Emergency Triage Assessment and Treatment (ETAT + Ethiopia)

Manual for Participants

Ethiopia

Federal Democratic Republic of Ethiopia
Ministry of Health

Emergency Triage Assessment and Treatment (ETAT + Ethiopia)

Manual for Participants

Ethiopia

May, 2014

Acknowledgements

This first edition of Emergency Triage Assessment and Treatment Plus Ethiopia (ETAT + Ethiopia) adapted from the WHO generic ETAT material (2005) through the technical and financial assistance of WHO/Ethiopia and with the support and input of many experts in the field. Great effort has been made to harmonize each chapter of the training manual to with the existing national care and treatment guidelines. It is our strong belief that this guideline will contribute significantly to the efforts being made to improve quality of Pediatric care for children with acute problems.

The Federal Ministry of Health (FMOH) of Ethiopia is very grateful for the all rounded support of WHO/Ethiopia and the commitment and devotion shown by the Child Health Team of the country office for the accomplishment of this work.

We would like to sincerely acknowledge the remarkable contribution of Dr. Mehretie Kokeb and Dr. Tigist Bacha who served as consultants in the adaptation of the generic WHO ETAT guideline.

The FMOH gratefully acknowledges the technical contribution of all professionals who were involved in the development of this national ETAT+ Ethiopia guideline particularly the following experts: Dr. Amha Mekasha, Prof. Bogale Worku, Dr. Berhanu Gudeta, Dr. Sirak Hailu, Dr. Solomon Emyu, Dr. Wegen Shiferaw, Dr. Amezene Tadesse, Dr. Muluwork Tefera, Dr. Yiheyis Feleke Dr. Mesfin Zerfu, Dr. Loko Abraham, Dr. Temesgin Tsega, Dr. Zemene Tigabu, Dr. Netsanet Workneh, Dr. Lisanu Tadesse, Dr. Gezahagn Nekatibeb and Mohammedamin Adem.

Special thanks go to Salem Fisseha and Tewodros Emiru of CHAI Ethiopia for their technical assistance in editing and formatting of the material.

Finally, the Ministry of Health would like to recognize all the program managers and technical staff in the Medical Services Directorate who contributed to the finalization of the document.

Design: Tewodros Emiru, Clinton Health Access Initiative *(Design is Based on Emergency Triage Assessment and Treatment (ETAT) Facilitator Guide and Manual for participants - Publications of the World Health Organization.)*

Table of Contents

Acknowledgements IV
Table of Contents V

Introduction 1
Learning objectives of the training course 2

Module One: Triage and the "ABCDO" Concept 3
The ABCDO concept 4
Emergency signs include: 4
Priority signs 5
The triaging process 5
Who Should Triage? 9
How to Triage? 9
Assessing priority signs 10
Tiny infant (less than two months of age) 10
Temperature: hot/cold (fever – high/low Temperature) 11
Trauma (or other urgent surgical condition) 11
Poisoning 11
Severe Pain 11
Lethargy or Irritable and Restless 11
Respiratory distress 11
Urgent Referral 12
Severe wasting (Severe Malnutrition) 12
Oedema of both feet 12
Burn 12
General Treatment for Priority Signs 13
The Need for Frequent Reassessment 13
Assessment Questions: Triage 14

Module Two: Airway and Breathing 17
Assessment of the Airway 18
Management to open the airway 19
Simple techniques to open the airway 19
Advanced intervention 19
Maneuvers to open the airway 19
Manage Anatomic obstruction (hypo pharyngeal tissue blocking the airway). 19
Chin lift and head tilt 20
Jaw trust 20
Log roll 21

Insertion of an Oropharyngeal (Guedel) Airway 22
Infant 22
Child 22
Management of foreign body aspiration (a choking child) 23
Management of young infant with foreign body aspiration (see Figure 15) 23
Management of child with foreign body (see Figure 16) 24
Assessment of breathing 24
Is the Child Breathing? 24
Ventilate with Bag and Mask 25
Does the Child Show Central Cyanosis? 26
Give Oxygen 26
Sources of oxygen to treat hypoxemia 27
Oxygen Delivery 27
Assessment Questions: Airway and Breathing 30
Module Three: Circulation 33
Does the Child have Warm Hands? 34
Is the Capillary Refill Time ≥ 3 Seconds? 34
Is the Pulse Weak and Fast? 35
Shock 35
Treatment of Shock 36
Stop any bleeding 36
Give oxygen 36
Make sure the child is warm 36
Select an appropriate site for administration of fluids 36
Give intravenous fluid 36
Assessment Questions: Circulation 40
Module Four: Coma and convulsion 43
Assess the child for coma and convulsion 43
Is the Child in Coma? 43
Is the Child Convulsing Now? 45
Treatment of coma and convulsion 45
Manage the Airway 45
Coma 45
Convulsion 45
Position the Child 46
Coma 46
Convulsion 46
Check the Blood Sugar 46
Coma and convulsion 46
Give IV Glucose 47
Coma and convulsion 47
Give an Anticonvulsant 48
Convulsion 48
Assessment Questions: Coma and convulsion 50
Module Five: Dehydration 53
Does the Child Have Diarrhoea? 53
Is the Child Lethargic? 54
Does the Child have Sunken Eyes? 54
Is the Child Unable to Drink? 54
Treatment of severe dehydration in an emergency setting 55
Severe Dehydration (Without Shock or Severe Malnutrition) 55

Give oral fluids 56
Give Fluids by Intraosseous if Setting an IV Line is Not Possible. 56
Dehydration in Severely Malnurshed child 58
Assessment Questions: Dehydration 60
Module Six: Cardiopulmonary Resuscitation in the Newborn and Children 65
Cardiopulmonary Resuscitation (CPR) 65
Introduction: 65
Management of cardiac arrest 65
Deciding to Terminating Resuscitative Efforts: 67
Neonatal resuscitation 69
Drying and keeping the baby warm 69
Airway 69
Breathing 69
Circulation 70
Drugs 70
Post resuscitation stabilization 70
Cessation of resuscitation 70
Assessment Questions: Cardiopulmonary Resuscitation and Neonatal Resuscitation 73
Module Seven: Common Respiratory Emergencies in Children 75
What is stridor? 75
What is Croup? 75
Clinical Manifestations 76
How do you manage croup? 76
Wheezing in Children 76
What is asthma? 77
Rapid Acting Bronchodilators: 77
Assessment Questions: Child presenting with stridor 79
Assessment Questions: Wheezing 80
Module Eight: Pediatric Trauma 81
Evaluation of trauma patients 81
Primary survey 81
A - Airway maintenance with cervical spine protection 82
Is the airway open? 82
B - Is the breathing normal? 82
C - Assess Circulation 82
Management of Circulation 83
$C_{m,n}$ – Assess consciousness (C_m)and Convulsion (C_n) 83
D_s - Disability 83
O - Assess for other emergencies (abnormalities) 83
Adjuncts to primary survey: 83
Secondary survey 83
Common Conditions Presenting with Trauma: 84
Assessing the Child with Head Trauma 84
Overview of pediatric head trauma 84
Classification of Head Injuries 84
Management of Head Injury 84
Airway & Breathing management: 84
Circulation management: 85

Secondary survey 85
Spinal Cord Injury 86
X-ray examination 86
Management 86
Assessing the Child with Thoracic Trauma 86
Thoracic Traumas of Importance: 86
Is air in the pleural space? 87
Assessing the Child with Abdominal or Pelvic Injuries 88
Skin Traction 91
How to do skin traction? 91
Managment of open fractures 91
Assessment Questions: Pediatric Trauma 92

Module Nine: Burn Injury 95
Classification of burn 96
Body surface area Estimation 96
Emergency treatment 97
Airway & Breathing: 97
Circulation: 97
Indication for Hospital Admission 98
Monitoring: 98
Prevention and Treatment of Infection 99
Pain control 100
Nutrition 100
Addressing Different Types of Burns 100
Circumferential Extremity Burns 101
Child Abuse in Burn Injuries: 101
Assessment Questions: Burn Injury 102

