide chest compressions coordinated with ventilations. Recheck pulse after 2 minutes. The child should be supine on a hard-flat surface.

Chest compression in the infant

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

- a. ***Thumb technique***, where the 2 thumbs are used to depress the sternum, while the hands encircle the torso and the fingers support the spine (*figure 2.11*).
 - o This is preferred method when 2 or more health workers are available
 - o Stand at the infant's feet or side
 - o Place your thumbs side by side over lower half of sternum, encircle the infant's chest and support the infants back with the fingers of both hands.
 - o Use both thumbs to depress the sternum.

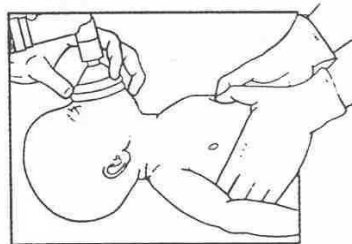


Figure 2.9: Chest Compression-Thumb Technique

- b. ***2-finger technique***, where the tips of the middle finger and either the index finger or ring finger of one hand are used to compress sternum (avoiding compressing on or near the xiphoid process), while the other hand is used to support the baby's back (unless the baby is on a very firm surface) *figure 2.12*.



Figure 2.10: 2-Finger Technique

High quality CPR

- Using either method to give chest compressions, **compress the lower half of the sternum but do not compress over the xiphoid**. After each compression, allow the chest to recoil fully because complete chest re-expansion improves blood flow into the heart.
- **“Push hard”**: push with sufficient force to depress the chest approximately one third to
 - one half the antero-posterior diameter of the chest.
- **“Push fast”**: push at a rate of at least 100 compressions per minute.
- **Release completely** to allow complete recoil of the chest by completely releasing the pressure but maintaining contact with the compression site.
- **Minimize interruptions** in chest compressions.
- The ratio of chest compressions and ventilation should be **15:2 if there are two rescuers**. Two effective breaths should be given after every 15 chest compressions. With a single rescuer the ratio of chest compressions and ventilation should be 30:2. (*box 2.4*)

Box 2.4: High quality CPR

- | |
|--|
| <ul style="list-style-type: none">- Rate at least 100/min- Compression depth to at least 1/3 AP diameter of the chest, about 1.5 inches (4 cm) in infants and 2 inches (5 cm) in children- Allow complete chest recoil after each compression- Minimize interruptions in chest compressions- Avoid excessive breaths |
|--|

Chest compressions for the child (1 year or above)

- ❖ Place the heel of one hand over the lower half of the sternum. Lift your fingers to avoid pressing on the ribs (*figure 2.13*)
- ❖ Depress the sternum $\frac{1}{3}$ to $\frac{1}{2}$ of the depth of the chest. This corresponds to approximately 4-5 cm.
- ❖ Compress at the rate of approximately 100 times per minute.
- ❖ The compression to ventilation ratio remains same as described for infants.

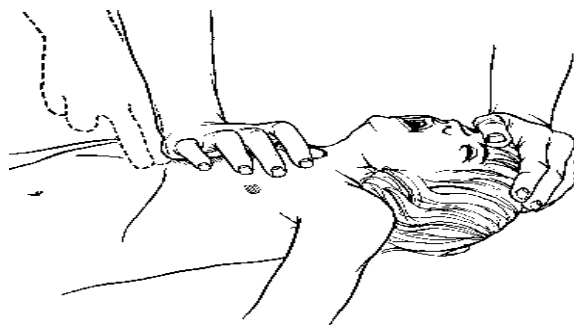


Figure 2.11: Chest Compression for the Child 1 year or above

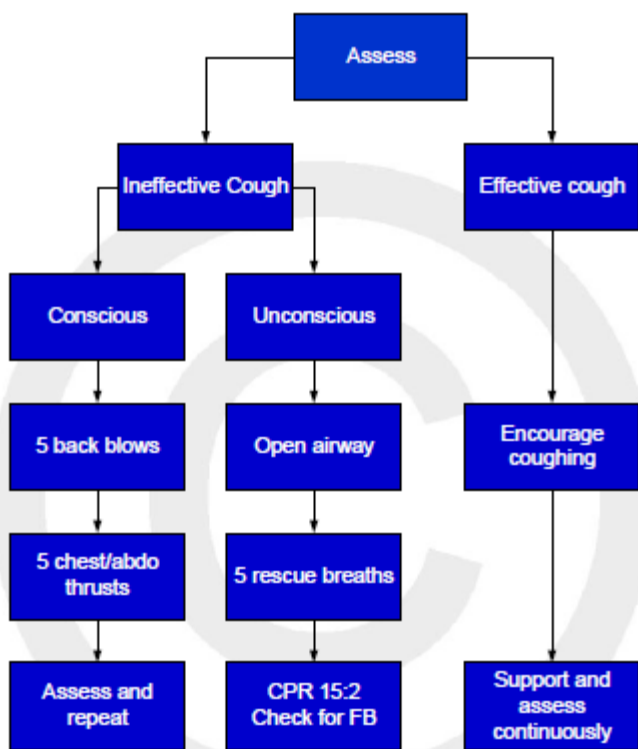


Figure 2.12: Sequence of Actions for a Choking Child

2.2.7: Give Oxygen

For all children who have any problem with their airway or breathing, always give oxygen first, while you continue to assess for other problems. Oxygen therapy should be guided by pulse oximetry.

- When the child has only respiratory distress, oxygen supplementation is recommended at SpO₂ < 90%.
- Children presenting with other emergency signs with or without respiratory distress should receive oxygen therapy if their SpO₂ is <94%. When a pulse oximeter is not

available or pulse oximeter does not pick saturation (shock, hypothermia) the necessity for oxygen therapy should be guided by clinical signs and should be continued till emergency signs persist. Oxygen therapy can be stopped when a child no longer has emergency signs and maintains a peripheral capillary oxygen saturation $\geq 90\%$ in room air.

Sources of oxygen to treat hypoxaemia

There are two possible sources of oxygen: oxygen concentrators and oxygen-filled cylinders

- ❖ Oxygen concentrators work by pumping room air through a zeolite canister to remove nitrogen, thus concentrating the oxygen. The device is of moderate cost, requires little maintenance, and, once purchased, produces oxygen continuously at low cost. A continuous electrical supply is required, however, to operate the pump.
- ❖ Oxygen cylinders are easy to use, requiring only a flow meter and appropriate tubing, and can operate even when there is no electrical supply. The oxygen in cylinders is, however, relatively expensive and maintaining a constant supply is often difficult, especially at peripheral hospitals and health centers. They are useful during transportation.

Oxygen delivery

- Give oxygen to a child in a non-threatening manner as anxiety increases oxygen consumption and possibly respiratory distress.
- If a child is upset by one method of oxygen support, you should attempt to deliver the oxygen by an alternative technique.
- If the child is unconscious, manage airway and do suction to maintain the airway.
- In an alert child with respiratory difficulty allow him to remain in a position of comfort because they will assume a position that promotes optimal airway patency and minimizes respiratory effort.

It is important to have the proper equipment to control oxygen flow rates.

Severely ill children with signs of obstructed breathing, central cyanosis, severe respiratory distress or signs of shock or who are unconsciousness should receive oxygen initially by nasal prongs at a standard flow rate (0.5 – 1 L/min for infants and 2-4 L/min for older children) or through an appropriately sized face mask (flow rate > 4 L/min) to reach a peripheral capillary oxygen saturation $\geq 94\%$.

1. NASAL PRONGS

Nasal prongs are the preferred method of delivery in most circumstances, as they are safe, non-invasive, reliable and do not obstruct the nasal airway.

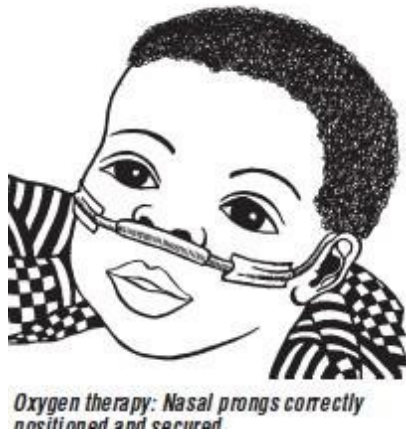


Figure 10.1: Nasal prongs correctly positioned and secured

Nasal prongs are short tubes inserted into the nostrils. Place them just inside the nostrils and secure with a piece of tape on the cheeks near the nose. Care should be taken to keep the nostrils clear of mucus, which could block the flow of oxygen. Prongs come in different sizes for adults and children. Nasal prongs are best for delivering oxygen to young infants and children with severe croup or pertussis; do not use a nasal catheter as they provoke paroxysms of coughing.

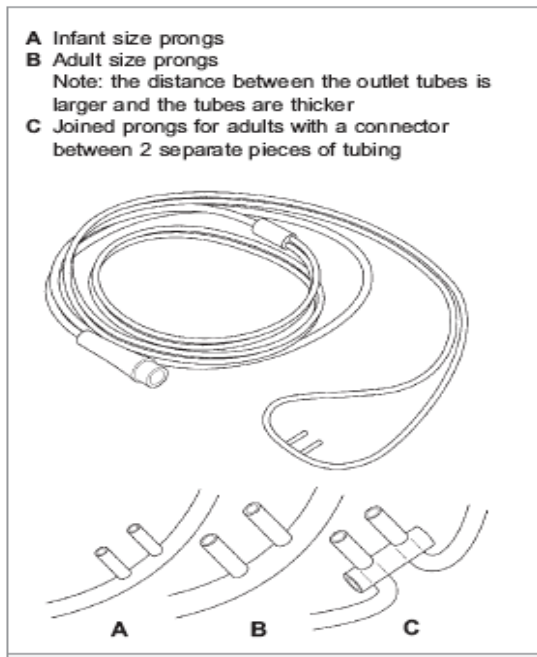


Figure 10.2: Nasal Prongs with Tubing

Nasal prongs are preferred method for oxygen administration because of minimal wastage of oxygen by this method.

2. Oxygen mask: The soft vinyl pediatric mask is often poorly tolerated by infants & toddlers but may be accepted by older children. A flow rate of 6 liters/minute should be kept and titrated with SpO₂ monitoring.

3. Oxygen hood (Head box): A clear plastic shell that encompasses the patients head. It is very well tolerated by infants; allow easy access to the chest, trunk and limbs and permits control of inspired oxygen. A high flow rate is required (10 liters/minute). As a rule, a hood is too small to use with children older than approximately 1 year.

4. Nasal catheter is made from tubing of 6 or 8 FG size such as a nasogastric tube or suction catheter. The tubing is inserted into either nostril a distance equivalent to that from the child's nostril to the inner eyebrow. It must then be firmly secured using tape, and connected to the oxygen. The tip of the catheter should NOT be visible below the uvula. Set a **flow rate of 0.5-1 litres for infants and 1-2 litres/ min for older children**. Remove and clean the nasal catheter or prongs at least twice a day.

For standard flow oxygen therapy, humidification is not needed. In an emergency setting when a

flow > 4 L/min through nasal cannulae is required for more than 1-2 h, effective heated humidification should be added.

Monitoring during Oxygen Therapy

Monitor the child at least every 3 h to identify and correct any problems, including: Oxygen

saturation, by pulse oximeter

Position of nasal prongs

Leaks in the oxygen delivery system Oxygen

flow rate

Airway obstructed by mucus (clear the nose with a moist wick or by gentle suction)

Duration of Oxygen Therapy

Oxygen therapy can be stopped when a child no longer has ETAT emergency signs and maintains a peripheral capillary oxygen saturation $\geq 90\%$ in room air. When the child is stable and improving, take the child off oxygen for 15 min. If the SpO₂ readings in room air remain $\geq 90\%$, discontinue oxygen but check again 30 min later and every 3 hour thereafter on the first day off oxygen to ensure that the child remains stable.

CHAPTER 3: CIRCULATION

2.3.1 Assess the circulation status

After the airway has been opened, to assess if a child has a circulation problem you need to know:

- ❖ Does the child have warm hands?
- ❖ Is the capillary refill time (CRT) longer than 3 seconds?
- ❖ Is the pulse weak and fast?

Are the child's hands warm?

To assess the circulation, take the child's hand in your own. If it feels warm, the child has no circulation problem and you do not need to assess capillary refill or pulse. If the child's hands feel cold, you need to assess the capillary refill.

Is the CRT ≥ 3 seconds?

Capillary refill is a simple test that assesses how quickly blood returns to the skin after pressure is applied. It is carried out by applying pressure to the pink part of the nail bed of the thumb or big toe in a child and over the sternum or forehead in an infant for 5 seconds (figure 2.14). CRT is the time from

release of pressure to complete return of the pink color. Normally it is less than 3 seconds. If it is ≥ 3 seconds then this is prolonged.

While checking the CRT in a limb, lift it slightly above heart level. Lifting of the limb helps in assessing arteriolar capillary refill and not venous stasis. Lifting is not required when tested on forehead or sternum. Capillary refill is prolonged in shock because the body tries to maintain blood flow to vital organs and reduces the blood supply to less important parts of the body like the skin (peripheral vasoconstriction). This sign is reliable except when the room temperature is low, as cold environment can cause a delayed capillary refill.

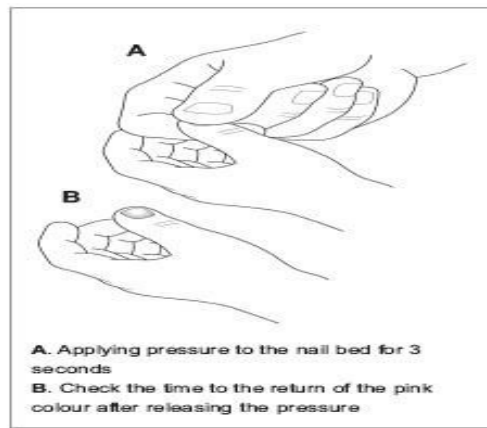


Figure 2.12: Checking Capillary Refill

2.3.2 How to check pulse

Check the child's pulse (take at least 5 seconds but no more than 10 seconds). Check for the carotid pulse in a child. In infants, check brachial pulse. If the infant is lying down, you may check the femoral pulse. If you do not definitely feel a pulse within 10 seconds, start chest compressions.

Locating the Central Pulse

- For palpating a carotid pulse, locate the trachea, using 2 or 3 fingers, slide these 2-3 fingers into the groove between the trachea and the muscles at the side of the neck. Feel for pulse at least 5 seconds but no more than 10 seconds
- For palpating brachial pulse in an infant, place 2 fingers on inside of the upper arm, between the elbow and the shoulder
- For palpating femoral pulse, place 2 fingers in the inner thigh, midway between the hip bone and the pubic bone and just below the crease, where the thigh meets the abdomen.

When a child or infant has a pulse, but is not breathing effectively, rescuers should give breaths without chest compressions. This is rescue breathing. In infants and children, if, despite adequate oxygenation and ventilation, the pulse is $<60/\text{min}$ with signs of poor perfusion, start cardio pulmonary resuscitation (CPR), starting with chest compression (C-A-B sequence).

Is the pulse weak and fast?

The central pulse (a pulse nearer to the heart) should be felt. If this is strong and not obviously fast, then the pulse is adequate and no further assessment is needed. In an infant the best place to feel pulse is at the middle of the upper arm medially (brachial pulse) as shown in *figure 2.13*. If the child is lying down, feel for the femoral pulse in the groin. Locate the superior border of the pubic symphysis in the mid line of the body. Feel the bony prominence in the anterior limit of the iliac crest. The femoral pulse can be found midway between these two bony points (the mid-inguinal point). In an older child, feel for the carotid pulse in the neck. Pulse is fast if rate is $> 160/\text{min}$ in an infant and $>140/\text{min}$ in children above 1 year.



Figure 2.13: Palpating the brachial artery

Note that it is not recommended to check blood pressure to assess for shock during the ETAT because of two reasons:

Low blood pressure is a late sign in children and may not help to identify early (compensated) shock cases

Normal BP readings will not exclude compensated type of shock. However, Blood Pressure measurement helps identify hypotensive shock, when systolic BP is less than 5th percentile for age.

2.3.3: Definition and classification of Shock

Shock is a critical condition that results from inadequate delivery of oxygen and nutrients, to meet tissue metabolic demand and is characterized by inadequate peripheral and end-organ perfusion. Shock can occur with a normal, increased or decreased systolic blood pressure. In children, most cases of shock has low cardiac output; however, in some types of shock (e.g. caused by sepsis or anaphylaxis), cardiac output may be high. All types of shock can result in impaired function of vital organs, such as the brain (decreased level of consciousness) and kidneys (low urine output).

Types of Shock:

- ❖ **Hypovolemic shock** (due to fluid loss from diarrhoea, vomiting, third space loss in intestinal obstruction, dengue, burn or DKA or blood loss from trauma or bleeding disorder)
- ❖ **Cardiogenic shock** (due to impaired cardiac contractility resulting from congenital or acquired heart diseases or myocarditis)
- ❖ **Obstructive shock** (due to obstructed blood flow resulting from pneumothorax or cardiac tamponade)
- ❖ **Septic shock** (due to capillary leak and inappropriate distribution of blood volume, resulting from severe infections)
- ❖ **Anaphylactic shock** (due to severe allergic reaction) & Neurogenic shock (inappropriate distribution of blood volume and flow)

The commonest cause of shock in children is due to loss of fluid from circulation, either through loss from the body as in severe diarrhoea or when the child is bleeding, or through capillary leak in a disease such as severe dengue fever. In all cases, it is important to replace this fluid quickly. An intravenous line must be inserted and fluids given rapidly in children with shock and without severe acute malnutrition.

2.3.4 Clinical progression of shock from compensated state to multi-organ failure.

In the initial phase of any type of shock, compensatory mechanism sets in, in the form of tachycardia and increased peripheral vascular resistance to increase the blood supply to the vital organs like brain, heart and kidneys. When blood is diverted from peripheral circulation, hands and legs become cold and clammy and capillary refill will be slow. Peripheral pulses become fast but weak and child looks pale.

Pulse pressure, which is the difference between systolic and diastolic pressure, helps to identify the type of shock. In hypovolemic and cardiogenic shock, pulse pressure becomes narrow while it is wide in distributive shock like septic shock and anaphylactic shock.

When shock is not corrected in this early, compensated phase, it goes into decompensated phase in which blood pressure falls.

For quick estimation of hypotension in a child, use the following formula.

Systolic BP < 70 + (age in years x 2) mmHg

This applies for 1-10 years of age. In infants systolic BP < 70 mmHg is hypotension while in term neonates < 60 mmHg is hypotension. After 10 years, SBP < 90 mmHg is hypotension.

When there is hypotensive shock, the blood supply to the end organs becomes compromised. Child becomes irritable, then drowsy or lethargic and then unconscious. Urine output decreases. This is the phase when multi organ dysfunction and failure can occur.

Peripheral pulses may be absent and even ventral pulse can be weak or absent and heart rate begins to fall. When shock is not corrected even at this phase, child deteriorates rapidly and can die within an hour due to cardiac arrest.

Treatment of Shock:

If the child has cold hands and a CRT \geq 3 seconds, and a fast & weak pulse, then he or she is in shock. Treatment of shock requires teamwork and following actions need to be started simultaneously

2.3.5 General management of shock

1. If the child has any bleeding, apply pressure to stop the bleeding (do not use tourniquet)
2. Management of airway and Breathing-Maintain a patent airway and support breathing as described in ETAT section. Give 100% oxygen and provide positive pressure ventilation if there is no spontaneous breathing.
3. Establish IV access at an appropriate site or intra-osseous access. Begin fluid resuscitation & start specific treatment for the condition leading to shock. Follow aseptic technique to insert the intravenous cannula.

4. Correction of underlying metabolic, electrolyte and acid base abnormalities. Check and correct hypoglycemia, hypocalcemia and acidosis. Make sure the child is warm.

5. Monitoring: Assess the effectiveness of fluid resuscitation and inotropic therapy by frequent monitoring of:

- Heart rate
- Pulse rate
- Level of consciousness
- Temperature
- SpO₂
- Blood pressure
- Urine output

6. Laboratory studies: Take blood samples for emergency laboratory tests including

- CBC
- Blood glucose
- Serum electrolytes (sodium, potassium, calcium)

Other investigations if facilities are available:

- CRP
- Chest X-ray

7. Medications: Use vasopressors like dopamine.

8. Referral- If no improvement after dopamine at 20 mcg/kg/min

2.3.6: Administering IV Fluids Rapidly For Shock in a Child *Without Severe Malnutrition (Chart 2.3)*

Expansion of circulating blood volume is a critical component of treatment for any type of shock. Early volume replacement is important to prevent progression to refractory shock and multiple organ dysfunctions. Therefore, quickly establish vascular access in all patients with shock. Volume expansion is best achieved with isotonic crystalloid solutions such as normal saline (NS) as they are easily available and effectively expand the intravascular volume.

As only approximately one fourth of administered solution remains in the intravascular compartment, large quantity of crystalloid solution must be administered in hypovolemic children. Large quantity of fluids may cause problems in severely malnourished or children with cardiogenic shock.

Colloid solutions (e.g. hemacel, 5% albumin, blood, and fresh frozen plasma also are efficient volume

expanders but are not easily available or may cause hypersensitivity reactions and other complications. If the signs of poor perfusion persist despite adequate fluid bolus, start inotrope (Dopamine).

How to give Dopamine

- For giving 1 mcg/kg/minute of dopamine
- Amount of dopamine (mg) to be added = Weight in kg x 3
- To convert this dose into amount to ml of dopamine divide by 40
- Add this amount of dopamine (ml) to make 50 ml of total fluid
- 1ml/hour of this fluid gives 1mcg/kg/minute
- To give 10mcg/kg/minute give 10ml/hour or 10 microdrops/minute (as 60 microdrops = 1ml)

Example: Giving 10mcg/kg/minute for a 10kg child

- Amount of dopamine (mg) to be added = $10 \times 3 = 30\text{mg}$
- To convert this dose into amount to ml of dopamine: $30/40 = 0.75\text{ml}$
- Add 0.75ml of dopamine to 49.25ml to make 50ml of total fluid
- 10ml/hour of this fluid gives 10mcg/kg/minute. And to give dopamine at this rate, give at the rate of 10 microdrops/minute

Refer to **checklist 2.5** for the detail procedure of **preparation and administration of Dopamine**.

Refer to **checklist 2.6** for the detail procedure of **Blood Transfusion**.

Box 2.5: Initial fluid therapy in a child with shock

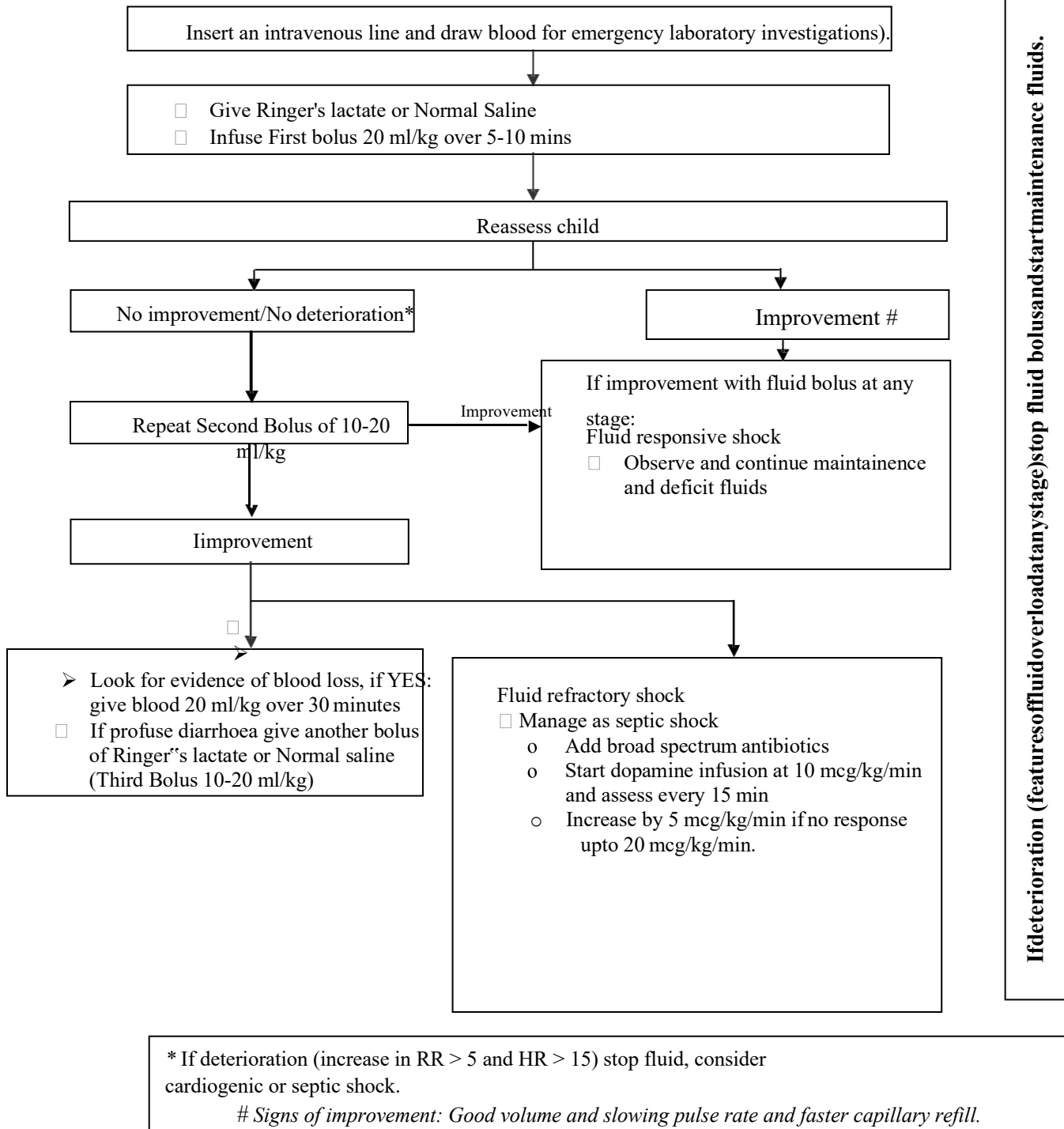
When signs of shock are detected, rapidly administer a fluid bolus of 20 ml/kg of Normal Saline as fast as possible (over 5-10 mins) and assess child's response (pulse rate, capillary refill, breathing rate). Placement of a 3-way stopcock in the IV tubing system can facilitate rapid fluid delivery as fluids can be pushed by syringe or applying pressure over the plastic fluid bottle.

If you reassess the circulation and find a definite improvement at any stage, the pulse has slowed or the capillary refill has improved, you can prescribe maintenance fluids along with deficit fluid if needed and move onto the next stage of triage.

If the child is still in shock consider giving additional fluid 20 ml/kg over 5-10 minutes: Consider giving 10 ml/kg bolus over 20-30 minutes in neonates suspected cardiogenic shock and septic shock, In neonates only 30 ml/kg of total boluses can be given.

Chart 2.3: How to Give IV Fluids Rapidly for Shock in a Child without Severe Acute Malnutrition

- Weigh the child. Estimate the weight if child cannot be weighed or weight not known
- Check that the child does not have severe acute malnutrition



2.3.7: Administering IV Fluids for Shock In A Child With Severe Malnutrition (*Chart 2.4*)

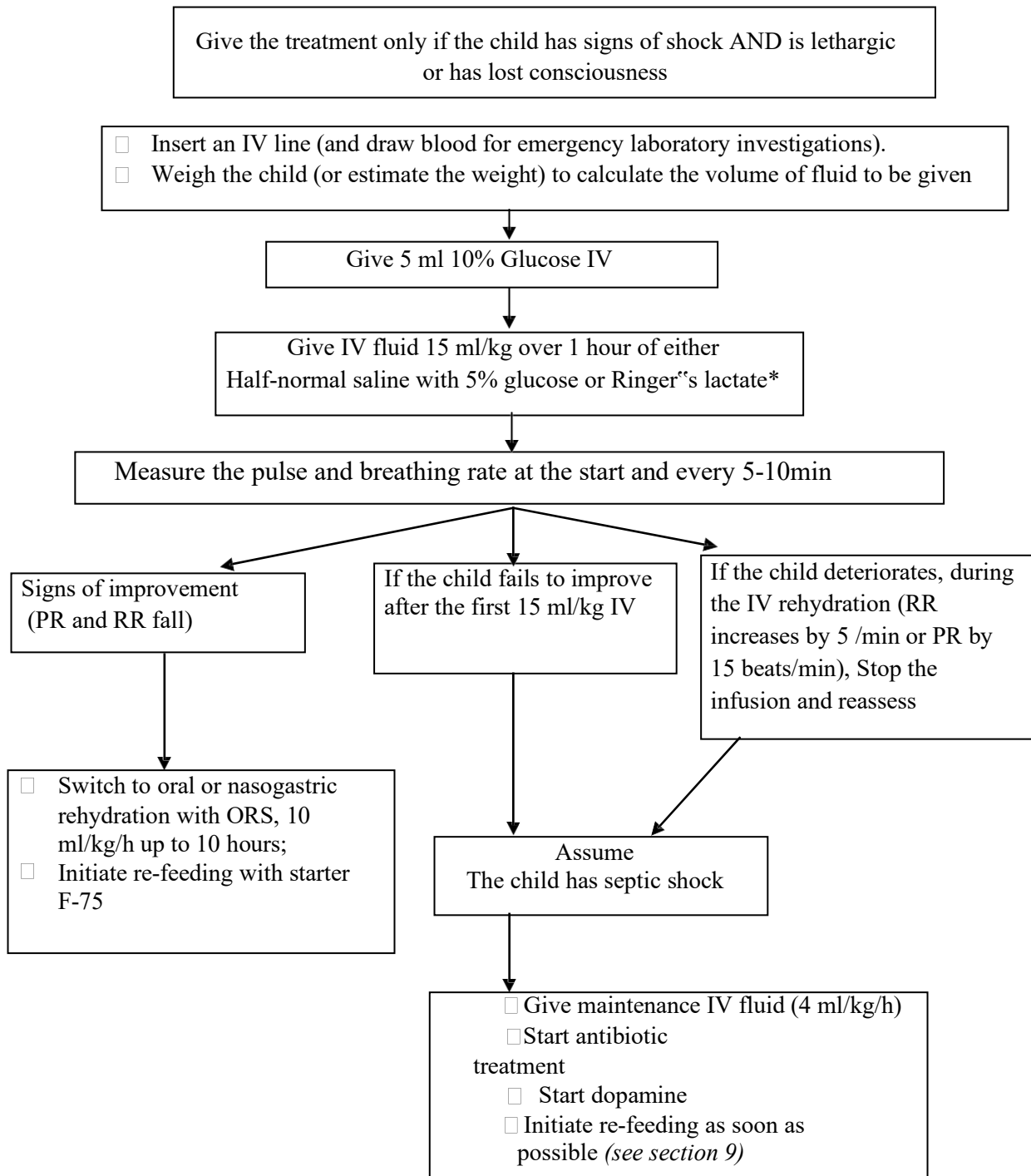
Shock in children with severe malnutrition is difficult to assess and manage. Malnutrition not only affects the muscles but also other internal organs. The heart become very weak and may fail if it has to pump large volumes of fluid. Fluid accumulates in the lungs (pulmonary oedema) and makes breathing difficult with the child getting worse or even critical. Therefore, a child who is severely malnourished should not be treated by rapid IV infusion of fluid.

Children with severe malnutrition should be managed with different type of fluid and a different rate of administration and need close monitoring. Sometimes children with severe malnutrition have circulatory signs suggesting shock, but have septic shock rather than hypovolemia. In children with SAM it is preferable to administer fluids orally or through nasogastric tube.

Only if the child is lethargic or unconscious and cannot swallow or tolerate an NG tube (e.g. vomiting), use IV fluids ½-strength normal saline (N/2) with 5% glucose or Ringer Lactate at 15 ml/kg in 1 hr. Monitor child closely by checking the pulse and breathing rate every 5 minutes. Discontinue the intravenous infusion if either of these increase (pulse by 15/minute, respiratory rate by 5/minute). If the child shows signs of improvement, then switch to oral or nasogastric rehydration.

If the child fails to improve after the first 15 ml/Kg IV, assume the child has septic shock and manage as per management guidelines for children with severe acute malnutrition.

Chart 2.4: How to Give IV Fluids for Shock in a Child with Severe Acute Malnutrition



* If profuse diarrhoea, repeat 15 ml/kg of Ringer's lactate/NS

2.3.8: Monitoring Children Who Are Not In Shock BUT Have Signs Of Circulatory Impairment

The presence of one or two of three signs i.e. cold extremities, $CRT \geq 3$ seconds and a weak and fast pulse indicates nonspecific circulatory impairment that could be due to conditions other than circulatory shock. For example, cold extremities and prolonged capillary refill may be due to exposure to cold and a fast pulse may be due to pain or distress.

These children should not be given rapid infusions of fluids but should receive maintenance fluids, appropriate for their age and weight. In the absence of shock, rapid intravenous infusions of fluids may be particularly harmful in children with severe febrile illness, severe pneumonia, severe malaria, meningitis, severe acute malnutrition, severe anaemia, congestive heart failure with pulmonary oedema, congenital heart disease, renal failure and diabetic ketoacidosis.

Children with any sign of impaired circulation, i.e. cold extremities, or prolonged capillary refill or a weak and fast pulse, should be prioritized for full assessment and treatment and reassessed within 1 hour.

2.3.9: Fluid Management

Sick children often need maintenance fluids, if enteral feed is not possible or contraindicated in conditions like severe pneumonia.

The total daily fluid requirement of a child is calculated from the following

formula: First 10 Kg -100 ml/kg

Next 10 kg- 50 ml/kg

Next each additional kg- 20 ml/kg.

For example, an 8 kg infant receives $8 \times 100 \text{ ml} = 800 \text{ ml}$ per day, a 15 kg child $(10 \times 100) + (5 \times 50) = 1250 \text{ ml}$ per day.

Choice of intravenous fluids

Resuscitation: Children who are severely dehydrated or with signs of shock should be resuscitated with isotonic IV solutions (normal saline 0.9% or Ringer's lactate lactate).

Intravenous maintenance fluid: Children who require IV fluids for maintenance should be managed with Ringer's lactate solution with 5% dextrose (Add 50 ml 50% dextrose to 500 ml of RL) or 0.9% normal saline with 5% glucose or half-normal saline (0.45% sodium chloride) with 5% glucose

Give the sick child more than the above amounts if he or she has fever (increase by 10% for every 1 °C of fever).

Monitoring fluid intake

Pay careful attention to maintain adequate hydration in very sick children, who are not accepting orally. If there is no contraindication, feeds, may be given through nasogastric tube.

If fluids have to be given IV, it is important to

- monitor infusion closely Check for urine output which is the most sensitive indicator of fluid status in a child
 - Normal urine output in infants is 1-2 ml/kg/hr and in children is 1 ml/kg/hr
 - Urinary catheterisation is done in children who are very sick or unable to void urine
- Check for features of fluid overload
 - Tachycardia, tachypnea
 - Hepatomegaly
 - Basal crepts
 - Edema

If it is impossible to monitor the IV fluid infusion closely, the IV route should be used only for the management of severe dehydration, septic shock, delivering IV antibiotics and for children for whom oral fluids are contraindicated (such as those with perforation of the intestine or other surgical abdominal problems).

CHAPTER 4: COMA AND CONVULSION

Now we shall look at the second and third components in which C represents “coma and convulsion”.

2.4.1 Various levels of consciousness

Coma, lethargy, and convulsions indicate impaired neurological state.

Impaired consciousness implies a significant alteration in the awareness of self and of the environment, with varying degrees of wakefulness.

Coma is characterized by the total absence of arousal and of awareness.

Encephalopathy, describes a clinical syndrome of altered mental status, manifesting as reduced consciousness or altered behavior.

Acute Encephalitis Syndrome, clinically a case of acute encephalitis syndrome is defined as a person of any age, at any time of year with the acute onset of fever and a change in mental status (including symptoms such as confusion, disorientation, coma or inability to talk) AND/OR new onset of seizures (excluding simple febrile seizure).

2.4.2 Assessment of neurological status

To assess the child's neurological status, you need to know:

- ❖ Is the child in coma?
- ❖ Is the child convulsing?

Is the Child in Coma?

A child who is awake is obviously conscious and you can move to the next component of the assessment. If the child is asleep, ask the mother if the child is just sleeping. If there is any doubt, you need to assess the level of consciousness.

Try to wake the child by talking to him/her, e.g. call his/her name loudly. A child who does not respond to this should be gently shaken. A little shake to the arm or leg should be enough to wake a sleeping child. Do not move the child's neck. If this is unsuccessful, apply a firm squeeze to the nail bed, enough to cause some pain. A child who does not wake up to voice or being shaken or to pain is unconscious.

To assess level of consciousness of a child, a simple scale (AVPU) is used:

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

A child who is not alert, but responds to voice, is lethargic. An unconscious child may or may not respond to pain. A child with a coma scale of "P" or "U" will receive emergency treatment for coma as described below.

Is the Child Convulsing Now?

This assessment depends on your observation of the child and not on the history from the parent. Children who have a history of convulsion, but are alert during triage, need a complete clinical history and investigation, but no emergency treatment for convulsions. Convulsion can be recognized by the sudden loss of consciousness associated with uncontrolled jerky movements of the limbs and/or the face. There is stiffening of the child's arms and legs and uncontrolled

movements of the limbs. The child may lose control of the bladder, and is unconscious during and after the convulsion.

Sometimes, in infants, the jerky movements may be absent, but there may be twitching (abnormal facial movements) and abnormal movements of the eyes, hands or feet. Therefore, observe the infant carefully for convulsion.

2.4.3 Treatment of coma and convulsion

Treatment of coma and convulsions are similar and will be described together. Airway is managed in a manner similar to treating any child with an airway or breathing problem. This has been discussed earlier. Give oxygen to all children with SpO₂ < 94%

2.4.3 (a) Coma

Any unconscious child who is breathing and keeping the airway open should be placed in the recovery position (*Figure 2.14*). This position helps to reduce the risk of vomitus entering the child's lungs. It should only be used in children without any trauma.

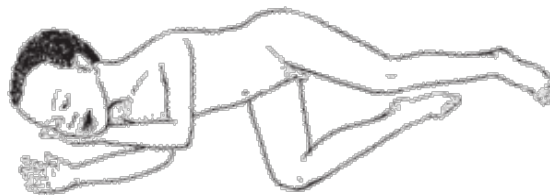


Figure 2.14: Recovery Position of Unconscious Child

If neck trauma is not suspected:

- Turn the child on the side to reduce risk of aspiration
- Keep the neck slightly extended and stabilize by placing the cheek on one hand
- Bend one leg to stabilize the body position

If trauma is suspected:

- Stabilize the child while lying on the back
- Use the “log roll” technique as shown in *Figure 2.15* to turn the child on the side if the child is vomiting

Log roll

Move a patient with a suspected cervical spine injury carefully. Avoid rotation and extremes of flexion and extension. One person, usually the most senior attendant, should assume responsibility for the neck. He should stand at the top end of the patient, hold the patient's head, and place the fingers under the angle of the mandible with the palm over the ears and parietal region and maintain gentle traction to keep the neck straight and in line with the body. Patient then can be rolled to one side with the help of two more persons simultaneously moving the torso and lower limbs on instructions from the senior attendant. When the patient is not being moved, a sandbag placed on each side or a cervical collar can splint the neck. Use bottles or rolled towels in case sandbags are not available.

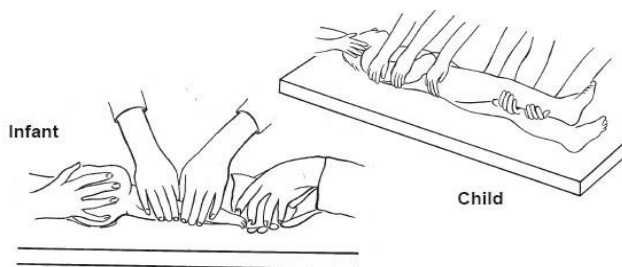


Figure 2.15: Log Roll-Stabilizing the Neck of the Patient while Moving the Body

2.4.3 (b) Convulsion

If the child is having a convulsion, do not attempt to hold him/her down or put anything in the child's mouth. If the child vomits turn the child on his/her side to avoid aspiration. If the convulsion has stopped and the airway is clear, the child can be placed in the recovery position.

Insertion of an Oropharyngeal (Guedel) Airway

The oropharyngeal or Guedel airway can be used in an unconscious patient to improve airway opening. It may not be tolerated in a patient who is awake and may induce choking or vomiting. Guedel airways come in different sizes (Guedel size 000 to 5). An appropriate sized airway goes from the angle of mouth to the angle of the jaw when laid on the face with the raised curved side (convex) up (“the right side up”).

Infant

Select an appropriate sized airway

- Position the child to open the airway, taking care not to move the neck if trauma suspected
- Using a tongue depressor, insert the oropharyngeal airway the convex side up
- Re-check airway opening

- Use a different sized airway or reposition if necessary
- Give oxygen

Child

- Select an appropriate sized oropharyngeal airway
- Open the child's airway, taking care not to move the neck if trauma suspected
- Using a tongue depressor, insert the airway “upside down” (concave side up) until the tip reaches the soft palate
- Rotate through 180° and slide back over the tongue
- Re-check airway opening
- Use a different sized airway or reposition if necessary
- Give oxygen



Fig 2.16a: Guedel airway of Fig 2.16 b: Selecting right size of an airway Different sizes

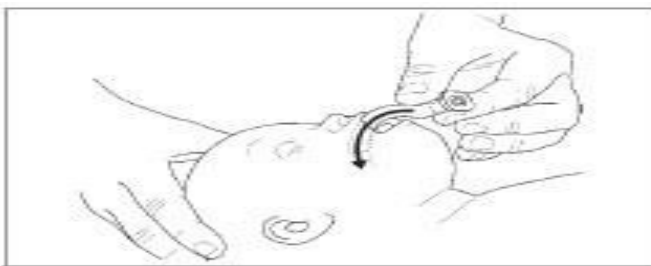


Figure 2.17: Inserting an Oropharyngeal Airway in an Infant: Convex Side Up

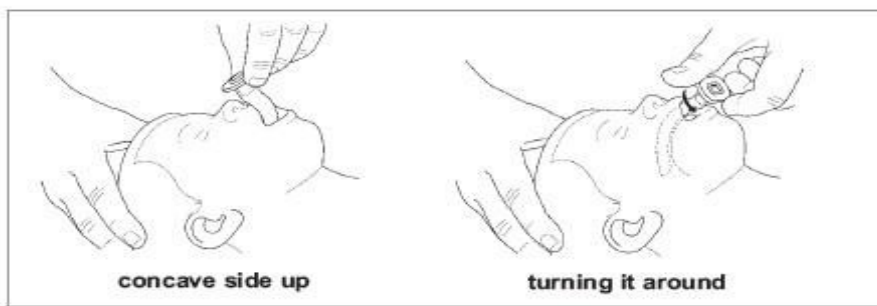


Figure 2.18: Inserting an Oropharyngeal Airway in an Older Child

Suctioning

Suctioning of secretions, blood, and vomitus may be necessary to maintain a patent airway. Portable suction devices are easy to transport but may not provide adequate suction power. Large-bore, non-collapsible suction tubing should always be joined to the suction unit and appropriately sized suction catheters should be available. In children presenting with acute seizures or status epilepticus where intravenous administration is available, either intravenous diazepam or intravenous midazolam should be used to terminate the seizure.

2.4.4: Administering Diazepam for Convulsions

Diazepam can be given by the intravenous or rectal route. If you already have intravenous access, you can give the correct volume of drug directly, but slowly, in at least one full minute. Reassess the child after 10 minutes. Base the dose on the weight of the child if available. The dose of diazepam is 0.5mg/kg (0.1 ml/kg) rectally or 0.25mg/kg (0.05 ml/kg) intravenously (Max. total dose: < 5year: 5 mg, ≥ 5 year: 10mg). This is a useful guideline in an emergency situation when you may not have a chance to weigh the child. Display the guideline on wall of your department.

Table 2.2: Dosages of diazepam

	Diazepam given rectally	Diazepam 10 mg/2 ml
Age / weight	Dose 0.1 ml/kg	0.05 ml/kg
2 weeks to 2 months (<4 kg)	0.3 ml	0.15 ml
2 - <4 months (4 - <6 kg)	0.5 ml	0.25 ml
4 - <12 months (6 - <10 kg)	1.0 ml	0.5 ml
1 - <3 years (10 - <14 kg)	1.25 ml	0.60 ml
3 - <5 years (14 – 19 kg)	1.5 ml	0.75 ml

Administer diazepam injection solution per rectum by a tuberculin syringe preferably with a catheter. Hold the buttocks together for a few minutes. Flush the catheter with 2ml of normal saline after administering diazepam.

If convulsions continue after 10 min, give a second dose of diazepam (or give diazepam IV at 0.5 ml/kg = 0.25 mg/kg if IV infusion is running).

Diazepam can affect the child's breathing, so it is important to reassess the airway and breathing regularly.

Do not give more than two doses of diazepam.

Midazolam (Intravenous/intramuscular 0.15-0.2 mg/kg or intranasal 0.3 mg/kg) may be used in place of diazepam. (Maximum IV dose: 6 month-5-year age = 6 mg; >6 years age = 10 mg).

In children with established status epilepticus, i.e. seizures persisting after two doses of benzodiazepines, intravenous valproate, intravenous Phenobarbital or intravenous phenytoin can be used, with appropriate monitoring. The choice of these drugs depends on local resources, including availability and facilities for monitoring. If available, intravenous valproate is preferred to intravenous Phenobarbital or intravenous phenytoin because of its superior benefit-risk profile.

If convulsions do not stop after 10 minutes of second dose of diazepam, Inj. Phenytoin can be given intravenously if access has been achieved. 15-20 mg/kg Phenytoin is diluted in about 20 ml of saline (not a solution containing dextrose) and given slowly over 20 mins (not more than 1 mg/kg phenytoin per minute). Alternatively, Phenobarbitone can be used in a dose of 15-20 mg/kg IV (in 20 ml 5% dextrose or saline) or IM. Seek help of a senior or more experienced person, if available.

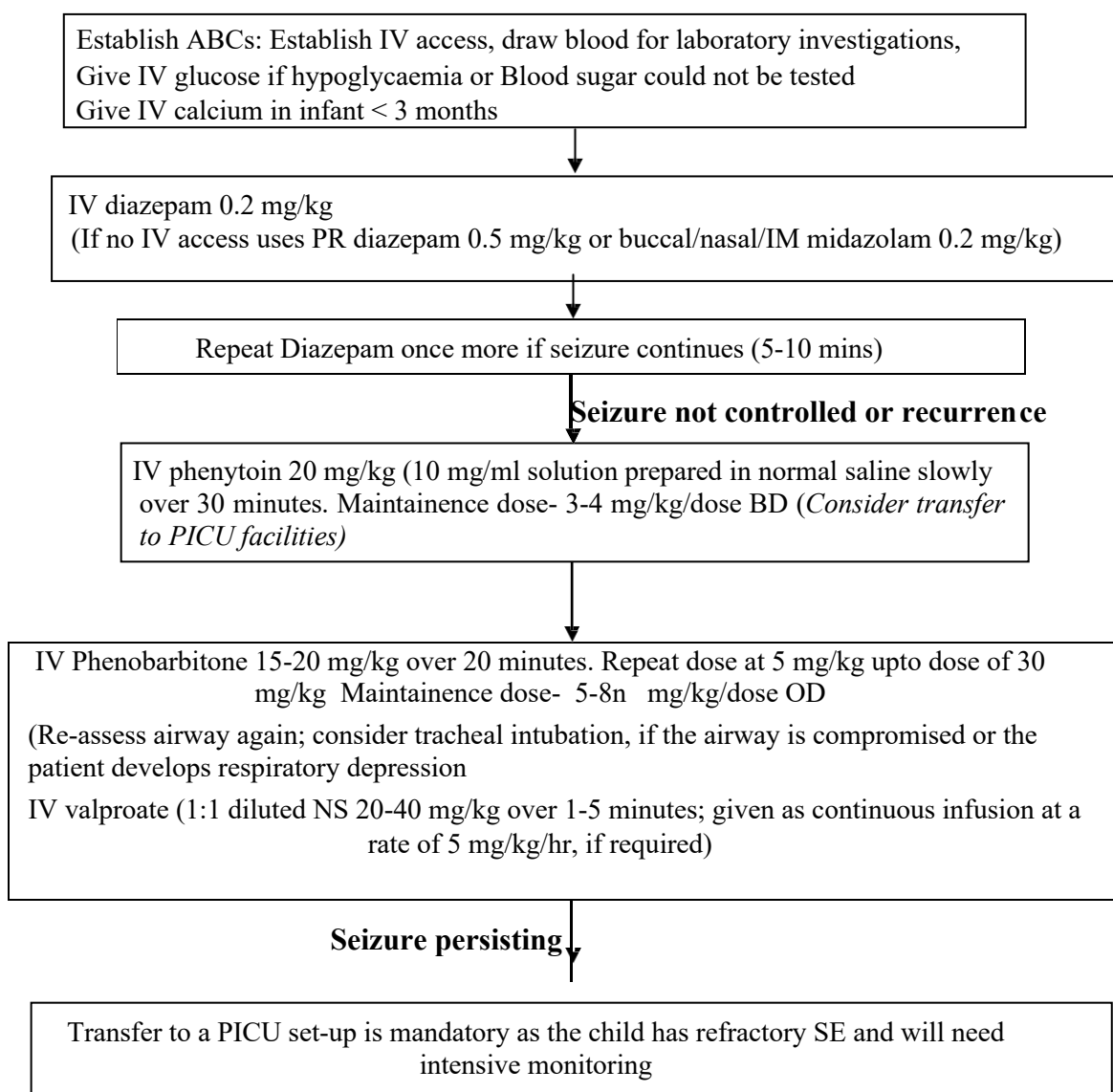
Intramuscular Phenobarbital remains an option in settings where intravenous infusion or monitoring is not feasible. Phenytoin and valproate should not be given intramuscularly. Seek help of a senior or more experienced person, if available.

Follow management guidelines for status epilepticus if seizure persists (Chart 2.5).

If there is high fever:

- Sponge the child with room-temperature water to reduce the fever.
Do not give oral medication until the convulsion has been controlled (danger of aspiration)

Chart 2.5: Management algorithm for status epilepticus



Box 2.6: Give Diazepam to Stop Convulsions

- Turn the child to his/her side and clear the airway (recovery position).
- Give 0.5mg/kg diazepam injection solution per rectum using a small syringe without a
 - Needle (like a tuberculin syringe) preferably using a catheter. Flush the catheter, after
 - Giving drug.
- Check for low blood sugar
- Give oxygen
- If convulsions have not stopped after 10 minutes repeat diazepam dose

AGE or WEIGHT	DIAZEPAM
2 months up to 6 months (5 -7 kg)	0.5 ml
6 months up to 12 months (7-<10 kg)	1.0 ml
12 months up to 3 years (10-<14 kg)	1.5 ml
3years up to 5years (14-19 kg)	2.0 ml

2.4.5: Supportive Care in Patient with convulsion or coma

After stabilization of airway, breathing and circulation, other supportive care measures must be instituted along with the empirical treatment as mentioned above.

(a) Maintenance intravenous fluids: Fluid therapy should be targeted to maintain euvolemia and normoglycaemia, and to prevent hyponatremia. Give isotonic fluids. Serum sodium should be monitored, and abnormalities of serum sodium should be corrected slowly.

(b) Management of raised intracranial pressure: Raised intracranial pressure is a common cause of death in children with viral encephalitis. It is important to recognize and promptly manage signs of raised ICP- hypertension, bradycardia, irregular respiration, irregular pupils. A common mistake in the emergency departments is to mistake decerebrate posturing for seizures, and inappropriately treat with anti- epileptic drugs.

Mannitol should be given with loading dose 5 ml /kg/ dose followed by 2.5 ml/ kg /dose 6 hourly, up to 48 hours.

Frusemide at the dose of 1-2 mg/kg 12 hourly may be added to mannitol.

(c) Maintain euglycaemia: Identify and treat hypoglycemia with intravenous dextrose (5 ml/kg 10% dextrose, then glucose infusion rate of 6–8 mg/kg/min). Blood glucose should be monitored and both hypo- and hyper-glycaemia should be avoided.

Box 2.7: How to prevent low blood sugar

- **If the child is able to breastfeed:**
 - Ask the mother to breastfeed the child
- **If the child is not able to breastfeed but is able to swallow:**
 - Give expressed breast milk or abreast-milk substitute
 - If neither of these is available, give sugar water*
 - Give 30-50 ml of milk or sugar water* before departure
- **If the child is not able to swallow:**
 - Give 50 ml of milk or sugar water* by nasogastric tube
 - If no nasogastric tube available, give 1 teaspoon of sugar moistened with 1-2 drops of water sublingually and repeats doses every 20 minutes to prevent relapse.

**How to make sugar water: Dissolve 4 level tea spoons of sugar (20grams) in a 200-ml cup of clean water*

(d) Treatment and prevention of seizures: A benzodiazepine should be given (Lorazepam 0.1 mg/kg, diazepam 0.3 mg/kg, or midazolam 0.1 mg/kg) to terminate seizure followed by phenytoin loading (20 mg/kg). Even if there is no history or clinical evidence of seizure, empirical anti convulsants may be considered in children with deep coma or features of raised intracranial pressure.

(e) Prevention of complications or rehabilitation: Regular posture change must be done to prevent the development of bed sores. Passive movements of major joints and measures to prevent contractures are important.

2.4.6 Indication for referral

- ❖ Seizures not controlled with 2nd line antiepileptics like phenytoin, phenobarbitone, and valproate.
- ❖ Seizure and LOC following head trauma- Need of CECT
- ❖ Cause of coma/ convulsion not known after stabilization
- ❖ Cause of coma/convulsion known but cannot be managed- Diabetic ketoacidosis, unknown poisoning, Viral encephalitis

ADDITIONAL READING

2.4.7 Evaluation of child with convulsion or coma

History

The following history may help in the management of a child with coma/convulsions:

- Fever, headache, vomiting, seizures, abnormal posturing
- Altered behaviour, cognition, personality changes, altered consciousness
- History of passing dark urine with yellowish discoloration of eyes & skin
- Prodromal symptoms - flu-like illness, diarrhoea
- Rash, vesicles, past history of chicken pox
- Residence: Rural/urban, endemic for cerebral malaria, any epidemic of AES in that area
- History of animal contact, insect bite, dog bite
- Drug or toxin exposure
- Known diabetes, congenital heart disease, chronic kidney or liver disease

Examination

- The examination should begin with assessment of vital signs.
 - Bradycardia- Increased ICP
 - Hypertension- Increased ICP or hypertensive encephalopathy
 - Irregular respiration- Increased ICP
- Look for pallor, icterus, rash, or other general physical examination findings
 - Pallor suggests Cerebral malaria, intracranial bleed, haemolytic uremic Syndrome
 - Icterus suggests Hepatic encephalopathy, leptospirosis, complicated Malaria
 - Rashes suggests Meningococemia, Dengue, Measles, Rickettsial diseases, hemorrhagic fever
 - Head and scalp hematomas suggests traumatic brain injury
 - Abnormal odour of breath suggests diabetic or hepatic coma
 - Dysmorphic features of neurocutaneous markers suggest post seizure coma
- Neurological examination at admission
 - Level of consciousness- AVPU

- Facial asymmetry
- Pupillary size, shape and symmetry
- Neck rigidity

Table 2.3: differential diagnosis for a child presenting with coma or convulsions

Diagnosis or underlying cause	In favour
Meningitis ^{a,b}	<input type="checkbox"/> Fever, lethargy, refusal to feed <input type="checkbox"/> Very irritable <input type="checkbox"/> Stiff neck or bulging fontanelle <input type="checkbox"/> Petechial rash (meningococcal meningitis) <input type="checkbox"/> hypertonia <input type="checkbox"/> headache, vomiting
Cerebral malaria (often seasonal)	<input type="checkbox"/> Blood smear or rapid diagnostic test positive for malaria parasites <input type="checkbox"/> Jaundice <input type="checkbox"/> Anaemia <input type="checkbox"/> Convulsions <input type="checkbox"/> Hypoglycaemia
Febrile convulsions (not likely to be the cause of unconsciousness)	<input type="checkbox"/> Prior episodes of short convulsions with fever <input type="checkbox"/> Associated with fever <input type="checkbox"/> Age 6 months to 6 years <input type="checkbox"/> Blood smear negative for malarial parasites <input type="checkbox"/> Tone – normal
Hypoglycaemia	<input type="checkbox"/> Blood glucose low <input type="checkbox"/> <45 mg/dl (<54 mg/dl in a severely malnourished child) <input type="checkbox"/> responds to glucose treatment
Poisoning	<input type="checkbox"/> History of poison ingestion or drug overdose
Shock	<input type="checkbox"/> Poor perfusion <input type="checkbox"/> Rapid, weak pulse <input type="checkbox"/> Absence of convulsion
Acute glomerulonephritis with Encephalopathy	<input type="checkbox"/> Raised blood pressure <input type="checkbox"/> Peripheral or facial oedema <input type="checkbox"/> Blood in urine <input type="checkbox"/> Decreased or no urine
Diabetic ketoacidosis	<input type="checkbox"/> High blood sugar <input type="checkbox"/> History of polydipsia and polyuria <input type="checkbox"/> Acidotic (deep, labored) breathing
Head injury	<input type="checkbox"/> Signs or history of head trauma

a The differential diagnosis of meningitis may include encephalitis, cerebral abscess or tuberculous meningitis. Consult a standard textbook of paediatrics for further guidance.

b A lumbar puncture should not be done if there are signs of raised intracranial pressure (see section 7).

Table 2.4: Management of a child with Acute Encephalitis Syndrome/febrile encephalopathy

Rapid assessment and Stabilization	<ul style="list-style-type: none"> <input type="checkbox"/> Establish and maintain airway: as described in section 2. <ul style="list-style-type: none"> o Arrange referral (If the child is showing abnormal respiratory pattern) o Intubate if facility available in presence of raised ICP, oxygen saturation <90% despite high flow oxygen and fluid refractory shock <input type="checkbox"/> Give oxygen to maintain oxygen saturation > 94% <input type="checkbox"/> Circulation: <ul style="list-style-type: none"> o Establish IV access, o Give fluid bolus (20 ml/kg NS) if child shows signs of shock o If signs of circulatory impairment, start maintenance intravenous fluids <input type="checkbox"/> Take samples (CBC, Blood sugar, KFT, LFT, electrolytes, PS and RDT for malarial parasite). <input type="checkbox"/> Identify signs of cerebral herniation or raised ICP- irregular pupils <input type="checkbox"/> Temperature: treat fever, hypothermia (see section 10) <input type="checkbox"/> Treat ongoing seizures with benzodiazepines, followed by Phenytoin loading
Investigation/Samples to be Collected	<ul style="list-style-type: none"> <input type="checkbox"/> <i>See Annexure 4.1</i>
Start Empirical treatment* (must be started if CSF cannot be done/report will take time and patient sick)	<ul style="list-style-type: none"> <input type="checkbox"/> Ceftriaxone (100mg/kg/day once daily or 50mg/kg every 12 hours) <input type="checkbox"/> Acyclovir (10mg/kg 8 hourly use in all suspected sporadic viral encephalitis) <input type="checkbox"/> Artesunate*
Supportive care and treatment	<ul style="list-style-type: none"> <input type="checkbox"/> Maintain euglycemia, maintain hydration (<i>see Section 10</i>) <input type="checkbox"/> Treat raised intracranial pressure, mild head-end elevation up to 15-30° <input type="checkbox"/> Give anticonvulsant if history of seizures or child has features of raised ICT
Prevention/treatment of complications and rehabilitation	<ul style="list-style-type: none"> <input type="checkbox"/> Aspiration pneumonia, nosocomial infections, coagulation disturbances <input type="checkbox"/> Psychological support to patient and family

* stop acyclovir, if an alternative diagnosis is confirmed

* stop artesunate if peripheral smear and RDT are negative for malaria.

CHAPTER 5: DEHYDRATION

The letter D in the ABCD mnemonic stands for severe Dehydration. In this section we will look at the assessment of severe dehydration in the child with diarrhoea or vomiting. If the child is severely malnourished these signs are not as reliable.

2.5.1 Assessing and classifying dehydration

Most of the diarrhoeal deaths occur due to dehydration. Hence, the hydration status of the child determines the immediate management. For all children with diarrhoea, their hydration status should be assessed & classified as severe dehydration, some dehydration or no dehydration (Table 2.6).

i LOOK at the general condition - Is the child lethargic or unconscious? Restless and irritable?