Module Ten: Common Childhood Poisoning 105
History and physical examination: 106
General Principles of Management 106
Gastrointestinal decontamination 106
Activated charcoal 107
Whole bowel irrigation (WBI) 107
Skin Decontamination 108
Eye Decontamination 108
Decontamination for Inhaled poisons 108
Multiple-Dose Activated Charcoal 108
Assessment Questions: Common Childhood Poisoning 114

Module Eleven: Pain Management in Children 117
Barriers for pain management in children 117
Ways of assessing level of pain in children 117
Non-Pharmacological Management of Pain 119
Glucose analgesia: 120
Pharmacologic Treatments of pain 120
Assessment Questions: Assessment and management of pain 121

Module Twelve: Case management scenarios 123

Module Thirteen: Implementing ETAT 125
Objectives of the chapter/session 125
Implementing ETAT in your hospital 126
Advocacy 126

Patient flow and tasks **126**
Material Resources **127**
Developing individual plans of actions **127**

Annex One: Practical procedures **129**
Giving Parenteral fluids **129**
Vascular Access 129
Peripheral Vein 129
Scalp Veins 130
Care of the Cannula 130
External Jugular Vein 130
Intraosseous Needle Insertion 131
Contra-indications: 131
Complications 132
IV Drug Administration Through an Indwelling Cannula 132
Insertion of a nasogastric tube **132**
Contraindications: 133
Needle chest decompression / Needle thoracostomy **134**
Needle thoracostomy: Procedure 134
Needle cricothyroidotomy **135**
Splinting Techniques **137**
Application of skin fraction 137
Pop cast application 137
Nebulizer Use **139**
Umbilical Catheterization **140**
Indication 140
Contraindication 140
Equipment 140
Technique 140
Complications of umbilical vein catheterization include the following: 141
Orogastric tube **141**
Indication 141
Contraindication 141
Equipment 142
Technique 142
Confirmation that it is in the stomach 142

Annex Two: Resources required to implement emergency care of children in hospitals **143**

Annex Three: ETAT charts **147**

Annex Four: Anaphylaxis **163**

Annex Five: Management of Diabetes Ketoacidosis **165**

Annex Six: Pain Assessment and Management **169**

Introduction

The Emergency Triage Assessment and Treatment (ETAT) course is designed to familiarize health workers with the ETAT guidelines and help them acquire the necessary knowledge and skills for applying the guidelines. Triage is the process of rapidly examining all sick children when they first arrive in health facility in order to place them in one of the following categories: E-Emergency- Priority and Q-Queue (non-urgent).

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 were started immediately. 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 or by non-medical staff (after appropriate training) 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.

WHO has developed Emergency Triage Assessment and Treatment (ETAT) guidelines. These are adapted from the Advanced Pediatric Life Support guidelines used in western countries. Using the guideline allows for the immediate identification of children with life-threatening conditions which are most frequently seen in developing countries, such as obstruction of the airway and other breathing problems caused by infections, shock, neurologic emergencies (coma or convulsions), and severe dehydration.

The generic WHO guidelines were developed in Malawi, and were field-tested in several other countries including Angola, Brazil, Cambodia, Indonesia, Kenya and Niger. Since Ethiopia does not have a national training manual on Pediatric Emergencies, it adapted the WHO generic ETAT manual as the ETAT training manual for Ethiopia with the addition of common pediatrics emergencies in Ethiopia based on recommendations of experts from different health facilities and universities in Ethiopia.

The guidelines are contained in the manual “Management of the child with a serious infection or severe malnutrition” and in the “Pocketbook of hospital care for children”, on which this training course is based. This course manual is primarily meant for the participants of a 5 and 1/2 days training course in Emergency Triage, Assessment and Treatment. It provides participants with the reading materials to prepare themselves for the modules taught in the course.

Some of the reading might be done during the course. In addition, it provides questions for self-assessment which participants can respond to after having gone through the training. Apart from use in a full-time training course, the reading will be useful for trainers and participants who take part in training as a series of seminars. Guidance on how to conduct such training is contained in a parallel facilitator's guide.

This training course does not stand on its own. It can be included in a quality improvement process which targets the whole hospital or it can start such a process. At the end of the course, participants plan for introducing an ETAT process at their institution, by comparing the existing situation with international standards, and suggesting actions to solve identified problems and to document and evaluate such a process. Lessons learned in this process can be applied to other areas of child health in hospital and to care of other patient groups. Emergency management is done by team, rather than by individual players, so team work is emphasized and practiced throughout the course.

Learning objectives of the training course

At the end of the course, trainee will be able to:

- Triage all sick children when they arrive at a health facility, into the following categories:
  - those with emergency signs
  - those with priority signs
  - those who are queue cases.
- Assess a child's airway and breathing and give emergency treatments
- Assess the child's status of circulation and level of consciousness.
- Assess and manage DKA and anaphylaxis in children
- Manage shock, coma, and convulsions in a child.
- Assess and manage severe dehydration in a child with diarrhoea.
- Give cardiopulmonary resuscitation and neonatal resuscitation
- Manage a child with stridor and wheezing
- Assess and manage a child with trauma and acute burn
- Assess and manage a child with acute poisoning
- Asses and manage pain in children
- Plan to implement ETAT in your own hospital.

Module One

Triage and the "ABCDO" Concept

Learning Objectives:

At the end of this Module, you will be able to:

- Triage all sick children when they arrive at a health facility, into the following categories:
  - those with emergency signs
  - those with priority signs
  - those who are non-urgent cases
- Describe the "ABCDO" concept

TRIAGE
is the sorting of patients into priority groups according to their need and the resources available

Many deaths in hospital occur within 24 hours of admission. Some of these deaths can be prevented if very sick children are quickly identified on their arrival and treatment is started without delay. In many hospitals, children are not checked before a senior health worker examines them; as a result, some seriously ill patients have to wait a very long time before they are seen and treated. Children are known to have died of a treatable condition while waiting in the queue for their turn. The idea of triage is to prevent this from happening. The word "triage" means sorting.

Triage is the process of rapidly examining all sick children when they first arrive in hospital in order to place them in one of the following three categories:

Those with **EMERGENCY SIGNS (E)**, require immediate emergency treatment:

If you find any emergency signs, do the following immediately:

- Start to give appropriate emergency treatment.
- Call a senior health worker and other health workers to help.
- Carry out emergency laboratory investigations.

E **E**mergency
P **P**riority
Q **Q**ueue (non-urgent)

Those with **PRIORITY SIGNS (P)**, indicating that they 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 and therefore are non-urgent or they are patients assigned as **QUEUE (Q)**. These children can wait their turn in the queue for assessment and treatment.[1] 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.

1 *Sometimes it is discovered that a child in the queue is waiting for immunization. These children do not need assessment and can be referred to the right department without delay.*

All children should be checked on their arrival in a health facility 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.

Categories after Triage	Action required
EMERGENCY CASES	Need immediate emergency treatment
PRIORITY CASES	Need assessment and rapid attention
QUEUE CASES	Can wait their turn in the queue

A	**A**irway
B	**B**reathing
C	**C**irculation, **C**oma, **C**onvulsion
D	**D**ehydration (severe), **D**isability
O	**O**thers (immediate Poisoning, Major Trauma with open fracture, Bleeding Child)

The ABCDO concept

Triage of patients involves looking for signs of serious illness or injury. These emergency signs related to the Airway-Breathing-Circulation/Consciousness-Dehydration/Disability, and Other Emergencies are easily remembered as "ABCDO".

Each letter refers to an emergency sign which, when positive, should alert you to a patient who is seriously ill and needs immediate assessment and treatment.