If the child is not alert but responds to voice, he or she is lethargic. If the child is restless and irritable all the time or every time s/he is touched and handled, then this is the restless *and irritable* sign. If an infant who is irritable initially, becomes calm when breastfeeding but again becomes restless and irritable when he stops breastfeeding then he has the sign "restless and irritable".

ii LOOK for sunken eyes.

The eyes of a child who is dehydrated may look sunken. Decide if you think the eyes are sunken. In case of doubt, ask the mother if she thinks her baby's eyes look unusual.

iii PINCH the skin of the abdomen. Does it go back: Very slowly (longer than 2 seconds)

Ask the mother to place the child on the examining table so that s/he is lying flat on the back with arms at the sides and legs straight. Or ask the mother to hold the young infant or child so s/he is lying flat in her lap.



Figure 6.1: Checking skin pinch

Locate the area on the child's abdomen halfway between the umbilicus and the side of the abdomen. To do the skin pinch, use your thumb and first finger. Do not use your fingertips because this will cause pain. Place your hand so that when you pinch the skin, the fold of skin will be in a line with the child's body and not across the child's body. Firmly pick up all of the layers of skin and the tissue under them. Pinch the skin for one second and then release it. When you release the skin, look to see if the skin pinch goes back:

- Very slowly (longer than 2 seconds)
- Slowly
- Immediately

If the skin stays up for even a brief time after you release it, decide that the skin pinch goes back slowly.

iv. OFFER the child fluid - Is the child not able to drink or drinking poorly?

Drinking eagerly, thirsty?

Ask the mother to offer the child some water in a cup or spoon. Watch the child drink. A child is ***not able to drink*** if he is not able to suck or swallow when offered a drink.

A child has the sign ***drinking eagerly, thirsty*** if it is clear that the child wants to drink. When the water is taken away, see if the child is unhappy because he wants to drink more. If the child takes a drink only with encouragement and does not want to drink more, he does not have the sign "drinking eagerly, thirsty" and has **normal thirst**.

Now use these 4 clinical signs for classifying dehydration (*Table 2.6*)

Table 2. 6: Assessment and classification of dehydration

Classification	Signs or symptoms	Treatment
Severe dehydration	<p>Two or more of the following signs:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Lethargy / unconsciousness <input type="checkbox"/> Sunken eyes <input type="checkbox"/> Unable to drink or drinks poorly <input type="checkbox"/> Skin pinch goes back very slowly (> 2 seconds) 	<ul style="list-style-type: none"> <input type="checkbox"/> Give fluids for severe dehydration (Plan C) <input type="checkbox"/> If child also has another severe classification: Hospitalize. <input type="checkbox"/> Refer URGENTLY to hospital with mother giving frequent sips of ORS on the way. <input type="checkbox"/> If child is 2 years or older and there is cholera in your area, give Ciprofloxacin for cholera
Some dehydration	<p>Two or more of the following signs:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Restlessness, irritability <input type="checkbox"/> Sunken eyes <input type="checkbox"/> Drinks eagerly, thirsty <input type="checkbox"/> Skin pinch goes back slowly 	<ul style="list-style-type: none"> <input type="checkbox"/> Give fluids for some dehydration (Plan B) <input type="checkbox"/> If the child also has a severe classification: Hospitalize. <input type="checkbox"/> After rehydration, advise mother on home care <input type="checkbox"/> Follow up in 5 days if not improving
No dehydration	Not enough signs to classify as some or severe dehydration	<ul style="list-style-type: none"> <input type="checkbox"/> Give extra fluids, zinc supplements, advise to continue feeding at home (Plan A) <input type="checkbox"/> Advise mother when to return immediately. <input type="checkbox"/> Follow up in 5 days if not improving.

2.5.2 Management of Children with Severe Dehydration

Box 2.8: IV Rehydration

- Start IV fluid immediately. If the child can drink, give ORS by mouth while the drip is set up. Give 100 ml/kg Ringer's Lactate Solution (or, if not available, normal saline), divided as follows


AGE	First give 30ml/kg in:	Then give 70 ml/kg in:
Infants (under 12 months)	1 hour*	5 hours
Children (12 months up to 5 years)	30 minutes*	2 ½ hours

**Repeat once if radial pulse is still very weak and not detectable*

- Reassess the child every 15-20 min till a strong radial pulse is detectable. Thereafter reassess the hydration status after every 1-2 hours. If hydration status is not improving, give the IV drip more rapidly. Monitor number of stools, vomiting and urine output.
- Also give ORS (about 5ml/kg/hour) as soon as the child can drink: usually after 3-4 hours (infant) or 1-2 hours (children)
- Reassess an infant after 6 hours and a child after 3 hours. Classify dehydration. Then choose the appropriate Plan (A, B or C) to continue treatment. **

****All children with severe dehydration should be observed in the facility for at least 6 hours after successful rehydration (not enough signs to classify as either some or severe dehydration).**

Fig 2.19: Carefully monitor amount infused as shown below

Time (hr)	Volume (ml) Set-up*		Estimated Volume (ml) Remaining	Volume Received
<u>11:00 am</u>	<u>1000 ml</u>			
<u>12:00 pm</u>	<u>---</u>		<u>800 ml</u>	<u>200 ml</u>
<u>1:00 pm</u>	<u>---</u>		<u>600 ml</u>	<u>400 ml</u>
<u>2:00 pm</u>	<u>---</u>		<u>400 ml</u>	<u>600 ml</u>
<u>3:00 pm</u>	<u>---</u>		<u>200 ml</u>	<u>800 ml</u>
<u>4:00 pm</u>	<u>1000 ml</u>		<u>0 ml</u>	<u>1000 ml</u>
<u>5:00 pm</u>			<u>800 ml</u>	<u>1200 ml</u>

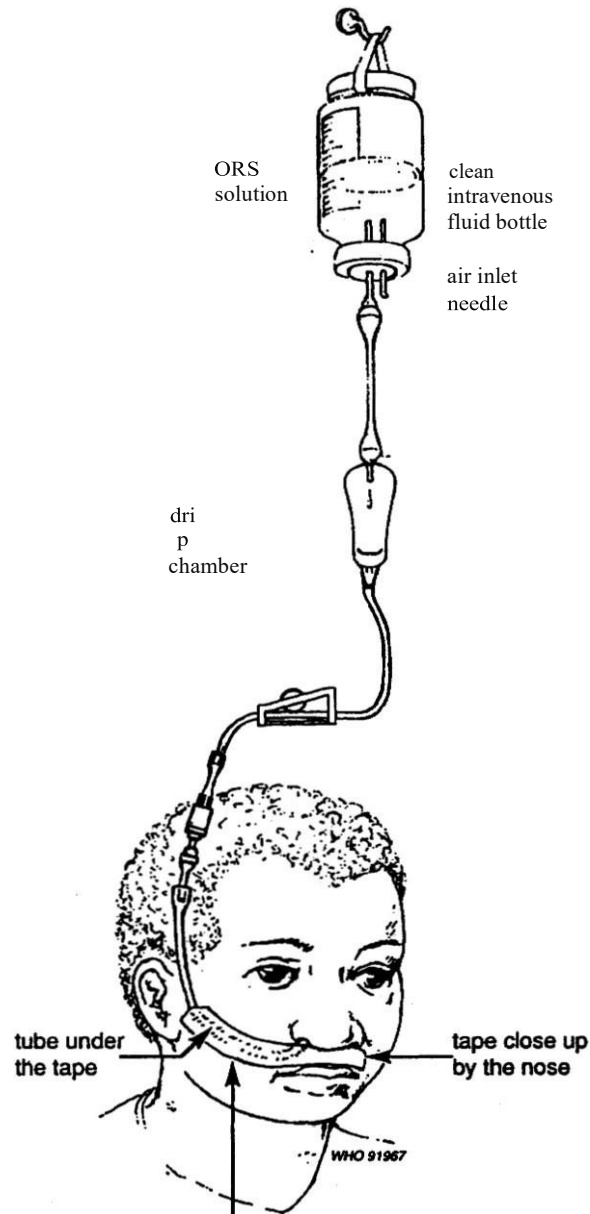
* For each new bottle/pack, initial or added

2.5.3 Nasogastric Rehydration: Use this if child is not lethargic/unconscious, but is not accepting orally or IV rehydration is not possible.

- Use a sterile NG tube 8-10F size for children less than 2 years and 10-12 F for children 2-5 years.
- Place the patient on his or her back, with the head slightly raised. Older children and adults may prefer to sit up.
- Measure the length of tube to be inserted by placing the tip just above the navel. Then stretch the tubing over the back of the ear and forward to the tip of the nose. Mark the tube with a piece of tape where it touches the end of the nose. This mark shows the length of tubing needed to reach from the tip of the nose to the stomach.
- Moisten the tube with a water-soluble lubricant or plain water; do **not** use oil.
- Pass the tube through the nostril having larger opening. Gently advance it until the tip is in the back of the throat. Each time the patient swallows, advance the tube another 3.5cm. If the patient is awake, ask him or her to drink a little water.
- If the patient chokes, coughs repeatedly or has trouble breathing, the tube has probably passed into the trachea. Pull it back 2cm–4cm until the coughing stops and the patient is comfortable. Wait a minute, and then try to insert the tube again.
- Advance the tube each time the patient swallows until the tape marker reaches the nose. If the patient is comfortable and not coughing, the tube should be in the stomach.

- Look into the patient's mouth to be certain that the tube is not coiled in the back of the throat. Confirm that the tube is in the stomach by attaching a syringe and withdrawing a little stomach fluid. You could also do this by placing a stethoscope just above the navel. Inject air into the tube with an empty syringe. Listen for the air entering the stomach.
- Fasten the tube to the face with tape and attach IV tubing that is connected to a clean IV bottle containing ORS solution. Regulate the infusion to a rate of 20 ml/kg per hour, or less with careful monitoring.
- If an IV bottle is not available, a syringe (with the barrel removed) can be attached to the tube and used as a funnel. Hold the syringe above the patient's head and pour ORS solution into it at regular intervals.

TECHNIQUE FOR NASOGASTRIC REHYDRATION



sticky tape going across
the face as far as the ear

Source: King, M. et al. *Primary child care: a manual for health workers*. Book One. Oxford University Press, 1978

Figure 2.20: Technique for Nasogastric Rehydration

CHAPTER 6 : BASIC LIFE SUPPORT

2.6.1. Introduction

Pediatric basic life support (BLS) is not simply a scaled-down version of that provided for adults, although, where possible, guidelines are the same for all ages to aid teaching and retention. Some of the techniques employed need to be varied according to the size of the child. A somewhat artificial line is generally drawn between infants (less than 1-year-old) and children (between one year and puberty), and this chapter follows that approach.

Once the child has been approached safely and a simple test for unresponsiveness has been carried out, assessment and treatment follow the familiar ABC pattern. The overall sequence of basic life support in pediatric cardiopulmonary arrest is summarized in Chart 2.2

Most causes of pediatric cardiorespiratory arrest are due to hypoxia. It means that oxygen delivery rather than defibrillation or chest compression is the critical step in children. This underlines the major differences with the adult algorithm, which follows C-A-B (Circulation- Airway-Breathing) algorithm.

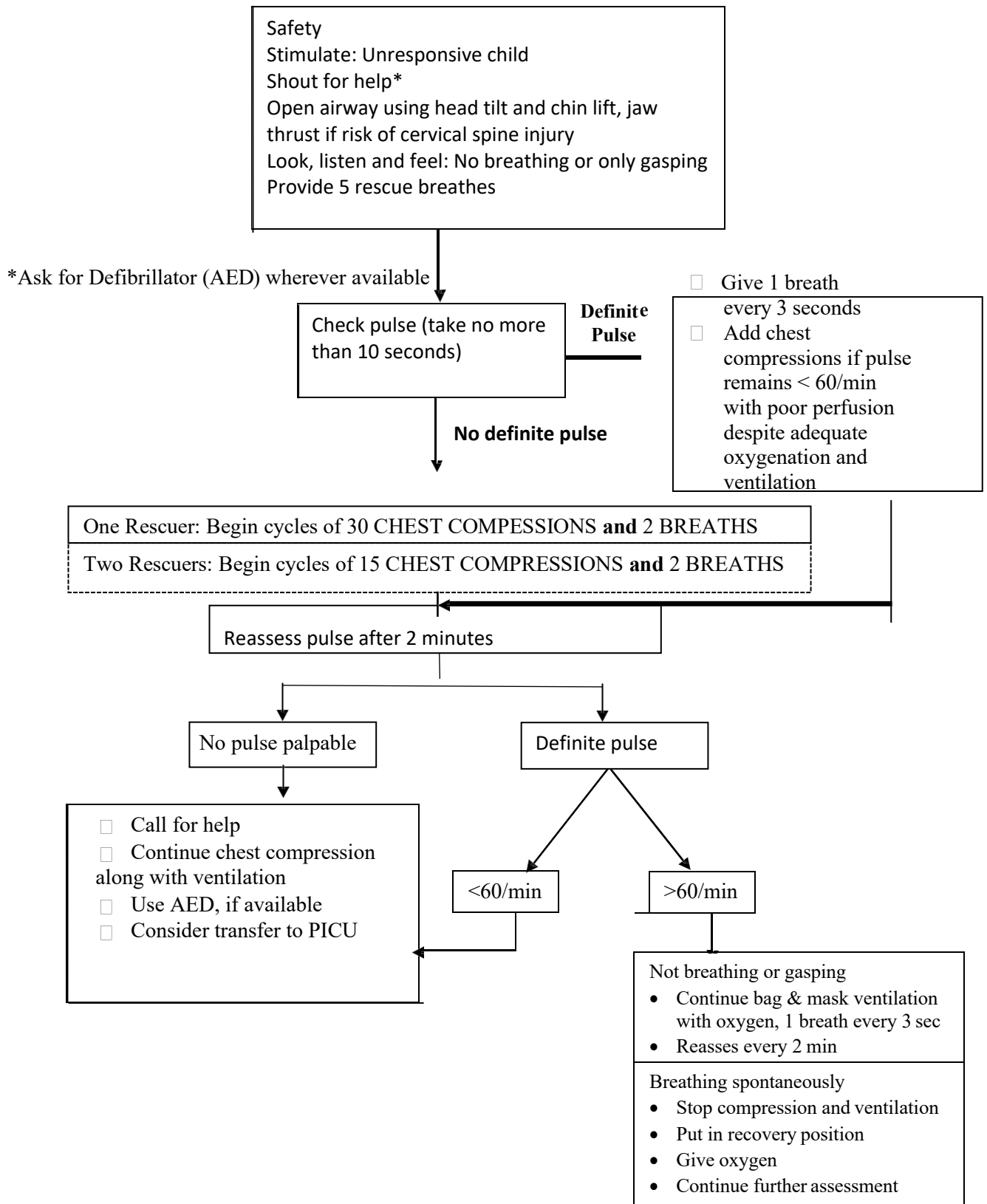
Note: PALS (Pediatric Advanced Life Support) algorithm follows C-A-B sequence even in children. The A-B-C sequence described in this chapter has been derived from APLS (Advanced Pediatric Life Support) Fifth Edition.

By applying the basic techniques described, a single rescuer can support the vital respiratory and circulatory functions of a collapsed child with no equipment. Basic life support is the foundation on which advanced life support is built. Therefore, it is essential that all advanced life support providers are proficient at basic techniques, and that they are capable of ensuring that basic support is provided continuously and well during resuscitation.

Table 2.1: Difference in Basic Life Support in Infants and Children

Airway		
Head-tilt position	Neutral	Sniffing
Breathing		
Initial slow breaths	Five	Five
Circulation		
Pulse check	Brachial or femoral	Carotid
Landmark	Lower half of the sternum	Lower half of the sternum
Technique	Two fingers or two thumbs	One or two hands
CPR ratio	15:2	15:2

Chart 2.2: Basic Life Support Algorithm



SECTION 3 NEWBORN CARE

3.1. CARE OF NORMAL NEWBORN AT BIRTH

3.1.1. Basic needs of a newborn

The Four basic needs of **ALL** newborns at the time of birth and for the first few weeks of life are:

1. To be warm	2. To breathe normally
3. To be protected (prevent infection)	4. To be fed

3.1.2. Immediate Newborn Care

Most babies would require routine care; 5-10% may need assistance to establish adequate breathing and therefore will need resuscitation.

Immediately after delivery dry the baby with pre warm cloth and assess whether baby is breathing or crying, if yes go for routine newborn care.

Routine newborn care after birth includes

- Place the baby on the mother's abdomen
- Dry the baby with a warm clean sheet. Do not wipe off vernix.
- Clamp the cord after 1-3 min and cut with a sterile instrument.
- Tie the cord with a sterile tie/cord clamp.
- Examine the baby quickly for malformations/birth injury
- Leave the baby between the mother's breasts to start skin-to-skin care.
- Support initiation of breastfeeding
- Apply 4 % chlorhexidine gel over umbilical stump wearing gloves
- Cover the baby's head with a cloth. Cover the mother and baby with a warm cloth
- Determine the sex and place an identity label on the baby
- Give Inj Vit K 1mg IM ((0.5 mg for < 1000 grams baby and 1 mg for rest))
- Record the baby's weight Monitor the baby
 - Monitor baby every 15 min for next 1 hour and 2 hourly for next 6 hours (more frequently if needed)
 - Breathing
 - Grunting
 - Chest indrawing
 - Fast breathing
 - Heart rate
 - Color
 - Warmth
 - Bleeding from the cord
 - Examine the baby quickly for malformation /birth injury. Quick but thorough clinical screening is essential to identify any life threatening congenital anomalies eg. Meningomyelocele, trachea-oesophageal fistula, anal atresia and omphalocele.

3.1.3. After immediate newborn care

- Write records of newborn and immediate newborn care.
- Report to an appropriate person.
- Explain findings to mother and family (normal and abnormal)

3.2. BREASTFEEDING

Breastfeeding is one of the cardinal principles of newborn care and breast milk is the optimum nutrition for both healthy and sick newborn babies

3.2.1. Ten steps to achieve successful breastfeeding

1. Have a written breastfeeding policy that is routinely communicated to all health care staff
2. Train all health care staff in skills necessary to implement this policy
3. Inform all pregnant women about benefits and management of breast feeding
4. Help mothers initiate breastfeeding within 1 hour of birth of baby
5. Show mothers how to breastfeed and how to maintain lactation even if they are separated from their infants
6. Give newborn infants no food or drink other than breast milk, unless medically indicated
7. Practice rooming – in: allow mothers and infants to remain together for entire 24 hours in a day
8. Encourage breastfeeding on demand
9. Give no artificial teats or pacifiers (also called dummies or soothers) to breastfeeding infants
10. Foster the establishment of breastfeeding support groups and refer mothers to them on discharge from the hospital or clinic

3.2.2. General principles of exclusive breastfeeding

- Encourage early and exclusive breastfeeding whenever possible
- Explain to mother and her family the benefits of early and exclusive breastfeeding:
 - Breast milk contains the exact nutrients the baby needs and promotes the baby's development
 - Breast milk is easily digested and efficiently used by the baby's body
 - Breast milk protects baby from infection
 - Breastfeeding can be used as a contraceptive method (lactational amenorrhea method)
- Encourage the mother to breastfeed the baby on demand, both day and night (eight or more times in 24 hours), for as long as the baby wants.
- Have the mother offer the second breast once the baby releases the first breast on her/his own.
- Advise the mother that she should not:
 - Force the baby to feed

- Interrupt a feed before the baby is done
- Use artificial teats or pacifier
- Give the baby any other food or drink (eg commercial breast milk substitute, animal milks, local porridges, tea, water etc) other than breast milk for the first six month of life.
- Include the family member or other support person in discussion about breastfeeding if possible
- Ensure that the mother eats nutritious food
- Ensure that the mother can wash or shower daily but tell her to avoid washing or wiping her nipples before breastfeeding.
- If mother is too ill or baby is too sick to breast feed
 - Advise the mother on expression of breast milk
 - Suggest mother to apply warm compression before expression and cold compression afterward to reduce swelling

Give the baby a breast milk substitute only if expression is not possible or is contraindicated because of maternal illness or drugs

3.2.3. Breastfeeding technique

For mothers to produce enough milk, the baby must suckle often enough, and must also suckle in the correct manner. Correct positioning ensures effective suckling and prevents breast engorgement as well as sore nipples.

Figure 8: Correct Positioning



Proper positioning involves:

1. Baby's body is well supported
2. The hand, neck and body of the baby are in the same plane
3. Entire body of the baby faces the mother
4. Baby's abdomen touched mother's abdomen

Figure 9: Good attachment



Proper attachment involves:

1. Baby's mouth is wide open
2. Lower lip is turned outwards
3. Baby's chin touches mother's breast
4. Majority of areola is inside the baby's mouth

3.2.4. Expression of breast milk

Breast milk expression is required for optimal feeding of newborns that are preterm, low birth weight and sick that cannot feed directly from the breast but can tolerate assisted feeding.

Expressing breast milk

Teach the mother to

- Wash hands with soap and water before expression.
- Sit comfortably
- hold the clean container under the nipple
- Place thumb above and first finger below and behind the nipple approximately 4cm from the base of the nipple.
- Support the breast with other three fingers
- Press the breast gently slightly inwards towards the chest wall
- Press the breast between the fore-finger and thumb. Press and release, press and release. This should not hurt
- Avoid rubbing or sliding fingers along the skin
- Rotate the position of the thumb/finger around the breast with each compression
- Express breast milk until milk drips, then express the other breast
- Alternate between the breasts 5-6 times (20-30 minutes)

Consider massage of breasts and use of warm compresses prior to or during expression to improve milk flow

Express milk at the times when a baby would normally feed (every 2-4 hours and at least 8 times during a 24 hour period).

Storing expressed breast milk (EBM)

- Store in clean, covered container
- EBM can be kept at room temperature for 8 hours and in the refrigerator for 24 hours
- EBM stays in good condition longer than animal milk. Do not boil the EBM. For warming, place the container in a bowl of warm water
- Before feeding gently shake the container or use a stirrer to recombine the separated

3.3. EXAMINATION OF NEWBORN

S.No.	Initial newborn examination
	PREPARE BEFORE EXAMINATION
1	Prepare equipment: Thermometer, watch or clock with second hand, scale for weighing (if available), clean clothes, gloves
2	GET HISTORY OF PREGNANCY, BIRTH AND IMMEDIATE NEWBORN PERIOD
3	Ask the mother or look at her prenatal and intrapartum records to find out the following information:
a.	Fever during labour
b.	Duration of labour, mode of delivery, Bag of water broken more than 18 hours before delivery, APGAR score
c.	any other infections (hepatitis B, syphilis or other sexually transmitted infections, HIV/AIDS)
d.	Any other diseases (TB, Malaria, diabetes, chronic infections, pre-eclampsia) or medicines and immunization?
e.	Method, time and place of delivery
f.	Was the amniotic fluid clear?
g.	Was newborn resuscitation done?
h.	How many times baby had passed urine in last 24 hours?
i	How many times has the baby breastfed?
j	Any prelacteal feed being given?
k	Does the baby feed on the breast well?
l	Do you think the baby is well?
m	Are you (mother or family) worried about anything?
	PREPARE TO DO THE PHYSICAL EXAMINATION
4	Explain to the mother and family what you are going to do
5	Wash your hands thoroughly with soap and water
6	Dry with a clean dry cloth or air-dry
7	Place of Exam:
	•Do exam with baby in mother's lap, if possible
	• or do exam on a table or bed with a clean warm cloth covering surface close to mother
	Throughout the exam:
8	Explain to the mother and family what you are doing and answer any questions they ask
9	Praise the baby as you do the exam
10	Handle the baby gently
	DO PHYSICAL EXAMINATION
11	Without touching the baby, observe and teach the mother to observe the baby's:
12	Breathing (count for 1 full minute):
	• 30-60 quite breaths in 1 minute
	• No indrawing of the chest or nostril flaring
	• No apnoea (periods of not breathing for more than 20 seconds)
	• Chest and abdomen move with each breath

13	Look at colour:
	• Face, chest, tongue and lips are pink
	• Hands and feet may be bluish during first 48 hours
14	Look at posture: Arms and legs are flexed.
15	Look at activity:
	• Moves legs and arms equally
	• Opens mouth and turns head to search for nipple when cheek is stroked gently
	• Touch the baby gently and check the following:
16	Heart rate (count for 1 full minute):
	HR • 100-160 beats in 1 minute
17	Temperature:
	• Normal: Axillary temperature between 36.5°C - 37.5°C
	• If no thermometer available. Use back of hand to feel abdominal wall and both lower limbs. Severe hypothermia present if both the abdomen and feet feel cold.
	• If baby is cold, either delay examination until baby is warm or do exam near a heat source.
18	Look at skin:
	• Normal: (Milia [white bumps on face] bluish area over lower back, peeling of skin, pustules, blisters, red or purple spots)
19	Look at and feel the head:
	• Moulding, caput
	• Anterior fontanelle flat or bulging
20	Look at eyes: No discharge, not sticky
21	Look at and feel the mouth: Lips, gums, and palate intact
22	Look at the chest:
	• Both side of chest move equally
	• Breast nodules maybe enlarged in both girls and boys at birth
23	Look at and feel the abdomen:
	• Rounded and soft
	• Umbilical cord tied tightly, dry, not bleeding
24	Look at back and spine: Any swelling over spine
25	Look at anus: Do not insert finger or instrument to inspect the anus
26	Look at girl's external genital organs:
	• Vaginal opening present (Discharge: normal to have white vaginal discharge and bloody vaginal discharge that starts on day 2 or 3 and continues up to day 7)
27	Look at boy's external genital organs:
	• Urethra opens a end of penis
	• one or two testes felt in the scrotum
28	Weight: Normal range is 2.5 - 4 kg
	Watch the baby breastfeed
29	Position
30	Sucking
31	Attachment
32	Watch Mother-Baby interaction
33	Dress the baby or place the baby close to mother and cover both
	DECIDE NEEDS / PROBLEMS
34	Compare your findings with the normal findings

35	If all is normal, tell mother her baby is healthy and normal.
	If any of the findings not under " Normal Findings":
36	Gently explain to mother what abnormal findings may mean and what action is needed
37	<p>Explain Dos and Don'ts while caring for normal newborn</p> <ul style="list-style-type: none"> • Exclusive breast feeding • Immunize as appropriate • Learn about danger signs • Mother should be getting iron and folic acid and adequacy about mother's diet • Do not put oil in eyes, ear, nose and umbilicus • Do not squeeze newborn's breast • Do not apply <i>kajal</i> or <i>gajal</i> • Do not try to warm baby by using coal and fire • Do not give vigorous massage to the newborn • Do not give water or any other medicine without consulting doctor

3.4. CRITERIA FOR ADMISSIONS TO SNCU FOR TRANSFER TO STEP-DOWN UNIT AND DISCHARGE

Any newborn with following criteria should be immediately admitted to the SNCU:

- Birth weight <1800 gm or gestation <34 weeks)
- Large baby (4 kg or more)
- Perinatal asphyxia
- Apnea or gasping
- Refusal to feed
- Respiratory distress (Rate 60 or more/min or grunt/retractions)
- Severe jaundice (Appears<24 hrs/stains palms & soles/lasts>2 weeks)
- Hypothermia less than 36°C (96.8°F), or hyperthermia ($\geq 37.5^{\circ}\text{C}$, $\geq 99.5^{\circ}\text{F}$)
- Central cyanosis
- Shock (cold periphery with CRT>3 seconds and weak & fast pulse)
- Coma, convulsions or encephalopathy
- Abdominal distension

- Diarrhoea/dysentery
- Bleeding
- Major malformations

Guidelines for entry into the newborn corner/nurseries/NICU:

- Remove shoes, socks, woollens, watch, bangles and rings
- Roll up the full sleeves up to elbow
- Put on clean slippers
- Wash hands with soap and water for 2 minutes
- Put on gown

Guidelines for Visitors for newborn corner/nurseries/NICU

- Babies are kept with mother in nurseries and newborn corner unless very sick and requires NICU care
- NICU should have limited person entering the areas. No visitors should be allowed in NICU
- Mothers should wear clean cloth and wash hands
- Parents should be guided and supervised about proper hand washing technique
- Any person with active infection should not be allowed into the baby care area

Nursery environment:

- The nursery temperature should be maintained between 28 to 30°C
- The environment should be calm and clean
- There should be 24 hour water and electric supply with adequate ventilation and lighting
- Overcrowding should be avoided
- Floor should be cleaned with dilute phenyl
- Clean the walls with 2% bacillocid once in each nursing shift
- Dustbins should be washed with soap and water daily

Criteria for transfer from SNCU to the Step-down¹

- Babies whose respiratory distress is improving and do not require oxygen supplementation to maintain oxygen saturation
- Babies on antibiotics for completion of duration of therapy
- Low birth weight babies (less than 1800 g), who are otherwise stable (for adequate weight gain)
- Babies with jaundice requiring phototherapy but otherwise stable
- Babies admitted for any condition but are now thermodynamically and hemodynamically stable

¹In places where there is set up for intermediate care facilities

Criteria for discharge from SNCU to home

- Baby is able to maintain temperature without radiant warmer
- Baby is hemodynamically stable (normal CRT, strong peripheral pulses)
- Baby accepting breast feeds well
- Baby has documented weight gain for 3 consecutive days; and the weight is more than 1.5 kg
- Primary illness has resolved

In addition to the above, mother should be confident of taking care of the baby at home.

3.5. MANAGEMENT OF PRETERM AND LOW BIRTH WEIGHT BABIES

3.5.1. Two clinical types of LBW

1. Preterm or premature (< 37 weeks of gestation)
2. Small for gestational age (SGA) or intrauterine growth retardation or restriction (IUGR) or Small for date (SFD)

3.5.2. Classification of LBW:

- Low birth weight: - Birth weight less than 2500gms irrespective of the gestational age.
- Very low birth weight: Birth weight less than 1500gms irrespective of the gestational age.
- Extremely low birth weight: Birth weight less than 1000gms irrespective of the gestational age.

3.5.3. Assessing gestation age of the newborn baby

Knowledge of the gestation age of newborn babies may modify the detail of their care thereby maximizing the outcome. Though GA usually calculated from history of LMP, this date is not known in a large minority of pregnancies, like in irregular menstruation, women in contraception etc.

A simple, quick and reliable scoring system developed by J M Parkin is suitable in our setup. Mean gestational age is derived from the total scores of skin color, skin texture, ear firmness & breast size.

Score	GA(Day)	GA(week)
1	190	27
2	210	30
3	230	33
4	240	34.5
5	250	36
6	260	37

7	270	38.5
8	276	39.5
9	281	40
10	285	41
11	290	41.5
12	295	42

Skin texture: tested by picking up a fold of abdominal skin between finger and thumb & by inspection

0: Very thin and gelatinous feel
1: Thin and smooth
2: Smooth and of medium thickness, irritation rash and superficial peeling may be present
3: Slight thickening and stiff feeling with superficial peeling especially evident on the palm and feet.
4: Thick and parchment like with superficial or deep cracking

Skin colour: Estimated by inspection when the baby is quiet

0: Dark red
1: Uniformly pink
2: Pale pink, though the color may vary over different parts of the body, some parts may be very pale.
3: Pale, nowhere really pink except ears, lip, palm and sole

Breast size: Measured by picking up the breast tissue between finger and thumb




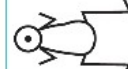












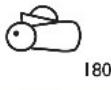
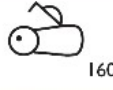


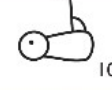
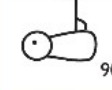
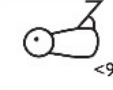

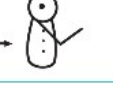

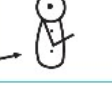
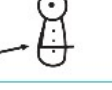
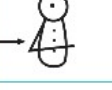






0: No breast tissue palpable.
1: Breast tissue palpable on one or both sides, neither being more than 0.5 cm in diameter.
2: Breast tissue palpable on both sides one or both being 0.5 to 1 cm in diameter.
3: Breast tissue palpable on both sides one or both being > 1 cm in diameter.

Ear firmness: Tested by palpation and folding of the upper pinna.

0: Pinna feels soft and is easily folded bizarre position without springs back into position spontaneously.
1: Pinna feels soft along the edge and is easily folded but returns slowly to the correct position spontaneously
2: Cartilage can be felt to the edge of the pinna though it is thin in places and the pinna spring back readily after being folded
3: Pinna firm with definite cartilage extending to the periphery and spring back immediately into position after being folded

**Assessing gestational age of a newborn baby
(Expanded new Ballard score)**

Neuromuscular maturity

Score	-1	0	1	2	3	4	5
Posture							
Square window (wrist)	 >90°	 90°	 60°	 45°	 30°	 0°	
Arm recoil		 180°	 140-180°	 110-140°	 90-110°	 <90°	
Popliteal angle	 180°	 160°	 140°	 120°	 100°	 90°	 <90°
Scarf sign							
Heal to ear							

Physical maturity

Skin	Sticky, friable, transparent	Gelatinous, red, translucent	Smooth, pink, visible veins	Superficial peeling and / or, rash few veins	Cracking, pale areas, rare veins	Parchment, deep cracking, no vessels	Parchment, deep cracking, no vessels
Lanugo	None	Sparse	Abundant	Thinning	Bald areas	Mostly bald	Maturity rating
Plantar surface	Heel-toe 40-50 mm: -1 < 40 mm: -2	>50 mm, no creases	Faint red marks	Anterior transverse crease only	Creases anterior 2/3	Creases over entire sole	
Breast	Imperceptible	Barely perceptible	Flat areola, no bud	Stippled areola, 1-2 mm bud	Raised areola, 3-4 mm bud	Full areola, 5-10 mm bud	Weeks
							-10
							-5
							0
							5
							10
							20
							22
							24
							26
							28

Eye /ear	Lids fused loosely: -1 Tightly: -2	Lids open, pinna flat stays folded	Slightly curved pinna soft, slow recoil	Well curved pinna, soft slow recoil	Formed and firm, instant recoil	Thick cartilage, ear stiff	15	30
							20	32
							25	34
							30	36
							35	38
							40	40
45	42							
Genitalia Male	Scrotum flat, smooth	Scrotum empty, faint rugae	Testes in upper canal rare rugae	Testes descending, few rugae	Testes down, good rugae	Testes pendulous, deep rugae	50	44
Genitals (female)	Clitoris prominent, labia flat	Clitoris prominent, small labia minora	Clitoris prominent, enlarging minora	Majora and minora equally prominent	Majora large, minora small	Majora cover clitoris and minora		

3.5.4. Problems of Preterm: Immediate problems:

- Birth Asphyxia
- Hypoglycemia
- Hypothermia
- Hypocalcemia
- Apnoea
- Feeding difficulties
- Infections
- Hyaline membrane disease (HMD)
- Apneic spells
- Intraventricular hemorrhage (IVH)
- Necrotizing enterocolitis (NEC)
- Metabolic acidosis
- Hyperbilirubinemia
- Fluid and electrolyte imbalance
- Patent ductus arteriosus

Long term problems:

- Anemia
- Retinopathy of prematurity
- Bronchopulmonary dysplasia
- Cerebral palsy

3.5.5. Management of preterm baby Management

at birth

- Preterm delivery should be attended by a skilled health worker trained in newborn care
- The baby should be promptly dried, effectively covered and kept warm.
- Vitamin K 0.5mg IM should be given

Oxygen Therapy

- Only when indicated
- Administer when SaO₂ falls below 85% and gradually withdraw when >92% (maintain Spo₂ between 85-92%)

Monitor and manage for hypoglycemia Monitor and

manage for hypocalcemia Prevention of hypothermia

- Pre-warmed open care system / room with radiant warmer.
- Dry the infant and delay bathing
- Effectively clothed and provided with cap, socks, mitten
- Kangaroo mother care

3.5.6. Apnoea of prematurity

Apnea is defined as cessation of respiration for >20 sec or cessation of respiration of any duration accompanied by bradycardia (HR <100/min) and/or cyanosis. Due to immaturity in mechanism for controlling breathing usually presents after 1-2 days of life and within the first 7 days

Emergency treatment

- Check for bradycardia, cyanosis and airway obstruction
- The neck should be positioned in slight extension; oro-pharynx gently suctioned
- Give tactile stimulation
 - Most apneic spells respond to tactile stimulation
- Provide oxygen if patient is hypoxic (maintain saturation 92-95%) by head box or nasal cannula or CPAP
- If the newborn continues to remain apneic and does not respond to tactile stimulation, ventilation with bag and mask (BMV) using 100% oxygen should be initiated.

If BMV fails to initiate spontaneous respiration in the newborn, then the infant should be managed with positive pressure ventilation.

Specific measures

- Drugs
 - Caffeine citrate
 - Loading dose 10 mg/kg IV or oral (20 mg/kg)
 - Followed by maintenance dose of 2.5 mg/kg once a day
 - Less side-effects such as tachycardia and arrhythmia, but higher cost compared to Aminophylline
 - Aminophylline therapy
 - Loading dose of 5-7 mg/kg

- Followed by maintenance dose of 1.5-2 mg/ kg/dose 6-8 hourly
 - Given till 34 weeks of gestational age /apnea free period of 1 week
- CPAP
 - Requires mechanical ventilation if frequent or persistent

3.5.7. Kangaroo Mother Care

Kangaroo Mother Care is the low cost, humane technique for caring low birth weight babies by direct skin to skin contact with the mother

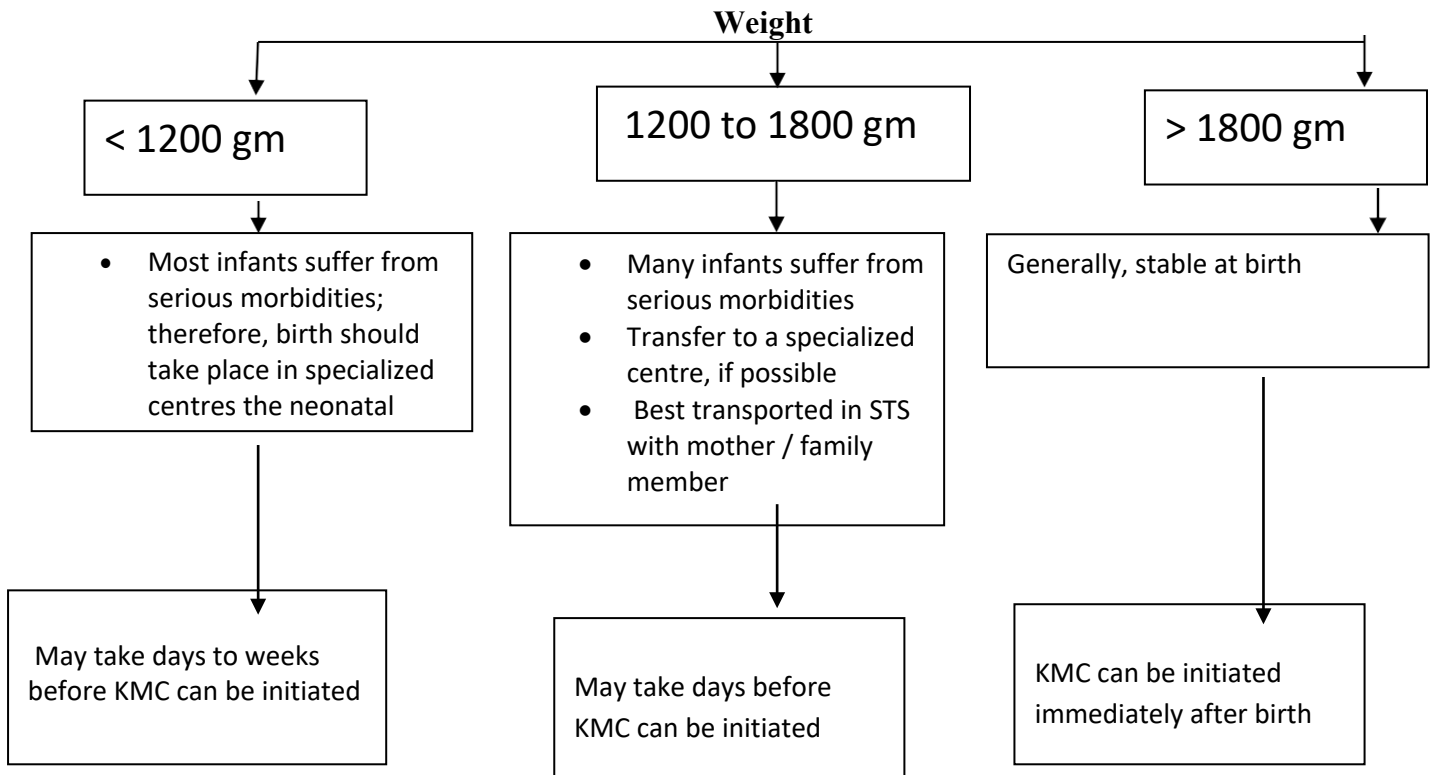
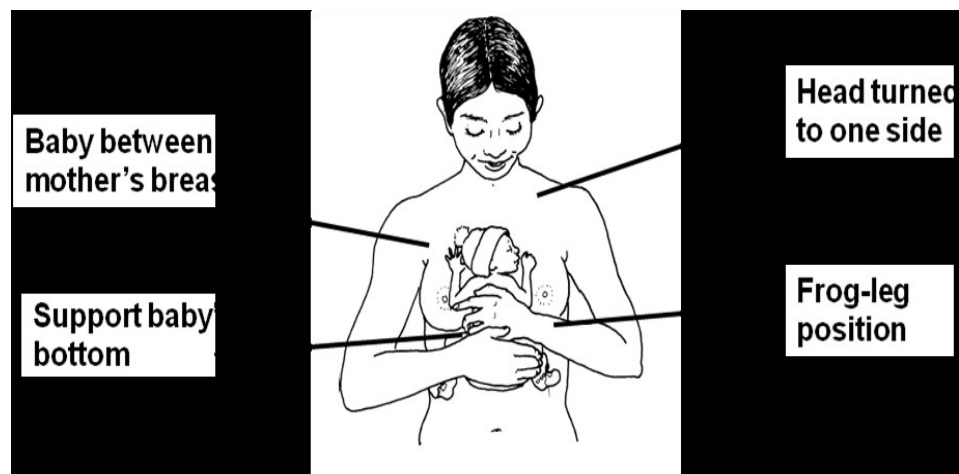


Figure: Timing of KMC initiation for different birth weight categories

KMC procedure

1. **Provide privacy**
2. **Kangaroo position**
 - Baby should be placed between mother’s breast in upright position
 - Head should be turned to one side in slightly extended position. The slightly extended head keeps the airway open and allows eye to eye contact with mother
 - Hips should be flexed and abducted in a “frog” position and arms should also be flexed
 - Baby’s abdomen should be at the level of mother’s epigastrium. Mother’s breathing stimulates the baby thus reducing apnea.

- Support the baby's bottom with a sling/binder



Monitoring

- Important especially in early stage
- Make sure neck in slightly extended position
- Airway clear
- Regular breathing
- Pink in color
- Temperature normal

Feeding

- Explain about breast feeding while in KMC
- Can give express breast milk cup/spoon, orogastric tube

3.6. ASSISTED FEEDING OF LOW BIRTH WEIGHT BABIES

3.6.1. Newborns that require assisted feeding:

- Preterm <34weeks or birth <1800 g
- Babies having mild respiratory distress
- Babies with inability to feed at breast or cup/paladai
- Oro-facial defects/malformations (cleft lip or palate)

3.6.2. Guidelines for the modes of providing fluids and feeding:

Birth weight (grams)	<1200	1200-1800	>1800
Gestation (weeks)	<30	30-34	>34
Initial feeding	Intravenous fluids try gavage feeds, if not sick	Gavage, try paladai if not sick	Breastfeeding, if unsatisfactory, give paladai feeds
After 1-3 days	Gavage	Cup/paladai	Breastfeeding
Later (1-3 weeks)	Cup/ paladai	Breastfeeding	Breastfeeding
After some more time (4-6 weeks)	Breastfeeding	Breastfeeding	Breastfeeding

Breast milk is the ideal feed for low birth weight babies.

Those unable to feed directly on the breast can be fed expressed breast milk (EBM) by gavage or cup or paladi.

3.6.3. Modes for providing fluids and feeds:

Feeding with a nasogastric or orogastric tube

- Place an oro-gastric feeding catheter of size 5-6 Fr after measuring the correct insertion length from ala of nose to tragus and from tragus to midway between xiphisternum and umbilicus.
- Check correct placement by pushing in air with 10 ml syringe and listening with stethoscope over upper abdomen.
- Attach 10 ml syringe (without plunger) at the outer end of the tube, pour measured amount of milk and allow milk to trickle by gravity. Close outer end of tube after feeding
- Place baby in left lateral position for 15 to 20 minutes to avoid regurgitation
- Leave oro-gastric tube in situ

Measure pre-feed abdominal girth just above the umbilical stump. Do not attempt pre-feed aspirates

3.7. GRADING AND MANAGEMENT OF HYPOTHERMIA

Baby who is cold to touch both centrally and peripherally if temperature is less than 36.5°C (97.7°F)

Grading of hypothermia

- Normal temperature : 36.5 to less than 37.5 0°C (97.7°F to <99.5°F)
- Cold stress : 36 to less than 36.5 0°C (96.8°F to <97.7°F)
- Moderate hypothermia : 32 to less than 36. 0°C (89.6°F to <96.8°F)
- Severe Hypothermia : <32°C (<89.6°F)

Management of hypothermia

- Record actual body temperature
- Re-warm a hypothermic baby as quickly as possible:
 - Severe hypothermia – Radiant warmer
 - Mild to moderate hypothermia – Kangaroo mother care or Radiant warmer

If hypothermic still persists despite taking above measures, infection should be suspected

Management of severe hypothermia

1. Keep under radiant warmer
2. Reduce further heat loss
3. Infuse IV 10% Dextrose @ 60ml/kg/day
4. Inject Vitamin K 1.0 mg intramuscular
5. Provide oxygen
6. Consider and assess for sepsis

Baby must be kept warm at all times right from birth. The "warm chain" is a set of 10 interlinked procedures carried out at birth and later

1. Warm delivery room (>25 °C, 77°F)
2. Warm resuscitation
3. Immediate drying
4. Skin- to- skin contact between baby and the mother
5. Breast feeding
6. Bathing and weighing postponed
7. Appropriate clothing and bedding
8. Mother and baby together
9. Warm transportation
10. Training of the health care providers in warm chain

3.8. MANAGEMENT OF HYPOGLYCEMIA

3.8.1. Definition:

Hypoglycemia in newborns is defined as blood glucose levels less than 45 mg/dl

3.8.2. Newborn who need monitoring of blood sugar level

- a. Small for gestational age
- b. Large for gestational age
- c. Infant of diabetic mother
- d. Preterm babies
- e. Symptomatic babies
- f. Infants with Rh hemolytic disease
- g. Any sick neonate such as those with perinatal asphyxia, polycythemia, sepsis, shock etc, when they are in active phase of illness

3.8.3. Clinical features of hypoglycemia: No specific signs.

- i. Jitteriness, cyanosis, seizures, apneic episodes, tachypnoea, weak or high pitched cry, floppiness or lethargy, poor feeding, eye rolling, severe hypothermia.
- ii. Blood sugar testing is done in all those babies who are at risk of hypoglycemia at one hour of life or immediately in symptomatic babies.
- iii. If blood glucose is normal i.e. > 45 mg/dl, prevent hypoglycemia by initiating early breast feeding and continue feeding every 2-3 hours.

3.8.4. Management of asymptomatic hypoglycemia

If blood glucose is low see whether baby is symptomatic or asymptomatic.

If asymptomatic see the level of blood glucose, whether 25-45 mg/ dl or < 25 mg/dl.

Direct breast-feeding is the best option of an oral feed. If the infant is unable to suck, expressed breast milk may be given. Breast milk promotes ketogenesis (ketones are important alternate sources for the brain along with other sources such as pyruvate, free fatty acids, glycerol, and amino acids). If breast milk is not available, then formula feeds may be given

3.8.5. Management of symptomatic / severe Hypoglycemia

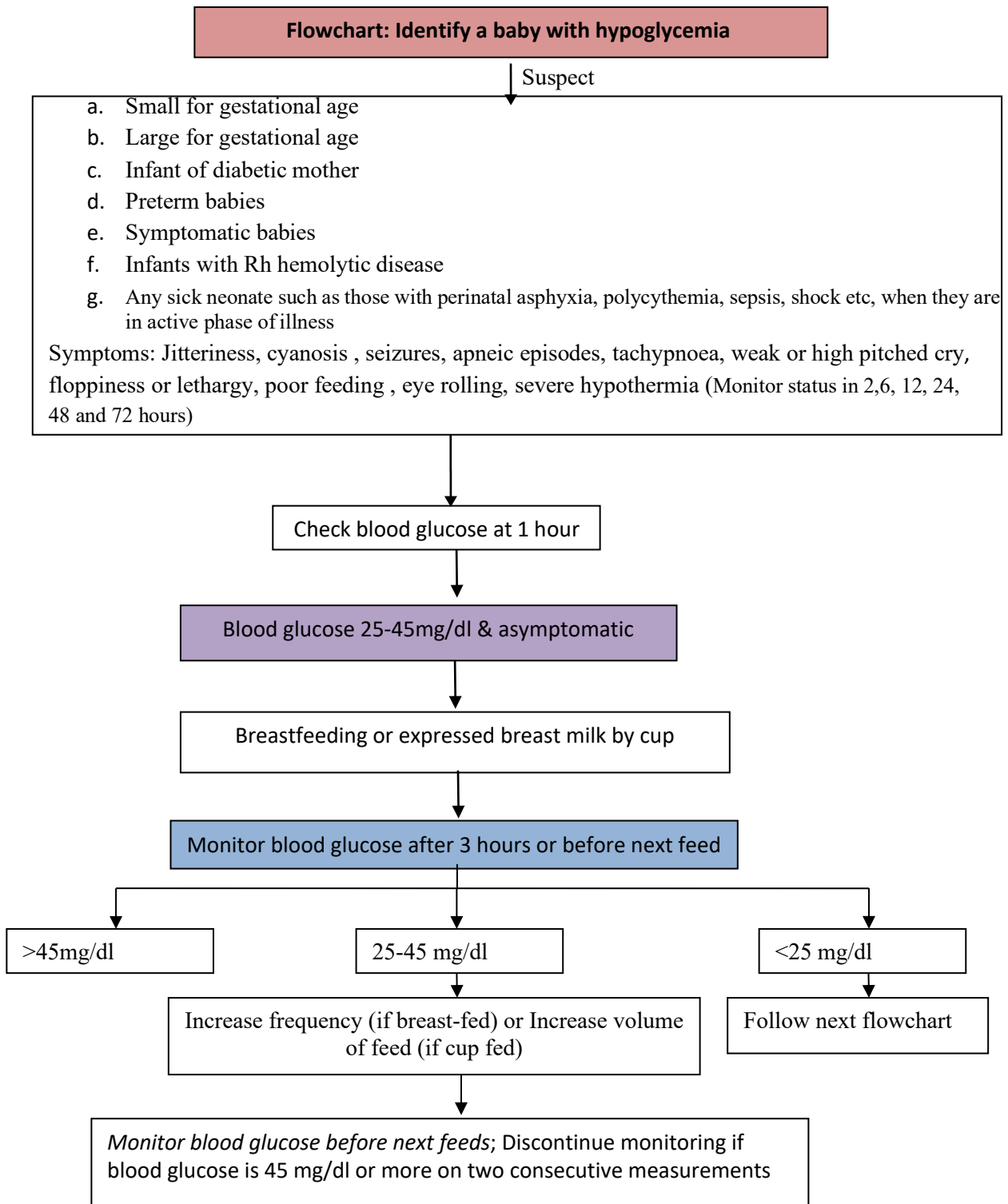
- Establishment an IV line in symptomatic babies.

- If a facility for IV insertion is not available give 2ml/kg 10% dextrose orally or through nasogastric tube, keep baby warm and refer to nearest higher center.
- Draw blood for blood glucose estimation, septic screening and blood culture.
- Keep baby warm.
- Infuse bolus of 2 ml/kg body weight if 10% dextrose slowly over 5 min
 - If an IV line is not available, administer 2 ml/kg body weight of 10% dextrose by oro/naso gastric tube.
- Start infusion of dextrose at the daily maintenance volume to provide at the rate of 6 mg/kg/min
- Measure blood glucose after 30 min.
- If blood glucose <25mg/dl:
 - Repeat bolus of dextrose as above
 - Increase to infusion rate of 8 mg/kg/min
- If the blood glucose > 25 mg/dl but < 45 mg/dl:
 - Increase infusion rate by 2 mg/kg/min
 - Measure blood glucose after 30 min if dextrose bolus is given or abnormal previously
 - Repeat blood glucose measurement every 3 hours
 - Continue the infusion at this rate until 2 consecutive values 6 hrs apart are above 50 mg/dl
 - If blood glucose level is > 50 mg/dl monitor glucose every 12 hours for at least 24 hours.
- Begin breastfeeding as soon as baby is able to breastfeed
 - If cannot be breastfed, give EBM by cup or paladai
- As feeding improves, slowly decrease (over 1-2 days) IV dextrose and increase oral feeds

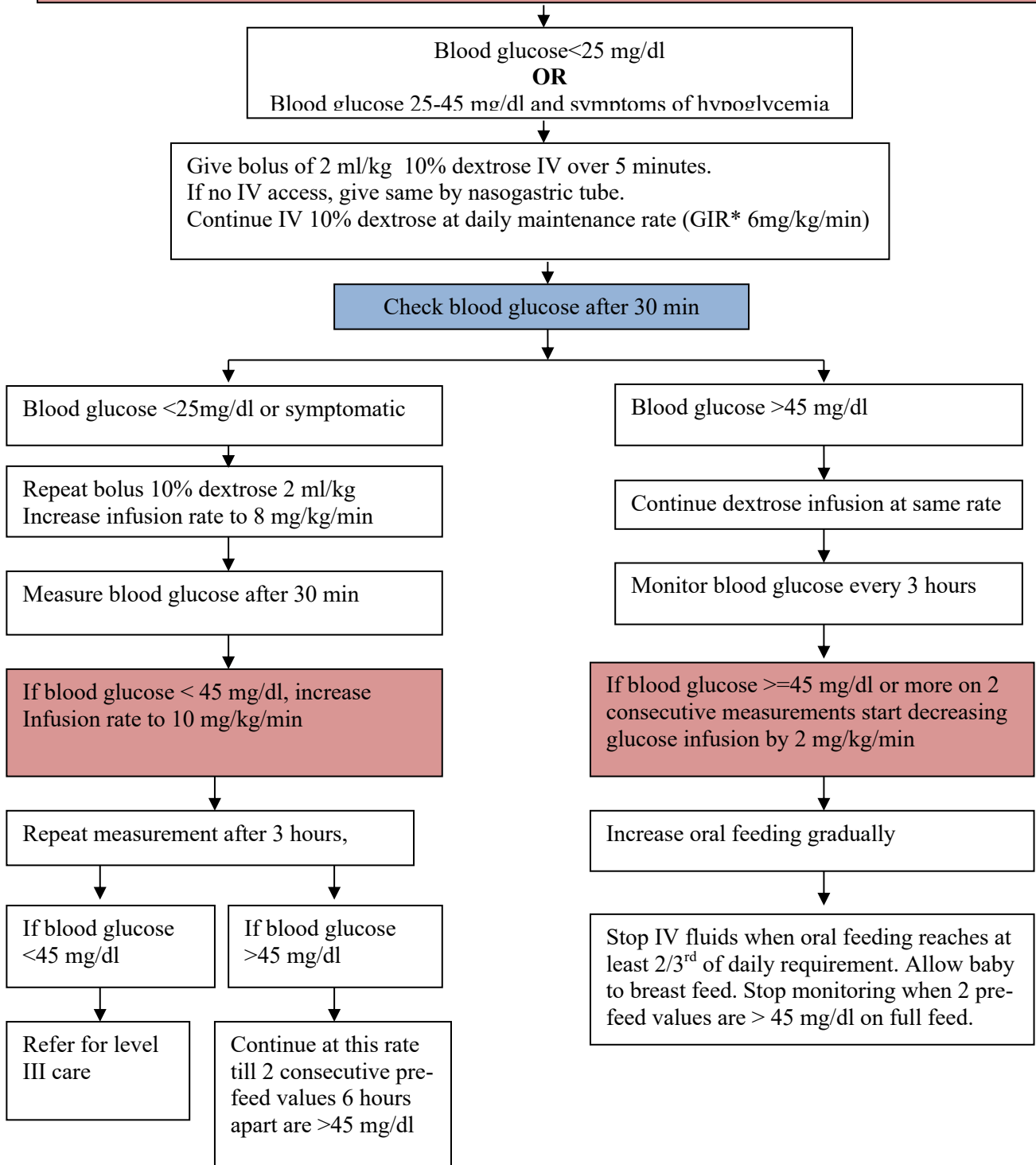
Do not discontinue the glucose infusion abruptly to prevent rebound hypoglycemia.

If blood sugar is persistently low despite of giving glucose infusion at the rate of 10mg/kg/min, refer baby to nearest hospital with level III care.