Emergency signs include:

- obstructed or absent breathing
- severe respiratory distress
- central cyanosis
- signs of shock (cold hands, capillary refill time longer than 3 seconds, weak and fast pulse)
- coma (or seriously reduced level of consciousness)
- convulsions
- signs of severe dehydration in a child with diarrhoea
- Disabilities like motor deficiet (paraplegia/paresis, hemiplegia/paresis, facial palsy…)
- Other emergency signs (bleeding child, immediate Poisoning, Major Trauma)

Bleeding child:

- Bleeding due to trauma
- Spontaneous bleeding (epistaxis, hematemesis, rectal bleeding, umbilical bleeding…)

Immediate poisoning:

- Acute eye or skin poisoning
- Ingested poison within one hour

Major trauma:

- Compound (open) fracture

Priority signs

These children need prompt assessment (no waiting in the queue) to determine what further treatment is needed. Besides the group of emergency signs described above, there are priority signs, which should alert you to a child who needs prompt, but not emergency assessment. These signs can be remembered with the symbols **3 TPR - MOB**:

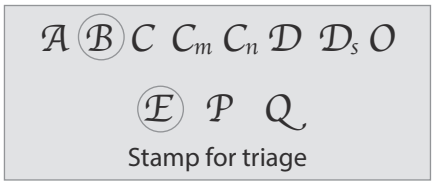
- Tiny baby: any sick child aged less than two months
- Temperature: child is very hot or very cold
- Trauma or other urgent surgical condition
- Pallor (severe)
- Poisoning (other than those require emergency care)
- Pain (severe)
- Respiratory distress
- Restless, continuously irritable, or lethargic
- Referral (urgent)
- Malnutrition: Visible severe wasting
- Oedema of both feet
- Burns

The triaging process

Triaging should not take much time. For a child who does not have emergency signs, it takes on average 20 seconds. The health worker should learn to assess several signs at the same time. A child who is smiling or crying does not have severe respiratory distress, shock or coma. The health worker looks at the child, observes the chest for breathing and priority signs such as severe malnutrition and listens to abnormal sounds such as stridor or grunting.

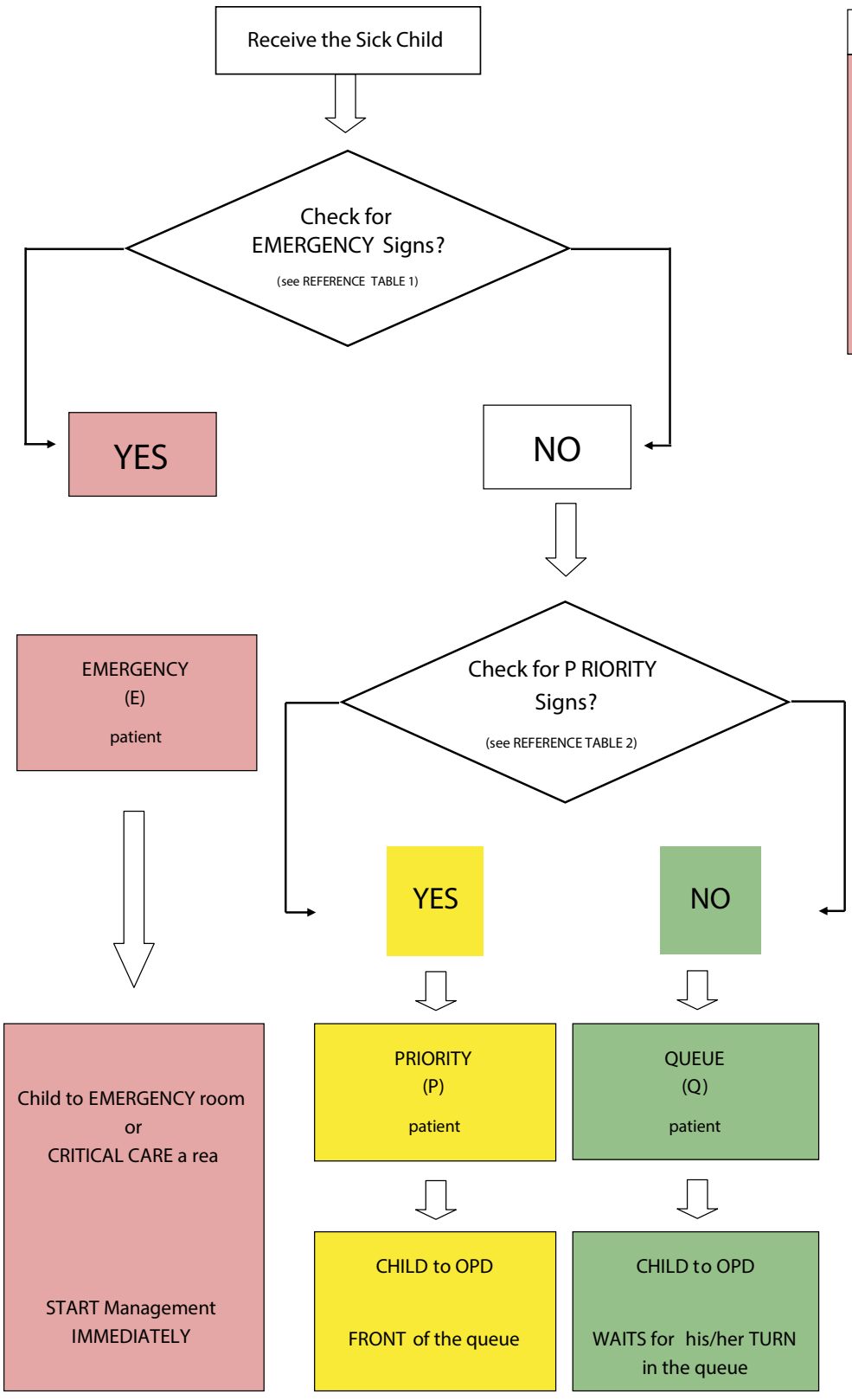
Several methods are available to facilitate the triaging process. One example is a stamp consisting of "ABCDDsO" signs in which the health worker circles the correct step and initiates emergency treatment for those with "E" or put them in priority groups "P" or "Q" for children who can wait in the queue.

Colors can also be used in differentiating the three groups (red stickers to emergency, yellow for priority and green for the queue.



Stamp for triage

Chart 1: Sick Child triage chart



REFERENCE TABLE 1

Emergency Signs

A: Airway problem
B: Breathing problem
C: Circulation or shock
Cm: Coma or Unconscious
Cn: Convulsion
D: Dehydration, Severe
Ds: Disability
O: Bleeding child, poisoning (immediate) open fracture.

REFERENCE TABLE 2

Priority Signs "3TPR - MOB"

Tiny baby (sick child < 2 months)

Temperature (child is very hot/cold)

Trauma or other urgent surgical condition

Pallor (severe)

Poisoning (history of)

Pain (severe)

Respiratory distress

Restless, irritable, or lethargic

Referral (urgent)

Malnutrition (visible severe wasting)

Oedema (of both feet)

Burn

When and Where Should Triaging Take Place?

Triage should be carried out as soon as a sick child arrives in the health facility, well before any administrative procedure such as registration. This may require reorganization of the flow of patients in some locations of the hospital.

Chart 2: Emergency Management of Triaged Children

EMERGENCY(E) SIGNS: If any sign positive: give treatment(s) for ABCDO, call for help, draw blood for emergency laboratory investigations (glucose, malaria smear, Hb and cross match if necessary)

		TREAT
1. ASSESS: AIRWAY AND BREATHING ■ Obstructed or absent breathing ■ Central cyanosis ■ Severe respiratory distress	**Any Sign Positive**	■ Do not move neck if cervical spine injury possible. ■ If foreign body aspiration: manage airway in choking child ■ If no foreign body aspiration: manage airway ■ Give oxygen
2. ASSESS: CIRCULATION ■ Cold skin with: – Capillary refill longer than 3 seconds, and – Weak and fast pulse	**Signs Positive** **Check for Severe Malnutrition**	■ Stop any bleeding ■ Give oxygen ■ Make sure child is warm **If no severe malnutrition:** – Insert an IV and begin giving fluids rapidly – If not able to insert peripheral IV, insert an intraosseous or external jugular line **If severe malnutrition:** ■ If lethargic or unconscious: – Give IV glucose – Insert IV line and give fluids ■ If not lethargic or unconscious: – Give glucose orally or by NG tube – Full assessment and treatment
3. ASSESS: COMA/ CONVULSION ■ Coma **OR** ■ Convulsing (now)	**If the Child is in Coma or Convulsing**	■ Do not move neck if cervical spine injury possible ■ Manage airway – If convulsing, give diazepam rectally – Position the unconscious child (if head or neck trauma is suspected, stabilize the neck first ■ Give IV glucose

<table>
<tr><th colspan="3">Chart 2: Emergency Management of Triaged Children</th></tr>
<tr><td>4. ASSESS: SEVERE DEHYDRATION
(In a child with diarrhoea)
Diarrhoea plus any two of these signs:
■ Lethargy
■ Sunken eyes
■ Very slow skin pinch
■ Unable to drink</td><td>Two Signs Positive
Check for Severe Malnutrition</td><td>■ Make sure child is warm
If no severe malnutrition
■ Insert an IV line and begin giving fluids rapidly
If severe malnutrition:
■ Do not insert IV
■ Proceed immediately to full assessment and treatment</td></tr>
<tr><td>5. OTHERS: MAJOR TRAUMA, IMMEDIATE POISONINGS
■ Immediate poisoning, actively bleeding child, compound fracture</td><td>Any Sign Positive</td><td>■ Manage ABC
■ Airway Protection
■ Arrest bleeding
■ Decontaminate acute poisoning
■ Stabilize fracture</td></tr>
<tr><td colspan="3">Proceed with assessment and further treatment according to the child's priority</td></tr>
<tr><td>PRIORITY(P) SIGNS:
These children need prompt assessment and treatment
■ Tiny baby (<2 months)
■ Temperature very high or cold
■ Trauma or other urgent surgical condition
■ Pallor (severe)
■ Poisoning (history of)
■ Pain (severe)
■ Respiratory distress
■ Restless, continuously irritable, or lethargic
■ Referral (urgent)
■ Malnutrition: visible severe wasting
■ Oedema of both feet or face
■ Burns (major)</td><td>Any Sign Positive</td><td>Move a child with any priority sign to the front of the queue
Note: If a child has trauma or other surgical problems, get surgical help or follow surgical guidelines</td></tr>
<tr><td>NON-URGENT(Q)</td><td></td><td>■ The child can wait her/his turn in the queue for assessment and treatment</td></tr>
</table>

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 at night. In some settings, triage is done in all these places. Since sick children may deteriorate rapidly, the health worker has to make a continuous triage. Emergency treatment can be given wherever there is room for a bed and trolley for the sick child and enough space for the staff to work on the patient, and

where appropriate drugs and supplies are easily accessible. Triage should be done repeatedly and continuously since a child can have deterioration or develop new sign of emergency. 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.

WHO SHOULD TRIAGE?

All clinical staff involved in the care of sick children should be prepared to carry out rapid assessment in order to identify the few who are severely ill and require emergency treatment. If possible, all such staff should be able to give initial emergency treatment, as described in the flowchart and treatment charts. In addition, people such as gatemen, record clerks, cleaners, janitors who have early patient contact should be trained in triage for emergency signs and should know where to send people for immediate management.

HOW TO TRIAGE?

Keep in mind the ABCDO steps: Airway, Breathing, Circulation, Coma, Convulsion, Dehydration and Other Emergencies (Immediate poisoning, actively bleeding child, compound fracture).

To assess if the child has **airway or breathing problems** you need to know:

- Is the child breathing?
- Is the airway obstructed?
- Is the child blue (centrally cyanosed)?

Look, listen and feel for air movement: Obstructed breathing can be due to blockage by the tongue, a foreign body, a swelling around the upper airway (retropharyngeal abscess) or severe croup which may present with abnormal sounds such as stridor.

- Does the child have severe respiratory distress?

Is the child having trouble catching his breath so that it is difficult to talk, eat or breastfeed? Is he/she breathing fast and getting tired, does he/she have severe chest in drawing or is he/she using auxiliary respiratory muscles?

To assess if the child has circulation problems you need to know:

- Does the child have warm hands?
- If not, is the capillary refill time ≥ 3 seconds?
- And is the pulse weak and fast?

In the older child the radial pulse may be used; however, in the infant, the brachial or femoral pulses may need to be felt.

To assess for coma you need to know:

A rapid assessment of conscious level can be made by assigning the patient to one of the **AVPU** categories:

A	**A**lert
V	**V**oice (Respond to voice)
P	**P**ain (Respond to pain)
U	**U**nresponsive

If the child has **any sign** of the ABCDO, it means the child has an emergency **"E"** sign and **emergency treatment** should start **immediately!**

A child who is not alert but responds to voice is lethargic and labeled as "V". If the assessment shows that the child does not respond to voice and only responds to pain (with targeted or untargeted movements), or does not respond at all, the level is at "P" and "U" respectively. We then refer to that child (labeled as "P" or "U") as having coma and the child needs to be treated for coma.

To assess for dehydration, you need to know:

- if the child is lethargic or unconscious
- if the child has sunken eyes
- if the skin pinch goes back very slowly
- if the child is unable to drink

To assess for any disability (Ds) for a child with major trauma

- if the child can move his extremities

To assess for other emergency signs, you need to know:

- if the child has active bleeding
- if the child brought within an hour of ingestion of poison
- if the child has open fracture

When ABCDO has been completed and there are no emergency signs, continue to assess the priority

Assessing priority signs

If the child does not have any of the E signs, the health worker proceeds to assess the child on the priority signs. This should not take more than few seconds. Some of these signs will have been noticed during the ABCDO triage discussed so far, and others need to be rechecked. Follow the 3 TPR-MOB to quickly complete this section.

Tiny infant (less than two months of age)

If the child appears very young, ask the mother his age. If the child is obviously not a young infant, you do not need to ask this question. Small infants are more difficult to assess properly, more prone to getting infections (from other patients), and more likely to deteriorate quickly if unwell. All tiny babies of younger than two months should therefore be seen as a priority.

Temperature: hot/cold (fever – high/low Temperature)

A child that feels very hot may have a high fever. Children with high fever on touch need prompt treatment. Take the waiting child to the front of the queue and take locally adopted action, like having the temperature checked by thermometer, giving an antipyretic, or doing investigations like a blood film for malaria. Also, patients who are very cold with no shock should have their temperature measured, keep them warm and assess with management for possible hypoglycemia and serious infection/sepsis.

Trauma (or other urgent surgical condition)

Any child with trauma or other surgical conditions need to be seen quickly and get surgical help immediately. Usually this is an obvious case, but one needs to think of acute abdomen, fractures and head injuries in this category.

Severe Pallor

Pallor is unusual paleness of the skin, and severe pallor is a sign of severe anemia which might need urgent transfusion. It can be detected by comparing the child's palms with your own. If the palms are very pale (almost paper-white), the child is severely anemic.

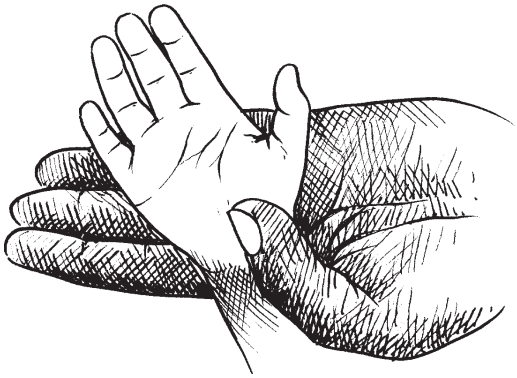


Figure 1
Severe pallor

Poisoning

A child with a history of swallowing drugs or other dangerous substances not included in the emergency needs to be assessed immediately, as he/she can deteriorate rapidly and might need specific treatments depending on the substance taken. The mother will tell you if she has brought the child because of possible intoxication.