Practical tip: *If there is persistent hypoglycemia, check the intravenous line for functioning. Also recheck the intravenous fluid preparation and infusion rate.*



Flowchart: management of baby with blood glucose <25 mg/dl or symptomatic hypoglycemia



*GIR-Glucose Infusion Rate

3.8.6. Achieving appropriate glucose infusion rates using a mixture of D10 & D25

Volume of fluids	Glucose Infusion Rate											
	6 mg/kg/min				8 mg/kg/min				10 mg/kg/min			
(ml/kg/day)	D10 (ml)	D25 (ml)	NS (ml)	DW (ml)	D10 (ml)	D25 (ml)	NS (ml)	DW (ml)	D10 (ml)	D25 (ml)	NS (ml)	DW
60	42	18	-	-	24	36	-	-	5	55	-	-
75	68	7	-	-	49	26	-	-	30	45	-	-
90	60	10	20	-	40	30	20	-	20	50	20	-
105	85	-	20	-	65	20	20	-	45	40	20	-
120	86	-	20	14	88	12	20	-	70	30	20	-
135	86	-	20	29	115	-	20	-	80	25	20	-
150	86	-	20	44	115	-	20	15	120	10	20	-

Formula for GIR Calculation - (% of dextrose X ml/kg/day) / 144

For example, if 10% Dextrose is used at 80 ml/kg/day that gives,

$$\text{GIR} = (10 \times 80) / 144 = 5.6 \text{ mg/kg/min}$$

3.9: INTRAVENOUS FLUID THERAPY

3.9.1. Choice of intravenous fluids

- Determine required volume of fluid as per birth weight and age (Table 2)
- Use 10% Dextrose for initial 48 hours of life
- After 48 hours, if baby is passing urine, use commercially available IV fluids such as Isolyte P or 10% Dextrose + 1/5 NS
- If the remixed solution is not available or baby requires higher GIR (Glucose infusion rate),
 - Take normal saline (NS) 20 ml/kg body weight
 - Add remaining fluid volume as 10% dextrose
 - Add 1 ml KCL/100 ml of prepared fluid

3.9.2. Administration of intravenous fluids

- Use micro-drip infusion set (where 1 ml =60 micro drops)
- In this device, ml of fluids per hour is equal to number of micro-drops per minute e.g. 6ml/hr = 6 micro drops/minute
- Calculate rate of administration, monitor to ensure that micro-dropper delivers required rate
- Change the IV infusion set and fluid bag every 24 hours
- Before infusing IV fluid, carefully check:
 - Expiry date of the fluids
 - Seal of the infusion bottle or bag
 - Fluid is clear and free from any visible particles
- Inspect infusion site every hour for redness and swelling
- If redness and /or swelling is present, stop infusion, remove cannula and establish a new IV line in a different vein
- Check the volume of fluid infused, compare to the prescribed volume and record all findings
- Measure blood glucose every nursing shift, i.e. 6-8 hours
- If the blood glucose is less than 45 mg/dl, treat for low blood glucose
- If the blood glucose is more than 150 mg/dl on two consecutive readings: change to 5% dextrose solution –measure blood glucose again in three hours
- Weigh the baby daily weight loss is more than 5%, increase the total volume of fluid by 10 ml/kg body weight for one day
- If there is no weight loss in the initial 3 days of life, do not give the daily increment
- If there is excessive weight gain (3-5%) decrease the fluid intake by 15 to 20 ml/kg/day
- Check urine output: normally a baby passes urine 5-6 times everyday

3.9.3. Fluid requirements of newborns

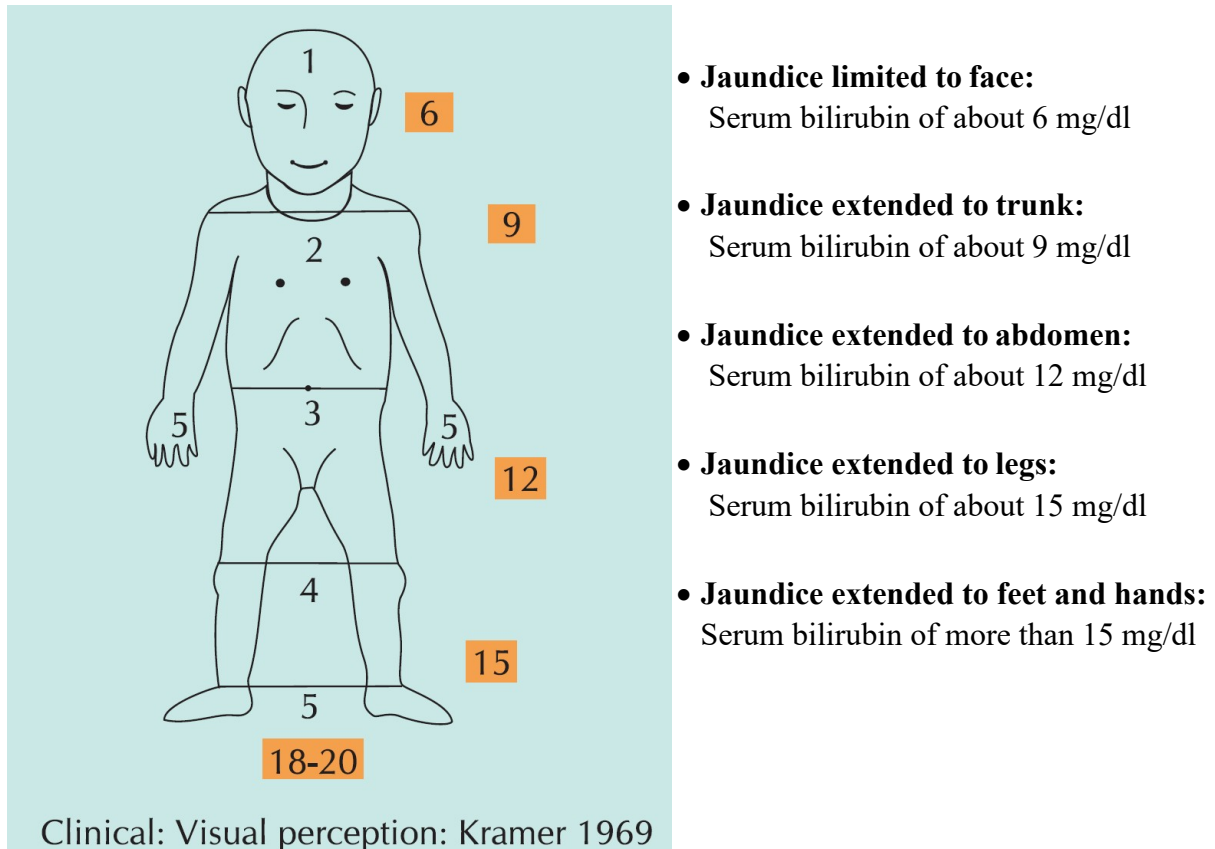
Day of life	Amount of fluids required (ml/kg/day)	
	Birth weight > 1500 g	Birth weight < 1500 g
1	60	80
2	75	95
3	90	110
4	105	125
5	120	140
6	135	150
Day 7 onwards	150	150

3.10. ASSESSMENT AND MANAGEMENT OF JAUNDICE

3.10.1. Clinical assessment of severity of jaundice in a newborn

In a newborn that has not been treated earlier, Kramer's criteria are used to clinically estimate severity of jaundice.

Figure 4: Kramer's criteria to clinically estimate severity of jaundice



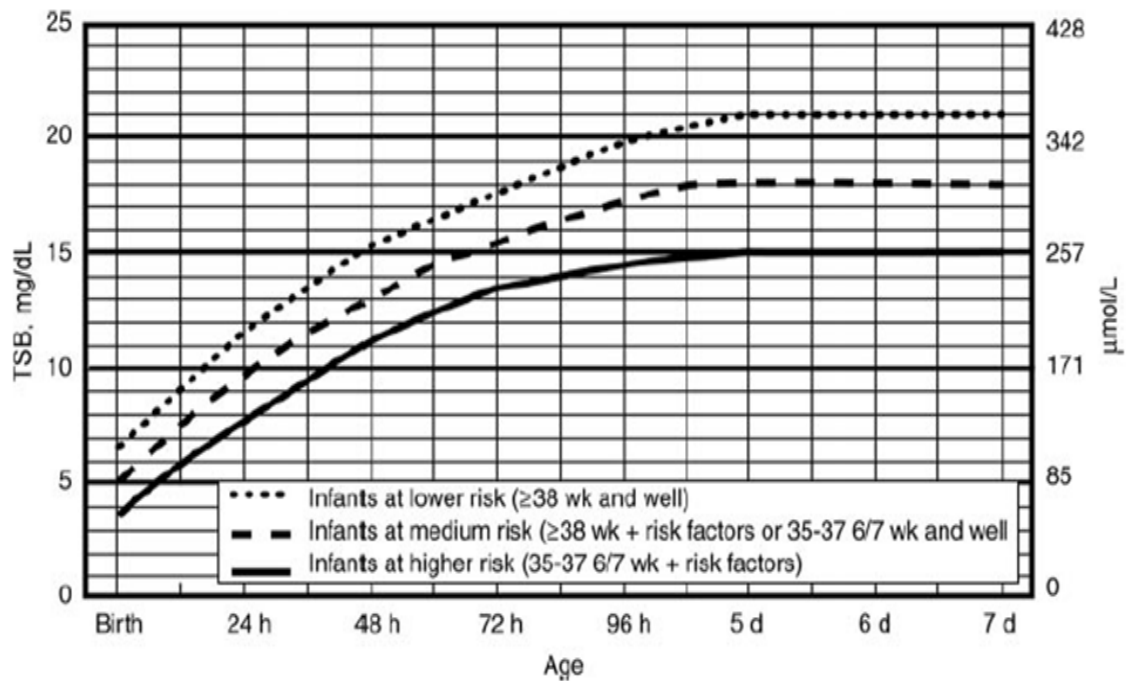
3.10.2. Alert signs in a newborn with jaundice (any one sign of the following):

- Clinical jaundice in first 24 hrs of life
- Total Serum Bilirubin (TSB) increasingly by >5 mg/dl/day or 0.5 mg/dl/hour
- TSB >15 mg/dl
- Conjugated serum bilirubin > 2 mg/dl
- Clinical jaundice persisting for > 2 week in full term and > 3 weeks in preterm neonates

3.10.3. Management of hyperbilirubinemia:

- Estimate total serum bilirubin in a baby with clinical jaundice at risk for hyperbilirubinemia
- Decide for phototherapy/exchange transfusion based on
 - Gestation
 - Postnatal age in hours
 - Presence or absence of risk

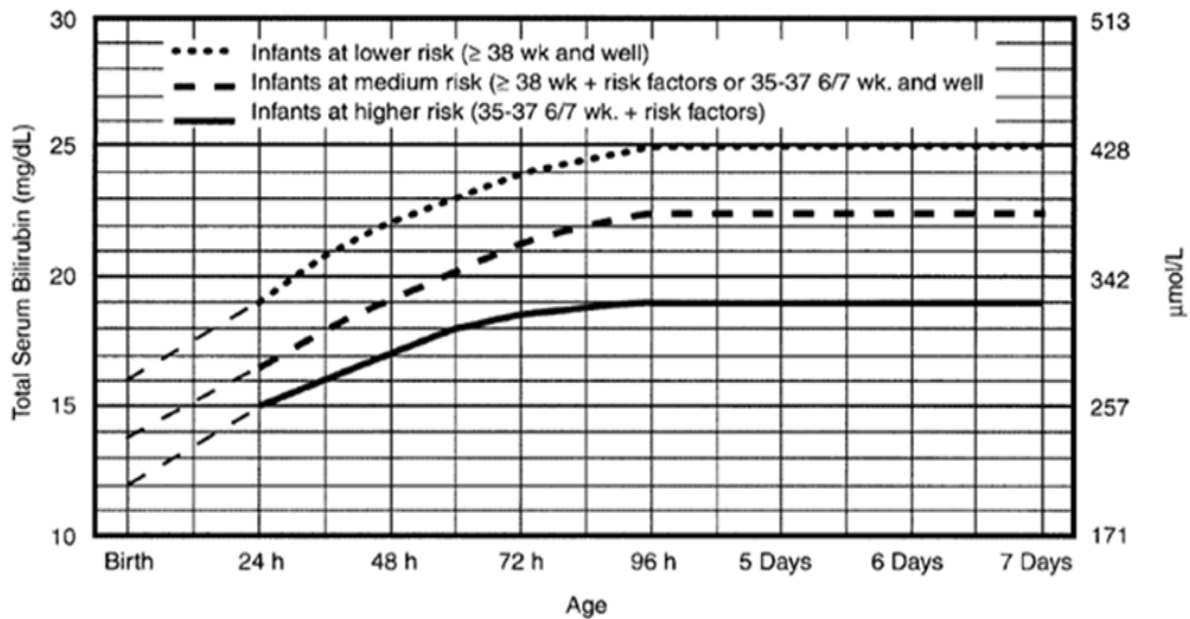
Figure 1: Normograph for initiating phototherapy (for newborns >35 weeks)



For newborn > 35 weeks:	Consult Normograph 1 to identify requirement for phototherapy Consult Normograph 2 to identify requirement for exchange transfusion
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- Use of bilirubin. Do not subtract direct reacting or conjugated bilirubin
- Risk factors= isoimmune hemolytic disease, G&PD deficiency, asphyxia, significant, lethargy, temperature instability, sepsis, acidosis, or albumin <3.0 g/dl (if measured)
- For well infants 35-37 6/7 wk can adjust TSB levels for intervention around the medium risk line. It is an option to intervene at lower TSB levels for infants closer to 35 wks and at higher TSB levels for those closer to 37 6/7 wk.

Figure 2: Normograph for instituting exchange transfusion (newborns with gestation >35 weeks)



- The dashed line for the first 24 hours indicates uncertainty due to a wide range of clinical circumstances and a range of responses to phototherapy.
- Immediate exchange transfusion is recommended if infant shows signs of acute bilirubin encephalopathy (hypertonia, arching, retrocollis, opisthotonos fever, high pitched cry) or if TSB is ≥ 5 mg/dl (85mol/L) above these lines.
- Risk factors-isoimmune hemolytic disease, G6PD deficiency, asphyxia, significant lethargy, temperature instability, sepsis, acidosis.
- Measure serum albumin and calculate B/A ration (see legend)
- Use total bilirubin. Do not subtract direct reacting or conjugated bilirubin
- If infants is well and 35-37 6/7 wk (median risk) can individualize TSB levels for exchange based on actual gestational age.

For newborn ≤ 35 weeks:

Consult table given below for identifying requirement for phototherapy or exchange transfusion.

Guidelines for phototherapy and exchange transfusion (for newborns with gestation ≤ 35 weeks)

Weight (Grams)	Serum bilirubin levels (mg/dl)	
	Phototherapy, if TSB	Exchange transfusion, if TSB
500-750	5-8	12-15
750-1000	6-10	>15
1000-1250	8-10	15-18
1250-1500	10-12	17-20
1500-2500	15-18	20-25

Note: For exchange transfusion required refer baby to higher center (level III)

3.10.4. Precautions for phototherapy

- Baby should be naked
 - Eyes and genitals should be covered
- Newborn should be kept at a distance of not more than 45 centimeters below the light source
 - They can be kept as close to the phototherapy units as possible
- Frequent feeding every 2 hours and change of posture should be promoted
- Once under phototherapy, clinical assessment is not reliable. Serum bilirubin must be monitored

3.10.5. Choice of blood for exchange transfusion

ABO incompatibility: use Type O Rh-negative or O cells of same Rh type as baby; ideal is to have O cells suspended in AB plasma.

Rh iso-immunization: In emergency use O negative blood; ideal is O negative cells suspended in AB plasma. One may use baby's blood group but care must be taken to use Rh negative blood

Other condition: Baby's blood group

3.11. ASSESSMENT AND MANAGEMENT OF RESPIRATORY DISTRESS

Respiratory distress in a newborn as defines as Respiratory rate $>60/\text{min}$ and /or any of the following signs:

- ❖ Grunting
- ❖ Retractions
- ❖ Cyanosis

Assessment of severity of respiratory distress using Downe's score

Score	Respiratory rate	Cyanosis	Air entry	Grunting	Chest retraction
0	$<60/\text{min}$	Nil	Normal	None	Nil
1	60-80/min	In room air	Mild	On auscultation with stethoscope	Mild
2	$>80/\text{min}$	In $>40\% \text{O}_2$	Marked	Audible with naked ear	Moderate

Score of ≥ 4 for at least 2 hours during the first 8 hours of life denotes clinical respiratory distress.

Score of ≥ 6 is an indication for ventilatory assistance.

Monitoring of a newborn with respiratory distress (2-4 hourly)

- Clinical assessment with respiratory distress charting
- Continuous pulse-oximetry is desirable. Change probe site regularly to avoid pressure sores
- Maintain saturations between 88-92% in preterm and 90-95% in term neonates
Titrate oxygen flow as per SpO_2

If the baby's respiratory distress score is ≥ 4

- Give oxygen at a high flow rate (5-10L/min)

If the baby's respiratory distress score is ≥ 6 , or not improving on high flow oxygen

- Organize transfer to a tertiary hospital for assisted ventilation and further diagnosis evaluation
- Give first dose of antibiotics (Ampicillin and gentamicin) prior to transfer

Device for oxygen delivery

Nasal prong	O₂ Hood	Nasal catheter/ Cannula
<ul style="list-style-type: none">• Use appropriate size prongs• Appropriate sized prong fits into nostrils without blanching columella or ala nasai• Flow rates: 0.5 to 1 L/min for preterm and 1 to 3L/min for term	<ul style="list-style-type: none">• Choose appropriate sized hood• Use transparent hood• Flow rate > 5 L/min	<ul style="list-style-type: none">• Use 6-8 Fr catheter• Measure distance of insertion from nostril to inner margin of eyebrow• Gently insert into nostril• Flow rate 0.5-1 L/min

3.12. ASSESSMENT AND MANAGEMENT OF NEONATAL SEPSIS

Neonatal sepsis is one of the three major causes of neonatal mortality. Sepsis is largely preventable.

At birthing center or at PHC

Evaluate for:

High risk factors associated with development of sepsis

1. Low birth weight (<2500g) or preterm baby
2. Febrile illness in mother during or within two weeks of delivery
3. Foul smelling and/or meconium stained liquor
4. Prolonged rupture of membrane (>18hr)
5. Single unclean or more than three vaginal examinations during labor
6. Prolonged labor (>24 hours both stages) and difficult delivery with instrumentation
7. Birth asphyxia and difficult resuscitation

Foul smelling liquor alone can be considered as having sepsis and warrants initiation of antibiotic therapy. Presence of at **least three** of the above mentioned risk factors is considered to be infected and requires investigation and treatment with appropriate antibiotics therapy.

Clinical manifestations of neonatal sepsis

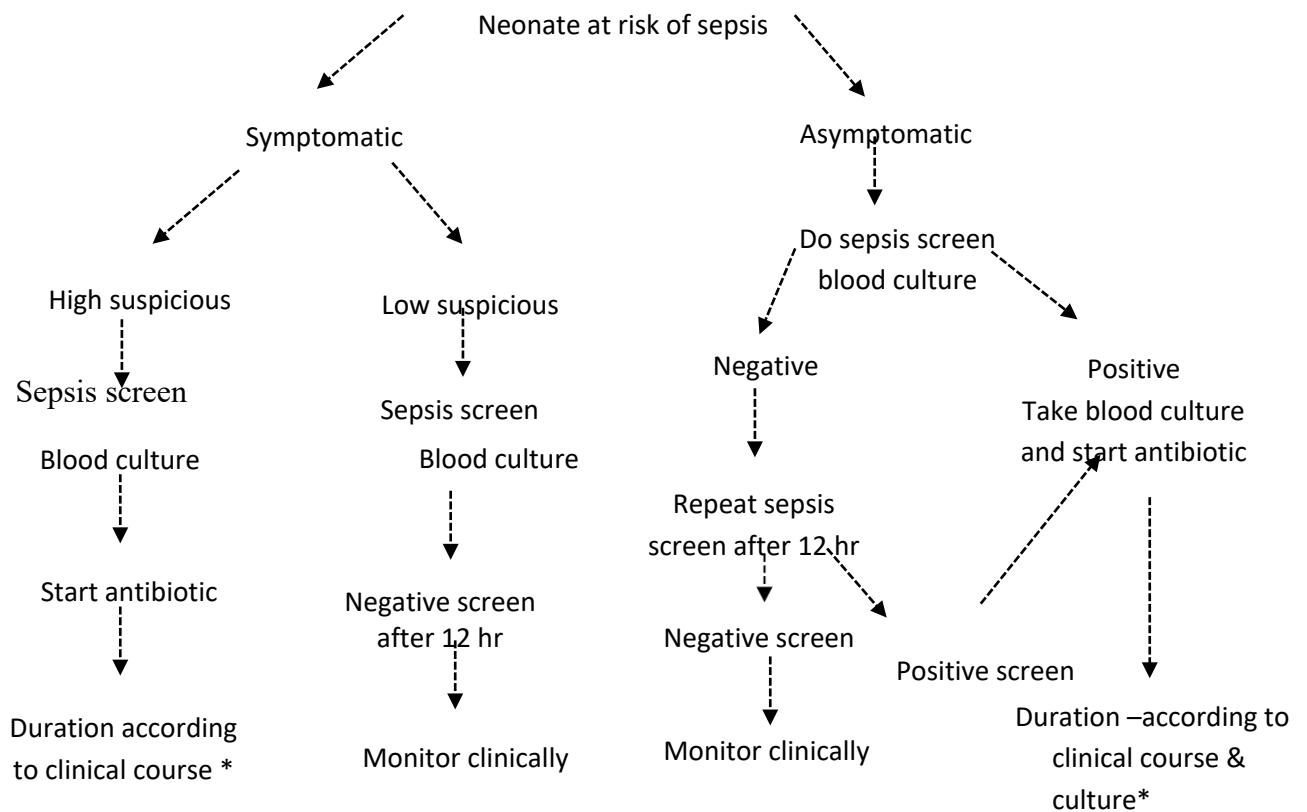
- Non-specific: Hypothermia or fever, lethargy, refusal to suckle, poor cry, not arousable, comatose
- Gastrointestinal: Abdominal distension, diarrhoea, vomiting, poor weight gain
- Hematological system: Severe jaundice, pallor, petechiae, purpura, bleeding
- Cardiovascular: poor perfusion, shock, bleeding and sclerema
- Respiratory: Cyanosis, tachypnea, chest retractions, grunt, apnea/gasping
- CNS: Fever, seizures, blank look, high pitched cry, excessive crying/irritability, neck retraction, bulging fontanel

Laboratory diagnosis of a newborn with sepsis

Sepsis screening: Any of two tests that come positive out of the following five tests strongly indicate presence of sepsis:

1. Leukopenia (LC/Total leukocyte count <5000/cubic mm)
2. Neutropenia (ANC/Absolute neutrophil count <1800/cubic mm)
3. Immature neutrophil to total neutrophil (I/T) ratio (>0.2)
4. Micro ESR (3 + age in days upto 7 days of life or >15 mm 1st hour)
5. Positive CRP

Figure: 7 : Approach to newborns at risk of sepsis



Culture sterile – 7-10 days

Culture Positive – 10-14 days

* Do lumbar puncture if meningitis suspected clinically; if positive then treat for 21 days

Antibiotic therapy for a newborn with sepsis

Choices of antibiotics

- Antibiotic therapy should cover the common causative bacteria namely *Escherichia coli*, *Staphylococcus aureus* and *Klebsiella pneumonia*
- A combination of Ampicillin and Gentamicin is recommended for the treatment of sepsis and pneumonia
- In suspected or confirmed meningitis, add cefotaxime with an aminoglycoside (+Amikacin)
- Following table provides the antibiotics and dosages of antibiotics for new born sepsis

Antibiotic therapy of neonatal sepsis

1. Septicaemia or pneumonia

Antibiotic	Each dose	Frequency		Route	Duration
		<7 days age	>7 days age		
Inj. Ampicillin and Inj. Gentamicin	50 mg/kg/dose	12 hourly	8 hourly	IV	7-10 days
	5 mg/kg/dose	24 hourly	24 hourly	IV	7-10 days

2. Meningitis

Antibiotic	Each dose	Frequency		Route	Duration
		<7 days age	>7 days age		
Inj. Ampicillin and Inj. Gentamicin and Inj. Cefotaxime	100 mg/kg/dose	12 hourly	8 hourly	IV	3 weeks
	2.5 mg/kg/dose	12 hourly	12 hourly	IV	2 weeks
	50 mg/kg/dose	6 hourly	6 hourly	IV	3 weeks

Supportive care of a newborn with sepsis

1. Provide warmth, ensure consistency normal temperature
2. Start intravenous line
3. If CRT > 3 seconds, infuse normal saline 10 ml/kg over 30 minutes, repeat the same 1-2 times, if perfusion continues to be poor
4. Infuse 10% dextrose 2 ml/kg stat
5. Inject Vitamin K1 mg IM (if ≥ 1000 gm) and 0.5 mg if <1000 gm
6. Start oxygen by hood or mask, if cyanosed or grunting
7. Provide gentle physical stimulation, if apnoeic. Provide bag and mask ventilation with oxygen if breathing is inadequate
8. Avoid enteral feed if hemodynamically compromised, give maintenance IV fluids
9. Consider use of dopamine if perfusion is persistently poor

Rational Use of Antibiotics

- Indication of antibiotics
- Appropriate choice and correct combination antibiotics
- Correct regimen - dose, duration, frequency
- The cost effectiveness with adequate efficacy

Indication of antibiotics

The indication for starting antibiotics for at risk neonates with early onset sepsis are

1. Presence of ≥ 3 risk factors for EoNNS
2. Presence of foul smelling liquor
3. Presence of 2 antenatal risk factors and a positive septic screen
4. Strong clinical suspicion of sepsis

The indication for starting antibiotics for at risk neonates with late onset sepsis are:

1. Positive septic screen and or
2. Strong clinical suspicion of sepsis

Choice of Antibiotics

Depends on

- Most probable etiological agent
- Bacterial isolate from culture
- Sensitivity pattern
- Hierarchy and combination

Empirical choice of antibiotics for treatment of neonatal sepsis

Clinical situation	Septicemia and Pneumonia	Meningitis
FIRST LINE Community acquired (resistance unlikely)	Ampicillin and Gentamicin	Add Cefotaxime
SECOND LINE Hospital acquired Some strain likely to be resistance	Ampicillin or Cloxacillin and Gentamicin or Amikacin	Add Cefotaxime
THIRD LINE Hospital acquired sepsis (most strain likely to be resistance)	Cefotaxime or Piperacillin-Tazobactam or Ciprofloxacin and Amikacin Consider Vancomycin if MRSA suspected	Cefotaxime or Piperacillin-Tazobactam and Amikacin

The choice of antibiotics also depends upon the prevalent spectrum of organism generally isolated in that setup and its sensitivity pattern. The antibiotics should be changed accordingly on the basis of culture report wherever possible.

Duration of course of antibiotics in neonatal sepsis

1. **Meningitis** (with or without positive blood/CSF culture)- 21 days
2. **Blood culture positive but no meningitis**-14 days
3. **Culture negative, sepsis screen positive and clinical course consistent with sepsis**-7-10 days
4. **Culture and sepsis screen negative, but clinical course compatible with sepsis**-5-7 days

Antibiotics therapy of neonatal sepsis

1. Sepsis or Pneumonia

Antibiotic	Each dose	Frequency		Route	Duration
		<7days age	>7days age		
Ampicillin	50mg/kg/dose	12hrly	8hrly	IV, IM	7-10 days
Cloxacillin	50mg/kg/dose	12hrly	8hrly	IV	7-10 days
Gentamicin	5mg/kg/dose	24hrly	24 hrly	IV, IM	7-10 days
Amikacin	7.5mg/kg/dose	12hrly	12 hrly	IV, IM	7-10 days
Cefotaxim	50mg/kg/dose	12hrly	8hrly	IV, IM	7-10 days
Piperacillin+ Tazobactam	50-100 mg/kg/dose	12hrly	8hrly	IV	7-10 days
Ceftriaxone	50mg/kg/dose	12hrly	8hrly	IV, IM	7-10 days
Ciprofloxacin	10-20mg/kg/dose	12hrly	12 hrly	IV, PO	7-10 days
Vancomycin	15mg/kg/dose	12hrly	8hrly	IV	7-10 days

II. Meningitis

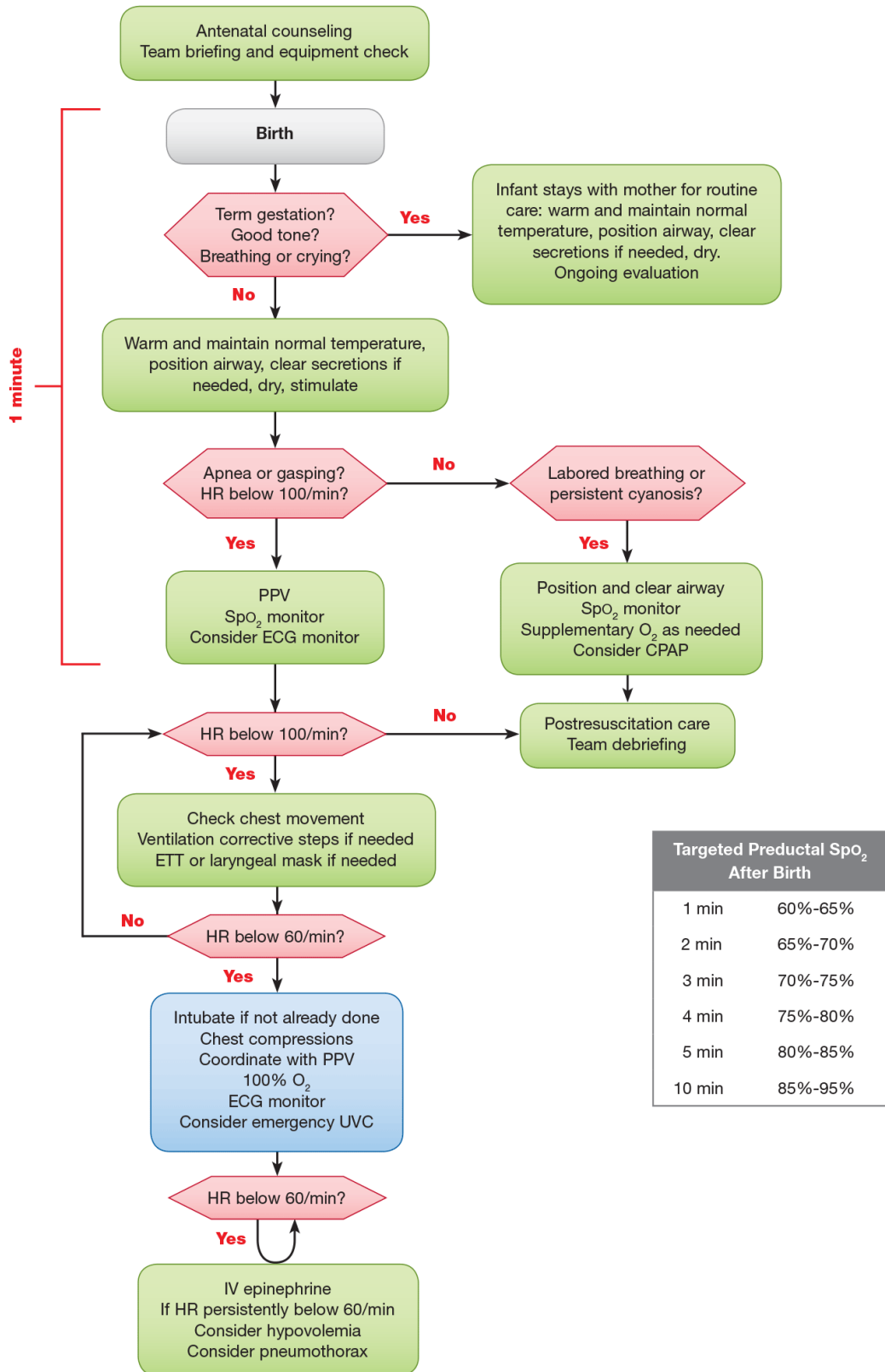
Antibiotic	Each dose	Frequency		Route	Duration
		<7days age	>7days age		
Ampicillin	100mg/kg/dose	12hrly	8hrly	IV, IM	21 days
Cloxacillin	50mg/kg/dose	12hrly	8hrly	IV	21 days
Gentamicin	5mg/kg/dose	24hrly	24hrly	IV, IM	21 days
Amikacin	7.5mg/kg/dose	12hrly	12hrly	IV, IM	21 days
Cefotaxim	50mg/kg/dose	6hrly	6hrly	IV, IM	21 days
Ceftriaxone	50mg/kg/dose	12hrly	8hrly	IV, IM	21 days
Vancomycin	15mg/kg/dose	12hrly	8hrly	IV	7-10 days
Ceftazidime	50 mg/kg/dose	12hrly	12hrly	IV	7-10 days

Prevention of neonatal sepsis

- Use infection prevention practices while caring for mother and newborn.
- Treat mother's infection adequately during pregnancy.
- Use clean delivery practices during labour and birth.
- Treat mother with antibiotics if she has prolonged rupture of membrane (>18 hours).
- Keep umbilical cord dry and uncovered.
- Teach mother and family infection prevention practices
 - Hand washing
 - Minimum visitors
 - Clean clothing
- Exclusive breast feeding.
- Adequate and timely immunization.

3.13. RESUSCITATION OF ASPHYXIATED NEWBORN

Neonatal Resuscitation Algorithm



Source: American Heart Association, 2015

Checklist 3.2. Neonatal resuscitation

SN	Procedure	Yes	No	NA
1.	Assesses perinatal risk factor(gestation, fluid, how many babies, additional risk factor)			
2.	Antenatal counseling			
3.	Team briefing (assemble team, identify leader and delegate task)			
4.	Evaluate gestation, tone and breathing or crying			
5.	Positions, suctions, dries remove linens and stimulates (back rubbing or flickers soles)			
6.	Checks breathing and heart rate			
7.	Start PPV with 21-35% oxygen			
8.	Check for chest movement and HR after 15 secs			
9.	Performs ventilation corrective steps(MRSOPA) Mask reposition Reposition of head Suction Open mouth Pressure increase Alternative airway			
10.	PPV for 30 secs with adequate chest rise			
11.	Assess HR and respiration			
12.	Starts CPR at the ratio of 3:1			
13.	Reassess HR after 1 minute			
14.	Inj. Adrenaline via UVC followed by a flush			
15.	Check for pneumothorax and hypotension			
16.	Post resuscitation care			

Checklist 3.3. Equipment needed for neonatal resuscitation

Warm	<ul style="list-style-type: none"> • Preheated warmer
	<ul style="list-style-type: none"> • Warm towels or blankets
Clear airway	<ul style="list-style-type: none"> • Bulb syringe/ Penguin suction
	<ul style="list-style-type: none"> • 10F or 12F suction catheter attached to wall suction, set at 80-100 mm Hg
Auscultate	<ul style="list-style-type: none"> • Stethoscope
Ventilate	<ul style="list-style-type: none"> • Flowmeter set to 10L/min
	<ul style="list-style-type: none"> • Positive pressure ventilation device
	<ul style="list-style-type: none"> • Term and preterm sized masks
	<ul style="list-style-type: none"> • 8F feeding tube and large syringe
Oxygenate	<ul style="list-style-type: none"> • Oxygen tubing
	<ul style="list-style-type: none"> • Pulse oximeter with sensor and cover
	<ul style="list-style-type: none"> • Target oxygen saturation table
Intubate	<ul style="list-style-type: none"> • Laryngoscope with size 0 and size 1 straight blades (size 00, optional)
	<ul style="list-style-type: none"> • Stylet (optional)
	<ul style="list-style-type: none"> • Endotracheal tubes (sizes 2.5, 3.0, 3.5)
	<ul style="list-style-type: none"> • Measuring tape and/or endotracheal tube insertion depth table
	<ul style="list-style-type: none"> • Waterproof tape or tube securing device
	<ul style="list-style-type: none"> • Scissors
Medicate	Access to
	<ul style="list-style-type: none"> • 1:10,000 (0.1mg/ml) epinephrine
	<ul style="list-style-type: none"> • Normal saline
	<ul style="list-style-type: none"> • 5 or 6 Fr feeding tube
	<ul style="list-style-type: none"> • ECG monitor leads and ECG monitor

3.14. MANAGEMENT OF NEWBORN WITH SEIZURE

Identify and characterize seizures in newborn

Generalized convulsion

- Repetitive jerking movements of limbs and face
- Continuous extension and flexion of arms and legs, either Synchronous or asynchronous
- Apnea (cessation of breathing for more than 20 seconds)

Subtle convulsion

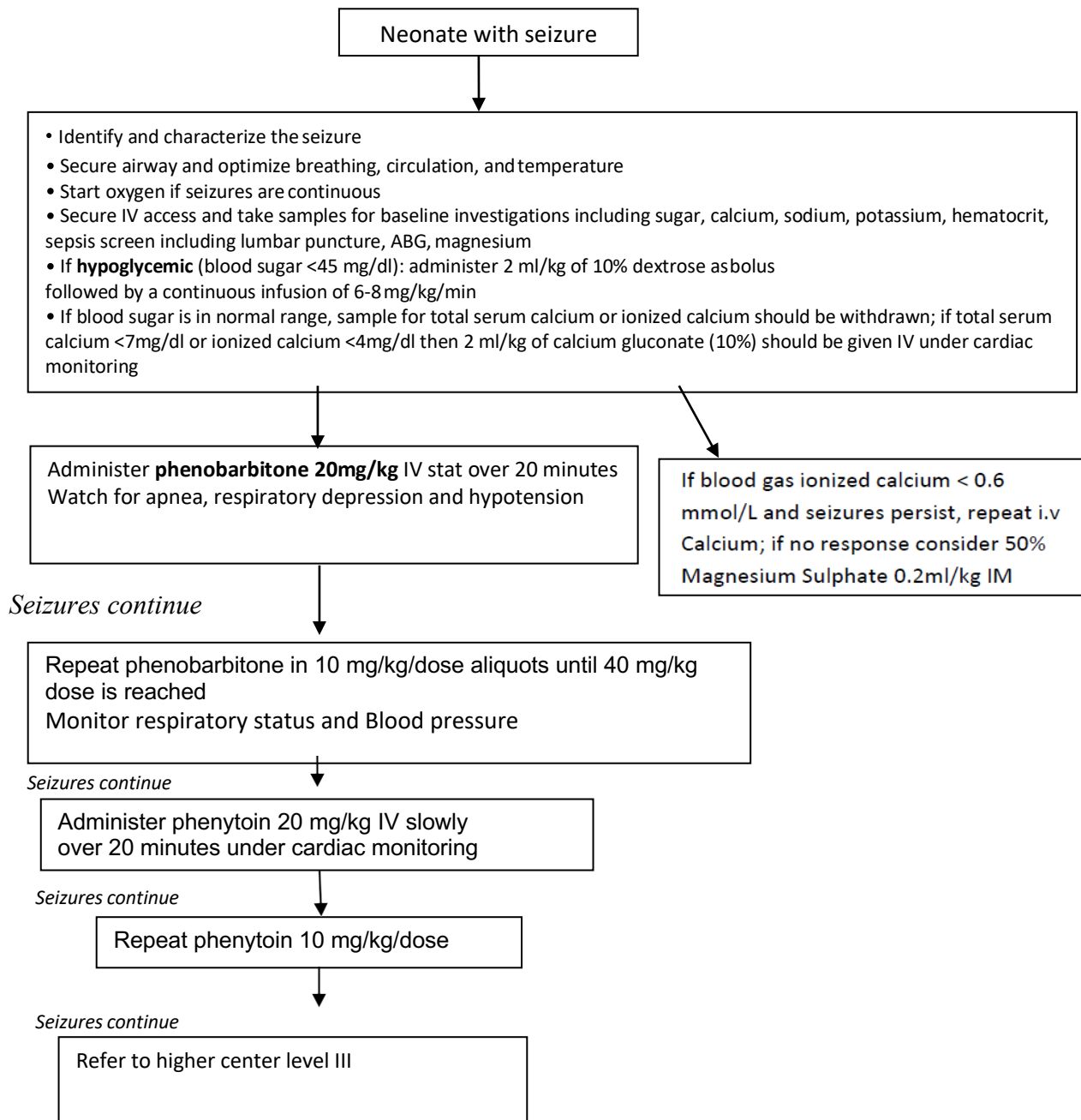
- Repetitive blinking, eye deviation or staring
- Repetitive movements of mouth or tongue
- Purposeless movement of limbs as if bicycling or swimming
- Apnea
- Baby may be conscious

Distinction of epileptic from non-epileptic phenomena (jitteriness)

Non epileptic phenomena are characterized by

- Can be provoked by stimulation
- Can be suppressed by gentle restraint
- Are not accompanied by autonomic changes (eg- tachycardia, tachypnea , hypoxia or apnea)
- Are not accompanied by abnormal eye movements?

Flow chart for the management of acute neonatal seizure



Adequacy of anticonvulsant therapy

Occasional subtle seizures not interfering with vital functions may be left alone if maximal doses of phenobarbitone and phenytoin have already been reached

Maintenance therapy

Monotherapy is the most appropriate strategy to control seizures. Attempts should be made to stop all anti-epileptic drugs and wean the baby to only phenobarbitone at 3-5 mg/kg/day. If

seizures are uncontrolled or if clinical toxicity appears, a second AED may be added. The choice

may vary from phenytoin (5-8 mg/kg/day IV or P.O in two divided doses). Bioavailability of Phenyoin may be reduced if the tablets are crushed.

Duration of therapy

This depends primarily on the risk of recurrence of seizures, which is determined by the neurological examination, the cause of seizures and EEG. Cranial USG or MRI head should be done once newborn is stable to identify the underlying etiology.

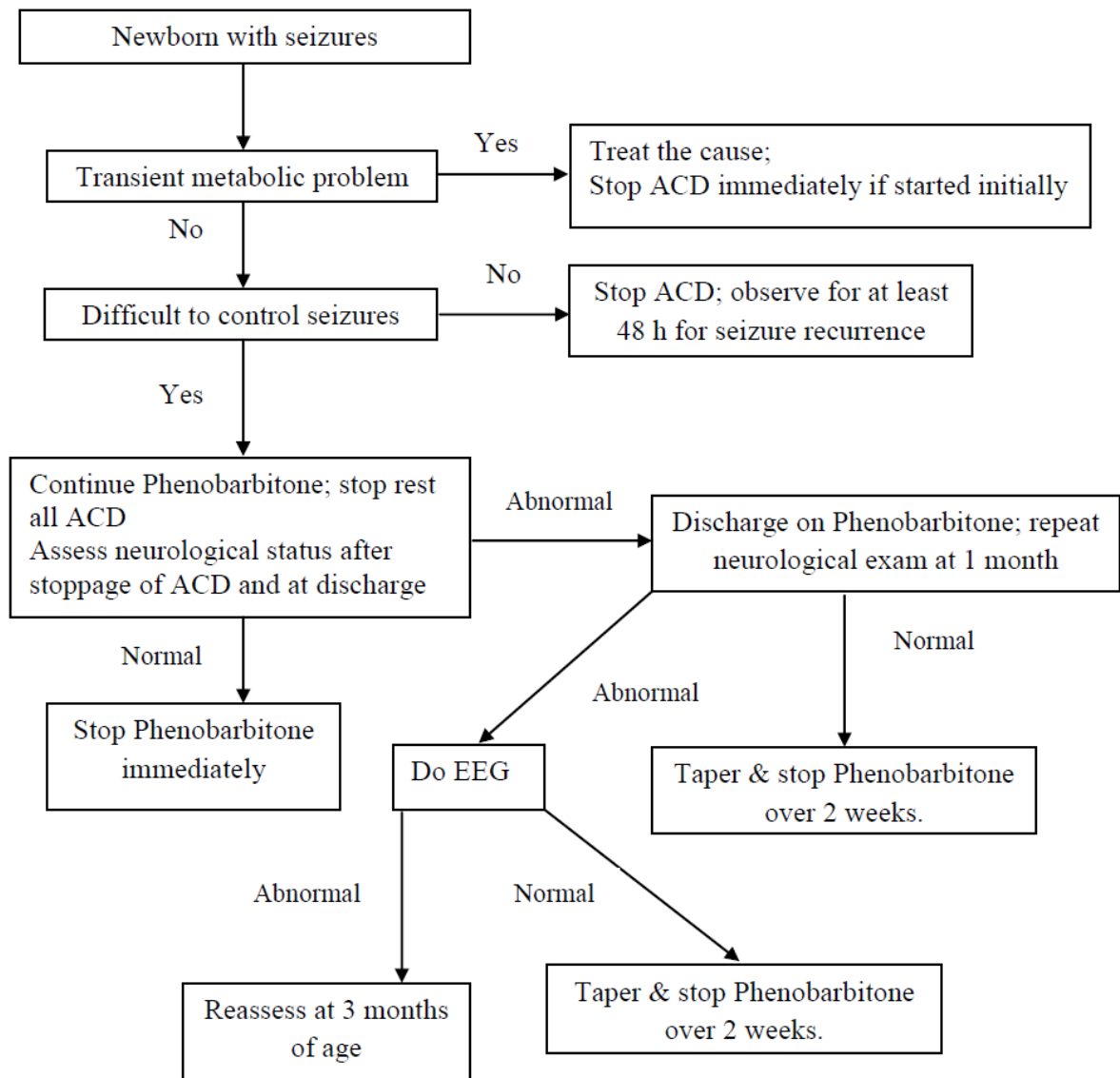
Seizures due to hypoglycemia, hypocalcemia do not need long term anticonvulsants. Most of the seizures due to HIE also do not need long term anticonvulsants.

Long term anticonvulsant may be considered in the following situations

1. Recurrent seizures especially those with persistent neurological abnormality, EEG abnormality or family history of epilepsy
2. If neurological examination is normal and seizures are controlled, anticonvulsants are usually stopped in 5-7 days. Anticonvulsants are continued for longer duration if seizures are recurrent or neurological examination is abnormal. Periodic reassessment should be done and one should try to stop anticonvulsants as soon as possible.

If neurological examination remains abnormal at 4 weeks, do an EEG. If EEG does not show seizure activity, taper off phenobarbitone over 2 weeks. Babies whose EEG is abnormal will usually require long term anticonvulsant therapy.

Guideline for weaning anticonvulsant drug (ACD)



3.15. MANAGEMENT OF A NEWBORN WITH HEMODYNAMIC COMPROMISE

Signs of hemodynamic compromise in a newborn

- Pallor
- Tachycardia
- Reduced pulse volume
- Decreased urine output

Action to be taken

- Assess for signs of respiratory distress
- Oxygen via nasal prong or oxygen hood
- IPPV with bag and mask ventilation if signs of severe distress
- Obtain IV access
- Normal saline @10ml/kg IV over 15 to 20 minutes
- Reassess and repeat if required
- IV antibiotics (Ampicillin and Gentamycin) after obtaining blood for culture and sensitivity
- Full septic work up (Blood for CBC, culture and sensitivity, urine for RME and culture, lumbar puncture)
- Proceed to further management of shock using inotropic agents. Dopamine should be started if signs of shock persist after two fluid boluses. Dobutamine should be considered if there is suspicion of cardiac disease.
- Consider IV Hydrocortisone in case of vasopressor-resistant shock
- Hydrocortisone for vasopressor-resistant hypotension:

• Day	• Dose/frequency
• Day 1 initial dose	• 1mg/kg/dose q8h x 3 doses
• Day 2 follow in 12 h with	• 0.5mg/kg/dose IV q12 h x 2 doses
• Day 3 follow in 12 h with	• 0.25 mg/kg/dose IV q12h x 2 doses
• Day 4 follow in 24 h with	• 0.125 mg/kg/dose IV x 1 dose

- If BP improves and other vasopressors have been weaned off, treatment may stop after 24 hours.

Ionotropic Agents

Preparation before infusion

• Inotrope	• Commercially available concentration	• Dilution Step 1	• Dilution Step 2 • NEONATAL	• Final concentration
• Dopamine	• 1ml=40mg	•	• 2ml of undiluted Dopamine + • 48ml NS or 5% Dextrose	• 1.6mg/ml

Dose and Dose calculation:

Dopamine: 5-20 mcg/kg/min

Dose of Dopamine added to make 50 ml NS-
 $\frac{3 \mu\text{g}/\text{kg}/\text{min} \times \text{wt}}{\text{ml}/\text{hr}}$

This amount divided by 40 gives the amount to add in ml

Example of Dopamine calculation:

Weight of the baby 2.5 Kg, starting dose: 10 mcg/kg/min at infusion rate of 1 ml/hr

$3 \times 2.5 \times 10 / 1 = 75 \text{ mg}/40 = 1.8 \text{ ml}$ in 48.2 ml NS at the rate to 1 ml/ hr or 16 drops per minute via burette set provides dopamine at 10 ug/kg/min

3.16. CHECKLIST FOR ASSESSMENT AND MANAGEMENT OF A NEWBORN REQUIRING SPECIAL CARE

A simple mnemonic is TABCFMFMCF

1. Temperature – assess	Hypothermia	- Provide heat by radiant warmer, warm clothing
	Cold stress	- Skin to skin contact, warm clothing
	Hyperthermia	- Uncover
2. Airway	Compromised	- Open and maintain airway <ul style="list-style-type: none"> • Position • Suction
	Maintained	- No intervention
3. Breathing	None or gasping	- Positive-pressure ventilation with 100% oxygen
	Respiratory distress	- Provide oxygen
	Normal	- No intervention
4. Circulation – CRT	>3 seconds	- Normal saline bolus - Check temperature - Check heart rate
	Normal	- No intervention
5. Fluids	If CRT >3 sec	- IV NS 10 ml/kg
	If stressed baby	- IV 10% Dextrose 2ml/kg
	If circulation not compromised	- Normal requirement
	(refer to Chart 8)	
6. Medications	Pneumonia	- IV antibiotics- Ampicillin, Gentamycin
	Apnea	- IV Aminophyllin
	Meningitis	- IV antibiotics (Ampicillin, Gentamycin, Cefotaxim)
	Bleeding Convulsions	- Inj Vitamin K- 1 mg IM - Inj Phenobarbitone, Inj Phenytoin
7. Feeds	Weight < 1200 g	- Gavage feeds
	Weight 1200-1800 g	- <i>Katori</i> /cup feeding
	Weight > 1800 g (>34 wk)	- Breastfeeding
8. Monitoring	Temperature	- Touch method - Temperature recorded 2 hourly
	Respiration	- Apneic - Gasping

	- Retractions +/-
	- Grunts +/-
Color	- Pink
	- Pink with peripheral cyanosis
	- Pale
	- Cyanosis
Heart Rate	- Normal
	- Tachycardia
	- Bradycardia
CRT	- Normal
	- > 3 seconds
SpO ₂	- 90-93
	- <90
	- >93

9. **Communication**

a) For referral

- i) Inform parents/relatives about baby's referral
- ii) Inform need for referral
- iii) Communicate place of referral
- iv) Communicate with the higher center if possible
- v) Send a written note about details of birth and care
- vi) Send a health worker with the family if possible
- vii) Mother to accompany as far as possible

b) For hospitalized neonates in SNCU

- i) Inform neonate's status to family at least twice everyday
- ii) Report to temperature, color, perfusion and general activity
- iii) Report on progress in terms of resolution of respiratory distress requirement of oxygen, intravenous feeding , IV antibiotics and feeding

b) For home care

- i) Exclusive breastfeeding
- ii) Maintain temperature – teach tactile assessment
- iii) Prevent infection – cord and eye care
- iv) Danger signs – early care seeking
- v) Maternal nutrition, rest supplements and spacing

10 **Follow up**

- i) After 48 hr of discharge, then 2 weekly initially for 2-3 visits
- ii) Check weight, mode of feeding, enquire problems during each visit
- iii) Follow up every month thereafter
- iv) Advise about immunization
- v) Advise about complementary feeding

SECTION 4

APPROACH TO A CHILD WITH COUGH OR DIFFICULTY IN BREATHING

4.1: INTRODUCTION

Cough and difficulty in breathing are common problems in young children. The causes range from mild, self-limiting illness to severe, life-threatening disease like pneumonia. Pneumonia is the single largest infectious cause of death in children under five years of age. This chapter provides guidelines for managing the under-five-children with cough and/or difficulty in breathing.

Before taking detailed history and examination, you must ensure that emergency treatment has been provided for the emergency signs detected using ETAT. After you have completed ETAT, following history & examination will help you in reaching a diagnosis in children presenting with cough or difficult breathing

History

- Cough
 - Duration in days
 - Diurnal variation
 - Paroxysms with whoop or vomiting or central cyanosis
- Noisy breathing, difficulty in breathing
- Chest Pain
- History of choking or sudden onset of symptoms
- Fever – duration and details (See section
- History suggestive of measles (See section
- Past history- Similar episodes, history of use of salbutamol, history of allergy
- Known or possible HIV infection (See section
- Immunization: BCG; DPT; Haemophilus influenza type b or Pentavalent Vaccine, OPV/ IPV, PCV- 10, Measles- Rubella, JE vaccine
- Family history of asthma, allergy
- History of contact with tuberculosis

Examination

The symptoms and signs listed below are a guide to reach a diagnosis. Not all children will show every symptom or sign.

- General condition
 - Sick looking or well looking
 - Irritable or lethargic

- Vitals-
 - Heart rate- Tachycardia may be due to fever, shock, dehydration, congestive cardiac failure
 - Respiratory rate- Count respiratory rate for full 1 minute when baby is calm and not feeding, look for chest indrawing, nasal flaring, head nodding, grunting, audible wheeze, stridor
 - *HR may increase by 10 beats/min and RR may increase by 4 breaths/min for every 1-degree C rise in temperature
 - Blood pressure- Hypotension due to septic shock or dehydration (See appendix for hypotension)
 - SpO₂ if available

- Head to toe examination
 - Subconjunctival hemorrhage
 - Throat – Congestion, enlarged & inflamed tonsils, membrane over tonsils
 - Cyanosis
 - Severe palmar pallor
 - Lymphadenopathy
 - Large skin boils or abscess or infected scabies
 - Skin rashes suggestive of measles

- Respiratory system examination-
 - Inspection- signs of respiratory distress
 - Palpation- Apex beat displaced or trachea shifted for midline
 - Percussion- Dullness (Pleural effusion, pneumonia) or hyper- resonant(pneumothorax)
 - Auscultation- Unequal air entry, no air entry, crackles, bronchial breath sounds, wheeze, stridor

- Cardiovascular system examination-
 - Heart murmurs

- Per Abdominal examination-
 - Enlarged liver and spleen

4.2: CLASSIFICATION OF CHILDREN WITH COUGH/ DIFFICULTY IN BREATHING

Cough and/ or difficulty breathing may classified into lasting \leq 14 days and lasting $>$ 14 days as given Table 4.1.

Table 4.1: Classification of cough

Cough \leq 14 days	Cough $>$ 14 days
<p>Respiratory</p> <ul style="list-style-type: none"> Viral URTI Pneumonia Croup Epiglottitis Diphtheria Anaphylaxis Bronchiolitis Bronchial Asthma Exacerbation Foreign body <p>Non- respiratory</p> <ul style="list-style-type: none"> Congestive cardiac failure Malaria Severe anemia Diabetic ketoacidosis 	<ul style="list-style-type: none"> Bronchial Asthma Tuberculosis Pertussis HIV <p>*Some causes of cough \leq14 days may persist for $>$ 14 days</p>

4.3: COUGH/ DIFFICULTY IN BREATHING OF \leq 14 DAYS CHILDREN

The cause of cough of \leq 14 days duration can be due to self-limiting viral upper respiratory tract infection or severe life threatening illness like pneumonia. Box 4.1 and 4.2 gives definition of fast breathing and emergency/ general danger signs respectively. Algorithm 4.1 gives the approach to cough/ difficulty in breathing of \leq 14 days.

Box 4.1: Fast Breathing

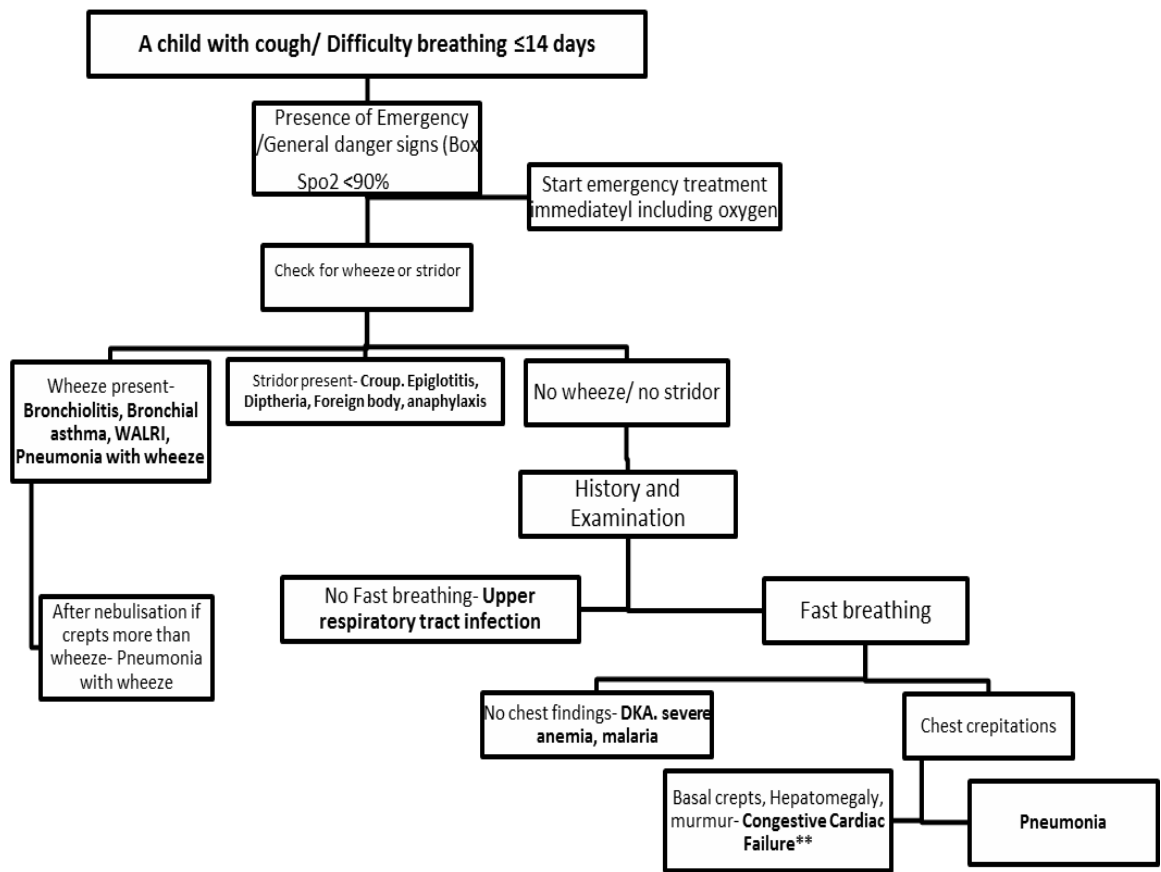
- \geq 50 breaths/min in a child aged from 2 months upto 12 months
- \geq 40 breaths/min in a child aged from 1 year upto 5 years

Box 4.2: Emergency/General Danger Signs

- Not breathing at all or gasping
- Obstructed breathing
- Central cyanosis
- Severe respiratory distress (RR>70, grunting, very severe chest indrawing)
- Shock: Cold hands with Capillary refill > 3seconds and weak and fast pulse
- Coma (lethargy or reduce level of consciousness)
- Convulsions
- Inability to breastfeed or drink due to respiratory distress

**Many of these illnesses have already been covered in ETAT section and initial management would have been started.*

Algorithm 4.1: Assessment of a child with Cough/Difficult Breathing



See box 4.3 for management of CCF

Box 4.3: Treatment of Congestive Cardiac Failure

1. Provide oxygen
2. Keep child in propped up position
3. Provide 2/3 rd of maintenance fluid
4. Inj. Lasix 1-2 mg/kg stat if blood pressure maintained
5. Refer to higher centre

4.4: SEVERE PNEUMONIA

Severe pneumonia is defined as cough or difficult breathing in a child with at least one of the following conditions:

- Central cyanosis
- Severe respiratory distress (Respiratory rate >70 /min, head nodding, grunting, severe chest indrawing, inability to breastfeed or drink due to respiratory distress)
- Emergency/ General danger signs like coma, convulsion, shock

On auscultation, you may get following signs:

- Crackles
- Bronchial breath sounds
- Decreased breath sound over effusion or empyema
- Abnormal vocal resonance (decreased over a pleural effusion or empyema, increased over lobar consolidation)
- If the child has wheezing, give salbutamol nebulization or MDI therapy should be given before classifying the child as severe pneumonia or pneumonia.

Investigations

- Obtain a chest X-ray in all children with severe pneumonia to identify complications and decide treatment.
- Complete blood count (Hb, TLC, DLC, Platelet count), blood culture if available

Treatment:

See Algorithm 4.2 for management of severe pneumonia

1. Oxygen therapy:

- Give oxygen to all children with oxygen saturation $<90\%$ ($<94\%$ if they also have other emergency signs like shock etc.).

- Use nasal prongs/ face mask/ hood box as the methods of oxygen delivery to young infants; If not better, start Continuous positive airway pressure if available.
- Use a pulse oximetry to guide oxygen therapy (to keep oxygen saturation > 90%). If a pulse oximeter is not available, continue oxygen until the clinical signs of hypoxia (such as inability to breastfeed or breathing rate ≥ 70 /min) are no longer present.

MAKING CPAP

Indication- Respiratory distress in neonates and infants not responding to oxygen therapy

Complications- Pneumothorax, nasal cavity drying

Procedure-

- Make all the equipment ready
 - Nasal prongs that snugly fits into the nostrils
 - A tube to connect to the nasal prongs to dip in the water
 - A clean bottle filled with distilled water upto the level of the pressure to be given- 5-6 cm
 - Adhesive tape
 - Oxygen cylinder/ concentrator
- Take the nasal prongs and cut one end of the tubing
- Attach the connector tubing to the cut end of the nasal prongs that is exiting out of the baby and tie the other end that goes to the oxygen and secure with tape
- Dip the end of the connector tubing into the distilled water which is measured upto the level of the pressure (5-6 cm of water) to be given.
- Attach the inlet of nasal prongs to the oxygen delivery device
- Apply the nasal prongs to the baby's nostrils and secure with tape
- Watch for presence of bubbling in the distilled water

(Note: Use checklist 4.1. in the participants' workbook for demonstration and practice of CPAP)

2. Antibiotic therapy

Give antibiotics

- Injection Ampicillin 50 mg/kg/ dose IM or IV every 6 hours.
- Give Injection Cloxacillin 25 mg/kg/dose every 6 hours if staphylococcal pneumonia is suspected (See box 4.4)
- Injection Gentamicin 7.5 mg/kg IM or IV once a day if the child is severely malnourished.
- If the child does not show signs of improvement within 48 hours, switch to Ceftriaxone 50

mg/ kg/dose twice daily or Cefotaxime 50 mg/kg/dose every 6 hours

- Shift to oral drugs as soon as the child is able to take orally
 - Injection Ampicillin and Cloxacillin can be shifted to oral Amoxicillin 40 mg/kg/dose twice a day and Cloxacillin 25 mg/kg/dose four times daily respectively.
 - Injection Gentamycin can be shifted from intravenous to intramuscular injection once a day
- Total duration of antibiotics in severe pneumonia
 - Clinical response within 48 hours: 7 days
 - Clinical response after 48 hours: 10 days

Box 4.4: When to suspect Staphylococcus aureus pneumonia

It is important to have high index of suspicion for staphylococcal infection as the initial choice of antibiotic does not cover this less common but a more severe infection adequately. Staphylococcal pneumonia is suspected if any child with pneumonia has:

- Rapid progression of the disease, **or**
- Presents in septic shock
- Pneumatocele, or Pneumothorax, or Effusion on chest radiograph, **or**
- Large skin boils or abscess or infected scabies **or**
- Post-measles pneumonia, which is not responding within 48 hours to the initial therapy.