Severe Pain

If a child has severe pain and is in agony, she/he should be prioritized to receive early full assessment and pain relief. Severe pain may be due to severe conditions such as acute abdomen, meningitis, etc.

Lethargy or Irritable and Restless

Recall from your assessment of coma with the AVPU scale whether the child was lethargic. A lethargic child responds to voice but is drowsy and uninterested (V (voice) in the AVPU scale).

The continuously irritable or restless child is conscious but cries constantly and will not settle easily.

Respiratory distress

When you assessed the airway and breathing, did you observe any respiratory distress? If the child has severe respiratory distress, it is an emergency. There may be signs present that you do not think are severe, e.g. Lower chest wall in drawing (not severe), or difficulty in breathing. In this case, the child does not require

emergency treatment but will need urgent assessment. Decisions on the severity of respiratory distress come with practice. If you have any doubts, have the child seen and treated immediately.

Urgent Referral

The child may have been sent from another clinic. Ask the mother if she was referred from another facility and for any note that may have been given to her. Read the note carefully and determine if the child has an urgent problem.

Severe wasting (Severe Malnutrition)

A child with visible severe wasting has a form of malnutrition called marasmus. To assess for this sign, look rapidly at the arms and legs as well as the child's chest and buttock.

Oedema of both feet

Edema of both feet is an important diagnostic feature of kwashiorkor, another form of severe malnutrition. Other signs are changes in the skin and hair.

Burn

Burns are extremely painful and children who seem quite well can deteriorate rapidly. If the burn occurred recently, it is still worthwhile to cool the burnt area with water, for example, by sitting the child in a bathtub with cool water. Any child with burn needs to be seen quickly.

Triage all sick children. When a child with emergency signs is identified, take to the emergency room or treatment area and start the appropriate emergency treatments immediately. Do not proceed to the next step before treatment is begun for a positive sign.

Treatment begins when **any emergency sign is identified**

Triage Steps	
Assess A	if positive, treat, if negative, proceed to B
Assess B	if positive, treat, if negative, proceed to C
Assess C	if positive, treat, if negative, proceed to D
Assess D	if positive, treat, if negative, proceed to O
Assess O	if positive, treat, if negative, proceed to priority signs

If the child has no emergency signs, check for priority signs. After the examination for priority signs has been completed, the child will be assigned to one of:

Priority (P): the child should be put at the front of the queue

Queue (Q): if the child has no emergency or priority signs

Once appropriate emergency treatments have been initiated:

- Call for a senior health worker
- Ask about head or neck trauma before providing treatment
- Draw blood for emergency laboratory investigations such as blood glucose, hemoglobin and malaria smear
- Take careful note if the child is severely malnourished, because this will affect the treatment of shock and dehydration caused by diarrhoea.

More than one treatment may have to be administered as quickly as possible, and several people may have to work together as a team

It is essential to act as quickly as possible and to start the emergency treatments. The team needs to stay calm and work together efficiently. The person in charge of the emergency management of the child assigns tasks so that the assessment can continue and treatments can be initiated as quickly as possible. Other health workers help to give the treatment needed, especially since a very sick child may need several treatments at once. The senior health worker will direct the treatment and immediately continue with a core assessment and follow-up of the child, identifying all the child's problems and developing the treatment plan.

GENERAL TREATMENT FOR PRIORITY SIGNS

Priority signs lead to quicker assessment of the child by moving the child to the front of the queue. While waiting, some supportive treatments may already be given. For example, a child found to have a hot body may receive an antipyretic such as paracetamol. Similarly, a child with a burn may have severe pain and the pain could be controlled while waiting for definitive treatment. If a child has no emergency signs or priority signs, she/he may return to the queue.

THE NEED FOR FREQUENT REASSESSMENT

During and following emergency treatment, the child should be re-assessed using the complete ABCDO process. 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 ABCDO.

SUMMARY

Triage is the sorting of patients into priority groups according to their need. All children should undergo triage. The main steps in triage are:

- Look for emergency signs
- Treat any emergency signs you find
- Call a senior health worker to see any emergency
- Look for any priority signs
- Place priority patients at the front of the queue
- Move on to the next patient

Triage should be carried out quickly. You will soon learn to observe several things at once. For example, when assessing the airway and breathing you may note that the baby is very small or is restless. With practice, a complete triage (if no emergency treatment is needed) takes less than a minute.

Assessment Questions: Triage

Answer all the questions on this page, writing in the given spaces. If you have a problem, ask for help from one of the facilitators.

1. Define "triage".

2. When and where should triage take place?

3. Who should do triaging?

4. What do the letters A, B, C, D and O in "ABCDO" stand for?

5. List the priority signs:

6. Put the actions in the right chronological order: what will you do first, what next, what after that, and so on, and what last?

Actions are given in the correct chronological order on the right:

☐	Ask about head or neck trauma
☐	Call a senior health worker to see any emergency
☐	Have blood specimens taken for laboratory analysis
☐	Look for any priority signs
☐	Look for emergency signs
☐	Move on to the next patient
☐	Place priority patients at the front of the queue
☐	Start treatment of any emergency signs you find

7. A three-year old girl is carried in her mother's arms wrapped in a blanket, in the queue. Her airway and breathing are OK. She has cold hands. Her capillary refill is 2 seconds. She is lethargic. Asked if the child has had diarrhoea, the mother answered "YES. Four loose stools per day". The skin pinch takes 3 seconds. How would you triage this child?

8. A four-year old male child was rushed in. He convulsed one hour ago. He is breathing fast but there is no cyanosis and no respiratory distress. He feels very hot, but responds quickly to questions. He has no diarrhoea or vomiting. How do you triage this child?

9. A one-year old had a seizure at home; then again outside the clinic. He became unconscious. His breathing sounds very wet and noisy and there is drool coming from his mouth. He is looking blue. How do you triage this child?

10. A two-year old male is rushed to your clinic acutely convulsing. How do you triage this child?

11. What signs of malnutrition do you check during triage?

12. Where do you look for signs of severe wasting?

13. Below what age is a child always a priority?

14. What should you do if the child has a priority sign?

Module Two

Airway and Breathing

Learning Objectives:

At the end of this module, you will be able to:

- Assess and manage airway problems in children
- Assess and manage breathing problems in children
- Administer Oxygen

The letters A and B in "ABCDO" represent "airway and breathing". It is evident that an open (patent) airway is needed for breathing. An airway or breathing problem is life-threatening and must receive your attention before you move on to other systems. It is therefore convenient that the first two letters of the alphabet represent the two most important areas to look for emergency signs. An airway or breathing problem is life-threatening. This child needs immediate treatment even before you continue with the assessment of other emergency signs. If there is no problem with the airway or breathing, you should look for signs in the areas represented by C.

Common causes of airway obstructions:

- **Excessive secretions**
- **Anatomic obstruction (e.g. tongue fall)**
- **Foreign body**
- **Upper airway infections (e.g. croup)**
- **Anaphylaxis (see Annex 4)***
- **Injuries (burn, trauma)**

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

- Is the child breathing?
- Is the airway obstructed?
- Is the child blue (centrally cyanosed)?
- Does the child have severe respiratory distress?

If the child is not breathing or if the airway appears obstructed, you must first open the airway.

* *In case of upper airway obstruction (UAWO) secondary to Anaphylaxis it is a medical emergency that should be recognized immediately. The signs are due to edema of the larynx, epiglottis and other surrounding structures.*

Table 1
Assessment and treatment of airway and breathing

AB AIRWAY AND BREATHING	■ Not breathing ■ Central cyanosis, or ■ Severe respiratory distress If yes, is the breathing obstructed?	**Any Sign Positive**	■ Manage airway ■ Give oxygen ■ Make sure the child is warm
Check for head/neck trauma before treating the child; do not move neck if cervical spine injury is possible.			