3. Supportive care

- Remove any thick secretions at the entrance to the nasal passages or throat, which the child cannot clear by gentle suction.
- Manage fever (See section)
- Provide maintenance IV fluid if child cannot accept oral feeds. Stop IV fluids gradually when the child is accepting orally satisfactorily.
- If wheeze is present, give Nebulization Salbutamol (<14kg- 0.5 ml ≥14 kg- 1 ml to make 3 ml with NS) or MDI Salbutamol 2 puff
- There is no role of Cough Syrup (may be harmful)
- Ensure vaccination/ Nutritional advice

4. Monitoring:

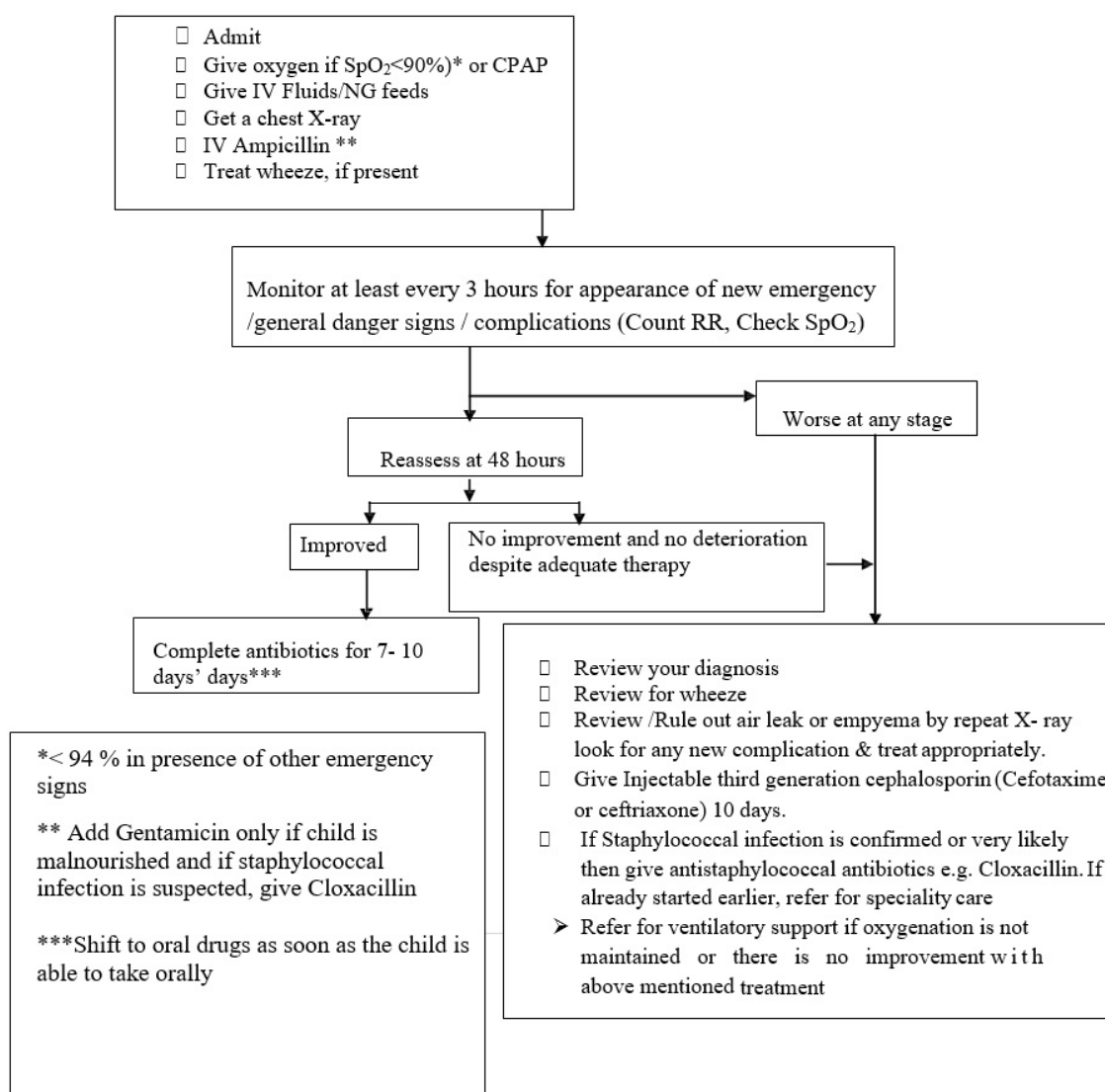
- The child should be checked by a nurse at least every 3 hourly and by a doctor at least twice daily

- Monitor vitals, intake/ output
- In the absence of complications, there should be signs of improvement like breathing slower, less indrawing of the lower chest wall, less fever, improved ability to eat and drink better oxygen saturation in next 48 hours.

5. Other alternative diagnosis and treatment

- If the child has not improved after 48 hours or if the child's condition has worsened, repeat Chest X-ray.
 - Check for complications (See section
 - Reassess for possibility of Staphylococcal pneumonia
 - Consider tuberculosis if cough and fever persists for more than 2 weeks

Algorithm 4.2: Management of children with severe pneumonia



6. Discharge

Children with severe pneumonia can be discharged when:

- Respiratory distress has resolved.
- There is no hypoxaemia (oxygen saturation $\geq 90\%$ on room air)
- They are feeding well.
- They are able to take oral medication or have completed a course of parenteral antibiotics.
- The family is counseled when to return.

At discharge, give feeding advice, vaccinations that are due, address risk factors like malnutrition, indoor air pollution and parental smoking.

4.5: PNEUMONIA

A child is classified as pneumonia if he/she has cough or difficult breathing plus at least one of the following signs:

- Fast breathing: Age 2-11 months, $\geq 50/\text{min}$
Age 1-5 years, $\geq 40/\text{min}$
- Lower chest wall indrawing

On auscultation, crackles may be present.

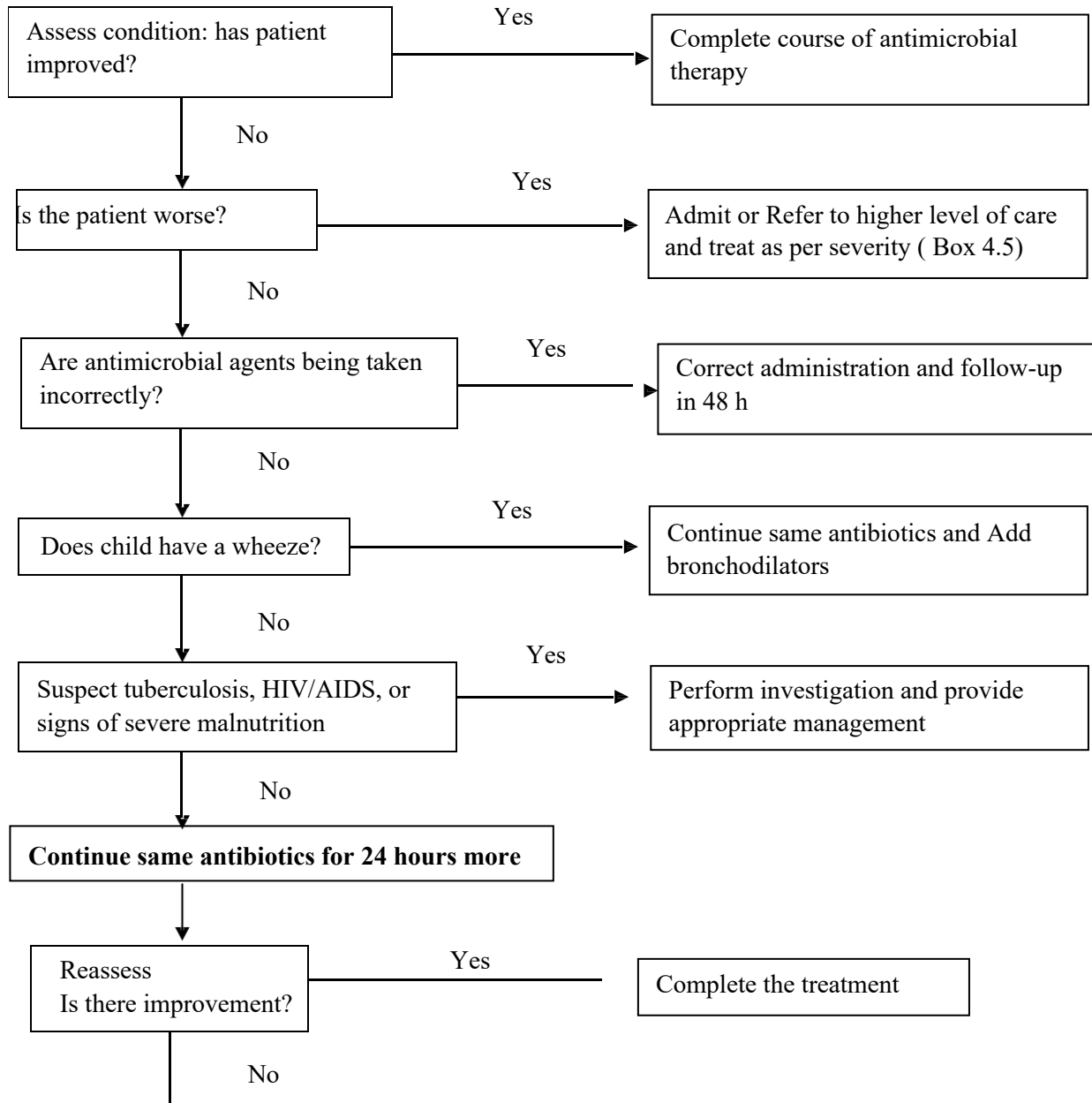
Treatment

- Treat child as outpatient. Advise to continue feeding.
- Treat wheeze with oral Salbutamol or MDI Salbutamol
- Antibiotic therapy
 - Give oral Amoxicillin
 - Give the first dose at the clinic and teach the mother how to give the other doses at home.
 - Give 40 mg/kg/ dose twice a day for 5 days
- Avoid unnecessary harmful medications such as cough syrups, medicated nose drops, steam inhalation.

Follow up: Encourage the mother to feed the child.

When to return: Advise her to bring the child back after 2 days or earlier if the child becomes sicker or is unable to drink or breastfeed.

Algorithm 4.3: Systematic assessment of children with non-severe pneumonia at follow-up



Admit and give second line antibiotics like Ceftriaxone or refer

Box 4.5: Indication for admission

Age < 6 months
Multiple lobe involvement
Immunocompromised state
Toxic appearance(See section of fever)
Hypoxia
Dehydration
Vomiting or inability to tolerate oral fluids or medications
No response to appropriate oral antibiotic therapy
Inability of caregivers to administer medications at home
Inability to come for follow up

4.6: COMPLICATIONS OF PNEUMONIA

4.6a: Septicaemia

Septicaemia is the most common pneumonia complication and occurs when the bacteria causing pneumonia spreads into the bloodstream. The spread of bacteria can lead to septic shock or metastatic secondary infections like meningitis in infants. The management of these conditions will be discussed in Section

4.6b: Pleural Effusion and Empyema

A child with pneumonia should be suspected to have pleural effusion or empyema if any one of the following is present.

- Pain in chest during breathing
- On examination, the chest is dull to percussion, breath sounds are reduced or absent over the affected area.

- Fever persists despite antibiotic therapy for >72 hours

A chest X-ray shows fluid on one or both sides of the chest. Diagnostic pleural tap is a must to make a diagnosis. Frank pus (thick or thin) is aspirated in cases of empyema. The aspirate should be sent for Gram's staining and culture, Cytology, and for aspirate's Sugar and protein levels if available.

CHEST THORACOCENTESIS

Indications- Evacuation of pleural effusion for diagnostic and therapeutic purposes.

Complications- Pneumothorax

Procedure-

- Keep all equipment ready
- Sterile gloves
- 18-22 gauge needle
- 5 ml, 20 ml syringe
- 1% lignocaine
- Three way stop-cock
- Antiseptic wipes
- Intravenous set
- Bottle to collect fluid
- Attach the 18-22 G needle to the 3 way stop-cock. Attach the intravenous set with its end cut and placed in the collection bottle and attach the other end a 20 ml syringe. Close the end attached to the IV set. A 10 ml syringe can be used if fluid is being collected for diagnostic purpose.
- Confirm fluid in pleural space clinically and by X-ray
- Place the child in sitting position leaning over table
- Point of entry is the seventh intercostal space and posterior axillary line
- Prepare and drape area in sterile fashion
- Anaesthetize skin, subcutaneous tissue, rib periosteum, chest wall and pleura with lignocaine
- Insert the needle slowly over the 8th rib over the upper border of lower rib providing a steady negative pressure. As soon as the fluid is aspirated hold the needle steadily.
- Pull on the syringe to fill its cavity and when filled, open the stop-cock towards the IV set site and push to drain into the collecting bottle.
- Then close the end to IV set and open to the 20 ml syringe to re-aspirate the fluid.

- Repeat the above procedure till no fluid can be aspirated.
- Remove the needle and place a dressing over the site.
- Monitor signs of respiratory distress which might indicate development of pneumothorax. (Use checklist 4.2. from participants' workbook for demonstration and practice of Thoracocentesis)

Treatment of Pleural effusion/ Empyema

- Antibiotic therapy-
 - Start with Ampicillin and Cloxacillin. If already on Ampicillin, switch to Ceftriaxone and add Cloxacillin.
 - The antibiotics may then be revised as per the sensitivity of the pus isolate, are available.
 - If not better within 48 hours refer to higher center.
 - Usually intravenous antibiotic therapy shall be needed for 10-14 days.
 - When the child improves, continue with Cloxacillin orally, 4 times a day.
Continue treatment for a total of 4-6 weeks.
- Chest drainage: Management of fluid in the pleural cavity depends on the character of the fluid obtained. If there is pus in the pleural cavity then a chest thoracotomy with chest tube drain is must, unless the collection is very small. If not available, child needs to be referred as giving antibiotics is not sufficient.
- Supportive therapy: Every child should receive oxygen and other supportive therapy as needed (nutritional support, and antipyretics/analgesic if required)

4.6c: Pneumothorax

A child with pneumonia should be suspected to have pneumothorax in the presence of the following signs and symptoms.

- Chest bulging on the affected side if one side is involved
- Shift of cardiac impulse away from the site of the pneumothorax
- Hyper- resonant on percussion
- Decreased breath sounds on the affected side
- Severe respiratory distress and cyanosis may be late presentation.
- Severity of presentation may vary according to the extent of lung collapse, degree of

intra-pleural pressure, and rapidity of onset.

Investigation: Chest X-ray is crucial in the confirmation of diagnosis but should not delay treatment

Treatment: For urgent decompression needle may be inserted in 2nd intercostal space. (See procedure) Thereafter intercostal chest tube drain should be inserted if facilities available or else child should be referred after initial stabilization.

(Use checklist 4.3. from participants' workbook for demonstration and practice of Chest Thoracostomy)

4.7: UPPER RESPIRATORY INFECTION

These are common, self-limiting viral infections that require only supportive care. Antibiotics should not be given. Most episodes end within 14 days. Cough lasting 14 days or more should be evaluated for other causes like TB, Asthma, Pertussis.

Treatment

- Treat the child as an outpatient.
- Soothe the throat and relieve the cough with a safe remedy, such as a warm, sweet drink.
- Manage fever
- Clear secretions from the child's nose before feeds with a cloth soaked in water that has been twisted to form a pointed wick. Use nasal saline drops if nasal block.
- Give age appropriate feed plus extra breast milk or fluids if there is fever. Small frequent drinks are more likely to be taken and less likely to be vomited.
- Indication for antibiotics
 - Streptococcal pharyngitis (Enlarged congested tonsils with pus point)
 - Acute supportive otitis media (ASOM) (See fever)
 - Do not give unnecessary or harmful medications such as cough syrups, medicated nose drops, steam inhalation.

4.8: CHILD PRESENTING WITH WHEEZE

Wheeze is a high-pitched whistling sound on expiration usually heard by auscultation, occasionally audible without stethoscope in severe cases. It is caused by narrowing of the distal airway. To decide whether the child has wheeze or not, do auscultation with a stethoscope.

In children below 2 years of age the most common cause of wheeze is bronchiolitis. Some children may have wheeze with recurrent lower respiratory infections also, called wheeze associated lower respiratory infection (WALRI). A proportion of these children may have wheeze in absence of viral infection and they may be diagnosed as asthma. Algorithm for assessment of children with wheeze is given in Algorithm 4.4.

History

- Recurrent episodes of wheeze/ respiratory difficulty
- Night-time or early morning shortness of breath, cough or wheeze
- Cough aggravated by exertion (laughing, crying, running etc.)
- Response to Salbutamol nebulization or MDI
- Personal/ family history of allergy or asthma

Examination

- Wheezing on expiration
- Signs of hyperinflation like pushed down liver and spleen
- Signs of respiratory distress (signs of severe respiratory distress are same as given in severe pneumonia)

Check responses to rapid-acting bronchodilator

- If the cause of the wheeze is not clear or if the child has fast breathing or chest indrawing in addition to wheeze, give a rapid-acting bronchodilator and assess after 1 hour. The response to a rapid-acting bronchodilator helps to determine the underlying

diagnosis and treatment.

- Give the rapid-acting bronchodilator by one of the following methods:
 - nebulized salbutamol
- OR
- salbutamol by a metered dose inhaler with spacer device
- Assess the response after 1 hour. Signs of improvement are:
 - less respiratory distress (easier breathing)
 - less low chest walls indrawing
 - improved air entry
- If no response to rapid acting bronchodilators, look for other causes like foreign body aspiration.

METERED DOSE INHALER THERAPY

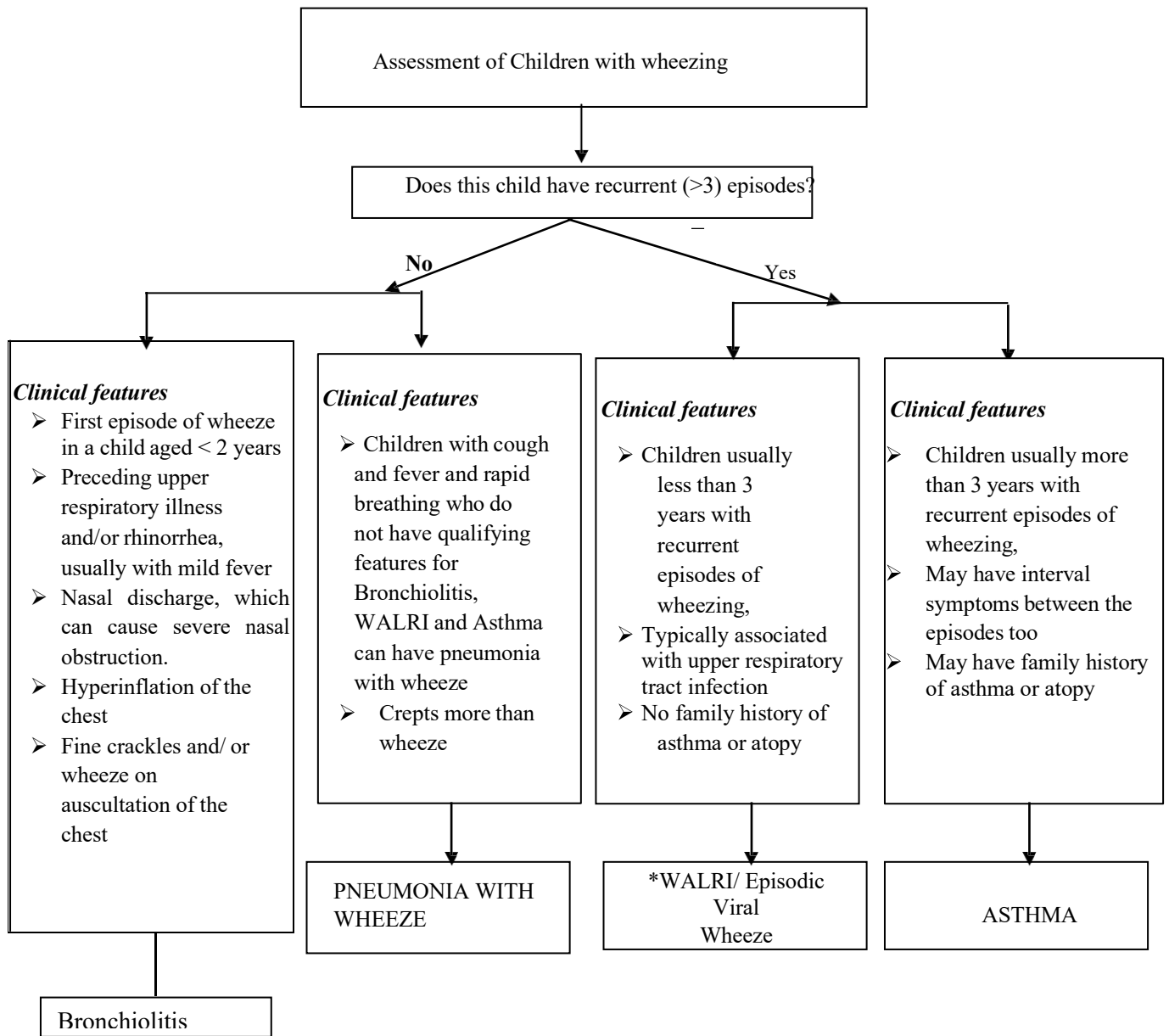
Indications- To deliver inhaler therapy in cases of wheezing child

Procedure-

- Make all the components of MDI therapy ready- Mask, Spacer, Inhaler drug
- Attach the mask to the spacer
- Shake the inhaler drug and attach to the other end of the spacer
- Apply the mask over the child covering the mouth and the nose
- Press the inhaler drug
- Allow the child to take few breaths(around 10)
- To give another puff, again re- shake the inhaler drug and repeat the procedure
- Clean the spacer by washing in free flow water and allow it to air dry
- Check for presence of inhaler drug by giving one puff in air or dipping it in water the floating of the canister will be present if the drug is not finished.

(Note: Use checklist 4.4. in the participants' workbook for demonstration and practice of MDI therapy)

Chart 4.4: Assessment of Children with wheezing



WALRI – Wheeze associated with lower respiratory infection

Box 4.6

Suspect for foreign body aspiration in a child with wheeze, if there is one or more of the following:

- History of sudden onset of choking
- Unilateral or localized wheeze
- Wheeze with poor or no response to bronchodilators
- Asymmetric air entry on chest examination
- Segmental or lobar pneumonia that fails to respond to antibiotic therapy

Refer such a child to a facility hospital where bronchoscopy for diagnosis and removal is possible. Emergency management of a child developing obstructed breathing or apnoea following foreign body aspiration has already been discussed in ETAT section

4.9: BRONCHIOLITIS

Bronchiolitis is a lower respiratory viral infection, which is typically most severe in young infants, occurs in annual epidemics and is characterized by airways obstruction and wheezing. It is most commonly caused by respiratory syncytial virus. Infants and young children with bronchiolitis may present with a wide range of clinical symptoms and severity from mild distress to impending respiratory failure.

Typical features of bronchiolitis include

- age less than 2 years
- preceding upper respiratory illness and/or rhinorrhea
- mild fever
- unpredictable response to a rapid-acting bronchodilator
- hyperinflation of the chest, with increased resonance to percussion
- lower chest walls indrawing
- fine crackles and wheeze on auscultation of the chest
- difficulty in feeding, breastfeeding or drinking owing to respiratory distress
- nasal discharge, which can cause severe nasal obstruction.

Risk factors for severe disease include age less than 12 weeks, prematurity, underlying cardiopulmonary disease, or immunodeficiency.

Management

1. Oxygen

- Give oxygen to all children with severe respiratory distress or oxygen saturation $\leq 90\%$.
- The recommended method for delivering oxygen is by nasal prongs. If not improved, may need CPAP.
- The nurse should check, every 3 hour, that the prongs are in the correct position and nostrils are not blocked with mucus.

2. Other treatment

- Nebulized epinephrine (2 ml of inj. Epinephrine 1:1000 solution in 2 ml of normal saline) may decrease distress or improve oxygenation. The dose can be repeated 4 hourly for 1-2 days depending on the severity and response.
- In case of severe disease, particularly if the child has personal or family history of atopy, beta 2 agonists like Salbutamol by nebulized route 0.5 ml with 2.5 ml NS if wt ≤ 14 kg and 1 ml in 2 ml NS if wt > 14 kg (0.15 mg /kg minimum 1.25 mg) can be given. However, as the response to bronchodilators in bronchiolitis is not predictable continued or more frequent usage should be done, only if there is a clinical response after 15-30 minutes of inhalation with initial doses.
- Routine antibiotics have no role but may be used in young infants or in a really sick looking infant as the distinction from pneumonia may be difficult.

3. Supportive care

- Manage fever
- Encourage breastfeeding and oral fluids.
- Nasogastric feeding should be considered in any patient who is unable to maintain oral intake or hydration (expressed breast milk should be given).
- Give intravenous fluids if needed but avoid over hydration.
- Gentle nasal suction should be used to clear secretions in infants where nasal blockage appears to be causing respiratory distress.

4. Monitoring

- A hospitalized child should be assessed by a nurse every 3 hourly and by a doctor at least twice a day.
- Monitor vitals. Watch for signs of respiratory failure, i.e. increasing hypoxia and respiratory distress leading to exhaustion.
- Monitor input/ output.

Complications

If the child fails to respond to oxygen therapy or the child's condition worsen suddenly, obtain a chest X-ray to look for evidence of pneumothorax. If severe respiratory distress is persistent, consider transfer to a facility with ventilation facility.

Infection control

Bronchiolitis is very infectious and dangerous to other young children in hospital with other conditions. The following strategies may reduce cross-infection:

- Hand-washing by health personnel between patients, no sharing of nebulizer tubes and oxygen tubing
- Clinicians should encourage exclusive breastfeeding for at least 6 months to decrease the morbidity of respiratory infections.

Discharge

- An infant with bronchiolitis can be discharged when respiratory distress (no fast breathing/chest indrawing and maintaining SPO₂ > 90 % on room air) and hypoxaemia have resolved and the infant is feeding well.
- At discharge, advise parents against smoking and indoor pollution.

4.10: BRONCHIAL ASTHMA

Asthma is a chronic inflammatory condition with reversible airways obstruction generally seen in children more than 3 years of age. It is characterized by recurrent episodes of wheezing, cough, and difficult breathing, which responds to treatment with bronchodilators and anti-inflammatory drugs.

If the diagnosis is uncertain, give a dose of a rapid-acting bronchodilator. A child with asthma will often improve rapidly with such treatment, showing signs such as slower respiratory rate, less chest wall indrawing and less respiratory distress. However, a child with severe asthma may require several doses in quick succession before a response is seen. Severity of attack may be graded as mild to moderate, severe or life threatening as given in Table 4.2.

Table 4.2: Classification of severity & grading of bronchial asthma attack

Mild-Moderate	Severe or Life threatening
<ul style="list-style-type: none"> ➤ Talks in phrases ➤ Prefers sitting to lying ➤ Respiratory rate increased but accessory muscles not used ➤ Oxygen saturation $\geq 92\%$ on room air ➤ Agitated 	<ul style="list-style-type: none"> ➤ Talks in words ➤ Central cyanosis ➤ Sits hunched forwards ➤ Accessory muscles in use ➤ Oxygen saturation $< 92\%$ on room air ➤ Drowsy, confused or silent chest ➤ Pulse rate > 200 bpm (0-3 yrs) or > 180 bpm (4-5 yrs)

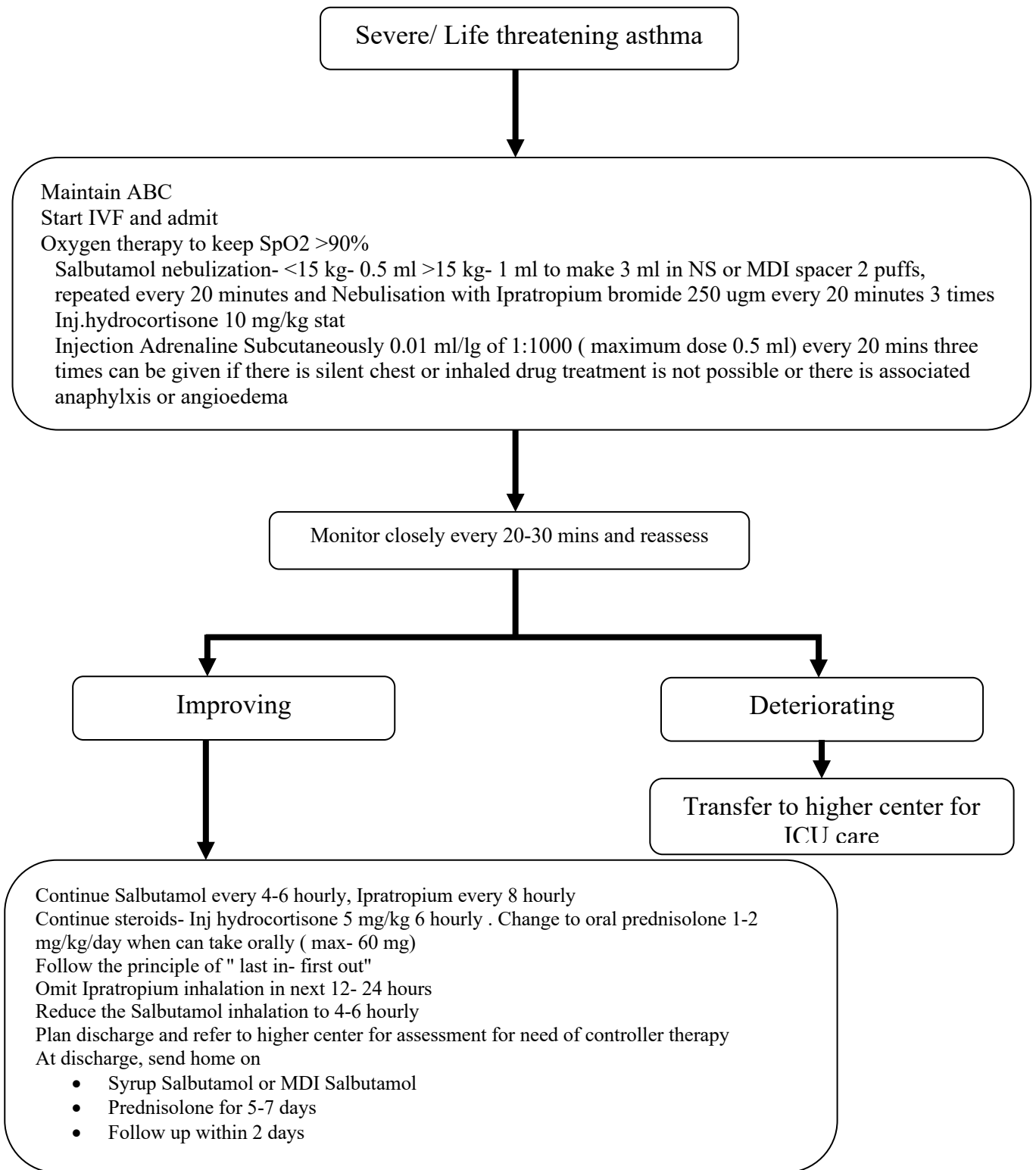
Box4.7: Treatment of Asthma

<ul style="list-style-type: none"> ➤ Two forms of treatment: <ul style="list-style-type: none"> • Treatment of exacerbations- Will be discussed in detail • Controller treatment- Should be referred to a higher centre for controller treatment if <ul style="list-style-type: none"> ○ Asthma symptoms more than twice a month ○ Waking due to asthma more than once a month ○ Any asthma symptoms with any risk factor for exacerbation like needing oral corticosteroid for asthma within the last 12 months, ever in intensive care unit for asthma
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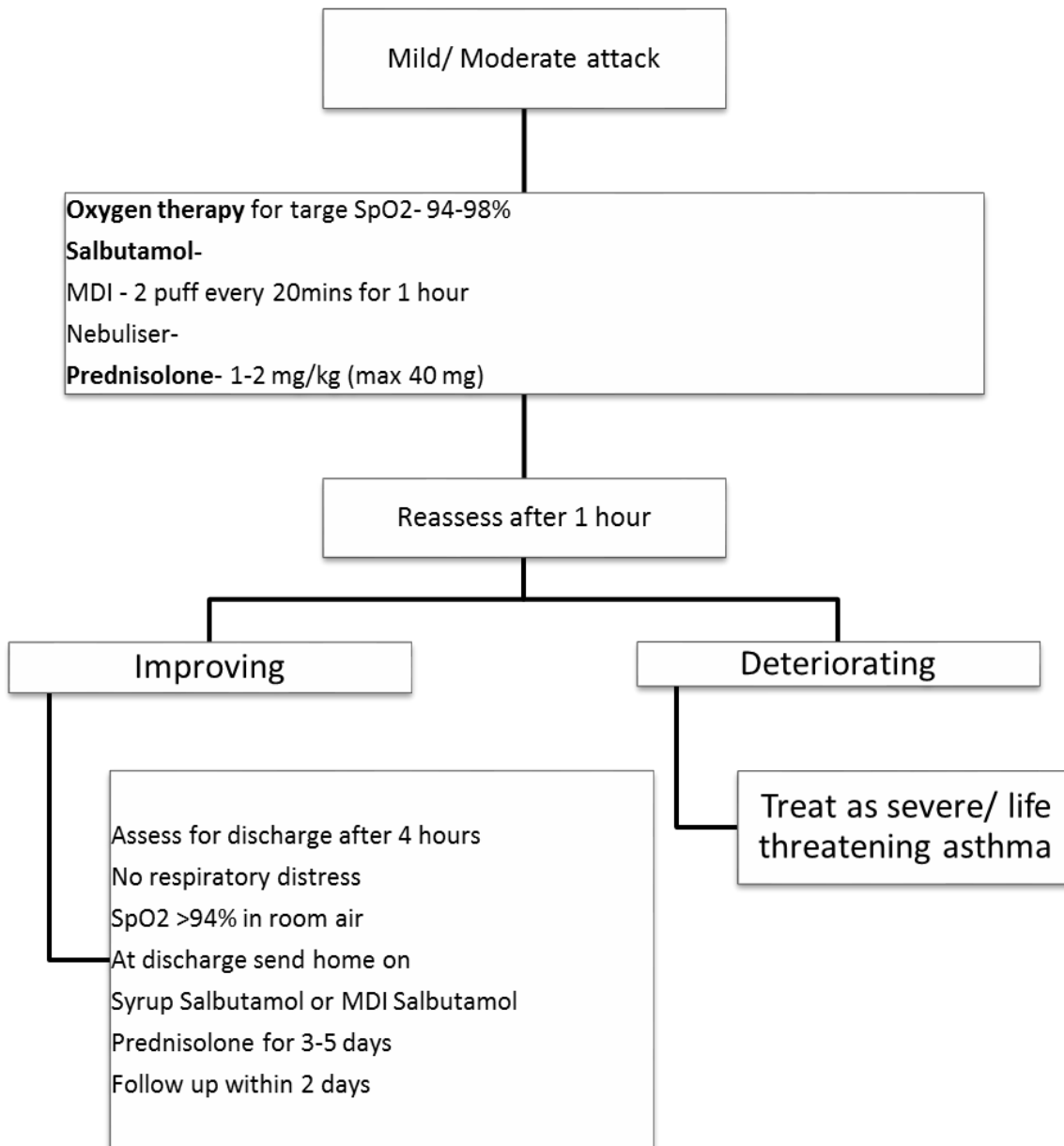
Treatment of exacerbations

- Mainstay of drug therapy is bronchodilators and steroids.
- Child with severe and life threatening attack, should be admitted in hospital.
- Child with mild to moderate attack should be treated in hospital and then discharged with medications for treatment at home.
- The types of drug used, their doses are largely governed by the severity of the attack (see below).

Algorithm 4.5: Management of severe/ life threatening asthma



Algorithm 4.6: Management of mild/ moderate asthma attack



Monitoring

- A child with severe/ life threatening attack should be monitored every 20-30 mins for first 1 hour and hourly till next 4 hours to assess for improvement or deterioration.
- Record vitals especially the respiratory rate, and watch especially for signs of respiratory failure – increasing hypoxia and respiratory distress leading to exhaustion.
- Monitor input/output

Complications

- If the child fails to respond to the above therapy, or the child's condition worsens suddenly, obtain a chest X-ray to look for evidence of pneumothorax. Be very careful in making this diagnosis as the hyperinflation in asthma can mimic a pneumothorax on a chest X-ray.

Discharge and Follow-up

- The patient is considered for discharge when:
- The patient is stable (able to eat and drink without problems and does not need oxygen) and there is sustained relief in respiratory complaints.
- Need for Controller and referral has been assessed
- Inhaler technique has been reviewed and corrected.
- Parents have been explained
 - Signs of recurrence and worsening of asthma
 - To avoid factors that precipitate exacerbation (e.g. smoking, exposure to smoke etc.)
 - Ask them to come for follow-up after 48 hours.

4.11. CONDITIONS PRESENTING WITH STRIDOR

Stridor is a harsh noise during inspiration, which is due to narrowing of the air passages in the oropharynx, sub glottis or trachea. If the obstruction is below the larynx, stridor may also occur during expiration.

Table 4.3: Differential diagnosis in a child presenting with stridor

Diagnosis	In favour	Treatment
Croup	<ul style="list-style-type: none"> ➤ Barking cough ➤ Respiratory distress ➤ Hoarse voice ➤ Low grade fever 	See section 4.11 a
Epiglottitis	<ul style="list-style-type: none"> ➤ Soft stridor ➤ Toxic look ➤ Little or no cough ➤ Drooling of saliva ➤ Inability to drink 	Needs immediate intubation or tracheostomy. Refer to higher center Prior to referral, Inj Ceftriaxone 50 mg/kg/dose stat or Cefotaxime 50 mg/kg/dose stat.
Diphtheria	<ul style="list-style-type: none"> ➤ Bull neck appearance due to enlarged cervical nodes and oedema ➤ Congested throat ➤ Grey pharyngeal membrane ➤ Blood-stained nasal discharge ➤ No Pentavalent vaccination 	See section 4.11 b
Anaphylaxis	<ul style="list-style-type: none"> ➤ History of allergen exposure ➤ Wheeze ➤ Shock ➤ Urticaria and oedema of lips and face 	See section 4.11 c

4.11 a: Treatment of Croup-

Keep baby calm, do not do throat examination

Admit to hospital if severe croup- Spo₂ <90%, stridor at rest and respiratory distress

- **Steroid** – Single dose Inj Dexamethasone (0.6 mg/kg) I/M or IV
- **Epinephrine (adrenaline)** – Nebulized Epinephrine (1:1000 solution) 0.4 ml/kg
Maximum 5 ml
- **Oxygen therapy**
- **Intubation or Tracheostomy** in children with incipient obstruction so need referral after above treatment.

If no above signs, treat as mild croup with

- Home care (fluid, feeding, when to return)
- **Oral corticosteroids** - (single dose of dexamethasone or equivalent) can be given if patient is brought/referred to hospital

4.11b Diphtheria

Diagnosis

Carefully examine the child's nose and throat and look for a grey, adherent membrane.

Great care is needed when examining the throat, as the examination may precipitate complete obstruction of the airway.

A child with pharyngeal diphtheria may have an obviously swollen neck, termed as bull's neck.

Treatment

1. Antibiotics

- Any child with suspected diphtheria should be given a daily deep IM injection of procaine benzyl penicillin at 50 mg/kg (maximum, 1.2 g) daily for 10 days.
- If not available give erythromycin for 14 days.

2. Antitoxin

- Give 40000 U diphtheria antitoxin (IM or IV) if available, because delay can increase the risk for mortality.
- As there is a small risk for a serious allergic reaction to the horse serum in the antitoxin, an initial intradermal test to detect hypersensitivity should be carried out, as described in the instructions, and treatment for anaphylaxis should be available.

3. Oxygen

- Avoid using oxygen unless there is incipient airway obstruction. Such cases should be referred to a higher health facility where tracheostomy may be performed. Signs such as severe lower chest wall in drawing and restlessness are more likely to indicate the need for tracheostomy (or intubation) than oxygen.

Monitoring

- The child's condition, especially respiratory status, should be assessed by a nurse every 3 hrs. and by a doctor twice a day. The child should occupy a bed close to the nursing station, so that any sign of incipient airway obstruction can be detected as soon as it develops.

Complications

- Myocarditis, flaccid paralysis of limbs, palatal palsy may occur 2-7 weeks after the onset of illness.

Preventive measures

- The child should be nursed in a separate room by staffs who are fully vaccinated against diphtheria.
- Give all vaccinated household contacts a diphtheria toxoid booster and prophylaxis (oral erythromycin 10 days)

4.11 c: Anaphylaxis

Anaphylaxis is a severe allergic reaction, which may cause upper airway obstruction with stridor, lower airway obstruction with wheezing or shock or all three. Common causes include allergic reactions to antibiotics, to vaccines, to blood transfusion and to certain foods, especially nuts. Consider the diagnosis if any of the following symptoms is present and there is a history of previous severe reaction, rapid progression or a history of asthma, eczema or atopy.

Table 4.4: Severity of anaphylaxis

Severity	Symptoms	Sig	Treatment
Mild	<ul style="list-style-type: none"> ➤ Itching mouth ➤ Nausea 	<ul style="list-style-type: none"> ➤ Urticaria ➤ Oedema of the face ➤ Conjunctivitis ➤ Throat congestion 	<ul style="list-style-type: none"> ➤ Remove the allergen as appropriate ➤ Give oral anti-histaminic like cetirizine, chlorpheniramine
Moderate	<ul style="list-style-type: none"> ➤ Cough or wheeze ➤ Diarrhoea ➤ Sweating ➤ Pain abdomen 	<ul style="list-style-type: none"> ➤ Wheeze ➤ Tachycardia ➤ Pallor 	<ul style="list-style-type: none"> ➤ Give adrenaline 0.01ml/kg of 1:1000 IM into the thigh; the dose may be repeated every 5-15 mins
Severe	<ul style="list-style-type: none"> ➤ Difficulty in breathing ➤ Collapse ➤ Vomiting ➤ Cyanosis 	<ul style="list-style-type: none"> ➤ Severe wheeze with poor air entry ➤ Oedema of the larynx ➤ Shock ➤ Respiratory arrest ➤ Cardiac arrest 	<ul style="list-style-type: none"> ➤ If the child is not breathing, start basic life support ➤ Give adrenaline 0.01ml/kg 1:1000 IM and repeat every 5-15 min. ➤ Give 100% oxygen. ➤ Ensure stabilization of the airway, breathing, circulation and secure IV access ➤ Administer 20 ml/kg normal saline 0.9% or

4.12: CONDITIONS PRESENTING WITH CHRONIC COUGH

A chronic cough is an unremitting cough that lasts ≥ 14 days. Many conditions may present with a chronic cough such as TB, pertussis, foreign body or asthma.

Table 4.5: Differential diagnosis in children presenting with chronic cough

Diagnosis	History	Examination
TB (See section of TB)	<ul style="list-style-type: none"> ➤ Weight loss (>5% loss in last 3 months) ➤ Anorexia, easy fatigability ➤ Chronic or intermittent fever ➤ History of contact with tuberculosis 	<ul style="list-style-type: none"> ➤ Lymphadenopathy ➤ Crepitations on chest examination ➤ Hepatosplenomegaly
Asthma (See section of asthma)	<ul style="list-style-type: none"> ➤ History of recurrent wheeze ➤ Hyperinflation of the chest ➤ Prolonged expiration ➤ Reduced air entry (in very severe airway obstruction) ➤ Good response to bronchodilators 	<ul style="list-style-type: none"> ➤ Hyperinflation of chest ➤ Prolonged expiration ➤ Wheeze ➤ Good response to bronchodilators
Pertussis	<ul style="list-style-type: none"> ➤ Paroxysms of cough followed by whoop, vomiting, cyanosis or apnoea ➤ Not received Pentavalent vaccination. ➤ No fever 	<ul style="list-style-type: none"> ➤ Subconjunctival hemorrhage
HIV (See section of HIV)	<ul style="list-style-type: none"> ➤ Known or suspected maternal or sibling HIV infection ➤ Weight/Height less than $<2SD$ ➤ Chronic parotitis, ➤ Chronic ear discharge ➤ Chronic fever ➤ Persistent diarrhoea 	<ul style="list-style-type: none"> ➤ Oral or oesophageal thrush ➤ Skin infection with herpes zoster (past or present) ➤ Generalized lymphadenopathy ➤ Clubbing

4.12 a: PERTUSSIS

When should one suspect Pertussis?

In any individual with prolonged paroxysmal cough with or without whoop/post-tussive vomiting irrespective of the immunization status.

- a. **Prolonged cough:** Defined as 2 weeks or more, the duration of cough to make one suspect pertussis has been variably defined as 2 weeks by the CDC and 3 weeks by the WHO. A 2 week's cut off would be more sensitive as about 20% of confirmed cases have cough for <3 weeks. The diagnosis could be considered earlier if other typical

features, such as whoop, are present.

- b. **Paroxysmal (spasmodic) cough with or without whoop/vomiting:** A typical paroxysm consists of a series of rapid, forced expirations (usually 5-10) followed by gasping inhalation, leading to the typical whooping sound. Cyanosis, bulging eyes, protrusion of the tongue, salivation, lacrimation and distension of the neck veins occur during the paroxysm. Post-tussive vomiting is common. These paroxysms may occur several times per hour during both day and night. Attacks are triggered by yawning, sneezing or physical exertion.

Paroxysmal cough is an essential criterion as even partially immune individuals (previously vaccinated/adolescents/adults) retain the paroxysmal nature of cough. However, the whoop and post tussive vomiting components of the paroxysm may not be found in the partially immune and are therefore non-essential criteria.

- c. **Irrespective of immunization status:** Pertussis can occur in immunized individuals because of limited protection provided by the vaccine. However, if the individual is unimmunized / partially immunized, the diagnosis of pertussis can be made with greater confidence.

2. Any individual with respiratory tract symptoms such as coryza, cough (paroxysmal/non paroxysmal) during an outbreak or who has had contact with a suspect /case.

3. Any individual with a respiratory illness and presence of typical complications of pertussis such as hernia, rectal prolapse, sub conjunctival hemorrhages, seizures and encephalopathy.

4. Neonates or young infants with pertussis do not have the typical paroxysmal cough, whoop and post tussive vomiting. Instead the presentation is usually of apnea, respiratory failure, cyanosis, seizures, encephalopathy or an acute life threatening event.

Pertussis is most severe in young infants who have not yet been immunized.

Admit infants aged <6 months to hospital; also admit any child with pneumonia, convulsions, dehydration, severe malnutrition or prolonged apnoea or any other danger signs.

Treatment

1. Antibiotics

- Give oral erythromycin (12.5 mg/kg four times a day) for 10 days

OR

- Azithromycin at 10 mg/kg (maximum 500 mg) on the first day, then 5 mg/kg (Maximum 250 mg) once a day for 4 days.

2. Oxygen

- Give oxygen to children who have spells of apnoea or cyanosis, severe paroxysms of coughing or low oxygen saturation $\leq 90\%$ on a pulse oximeter.

3. Supportive care

- Avoid, as far as possible, any procedure that could trigger coughing, such as application of suction, throat examination or use of a nasogastric tube (unless the child cannot drink).
- Do not give cough suppressants, sedatives, mucolytic agents or antihistamines.
- Encourage breastfeeding or oral fluids.

SECTION 5: APPROACH TO A CHILD PRESENTING WITH DIARRHOEA

5.1: DIARRHOEA

Diarrhoeal diseases are a leading cause of morbidity and mortality among under-five children. Although diarrhoeal deaths have significantly declined in recent years; it remains unacceptably high in developing countries.

Diarrhoea is defined as the passage of three or more loose or watery stools per 24 hours. However, recent change in consistency and character of the stools is more important than the number of stools. A breast fed baby may normally pass as many as 8-10 semi formed, pasty stools daily that does not amount to diarrhoea.

5.2: TYPES OF DIARRHOEA

Two clinical forms of diarrhoea have been identified – acute diarrhoea and persistent diarrhoea

1. Acute diarrhoea- Duration of < 14 days

a. Watery

b. Dysentery- Presence of visible blood in the stools and is usually associated with abdominal cramps and fever. The most common cause of dysentery is Shigella bacteria. Amoebic dysentery is not common in young children.

2. Persistent diarrhoea-Duration of ≥ 14 days. Up to 20% of episodes of diarrhoea become persistent. Persistent diarrhoea often causes nutritional problems and contributes to deaths in children.

Dehydration occurs when these losses are not adequately replaced and there are deficits of water and electrolytes.

During diarrhoea, malnutrition is caused by decreased food intake and nutrient absorption and increased requirement which can make diarrhoea more severe, prolonged and frequent. So the intake of nutrient rich foods during and after diarrhoea should be emphasized.

5.3: APPROACH TO A CHILD PRESENTING WITH DIARRHOEA

History

Inquiries should be made about:

- Frequency and consistency of stools in last 24 hours
- Number of days of diarrhoea
- Visible blood in stools
- Tenesmus (abdominal cramps)
- Vomiting
- Fever
- Urine output
- Eagerness to drink, lethargy, seizures, abdominal distension, floppiness

In addition, following history helps in the management:

- Treatment received – ORS, Zinc or other drug treatment
- Feeding history- breastfeeds, formula, use of bottle, dilution of feeds etc.

Examination

Look for:

- Signs of dehydration (as described in Table 5.1)
- Blood in stools
- Signs of severe malnutrition
- Abdominal distension, hypotonia

Investigations:

Investigations are not useful in majority of acute diarrhoea cases.

Following investigations may help in specific conditions:

- **Stool routine and microscopy:** Can be done in bloody diarrhoea
- **Hanging drop** in suspected cholera
- **Stool Culture & sensitivity:** May help in Persistent diarrhoea, immunosuppressed children

➤ **Serum electrolytes: (if available)**

- **Sodium**-If excessive irritability persists after rehydration or history of convulsion is present.
- **Potassium**- If child is hypotonic and has abdominal distension

➤ **Renal function tests**- should be done if there is low (<0.5ml/kg/hr) or nil urine output over more than 6 hours after rehydration

5.4: ASSESSING DEHYDRATION

For all children with diarrhoea, their hydration status should be assessed & classified as severe dehydration, some dehydration or no dehydration (Table 5.1).

Now use these 4 clinical signs for classifying dehydration (Table 5.1)

Table 5.1: Assessment and classification of dehydration

Classification	Signs or symptoms	Treatment
Severe Dehydration	<p>Two or more of the following signs:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Lethargy / unconsciousness <input type="checkbox"/> Sunken eyes <input type="checkbox"/> Unable to drink or drinks poorly <input type="checkbox"/> Skin pinch goes back very slowly > 2 seconds (See Fig. 5.1) 	<p><input type="checkbox"/> Plan C (Table 5.2)</p> <p><input type="checkbox"/> Admit if other indication for admission is present as given below.</p> <p><input type="checkbox"/> If child is 2 years or older and there is cholera in your area, treat for cholera</p>
Some Dehydration	<p>Two or more of the following signs:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Restlessness, irritability <input type="checkbox"/> Sunken eyes <input type="checkbox"/> Drinks eagerly, thirsty <input type="checkbox"/> Skin pinch goes back slowly 	<p><input type="checkbox"/> Plan B (Table 5.2)</p> <p><input type="checkbox"/> Admit if other indication for admission is present as given below.</p> <p><input type="checkbox"/> After rehydration, advise mother on home care</p>
No Dehydration	Not enough signs to classify as some or severe dehydration	<input type="checkbox"/> Plan A (Table 5.2)



Figure 5.1: Checking skin pinch

Indications for hospitalization in acute watery diarrhoea

- Presence of emergency signs (e.g. Not breathing, gasping or severe respiratory distress, unconsciousness, convulsion, shock or severe dehydration)
- Persistent vomiting- >3 times /hour
- High purge rate- > 10 ml/kg/hr or more than 10 stools per day
- Inability or refusal to drink
- Decreased urine output
- Abdominal distension
- Children with severe acute malnutrition.
- Children with associated co-morbid conditions which require inpatient management e.g. severe pneumonia.
- Age less than 2 months with some dehydration

5.5: MANAGEMENT OF CHILDREN WITH DEHYDRATION

5.5 a: Management of dehydration can be done by using the WHO protocol- Plan A, B and C (Table 5.2)

Table 5.2: WHO protocol for management of dehydration

Degree of dehydration	Fluid management								
Severe (Plan C)	IV fluid- RL or NS								
	<table border="1"> <thead> <tr> <th>Age</th> <th>First give 30ml/kg</th> <th>Then give 70 ml/kg in:</th> </tr> </thead> <tbody> <tr> <td>Infants (under 12 months)</td> <td>1 hour*</td> <td>5 hours</td> </tr> <tr> <td>Children (12 months up to 5 years)</td> <td>30 minutes*</td> <td>2 ½ hours</td> </tr> </tbody> </table> <p><i>*Repeat once if radial pulse is still very weak and not detectable</i></p> <ul style="list-style-type: none"> -Reassess the child every 15-20 min till a strong radial pulse is detectable. Thereafter reassess the hydration status after every 1-2 hours. -If hydration status is not improving, give the IV drip more rapidly. -Monitor number of stools, vomiting and urine output. -Also give ORS (about 5ml/kg/hour) as soon as the child can drink: usually after 3-4 hours(infant) or 1-2 hours (children) -Reassess an infant after 6 hours and a child after 3 hours. Classify dehydration. Then choose the appropriate Plan (A, B or C) to continue treatment. ** -All children with severe dehydration should be observed in the facility for at least 6 hours after successful rehydration (not enough signs to classify as either some or severe dehydration). <p>If IV access not possible, see section 5.5 a for nasogastric rehydration</p>	Age	First give 30ml/kg	Then give 70 ml/kg in:	Infants (under 12 months)	1 hour*	5 hours	Children (12 months up to 5 years)	30 minutes*
Age	First give 30ml/kg	Then give 70 ml/kg in:							
Infants (under 12 months)	1 hour*	5 hours							
Children (12 months up to 5 years)	30 minutes*	2 ½ hours							
Some (Plan B)	<ul style="list-style-type: none"> -Administer 75ml/kg body weight of ORS over a period of 4 hours- Spoon, cup, dropper, syringe without needle. -If the child wants more, give more. -Allow breastfeeds in between -Reassess after 4 hours, classify dehydration 								

	- If vomits repeat ORS after 10 mins
No (Plan A)	<p>4 Rules of Plan-A treatment:</p> <p>Rule-1: Give more fluids than normal. For ongoing loss give For children < 2 years, about 50–100 ml after each loose stool For children ≥ 2 years, about 100–200 ml after each loose stool</p> <p>Rule-2: Continue feeding (including breastfeeding)</p> <p>Rule-3: Give zinc supplements 2-6 months- 10 mg once a day for 10 days >6months- 20 mg once a day for 10 days</p> <p>Rule-4: Bring the child back after 5 days if diarrhoea is persisting or earlier if s/he has any of the danger signs (thirsty, irritable/ restless, fever, high purge rate, repeated vomiting, blood in stool, eating or drinking poorly, lethargic)</p>

5.5 b: Nasogastric Rehydration if IV rehydration is not possible.

Keep all equipment ready-

- Nasogastric tube of appropriate size
- Lubricating jelly
- 5 ml syringe
- Stethoscope

Procedure:

Aseptic precaution- Wear gloves

Decide the length of insertion of NG tube- Measure from nostrils to tragus and from tragus to a point in between xiphisternum and umbilicus and add the length. (Fig. 5.2)

Lubricate the end of the nasogastric tube

Elevate the head of the baby at 30 degrees. Insert the Nasogastric tube at backward and downward till the calculated depth.

Confirm the entry into stomach by air pushed via a syringe and a gurgling sound heard by a stethoscope placed in the left hypochondrium.

Fix the nasogastric tube using tape.

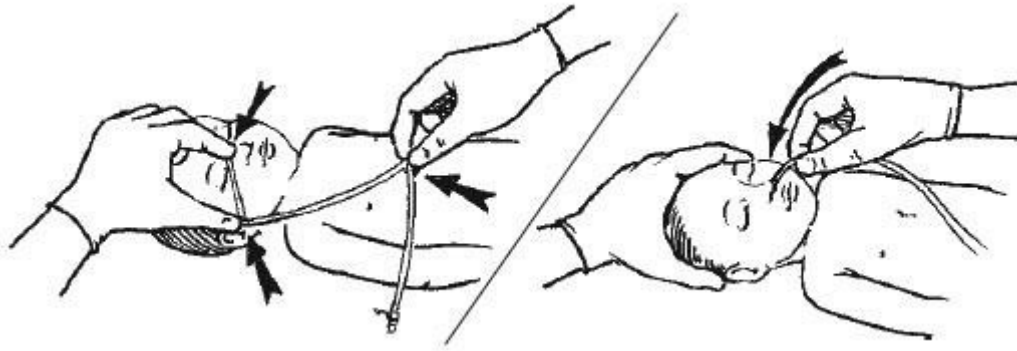
At each feed confirm that the tube is not displaced by the above method.

Feed by a syringe upside down with the plunger removed attached to the open end of the nasogastric tube.

Do not push feed through the nasogastric tube.

Watch for displacement of the tube.

Figure 5.2: Measurement of insertion of nasogastric tube

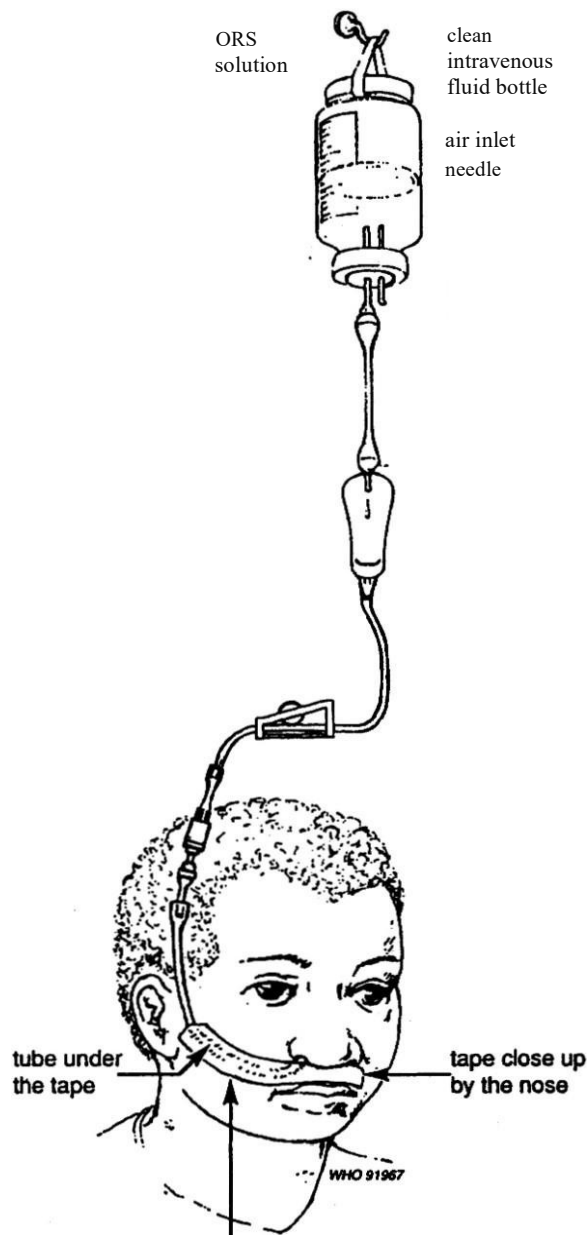


For rehydration

Fasten the tube to the face with tape and attach IV tubing that is connected to a clean IV bottle containing ORS solution. Regulate the infusion to a rate of 20 ml/kg per hour, or less with careful monitoring.

If an IV bottle is not available, a syringe (with the barrel removed) can be attached to the tube and used as a funnel. Hold the syringe above the patient's head and pour ORS solution into it at regular intervals.

Figure 5.3: Technique for Nasogastric Rehydration



Source: King, M. et al. *Primary child care: a manual for health workers*. Book One. Oxford University Press, 1978

5.5 c: When to refer patient to higher center?