Assessment of the Airway

- Is the child breathing?
- 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?

Assessment of an obstructed Airway

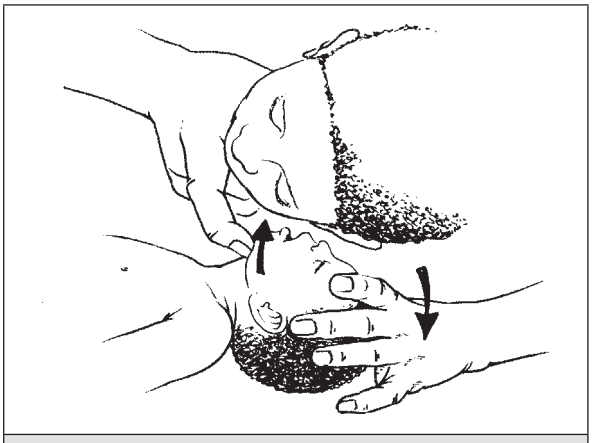


Figure 2
Look, listen, feel

- **LOOK**
  Is the chest moving?
- **LISTEN**
  Listen for any breath sounds. Are they normal?
- **FEEL**
  Can you feel the movement of air through nose or mouth of the child?

The following signs suggest that the upper airway is obstructed

- Increased inspiratory effort with retraction
- Abnormal respiratory sounds (e.g. stridor)
- Lack of breath sounds despite respiratory effort (i.e. complete airway obstruction)

If the child is not breathing or if the airway appears obstructed, you must first open the airway.

Management to open the airway

If the upper airway is obstructed use the following techniques:

SIMPLE TECHNIQUES TO OPEN THE AIRWAY

1. Open the airway with head tilt–chin lift for non-trauma patients or jaw trust for trauma or suspected trauma patients
2. Clear the airway by suctioning the mouth and nose
3. Perform techniques to remove foreign body obstructing the airway
4. Use airway adjuncts (e.g. oral airway)
5. Avoid unnecessary agitation which worsens the obstruction

ADVANCED INTERVENTION

This is done in a setting where experts are available

1. Endotracheal intubation
2. Removal of foreign body with direct visualization by laryngoscope
3. Application of positive airway pressure (CPAP)
4. Cricothyroidotomy

If the airway obstruction is due to anaphylaxis (patients with urticaria, swelling of the lips and face, change of voice, cough, wheeze and dyspnea) manage airway, give adrenaline and other management for Anaphylaxis (Refer Annex 4).

Maneuvers to open the airway

Manage Anatomic obstruction (hypo pharyngeal tissue blocking the airway).

If a patient is not properly positioned, there will be anatomic obstruction of the airway by the hypopharyngeal tissue as you can see in Figures 3 and 4.

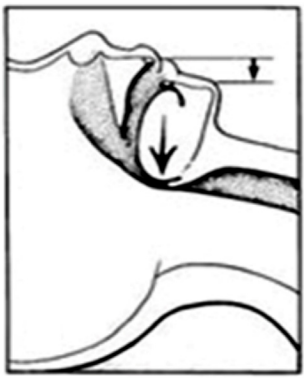


Figure 3
Anatomic obstruction

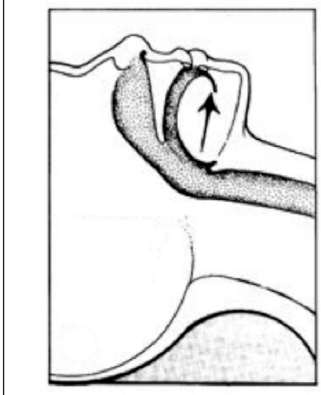


Figure 4
Relieving anatomic obstruction

Chin lift and head tilt

Place your hand on the child's forehead and apply a little pressure to achieve the tilt. The fingers of the other hand are used to gently lift the chin. The drawings illustrate two different positions. Figure 5 shows the position for infants, the nose pointing upwards. Figure 6 shows the position for children, the chin pointing up. Use it only for patients without trauma or suspected trauma.

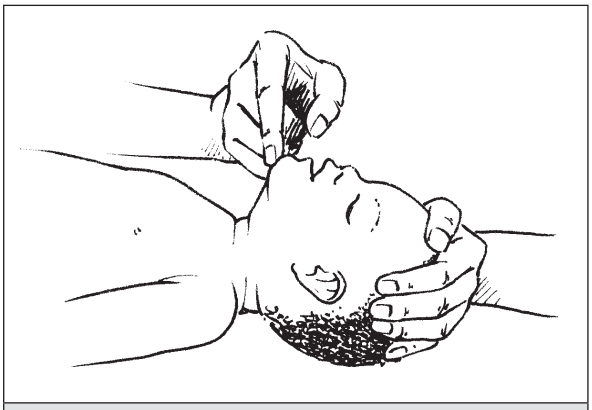


Figure 5
Neutral position to open airway in an infant ("nose up")



Figure 6
Sniffing position to open airway in an older child ("chin up")

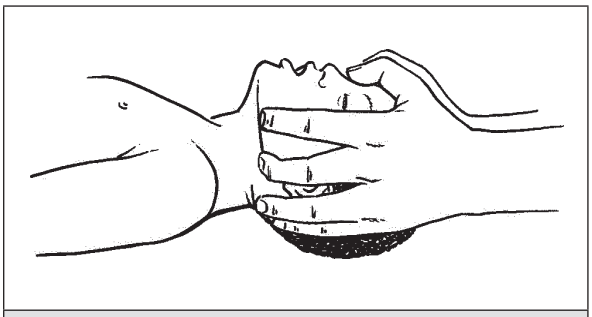


Figure 7
Jaw thrust technique to open the airway.

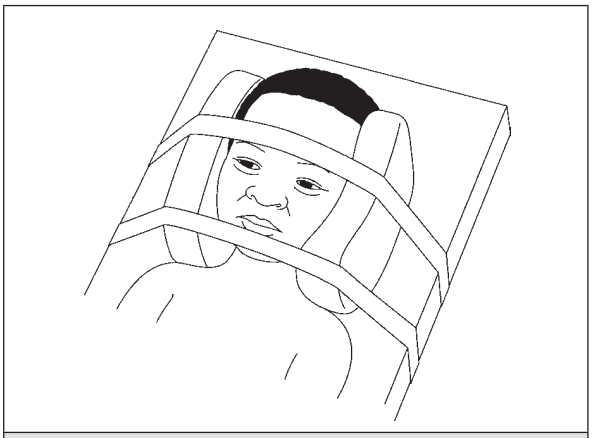


Figure 8
Stabilizing the neck when trauma is suspected

Jaw trust

To open and manage the airway when trauma is suspected a jaw thrust is used, as illustrated in Figure 7. This is a way of opening the airway without moving the head. It 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.

If a child has trauma you must avoid further injury during assessment or treatment. This child may have a spinal injury, which could be made worse by moving him. Therefore, stabilization of the head and neck should be performed for all patients with suspected trauma of the head and neck.

To check for head or neck trauma:

- Ask if the child has had trauma to the head or neck or a fall which could have damaged the spine
- Look for bruises or other signs of head or neck trauma

To stabilize the neck:

- Keep the child lying on his/her back
- Prevent the neck from moving by supporting the child's head with a cervical collar or using other materials (e.g. liter bags of IV fluid on each side)
- Tape the child's forehead to the sides of a firm board to secure this position (see Figure 8)
- Place a strap over the chin

If the child is vomiting, turn them on their side, keeping the head in line with the body (log roll maneuver, See Figure 9). If the child is restless, ask an attendant to stabilize the neck without upsetting the child more.

Log roll

This maneuver is used when a patient's body needs to be moved while still providing stability to the neck. 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 or she should stand at the head of the bed, hold the patient's head, place their 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 (see Figure 9). When the patient is not being moved, a sandbag placed on each side or a cervical collar can splint the neck.

Addition methods for maintaining anatomic airway.

The occiput is prominent in neonates and in young infants and during supine flexion of the neck, partial obstruction of the airway may occur. Putting a small towel roll placed under the shoulder could help infants to open the airway (demonstrate with doll), similarly putting towel under the neck and head for older children help to open the airway.

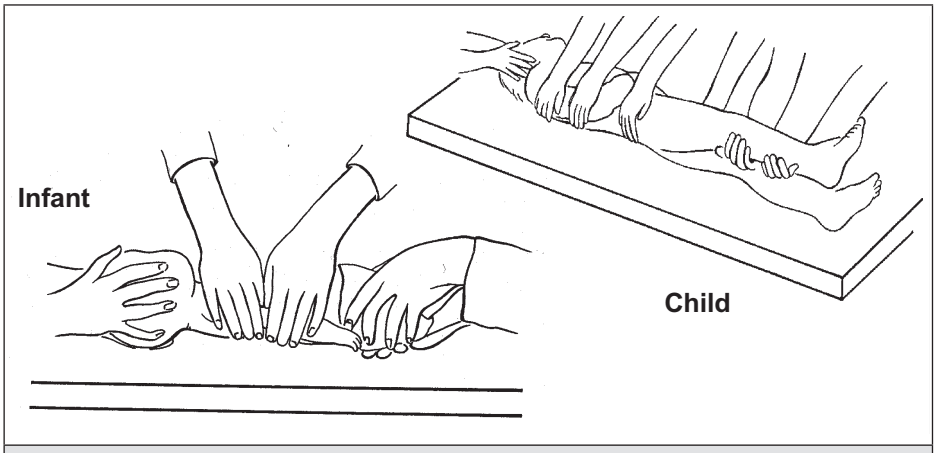


Figure 9
Log roll: stabilizing the neck of the patient while moving the body

Before moving to the next section you will be given the opportunity to practise the skills needed for moving a patient with an injury of the neck

Clearing the airway

Besides manual opening of the airway, suction of secretions, mucus, or blood from the mouth may be necessary to re-establish airway patency. It aids in the clearance of liquid and particulate material. An example of a common suction device is seen in Figure 10.

Appropriate size catheter is required. Excessively deep suctioning of any patient should be avoided to minimize the risk of vomiting, aspiration, laryngospasm, or bradycardia. If vomiting occurs, the child's head is first turned to one side, and suctioning is continued until the emesis is cleared. This procedure is done once we are

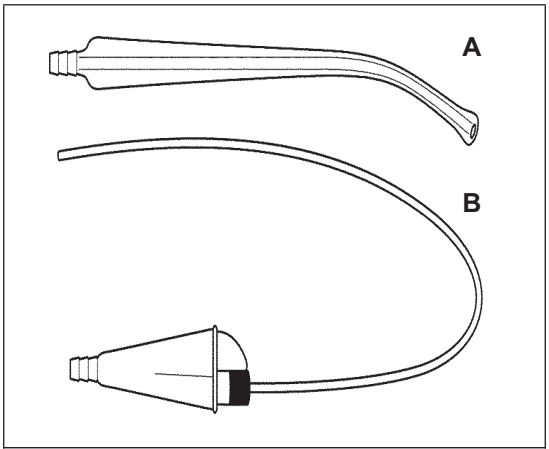


Figure 10
Yankauer (A) catheter and suction (B) catheter for clearing secretions from the airway

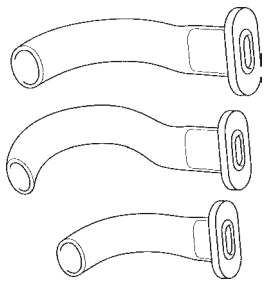


Figure 11
Guedel tubes of different sizes and types

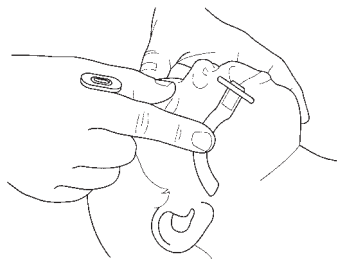


Figure 12
Selecting the right size of an oropharyngeal airway

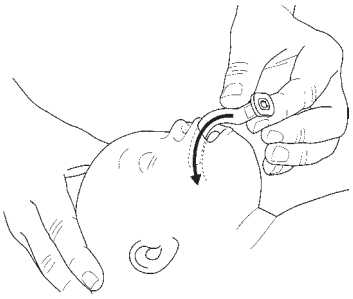


Figure 13
Inserting an oropharyngeal airway in an infant: convex side up

sure that the child is not having cervical cord injury which may be aggravated by the movement.

INSERTION OF AN OROPHARYNGEAL (GUEDEL) AIRWAY

The oropharyngeal 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 (see Figure 11). An appropriate sized airway goes from the centre of the teeth (incisors) to the angle of the jaw (see Figure 12).

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 orpharyngeal airway the convex side up (Figure 13)
- 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 (Figure 14)
- Re-check airway opening
- Use a different sized airway or reposition if necessary
- Give oxygen

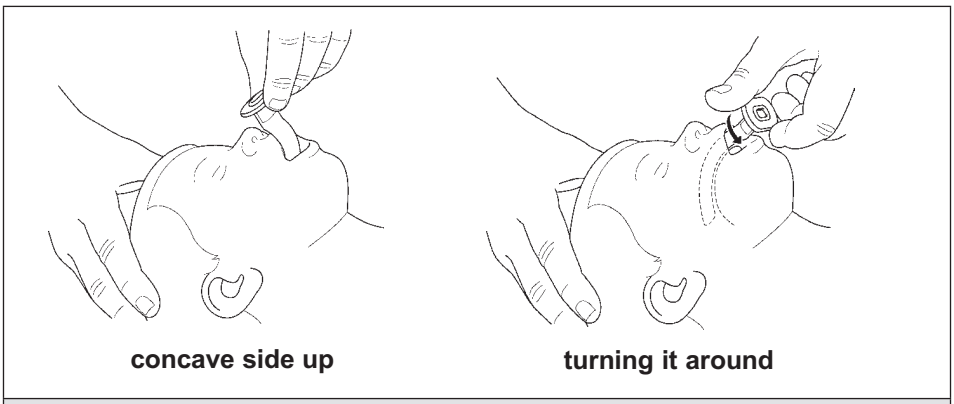


Figure 14
Inserting an oropharyngeal airway in an older child: concave side up and turning it around

MANAGEMENT OF FOREIGN BODY ASPIRATION (A CHOKING CHILD)

Ask the child's caretaker explicitly for a history of choking. Techniques to remove foreign bodies are based on support of forced expiration rather than a blind finger sweep of the mouth or other mechanical. A blind finger sweep in infants and children should not be done, as it might cause serious bleeding. Attempts to force the foreign body out of the airway should be done immediately, because airflow may be halted completely and sudden death could be imminent.

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. If a foreign body is causing the obstruction, the treatment depends on the age of the child.

Techniques to remove foreign bodies are based on support of forced expiration rather than a blind finger sweep of the mouth or other mechanical. A blind finger sweep in infants and children should not be done, as it might cause serious bleeding. Attempts to force the foreign body out of the airway should be done immediately, because airflow may be halted completely and sudden death could be imminent.

Management of young infant with foreign body aspiration (see Figure 15)

- Lay the infant on your arm or thigh in a head down position
- Give 5 blows to the infant's back with heel of hand.
- 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 obstruction which can be removed
- if necessary, repeat sequence with back slaps again.