- Any electrolyte imbalance like abnormality in sodium, potassium
- Deranged renal function like increased urea, creatinine
- No urine output after fluid resuscitation

Initiate treatment and refer to higher center with ongoing treatment on the way- continue NG or oral rehydration or IV rehydration.

5.5 d: When to treat for cholera?

In areas where cholera is endemic and a child above 2 years comes with severe dehydration cholera should be suspected and stool should be tested for hanging drop and culture if available.

Fluid management-

Different from others as high purging rate and monitoring should also be done frequently

Choice of fluid-

NS bolus if patient presents with shock or anuria

RL with 3.5 ml of KCl in 500 ml of fluid

Rate of fluid- Deficit fluid (10 *wt*% dehydration) should be given over 4 hours

Reassessed after 4 hours and again repeated according to the % dehydration

Table 5.3:Antimicrobial therapy-

Drug	Dose	Duration
Doxycycline	2-4 years: 50 mg 4-5 years: 100 mg	Single dose
Erythromycin	12.5 mg/kg/dose four times a day	3 days
Azithromycin	20 mg/kg	Single dose
Ciprofloxacin	20 mg/kg	Single dose

Monitoring during treatment of diarrhoea-

- Daily weight
- Vitals including blood pressure
- Input- IV fluids, oral intake
- Output- Urine output, stool frequency and amount

5.6: DYSENTERY

Dysentery is diarrhoea with visible blood. It is usually associated with fever, abdominal cramps and rectal pain. Most episodes in children are due to *Shigella* but can be caused by *Salmonella*, *E.coli*, *C. jejuni* and infrequently by *E.histolytica*.

Box 5.1: Indications for hospitalization in children with dysentery

- Age less than 12 months
- Presence of dehydration
- H/O Measles in last 3 months
- Presence of severe acute malnutrition
- Presence of complications –shock, abdominal distension, convulsion etc.
- Fails to respond to two commonly used oral drugs

1. Antimicrobial therapy

It is given for 5 days. The choice of antibiotics used is given in Table 5.4.

Table 5.4: Antimicrobial therapy-

Drugs	Doses	Remarks
Oral Ciprofloxacin	15 mg/kg/dose twice daily <6 months- ½ tab (250 mg) >6months- 1 tab(250mg)	1 st line
Oral Azithromycin	10 mg/kg/dose once daily	2 nd line
Oral Cefixime	5 mg/kg/dose twice daily	3 rd line
Inj Ceftriaxone	40-50 mg/kg/dose twice daily	If there is indication for admission

2. Correct & prevent dehydration as described earlier.
3. Prescribe a zinc supplement as done for children with watery diarrhoea.
4. Treat fever

Re-evaluation after 2 days and see for improvement- disappearance of fever, less blood in stools, fewer stools, improved appetite, decreased abdominal pain and improved activity

5. Monitor for complications:

- Abdominal distension- toxic ileus
- Hemolytic uremic syndrome (HUS) - decreased urine output, easy bruising, pallor and altered consciousness which needs early referral to higher center.
- Seizures- Electrolyte imbalance, meningitis, shigellosis (*Shigella* toxin affecting brain)

- Intussusception- Increased irritability, red currant jelly stool, abdominal distension.
Refer to higher center
- Rectal prolapse- Reduction of prolapse, refer to higher center

5.7: PERSISTENT DIARRHOEA

Persistent diarrhoea is diarrhoea, with or without blood, which starts acutely and lasts 2 weeks or more. When there is some or severe dehydration, persistent diarrhoea is classified as “**severe**”. In recent years persistent diarrhoea has emerged as major cause of mortality accounting for more than one-third of all diarrhoea deaths. With better management of dehydration, deaths due to persistent diarrhoea have reduced.

Box 5.2: Indications for hospitalization in persistent diarrhoea

Admit child with persistent diarrhoea if:

- Dehydrated (severe persistent diarrhoea), or
- Has associated severe malnutrition or severe illness, or
- Failure of routine OPD management for persistent diarrhoea

5.7a: Steps of management

1. Assess, classify, treat & prevent dehydration

2. Associated systemic infection: Combination of parenteral Ampicillin and gentamicin is usually effective for sepsis, pneumonia and UTI. Antibiotics should be changed as per culture sensitivity report if it is available.

3. Presence of gross blood in stools: Treat as for dysentery

4. Amoebiasis: Give oral Metronidazole 15 mg/kg/dose, 3 times a day for 7 days only if

- Microscopic examination of fresh feces carried out in a reliable laboratory reveals trophozoites of *E. histolytica* with red blood cells, **or**
- Two different antibiotics, which are usually effective for *Shigella* locally, have been given without clinical improvement.

6. Giardiasis: Give oral metronidazole 15 mg/kg/dose, 3 times a day, for 7 days if trophozoites of *Giardia lamblia* are seen in the feces.

7. Give zinc supplements for 14 days

8. Nutritional Management:

Various diets are recommended in persistent diarrhoea.

Given below are three diets recommended for children and infants aged >6 months with severe persistent diarrhoea. If there are signs of dietary failure or if the child is not improving after 7 days of treatment, stop the first diet and give the next diet for 7 days.

1. The Initial Diet A: [Reduced lactose diet, milk rice gruel, milk sooji gruel, rice with curd, dalia]

Table 5.5: Reduced lactose diet

Ingredients	Measure	Approximate quantity
Milk	1/3 cup	40 ml
Sugar	½ level tsp	2 g
Oil	½ level tsp	2 g
Puffed rice powder*	4 level tsp	12.5 g
Water		To make 100 ml

* can be substituted by cooked rice or sooji

Preparation

- Mix milk, sugar, rice together
- Add boiled water & mix well
- Add oil

The feed can now be given to the child

2. The second Diet B: [Lactose-free diet with reduced starch]

About 50-70% of children improve on the initial Diet A. Remaining children, if free of systemic infection are changed to Diet B which is milk (lactose) free and provides carbohydrates as a mixture of cereals and glucose. Milk protein is replaced by chicken, egg or protein hydrolysate.

Table 5.6: Lactose free diet with reduced starch

Ingredients	Measure	Approximate quantity
Egg white	3 level tsp	15 g
Glucose	¾ level tsp	3 g
Oil	1 level tsp	4 g
Puffed rice powder*	2 level tsp	7 g
Water	¾ cup	To make 100 ml

*Can be substituted with cooked rice

Preparation

Whip the egg white well. Add puffed rice powder, glucose, oil and mix well. Add boiled water and mix rapidly to avoid clumping.

The Third Diet C: [Monosaccharide based diet]

Overall 80-85% patients with severe persistent diarrhoea will recover with sustained weight gain on the initial Diet A or the second Diet B. A small percentage may not tolerate a moderate intake of the cereal in Diet B. These children are given the third diet (Diet C) which contains only glucose and a protein source as egg or chicken. Energy density is increased by adding oil to the diet.

Table 5.7: Monosaccharide based diet

Ingredients	Measure	Approximate quantity
Chicken / Egg white	2 ½ level tsp / 5 level tsp	12 g / 25 g
Glucose	¾ level tsp	3 g
Oil	1 level tsp	4 g
Water	½ - ¾ cup	To make 100 ml

Preparation

Boil chicken, remove the bones and make chicken puree. Mix chicken puree with glucose and oil. Add boiled water to make a smooth paste.

Or

Whip the egg white well. Add glucose, oil and mix well. Add boiled water and mix rapidly to avoid clumping.

5.7b: Response to diet

Given in Box 5.3 and 5.4 are features suggestive of good response to diet and failure to respond to diet therapy. The most important criterion is weight gain. Ensure at least three successive days of increasing weight (>5gm/kg/day) before you conclude that weight gain is occurring. Give additional fruits like banana, papaya and well-cooked vegetables to children who are responding well. After recovery, resume an appropriate diet for their age, including

Milk, which provides at least 110Kcal/ kg/ day. Children may then return home, but follow them up regularly to ensure continued weight gain and compliance with feeding advice.

Box 5.3: Good response to diet

- Adequate food intake
- Weight gain > 5 gm/kg/day
- Fewer diarrhoeal stools
- Absence of fever & better activity

Box 5.4: Failure to respond to diet

- An increase in stool frequency (usually to >10 watery stools a day), often with a return of signs of dehydration
- Failure to establish weight gain within 7 days

8. Give supplementary multivitamins and minerals

Give supplement vitamins and minerals, twice the RDA for at least 2 weeks (Box 5.5). Introduce iron supplements only after the diarrhoea has ceased. Provide vitamin A (single large dose) if the child has not received it as pre-referral treatment.

Vitamin A Single dose

- < 6 months = 50,000 IU
- 6 - 12 months = 1,00,000 IU
- >12 months = 2,00,000 IU

Box 5.5: Recommended Daily Allowances

One RDA for a child aged 1 year is:

- Folate 50 mcg
- Zinc 10 mg
- Vitamin A 400 mcg
- Iron 10 mg
- Copper 1 mg
- Magnesium 80 mg

Monitoring

Check the following parameters daily during hospital stay

- Body weight
- Temperature
- Food intake
- Number of diarrhoeal stools

5.8: ORT CORNER

An ORT corner is an area in a health facility available for oral rehydration therapy (ORT). This area is needed because mothers and their children who need ORS solution will have to stay at the clinic for several hours.

ORT corner can also be used for correcting feeding problems.

The ORT corner should be:

- Located in an area where staff frequently pass by but not in a passageway. The staff can observe the child's progress and encourage the mother.
- Near a water source.
- Near a toilet and washing facilities.
- Pleasant and well-ventilated.

The ORT corner should have the following furniture:

- Table for mixing ORS solution and holding supplies.
- Shelves to hold supplies.
- Bench or chairs with a back where the mother can sit comfortably while holding the child.
- Small table where the mother can conveniently rest the cup of ORS solution.

The ORT corner should have the following supplies. These supplies are for a clinic that receives 25-30 diarrhoea cases in a week.

- ORS packets (a supply of at least 300 packets per month)

- Bottles/ utensils that will measure correct amount of water for mixing the ORS packet, including some containers like those that mother will have at home.
- Cups, spoons
- Cards or pamphlets (such as a Mother's Card) that remind mothers how to care for a child with diarrhoea.
- Soap (for hand washing)
- Waste basket
- Food available (so that children may be offered food or eat it regular meal times)

The ORT corner is a good place to display informative posters. Since mothers sit in the ORT corner for a long time, they will have a good opportunity to learn about health prevention from the posters.

Mothers are interested in posters about the treatment and prevention of diarrhoea and dehydration. The posters should contain information about ORT, use of clean water, breastfeeding, weaning foods, hand washing, the use of latrines, and when to take the child to the clinic. The messages should include information on immunizations.

Posters alone are not adequate for informing mothers. Doctors should also counsel mothers in person, using a Mother's Card if there is one available.

SECTION 6

CASE MANAGEMENT OF CHILDREN PRESENTING WITH FEVER

6.1. INTRODUCTION

Fever is a common presenting complaint and common cause of hospital admission. It is defined as axillary temperature of more than 37.5 deg C. The causes of fever are usually benign like URTI and viral fever but some causes can be life threatening. The consequences of delayed or missed diagnosis can be serious and over treatment may be hazardous too. As discussed in ETAT section, look for emergency signs and initiate treatment before taking detailed history and examination.

Following history and examination may help you in reaching a diagnosis:

History-

- Fever- Onset, duration, continuous or intermittent, response to general measures or medication
- Associated signs and symptoms- cough, cold, loose stools, blood in stools, pain on passing urine, increase in frequency of urine, convulsions, headache vomiting, excessive irritability or inconsolable crying, stiff neck or neck pain, skin rash, ear pain
- Recent use of antibiotics
- Recent vaccination within 48 hrs and vaccination history
- Recent travel or residency area
- History of other family members, exposure to sick individuals
- Previous illnesses like immunodeficiency and chronic illness
- Activity level, feeding, urine and stool

Examination

- Initial impression: Potentially life- threatening features like compromised airway, breathing and circulation and decreased level of consciousness.
- Features suggesting a toxic/ ill looking child like pallor or cyanosis, lethargy, inconsolably irritable, tachycardia, tachypnoea.
- Vital signs- Temperature, heart rate, respiratory rate, capillary refill time, blood pressure
- General: drowsiness or altered consciousness, pallor, jaundice, lymphadenopathy, edema, dehydration
- Head and neck: bulging fontanel, stiff neck, discharge from ear, swelling or tenderness in mastoid region
- Chest: reduced air entry, added sounds
- Abdomen: distension, tenderness, enlarged liver or spleen
- Limbs: swelling, redness, warmth, difficulty in moving joint or limb
- Skin: pyoderma, hemorrhagic rashes like purpura, petechiae, maculopapular rash

6.2. DIFFERENTIAL DIAGNOSIS

You can classify fever cases into two major categories

- **Acute fever- Fever \leq 7days**
 - Fever without localized signs-
 - Sick looking
 - Not sick looking
 - Fever with localized signs
 - Fever with rash
- **Prolonged fever- Fever $>$ 7days with daily fever**

6.2a.Fever without localized signs and sick looking

Sick looking- Any of the following symptoms

- Pale/ mottled/ blue skin, lips or tongue
- No or poor response to social cues
- No smile
- Does not wake or wakes to prolonged stimulation
- Weak, high- pitched or continuous cry
- Rigors
- Poor feeding
- Age 3-6 months with temperature >39 deg C
- Age $<$ 3 months with temperature $> \neq 38$ deg C
- Fever for ≥ 5 days

Table 6.1: Causes of fever without localized signs and sick looking

Diagnosis	History	Examinations	Investigation
Malaria	Endemic zone	Anaemia Enlarged spleen	Positive blood film Positive rapid diagnostic test for malaria parasites
Septicaemia		Seriously ill Purpura, petechiae Shock Hypothermia in a young infant or severely malnourished child	Leucocytosis with neutrophilia Thrombocytopenia Raised CRP, ESR Positive blood culture
Typhoid	Pain abdomen Diarrhoea/ constipation	Seriously ill Shock Abdominal tenderness Confusion	Leucopenia Positive blood culture

Urinary tract infection	Abdominal pain Crying during passing urine Frequent passage of urine Urinary	Loin or suprapubic tenderness	White blood cells in urine Positive dipstick Positive urine culture
Fever associated with HIV	See section for HIV		

6.2b. Fever without localized signs and not sick looking

Table 6.2: Fever without localized signs and not sick looking

Diagnosis	History	Examination	Investigation
Viral fever		Not sick looking	No investigations. Follow up in 48 hrs

6.2c: Fever with localized signs

Table 6.3: Fever with localizing signs

Diagnosis	History	Examination	Investigations
Meningitis	Vomiting Headache Seizures Altered level of consciousness Inability to drink or breastfeed Pain at back of neck Irritability	Bulging fontanelle in infancy Signs of meningeal irritation(Neck stiffness, Kernig's , Brudzinski) in > 18 months Meningococcal rash(petechiae or purpura) Raised ICP(unequal posturing, rigid posture or posturing, focal limb paralysis, irregular breathing, hypertension)	Leucocytosis with neutrophilia Lumbar puncture-findings as given in table 6.6
Acute encephalitic syndrome	Change in mental status Seizures	Change in mental status	Serology for JE
Otitis media	Ear discharge Ear pain	Red immobile ear drum on otoscopy Pus	
Mastoiditis		Tender swelling behind the ear	
Osteomyelitis	Limb pain Refusal to move the affected limb	Swelling and redness over bone sites	Leucocytosis with neutrophilia High ESR, CRP
	Refusal to bear weight on leg		Positive blood culture X-ray- Positive after 14 days

Septic arthritis	Joint swelling	Joint hot, tender swelling	Leucocytosis with neutrophilia High ESR, CRP Positive blood culture
Skin and soft tissue infection	Pus filled lesions Painful, red swelling over skins Fluctuating, painful, red swellings	Cellulitis Pustules Abscess	Leucocytosis with neutrophilia Positive blood culture Positive pus culture
Pneumonia	Cough	Tachypnea Chest retractions Grunting Nasal flaring Crepitations	Leucocytosis with neutrophilia High CRP Positive blood culture Chest X-ray- infiltration, consolidation
Viral upper respiratory tract infection	Coryza, cough	No findings	
Bronchiolitis	Coryza, cough	Chest- Wheezing	
Sinusitis	Headache Foul smelling nasal discharge Nasal blockade	Tenderness over sinuses	X-ray- Haziness over sinuses
Hepatitis	Anorexia Nausea Vomiting Yellowish discoloration of body	Jaundice Hepatomegaly	Elevated ALT Deranged PT

6.2d: Fever with rash

Table 6.4: Fever with rash

Diagnosis	History	Examination	Investigations
Measles	Coryza Cough Conjunctivitis Rash Recent exposure to measles case No measles vaccination	Rashes	Measles/ Rubella serology
Rubella	Low grade fever	Rashes Lymphadenopathy	Measles/ Rubella serology
Viral infections	Coryza Cough Transient non- specific rash		

Typhus	Muscle pain Epidemic of typhus in region	Macular rash	Thrombocytopenia Typhus serology
Dengue hemorrhagic fever	Bleeding- nose, gums, vomitus, stool, skin Abdominal pain	Hepatosplenomegaly Shock	Thrombocytopenia Dengue serology
Meningococcal	Features of meningitis	Very ill child Petechiae Shock	Leucocytosis with neutrophilia Thrombocytopenia Deranged PT, APTT Positive blood culture

6.2e. Fever more than 7 days

Table 6.5: Fever of more than 7 days

Diagnosis	History	Examination	Investigations
Any causes of fever < 7 days except viral infections			
Childhood malignancies	Loss of appetite Weight loss Increasing pallor Bleeding Neck masses Abdominal distension	Anemia Lymphadenopathy Petechiae Hepatosplenomegaly	Leucocytosis or Leucopenia Anemia Thrombocytopenia Peripheral blood smear- Blasts
Tuberculosis	Pneumonia > 14 days Meningitis > 14 days Abdominal distension Neck swellings Loss of appetite Weight loss History of contact with tuberculosis	Seizures, altered level of consciousness Ascites, pleural effusion Lymphadenopathy	Mantoux test Chest X-ray Elevated ESR Gene expert of sputum, fluids
Connective tissue disorders	Joint pain, swelling Rashes	Rashes Effusion Ascitis	Elevated ESR, CRP Leucocytosis Anaemia Leucopenia Albuminuria in urine Chest X-ray- Effusion
Infective endocarditis	Cough, shortness of breath	Murmur Spleno-megaly	Leucocytosis Elevated ESR, CRP Chest X-ray- Cardiomegaly Positive blood culture
			Microscopic hematuria

Rheumatic fever	Cough, shortness of breath Joint pain/ swelling Abnormal body movements Rashes Recent streptococcal infection	Murmur Arthritis Chorea Rashes	Leucocytosis Elevated ESR, CRP Elevated ASO titre Chest X-ray- Cardiomegaly
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6.2 f: Management of Fever

Fever is not an indication for antibiotic treatment and may help the immune defense against infection. However, high fever ($\geq 38.5^{\circ}\text{C}$ or 101.3°F) can have harmful effects such as:

- Reducing the appetite
- Making the child irritable
- Precipitating febrile convulsions in some children aged between 6 months and 5 years
- Increasing oxygen consumption (e.g. in a child with very severe pneumonia, heart failure or meningitis).

Treatment with oral paracetamol should be given if the baby has a fever of $\geq 38.5^{\circ}\text{C}$. The dose of paracetamol is 15 mg/kg 6-hourly. Children with fever should be lightly clothed, kept in a warm but well-ventilated room, and encouraged to increase their oral fluid intake. Sponging with tepid water lowers the temperature during the period of sponging. All children with fever should be carefully examined for finding etiology. Ibuprofen/other NSAID/Aspirin should not be used due to risk of severe complications like Reye syndrome.

6.3. MENINGITIS

Meningitis is one of the important causes of mortality and brain damage in infants and children. Early diagnosis of meningitis is essential for effective treatment. Diagnosis is done by Lumbar puncture.

Lumbar puncture:

Indication- Examination of spinal fluid for suspected meningitis

Contraindications-

- Increased ICP- unequal pupils, rigid posture or posturing, focal limb or facial paralysis, irregular breathing, hypertension
- Bleeding diathesis- Active bleeding, Thrombocytopenia $< 50,000$ cells/uL , deranged PT/ APTT
- Overlying skin infection
- Cardiorespiratory instability

Procedure

- Keep all equipments ready-
- Lumbar puncture needle of appropriate size
- Eye towel and sterile towels
- Antiseptic wipes
- Vials to collect the sample
- Aseptic precaution- Wear sterile gloves
- Position the child in lateral recumbent position with hips, knees and neck flexed.
- Prepare the skin in sterile fashion using betadine, betadine and spirit.
- Drape the area with eye towel and sterile towel
- Locate the desired intervertebral space by drawing an imaginary line between the top of the iliac crests
- Puncture the skin in the midline in the intervertebral space with needle angling slightly cephalad towards the umbilicus. Advance several millimetres at a time withdrawing the stylet each time to check for CSF flow. A pop may be felt as the dura is penetrated.
- If resistance is felt initially (hit bone), withdraw needle to skin surface and redirect angle slightly.
- Collect the samples for investigations.
- Remove the needle and give pressure over the prick site for few minutes.

Table 6.6: CSF analysis

Condition	WBC	Protein	Sugar
Normal	<5 >/=75% lymphocytes	20-45	>50 or 75% of serum glucose
Viral	< 1000 Neutrophils early but lymphocytes mostly	50-200	>50 % of serum glucose
Acute bacterial meningitis	100-10000 Neutrophils predominate	Raised 100-500	Decreased usually <40 <50% serum glucose
Partially treated bacterial meningitis	5-10000 Lymphocytes may predominate	Raised 100-500	Normal or decreased
Tuberculous meningitis	10-500 Neutrophils early but Lymphocytes predominate mostly	Raised 100-3000	Decreased <50

Treatment

1. Antimicrobial therapy

Start antibiotics immediately if meningitis is clinically suspected and the CSF is obviously cloudy or if lumbar puncture is not possible, contraindicated or traumatic.

Table 6.7: Antimicrobial therapy

Drug	Dose	Remarks
Ceftriaxone	50 mg/kg/dose IV or IM twice daily	
Cefotaxime	50 mg/kg/dose IV or IM four times daily	
Chloramphenicol	25 mg/kg/dose IV four times daily	
Gentamicin or Amikacin	7.5 mg/kg/ day once daily 15 mg/kg/day once daily	Child <3 months add to Ceftriaxone or Cefotaxime
Ampicillin	75mg/kg/dose 6 hourly	Child <3 months add to Ceftriaxone or Cefotaxime

*If Staphylococcus aureus meningitis is suspected (patients presenting with shock, penetrating head trauma, neurosurgical procedures, deep seated abscess, infective endocarditis) and if not improving with previous antibiotics within 48 hours

Duration of treatment - 10 to 14 days.

2. General measures-

- To maintain airway in an unconscious or convulsing child, frequent suctioning, nurse on lateral side, NG tube to allow continuous drainage to prevent aspiration
- Breathing- Oxygen support if desaturation or signs of respiratory distress
- Circulation- Fluid, nutrition, treatment of shock
- Treat hypoglycaemia
- Treat fever

3. Treatment of seizure- IV or rectal diazepam/ IV midazolam followed by Inj Phenytoin 20 mg/kg loading dose followed by 5 mg/kg/ day twice daily. Stop phenytoin when patient is seizure free for 48 hours. Check glucose, sodium, calcium

4. Treatment of increased ICP presenting with Unequal pupil, rigid posture or posturing, focal limb paralysis, irregular breathing, hypertension, bradycardia can be done with head end elevation and Inj Lasix 1mg/kg and Inj Mannitol(20%) 5 ml/kg followed by 2.5 ml/kg/dose 6 hourly if child not in shock.

Monitoring- state of consciousness, respiratory rate, heart rate, blood pressure, pupil size, urine output, glucose, head circumference

Public health measures- Prophylaxis with Ciprofloxacin or rifampicin for exposure to patients with meningococcal meningitis

Discharge and follow up- Hearing assessment, developmental assessment

Consider Tubercular meningitis-

- Fever persists for 14 days
- Fever persists more than 7 days and there is a family member with tuberculosis
- Chest X-ray suggests tuberculosis
- Patient remains unconscious despite treatment for bacterial meningitis
- The patient is known to have HIV or is exposed to HIV
- CSF findings of moderately high white cell count, elevated protein and low glucose
- Not responding to antibiotics

See Chapter on TB for specific treatment of tubercular meningitis.

Poor response to treatment

- Development of complications- Persistent fever (subdural effusion), increasing head size (hydrocephalus)- Refer
- Tubercular meningitis- Treat for tubercular meningitis
- Resistant organisms- Refer
- Cerebral malaria in malaria endemic zone- Investigate and treat for malaria

6.4. SEPTICAEMIA

Septicaemia should be considered in a child with acute fever who is severely ill. It can occur with association with meningitis, pneumonia, urinary tract infection or any other bacterial infection. The common causative agents include Streptococcus pneumoniae, Hemophilus influenzae, Staphylococcus aureus, Meningococcus (Neisseria meningitidis), enteric gram negative bacteria like Escherichia coli and Klebsiella pneumoniae (in patients with severe malnutrition). Staphylococcal sepsis presents with localized skin or bone infection and Meningococcal sepsis presents with petechiae or purpuric rashes and meningitis.

Treatment- Start with empirical broad spectrum antibiotics immediately

Table 6.8: Antibiotic therapy

Drugs	Dose	Remarks
Inj Ampicillin with Inj Gentamicin	50 mg/kg/ dose 6 hourly 7.5 mg/kg/dose once daily	
Inj Ceftriaxone	50 mg/kg/dose twice daily	2 nd line therapy
Inj Cloxacillin	25 mg/kg/dose 6 hourly	If Staphylococcal sepsis suspected or patient has septic shock

Supportive care - Fever control, fluid and nutrition, glucose

Monitoring- Shock, urine output, bleeding, skin ulceration

6.5: TYPHOID FEVER

Consider typhoid fever if a child has fever > 38 deg C persisting for more than 3 days plus any of the following: vomiting, abdominal pain, loose stools, headache, malaise, loss of appetite or cough. It can present atypically in young infants as an acute febrile illness with shock and hypothermia. It may be confused with typhus fever where typhus fever is common.

Treatment

Antibiotics should be given for 10 days. Choice of antibiotics depends on local resistance pattern of Salmonella isolates. Change to 2nd line antibiotics if not responding in > 72 hrs

Table 6.9. Choice of antibiotics for typhoid fever.

Drugs	Dose	Remarks
OPD		
Oral Ciprofloxacin	10mg/kg/dose twice daily for 10- 14 days	1 st line
Oral Ofloxacin	10 mg/kg/dose twice daily for 10- 14 days	1 st line
Oral Azithromycin	10 mg/kg/dose twice daily for 7 days	2 nd line
Oral Cefixime	10 mg/kg/dose twice daily for 10- 14 days	2 nd line
Oral Chloramphenicol	25 mg/kg/dose four times daily for 10 days	2 nd line
Admitted		Indication of admission: Seriously ill Not able to tolerate orally Not responding
Inj Ceftriaxone	50mg/kg/dose twice daily for 10 days	
Inj Chloramphenicol	25 mg/kg/dose four times daily for 10- 14 days	

Supportive care- Treatment of fever, nutrition, anaemia, shock

Monitoring- Vitals including blood pressure, input and output, anemia, level of consciousness, gastrointestinal perforation (abdominal distension, tenderness, vomiting), gastrointestinal bleeding (pallor, black stool or blood in stool)

6.6. URINARY TRACT INFECTION (UTI)

Urinary tract infection is common in infants and children. In young children, urinary tract infection often presents as nonspecific signs. Urine routine examination and culture is done to diagnose UTI. UTI can be divided into cystitis (involving bladder presenting with urinary symptoms) and pyelonephritis (involving kidneys presenting with high grade fever).

Urine is collected in children with no toilet training by urinary catheterisation and in toilet trained children by mid stream clean catch urine. UTI is diagnosed by

- Urine routine showing WBC > 10 in uncentrifused sample and
- Urine culture –
 - Clean catch- > 10⁵ CFU/ ml
 - Catheterization- >5 * 10⁴ CFU/ml

Choice of antibiotics

Depends on local sensitivity profile. (See Table 6.10) Antibiotics can be changed according to sensitivity report or if there is poor clinical response antibiotics used after 3 days and to oral antibiotics after child are afebrile.

Table 6.10. Choice of antibiotics for UTI

Out patient department	Dose	Remarks
Oral Ciprofloxacin	10 mg/kg/dose twice daily	1st line
Change to 2 nd line according to culture report if available		
Oral Cefixime	5 mg/kg/dose twice daily	2nd line
Oral Ofloxacin	7.5 mg/kg/dose twice daily	2nd line
Oral Cotrimoxazole	4 mg/kg/dose of trimethoprim equivalent twice daily	2nd line
Admission		Infants younger than 3 months Septic Vomiting Not tolerating oral medications Not responding to appropriate oral antibiotics after 3 days acc to sensitivity
Inj Ceftriaxone	40mg/kg/dose twice daily	
Inj Amikacin	15 mg/kg/dose once daily	
Inj Gentamicin	7.5 mg/kg/dose once daily	

Duration of antibiotics

Duration of antibiotics is 5 days for cystitis and 10 days for pyelonephritis. All patients with UTI should be evaluated with ultrasound abdomen to rule out anomalies of genitourinary tract.

Supportive care- Treatment of fever, nutrition, urine output, renal functions, rule out genitourinary tract abnormalities

Referral-

Not responding to treatment with injectable antibiotics- resistance organisms, complications like abscess

Recurrent UTIs- rule out genitourinary abnormalities like VUR

Genitourinary abnormalities in ultrasound

6.7. MEASLES

Measles is a highly contagious viral disease with serious complications (such as blindness in children with pre-existing vitamin A deficiency) and high mortality. It is rare in infants < 3 months of age.

Diagnosis

Diagnose measles if the child has fever (sometimes with a febrile convulsion) and a generalized maculopapular rash (Fig 6.1) and one of the following: cough, runny nose or red eyes. Blood sample for measles/ rubella antibodies should be sent .

In children with HIV infection, some of these signs may not be present, and the diagnosis of measles may be difficult.

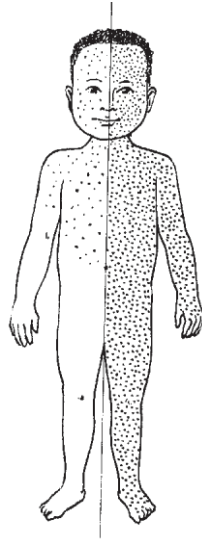


Fig 6.1: Distribution of measles rash. The left side of the drawing shows the early rash covering the head and upper part of the trunk; the right side shows the later rash covering the whole body.

6.7a: Severe complicated measles

Diagnosis

In a child with evidence of measles (as above), any one of the following symptoms and signs indicates the presence of severe complicated measles:

- inability to drink or breastfeed
- vomits everything
- convulsions
- On examination, look for signs of complications, such as:
- lethargy or unconsciousness
- corneal clouding (See Fig. 6.2)
- deep or extensive mouth ulcers
- pneumonia
- dehydration from diarrhoea
- stridor due to measles croup
- severe malnutrition



Fig. 6.2: Corneal clouding: sign of xerophthalmia in vitamin A-deficient child (left side) in comparison with the normal eye (right side)

Treatment

Children with severe complicated measles require treatment in hospital.

1. Vitamin A therapy.

Give oral vitamin A to all children with measles, unless the child has already had adequate vitamin A treatment for this illness as an outpatient. Give oral vitamin A at 50 000 IU (for a child aged < 6 months), 100 000 IU (6–11 months) or 200 000 IU (1–5 years). If the child shows any eye sign of vitamin A deficiency, give 2nd dose the next day and a third dose 2–4 weeks after the second dose on follow-up.

2. Manage Fever

3. Nutritional support

Assess the nutritional status by weighing the child and plotting the weight on a growth chart (rehydrate before weighing). Encourage continued breastfeeding. Encourage the child to take frequent small meals. Check for mouth ulcers and treat them, if present (see below).

Complications

Complications

Follow the guidelines given in other sections of this manual for the management of the following complications:

1. **Pneumonia**- Give antibiotics for pneumonia to all children with measles and signs of pneumonia, as over 50% of all cases of pneumonia in measles have secondary bacterial infection (See section for pneumonia).
2. **Otitis media** (See section for otitis media)

3. **Diarrhoea-** Treat dehydration, bloody diarrhoea or persistent diarrhoea

4. **Measles croup** - Give supportive care. Do not give steroids.

5. **Eye problems-**

Conjunctivitis and corneal and retinal damage may occur due to infection, vitamin A deficiency or harmful local remedies.

In addition to giving vitamin A (as above), treat any infection present. If there is a clear watery discharge, no treatment is needed.

If there is pus discharge, clean the eyes with cotton-wool boiled in water or a clean cloth dipped in clean water. Apply tetracycline eye ointment three times a day for 7 days. Never use steroid ointment. Use a protective eye pad to prevent other infections.

If there is no improvement, refer to an eye specialist

6. **Mouth ulcers-**

If the child can drink and eat, clean the mouth with clean, salted water (a pinch of salt in a cup of water) at least four times a day.

Apply 0.25% gentian violet to sores in the mouth after cleaning.

If the mouth ulcers are severe and/or smelly, give IM or IV benzylpenicillin (50 000 U/kg every 6 h) and oral metronidazole (7.5 mg/kg three times a day) for 5 days.

If the mouth sores result in decreased intake of food or fluids, the child may require feeding via a nasogastric tube.

7. **Neurological complications**

Convulsions, excessive sleepiness, drowsiness or coma may be symptoms of encephalitis or severe dehydration.

Assess the child for dehydration and treat accordingly.

Treatment of convulsions and care of an unconscious child.

8. **Severe acute malnutrition:** See section for malnutrition.

Monitoring

Take the child's temperature twice a day, and check for the presence of the above complications daily.

Follow-up

Recovery after acute measles is often delayed for many weeks and even months, especially in children who are malnourished. Arrange for the child to receive the third dose of vitamin A before discharge, if this has not already been given.

Public health measures

If possible, isolate children admitted to hospital for measles for at least 4 days after the onset of the rash. Ideally, they should be kept in a separate ward from other children.

For malnourished and immunocompromised children, isolation should be continued throughout the illness.

When there are measles cases in the hospital, vaccinate all other children > 6 months of age (including those seen as outpatients, admitted in the week after a measles case and HIV-positive children).

If infants aged 6–9 months receive measles vaccine, it is essential that the second dose be given as soon as possible after 9 months of age.

Check the vaccination status of hospital staff and vaccinate, if necessary.

6.7b: Non-severe measles

Diagnosis

Diagnose non-severe measles in a child whose mother clearly reports that the child has had a measles rash, or if the child has: fever and a generalized rash and one of the following: cough, runny nose or red eyes, but none of the features of severe measles (See section of severe measles).

Treatment

Treat as an outpatient.

- 1. Vitamin A therapy.** Check whether the child has already been given adequate vitamin A for this illness. If not, give 50 000 IU (if aged < 6 months), 100 000 IU (6–11 months) or 200 000 IU (1–5 years).
- 2. Manage fever.**
- 3. Nutritional support.** Assess the nutritional status by measuring the mid upper arm circumference (MUAC). Encourage the mother to continue breastfeeding and to give the child frequent small meals.

4. Treat mouth ulcers as given above

- 5. Eye care.** For mild conjunctivitis with only a clear watery discharge, no treatment is needed. If there is pus, clean the eyes with cotton-wool boiled in water or a clean cloth dipped in clean water. Apply tetracycline eye ointment three times a day for 7 days. Never use steroid ointment.

Follow-up

Ask the mother to return with the child in 2 days to see whether the mouth or eye problems are resolving, to exclude any severe complications and to monitor nutrition and growth.

6.8. MASTOIDITIS

Mastoiditis is a bacterial infection of the mastoid bone behind the ear. Without treatment it can lead to meningitis and brain abscess.

Diagnosis

Key diagnostic features are:

High fever and tender swelling behind the ear.

Treatment

1. Antimicrobial treatment

- Give Cloxacillin or Ceftriaxone until the child improves, for a total course of 10 days.
- If there is no response to treatment within 48 h or The child's condition deteriorates, refer child to a surgical specialist to consider incision and drainage of mastoid abscesses or mastoidectomy.
- If there are signs of meningitis or brain abscess, give antibiotic treatment as outlined in section of meningitis, and, if possible, refer to a specialist hospital immediately.

2. Manage fever

Monitoring- The child should be checked by a nurse at least every 6 h and by a doctor at least once a day. If the child responds poorly to treatment, such as decreasing level of consciousness, seizure or localizing neurological signs, consider the possibility of meningitis or brain abscess (See section for meningitis)

6.9. ACUTE OTITIS MEDIA

Diagnosis

This is based on a history of ear pain or pus draining from the ear (for < 2 weeks). On examination, confirm acute otitis media by otoscopy. The ear-drum will be red, inflamed, bulging and opaque, or perforated with discharge.

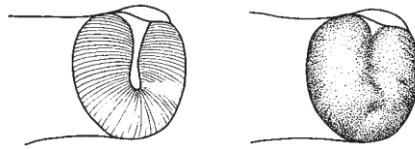


Fig 6.3: Acute otitis media: bulging, red ear-drum (on right) and normal ear-drum (on left)

Treatment

Treat the child as an outpatient.

1. Antimicrobial treatment:-
Oral amoxicillin at 30 mg/kg thrice a day for at least 10 days
2. If pus is draining from the ear, show the mother how to dry the ear by wicking. Advise the mother to wick the ear three times daily until there is no more pus.
3. Tell the mother not to place anything in the ear between wicking treatments. Do not allow the child to go swimming or get water in the ear.
4. Manage fever

Follow-up

Ask the mother to return after 5 days.

- If ear pain or discharge improved, treat for 5 more days with the same antibiotic and continue wicking the ear. Follow up in 5 days.
- If ear pain or discharge not better, treat with amoxicillin clavulanic acid 30 mg/kg/dose thrice daily for 5 days. If not improved in 5 days follow up admit and treat with Inj. Ceftriaxone 50 mg/kg/dose twice daily for 3 days.

6.10: CHRONIC OTITIS MEDIA

- If pus has been draining from the ear for ≥ 2 weeks and no earache, the child has a chronic ear infection.

Diagnosis

- A diagnosis is based on a history of pus draining from the ear for ≥ 2 weeks. On examination, confirm chronic otitis media (where possible) by otoscopy.

Treatment

- Refer to specialist if the ear discharge is foul smelling.
- If the discharge is mucopurulent and non-smelly
 - Treat the child as an outpatient.
 - Keep the ear dry by wicking (see above).
 - Instill topical antibiotic drops containing quinolones with or without steroids (such as ciprofloxacin, norfloxacin, ofloxacin) twice a day for 2 weeks. Drops containing quinolones are more effective than other antibiotic drops.
 - Topical antiseptics are not effective in the treatment of chronic otitis media in children.
 - If the patient develops fever and earache, treat as acute otitis media and refer to specialist for further treatment.

Follow-up

- Ask the mother to return after 5 days. If the ear discharge persists:
 - Check that the mother is continuing to wick the ear. Do not give repeated courses of oral antibiotics for a draining ear.
 - Refer to specialist for further management.



Fig.6.3: Mother wicking the ear of her child

6.11: MALARIA

Malaria continues to be a priority public health problem in Nepal. Plasmodium vivax and Plasmodium falciparum are responsible for most cases. The resistance to falciparum malaria and the development of mixed malaria infections have now created an even higher possibility of fatality if not detected and treated in time.

Serious complications may sometimes develop suddenly over a span of time as short as 12 -24 hours and may lead to death, if not treated promptly and adequately. Use of appropriate anti-malarial drugs is very important to save lives in malaria cases.

Classification of malaria-

➤ **Clinically suspected malaria case**

A resident of malaria endemic area or a person with a recent travel history to malarious area who presents with history of fever during last three days or patient with symptoms and/ or signs of uncomplicated malaria, or patients requiring hospitalization for symptoms and/or signs of malaria, is considered as a case of suspected malaria after the exclusion of other common causes of fever.

➤ **Confirmed malaria case**

A clinically suspected malaria case showing presence of malarial parasite in the thick/thin blood smear microscopy or detection of parasite specific antigen in the blood of the suspected patient in the laboratory

➤ **Confirmed uncomplicated malaria case**

A case of malaria confirmed by **laboratory (microscopy or RDT)**, without signs of severity or evidence of vital organ dysfunction.

➤ **Severe/complicated malaria case**

A confirmed malaria case requiring hospitalization for the treatment due to signs of severity and/or evidence of vital organ dysfunction, which includes:

- Prostration (inability to sit), altered consciousness lethargy or coma
- Breathing difficulties due to pulmonary edema or ARDS rare in children
- Severe anaemia (haemoglobin < 5mg/dl) with parasite count >10,000/uL
- Generalized convulsions/fits
- Inability to drink/vomiting
- Dark and/or limited production of urine or serum creatinine >3 mg/dl and Urea > 20 mmol/L- Renal failure less common in children
- Jaundice

- Hypoglycemia
- Shock
- Hyperparasitaemia- *P. falciparum* parasitaemia > 10%

Generally severe and/or cerebral malaria is caused by *Plasmodium falciparum*, but not all *Plasmodium falciparum* malaria become severe.

Duration of illness and resolution of coma is shorter (1-2 days) in children.

Diagnosis of malaria in our setting-

1. Rapid Diagnostic Tests to detect malarial antigen specific to the species of plasmodium (*P. falciparum* and *P. vivax*)
2. Microscopy for thick and thin smear for parasitological diagnosis, species identification and to see the density of parasites in patient's blood smear.

Indication for hospitalization: You will need to admit severe malaria cases. Uncomplicated malaria cases should be managed on OPD basis

6.11 a: Treatment of severe malaria-

1. **Provide emergency treatment if emergency signs are present** (See Section-2 - ETAT).
2. If the child is unconscious, **minimize the risk for aspiration pneumonia** by inserting a nasogastric tube and removing the gastric contents by suction. Keep the airway open, and place in recovery position.
3. Oxygen therapy to keep SpO₂ > 94%
4. **Treat hypoglycaemia:**
 - Give 5 ml/kg of 10% glucose (dextrose) solution IV rapidly.
 - Recheck the blood glucose after 30 minutes, and repeat the dextrose (5 ml/kg), if the level is low. If blood glucose cannot be measured and hypoglycaemia is suspected, give glucose empirically.

5. Treat convulsions

- Treat with rectal or IV diazepam. Do not give prophylactic anticonvulsants.
- Immediate assessment of blood glucose, hemoglobin, parasitemia, ECG, renal function test, blood grouping, complete blood count with platelets, clotting studies, blood culture and electrolytes.
- Lumbar puncture should be done to rule out meningitis in sick comatose children if it is not contraindicated as there is considerable clinical overlap between cerebral malaria and meningitis and they can also coexist. In such cases, treatment for meningitis should be started immediately with antimalarial treatment.

6. Manage fever

7. Provide intravenous fluid

8. Specific antimalarial treatment-

- **Inj. Artesunate 2.4mg/kg body weight** intravenous should be given (time should be maintained), then the same dose intravenous after 12 hrs for the first day followed by the same dose once daily on the next coming days until the patient becomes conscious. After returning consciousness, full course of ACT (Coartem) with single dose (0.75mg/kg body weight) of tab. Primaquine should be given.

OR

- If injection artesunate is not available, then **inj. Artemether 3.2mg/kg body weight i.m. stat and then 1.6mg/kg body weight i.m. once a day** on the next coming days should be given until consciousness returns and then ACT full course orally with the same dose of primaquine.
- If the above medicines are contra-indicated, then **Inj.quinine 20mg/kg bw by i.v** infusion as loading dose followed by **10mg/kg bw in every 8 hrs** should be given until the consciousness returns. The infusion should not exceed 5mg/kg body weight per hour. After consciousness full course of quinine tab should be given for 7 days with **single dose of tab. Primaquine 0.75mg/kg orally.**
- After 24 h of treatment with IV artesunate, counts usually fall in a log-normal manner and patient shows signs of clinical improvement in contrast to treatment with quinine infusion which may result in parasite counts often remaining unchanged, and could even rise further, during the first 18–24 h of treatment with quinine.
- Drugs should be given orally as the patient is able to take oral medication.
- Details of treatment are given in tables below

Table 6.11: Antimalarial drugs

Drug	Available as	Dose	Followed by (after gain of consciousness)	Remarks
Artesunate Intravenous	Ampoules with 60 mg of anhydrous artesunate acid with separate ampoule of 5% sodium bicarbonate solution	2.4 mg/kg stat then after 12 h and then once a daily until consciousness	Oral ACT (6 doses over 3 days in 12 hrs interval) with single dose of Primaquine 0.75 mg/kg	S/E- Allergy
Artemether Intramuscular		3.2 mg/kg stat then 1.6 mg/kg body weight per day	Oral ACT (6 doses over 3 days in 12 hrs interval) with single dose of Primaquine 0.75 mg/kg	Should be given if artesunate not available
Quinine Intravenous	Inj- 2ml contains 600 mg of quinine hydrochloride Tab- 300mg of quinine sulphate	20 mg/kg stat followed by 10 mg/kg every 8 hourly with infusion rate 5 mg/kg/hr	Oral quinine for 7 days with single dose of primaquine 0.75 mg/kg	S/E- hypoglycaemia, postural hypotension, local reactions, oculotoxicity Should be given if both above drugs contraindicated- Children < 1y or < 5kg Diluted in 5% dextrose or dextrose saline (10 ml/kg) and given by infusion over 4 hours (loading dose) and 2 hours (maintenance dose) Monitor blood sugar

				every 4 hourly and blood pressure 6 hourly
Quinine Intramuscular		Dilute in normal saline to 100 mg/ml and divide portion into two equal parts and administer in anterior thighs		If IV infusion no possible

Table 6.12: Dosage of quinine sulphate by body Weight-Tablet available as 300 mg tablets

Weight (Kg)	Age (years)	mg/ (Number of tablets) 3 times a day
5 –10	2-11 months	75 mg. (1/4)
10.1-14	1-2	150 mg (1/2)
14.1-20	3-5	225 mg (3/4)
20.1-30	6-8	300 mg (1)
30.1-40	9-11	375 mg (1+1/4)
40.1-50	12-13	450 mg (1+1/2)
>50	14+	600 mg (2)

9. Treatment of anemia

□ Blood transfusion

- All children with a hematocrit <15 or Hb ≤ 5 g/dl.
- Hematocrit between 15-20; (Hb 5-7 g/dl) with any of the following:
 - shock or clinically detectable dehydration
 - impaired consciousness
 - respiratory distress (deep, labored breathing)
 - heart failure
 - very high parasitaemia (>10% of red cells parasitized).

- Give 10 ml/kg packed cells or 20 ml/kg whole blood over 3–4 hour.
- A diuretic is not usually indicated, because many of these children are usually hypovolaemic with a low blood volume.
- Check the respiratory rate and pulse rate every 15 min. If there is any evidence of fluid overload (facial puffiness, enlarged liver, tachypnea, tachycardia) due to the blood transfusion, give IV furosemide (1–2 mg/kg) and transfuse very slowly.
- After the transfusion, if the Hb remains low, repeat the transfusion.

➤ **Iron therapy-**

- Give a daily iron–folate tablet or iron syrup for 14 days at discharge and follow up after 14 days.
- Treat for 3 months, as it takes 2-4 weeks to correct anaemia and 1-3 months to build up iron stores.

Monitoring-

Vitals, conscious level, input/ output chart, blood glucose every 3 hourly, haemoglobin, electrolytes and renal function tests

6.11b: Treatment of uncomplicated falciparum malaria/ mixed malaria

Fever or history of fever with high suspicion of malaria and positive RDT or blood slide examination

Treat with Tab Artemether- Lumefantrine 20 mg/120 mg given as 6 doses over 3 days with single dose of tab primaquine (0.25 mg/kg) on day 0

Table 6.13. Drugs used in uncomplicated falciparum malaria/ mixed malaria

Body weight (kg.)	Day-1		Day-2	Day-3	
	ACT		ACT	ACT	Primaquine
	First dose (0 hour)	12 hours later	Twice daily -12 hours apart	Twice daily -12 hours apart	0.25 mg/kg body weight
5-14	1 tablet	1 tablet	1 tablet	1 tablet	½ tablet
15-24	2 tablets	2 tablets	2 tablets	2 tablets	1 tablet
25-34	3 tablets	3 tablets	3 tablets	3 tablets	1.5 tablets
≥35	4 tablets	4 tablets	4 tablets	4 tablets	2 tablets

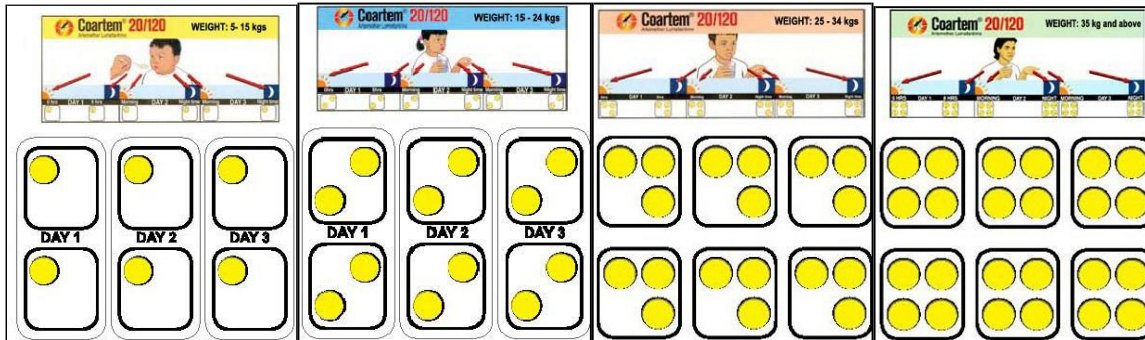


Fig 5.4: Dose of coartem tablets according to weight

6.11c: Treatment of uncomplicated vivax malaria

Fever of history of fever with high suspicion of malaria and positive RDT or blood slide examination.

Treat with Tab Chloroquine 10 mg/kg stat followed by 5 mg/kg after 6 hours and once daily for next 2 days and tab Primaquine 0.25 mg/kg daily for 14 days

Table 6.14: Drugs used in uncomplicated vivax malaria

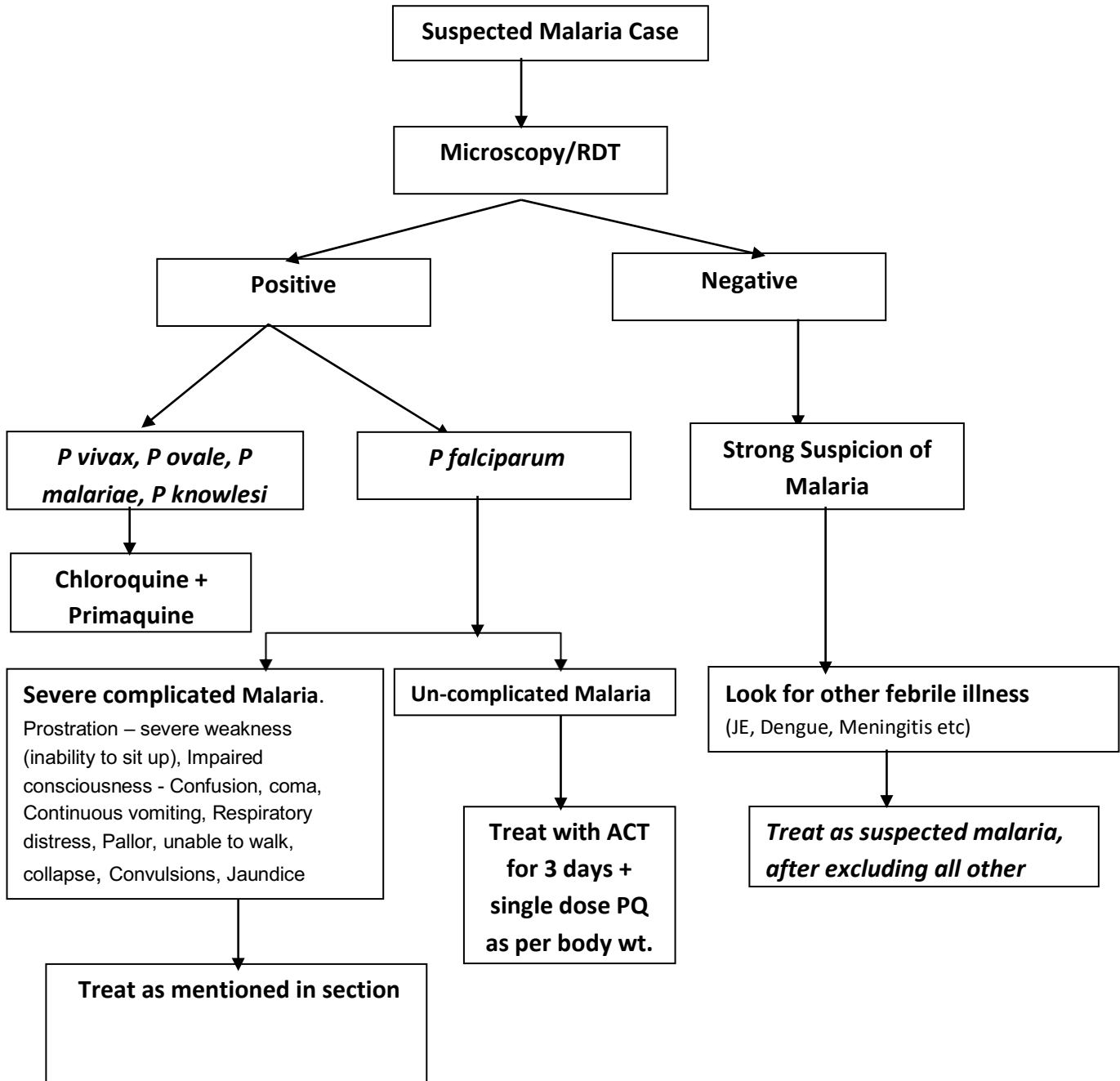
Days	Medicine	Age in years				
		< 1	1 – 4	5 – 9	10 – 14	> 14
1	Chloroquine tablet (150mg.)	½	1	2	3	4
	Primaquine tablet (7.5 mg.)	Nil	½	1	1 ½	2
2	Chloroquine tablet (150 mg.)	½	1	2	3	4
	Primaquine tablet (7.5 mg.)	Nil	½	1	1 ½	2
3	Chloroquine tablet (150 mg.)	½	½	1	1 ½	2
	Primaquine tablet (7.5 mg)	Nil	½	1	1 ½	2
4 – 14*	Primaquine tablet (7.5 mg.)	Nil	½	1	1 ½	2

Note: * = Standard 14 days Primaquine treatment is recommended ensuring close monitoring of the patients

Follow-up

Ask the mother to return if the fever persists after 3 days treatment, or sooner if the child's condition gets worse. Reassess the child to exclude the possibility of other causes of fever.

Algorithm 6.1: Diagnosis & Treatment of Malaria



6.11d: G6 PD deficiency and Primaquine

- Implement compulsory G6PDd testing for confirmed *P vivax* malaria cases and effective rollover of the radical cure using 3 days CQ+14 days PQ.
- In areas where G6PDd is not well understood and test kits are not available, consider risk/benefit with medical supervision in weekly regimen. You may radical cure (3 days CQ + 14 days PQ) of the *P vivax* cases with close monitoring on clinical signs and symptoms (brown urine, gum bleeding, anemia, etc.), should be started.
- In patients known to be G6PD deficient, primaquine may be considered at a dose of 0.75 mg base/kg body weight once a week for 8 weeks. The decision to give or withhold primaquine should depend on the possibility of giving the treatment under close medical supervision, with ready access to health facilities with blood transfusion services.
- In order to reduce the transmissibility of treated *P Falciparum* Malaria infections in low transmission areas, give a single dose of 0.25mg/kg body weight of primaquine with ACT to patients with *P falciparum* malaria (except pregnant women, infants aged <6 months and women breastfeeding infants aged <6 months) to reduce transmission.

6.12: DENGUE

Dengue ranks as the most important, rapidly emerged mosquito-borne viral disease in recent years.

Dengue viral infected child may be asymptomatic or symptomatic and clinical manifestations vary from undifferentiated fever to florid haemorrhage and shock. The clinical presentations depend on various factors such as age, immune status of the host, the virus strain and primary or secondary infection. Infection with one dengue serotype gives lifelong immunity to that particular serotype. A second infection with a different serotype is more severe.

There are three phases of Dengue fever with various complications. (Table 6.15)

Table 6.15: Dengue fever: Phases of disease & common complications

1	Febrile phase (2-7 days)	Fever with dehydration
2	Critical phase (3-7 days)	Shock from plasma leakage; severe haemorrhage; organ impairment
3	Recovery phase (24-48 hours after critical phase)	Hypervolaemia (only if intravenous fluid therapy has been excessive and/or has extended into this period)

Severity classification:

Dengue and its management depend upon its severity. It has been divided into different severity classification:

1. Dengue without warning signs
 - a. Probable dengue
 - b. Laboratory confirmed dengue
2. Dengue with warning signs
3. Severe Dengue

1. Dengue without warning signs:

a. Probable dengue

Fever and 2 of the following:

- Nausea/ vomiting
- Rash
- Aches and pains
- Leucopenia
- Positive tourniquet test*

b. Laboratory- confirmed dengue

- Isolation of the dengue virus (Virus culture +VE) from serum, plasma, leucocytes.
- Demonstration of dengue virus antigen in serum sample by NS1-ELISA.
- **Demonstration of IgM antibody titre by ELISA positive in single serum sample (available)**
- IgG sero-conversion in paired sera after 2 weeks with four-fold increase of IgG titre.
- Detection of viral nucleic acid by polymerase chain reaction (PCR).
Important when no signs of plasma leakage

2. Dengue with warning signs:

Dengue as defined above with any of the following:

- Abdominal pain or tenderness
- Persistent vomiting
- Clinical fluid accumulation (e.g., ascites, pleural effusion)
- Mucosal bleeding
- Lethargy/restlessness

- Liver enlargement >2 cm
- Laboratory: increase in haematocrit concurrent with rapid decrease in platelet count.

Warning signs require strict observation and medical intervention

3. Severe dengue:

Dengue with atleast one of the following:

- There is evidence of plasma leakage, such as:
 - high or progressively rising haematocrit
 - pleural effusions or ascites leading to respiratory distress
 - circulatory compromise or shock (tachycardia, cold and clammy extremities, capillary refill time greater than three seconds, weak or undetectable pulse, narrow pulse pressure or, in late shock, unrecordable blood pressure).
- There is significant bleeding.
- There is an altered level of consciousness (lethargy or restlessness, coma, convulsions).
- There is severe gastrointestinal involvement (persistent vomiting, increasing or intense abdominal pain, jaundice).
- There is severe organ impairment (acute liver failure- AST or ALT \geq 1000, acute renal failure, encephalopathy or encephalitis or cardiomyopathy)

***Tourniquet test:** The tourniquet test is performed by inflating a blood pressure cuff to a midpoint between the systolic and diastolic pressure and maintaining for five minutes. The test is considered positive when 10 or more petechiae per one square inch area over forearm are observed. In DHF, the test usually gives a definite positive test with 20 petechiae or more.

Diagnosis

Dengue fever can be diagnosed using the clinical and laboratory criteria as described above Antigen testing or serology can be done for confirmation of diagnosis.

Management of dengue fever

The case management of dengue fever includes classification of severity of infection, maintaining adequate intravascular volume (oral or intravascular fluid or blood transfusion) depending upon severity classification and close monitoring of the vitals, platelet count and haematocrit. Platelet transfusion may

be indicated in some cases. All cases of dengue fever should be reported to the local/district health authorities, as it is a notifiable disease.

Management decisions depends on the clinical manifestation and other circumstances

1. Group A- sent home
2. Group B- In- hospital management
3. Group C- Require emergency treatment and urgent referral

Group A

Done in patients who are

- Able to tolerate adequate volumes of oral fluids
- Passes urine atleast once every 6 hours
- Do not have warning signs particularly when fever subsides

1. Fluid intake

Encourage oral intake of ORS, fruit juice and other fluids containing electrolytes and sugar to replace losses from fever and vomiting

2. Manage Fever

Avoid aspirin, ibuprofen

3. Monitoring

Temperature pattern, volume of fluid intake and losses, urine output, warning signs, signs of plasma leakage and bleeding, hematocrit and white blood cell and platelet counts daily

Follow up immediately if

- No clinical improvement
- Deterioration around the time of defervescence
- Severe abdominal pain
- Persistent vomiting
- Cold and clammy extremities
- Lethargy or irritability/ restlessness

- Bleeding like black tarry stools or coffee- ground vomiting
- Not passing urine for more than 4-6 hours

Group B- In- patient management

Admitted for close observation particularly as they approach the critical phase

Should include patients

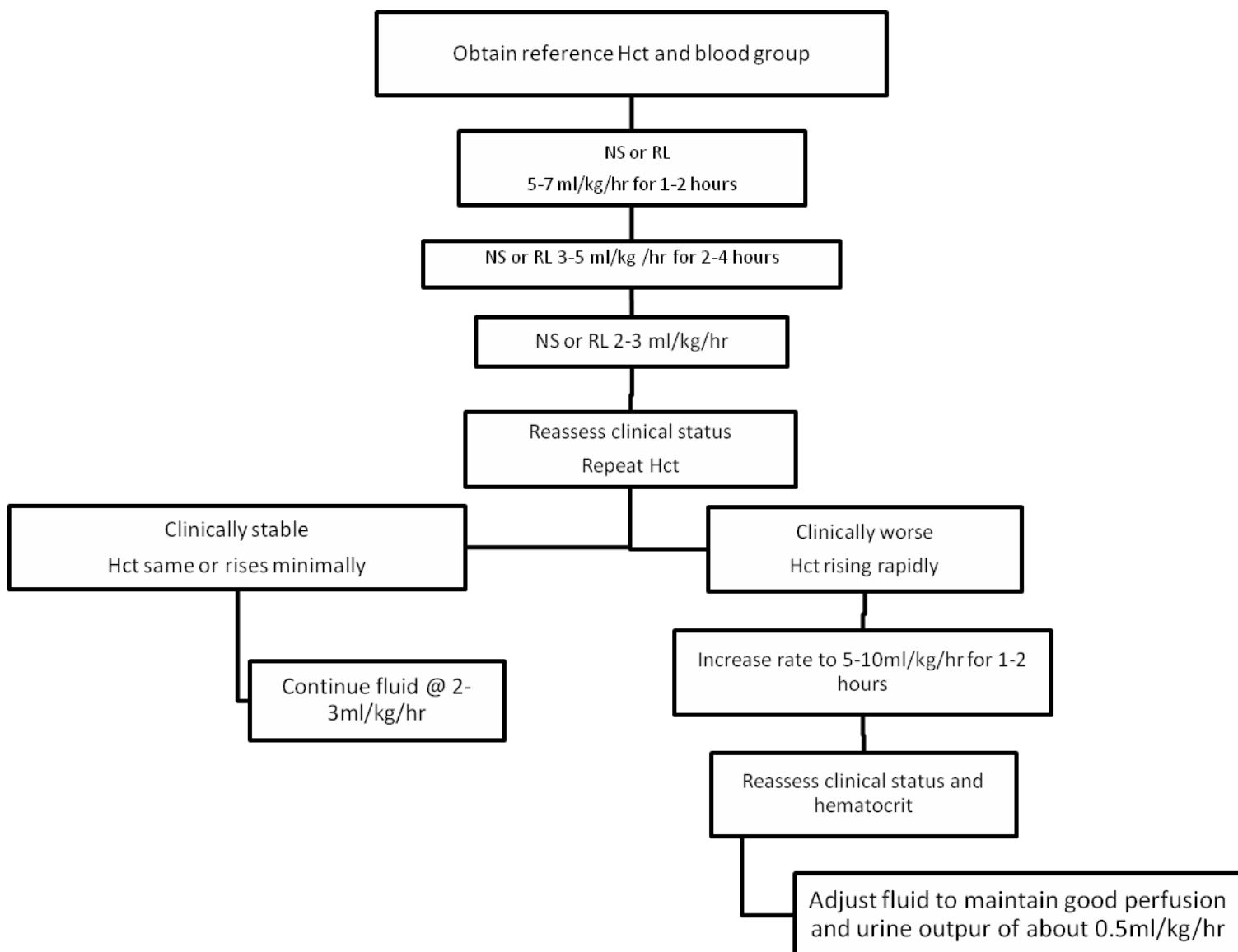
- With warning signs
- With co- existing conditions that may make dengue or its management more complicated like pregnancy, infancy, old age, obesity, diabetes mellitus, renal failure, chronic haemolytic disease
- With certain social circumstances like living alone, living far from health facility without reliable means of transport

If patient has dengue with warning signs (See algorithm 6.2)

- Obtain a reference hematocrit and blood grouping before fluid therapy.
- Give NS or RL- Start with 5-7 ml/kg/hr for 1-2 hours, then reduce to 3-5 ml/kg/ hr for 2-4 hours and then reduce to 2-3 ml/kg/hr or less according to the clinical response.
- Reassess the clinical status and repeat the haematocrit. If the haematocrit remains the same or rises only minimally, continue with the same rate (2–3 ml/kg/hr) for another 2–4 hours. If the vital signs are worsening and haematocrit is rising rapidly, increase the rate to 5–10 ml/kg/hour for 1–2 hours. Reassess the clinical status, repeat the haematocrit and review fluid infusion rates accordingly.
- Give the minimum intravenous fluid volume required to maintain good perfusion and urine output of about 0.5 ml/kg/hr. Intravenous fluids are usually needed for only 24–48 hours. Reduce intravenous fluids gradually when the rate of plasma leakage decreases towards the end of the critical phase. This is indicated by urine output and/or oral fluid intake that is/are adequate, or haematocrit decreasing below the baseline value in a stable patient.

- Patients with warning signs should be monitored by health care providers until the period of risk is over. A detailed fluid balance should be maintained. Parameters that should be monitored include vital signs and peripheral perfusion (1–4 hourly until the patient is out of the critical phase), urine output (4–6 hourly), haematocrit (before and after fluid replacement, then 6–12 hourly), blood glucose, and other organ functions (such as renal profile, liver profile, coagulation profile, as indicated).

Algorithm 6.2: Management of Dengue with warning signs



If patient has dengue without warning signs,

- Encourage oral fluids. If not tolerated, start intravenous fluid therapy of 0.9% saline or Ringer's lactate with or without dextrose at maintenance rate. For obese and overweight patients, use the ideal body weight for calculation of fluid infusion. Patients may be able to take oral fluids after a few hours of intravenous fluid therapy. Thus, it is necessary to revise the fluid infusion frequently. Give the minimum volume required to maintain good perfusion and urine output. Intravenous fluids are usually needed only for 24–48 hours.

- Patients should be monitored by health care providers for temperature pattern, volume of fluid intake and losses, urine output (volume and frequency), warning signs, haematocrit, and white blood cell and platelet counts daily. Other laboratory tests (such as liver and renal functions tests) can be done, depending on the clinical picture and the facilities of the hospital or health centre.

Treatment of hemorrhagic complications in non-severe dengue

In stable patient, mucosal bleed is considered minor. Thrombocytopenia in stable patients ensures strict bed rest, protect from trauma and avoid IM injections. No role of platelet transfusion. So do not refer these patients.

Group C- Require emergency treatment and urgent referral

- Patients with severe dengue
- Patient need hospital with access with intensive care facilities and blood transfusion.
- Patient with compensated(normal systolic pressure but has signs of reduced perfusion) shock should be given NS or RL at 5-10 ml/kg over 1 hour and referred with fluid continued as for dengue with warning signs
- Patient with hypotensive shock should be given NS or RL 20 ml/kg over 15 mins and refer to higher centre with fluid management as for compensated shock.

Criteria for discharge

Clinical-

- No fever for 48 hours
- Improvement in clinical status like general well being, appetite, urine output, no respiratory distress

Laboratory

- Increasing trend of platelet count
- Stable hematocrit without intravenous fluids.

6.13: KALAZAR

Visceral leishmaniasis (VL) or Kala-azar is a vector-borne disease caused in the Indian subcontinent by the protozoan parasite *Leishmania donovani* and transmitted by the sandfly, *Phlebotomus argentipes*.

The disease is characterized by prolonged fever (moderate, irregular), splenomegaly, anemia, and progressive weight loss and sometimes darkening of the skin. It is fatal if not treated and sometimes even when treated if it is not done timely.

Definition:

- **Suspected case of Kala-azar (KA):** Person from a Kala-azar endemic area with a history of fever for ≥ 2 weeks along with a palpable spleen and who does not respond to a full course of appropriate anti-malarial drugs.
- **A case of Kala-azar:** A person from an endemic area with fever of more than two weeks duration and with splenomegaly, who is confirmed by an RDT or a biopsy.
- **Probable post Kala-azar dermal leishmaniasis (PKDL):** A patient with papules, nodules, plaques, macular hypopigmentation and lived in or travelled to Kala-azar endemic area and/or past history of Kala-azar treatment and rK39 positive.
- **Confirmed PKDL:** A patient from a Kala-azar endemic area with multiple hypopigmented macules, papules, plaques or nodules, who is parasite positive in slit-skin smear (SSS) or biopsy.

Investigations-

1. Rapid dipstick test (rK39 test)

- The best available diagnostic tool for VL for use in routine services as well as in field setting.
- High sensitivity ranging from 92.8% to 100% and high specificity ranging from 99.2% to 100% (Chappuius et al., 2006; Cunningham et al. 2012).
- rK39 dipstick tests are easy to perform, rapid (10-20 minutes), cheap and give reproducible results.

2. Parasitological Diagnosis

- Demonstration of the *Leishmania donovani* (LD) bodies by microscopy in spleen aspirate is still considered as the gold standard for diagnosis of Kala-azar because of its high sensitivity and specificity.
- Examination of aspirates from bone marrow is less sensitive compared to spleen aspirate but much safer.

3. Other laboratory tests

In order to monitor the side effects of drugs and progress of treatment, CBC (Hb %, TLC, Platelet count), Pregnancy test, RDT and/or microscopy for malaria parasite and urine dipsticks for protein is done in level II facilities and if available Prothrombin time, Renal Function Test, Bilirubin and SGPT should be done.

Treatment of Kala-azar

The objective of treatment of Kala-azar is to cure the patient, prevent complications of the disease, minimize the side effects of medicines, contain the risk of development of drug resistance and reduce the risk of disease spread.

After confirming the diagnosis of Kala-azar the following needs to be explained to the patient and family:

- Explain the importance of the need to treat Kala-azar, and inform that it can kill an individual if treatment is not started. •
- Inform that the drug is provided free of cost.
- Explain the need to complete the full course of the treatment.
- Explain the need to start and continue treatment under supervision/observation.
- Inform that the patient will begin to start feeling better after a few days of treatment but this does not mean cure. The symptoms will reappear if the treatment is not taken as advised and cure would occur only when full treatment has been taken.
- Explain the side effects of the treatment and advised them to contact the health worker if such events occur.

The national program recommends the use of the following drugs for Kala-azar treatment:

1. First line therapy-

Liposomal amphotericin B infusion (5 mg/kg/dose once a day for 3 days or single dose of 10 mg/Kg). OR

Combination therapy regimens (i) Miltefosine (D1-10) + Paromomycin (D1-10) and (ii) L-AmB (5mg/Kg on D1) + Paromomycin (D2-D11).

In children (< 5 years), pregnant and breast feeding women and women of child bearing age group, the preferred regimens will be L-AmB or combination of L-AmB + Paromomycin.

2. Second line therapy

Miltefosine

>11 years and more than 25 Kg body weight- 50mg twice daily for 28 days for adults

> 11 years and less than 25 Kg body weight- 50mg daily for 28 days for adults

Children (2-11 years age) -2.5 mg/kg body weight 10 mg formulation in divided doses for 28 days.

OR

Amphotericin B at a dose of 0.75-1 mg/kg daily dose as a daily IV infusion in 5% dextrose over 4 hours daily for 14 days. If there is poor response to the treatment, the drug has to be continued for a period of 21-28 days.

Criteria for cure:

The cure of Kala-azar is confirmed by absence of parasite from splenic and bone marrow smears. Such provision is available in specialized institutions only. However, for program purpose a case completing treatment is considered clinically cured when there are no sign and symptoms of Kalaazar and skin lesion of PKDL are regressed.

Complete clinical criteria of cure of Kala-azar are as follows:

1. The full course of treatment has been taken.
2. Fever is absent.
3. Regression of spleen has occurred.
4. Return of normal appetite is reported.
5. Increase in body weight has been reported.

6. Improvement in anaemia and a rise in hemoglobin have been demonstrated.

Box 6.1: Liposomal Amphotericin B

- Comes in a lyophilized powder form which should be reconstituted in 12 ml of sterile water for injection to each vial (to yield a preparation containing 4 mg amphotericin B perml).
- The drug is given by infusion in 5% dextrose using a volume of at least 100 ml per vial. It should not be mixed with saline or other electrolyte solutions.
- Transfusion from the reconstituted vial into the infusion bag is done through a 5-micron filter provided to remove any particular matter. Once reconstituted the vials are stored at 2-8 degrees Celsius and to be used within 24 hours.
- The drug is given in slow intravenous infusion over a period of two hours.
- Before infusion each patient should be given Tab. Paracetamol (adult: 500 mg; children below 12 years 10 mg/kg) and Tab. Chlorpheniramine (adult: 4mg; children below 12 years 1-2mg).
- A test infusion of 1 mg is administered to the patient for about 10 minutes, after which the patient is observed carefully during half an hour. If no severe allergic reaction has occurred the infusion can be continued.

Things to be remembered

- Immediately after addition of water, shake the vial for 30 seconds.
- Do not reconstitute with saline or add saline to the reconstituted concentration, or mix with other drugs.
- L-AmB is administered intravenously, and therefore requires trained staff, who can ensure the drug is administered properly.
- A cold chain with a narrow temperature range (<25°C) is required for L-AmB storage and it should not be frozen.
- It should be protected from exposure to light.
- The reconstituted L-AmB may be stored for maximum of 24 hours at 2-8°C before use.
- Patients presenting with severe dehydration should be re-hydrated before starting the treatment.
- High-dose monotherapy in HIV-positive VL patients may have poor outcomes.

Box 6.: Liposomal Amphotericin B (Contd...)

Side effects and its management

Some reported side effects of L-AmB include infusion related fever and rigor, chills, nausea/vomiting, headache, backache, chest pain, hypokalemia, dyspnoea, bronchospasm, tachycardia, hypotension, nephrotoxicity, and hepatobiliary disorders.

Management








- Usually the drug may produce nausea/vomiting which are generally mild, of short duration and reversible. If vomiting is severe and does not stop, the patient should be referred to level III health institution for further treatment.
- If severe side effects are reported, the patient should be referred to level III health institution for further investigation and treatment.
- If fever is reported during follow up, then the patient may have other infections along with Kala-azar. Such patients should be referred to level III health institution for further investigation and treatment.
- Hypokalaemia may occur in some patients and should be corrected using potassium chloride. Indications for stopping L-AmB treatment

Patients who develop hypersensitivity reactions require cessation of L-AmB and switching to an alternative treatment. If a severe anaphylactic reaction occurs, the infusion should be immediately discontinued and the patient should not

SECTION 7: ASSESSMENT AND MANAGEMENT OF

Malnutrition remains one of the most common causes of morbidity and mortality among children. You have already learnt about difference of management for children with SAM right from emergency management in Section 2. Table 7.1 summarizes the feeding recommendation during sickness and health in Nepal and Table 7.2 summarizes the key feeding problems leading to malnutrition and possible solution.

Table 7.1: Feeding recommendation during sickness and health in Nepal

upto 6 months of age	6 months up to 12 months	12 months up to 2 years	2 years and older
			
<ul style="list-style-type: none"> • Breastfeed as often as the child wants, day and night, at least 8 times in 24 hours • Do not give other foods and fluids • Breastfeed at least for 15 minutes everytime 	<ul style="list-style-type: none"> • Breastfeed as often as the child wants, day and night, at least 8 times in 24 hours • Give adequate serving of Rice and <i>Daal</i>, <i>Jaulo</i>, <i>Haluwa</i>, Sugar and wheat bread with milk, <i>Khichadi</i>, <i>Lito</i>, fresh fruits like papaya, mango and banana • Give one more serving of snacks per day to 9 -11 months old child • Give 3 times per day if breastfed with snacks • Give five times per day if not breastfed <div style="text-align: center;">  </div>	<ul style="list-style-type: none"> • Breastfeed as often as the child wants • Give adequate serving of Rice and <i>Daal</i>, <i>Jaulo</i>, <i>Haluwa</i>, Sugar and wheat bread with milk, <i>Khichadi</i>, <i>Lito</i>, fresh fruits like papaya, mango and banana <div style="text-align: center;">  </div>	<ul style="list-style-type: none"> □ Give family food three times in a day, in addition to that give additional nutritious food between the meals such as, <i>Cheaura</i>, Ghee or Oil with wheat bread, roasted Maize and soyabean (<i>Bhuteko Makai- Bhatmas</i>) and beans etc. <div style="text-align: center;">  </div>

*A good quality diet should be adequate in quantity and include an energy-rich food (for example thick cereal with added oil; meat, fish, eggs or pulses; and fruits and vegetables)

Feeding recommendation for a child who has PERSISTENT DIARRHOEA

If still breastfeeding, give more frequent longer breastfed day and night

- If taking other milk and more than six months' old
 - replace with increased breastfeeding or
 - replace with fermented milk products such as yoghurt (*Dahi, Mohi*) or
 - replace half the milk with nutrient rich semi solid food
- for other variety of food follow the above servings as advised to respective age of the child

Table 7.2: Key feeding problems and possible solution.

Feeding Practices	Possible Solution
Complementary Feed started too early (<6 months of age)	<ul style="list-style-type: none"> • Build mother's confidence that she can produce all the breast milk that the child needs • Suggest giving more frequent, longer breastfeeds day or night, and gradually reducing other milk or foods
Complementary Feed is Delayed	<ul style="list-style-type: none"> • Offer small amounts of soft mashed cereals, pulses, vegetables and fruits • Try one new food at a time for 2-3 days • If a child refuses a particular food, try again after a week
Complementary feeds that are introduced are too thin or lack variety	<ul style="list-style-type: none"> • Offer mashed soft foods and gradually increase the consistency (thicker) as the child gets older • Offer chopped fine family foods to 10-12 months old children • Offer locally available variety of foods such as cereals, pulses, seasonal vegetables, green leafy vegetables and fruits • Add 1 teaspoon of cooking oil to the food
Child eating inadequate amounts of foods	<ul style="list-style-type: none"> • Feed frequently as the child gets older • Feed 6-9 months old babies at least ½ a katori/sitting 4 times a day (total at least 2 katoris a day) • Feed 10-12 months old babies at least ½ a katori/sitting 5 times a day

7.1 ASSESSMENT OF CHILD'S NUTRITIONAL STATUS

A child's growth provides important information on the adequacy of the child's nutritional status and health. Anthropometric measurements and plotting it on a growth chart is most commonly used method for determining nutritional status. There are separate standards for boys and girls.

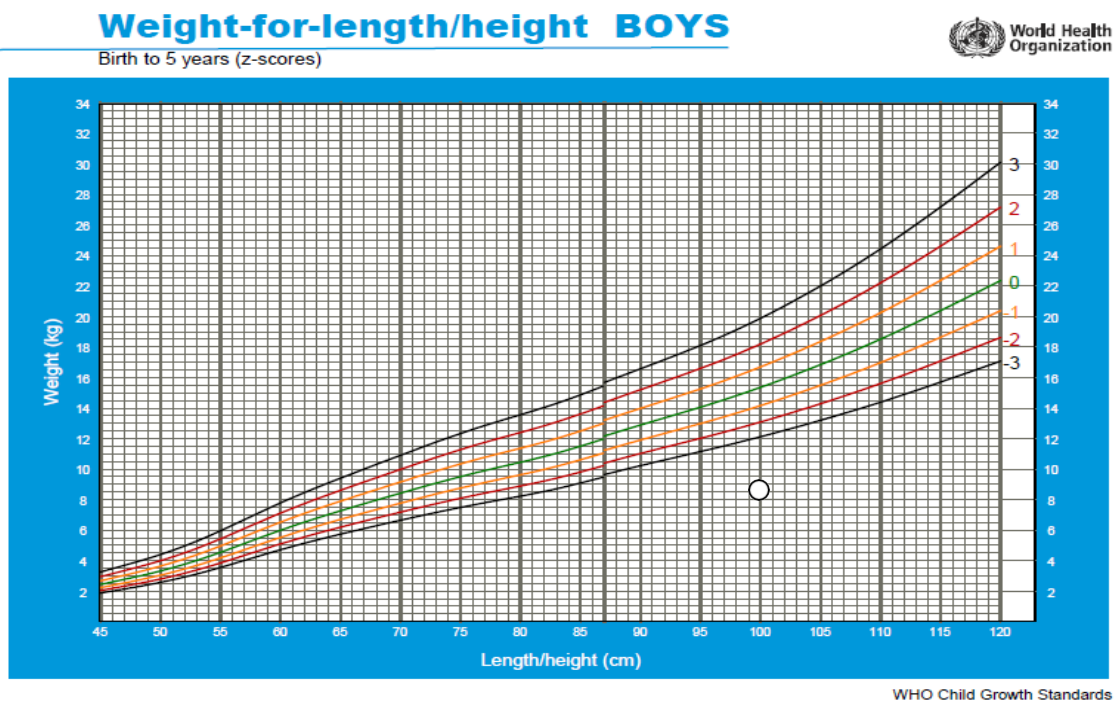
7.1.1. Calculate the age of the child

7.1.2. Check weight and height

7.1.3. Plot the weight and height on the weight for height chart and interpret the findings

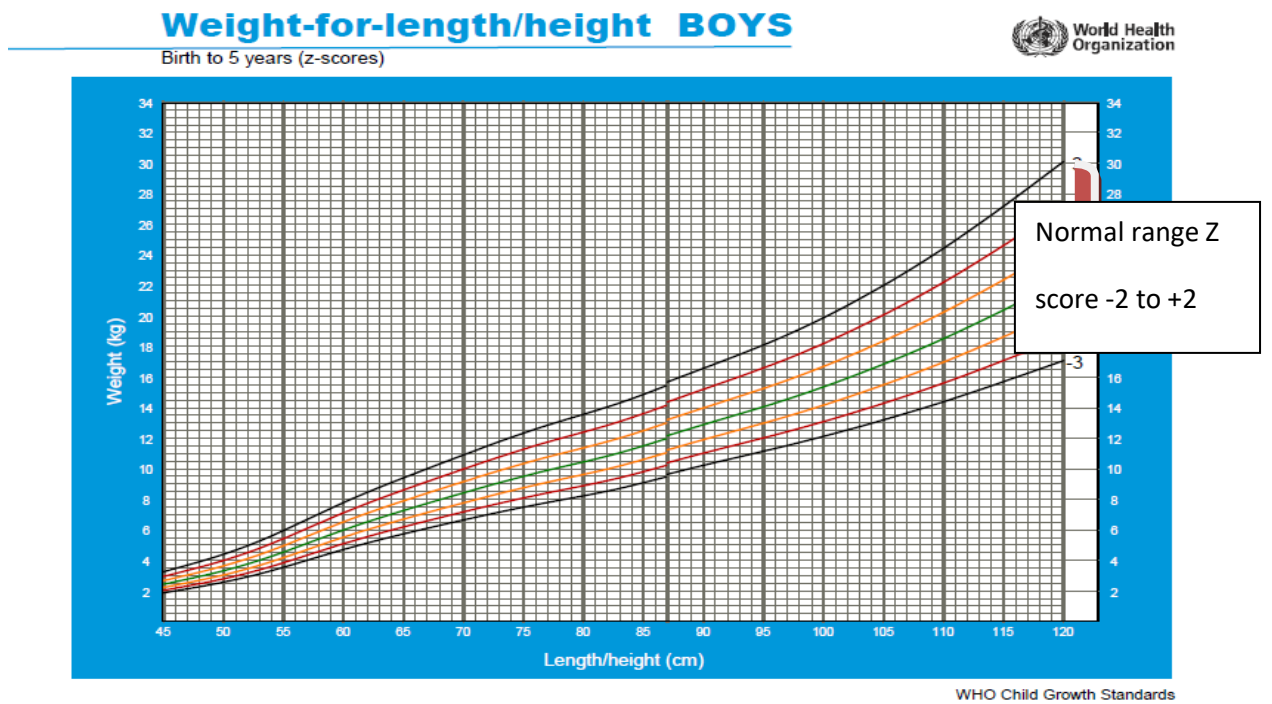
- Select the appropriate Growth Chart i.e. weight for height/ length based on the child's sex.
- Growth measurements will be plotted on the selected charts.
- For example: A 2 years old boy with Weight- 8 kg and Height- 100 cm

Figure 7.1: Plotting weight on Growth Chart

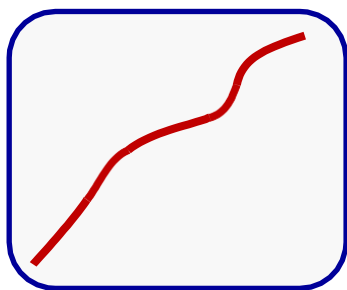


- Interpret the finding of the plotted weight

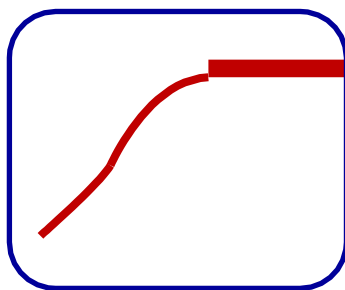
Figure 7.2: Interpretation of Growth Chart



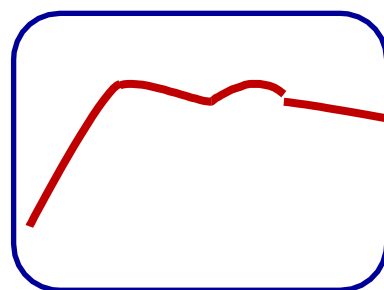
- Z score of +2 to -2 is normal
- Z score of -2 to -3 is suggestive of moderate abnormality
- Z score of less than -3 is suggestive of severe abnormality



Growing well: encourage mother to feed as before



Growth curve flattening: urgent assessment needed



Losing weight: urgent assessment needed

Figure 7.3: Various patterns observed on serial plotting on Weight for Age Chart

7.1.4. Check for pitting edema on both feet

Oedema in a child with SAM starts from the dependent part i.e. feet in a mobile child. As the severity of oedema increases, it extends to the legs. In severe cases, it may also be seen on upper limbs and face (anasarca). Table 7.3 gives the grades of edema

Table 7.3: Grades of edema.

Level	Classification	If yes
Absent	No depth on both legs	-
+	Mild	Both legs
++	Moderate	Both legs, hands and arms
+++	Severe	Both legs, hand and face

To check for edema, grasp both feet so that they rest in your hands with one thumb on top of each foot. Press your thumbs gently for a few seconds (approx. 10). Child has bilateral pitting oedema if pit (dents) remains in both feet when you lift your thumbs.

Figure 7.4: Checking for pedal oedema



Rule out other causes of edema like nephrotic syndrome and CCF.

7.1.5. Measure MUAC

Use Shakir's tape. Measuring MUAC is not used in children less than 6 months of age.

According to color calibration-

Red- Severe malnutrition

Yellow- Moderate malnutrition

Green- No malnutrition

According to single cut-offs-

<11.5 cm- Severe malnutrition

11.5-12.5- Moderate malnutrition

>12.5- Normal

7.1.6. Check for severe wasting

Check for severe wasting by looking at the front and back view of the child.

Fig 7.5 Front view of severe wasting

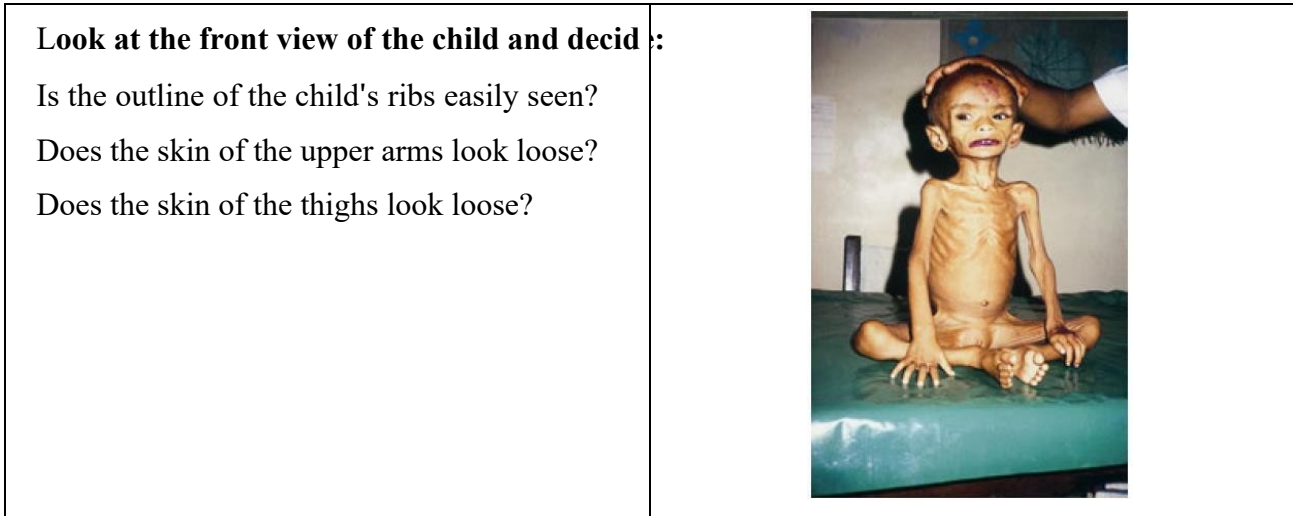


Fig 7.6 Back view of severe wasting

Look at the back of the child and decide: Are the ribs, shoulder bones and spine easily seen?

Is there any wasting seen on buttocks?

7.1.7. Assessment of appetite and medical complication

Test appetite with RUTF for children 6- 59 months of age. Severe acute malnutrition with poor appetite means that the child has a significant infection or a major metabolic abnormality. It is an indication for need of admission.

7.1.8. Take history and carry out medical assessment and check for presence of complications

Table 7.4: History & Examination

Taking a history concerning	On examination, look for
<ul style="list-style-type: none"> <input type="checkbox"/> Duration of sickness <input type="checkbox"/> Recent intake of food and fluids <input type="checkbox"/> Usual diet (before the current illness) <input type="checkbox"/> Breastfeeding <input type="checkbox"/> Complementary feeds- introduction time, quality, quantity <input type="checkbox"/> Duration and frequency of complaints if any: diarrhoea (watery/bloody), vomiting (number), fever, cough, presence of disability and/ or developmental problems that affect feeding <input type="checkbox"/> Loss of appetite <input type="checkbox"/> Contact with open case of tuberculosis <input type="checkbox"/> History of measles in last 3 months or repeated or chronic illness <input type="checkbox"/> Known or suspected HIV Infection <input type="checkbox"/> Birth history- Preterm or LBW <input type="checkbox"/> Immunization status <input type="checkbox"/> Health of parents ➤ Family circumstances (to understand the child's social background) 	<ul style="list-style-type: none"> ➤ Look for emergency signs ➤ Anthropometry- weight, height or length, mid arm circumference ➤ Baseline pulse, heart rate, respiratory rate ➤ Sensorium ➤ Oedema ➤ Lymphadenopathy ➤ Signs of dehydration if history of diarrhoea (general condition, sunken eyes, skin pinch and thirst) ➤ Signs of shock (cold hands, slow capillary refill, weak and fast pulse) ➤ Palmar pallor ➤ Eye signs of vitamin A deficiency (<i>Figure 9.7</i>): ➤ Dry conjunctiva or cornea, ➤ Bitot's spots ➤ Corneal ulceration ➤ Keratomalacia ➤ Localizing signs of infection, including ear and throat infections, skin infection or pneumonia ➤ Fever (temperature >37.5°C or 99.5 °F) ➤ Hypothermia (axillary temperature <35°C or 95 °F) ➤ Mouth ulcers/ Oral thrush ➤ Skin changes ➤ Hypo or hyperpigmentation ➤ Desquamation ➤ Ulceration (spreading over limbs, thighs, genitalia, groin, and behind the ears) ➤ Systemic examination- hepatosplenomegaly, any murmur or deformities, hypertonia (cerebral palsy) ➤ Signs of meningeal irritation

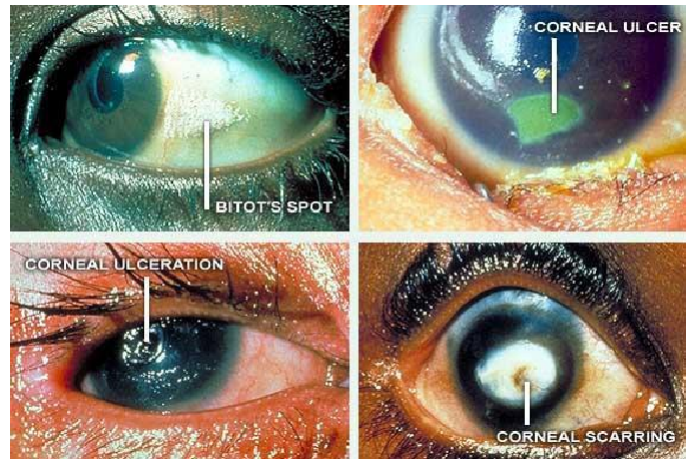


Figure 7.7: Vitamin A deficiency signs

Note: Children with vitamin A deficiency are likely to be photophobic and will keep their eyes closed. It is important to examine the eyes very gently to prevent corneal rupture



Figure 7.8: Skin changes in oedematous severe acute malnutrition.

7.1.9. Check for complications

- Anorexia, no appetite
- Lower Respiratory Tract infection
- High fever
- Severe dehydration
- Severe anaemia
- Not alert (very weak, lethargic, unconscious, convulsions)

- Hypothermia
- Intractable vomiting
- Extensive skin infection or extensive mouth ulcers or ear pain with tender swelling behind the ear
- Jaundice
- Eye infection and other eye problems like corneal clouding or other signs of Vitamin A deficiency

7.1.10. Check vaccination status, last deworming and Vitamin A supplementation

7.1.11. Review and record any relevant information from referral document where there is one

7.1.12. Classify nutritional status of child

The classification of acute malnutrition into moderate and severe malnutrition is done by using weight for height, MUAC and edema as given in Table 7.5

Table 7.5: Identification of acute malnutrition (wasting)

Moderate Acute Malnutrition	
<ul style="list-style-type: none"> • Weight-for-height between -2SD and-3SD and /or • Mid arm circumference (MUAC) 11.5 to 12.4cm <p style="text-align: center;">AND</p> <ul style="list-style-type: none"> • No Oedema 	
Severe Acute Malnutrition	
<p>For infants aged <6 months</p> <ul style="list-style-type: none"> • Weight for length is <-3 z score of median of WHO child growth standards*and/or • Bilateral pitting pedal oedema ** 	<p>For children aged 6-59 months</p> <ul style="list-style-type: none"> • Weight for length/height is <-3 z score of median of WHO child growth standards and/or • MUAC<11.5 cm and/or • Bilateral pitting pedal oedema

**Use visible severe wasting in emergency settings, if measurements not possible and for children who has length <45 cms*

7.2 MANAGEMENT OF SAM

Site of management of SAM given in Table 7.6

Table 7.6 Site of management of SAM

Inpatient management of SAM in children 6-59 months	Outpatient management of SAM in children 6-59 months	Inpatient management of SAM in children < 6 months
Severe acute malnutrition with complications Nutritional oedema +++ or Marasmic-Kwashiorkor (MUAC <11.5cm with any grade of oedema) OR MUAC <11.5cm or WHZ <-3 Z score <u>with</u> any of the complications <u>Referral from OTC</u> Due to deterioration or non-response	Severe acute malnutrition without complications MUAC<11.5 cm or WHZ <-3 Z score And/or Nutritional oedema + and ++ AND Appetite Clinically well Alert <u>Referral from ITC</u> After stabilisation	Visible wasting and/or WHZ <-3 zscores and/or oedema AND One of the below complications: Any of the medical complications Infant is lethargic and unable to suckle Recent weight loss/inability to gain weight Ineffective feeding (attachment, positioning and suckling) directly observed Any medical or social issue needing more detailed assessment or intensive support (e.g. disability, depression of the mother/caretaker, or other adverse social circumstances)

7.3 INPATIENT THERAPEUTIC CARE OF CHILDREN 6-59 MONTHS

It is a done during the stabilization phase of WHO inpatient protocols. The patients after stabilization has his treatment completed (where OTC is not available, infants < 6 months, cases with high risk home environment, patient choice) or is referred to OTC to complete treatment.

A good history and physical examination is required for treatment. Important history and examination points are summarized in Table 7.4

Laboratory Tests

- Blood glucose-
 - At admission
 - During stabilization if child is hypothermic or lethargic
- Haemoglobin or packed cell volume in all children
 - Peripheral smear if child has anemia/ palmar pallor
- Serum electrolytes e.g. (sodium, potassium, and calcium whenever possible)

- Screening for infections: - Children with SAM often harbor occult infections. Screen for common infections by following investigations
 - Total and differential leukocyte count
 - Urine routine & microscopy
 - Chest x-ray
 - Mantoux test
 - Blood smear for Malaria; if febrile
 - Screening for HIV (when suspected based on history and clinical signs/ symptoms (recurrent infections, presence of oral thrush, lymphadenopathy, unexplained death of parents, persistent diarrhoea, parotid enlargement)
- **Additional investigations depending on clinical situation and availability of Investigations**

There are 10 essential steps in two phases: an initial stabilization phase and a longer rehabilitation phase.

Table 7.7: General Steps for treatment of malnutrition

S.NO	STEPS	STABILIZATION PHASE		REHABILITATION PHASE
		Days 1-2	Days 3-7	Weeks 2-6
1.	Treat/Prevent Hypoglycemia	—————→		
2.	Treat/Prevent Hypothermia	—————→		
3.	Treat/Prevent Dehydration	—————→		
4.	Correct Electrolyte Imbalance	—————→		
5.	Treat/Prevent Infection	—————→		
6.	Correct micro-nutrient deficiencies	—————→		
	Iron supplementation	—————	No iron ———→	Iron ———→
7.	Start Cautious Feeding	—————→		
8.	Achieve Catch-up Growth			—————→
9.	Provide Sensory Stimulation and Emotional Support	—————→		
10.	Prepare for Follow up			—————→

During management, remember following broad principles given in box 7.1.

Box 7.1. Principles for management of malnutrition

- Do not give I/V fluids routinely.
- Do not give diuretics or albumin to treat oedema
- Do not give high protein formula.
- Do not give iron during the initial feeding phase.

7.3.1 Hypoglycemia

All severely malnourished children are at risk of developing hypoglycemia (blood glucose <54 mg/dl) which is an important cause of death. Measure blood sugar on admission and subsequently in children who become lethargic. If the blood glucose cannot be measured, assume hypoglycemia.

7.3.1a Treat & prevent hypoglycemia

- If the child is lethargic, unconscious, or convulsing, give IV 10% glucose 5 ml/kg followed by 50 ml of 10% glucose or sucrose by NG tube.
- If not lethargic, unconscious, or convulsing, give the first feed of F-75/Starter diet. If the first feed is not quickly available give 50 ml of 10% glucose or sugar solution (4 rounded teaspoon of sugar in 200 ml or one cup of water) orally or by nasogastric tube, followed by the first feed as soon as possible.
- Give 2-hourly feeds, day and night, at least for the first day.
- Give appropriate antibiotics and keep the baby warm and check temperature 8 hourly.

7.3.1b Monitoring

If the initial blood glucose was low, repeat the measurement after 30 minutes. If glucose is again <54 mg/dl, repeat the 10% glucose or sugar solution.

7.3.2 Hypothermia

If the axillary temperature is <35⁰C (<95⁰F) or does not register on a normal thermometer, assume hypothermia. Treat all hypothermic children for hypoglycemia and for infection as well.

7.3.2a Maintain warm room

- Place the bed in a warm, draught-free part of the ward and keep the child covered.
- Change wet nappies, clothes and bedding to keep the child and the bed dry.
- Avoid exposing the child to cold (e.g. after bathing, or during medical examinations).

7.3.2b Treat hypothermia

- Make sure the child is clothed (including the head). Cover with a warmed blanket and place a heater (not pointing directly at the child) or put the child on the mother's bare chest or abdomen (skin-to-skin) and cover mother–baby pair with a blanket.
- Take the child's temperature 2-hourly until it rises to more than 36.5°C. Take it half-hourly if a heater is being used.
- Check for hypoglycemia and give antibiotics whenever hypothermia is found.
- Give 2 hourly feed through the night till the time temperature is stable.

7.3.3 Dehydration

7.3.3a Recognize dehydration

Correct estimation of dehydration is difficult in severely malnourished children. In severely malnourished child, the loss of supporting tissue and absence of subcutaneous fat make the skin thin and loose. It flattens very slowly when pinched, or may not flatten at all. Edema if present may mask diminished elasticity of the skin.

Ask the mother if the child had watery diarrhoea or vomiting. If the child has watery diarrhoea or vomiting, assume dehydration and give ORS.

Remember a child with severe acute malnutrition may be dehydrated even in the presence of edema.

7.3.3b Treatment

Since signs of dehydrations are not very reliable, rehydration orally or through a nasogastric tube is recommended. It is also important to remember that these children are not able to handle high sodium load and are at risk of hypokalemia due to reduced muscle mass.

REMEMBER: Use IV rehydration only if the child has signs of shock and is lethargic or has lost consciousness

- Calculate the amount of ORS to give is given in table 7.8.

Table 7.8 . Amount of ORS for rehydration in malnutrition

How often to give ORS	Amount to give
Every 30 minutes for first 2 hours	5 ml/kg weight
Alternate hours for up to 10 hours	5-10 ml/kg**

*Starter (F-75) diet & ORS is given in alternate hours (e.g. Starter at 2, 4, 6 hours & ORS at 3, 5, 7) until the child is rehydrated

**The amount offered in this range should be based on child's willingness to drink and amount of ongoing losses in stool.

If the child has already received IV fluids for shock and is switching to ORS, omit the first 2-hour treatment and start with the amount for the next period of up to 10 hours.

□ **Which ORS to be used?**

- WHO recommended ORS for SAM children (ReSoMal) is not commercially available in Nepal. You can prepare modified ORS for SAM by dissolving one sachet (1 litre) of low-osmolarity oral rehydration salt in 2 Litre water (instead of 1 Litre) and adding and dissolving 50g of glucose/sugar and 30 ml of potassium chloride injection containing (40 mEq/L of potassium). In case preparation of modified ORS is not possible, start rehydration with low osmolarity. If the child has profuse watery diarrhoea or cholera is suspected, use low osmolarity ORS without any modification for rehydration.

Monitoring the child who is taking ORS: Check following signs at beginning and then every 30 minutes

- Respiratory rate
- Pulse rate
- Urine output
- Frequency of stools and vomiting

If you find signs of over hydration (increasing respiratory rate by 5/min and pulse rate by 15/min), stop ORS immediately and reassess after 1 hr.

Prevent dehydration from on-going losses:

Measures to prevent dehydration from continuing watery diarrhoea are similar to those for well-nourished children.

- If the child is breastfed, continue breastfeeding.
- Give ORS 50–100 ml after each watery stool between feeds to replace stool losses.

7.3.3d Shock in severely malnourished children

Management of shock depends upon cause of the shock. However, it is often difficult to differentiate shock due to dehydration & sepsis on clinical signs. Children with dehydration will respond to IV fluids while those with septic shock and no dehydration will not respond.

Box 7.2. Indication of intravenous fluids in severely malnourished child

Give IV fluids to severely malnourished child if:

- Child is lethargic or unconscious and**
- Has cold hands plus**
- Slow capillary refill (longer than 3 seconds)**
- Weak and fast pulse**

You have already learnt management of shock in severe acute malnutrition children in *Section -2*.

7.3.4 Electrolyte imbalance

Give supplemental potassium at 3-4 mmol/kg/day for at least 2 weeks. Potassium can be given as syrup potassium chloride; the most common preparation available has 20 mmol/15 ml.

- On day 1, give 50% magnesium sulphate IM once (0.3mL/kg up to a maximum of 2 ml). Thereafter, give extra magnesium (0.4–0.6 mmol/kg daily) orally. If oral commercial preparation is not available, you can give injection magnesium sulphate (50% which has 2 mmol/ml) **orally** mixed with feeds.
- Prepare food without adding salt to avoid sodium overload.

7.3.5 Infection

Children with SAM often harbor infections without manifestations. Hence assume all children with severe malnutrition admitted in a hospital have an infection and give broad spectrum antibiotics.

Table 7.9: Recommended antibiotics for children with SAM

STATUS	ANTIBIOTICS
All admitted case without medical complication	<ul style="list-style-type: none"> Give Oral Amoxicillin 40 mg/kg /dose twice times per day for 5 days
All admitted cases with any complications other than shock, meningitis and dysentery	<ul style="list-style-type: none"> Inj. Ampicillin 50 mg/kg/dose 6 hourly and Inj. Gentamycin 7.5 mg/kg once a day for 7 days Add inj. Cloxacillin 100 mg/kg day 6 hourly if Staphylococcal infection is suspected. Revise therapy based on sensitivity report
For septic shock or worsening/no improvement in initial hours	<ul style="list-style-type: none"> Give third generation cephalosporins like Inj. Cefatoxime 50 mg/kg/dose in 3 times daily or Ceftriaxone 50 mg/kg/day in 2 divided doses along with Inj. Gentamycin 7.5 mg in single dose. Do not give second dose of Gentamycin until child is passing urine
Meningitis	<ul style="list-style-type: none"> IV Cefatoxime 50mg/kg/dose 6 hourly or Inj. Ceftriaxone 50 mg/kg 12 hourly plus Inj. Amikacin 15mg kg/day single dose.
Dysentery	<ul style="list-style-type: none"> Give cefixime 5 mg/kg in twice a day for 5 days. If the child is sick , give Inj. Ceftriaxone 50 mg/kg/dose twice daily for 5 days
On Discharge	<ul style="list-style-type: none"> 200 mg albendazole for children aged 12-23 months, 400 mg albendazole for children aged 24 months or more.

7.3.5a Duration of antibiotic therapy depends on the diagnosis

i.e. Suspicion of clinical sepsis: at least 7 days

Culture positive sepsis: 10-14 days

Meningitis: at least 14-21 days

Deep seated infections like arthritis and osteomyelitis: at least 4 weeks

7.3.5b Treat associated conditions

- Give antimalarials, if blood smear or RDT is positive for malaria parasites.
- Start ATT if tuberculosis is diagnosed as per NTP recommended criteria.
- Suspect and investigate for HIV if he has also other problems like persistent diarrhoea, oral thrush, pneumonia, parotid swelling or generalized lymphadenopathy. For investigations and treatment follow HIV guidelines.
- Severe anaemia: Give whole blood or packed cell transfusion if Hb is < 4g/dl or Hb is 4-6 g/dl and child has respiratory distress. Give 10 ml/kg slowly over 4-6 hours and give Inj. Frusemide 1 mg/kg at the start of the transfusion.
- If keratomalacia /corneal ulcer present, give Vitamin A dose, instil ciprofloxacin eye drops 2- 3 hourly and atropine eye drops 3 times a day for 7-10 days. Also cover the eyes with pad and bandage.
- Skin lesions: Bathe or soak the affected areas for 10 min in 1% potassium permanganate solution and apply antibacterial cream& any barrier cream (zinc cream) to the raw areas.

7.3.5c Response to treatment for infection

- Good response**
 - Alert and active
 - Improved activity and weight gain > 5 gm/kg/day
 - Absence of clinical and lab. evidence of infections
 - Absence of complications like hypoglycaemia or hypothermia
- Poor response**
 - Lethargic, poor activity
 - Poor appetite or no weight gain
 - Clinical/ lab. evidence of infections
 - Appearance of danger signs

7.3.6 Micronutrients

- Vitamin A:** Give one dose oral vitamin A to all children with SAM unless there is evidence that child has received vitamin A dose in last 1 month or has oedema on admission.

Table 7.10: Recommended oral dose of Vitamin A according to child's age

Age	Vitamin A Dose
<6 months	50 000 IU
6-12 months or if weight <8kg	100 000 IU
>12 months or if weight > 8 kg	200 000 IU

**3 doses in case of signs of Vitamin A deficiency on Day-1, Day-2 and Day-15 to all children with SAM*

Other micronutrients should also be given daily for at least **2 weeks**:

- Multivitamin supplement** (should also contain vitamin A, C, D, E and B12 and not just vitamin B-complex): Twice Recommended Daily Allowance
- Folic acid**: 5 mg on day 1, then 1 mg/day
- Elemental Zinc**: 2 mg/kg/day (if the child has diarrhoea, give 10 mg to children aged less than 6 months and 20 mg to children aged 6-59 months for 14 days)
- Copper**: 0.3 mg/kg/day (if separate preparation not available use commercial preparation containing copper)
- Iron**: Start daily iron supplementation after two days of the child being on Catch up formula (F 100) or after 7 days or control of infection. Give elemental iron in the dose of 3 mg/kg/day in two divided doses, preferably between meals. (**Do not give iron in stabilization and transition phase**).

7.3.7 Initiate feeding

Nutrition management of cases in inpatient care should be guided by the appetite test:

7.3.7 a Children with SAM demonstrating appetite should be treated using RUTF. This includes those children referred to stabilisation from outpatient care that may already have appetite and be eating RUTF but not gaining weight for a number of reasons.

- RUTF- Energy dense mineral/ vitamin enriched food nutritionally equivalent to F 100. It is a oil based paste usually made of peanuts, oil, sugar and milk with low water activity. It is microbiologically safe and can be kept for months. The amount of RUTF to be given is 200 kcal/kg/day. The amount given is calculated according to present weight and adjusted as weight increases during treatment. No multivitamin or micronutrients supplementation should be given.

- Provide the RUTF to the mother/caretaker to feed the child. The mother/caretaker should be encouraged to provide RUTF feeds at the same time as feeds were provided during the stabilization phase (five to eight feeds per day).
- Breastfed children should be offered breast milk on demand before being fed RUTF.
- Children should be offered as much water to drink as they will consume during and after they have taken some of the RUTF.
- If the mother is still breastfeeding, advise her to continue breastfeeding before giving RUTF. If she is not breastfeeding, then always give plenty of safe water with RUTF as it does not contain any itself.
- The RUTF is all the food a child needs to recover. No other foods should be given until the full ration each day has been finished. Give small amount every 3 hours with water to drink
- The amount of RUTF to be given to a mother is given in Table 7.11

Table 7.11 Dose of RUTF

Weight of the child(kg)	Ration per week (No. of sachets)	Ration per day (No. of sachets)	Consumption per day (No. of sachets)
3.5-3.9	14	2	1.5
4-5.4	14	2	2
5.5-6.9	21	3	2.5
7-8.4	21	3	3
8.5-9.4	28	4	3.5
9.5-10.4	28	4	4
10.5-11.9	35	5	4.5
>12	35	5	5

7.3.7b Children 6-59 months with SAM with no appetite demonstrated should be treated using F75 (130ml =100kcal). See box 7.3

- Start feeding as early as possible.
- Feed the child if alert and drinking even during rehydration.
- Give frequent and small nutrient rich feeds of low osmolality and low lactose. A six-feed schedule (every four hour feeds) may be the most practical, but the option of an eight feed schedule is also given. Where night feeds are problematic, five-to-six feeds should be given during the daytime. Hypoglycaemia becomes a risk if the daytime intake is low.

- Offer 130 ml/kg/day of liquids (100 ml/kg/day if child has severe oedema), 80-100
- Kcal/kg/day and 1-1.5 g/kg/day of proteins.
- If child breastfed, continue breastfeeding but give the feed first

Box 7.3 F-75 diet

Severely malnourished children cannot tolerate usual amounts of proteins and sodium at this stage, or high amounts of fat. They may die if given too much protein or sodium. F-75/ starter formula is specially made to meet the child's needs without overwhelming the body's systems in the initial stage of treatment which provides 75 calories/100 ml and 0.9 gm of protein/100 ml.

F-75 Starter diets:

Contents	Starter (F-75) diet Amount for 100ml	Starter (F-75) diet (Cereal Based) Amount for 100ml
Milk (ml) (Animal /Full cream)	30	30
Sugar (g)	10	7
Vegetable oil (g)	2	2
Puffed Rice (Murmura) (g)	--	3.5
Water to make (ml)	100	100
Energy (kcal/100 mL)	75	75
Protein (g/100 mL)	0.9	1.1
Lactose (g/100 mL)	1.2	1.2

*Adapted from IAP Guidelines 2006

**Powdered puffed rice may be replaced by commercial pre-cooked rice preparations (in same amounts)

*****Important note about adding water:** Add just the amount of water needed to make 100 ml of formula. Do

Oral feeding

It is best to feed the child with a cup and spoon. Encourage the child to finish the feed.

Encourage breastfeeding on demand between F-75 feeds.

Nasogastric feeding

Indications for using Nasogastric tube is given in Box 7.4. The use of a NGT should not exceed three days and should only be used in the stabilization phase

Box 7.4 Indications for Nasogastric tube

- Takes less than 80 per cent of the prescribed diet per 24-hours during stabilisation
- Has pneumonia (rapid respiration rate) and has difficulties swallowing
- Has painful lesions of the mouth
- Has cleft palate or other physical deformity
- Shows disturbed level of consciousness

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Criteria for increasing volume/decreasing frequency of feeds

- If there is vomiting, significant diarrhoea, or poor appetite, continue 2-hourly feeds.
- If there is little or no vomiting, diarrhoea is less than before, and finishing most feeds are consumed, change to 3-hourly feeds.
- After a day on 3-hourly feeds: If there is no vomiting, occasional diarrhoea, and most feeds are consumed, change to 4-hourly.

Table 7.12. Recommended schedule with gradual increase in feed volume is as follows

Days	Frequency	Volume/kg/feed	Volume/kg/day
1-2	2 hourly	11 ml	130 ml
3-5	3 hourly	16 ml	130 ml
6 onwards	4 hourly	22 ml	130 ml

If the child has mild or moderate oedema continues with same feed chart (130ml/kg). If the child has gross oedema (+++), reduce the volume to 100 ml/kg/day (see feed chart for amounts).

7.3.9 Catch-up growth

7.3.9a Recognize readiness for transition

As soon as the medical condition of the patient is stabilised, oedema is reducing and the complications are resolving, the transition phase is started in preparation for transfer to OTC (or in a minority of cases to rehabilitation in inpatient care).

Transition is started by feeding the child a test dose of RUTF at alternate feeds retaining the same feeding schedule. If the child refuses the RUTF, the mother/caretaker is encouraged to try to get the child to start eating at every other milk feeding. In the meantime, F75 is continued until appetite returns and RUTF can be given at every scheduled feed. Monitoring continues as for the stabilisation phase and if any of the following develops the client should return to stabilisation.

Criteria for transfer from transition back to stabilization:

- Weight gain of more than 10 g/kg bodyweight/day in association with an increase in respiratory rate (indicative of excess fluid retention)
- Increasing or developing bilateral pitting oedema
- Rapid increase in liver size
- Any signs of fluid overload
- Tense abdominal distension
- Significant refeeding diarrhoea so that there is weight
- A complication that necessitates an IV infusion
- A need for feeding by NGT

7.3.9b Feeding formula: RUTF vs F-100?

If child accepts the RUTF, it is given as the catch up diet. If is given according to the weight of the child as given in Table 7.11.

In a minority (<5 per cent) of inpatient cases where the child is unable to eat RUTF but needs to progress to rehabilitation, F100 may be required. In this case F75 feeds are replaced with F100 during transition (maintaining the same quantities as for stabilisation with F75) and progress. For these children, progression onto rehabilitation with RUTF will be dependent on them reaching the discharge criteria to OTC given below. If these are not satisfied they may move into the inpatient rehabilitation phase (see below).

- Replace the starter F-75 with an equal amount of catch-up F-100 for 2 days. Give a milk- based formula, such as catch-up F-100 which contains 100 kcal/100 ml and 2.9 gm of protein per 100 ml.
- Then on the 3rd day: Increase each successive feed by 10 ml as long as child is finishing feeds. Continue increasing the amount until some feed remains uneaten (maximum 220 ml/kg/day).
- Frequent feeds, unlimited amounts with a target of
 - 150–220 kcal/kg/day
 - 4–6 g of protein/kg/day.

If the child is breastfed, continue to breastfeed between feeds. However, breast milk does not have sufficient energy and protein to support rapid catch-up growth, so give F-100 as indicated.

F-100 Catch-up diets:

Contents (Per 100 ml)	Catch-up (F-100) diet Amount for 100ml	Catch-up (F-10 (Cereal Based) 100ml
Milk (ml) (Animal / Full cream)	90	75
Sugar (g)	7.5	2.5
Vegetable oil (g)	2	2
Puffed Rice (Murmura) (g)		7
Water to make (ml)	100	100
Energy (kcal/100 mL)	100	100
Protein (g/100 mL)	2.9	2.9
Lactose (g/100 mL)	4.2	3

Adapted from IAP Guidelines 2006

**Powdered puffed rice may be replaced by commercial pre-cooked rice preparations (in same amounts)

*****Important note about adding water:** Add just the amount of water needed to make 100 ml of formula. Do not simply add 100 ml of water, as this will make the formula too dilute. A mark for 100 ml should be made on the mixing container for the formula, so that water can be added to the other ingredients up to this mark.

7.3.10 Sensory stimulation

As children become malnourished they gradually reduce their activity. They do not play, cry, smile, complain or show normal emotions – they become lethargic and feeble. Because they do not cry when they are hungry, thirsty or distressed a busy mother thinks that her child does not need more attention than she is giving to the child; the child is unintentionally neglected. Emotional and physical stimulation can substantially reduce the risk of permanent mental retardation and emotional impairment. Recovery is faster in children who receive sensory stimulation and are involved in play daily.

Teach mother to give structured play therapy for at least 15 minutes two times daily.

7.3.11 Monitoring progress, discharge & follow-up

7.3.11a Monitoring progress during treatment

- Weight is taken every day
- Degree of oedema (0 to +++) is assessed each day
- Body temperature is measured twice per day
- Standard clinical signs (stool, vomiting, dehydration, cough, respiration, liver size etc.) are noted each day
- MUAC is taken each week
- Record is taken if the patient is absent, vomits or refuses a feed, and whether the patient is fed by naso-gastric tube or is given IV infusion or transfusion. This information is collected for each feed, each day
- The mother/caretaker is consulted about the progress of the child
- Interpretation of weight gain
 - If good weight gain i.e. > 10 gm/kg/day, continue with the same treatment
 - If moderate weight gain i.e. 5-10 gm/kg/day, check whether intake targets are being met or if infection has been overlooked
 - If poor weight gain i.e. <5gm/kg/day, make a full assessment, particularly for:
 - Inadequate feeding
 - Untreated infection
 - HIV infection
- Psychological problems

Table 7.13 Failure to respond to treatment

	Time
Primary failure	
Failure to regain appetite	Day 4
Failure to start to lose oedema	Day 4
Oedema still present	Day 10
Secondary failure	
Failure to gain at least 5 gm/kg of body weight per day during rehabilitation for 3 successive days.	

7.3.11b Discharge

Continued rehabilitation and then discharge in inpatient care

For a minority of other special cases rehabilitation may continue in inpatient care:

- Where close medical supervision and treatment needs to continue
- Mother/caretaker refuses outpatient care
- The home environment means it is not possible for rehabilitation to continue at home
- Where no outpatient care is available

Table 7.14 Criteria for discharge.

	Criteria
Child	<ul style="list-style-type: none">• Appetite returns- Child eats >75% of RUTF ration• No medical complications• Oedema is resolving and/ or minimum edema is present• No objection/ contraindication for rehabilitation at home
Mother or Caretaker	<ul style="list-style-type: none">• Knows how to prepare energy dense foods and how to feed the child• Knows how to give prescribed medications, vitamins, folic acid and iron at home• Knows how to make appropriate toys and play with the child• Knows how to give home treatment for diarrhoea, fever and acute respiratory infections and how to recognize danger signs for which medical assistance must be sought• Follow-up plan is discussed and understood

7.4 OUTPATIENT THERAPEUTIC CARE

Aimed at providing treatment for children with SAM with appetite but no medical complications. These children can be treated at home with simple routine medicines and RUTF. Can include children when they come to health facility, referral from a FCHV or community agent, or referral from inpatient care once their condition has stabilized.

7.4a Routine medicines

Routine medicines that can be given to patients being treated in outpatient care is given in Table 7.15

7.15 Routine medicines for outpatient therapeutic care

Drug/Supplement	When	Age/Weight	Prescription	Dose
VITAMIN A**	At Admission (EXCEPT children with oedema)	< 6 months***	50,000 IU	Single dose (for children with oedema single dose on discharge)
		6 – 12 months	100,000 IU	
		> 12 months	200,000 IU	
		Do not use with Oedema		
AMOXYCILLIN	At Admission	All SAM cases	<10kg 125mg tds	3 times a day for 7 days
			>10kg 250mg tds	
CHLOROQUINE & PRIMAQUINE	At Admission in malaria areas (Terai)	All SAM cases	As given in Section	1 time a day for 3 days (on admission)
ALBENDAZOLE	Second visit	< 12 months	DO NOT GIVE	None
		12 – 23 months	200 mg	Single dose, on second visit
		≥ 24 months	400 mg	
MEASLES VACCINATION	On week 4	6 – 8 months	DO NOT GIVE until they complete 9 months of age	Single dose; when they reach 9 months old & after at least 4 weeks in OTC
		≥ 9 months	Standard	Single dose

*For children referred from inpatient stabilisation a check should be made of the treatments already received and the above adapted accordingly

** Vitamin A: Do not give if the child has already received Vitamin A in the last month. Do not give to children with oedema until discharge from OTC, unless there are signs of Vitamin A deficiency

*** Relevant for infants treated on outpatient basis

IRON and FOLIC ACID: *NOT to be given routinely*. Where severe anemia is identified according to CB-IMCI guidelines, the severely malnourished child should be referred to inpatient care. Where moderate anemia is identified treatment should *begin after 14 days* in the programme and not before because a high-dose may increase the risk of severe infections. Treatment should be given according to CB-IMCI protocol (one dose daily for 14 days).

The child's immunisation status should be checked and the mother/caretaker referred to the monthly immunisation outreach clinic in his/her area.

Other medical conditions/symptoms – eye infections, ear discharge, mouth ulcers, minor skin infections and lesions – should be treated

7.4b Dietary management

RUTF is provided as given in Table 7.11 and mother is counseled as for inpatient management.

Attend the health centre weekly for monitoring and to receive more RUTF supplies.

7.4c Monitoring at follow up

- Weekly basis
- Weight
- Edema
- MUAC
- Medical assessment
- Mother/ caretaker asked about progress
- Appetite is discussed and RUTF test performed at each follow up
- Weekly ration is calculated according to current weight and provided
- Criteria for referral to inpatient treatment is given in Table 7.16

7.16 Criteria for referral to inpatient treatment

Factor	Criteria for inpatient referral
Oedema	Increase of or development of oedema
Appetite	No appetite or unable to eat
Medical complications	As defined in Table 2 for admission to inpatient care
Weight changes	Weight loss for 3 consecutive weighing (2 consecutive weighing for 2 weekly follow-up) Static weight for 5 consecutive weighing (3 consecutive weighing for 2 weekly follow-up)
General	Other general signs the health worker thinks warrants referral (as per CB-IMCI)

7.4d Discharge from OTC-

Discharge Cured Criteria

For children 6-59 months, admitted by MUAC (or by W/H)

Minimum of 7 weeks AND MUAC >11.5cm AND
No oedema for two consecutive visits AND
Weight gain for last two consecutive visits AND
Clinically well and alert

7.5 MANAGEMENT OF SAM IN INFANTS < 6MONTHS

Most management is similar to children 6-59 months except nutrition management.

7.5.1 Assessment of nutritional status and medical condition

As given in Section 7.1.

7.5.2 Admission or referral based on programme criteria

Admission criteria are given in Table 7.6. The type of management required however is dependent on whether there is a possibility for breastfeeding (see below).

7.5.3 Medical Management

Routine antibiotic treatment should be provided for infants <6months **with SAM** admitted to inpatient and outpatient care in the same way as for those >6months in an appropriately weight adjusted dose (see Section 5.2.3).

Note: Do not use Chloramphenicol in young infants under 2 months, and use with caution in infants 2-6 months.

Folic Acid - Give 2.5 mg (tablet crushed) in a single dose.

7.5.4 Nutrition management

7.5.4a Where there is a possibility of breastfeeding the infant

- The main objective is to restore exclusive breastfeeding whether by the mother, a family member or wet-nurse. Therefore, supplement the child's breastfeeding with therapeutic milk while stimulating and supporting production of breast milk.
- Between one half and one hour after a normal breastfeeding session, give maintenance amounts of therapeutic milk.
- Provide F100-Diluted (Add 150 ml to F 100 catch up diet) for infants with severe wasting at 130 ml/kg bodyweight/day, distributed across eight feeds per day. F100-Diluted has a lower osmolality than F75 and thus is better adapted to immature organ functions. Also, the dilution allows for providing more water for the same energy with a better carbohydrate to lipid ratio.
- Provide F75 for infants with bilateral pitting oedema and change to F100-Diluted when the oedema is resolved.

Note: To prevent hypernatremia in hot climates, sips of water or 10 percent sugar-water solution (see Annex 7) are given in addition to the milk diet until the thirst of the child is satisfied.

- Monitoring should take place as for the older child (see section 7.3.11a) and recorded on the patient card
- If the volume of F100-Diluted being taken results in weight loss, either the maintenance requirement is higher than calculated or there is significant malabsorption. If the infant loses weight or has a static weight over three consecutive days but continues to be hungry and is taking all the F100-Diluted, add 5 ml extra to each feed.
- If, after some days, the child does not finish all the supplemental feed, but continues to gain weight, it means the intake from breast milk is increasing and the infant is taking adequate quantities to meet his/her requirements.
- The quantity of F100-Diluted (or F75) is not increased as the child starts to gain weight.
- Once the infant is gaining weight at 20 g per day (absolute weight gain), gradually decrease the quantity of F100-Diluted by one-third of the maintenance intake so that the infant gets more breast milk.
- If the weight gain of 10 g per day is maintained for two-to-three days (after gradual decrease of F100-Diluted), stop F100-Diluted completely.

- If the weight gain is not maintained, increase the amount of F100-Diluted given to 75 percent of the maintenance amount for two-to-three days, and then reduce it again if weight gain is maintained.

7.5.4b Infant with no possibility for breastfeeding

The aim of the treatment of infants less than 6 months with SAM without the prospect of being breastfed in Nepal is to receive F100-Diluted until they are old enough to take semisolid complementary food in addition to adapted cow milk.

- *Initial management* – As for the breastfed child, give maintenance amounts of F100-Diluted at 130 ml/kg bodyweight/day.
- Distribute the quantity of F100-diluted across eight feeds per day.
- Feed by cup and saucer or NGT by drip (using gravity not pumping).
- Only feed with NGT when the infant is not taking sufficient milk by mouth.
- The use of NGT should not exceed three days and should be used in the stabilisation phase only

7.5.5 Transition

- Move to transition when appetite returns and any oedema reduces to at least (++).
- The volume of the F100-Diluted feeds is increased by one-third in comparison to the stabilisation phase

7.5.6 Rehabilitation

- Move to rehabilitation phase when infant is taking at least 90 percent of the F100-Diluted prescribed for the transition phase, any oedema has gone, there are no additional medical complications and there is a minimum stay of 2 days in transition
- The volume of the F100-Diluted feeds is increased to twice the volume that was given during the stabilisation phase

7.5.7 Discharge

7.5.7a The breastfed infant

- Once the infant is gaining weight at 20 g per day on breastfeeding alone
- Check that there is no oedema and the child is clinically well
- If the mother/caretaker is agreeable, it is advisable to keep the infant in the health facility for an additional three-to-five days on breast milk alone to make sure that he/she continues to gain weight and then discharged.
- If the mother/caretaker wishes to go home as soon as the infant is taking the breast milk with increased demand, they should be discharged.
- When the child is gaining weight on breast milk alone, he/she should be discharged, no matter what his/her current weight or weight-for-length.
- The lactating mother should continue to receive supplementation support under the MAM programme until the infant is 6 months old.

7.5.7b The non-breastfed infant

- Discharge takes place when the following conditions are met:
- Breast milk substitute for the child has been defined within the families' possibilities and is sustainable and child has moved onto the substitute and is still gaining weight
- No bilateral pitting oedema for two weeks
- Infant is clinically well and alert
- Mother/Caretaker has been adequately counselled on use of the breast milk substitute and on complementary feeding (timing and foods).

7.6 MANAGEMENT OF SAM

A child with SAM and MAM is up to three times and nine times as likely to die as a well-nourished child respectively. While the immediate risk of mortality is higher for a child with SAM than with MAM, the total number of children affected by MAM is much greater, and therefore absolute mortality is higher for MAM than SAM. Children with moderate acute malnutrition need higher nutrient intake than non-malnourished children but fewer nutrients than those who are severely malnourished.

7.6.1 Assessment

- Determine age of the child in SAM management.
- Take MUAC and check for Bilateral pitting oedema to confirm MAM
- Take Weight (for weight monitoring during follow up visits)
- Where capacity exists take height measurement for admission based on WHZ
- Take medical history
- Assess medical condition of child and presence of complications
- Check immunization status, last deworming and vitamin A supplementation
- Review and record any relevant information from referral document where there is one

7.6.2 Medical management

The child with MAM should be treated medically like any child.

The opportunity should be taken to ensure they are fully immunised and have received any additional supplements (vitamin A) or routine medicines (albendazole) that are included in the national protocols for all children.

7.6.3 Nutritional management

Children with moderate acute malnutrition need higher nutrient intake than non-malnourished children but less than those suffering from SAM. The treatment of moderate acute malnutrition among children under five requires the following:

- Consumption of nutritious food
- Exclusive breastfeeding for the first six months of life
- Breastfeeding in combination with complementary food until 24 months of age (at least)
- Clean and Hygienic environment

- Access to health services (immunization, vitamin A supplementation)

7.3.4 Individual monitoring

Follow up two weekly

Check oedema

Check weight, height and MUAC

Ask mother/caretaker about the progress of the treatment and feeding history

Decide on appropriate counselling and/or action

Any children developing oedema or whose MUAC falls below 11.5cm should be referred to either outpatient or inpatient therapeutic care depending on the presence of medical complications and appetite (see Table 7.6).

In addition, health workers and community volunteers will need to investigate failure to respond to treatment for all the children who:

- Did not gain weight after 60 days in the programme
- Lost weight during four consecutive weeks in the programme
- Lost weight exceeding 5 per cent of the body weight at any time
- Failed to reach the discharge criteria after four months in the programme

Possible reasons for failure to respond to the treatment include:

- Problems with dietary feeding
- An underlying physical condition/illness, such as HIV/AIDS, TB. If a child does not respond to treatment it can be suspected they have HIV and/or TB and should be tested for both
- Economic and social circumstances of the mothers/caretakers
 - Excessive sharing of the ration
 - Nutritional deficiencies that are not being corrected by the diet supplied/feed
 - Other causes

ANTHROPOMETRIC MEASUREMENTS

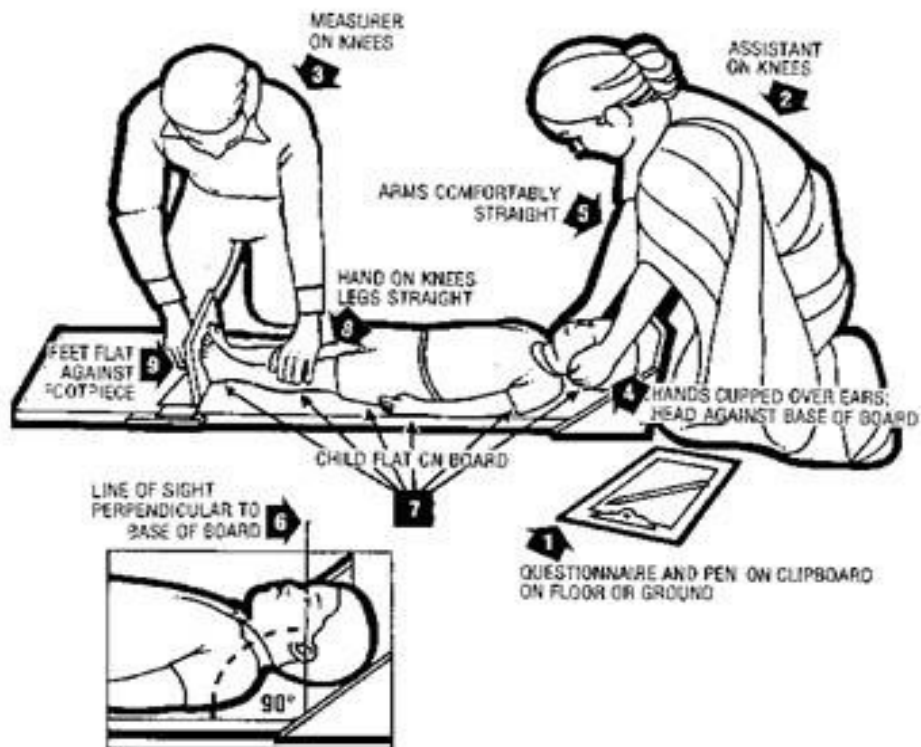
Measuring Weight



Key points to remember

- Remove the child's clothes, shoes, socks & hair braids, & ornaments to minimum as per weather conditions.
- Cover in a blanket or woollen shawl while carrying to the scale.
- Put a paper / cloth on the pan
- Set the weighing scale to zero before putting the child on the pan
- Place the child into the pan, wait for child to settle and weight to stabilize
- Allow mother to stand near weighing scale & make baby calm.
- Measure weight in gm & enter in the recording Performa **immediately**.
- Repeat the measurement & record.
- In case the difference of two measurements is more than 5 g, take third measurement and take the average of two nearest measurements.

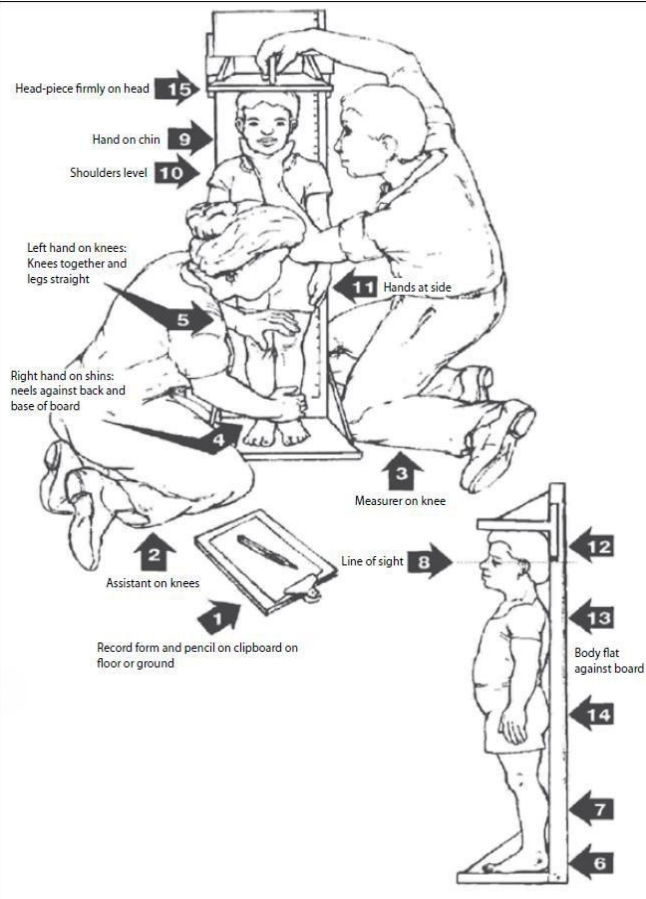
Child Length Measurement



Key Points to Remember

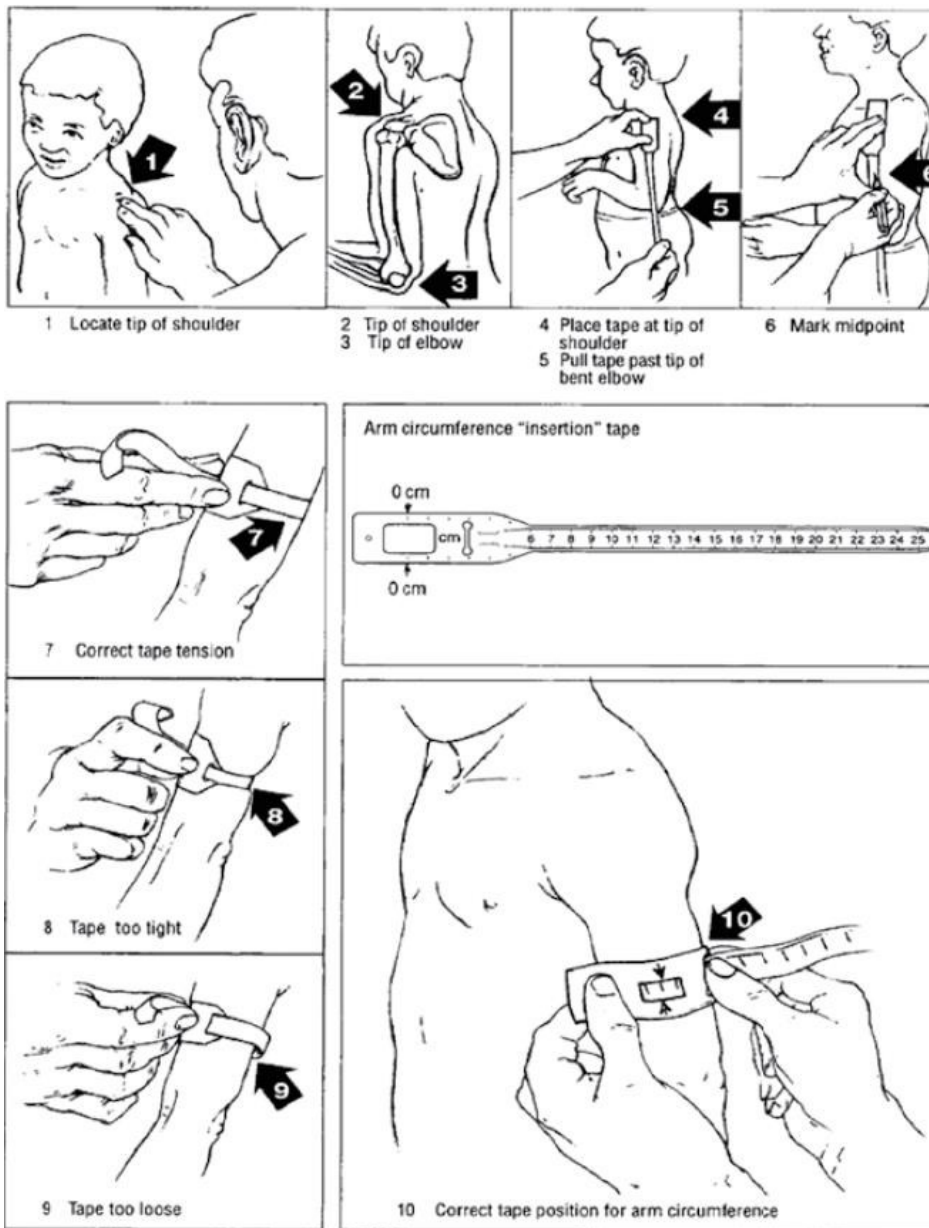
- Length is measured using a special device known as an infantometer which has a headboard and sliding foot piece. Lay the measuring board flat, on a stable, level table
- One person should stand or kneel behind the headboard and position the child lying on his back on the measuring board, supporting the head and placing it against the headboard.
- The other person should stand alongside the measuring board and Support the child's trunk as the child is positioned on the board.
- Position the crown of the head against the headboard, compressing the hair (Remove hair braids).
- Hold the head with two hands and tilt upwards until the eyes look straight up, and the line of sight is perpendicular to the measuring board.
- Check that the child lies straight along the centre line of the measuring board and does not change position
- Measure length to the last completed 0.1 cm and record immediately on the case recording form.

Measuring Height



- One person should kneel or crouch near the child's feet and help the child stand with back of the head, shoulder blades, buttocks, calves and heels touching the vertical board.
- Hold the child's knees and ankles to keep the legs straight and feet flat.
- Prevent children from standing on their toes.
- Young children may have difficulty standing to full height. If necessary, gently push the child's tummy to help him stand straight to full height.
- The other person should bend to level of the child's faces and Position the head so that the child is looking straight ahead (line of sight is parallel to the base of the board).
- Place thumb and forefinger over the child's chin to help keep the head in an upright position.
- With the other hand, pull down the head board to rest firmly on top of the head and compress hair.
- Measure height to the last

Measuring Mid Upper Arm Circumference



If using a 3 colour MUAC tape

Color zone	MUAC Measurement	Nutritional status
Green	≥ 12.5 cm	Well nourished
Yellow	11.5 cm-12.4 cm	Moderate acute malnutrition
Red	< 11.5 cm	Severe acute malnutrition

2. While locating the midpoint of upper arm, flex the elbow in 90 degree and mark the point between middle of shoulder and tip of elbow.
3. Extend the elbow while measuring the mid upper arm circumference

7.7: MANAGEMENT OF ANEMIA

Anaemia is very common in children in developing countries. Mild to moderate anaemia is a common co-morbidity in children attending health facility for various conditions. Hence, anaemia/pallor should be looked for in each patient attending the health facility. Severe anaemia in a child is suggested by the presence of severe palmar pallor and may be associated with a fast pulse rate, difficulty in breathing, or confusion or restlessness. There may be additional signs of heart failure such as gallop rhythm, an enlarging liver and rarely pulmonary oedema.

7.7a: Clinical approach

Nutritional anaemia is the most common cause of anaemia in children. Nutritional anaemia results from deficiency of iron, folic acid and vitamin B₁₂. Iron deficiency anaemia (IDA) commonly occurs in later part of infancy and preschool children particularly if they are not receiving balanced diet. Physical examination of children with IDA is usually unremarkable. They do not have significant hepatosplenomegaly or lymphadenopathy.

Common findings in history and physical examination, one should look for are listed in *Table 6.10*.

Table 7.17: Findings of anaemia in children

<i>Take a history concerning</i>	<i>On examination, look for</i>
<ul style="list-style-type: none"> • Duration of symptoms • Usual diet (before the current illness) • Family circumstances (to understand the child's social background) • Prolonged fever • Worm infestation • Bleeding from any site • Lymphnode enlargement • Previous blood transfusions • Similar illness in the family (siblings) 	<ul style="list-style-type: none"> • Severe palmar pallor • Skin bleeds (petechial and/or purpuric spots) • Lymphadenopathy • Hepato-Splenomegaly • Signs of heart failure (gallop rhythm, raised JVP, respiratory distress, basal crepitations)

7.7b: Laboratory diagnosis

- Hemoglobin < 11 gm/dl in children aged 6 months - 5 years indicates anaemia.
- Complete blood counts and examination of red cell indices and peripheral blood smear should be done in all anemic children whenever possible. (See appendix for normal values)
- Blood films should be examined for malaria parasites particularly in high malaria risk areas.
- Stool examination for ova, cyst and occult blood may be done.
- Blood counts should be performed using electronic cell counter if available. Children with IDA will have low MCH, MCV, MCHC in red cell indices and peripheral blood smear shows microcytic-hypochromic anaemia. Usually leucocyte counts and platelet counts are normal.
- Children with folate and/or B₁₂ deficiency will have increase MCV and PBS shows macrocytic anaemia. These cases may have associated leucopenia and/or thrombocytopenia. Such cases should be referred for specialized investigation as in these cases other causes resulting in alterations in blood counts (bi/pancytopenia) and macrocytosis need to be excluded.

7.7c: Treatment

All children with suspected IDA should be treated using oral iron 2-3 mg/kg/dose twice daily (dose of elemental iron). Older children who can take tablets can be given IFA tablets. Iron therapy should be continued 8-12 weeks after normal haemoglobin level is achieved.

The children on iron therapy should be evaluated for response to treatment. Iron therapy results in prompt clinical response (return of appetite, decreased irritability). Repeat complete blood count with red cell indices or peripheral smear after two weeks of therapy. Children not responding to treatment should be evaluated for compliance to treatment and adequacy of dose and presence of infections such as UTI and chronic infections or may be referred to rule out other causes of anemia.

□ *Deworming*

Give deworming agents to all children more than 1 year with anaemia at the time of discharge.

Albendazole (tab 400 mg, syrup 400 mg/10 ml)

– 1 tab (or 10 ml) once, then every 6 months – if the child >2 yrs

- ½ tab (or 5 ml), once every 6 months if the child ≤ 2 years

OR

Give Mebendazole (100 mg) – 1 tab x BD x 3 days

7.8. BLOOD TRANSFUSION

7.8.1 Indications for blood transfusion

There are five general indications for blood transfusion:

- Acute blood loss, when 20–30% of the total blood volume has been lost, and bleeding is continuing
- Severe anaemia(see below)
- Septic shock (if IV fluids are insufficient to maintain adequate circulation; transfusion to be given in addition to antibiotic therapy). Refer to *section*
- Whole fresh blood is required to provide plasma and platelets for clotting factors, if specific blood components are not available

7.8.2 Storage of blood

Use blood that has been screened and found negative for transfusion-transmissible infections. Do not use blood that has passed its expiry date or has been out of the refrigerator for more than 2 h.

Large-volume, rapid transfusion at a rate > 15 ml/kg per h of blood stored at 4 °C may cause hypothermia, especially in small infants.

7.8.3 Problems in blood transfusion

Blood can be the vehicle for transmitting infections (e.g. malaria, syphilis, hepatitis B and C, HIV). Therefore, screen donors for as many of these infections as possible. To minimize the risk, give blood transfusions only when essential.

7.8.4 Severe anaemia

- Give a blood transfusion as soon as possible to:
 - all children with Hematocrit of $\leq 12\%$ or Hb of ≤ 4 g/dl
 - less severely anaemic children (Hematocrit, 13–18%; Hb, 4–6 g/dl) with any of the following clinical features:
 - clinically detectable dehydration

- shock
 - impaired consciousness
 - heart failure
 - deep, laboured breathing
- If packed cells are available, give 10 ml/kg over 3–4 h in preference to whole blood. If not available, give fresh whole blood (20 ml/kg) over 3–4 h.
 - Check the respiratory rate and pulse rate every 15 min. If either rises or there is other evidence of heart failure, such as basal lung crepitations, enlarged liver or raised jugular venous pressure, transfuse more slowly. If there is any evidence of fluid overload due to the blood transfusion, give IV furosemide at 1–2 mg/kg, up to a maximum total of 20 mg.
 - After the transfusion, if the Hb remains below 7 gm/dl, transfusion may be repeated.
 - In children with severe acute malnutrition, fluid overload is a common and serious complication. Give packed cells when available or whole blood at 10 ml/kg (rather than 20 ml/kg).

7.8.5 Giving a blood transfusion

Before transfusion, check that:

- The blood is of the correct group, and the patient's name and number are on both the label and the form (in an emergency, reduce the risk for incompatibility or transfusion reactions by cross-matching group-specific blood or giving O-negative blood if available)
- The blood transfusion bag has no leaks
- The plasma is not pink or has large clots, and the red cells do not look purple or black
- Make baseline recordings of the child's temperature, respiratory rate and pulse rate.
- The blood is thawed to room temperature.

During transfusion:

- If available, use an infusion device to control the rate of transfusion.
- Check that the blood is flowing at the correct speed @ 3 drops/kg/minute with micro drip set.
- Look for signs of a transfusion reaction (see below), particularly carefully in the first 15 min of transfusion.

- Record the child's general appearance, temperature, pulse and respiratory rate every 30min.
- Record the times the transfusion was started and ended, the volume of blood transfused and any reactions.

After transfusion:

- Reassess the child. If more blood is needed, a similar quantity should be transfused and the dose of furosemide (if given) repeated.

7.7 d. Red flag signs for non-nutritional anaemia (Consider referral if investigations not available)

- Cases of anaemia and hepato-splenomegaly/splenomegaly, if malaria has been excluded
- or not strongly suspected (haemolytic anaemia, leukemia).
- Children with similar history in the family (haemolytic anaemia e.g. thalassemia, sickle cell anaemia).
- Cases of anaemia with significant lymphadenopathy, bleeding manifestations.
- Cases of anaemia with abnormal/immature cells or marked leucocytosis or bicytopenia or pancytopenia on smear examination (bone marrow failure).
- Also consider transfer of nutritional anemia other than iron deficiency anemia

- ***Investigations in such cases should be done before blood transfusion.***
- ***Iron therapy should be avoided in confirmed cases of hemolytic anaemia.***

SECTION 8 OTHER PROBLEMS

8.1. TUBERCULOSIS IN CHILDREN

8.1.1 How does TB in children differ from TB in adults?

- a) Children rarely have sputum smear positive TB. So they are rarely infectious. The **source of transmission of TB** to a child is usually an adult (usually a family member) with sputum smear-positive PTB. TB in children is therefore due to failure of TB control in adults.
- b) Risk of infection depends on 2 factors: a) extent of exposure to infectious droplet nuclei, and b) susceptibility to infection.
- c) An infected child can develop TB disease at any time. The chance of developing disease is greatest shortly after infection and then steadily decreases as time goes by. The most important trigger is weakening of immune resistance, especially by HIV infection. Other important triggers include the following: other infections (especially measles and whooping cough) and malnutrition.
- d) Tuberculosis in children is usually primary TB. A child may have asymptomatic M. tuberculosis infection: the tubercle bacilli can lie dormant for many years. If the tubercle bacilli reactivate some years later, causing postprimary TB, the child has usually grown into an adult by then. The age when a child is infected determines the pattern of primary disease.
- e) Up to puberty, blood-borne spread is common. This results in disseminated (miliary and extrapulmonary) disease. After puberty, pulmonary spread is more common.

8.1.2. APPROACH TO DIAGNOSIS

TB can be missed in children easily as well as it might be over diagnosed. Carefully assess all the evidence before making the diagnosis.

When to suspect tuberculosis in a child-

- Symptoms and signs suggestive of tuberculosis like cough \geq 14 days, fever \geq 14 days (not responding to antibiotic therapy), weight loss $>$ 5%, anorexia, easy fatigability,

lymphadenopathy. Hepatosplenomegaly, ascites, non- painful abdominal mass

- Low-grade fever for > 14 days with drowsiness, seizure, vomiting, headache, neck stiffness, paralysis and coma.
- History of contact with sputum positive pulmonary tuberculosis
- Ill child with history of contact with a suspected or confirmed case of pulmonary TB

Investigations

- ESR
- Mantoux test/ Tuberculin test

Check for skin induration at 48- 72 hours. If > 10 mm, it is positive. If < 10 mm it is negative. But negative test does not exclude TB. Certain conditions where tuberculin is suppressed in a person with active TB- HIV infection, malnutrition, severe bacterial infections, including TB itself, viral infections, e.g. measles, chickenpox, glandular fever, cancer, immunosuppressive drugs, e.g. steroids

- Chest X-ray
- AFB in sputum (In < 10 years gastric aspirate or induced sputum)
- Histology and biopsy of lymph nodes if indicated.
- Mycobacterium tuberculosis culture if available

In tubercular meningitis CSF routine analysis and AFB

Gene XPERT MTB/ RIF

Newer method to detect tuberculosis is to detect its sensitivity to Rifampicin. It has sensitivity to detect tuberculosis of 91% and accuracy of 99% and its sensitivity to detect rifampicin resistance is 98%. It should be done in

1. Cases with high risk of Drug resistant TB- IV drug abusers, diabetes, refugees
2. HIV/ AIDS cases with suspected TB
3. Cases with high probability of pulmonary TB but sputum smear for AFB negative
4. Cases who are to be started on Cat 2 ATT

8.1.3. MANAGEMENT OF CHILD CONTACTS OF INFECTIOUS ADULTS

In newborn children, if a baby is born to a woman with active tuberculosis and if the baby is sick with fever and failure to thrive, give a full course of treatment for tuberculosis. If the baby is well give isoniazid chemoprophylaxis for 3 months and then do a tuberculin testing. If the tuberculin test is negative, stop the isoniazid, and give BCG. If the tuberculin test is positive, continue the isoniazid up to 6 months.

Child under 5 years of age living with a sputum smear positive PTB patient. This child household contact is at high risk of TB infection and developing TB disease, especially if HIV-positive. Screen for TB infection, if positive treat for TB.

Isoniazid preventive treatment for all child household contacts (under 5 years of age) of sputum smear-positive PTB patients. If becomes sick at any time, treat for tuberculosis. Screen for active TB at 3 months. If positive, treat for tuberculosis. If no active TB but Mantoux positive, treat for 6 more months with Isoniazid. If no active TB and mantoux negative, stop Isoniazid prophylaxis.

8.1.4 Principles of Anti tubercular therapy (ATT) in children

- Dosages in children per kilogram body weight should be higher as they have a higher metabolism. They can tolerate higher doses with fewer side-effects
- Children usually have fewer microorganisms and are less likely to develop secondary resistance
- Extra-pulmonary TB is more common in children and therefore the drugs used should be able to penetrate and achieve the required concentration in specific body fluids and tissues
- Based on case definition, a TB patient falls into 1 of 3 categories for treatment. The table below shows the patients belonging to each category.

Table 7.1: TB TREATMENT CATEGORY PATIENT

Category	Patients included	Remarks
1	<p>New bacteriologically confirmed (sputum smear-positive) PTB</p> <p>Severe clinically diagnosed (sputum negative) PTB and</p> <p>Severe extra pulmonary TB</p>	<p>Patient who has never been treated for TB or has taken ATT for < 1 month</p> <p>Meningitis</p> <p>Miliary</p> <p>Pericarditis</p> <p>Peritonitis</p> <p>Bilateral or extensive pleural effusion</p> <p>Spinal</p> <p>Intestinal</p> <p>Genitor-urinary</p>
2	<p>Relapse</p> <p>Treatment after failure</p> <p>Treatment after loss to follow up</p>	<p>Bacteriologically positive after cure or treatment completion for TB</p> <p>Sputum positive after 2 months in case of extrapulmonary or sputum negative pulmonary TB and after 5 months in sputum positive pulmonary TB</p> <p>Under treatment but left treatment in between for ≥ 60</p>

	Other previously treated patients	days Previously completely treated but results not known or no papers available
3	New clinically diagnosed (sputum negative) pulmonary TB Less severe extrapulmonary TB	Lymph node Pleural effusion (unilateral) Bone (excluding spine) Peripheral joint Adrenal gland

Below mentioned medicines are available in fixed dose combination forms for children.

1. Isoniazid [30 mg], Rifampicin [60 mg], Pyrazinamide [150 mg] (HRZ)
2. Isoniazid [60 mg], Rifampicin [60 mg] (HR)
3. Ethambutol [100 mg] (to use in intensive phase regimen with HRZ)

Other available fixed dose combinations (for adolescents and adults) include

1. Isoniazide [75 mg] + Rifampicin [150 mg] + Pyrazinamide [400mg} +Ethambutol [275mg] (HRZE)
2. Isoniazide (150mg) +Rifampicin [150mg] (HR)
3. Isoniazide [75 mg] + Rifampicin [150 mg] + Ethambutol [275mg] (HRE)

The Category I treatment is given as follows.

Patient Body Weight (kg)	Intensive Phase		Continuation Phase
	HRZ(Combination)	E (100 mg)	HR(Combination)
	2 months No of Tablets	2 months/ No of Tablets	4 months No of Tablets
4-6 Kg	1	1	1
7-10 Kg	2	2	2
11-14 Kg	3	2	3
15-19 Kg	4	3	4
20-24 Kg	5	4	5

Note: Ethambutol is safe in children (the concerns of vision impairment has been disproved at doses used in ATT) and can be added to the intensive phase at the dose of 15-20 mg/kg/d.

TB meningitis, Miliary TB and Spinal TB with neurological involvement are given intensive phase for 2 months and continuation phase for 10 months.

The Category II treatment is given as follows.

Patient Body Weight (kg)	*SM Igm	Intensive Phase (3 months)		Continuation Phase (5 months)	
		HRZ (Combination)	Ethambutol- E (100 mg)	HR (Combination)	Ethambutol - E (100 mg)
		3 months/No of Tablets	3 months/No of Tablets	5 month/No of Tablets	5 months/No of Tablets
4-6 Kg	15 mg/ Kg Body Weight	1	1	1	1
7-10 Kg	0.120gm	2	2	2	2
11-14 Kg	0.180gm	3	2	3	2
15-19 Kg	0.250gm	4	3	4	3
20-24 Kg	0.350gm	5	4	5	4

Note: Inj Streptomycin is used for retreatment cases only. In bacteriologically confirmed cases, Ethambutol is added at 15-20 mg/kg/day in both intensive and continuation phases.

The Category III treatment is given as follows.

Patient Body Weight (kg)	Intensive Phase	Continuation Phase
	HRZ (Combination)	HR(Combination)
	2 months No of Tablets	4 months No of Tablets
4-6 Kg	1	1
7-10 Kg	2	2
11-14 Kg	3	3
15-19 Kg	4	4
20-24 Kg	5	5

8.1.5. Role of Corticosteroids in TB

Corticosteroids reduce morbidity in patients suffering from: central nervous system TB; miliary disease with alveolar-capillary block; pericarditis and pericardial effusion; endobronchial TB leading to partial or complete airway blockage, severe paradoxical response to drugs; and occasionally peritonitis or massive pleural effusions. All children with TB meningitis should be treated with adjuvant steroids irrespective of disease severity (Prednisolone 2 mg/kg/day, maximum 60 mg/day or Dexamethasone 0.6 mg/kg/day for 4 weeks followed by reducing course over 2 weeks).

Although helpful in certain patients, corticosteroids should not be prescribed injudiciously due to its potential to cause dissemination of TB.

8.2. HIV/AIDS IN CHILDREN

8.2.1. Differences in pediatric and adult HIV infection

- Most children acquire HIV infection in-utero, during delivery or through breastfeeding.
- Overall progression of disease is more rapid in children
- Immune system is more immature with higher CD4 counts
- Recurrent invasive bacterial infections are more common in children
- Disseminated CMV, Candida, herpes simplex and varicella zoster are more common
- LIP occurs almost exclusively in children
- CNS infections are common
- Peripheral neuropathy, myopathy and Kaposi sarcoma are rare in children

8.2.2. Clinical manifestations of pediatric HIV/AIDS

In general, progression of HIV and onset of opportunistic infections (OIs) occurs as plasma viral load increases and CD4 count decreases. **WHO clinical staging of HIV disease in children** (Source: *Adapted from WHO Case Definitions of HIV for surveillance and revised clinical staging and immunological classification of HIV related diseases in adults and children. Geneva, World Health Organization, 2007*)

Staging of severity of Pediatric HIV disease classifies the disease using WHO clinical criteria into four stages- asymptomatic, mild, moderate, and severe disease.

Clinical stage 1

1. Asymptomatic
2. Persistent generalized lymphadenopathy

Clinical stage 2

1. Unexplained persistent hepatosplenomegaly
2. Recurrent or chronic upper respiratory tract infections (otitis media, otorrhoea, sinusitis, tonsillitis)
3. Herpes zoster
4. Lineal gingival erythema
5. Recurrent oral ulceration
6. Papular pruritic eruption
7. Fungal nail infections
8. Extensive wart virus infection
9. Extensive molluscum contagiosum
10. Unexplained persistent parotid enlargement

Clinical stage 3

1. Unexplained moderate malnutrition not adequately responding to standard therapy
2. Unexplained persistent diarrhoea (14 days or more)
3. Unexplained persistent fever (above 37.5°C, intermittent or constant, for longer than one 1 month)
4. Persistent oral candidiasis (after first 6 weeks of life)
5. Oral hairy leukoplakia
6. Lymph node tuberculosis
7. Pulmonary tuberculosis
8. Severe recurrent bacterial pneumonia
9. Acute necrotizing ulcerative gingivitis or periodontitis

10. Unexplained anaemia (<8 g/dl), neutropaenia (<0.5 x 10⁹/l) or chronic thrombocytopaenia (<50 x 10⁹/l)
11. Symptomatic lymphoid interstitial pneumonitis, Chronic HIV-associated lung disease, including bronchiectasis

Clinical stage 4

1. Unexplained severe wasting, stunting or severe malnutrition not responding to standard therapy
2. Pneumocystis (jirovecii) pneumonia
3. Recurrent severe bacterial infections (such as empyema, pyomyositis, bone or joint infection, meningitis, but excluding pneumonia)
4. Chronic herpes simplex infection (orolabial or cutaneous of more than 1 month's duration or visceral at any site)
5. Oesophageal candidiasis (or candidiasis of trachea, bronchi or lungs)
6. Extrapulmonary tuberculosis
7. Kaposi sarcoma
8. Cytomegalovirus infection (retinitis or infection of other organs with onset at age more than 1 month)
9. Central nervous system toxoplasmosis (after the neonatal period)
10. HIV encephalopathy
11. Extrapulmonary cryptococcosis, including meningitis
12. Disseminated nontuberculous mycobacterial infection
13. Progressive multifocal leukoencephalopathy
14. Chronic isosporiasis
15. Disseminated endemic mycosis (extrapulmonary histoplasmosis, coccidioidomycosis, penicilliosis)
16. Cerebral or B-cell non-Hodgkin lymphoma
17. HIV-associated nephropathy or cardiomyopathy

8.2.3 Diagnosis of HIV in children-

Early Presumptive diagnosis

Clinical criteria for presumptive diagnosis of severe HIV disease among infants and children aged under 18 months in situation where virological testing is not available
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A presumptive diagnosis of severe HIV disease should be made if:

- The infant is confirmed as HIV antibody- positive And
- Diagnosis of any AIDS- indicator condition(s)* can be made Or
- The infant is asymptomatic with two or more of the following: oral thrush, severe pneumonia**, severe sepsis

Other factors that support the diagnosis of severe HIV disease in an HIV- seropositive infant include:

- Recent HIV related maternal death or advanced HIV disease in the mother
- CD4 <20%

HIV testing in HIV exposed children < 18 months of age *-

1. < 6 weeks and symptomatic- HIV DNA- PCR
2. < 6 weeks and asymptomatic- Wait till 6 weeks
3. At 6 weeks to 9 months- HIV DNA- PCR.
4. At 9- 18 months- Do an anti- HIV antibody testing-
 - a. If positive, send for HIV DNA- PCR.
 - b. If negative and breastfeeding stopped > 6 weeks earlier, no need of further test by HIV DNA- PCR
 - c. If negative and breast feeding , repeat test > 6 weeks after stopping breastfeeding

* All negative PCR should be confirmed by Anti- HIV antibody testing at 18 months.

* Should repeat HIV DNA- PCR for confirmation if positive at first. If negative second time, a third sample should be sent and consultation with an HIV expert is recommended.

* Repeat confirmation should not delay starting of ART

HIV testing in children 18 months of age and above–

Tested by Anti- HIV antibody test

1. A positive HIV antibody test indicates HIV infection.
2. A negative HIV antibody test means that the child is not HIV-infected, unless the child was breastfed within the last six weeks.

3. If the child was breastfed within last 6 weeks, repeat HIV antibody test after stopping breastfeeding for 6 weeks or more.

CD 4 count

Degree of immuno suppression is classified into three stages according to severity of CD4 counts vary with age during the first 5 years of life, the cut-offs for this immunologic indicator differs from those cut-offs used for adults.

ART is indicated in all children under five years of age irrespective of CD4 count.

8.2.4. Anti-Retroviral Therapy for Infants and Children

Before starting ART

- The following baseline tests should be carried out to assess hematological, liver and kidney function, as well as immune status:
 - Full blood count
 - Liver functions tests (do alanine transaminase)
 - Renal function tests (do serum creatinine)
 - CD4 % and count
 - Chest X-ray
 - Mantoux test
- Treat any inter-current illnesses.
- Initiate Cotrimoxazole Prophylaxis in all children.
- Counsel the parent/guardian on the following:
 - Goals of ART
 - Lifelong nature of therapy
 - Importance of adherence to ART
 - Importance of monitoring and need to attend clinical regularly as required and as well as for inter-current conditions.
 - When and how to administer the drugs
 - Possible adverse effects of the ARV drugs intended for use, how to recognize them and what to do should they arise

- Care takers should be encouraged to bring a child on treatment back to clinic if they have concerns or the child becomes ill.

When to start ART?

- ART should be started in all children infected with below 5 years of age regardless of WHO clinical staging or CD4 count.
- ART should be initiated in all HIV-infected children 5 years of age and older with CD 4 count ≤ 500 cells/mm³, regardless of WHO stage.
- ART should be started in all children with HIV with severe or advanced symptomatic disease (WHO clinical stage 3 or 4) regardless of age and CD 4 count.
- ART should be initiated in any child younger than 18 months of age who has been given a presumptive diagnosis of HIV infection.

First-line ART for children younger than three years of age

- Preferred regimen: ABC or AZT+3TC+NVP
- Alternative regimens if No virological suppression: ABC +3TC+LPV/r
- Co-infection with TB: ABC + AZT+3TC till ATT is given

First-line ART for children three years and older

- For children infected with HIV three years and older (including adolescents), EFV is the preferred NNRTI for first-line treatment and NVP is the alternative.
- For children infected with HIV three years to less than 10 years old (or adolescents less than 35 kg), the NRTI backbone for an ART regimen should be one of the following, in preferential order:
 - ABC + 3TC
 - AZT or TDF + 3TC

8.2.5. Vaccination for children living with HIV

- Should receive all vaccines under routine vaccination according to recommended national immunization schedules.

- Live vaccines should be avoided in children with advance clinical stages and severe immunosuppression.
- An extra dose of measles vaccination is recommended at 6 months of age.

8.2.6. Cotrimoxazole Preventive therapy (CPT)

Cotrimoxazole prophylaxis reduces morbidity, hospital admissions and death in children infected with HIV. Cotrimoxazole should be administered routinely to all HIV exposed children from the age of 6 weeks.

8.2.7. Isoniazid Preventive therapy (IPT)

- Children living with HIV who are more than 12 months of age and who are unlikely to have active TB on symptom-based screening and have no contact with a TB case should receive six months of IPT (10 mg/kg/day).
- In children living with HIV who are less than 12 months of age, only those who have contact with a TB case and who are evaluated for TB (using investigations) should receive six months of IPT if the evaluation shows no TB disease.
- All children living with HIV, after successful completion of treatment for TB disease, should receive isoniazid for an additional six months.

8.2.8. PMTCT

Mother-to-child transmission (MTCT) is the most frequent source of HIV infection in children in Nepal.

8.2.8.1. Recommendations for National PMTCT Programme

National PMTCT programme	Pregnant and breastfeeding women with HIV	HIV-exposed infant
Use lifelong ART for all pregnant and breastfeeding	Initiate ART and maintain after delivery and cessation	Breastfeeding 6 weeks of infant prophylaxis with

women (“Option B+”) of breastfeeding once-daily NVP regardless of WHO clinical stage or CD4 cell count.

Recommended 1st-line ART regimen for treating **pregnant women** is TDF + 3TC + EFV started ASAP in pregnancy and continue throughout pregnancy, labour and delivery and postpartum, for life

8.2.8.2. Neonatal/infant care & prophylaxis

Infants of mothers who are receiving ART and are breastfeeding should receive six weeks of infant prophylaxis with daily NVP. Infant prophylaxis should begin at birth or when HIV exposure is recognized postpartum. Ensure that the NVP is available through health worker or community home based care worker, if the mother plan to deliver at home or health facility with no PMTCT services.

Simplified infant prophylaxis dosing recommendations:

Infant age	Daily dose
• Birth to 6 weeks	10 mg twice daily
• Birth weight 2000–2499g	15 mg twice daily
• Birth weight >2500g	First dose should be given within 6 to 12 hours of birth or as soon as possible thereafter.

8.2.8.3. Immediate newborn care includes the following:

- Maintaining universal precautions throughout care and treatment:
 - wear gloves when giving injections;
 - clean injection sites;
 - dispose of all needles according to the injection safety protocol.
- Delayed cord clamping after birth

- avoid “milking” the cord towards the baby;
- cover the cord with gloved hand or gauze before cutting.
- Using suction only when meconium-stained liquid is present; use either mechanical suction at less than 100 mm Hg pressure.
- Wiping the infant dry with a towel, wrap with warm cloth, and give the baby to the mother for skin-to-skin contact.
- Determining the mother’s infant feeding choice, encourage breastfeeding according to the national breastfeeding protocol.
- Administering vitamin K, and Bacille Calmette Guérin (BCG; tuberculosis) vaccine according to national guidelines.
- Administering first dose of infant Nevirapine within 6 to 12 hours of delivery.
- Regardless of the mother’s HIV status, all infants should be kept warm after birth and handled with gloves until maternal blood and secretions have been washed off.

8.2.8.4. Recommendations on breastfeeding and infant feeding

The mothers known to be infected with HIV should exclusively breastfed their infants for the first six months of life, introducing appropriate complementary foods thereafter, and continue breastfeeding same as mother without HIV.

All pregnant women with HIV, who are on ART are recommended to continue breastfeeding as per the national breastfeeding protocol. During breast infection (especially mastitis) and cracked or bloody nipples, there is additional risk for HIV transmission; and the sores or oral thrush (candidiasis) in the infant’s mouth may also facilitate infection occurring during breastfeeding, and is suggested to avoid breastfeeding until complete cure or give expressed breast milk.

8.3. APPROACH TO A CHILD WITH SUSPECTED POISONING

8.3.1. Introduction:

Suspect poisoning in any unexplained illness in a previously healthy child. Consult standard textbook of paediatric for management of exposure to specific poisons and/or consult National Poisons Centre for guidance.

Only the principles for managing ingestion of few common poisons are given here.

8.3.2: Diagnosis of poisoning in children

A diagnosis is based on a history from the child or carer, a clinical examination and the results of investigations, where appropriate.

- Obtain full details of the poisoning agent, the amount ingested and the time of ingestion. Attempt to identify the exact agent involved by examining container, when relevant. Check that no other children were involved.
- The symptoms and signs depend on the agent ingested and therefore vary widely
- Check for signs of burns in or around the mouth or of stridor (upper airway or laryngeal damage), which suggest ingestion of corrosives.

8.3.3. Principles for management of ingested poison

- All children who present as poisoning cases should quickly be assessed for emergency signs (airway, breathing, circulation and level of consciousness), as some poisons depress breathing, cause shock or induce coma.
- Admit all children who have deliberately accidentally ingested iron, pesticides, paracetamol or some other drugs.
- Children who have ingested corrosives or petroleum products should not be sent home without observation for at least 6 h. Corrosives can cause oesophageal burns, which may not be immediately apparent, and petroleum products, if aspirated, can cause pulmonary edema, which may take some hours to develop. X ray Chest is mandatory before discharge.
- Check for hypoglycemia; if blood glucose estimation facility is not available and the child has a reduced level of consciousness, treat as if hypoglycemia.
- Identify the specific agent and remove or adsorb it as soon as possible. Treatment is most effective if given as quickly as possible after the poisoning event, ideally within 1 h.

- If the child swallowed kerosene, petrol or petrol-based products (note that most pesticides are in petrol-based solvents) or if the child's mouth and throat have been burnt (for example with bleach, toilet cleaner or battery acid), do not make the child vomit but give water or, if available, milk, orally.
- If the child has swallowed other poisons, never use salt as an emetic, as this can be fatal.
- Mix the charcoal in 8–10 volumes of water, e.g. 5 g in 40 ml of water.
- If possible, give the whole amount at once; if the child has difficulty in tolerating it, the charcoal dose can be divided. The dose is 1 g/kg. Children 1-12 years can be given 25-50 g charcoal.
- Undertake gastric lavage only if staff has experience in the procedure, if ingestion was less than 1 hr previously and is life-threatening.
- ***If the child has ingested corrosives or petroleum derivatives, gastric lavage should not be done.***
- Make sure a suction apparatus is available in case the child vomits. Place the child in the left lateral head-down position. Measure the length of tube to be inserted. Pass a nasogastric tube into the stomach and ensure the tube is in the stomach. Perform lavage with 10 ml/kg of normal saline (0.9%). The volume of lavage fluid returned should approximate the amount of fluid given. Lavage should be continued until the recovered lavage solution is clear of particulate matter.
 - Give a specific antidote if this is indicated
 - Keep the child under observation for 4–24 h, depending on the poison swallowed.
 - Keep unconscious children in the recovery position.
 - Consider transferring the child to the next level referral hospital only when appropriate and when this can be done safely, if the child is unconscious or has a deteriorating level of consciousness, has burns to the mouth and throat, is in severe respiratory distress, is cyanosed or is in heart failure.

8.3.4. Principle for management of poisons in contact with skin or eyes

- **Skin contamination:** Remove all clothing and personal effects, and thoroughly clean all exposed areas with copious amounts of tepid water. Use soap and water for oily substances. Attending staff should take care to protect themselves from secondary contamination by wearing gloves and aprons. Remove clothing.
- **Eye contamination:** Rinse the eye for 10–15 min with clean running water or normal saline, taking care that the run-off does not enter the other eye if the child is lying on the side, when it can run into the inner canthus and out the outer canthus. Evert the eyelids and ensure that all surfaces are rinsed. Take ophthalmologist opinion.

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8.3.5. Principle for management of inhaled poisons

- Remove the child from the source of exposure.
- Urgently call for help.
- Administer supplementary oxygen if the child has respiratory distress, is cyanosed or has oxygen saturation $\leq 90\%$.
- Inhalation of irritant gases may cause swelling and upper airway obstruction, bronchospasm and delayed pneumonitis. Intubation, bronchodilators and ventilatory support may be required.

8.3.6. Prevention of poisoning

- Teach parents to keep drugs and poisons in proper containers and out of reach of children.
- Advise parents on first aid if poisoning occurs again.

8.3.7. TREATMENT OF ORGANOPHOSPHORUS POISONING

OP compounds and carbamates are two main classes of insecticides.

Commonly used organophosphates: methyl parathion (metacid) and dichlorovos (nuvan)

They inhibit cholinesterase (AChE) by irreversibly binding to it; accumulation of acetylcholine at the neural synapses; initial over stimulation eventual exhaustion and disruption of neural transmission.

If left untreated OP forms a permanent bond with this enzyme inactivating it. This process, called 'aging' occurs 2-3 days after exposure; weeks to months be required for the body to regenerate inactivated enzymes. *In contrast carbamates form a temporary bond* to the enzyme allowing regeneration over several hours. Symptoms caused by carbamate toxicity are usually less severe than those seen with OP.

(1) ACUTE TOXICITY

The **muscarinic (cholinergic) signs** (caused by Organophosphates and Carbamates) can be remembered by use of one of two mnemonics

SLUDGE/BBB

Salivation, Lacrimation, Urination, Defecation, Garlic odor, Emesis (with Pin-point pupils), Bronchorrhea, Bronchospasm, Bradycardia

DUMBELS

Defecation, Urination, Miosis, Bronchorrhea/Bronchospasm/Bradycardia, Emesis, Lacrimation, Salivation

The **nicotinic effects**: fasciculations

CNS effects (probably through muscarinic and nicotinic receptors in the brain):

Respiratory depression, lethargy, excitability, seizures, coma

(2) INTERMEDIATE SYNDROME (IMS)

IMS occurs 24-96 hours after exposure. It arises between the early **cholinergic** syndrome and late onset peripheral neuropathy. Bulbar, respiratory and proximal muscle weakness is prominent. This resolves in 1-3 weeks.

(3) DELAYED PERIPHERAL NEUROPATHY

Occurs several weeks after exposure. Primarily motor involvement. May resolve spontaneously or result in permanent neurological dysfunction

TREATMENT OF ACUTE TOXICITY

Therapy depends on severity; mildest cases need only observation, aggressive cardiorespiratory support for seriously intoxicated.

Identify the type of ingestion, time interval, current symptoms, amount ingested. Average swallow 5-10 ml (young child) 10-15 (older child).

Protect yourselves with gloves

ABC

Give 100% oxygen, early intubation may be required

Skin decontamination; wash with soap and water twice, remove contaminated clothes.

Gastric lavage: If ingestion within one hour of presentation

- Single dose of activated charcoal 1g/kg (maximum dose 50 gm) is given for gastric lavage. If the patient is vomiting persistently, lavage is not necessary. Ensure that airway is protected.

- Forced emesis is contraindicated because of the risk of aspiration and seizures

Atropine: Specific antidote for muscarinic effects >12 yrs initial dose 1-2 mg; <12 yrs 0.05 mg/kg IV

Repeat the dose every 3-5 minutes until atropinization occurs which is indicated by clearing of bronchial secretions and cessation of wheezing. Do not rely on pupillary changes;

- Maintain atropinization by giving every hour 20-30% of the total amount that was required to atropinize. Maintain full atropinization for 2-3 days. Then atropine dose is daily reduced by 1/3 to ¼ of the dose given on the previous day.
- Continuous intravenous infusion of atropine may be necessary when atropine requirements are massive and the dose is 0.02 to 0.08 mg/kg/hr, depending on the degree and stage of intoxication. Hundreds of milligrams may be needed over several days in severe poisonings
- Signs of improvement after 12-24hrs are indications to begin gradual tapering of atropine doses.
- TACHYCARDIA AND MYDRIASIS ARE NOT CONTRAINDICATIONS TO ATROPINE USE
- Inhaled ipratropium 0.5 mg with parenteral atropine may be helpful for bronchospasm; may repeat 47
- Atropine blocks the acetylcholine receptor and so is effective in both OP and carbamate poisoning.

Pralidoxime: Bound AchE is reactivated by this drug; relieves nicotinic as well as muscarinic effects; should be administered as early as possible in severe poisoning

- >12 yrs 1 - 2 g IV infusion over 30 min; <12 yrs 25 mg/kg over 30 min

- May repeat after 30 minutes or give continuous infusion if severe
- Continuous infusion at 10 mg/kg/hour in children
- If no IV access, give pralidoxime 15 mg/kg IM in children <40 kg (>40 kg- 600mg).
Rapidly
- Repeat as needed to total of 1800 mg or 45 mg/kg in children.
- Pralidoxime should **NOT** be administered without concurrent atropine in order to prevent worsening symptoms due to transient oxime-induced acetylcholinesterase inhibition
It chemically breaks the bond between the OP and the enzyme liberating the enzyme and degrading the OP. Only effective before the bond 'ages' and becomes permanent. Not necessary for carbamate because bond between insecticide and enzyme degrades spontaneously.

Benzodiazepine:

- Diazepam 0.1 to 0.2 mg/kg, repeat as necessary if seizures occur. Do not give phenytoin.
Patient should be observed for 24 hrs after the last dose of atropine.

8.3.8. Snake bite

- Snake bite should be considered in any severe pain or swelling of a limb or in any unexplained illness presenting with bleeding or abnormal neurological signs. Some cobras spit venom into the eyes of victims causing pain and inflammation.

Diagnosis of envenoming

- General signs include shock, vomiting and headache. Examine bite for signs such as local necrosis, bleeding or tender local lymph node enlargement.
- Specific signs depend on the venom and its effects. These include:
 - Shock
 - Local swelling that may gradually extend up the bitten limb
 - Bleeding: external from gums, wounds or sores; internal especially intracranial

- Signs of neurotoxicity: respiratory difficulty or paralysis, ptosis, bulbar palsy
- (difficulty swallowing and talking), limb weakness
- Signs of muscle breakdown: muscle pains and black urine
- Check haemoglobin (where possible, blood clotting should be assessed).

Treatment

First aid

- Splint the limb to reduce movement and absorption of venom. If the bite was likely to have come from a snake with a neurotoxic venom, apply a firm bandage to affected limb from fingers or toes to proximal of site of bite.
- Clean the wound.
- If any of the above signs, transport to hospital which has antivenom as soon as possible. If snake has already been killed, take this with child to hospital.
- Avoid cutting the wound or applying tourniquet.

Hospital care

Treatment of shock/respiratory arrest

- Treat shock, if present (see pages 3, 17 and 18).
- Paralysis of respiratory muscles can last for days and requires intubation and mechanical ventilation or manual ventilation (with a mask or endotracheal tube and bag) by relays of staff and/or relatives until respiratory function returns. Attention to careful securing of endotracheal tube is important. An alternative is to perform an elective tracheostomy.

Antivenom

- If there are systemic signs or severe local signs (swelling of more than half of the limb or severe necrosis), give antivenom, if available.

- Prepare IM epinephrine and IV chlorpheniramine and be ready if allergic reaction occurs (see below).
 - Give monovalent antivenom if the species of snake is known. Give polyvalent antivenom if the species is not known. Follow the directions given on the antivenom preparation. The dose for children is the same as for adults.
 - Dilute the antivenom in 2–3 volumes of 0.9% saline and give intra- venously over 1 hour. Give more slowly initially and monitor closely for anaphylaxis or other serious adverse reactions.
 - If itching/urticarial rash, restlessness, fever, cough or difficult breathing develop, then stop antivenom and give epinephrine 0.01 ml/kg of 1/1000 or 0.1 ml/kg of 1/10,000 solution subcutaneously and IM or IV/SC chlorpheniramine 250 micrograms/kg. When the child is stable, re-start antivenom infusion slowly.
 - More antivenom should be given after 6 hours if there is recurrence of blood incoagulability, or after 1–2 hr if the patient is continuing to bleed briskly or has deteriorating neurotoxic or cardiovascular signs.
- Blood transfusion should not be required if antivenom is given. Clotting function returns to normal only after clotting factors are produced by the liver. Response of abnormal neurological signs to antivenom is more variable and depends on type of venom.
- If there is no reponse to antivenom infusion this should be repeated.
 - Anticholinesterases can reverse neurological signs in some species of snake (see standard textbooks of paediatrics for further details).

Other treatment

Surgical opinion

Seek surgical opinion if there is severe swelling in a limb, it is pulseless or painful or there is

local necrosis.

Surgical care will include:

- Excision of dead tissue from wound
- Incision of fascial membranes to relieve pressure in limb compartments, if necessary
- Skin grafting, if extensive necrosis
- Tracheostomy (or endotracheal intubation) if paralysis of muscles involved in swallowing occurs

Supportive care

- Give fluids orally or by NG tube according to daily requirements (see page 218).
- Keep a close record of fluid intake and output.
- Provide adequate pain relief
- Elevate limb if swollen
- Give antitetanus prophylaxis
- Antibiotic treatment is not required unless there is tissue necrosis at wound site
- Avoid intramuscular injections
- Monitor very closely immediately after admission, then hourly for at least 24 hours as envenoming can develop rapidly.

8.3.9. Near-drowning

Initial assessment should include ensuring adequate airway patency, breathing, circulation and consciousness (ABCs). Check if there are any injuries, especially after diving or an accidental fall. Facial, head and cervical spine injuries are common.

Management

- Give oxygen and ensure adequate oxygenation.
- Remove all wet clothes.
- Use a nasogastric tube to remove swallowed water and debris from the stomach, and when necessary bronchoscopy to remove foreign material, such as aspirated debris or vomitus plugs, from the airway.
- Warm the child externally if the core temperature is > 32 °C by using radiant heaters or warmed dry blankets; if the core temperature is < 32 °C, use warmed IV fluid (39 °C) or conduct gastric lavage with warmed 0.9% saline.
- Check for hypoglycaemia and electrolyte abnormalities, especially hyponatraemia, which increase the risk of cerebral oedema.
- Give antibiotics for possible infection if there are pulmonary signs.

8.3.10. *Electrocution*

- Provide emergency care by ensuring airway patency, breathing and circulatory support.
- Provide oxygen, especially for children with severe hypoxia, facial or oral burns, loss of consciousness or inability to protect the airway, or respiratory distress.
- Assess for traumatic injuries such as pneumothorax, peritonitis or pelvic fractures.
- Begin normal saline or Ringer's lactate fluid resuscitation, and titrate to urine output of at least 2 ml/kg per h in any patient with significant burns or myoglobinuria.
- Consider furosemide or mannitol for further diuresis of myoglobin.
- Give tetanus vaccine as indicated, and provide wound care. Treatment may include early fasciotomy when necessary

POISONING CENTRE NUMBER: 9851038490

8.4. DEVELOPMENTAL DELAY IN CHILDREN

Health care providers may note red flags in developmental milestones that are cause for concern, further monitoring, or referral (Table). In children, certain absent milestones may indicate a developmental delay that is more likely to be long-lasting or to require earlier intervention. Areas that benefit from intervention are particularly important to identify and treat to allow the child the greatest likelihood of healthy development. Studies show that beginning intervention earlier in a child’s developmental course leads to improved outcomes and can improve engagement of a family in the child’s developmental progress.

Parents may also exhibit patterns that are red flags for a child’s development. If a parent is frequently insensitive to an infant’s communication, is unable to recognize the infant’s cues, is easily angered by the infant, or ignores the infant, this may be a sign of difficulty with attachment and family support may be warranted.

The doctor is often the primary support for families in identifying red flags and guiding interventions. Children with unexplained early motor delays or hypotonia may benefit from further evaluation for conditions such as cerebral palsy, muscular dystrophy, or other neuromuscular disorders. Children who exhibit red flags in the areas of social communication can be referred for evaluation for autism spectrum disorders or language concerns. Children with receptive or expressive language delays benefit from a thorough evaluation and treatment by a speech/language pathologist. Children with developmental delay not explained by the medical history may benefit from evaluation by pediatrician.

Table 7.1. Upper limit of age of attainment of milestone

Milestone	Age
Visual fixation or following	2 month
Vocalization	6 month
Sitting without support	10 month
Standing with assistance	12 month
Hands and knees crawling	14 month

Standing alone	17 month
Walking alone	18 month
Single words	18 month
Imaginative play	3 year
Loss of comprehension, single words or phrase at any age	

Adapted from WHO; MGRS group, WHO motor development study. *Acta paediatrica* 2006;450:86-95

Table 7.2 Red flag signs for developmental delay

Time Period	Language/Cognitive	Motor	Social-Emotional
Neonatal period	Infant does not respond to loud sounds.	Muscle tone too low to feed.	Caregiver shows indifference or disinterest in infant.
2 months	Does not alert to voice.	Cannot raise head when prone.	Lack of looking at faces/lack of fixation.
4 months	No cooing or gurgling sounds.	Unable to bring hands to midline.	Lack of smiling.
6 months	Lack of turning toward voices.	Does not pass object from one hand to another.	No smiling, laughing, or expression.
9 months	Lack of babbling with consonants.	Inability to sit. Lack of rolling.	Absence of back-and-forth smiles and vocalizations in “conversation.”
12 months	Child does not respond to name. Does not understand “no”.	Does not stand or bear weight on legs when supported.	Indifferent or resistant attachment to caregiver. Does not look where caregiver points.
15 months	Does not use words such as mama and papa/dada.	No pincer grasp.	Absence of proto-imperative pointing (point to desired object).
18 months	Not using at least 6 words.	Inability to walk independently.	Absence of proto-declarative pointing (point to show interest) or showing gestures.
24 months	Lack of words and two-word meaningful sentences. Inability to follow simple commands.	Inability to walk well.	Does not imitate actions or words of caregivers. Poor eye contact.

Time Period	Language/Cognitive	Motor	Social-Emotional
36 months	Inability to use three-word sentences.	Frequent falling or difficulty with stairs.	Lack of pretend play.
4 years	Unclear speech. Does not answer simple questions. Inability to use pronouns.	Does not jump in place.	Ignores other children.
5 years	Inability to rhyme. Inability to recognize shapes, letters, colors. Resists dressing, sleeping, using the toilet.	Does not draw pictures, a square, or a cross. Poor balance.	Unusually fearful, sad, shy, angry. Does not distinguish between real and make-believe.
Any age	Loss of previously acquired skill.		

8.5 COMMON SURGICAL PROBLEMS

8.5.1 BURNS

Burns and scalds are associated with a high risk of mortality in children. Those who survive may suffer from disfigurement and psychological trauma as a result of a painful and prolonged stay in the hospital

Assessment

Burns may be partial or full thickness. A full thickness burn means the entire thickness of the skin is destroyed, and the skin will not regenerate.

Ask two questions:

1. How deep is the burn?

Full thickness burns are black or white, usually dry, have no feeling and do not blanch on pressure.

Partial thickness burns are pink or red, blistering or weeping, and painful.

2. How much of the body is burnt?

Use a body surface area chart according to age.

Alternatively, use the child's palm to estimate the burn area. A child's palm is approximately 1% of the total body surface area.

Treatment

- Admit all children with burns >10% of their body surface; those involving the face, hands, feet, perineum, across joints; burns that are circumferential and those that cannot be managed as outpatients.
- Consider whether the child has a respiratory injury due to smoke inhalation.

- If there is evidence of respiratory distress, then provide supplemental oxygen.
- Severe facial burns and inhalational injuries may require early intubation or tracheostomy to prevent or treat airway obstruction.
- Fluid resuscitation (required for >10% total body surface burn).
 - Use Ringer's lactate with 5% glucose, normal saline with 5% glucose or half-normal saline with 5% glucose.
 - 1st 24 hours: Calculate fluid requirements by adding maintenance fluid requirements and additional resuscitation fluid requirements (volume equal to 4 ml/kg for every 1% of surface burned)
Administer 1/2 of total fluid in first 8 hours, and remaining in next 16 hours.
Note: The first 8 hours refers to the period from the time of the burn, not the time the patient reached the hospital. And the maximum body surface area of burn taken for fluid calculation is 50%.

Example: 20 kg child with a 25% burn.

$$1. \text{ Resuscitation fluid} = 4 \text{ ml} \times 20 \text{ kg} \times 25\% \text{ burn} \\ = 2000 \text{ ml}$$

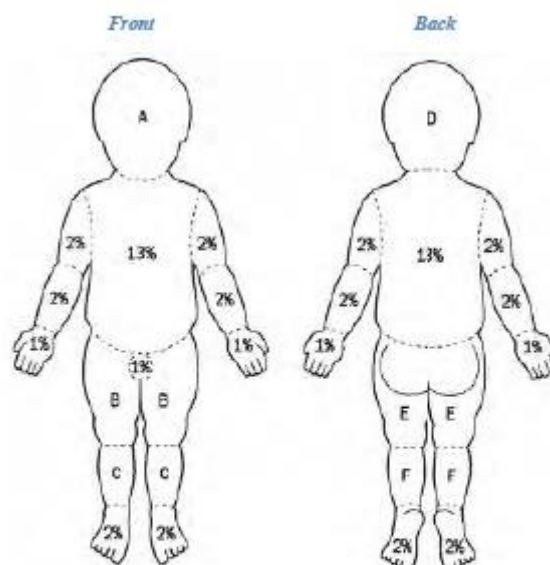
$$2. \text{ Maintenance fluid} = 100 \text{ ml} \times 10 \text{ kg} + 50 \text{ ml} \times 10 \text{ kg} \\ = 1500$$

$$\text{Total fluid requirement} = 2000 + 1500 \text{ ml} \\ = 3500 \text{ ml}$$

Out of this fluid, 1/2 of the fluid i.e. 1750 ml is given over first 8 hrs.

Remaining 1/2 is given over next 16 hours.

- 2nd 24 hours: give 1/2 to 3/4 of fluid required during the first day.
 - Monitor the child closely during resuscitation (pulse, respiratory rate, blood pressure and urine output).
 - Blood may be given to correct anemia or for deep burns to replace blood loss.
- **Prevent infection**
- If skin is intact, clean with antiseptic solution gently without breaking the skin.
 - If skin is not intact, carefully debride the burn. Blisters should be pricked and dead skin removed.
 - Give topical antibiotics/antiseptics (there are several options depending on resources available and these include: silver nitrate, silver sulfadiazine, gentian violet, betadine and even mashed papaya). Clean and dress the wound daily.
 - Small burns or those in areas that are difficult to cover can be managed by leaving them open to the air and keeping them clean and dry



Area	By age in years			
	0	1	5	10
Head (A/D)	10%	9%	7%	6%
Thigh (B/E)	3%	3%	4%	5%
Leg (C/F)	2%	3%	3%	3%

□ **Pain control**

- Make sure that pain control is adequate including before procedures such as changing dressings.
- Give paracetamol (10–15 mg/kg every 6 hours) by mouth or give intravenous narcotic analgesics (IM injections are painful), such as morphine sulphate (0.05–0.1 mg/kg IV every 2–4 hours) if pain is severe.

● **Tetanus Prophylaxis** Check tetanus vaccination status.

- If not immunized give tetanus immune globulin.
- If immunized, give tetanus toxoid booster if this is due.

● **Nutrition**

- Begin feeding as soon as practical in the first 24 hours.
- Children should receive a high calorie diet containing adequate protein, and vitamin and iron supplements.
- Children with extensive burns require about 1.5 times the normal calorie and 2–3 times the normal protein requirements.

● **Burn contractures**

- Burn scars across flexor surfaces contract.

- This happens even with the best treatment (nearly always happens with poor treatment).
 - Prevent contractures by passive mobilization of the involved areas and by splinting flexor surfaces. Splints can be made of plaster of Paris. Splints should be worn at night.
- **Physiotherapy and rehabilitation**
 - Should begin early and continue throughout the course of the burn care.
 - If the child is admitted for a prolonged period, ensure the child has access to toys and is encouraged to play.

8.5.2 Principles of wound care

The goal of caring for any wound is to stop bleeding, prevent infection, assess damage to underlying structures and promote wound healing.

Stop bleeding

- Direct pressure will control any bleeding
- Bleeding from extremities can be controlled for short periods of time (<10 minutes) using a sphygmomanometer cuff inflated above the arterial pressure.
- Prolonged use of tourniquets can damage the extremity. Never use a tourniquet in a child with sickle-cell anaemia.

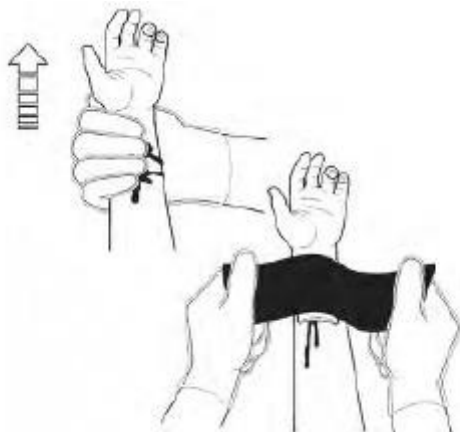


Figure: Controlling external bleeding- Elevate the limb, apply direct pressure, then put a pressure bandage

Prevent infection

- Cleaning the wound is the most important factor in preventing a wound infection. Most wounds are contaminated when first seen. They may contain blood clots, dirt, dead or dying tissue and perhaps foreign bodies.
- Clean the skin around the wound thoroughly with soap and water or antiseptic. Water and antiseptic should be poured into the wound.
- After giving a local anaesthetic such as bupivacaine 0.25% (not to exceed 1ml/kg), search carefully for foreign bodies and carefully excise any dead tissue. Determine what damage may have been done. Major wounds require a general anaesthetic.
- Antibiotics are usually not necessary when wounds are carefully cleaned. However, there are some wounds that should be treated with antibiotics

1. Wounds older than 12 hours (these are likely to be already infected).
2. Wounds penetrating deep into tissue (e.g. a dirty stick or knife wound).

Tetanus prophylaxis

- If not vaccinated, give anti-tetanus serum, if available, and start a course of tetanus toxoid vaccine.
- If the child has had active immunization, give a booster if vaccination status is not current.

Wound closure

- If the wound is less than a day old and has been cleaned satisfactorily, the wound can be closed (called primary closure).
- The wound should not be closed if it is more than 24 hours old, there has been a lot of dirt and foreign material in the wound, or if the wound has been caused by an animal bite.
- Wounds not treated with primary closure should be packed lightly with damp gauze.
- If the wound is clean 48 hours later, the wound can then be closed (delayed primary closure). If the wound is infected, pack the wound lightly and let it heal on its own.

Wound infections

- Clinical signs of wound infections are pain, swelling, redness, warmth and pus drainage from the wound.
- **Treatment of infected wound:**
 - Open wound if pus suspected
 - Clean the wound with disinfectant.
 - Pack the wound lightly with damp gauze. Change the dressing everyday, more frequently if needed.
 - Antibiotics until surrounding cellulitis has resolved (usually 5 days).
 - Give cloxacillin (25–50 mg/kg orally four times a day) for most wounds to deal with Staphylococcus.
 - Give ampicillin (25–50 mg/kg orally four times a day), gentamicin (7.5 mg/kg IM or IV once a day) and metronidazole (7.5 mg/kg three times a day) if bowel flora is suspected

8.5.3 DRAINING ABSCESS

Infection can cause a collection of pus in almost any area of the body.

Diagnosis

- Fever, swelling, tenderness, and fluctuant mass.
- Question what might be the cause of the abscess (e.g., injection, foreign body or underlying bone infection). Injection abscesses usually develop 2–3 weeks after injection.

Treatment

- Incision and drainage
- Large abscesses may require general anesthesia.

□ Antibiotics: cloxacillin (25–50 mg/kg four times a day) for 5 days or until surrounding cellulitis resolved. If bowel flora is suspected (e.g., perirectal abscess): give ampicillin (25–50 mg/kg IM or IV four times a day), gentamicin (7.5 mg/kg IM or IV once a day) and metronidazole (7.5 mg/kg three times a day).

8.5.4 ABDOMINAL PAIN

Children commonly complain of abdominal pain. Not all abdominal pain is caused by gastrointestinal infections. Abdominal pain lasting longer than four hours should be regarded as a potential abdominal emergency.

Assessment

Ask three questions:

- Are there associated symptoms? The presence of nausea, vomiting, diarrhoea, constipation, fever, cough, headache, sore throat or dysuria (pain on passing urine) helps determine the severity of the problem and can help narrow the diagnosis.
- Where does it hurt? Ask the child to point to where it hurts most. This can also help narrow the diagnosis. Periumbilical pain is a nonspecific finding.
- Does the child have peritonitis—inflammation of the lining of the peritoneal cavity? This is a critical question, as most causes of peritonitis in children require operation. Signs of peritonitis include tenderness during palpation, pain in the abdomen when the child jumps or has his pelvis shaken and involuntary guarding (spasm of the abdominal musculature following palpation). A rigid abdomen that does not move with respiration is another sign of peritonitis.

Treatment

- Give the child nothing orally.
- If vomiting or abdominal distension, place a nasogastric tube.
- Give intravenous fluids (most children presenting with abdominal pain are dehydrated) to correct fluid deficits (normal saline 10–20 ml/kg repeated as needed) followed by 150% maintenance fluid requirements
- Give analgesics if the pain is severe (this will not mask a serious intra- abdominal problem, and may even facilitate a better examination).
- Repeat the examinations if the diagnosis is in question.
- Give antibiotics if there are signs of peritonitis. To deal with enteric flora
- (Gram-negative rods, Enterococcus, and anaerobes): give ampicillin (25– 50 mg/kg IM or IV four times a day), gentamicin (7.5 mg/kg IM or IV once a day) and metronidazole (7.5 mg/kg three times a day).

URGENT REVIEW by a surgeon experienced in paediatric surgery.

8.5.5. Pain control

The underlying principles of pain control are:

- give analgesia by mouth, where possible (IM treatment may be painful)
- give it regularly, so that the child does not have to experience the recurrence of severe pain in order to get the next dose of analgesia
- give it in increasing doses, or start with mild analgesics and progress to strong analgesics as the requirement for pain relief rises or tolerance develops
- set the dose for each child, because children will have different dose requirements for the same effect.

Use the following drugs for effective pain control:

1. **Local anaesthetics:** for painful lesions in the skin or mucosa or during painful procedures.

- Lidocaine: apply on a gauze to painful mouth ulcers before feeds (apply with gloves, unless the family member or health worker is HIV-positive and does not need protection from infection); it acts in 2–5 minutes.

2. **Analgesics:** for mild and moderate pain (such as headaches, post-traumatic pain, and pain from spasticity).

- paracetamol
- nonsteroidal anti-inflammatory drugs, such as ibuprofen.

3. **Potent analgesics such as opiates:** for moderate and severe pain not responding to treatment with analgesics.

□ morphine, an inexpensive and potent analgesic: give orally or IV every 4–6 hours, or by continuous IV infusion.

- pethidine: give orally or IM every 4–6 hours
- codeine: give orally every 6–12 hours, combined with non-opioids to achieve additive analgesia.

Note: Monitor carefully for respiratory depression. If tolerance develops, the dose will need to be increased to maintain the same degree of pain relief.

4. **Other Drugs:** For specific pain problems. These include diazepam of muscle spasm, carbamazepine for neuralgic pain, and corticosteroids (such as dexamethasone) for pain due to an inflammatory swelling pressing on a nerve.

8.5.6. SEDATION FOR PROCEDURES




































- For some procedures (e.g. chest tube insertion or femoral cannulation) sedation with diazepam or light anaesthesia with ketamine should be considered
- For diazepam sedation give 0.1–0.2 mg/kg IV. For ketamine light anaesthesia give 2–4 mg/kg IM. This takes 5–10 minutes to act and lasts for about 20 minutes.
- When giving any sedation, manage the child's airway, beware of respiratory depression and monitor oxygen saturation with a pulse oximeter, where possible. Ensure you have a resuscitation bag available (and if possible oxygen).

APPENDIX 1 : NORMAL LABORATORY VALUES

Normal values	Age	Normal value
Hemoglobin(gm/dl)	1 month	10.7-13.9
	2 months	9.4-11.2
	3-6 months	11.1-12.6
	6 months to 2 years	10.5-12
	2-6 years	11.5-12.5
	6-12 years	11.5-13.5
Leukocyte count	1-3 day	9.4-34
	2 week	5-20
	1 mo	4-19.5
	6 mo	6-17.5
	6mo-2yr	6-17
	2-6yr	5-15.5
	6 yr-18yr	4.5-13.5
Differential	Neutrophils	54-62%
	Lymphocytes	25-33%
	Monocytes	3-7%
	Eosinophils	1-3%
	Basophils	0-0.75%
Calcium(total)	Preterm	6.2-11 mg/dl
	Full term < 10 days	7.6-10.4 mg/dl
	10days-24 mo	9-11 mg/dl
	2-12 yrs	8.8-10.8 mg/dl
	Adult	8.6-10 mg/dl
Creatinine	Newborn	0.3-1mg/dl
	<1 year	0.2-0.4 mg/dl
	Child	0.3-0.7 mg/dl
	Adolescent	0.5-1 mg/dl
ESR	Neonate	0-4mm in 1 st hour
	Child	4-20 mm in 1 st hour
Glucose	Neonate	>45mg/dl
	Children	>54 mg/dl
Sodium		135-135meq/dl
Potassium		3.5-5.5 meq/dl
Platelet count		150000-400000 cells/ mm ³
Urea		
MCH(pg/cell)	0-30days	33-39
	1-23 months	24-30
	2-5 yrs	25-31
MCHC(gm Hb/ dl RBC)		32-36
MCV(fL/ RBC)	0-30days	99-115
	1-23 months	72-88
	2-5 yrs	76-90
CRP(mg/L)	0-3 months	0.8-15.8
	3months- 3 years	0.8-11.2
	3-5 years	0.6-7.9

APPENDIX 2 : MODIFIED BALLARD CHART

Neuromuscular Maturity

Score	-1	0	1	2	3	4	5
Posture							
Square window (wrist)	 >90°	 90°	 60°	 45°	 30°	 0°	
Arm recoil		 180°	 140°–180°	 110°–140°	 90°–110°	 <90°	
Popliteal angle	 180°	 160°	 140°	 120°	 100°	 90°	 <90°
Scarf sign							
Heel to ear							

Physical Maturity

Skin	Sticky, friable, transparent	Gelatinous, red, translucent	Smooth, pink; visible veins	Superficial peeling and/or rash; few veins	Cracking, pale areas; rare veins	Parchment, deep cracking; no vessels	Leathery, cracked wrinkled
Lanugo	None	Sparse	Abundant	Thinning	Bald areas	Mostly bald	Maturity Rating
Plantar surface	Heel-toe 40-50 mm: -1 <40 mm: -2	>50 mm, no crease	Faint red marks	Anterior transverse crease only	Creases anterior 2/3	Creases over entire sole	
Breast	Imperceptible	Barely perceptible	Flat areola, no bud	Stippled areola, 1-2 mm bud	Raised areola, 3-4 mm bud	Full areola, 5-10 mm bud	Weeks
Eye/Ear	Lids fused loosely: -1 tightly: -2	Lids open; pinna flat; stays folded	Slightly curved pinna; soft; slow recoil	Well curved pinna; soft but ready recoil	Formed and firm, instant recoil	Thick cartilage, ear stiff	-10
Genitals (male)	Scrotum flat, smooth	Scrotum empty, faint rugae	Testes in upper canal, rare rugae	Testes descending, few rugae	Testes down, good rugae	Testes pendulous, deep rugae	-5
Genitals (female)	Clitoris prominent, labia flat	Clitoris prominent, small labia minora	Clitoris prominent, enlarging minora	Majora and minora equally prominent	Majora large, minora small	Majora cover clitoris and minora	0
							5
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APPENDIX 3 : DEVELOPMENTAL MILESTONES

Age	Gross motor	Fine motor	Language	Social
3month	Supports on forearm in prone	Holds hands open at rest	Cooing	Reaches for familiar objects
6 months	Sits with support	Unilateral reach, transfers object	Babbles	Stranger anxiety
9 months	Crawls, pull to stand	Immature pincer grasp	Says mama, dada indiscriminately	Exploring environment
12 months	Walks alone	Mature pincer grasp	2-4 words with meaning	Comes when called
2 years	Walks up and down steps without help	Imitates stroke with pencil	Uses two word sentences	Parallel play
3 years	Alternate feet when going up, Pedals tricycle	Copies circle	2 word sentences	Knows full name, age, gender
4 years	Hops, alternate feet while going down	Copies a square, catches ball	Knows colors, says song	Plays cooperatively with group of children
5 years	Jumps over low obstacle	Copies triangle	Writes first name	Likes to help in household task

APPENDIX 4: VITAL PARAMETERS

Heart rate

Normal heart rate by Age (beats/minute)		
Reference: PALS Guidelines, 2015		
Age	Normal heart rate(awake)	Normal heart rate(sleeping)
Newborn to 3 months	85-205	80-160
3 months to 2 yrs	100-190	75-160
2 yrs to 10 yrs	60-140	60-90
>10 yrs	60-100	50-90

Respiratory Rate:

Normal Respiratory Rate by Age (breaths/minute)	
Reference: PALS Guidelines, 2015	
Age	Normal Respiratory Rate
Infants (< 1 y)	30-53
Toddler (1-2 y)	22-37
Preschool (3-5 y)	20-28
School-age (6-11 y)	18-25
Adolescent (12-15 y)	12-20

Blood Pressure

Normal Blood Pressure by Age (mmHg)			
Reference: PALS Guidelines, 2015			
Age	Systolic Pressure	Diastolic Pressure	Systolic Hypotension
Birth (12 h, <1000 g)	39-59	16-36	< 40-50
Birth (12 h, 3 kg)	60-76	31-45	< 50
Neonate (96 h)	67-84	35-53	< 60
Infant (1-12 mo)	72-104	37-56	< 70
Toddler (1-2 y)	86-106	42-63	< 70 + (age in years x 2)
Preschooler (3-5 y)	89-112	46-72	< 70 + (age in years x 2)
School age (6-9 y)	97-115	57-76	< 70 + (age in years x 2)

Preadolescent (10-11 y)	102-120	61-80	< 90
Adolescent (12-15 y)	110-131	64-83	< 90

Temperature

Normal Temperature Range by Method	
Reference: CPS Position Statement on Temperature Measurement in Pediatrics, 2015	
Method	Normal Range (°C)
Rectal	36.6-38
Ear	35.8-38
Oral	35.5-37.5
Axillary	36.5-37.5

APPENDIX 5: APPROPRIATE SIZES OF PEDIATRIC EQUIPMENT ACCORDING TO AGE (WEIGHT) OF CHILD

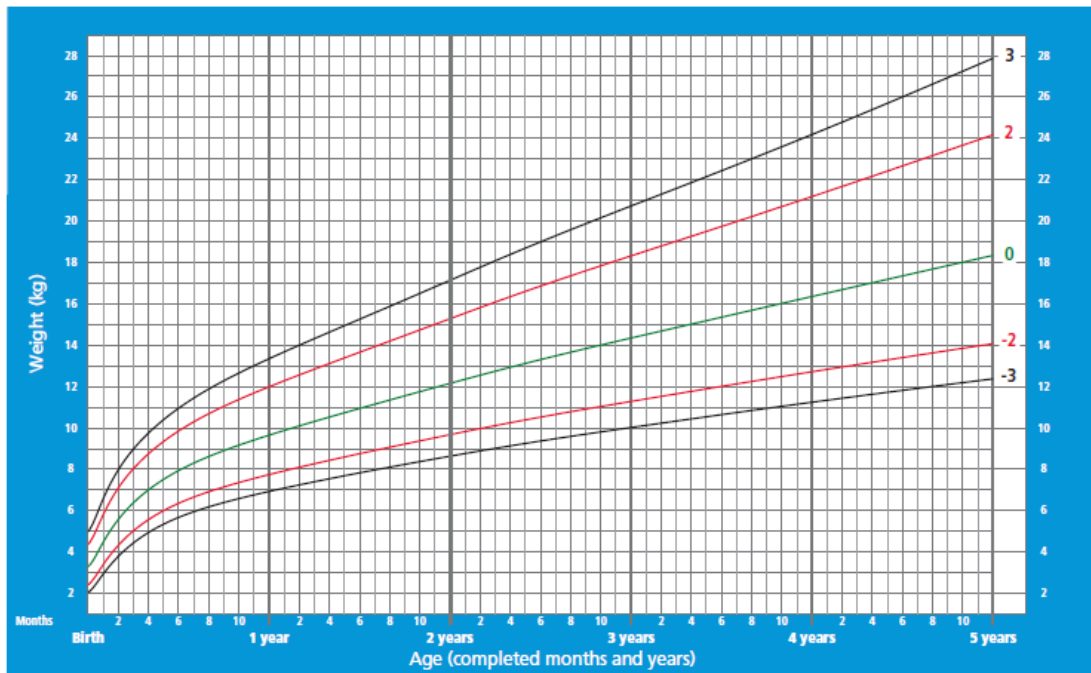
Equipment	Preterm	0-5 months(3-6 kg)	6-12 months (4-9 kg)	1-3 years (10-15 kg)	4-7 years (16-20 kg)
Suction catheter(Fr)	5	6- 10	8-10	8-10	10
IV cannula(gauze)	24	22-24	20-24	18-22	18-20
Nasogastric tube(Fr)	5	5-8	8-10	10	10-12
Urinary catheter	5 Feeding tube	5 feedingtube	5 feeding tube/F8	Foley 8	Foley 10
Lumbar puncture needle	26 G needle	24 G needle	24 G needle	23-24G needle/ 25 G spinal needle	22 G needle/ 25 G spinal needle
Chest tube (fr)	8-10	12-16	16	16	16-20

Sizes in French gauge or Charriere, which are equivalent and indicate the circumference of the tube in millimeters.

APPENDIX 6 : GROWTH CHART

Weight-for-age BOYS

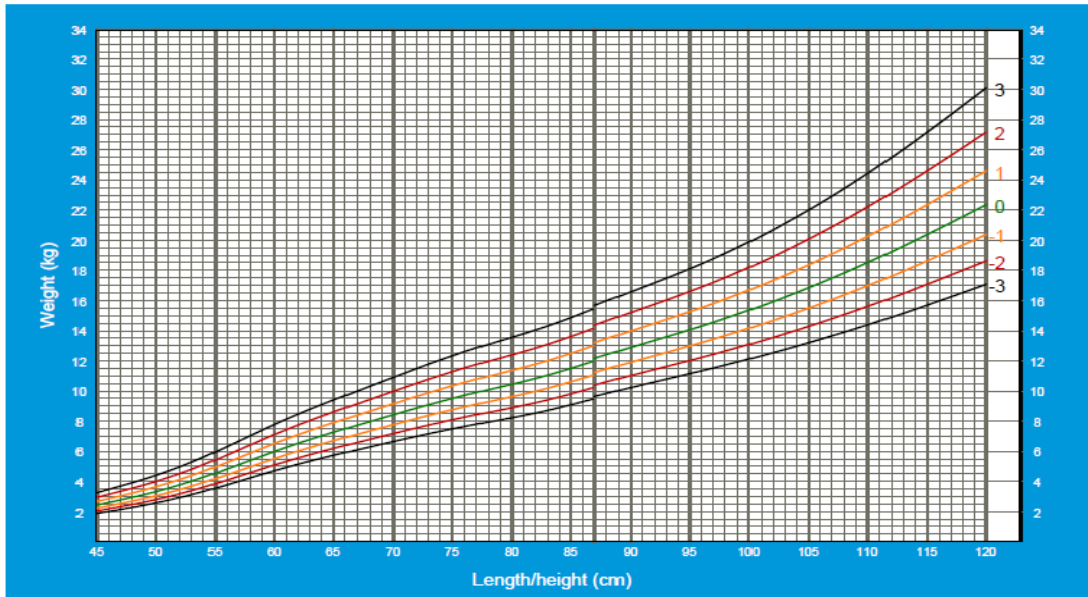
Birth to 5 years (z-scores)



WHO Child Growth Standards

Weight-for-length/height BOYS

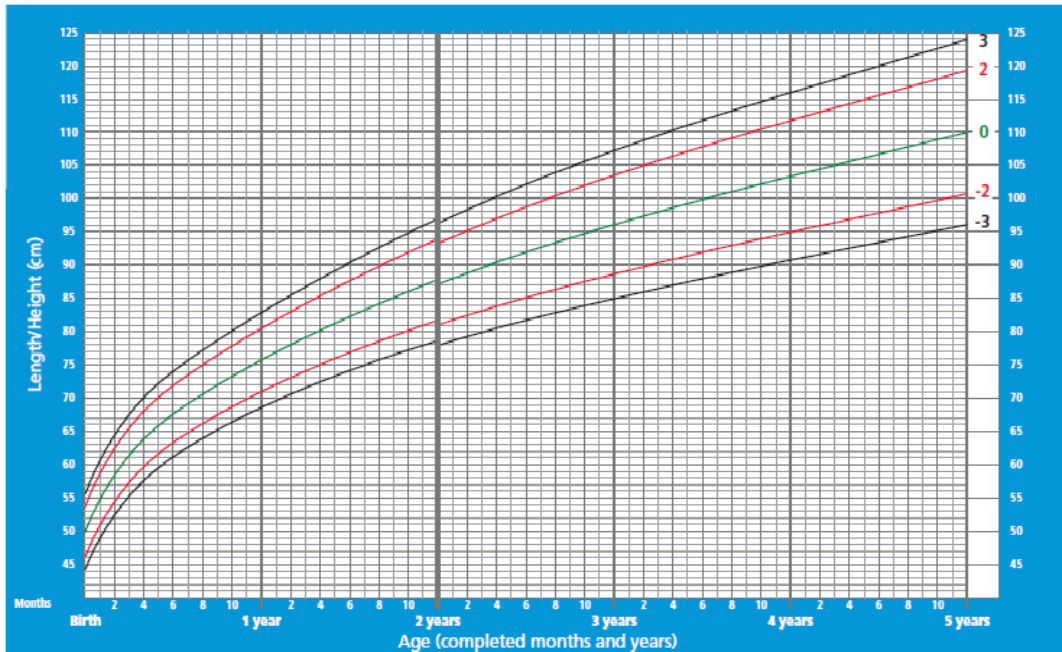
Birth to 5 years (z-scores)



WHO Child Growth Standards

Length/height-for-age BOYS

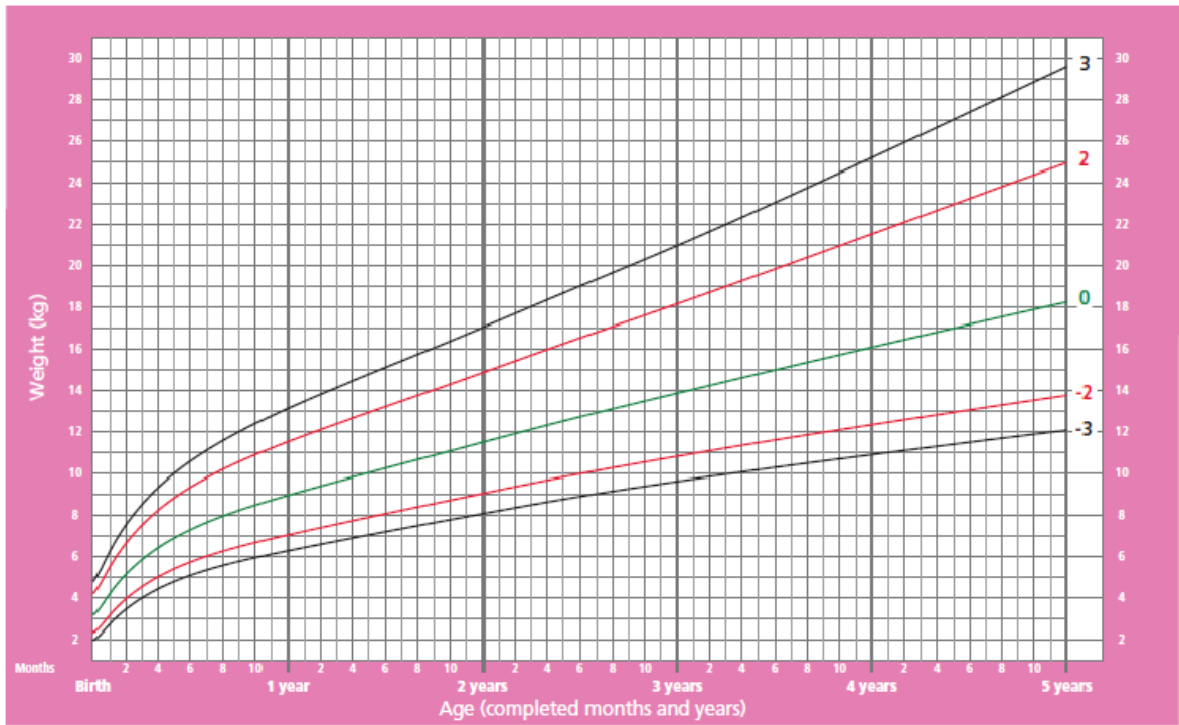
Birth to 5 years (z-scores)



WHO Child Growth Standards

Weight-for-age GIRLS

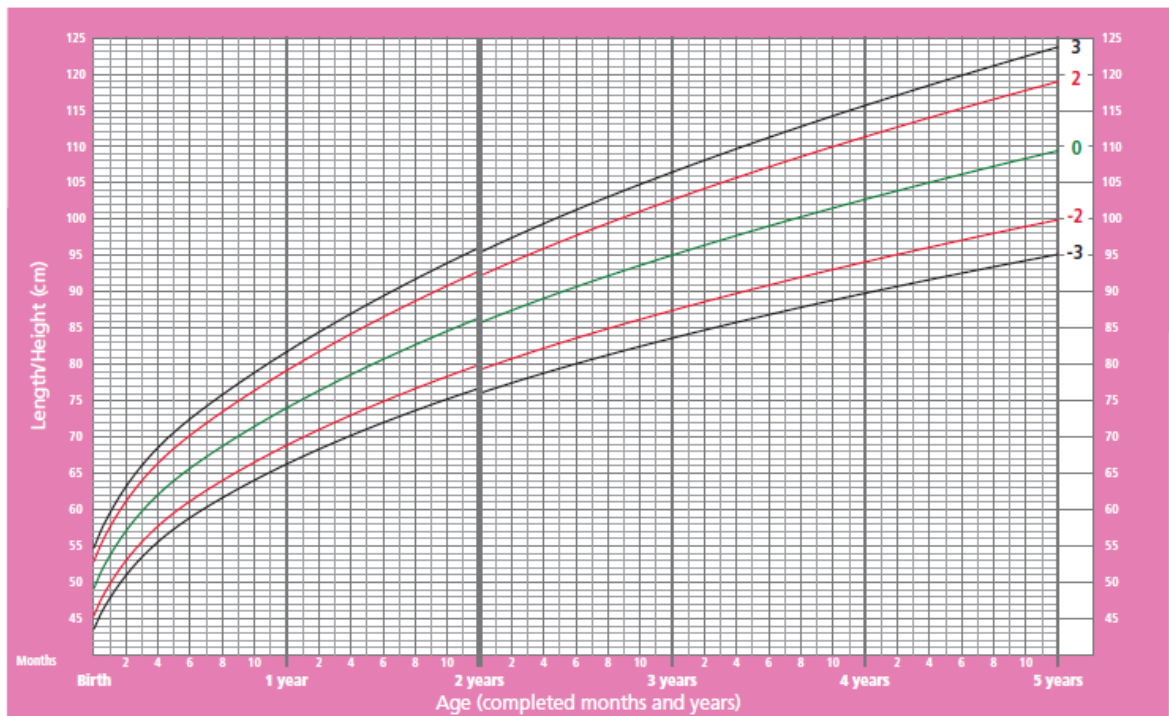
Birth to 5 years (z-scores)



WHO Child Growth Standards

Length/height-for-age GIRLS

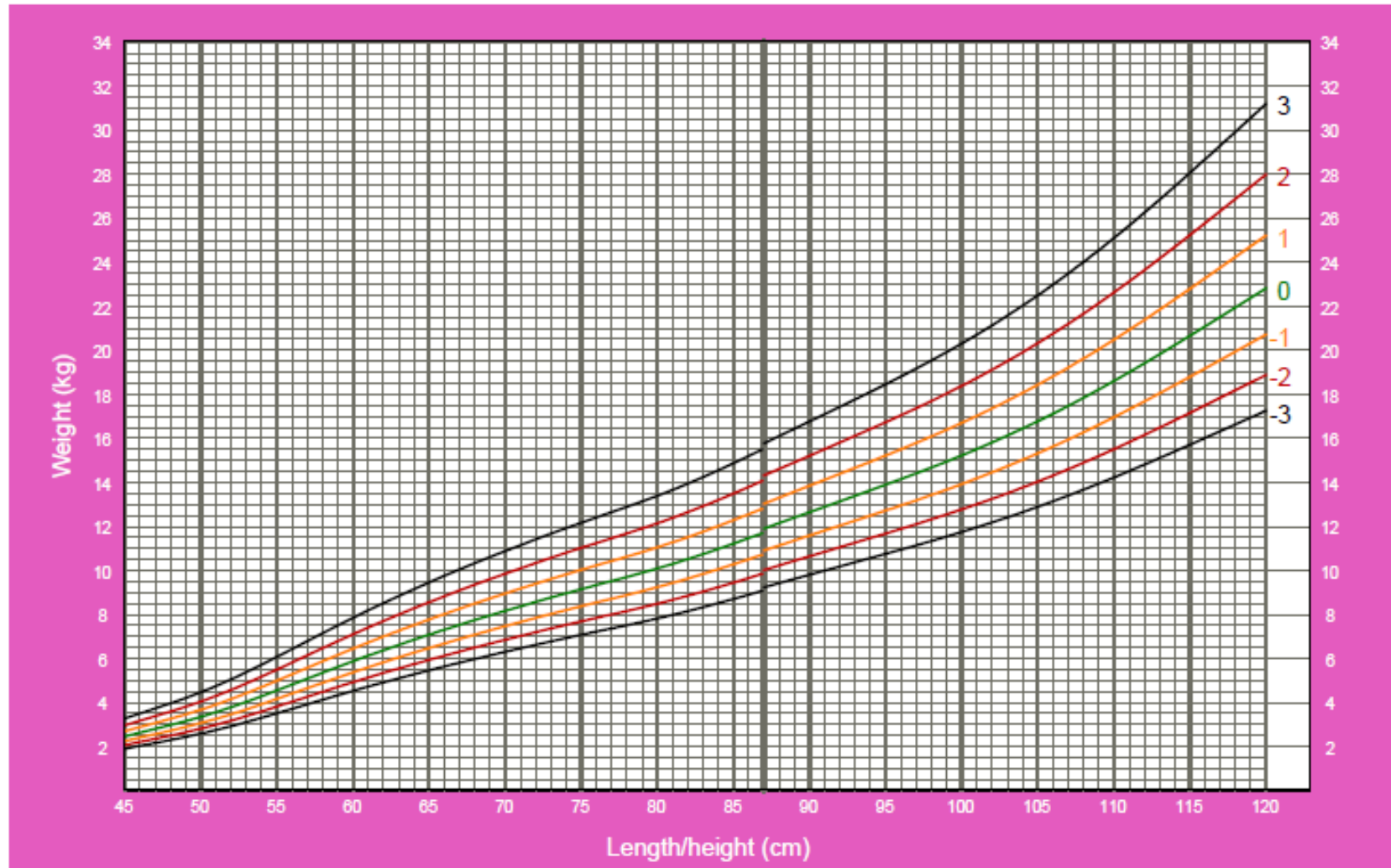
Birth to 5 years (z-scores)



WHO Child Growth Standards

Weight-for-length/height GIRLS

Birth to 5 years (z-scores)



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ANNEX 6: DRUG DOSES

Drugs	Route(Concentration)	Doses	Remarks	3-<6kg	6-<10kg	10-<15kg	15-<20 kg	20-<29kg
10% dextrose for hypoglycaemia	IV/ Oral	5 ml/kg	Start feed. Repeat glucose test after 30 mins					
Dopamine	IV infusion(200mg/5ml)	5-20 mcg/kg/min	See chapter for shock					
Calcium gluconate (10%)	IV	1 ml/kg	Can be diluted with normal saline. Give slowly over 15 mins					
Midazolam	IV(5mg/5ml)	0.1-0.2mg/kg	Repeat after 5 mins Watch for respiratory depression	0.5	1	1.5	2	2.5
	Intranasal(5mg/ml)	0.3mg/kg		1.5	3	4.5	6	7.5
Diazepam	IV(10mg/2ml)	0.25mg/kg(0.05ml/kg)	Give slowly over 1 minute Repeat after 10 mins Watch for respiratory depression	0.2	0.4	0.6	0.8	1
	PR(10mg/2ml)	0.5mg/kg(0.1ml/kg)	Repeat after 10 mins Watch for respiratory depression	0.4	0.8	1.2	1.6	2

Drugs	Route(Concentration)	Doses	Remarks	3-<6kg	6-<10kg	10-<15kg	15-<20 kg	20-<29kg
Salbutamol	MDI(100mcg/puff)	2 puff		2 puff	2 puff	2 puff	2	2 puff
	Nebulisation(500mcg/ml)	<14kg- 0.5 ml ≥14 kg- 1 ml	Dilute in NS to make 3 ml solution	0.5	0.5	0.5	1	1
	Syrup(2mg/5ml)	0.15mg/kg thrice a day		1.5ml	2.5ml	5	7.5ml	10ml
	Tablets 2mg			¼	½	1	1 1/2	2
	Tablets 4 mg				1/8	½	¾	1
Ampicillin	IV	50 mg/kg four times a day	Vial of 500 mg mixed with 2.1ml sterile water to give 50 mg/2.5 ml	1ml	2 ml	3 ml	5 ml	6 ml
Gentamicin	IV/IM	7.5mg/kg once a day	Vial containing 80 mg(2ml at 40mg/ml) 500mg/ml	0.5-0.9ml	1.1-1.7ml	1.9-2.6ml	2.8-3.5ml	3.75-5.4ml

Drugs	Route(Concentration)	Doses	Remarks	3-<6kg	6-<10kg	10-<15kg	15-<20 kg	20-<29kg	
Amikacin	IV/IM	15 mg/kg once a day							
Ceftriaxone	IV/IM	40-50 mg/kg two time a day (maximum dose 4 gm) Can be given once a day	Higher doses in meningitis Vial of 1g mixed with 9.6 ml sterile water to give 1g/10ml Vial of 2g mixed with 19 ml of sterile water to give 2g/20ml	2-3	4-6	6-10	9-14	12.5- 20	
Cefotaxime	IV/IM	25-50 mg/kg four times a day	Higher doses for meningitis Vial of 500mg mixed with 2ml sterile water or Vial of 1g mixed with 4 ml of sterile water or Vial of 2g mixed with 8 ml of sterile water to give 250mg/ml	0.5-1	1-2	2-3	3-4	4-6	
Cloxacillin	IV	25-50 mg/kg four times a day(50mg/kg in brackets) Maximum dose 4 g	Vial of 500 mg mixed with 8 ml sterile water to give 500mg/10ml Vial of 250mg mixed with 1,3 ml sterile water to give 250mg/.5ml	2(4)ml 0.6(1.2) ml	4(8)ml 1(2)ml	6(12)ml 1.8(3.6)ml	8(16)ml 2.5(5)ml	Cloxacillilin	IV

Drugs	Route(Concentration)	Doses	Remarks	3-<6kg	6-<10kg	10-<15kg	15-<20 kg	20-<29kg
	Syrup 250mg/5 ml	25-50mg/kg four times a day		5 ml	7.5 ml	12.5ml	17.5ml	25ml
	Tab 250 mg			½	¾	1 ½	2	2 ½
Paracetamol	Oral(120mg/5ml)	10-15 mg/kg four to six times daily		2ml	4ml	6ml	10ml	12.5
	Tablet 500 mg				1/8	¼	½	¾
Amoxicillin	Syrup- 125/5ml	40 mg/kg per dose twice a day		5ml	10ml	15ml	20	30
	Dispersible tablets- 250 mg			½	1	1 ½	2	3
	Dispersible tablets 125 mg			1	2	3	4	6
Prednisolone	Oral	1mg/kg twice daily	10mg tablet	½	¾	1	1.5	2.5

Drugs	Route(Concentration)	Doses	Remarks	3-<6kg	6-<10kg	10-<15kg	15-<20 kg	20-<29kg
Hydrocortisone	IV- 100mg/ml . Dilute in 4 ml WFI 20mg/ml	Asthma- 10 mg/kg stat then 5 mg/kg four times a day Anaphylaxis- 2.5 mg/kg four times a day	<6 months- 25 mg 6mo-5yrs- 50 mg	2ml 1ml	4ml 2ml	6 3	9 4.5	12 6
Adrenaline	Nebulisation(1:1 000)	2 ml in 2 ml NS		2ml	2ml	2ml	2ml	2ml
	SC/IM- Give exact dosing	0.01ml/kg/dose (max- 0.3ml)	Asthma – SC Repeat every 5-15 mins to 4 hourly till 3-4 doses Anaphylaxis- IM/SC Repeat every 20 mins till 3-4 doses					
Ipratropium bromide	Nebulisation(500 mcg/2.5ml)	250mcg/dose 6 hourly		1 ml	1ml	1ml	1ml	1ml

Drugs	Route(Concentration)	Doses	Remarks	3-<6kg	6-<10kg	10-<15kg	15-<20 kg	20-<29kg
Cetirizine	Syrup- 1mg/ml	6 mo- 1 yrs- 2.5ml OD 1-5yrs- 2.5ml OD to BD			2.5	2.5-5	5	10
	10 mg				1/4	¼-1/2	1/2	1
Fexofenadine	Syrup- 30 mg/5ml	6 mo-<2yr- 2.5ml BD 2-5 yrs- 5 ml BD			2.5	2.5-5	5	5
Chlorpheniramine	4mg	2-5 yrs- 1mg/dose 4-6 hourly			1/4	1/4	¼-1/2	½
Mannitol(20%)	IV- 200 mg/ml	5 ml/kg stat followed by 2 ml/kg 6 hourly	BP should be maintained prior to mannitol If crystallise in low temperature, warm by dipping in warm water	0.1 0.05	0.2 0.1	0.3 0.1	0.4 0.2	0.6 0.3

Drugs	Route(Concentration)	Doses	Remarks	3-<6kg	6-<10kg	10-<15kg	15-<20 kg	20-<29kg
Furosemide	IV- 10mg/ml	1-2 mg/kg 6-12 hourly	BP should be maintained prior to furosemide	0.4-0.8	0.8-1.6	1.2-2.4	1.7-3.4	2.5-5
	Tablet 40 mg			1/8-1/4	¼-1/2	½-3/4	¾-1	1 ½
Phenytoin	IV- 50mg/ml	IV-15-20 mg/kg loading dose followed by 3-4mg/kg/dose maintenance IV/PO twice daily	Loading dose should be diluted in 50-100 ml NS and given over 20 mins Maintenance dose can be dissolved in 10 ml NS and given over 10 mins Do not dissolve in dextrose containing solutions	1.5 ml 0.3ml	2.7ml 0.5ml	4ml 0.8ml	6ml 1.3ml	8ml 1.6ml
	Tab 50 mg			¼	½	¾	1 ¼	1
Phenobarbitone	IV or IM(200mg/ml)	15-20 mg/kg loading dose. Additional 5 mg/kg/dose upto 30 mg/kg followed by 3-4mg/kg/day twice daily IV or PO	Loading dose should be given over 20 mins	0.4	0.6	1ml	1.5	2ml
				0.1	0.15	0.3	0.4	0.6
				0.1	0.15	0.3	0.4	125
				0.1	0.1	0.2	0.3	0.4
	Tab 30 mg			½	2	1 ½	2	3

Drugs	Route(Concentration)	Doses	Remarks	3-<6kg	6-<10kg	10-<15kg	15-<20 kg	20-<29kg
Atropine	IV(0.6mg/ml)	OP poisoning- 0.05 mg/kg every 3-5 mins till clearing of secretions and cessation of wheezing Maintaince- 20- 30% of total atropinizing dose/hour for 2- 3 days. Then reduce by 1/3 to ¼ dose given on previous days if asymptomatic 1 drop three times a day		0.4	0.6	1	1.5	2
	Eye drops							
Pralidoxime	IV	25 mg/kg twice daily for 2 days	Given over 30 mins					

Drugs	Route(Concentration)	Doses	Remarks	3-<6kg	6-<10kg	10-<15kg	15-<20 kg	20-<29kg
Doxycycline	Tab 100 mg	Cholera 2-4 years 50 mg stat			1/8	1/21/4	1/21/2	13/4
		4-5 years 100 mg stat						
		Typhus 2.2 mg/kg twice daily						
Ciprofloxacin	IV 2 mg/ mL	10mg-15/kg/dose twice daily	Higher doses in enteric fever	30ml- 40ml	40ml-70 ml	70ml- 100ml	100-140	140-200
	Tablet 250 mg			¼	½	¾	1	1 ½
	Tablet 100 mg			½	1	1 ½	2	3
	Eye drop	1 drop 2-3 hourly	Keratomalacia					
	Ear drop	2 drops two times a day	CSOM					
Ofloxacin	IV(2mg/ml)	IV - 5- 7.5mg/kg/dose twice daily	Higher doses in enteric fever	12-20ml	22-35ml	35-50ml	5-750ml 15-20	65-80ml
		PO-7.5- 10 mg/kg/dose twice daily						
	Syrup 10mg/ml			3.5-5ml	7.5-9ml	10-14ml	15-20ml	20-28ml
	Tablet 200 mg DT			1/8- 1/4	¼- 1/2	½-3/4	¾-1	½

Drugs	Route(Concentration)	Doses	Remarks	3-<6kg	6-<10kg	10-<15kg	15-<20 kg	20-<29kg
Azithromycin	Syrup 200mg/5ml	Enteric fever- 10mg/kg/dose twice daily Pertusis- 10mg/kg stat then 5 mg/kg for 4 days		1ml	2ml	3.5	4.5	6
				1ml then 0.5ml	2 ml then 1 ml	3.5 ml then 1.5ml	4.5 ml then 2.5 ml	6 ml then 3 ml
	500 mg			1/8	¼ then 1/8	¼ then 1/8	½ then ¼	½ then ¼
Erythromycin	Tablet- 250mg	Diphtheria, Pertusis- 12.5mg/kg/dose four times daily		¼	½	¾	1	1 ½
	Syrup 125mg/ 5 ml			2.5	5	7.5	10	15
Cefixime	Tablet- 100 mg	Dysentery, UTI- 5mg/kg/dose twice daily Enteric fever- 10mg/kg/dose twice daily		¼	½	¾	1	¼
				½	1	1 1/2	2	2½
	Syrup- 100 mg/5ml			MI 3	2.5 5	4 7.5	5 10	7.5 15

Drugs	Route(Concentration)	Doses	Remarks	3-<6kg	6-<10kg	10-<15kg	15-<20 kg	20-<29kg
Metronidazole	IV- 500mg/100ml	Amoebiasis, Giardiasis- 15 mg/kg/dose three times daily Oral ulcers- 7.5 mg/kg/dose three times daily(half of above dose)		10 ml	20ml	40ml	40ml	50ml
	Syrup- 200 mg/5ml				2.5	5	5	10
	Tablet- 200 mg				½	1	1	2
	Tablet- 400 mg				¼	½	½	1
Vitamin A	Capsule	< 6 months = 50,000 IU	Stat for prophylaxis If feature of Vitamin A deficiency present repeat doses on next day and 2- 4weeks later	¼-1/2	½-1	1	1	1
	200000IU	6 - 12 months = 1,00,000 IU		1/2	1-2	2	2	2
	100000IU	>12 months &<8 kg = 1,00,000 IU		1	2-4	4	4	4
	50000IU	>12 months &> 8 kg = 2,00,000 IU						

Drugs	Route(Concentration)	Doses	Remarks	3-<6kg	6-<10kg	10-<15kg	15-<20 kg	20-<29kg
Folic acid	Oral	5 mg stat then 1 mg(1/4 th tab of 5mg) once a day						
Multivitamin	Oral							
Iron	Oral 920 mg/ml of elemental iron)	Iron deficiency anemia- 3 mg/kg/dose twice daily Prophylaxis- 1.5 mg/kg/dose twice daily	Continue 3 months following normalization of haemoglobin In iron deficiency anemia	1ml	1,25ml	2ml	2.5ml	4ml
Chloramphenicol	IV/IM	25 mg/kg/dose three to four times daily Maximum 1 gm/dose	Use four times per day IV doses for meningitis and cholera Vial of 1 g mixed with 9.2ml sterile water to give 1g/10ml	0.75-1.25ml	1.5-2.25ml	2.5-3.5ml	3.75-4.75ml	5-7.25ml
	Syrup 125mg/5ml			3-5 ml	6-9 ml	10-14 ml	15-19 ml	-
	Tablet 250 mg			-	-	1	1 ½	2

Drugs	Route(Concentration)	Doses	Remarks	3-<6kg	6-<10kg	10-<15kg	15-<20 kg	20-<29kg
Cotrimoxazole	Tablet- 480mg	4 mg/kg of trimethoprim equivalent twice daily Double dose in Interstitial pneumonia in HIV- 8mg/kg TMP three times a day	Avoid in jaundiced and premature neonates	¼(1/2)	½(1)	1(2)	1(2) 3(6) 8.5ml(17)	1(2) 4(8) 10ml(20)
	Tablet 120 mg			1	2	3	3	4
	Syrup 240 mg/5ml			2 ml	3.5 ml	6 ml	8.5 ml	10 ml
Tetracycline	Eye ointment	Thrice a day						
Gentian violet(0.5%)	Mouth paint	Four times a day						

Drugs	Route(Concentration)	Doses	Remarks	3-<6kg	6-<10kg	10-<15kg	15-<20 kg	20-<29kg
Amoxicillin Clavulanic acid	Oral liquid: 125 mg amoxicillin + 31.25 mg clavulanic acid/5 mL AND 250 mg amoxicillin + 62.5 mg clavulanic acid/5 MI	ASOM- 30 mg/kg/dose three times a day		4ml	6ml	10ml	15ml	20ml
Ceftazidime	IV	CSOM due to pseudomonas- 50mg/kg/dose three times daily						
Artesunate			See Chapter of malaria					
Quinine			See Chapter of malaria					
Artemether			See Chapter of malaria					

Drugs	Route(Concentration)	Doses	Remarks	3-<6kg	6-<10kg	10-<15kg	15-<20 kg	20-<29kg
Artemether/ Lumetantrine(ACT)			See Chapter of malaria					
Chloroquine			See Chapter of malaria					
Primaquine			See Chapter of malaria					
Albendazole	Oral	1-2 years- 200 mg >2 years- 400 mg						
Magnesium sulphate(50%)	IM 0.5g/ mL in 2- mL ampoule	Malnutrition 0.3 ml/kg upto 2 ml						
Potassium chloride	Oral(20 meq/15 ml)	Malnutrition- 0.75-1meq(0.5-0.75ml)/kg/day in four divided doses		3.5ml	6.5ml	10	14	20

Drugs	Route(Concentration)	Doses	Remarks	3-<6kg	6-<10kg	10-<15kg	15-<20 kg	20-<29kg
Zinc	Oral	Malnutrition- 2 mg/kg/day Diarrhoea- <6 months- 10 mg 6 months-5 years- 20 mg		10 mg	15mg	25 mg	35mg	50mg
Ketamine for anaesthesia in major procedure	IM	Loading dose- 5-8 mg/kg Further dose 1-2mg/kg(if required)	Calculate exact dose acc to body weight	20-35 mg 5-10 mg	40-60 mg 8-15 mg	60-100 mg 12-25 mg	80-140mg 15-35mg	125-200 mg 25-50mg
	IV	Loading dose 1-2 mg/kg Further dose- 0.5-1 mg/kg(if required)		5-10mg 2.5-5mg	8-15mg 4-8mg	12-25mg 6-12mg	15-35mg 8-15mg	25-50mg 12-25mg
Ketamine for light anaesthesia in minor procedures	IM	2-4 mg/kg						
	IV	0.5-1mg/kg						

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