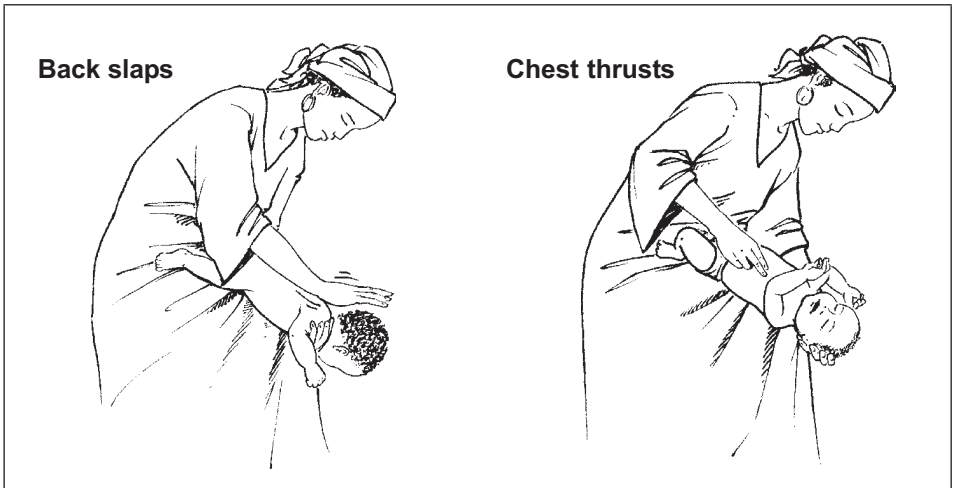


Figure 15
Management of young infant with Foreign Body Aspiration

Management of child with foreign body (see Figure 16)

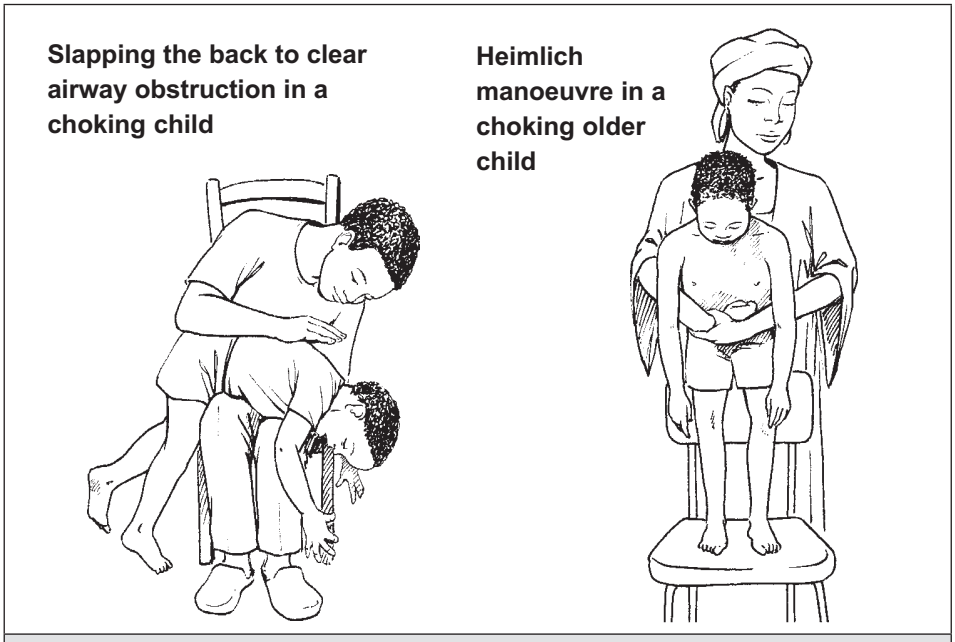


Figure 16
Management of child with foreign body Aspiration

- Give 5 blows to the child's back with heel of hand with child sitting, kneeling or lying.
- If the obstruction persists, go behind the child and pass your arms around the child's body; form a fist with one hand immediately below the child's sternum; 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 obstruction which can be removed.
- If necessary, repeat this sequence with back slaps again.

After you have performed this procedure you should check inside the mouth for any foreign body. Obvious foreign bodies should be removed. The breathing should be checked again. If these maneuvers are unsuccessful or if the child becomes unconscious, start bag mask ventilation as you will learn later in this module and simultaneously call for additional help. If available, laryngoscopy with direct visualization can remove the foreign body with a forceps.

Assessment of breathing

IS THE CHILD BREATHING?

After you managed the airway, you need to reassess for breathing.

- **LOOK**
  Is the chest moving? Is there severe respiratory distress? Is there central Cyanosis?
- **LISTEN**
  Listen for any breath sounds. Are they normal?
- **FEEL**
  Can you feel the movement of air through nose or mouth of the child?

Your facilitator will help you know how to assess the quality of breathing: description of wheeze, grunting how to count respiratory rate, how to recognize increased work of breathing and signs of severe respiratory distress.

If the child is not breathing; you need to support the breathing artificially by ventilating the child with a bag and mask.

Signs of severe respiratory distress

- Severe lower chest wall indrawing
- Use of auxiliary muscles
- Head nodding
- Inability to feed because of respiratory problems

Common causes of breathing problem in children:

- Lower airway obstruction: Asthma, Bronchiolitis
- Lung parenchymal disease: Pneumonia, Pulmonary edema
- Traumatic cause: Pneumothorax, hemothorax, flail chest
- Central nervous system: poisoning or drug over dose, increased intracranial pressure, neuromuscular disease
- Metabolic: Diabetic ketoacidosis, Fever

Management of breathing problem

1. Bag mask ventilation
2. Give oxygen by different ways depending on the child condition.
3. Thoracentesis and or tube thoracostomy (Annex 2)

VENTILATE WITH BAG AND MASK

If the child is not breathing after management of the airway, ventilate with a self-inflating bag and mask. Such a bag fills itself with room air when released, and when squeezed again, pushes air through an outlet to which a mask is attached for inflating the lungs. Before use, check the bag and valve by obstructing the mask with your palm and squeeze the bag. If the bag and valve are working, air will not leak until you release your palm. If either the bag or valve is faulty, you will hear air leaking.

Proper Technique for Bag-Mask Ventilation:

- It is important for the mask to be the correct size for the child
- The correct size and position are shown in the illustration (see Figure 17).
- The mask should also be placed correctly over the face in order to prevent leakage. The mask should cover both the entire mouth as well as both nostrils.
- To ensure a proper seal around the mask, use the C-E technique. This involves making a C-shape using your thumb and index finger around the base of the mask and press down onto the face. At the same time, use your 3-5th digits and place them along the edge of the jaw in the shape of inverted E shape and elevate the mandible anteriorly. (see Figure 18 & 19)
- If oxygen is available, connect it to the bag-mask.
- When providing bag-mask ventilation, ensure for chest rise or auscultation of breath sounds.
- Ventilate the child with a rate of 30/min for neonate, 20/min for infant and 12-15 breath per minute for child.
- Don't hyperventilate and avoid pressure over the mask .
- If chest rise is not visible, common problems include poor mask seal around the face, airway obstruction due to improper airway positioning, or excessive secretions requiring suctioning

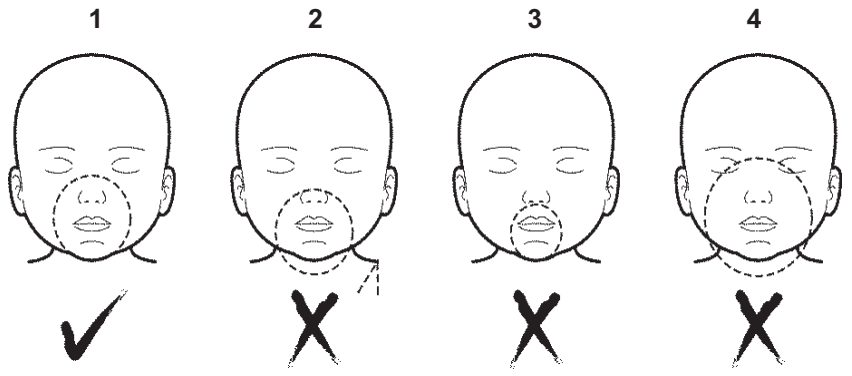


Figure 17
Choosing the right mask size

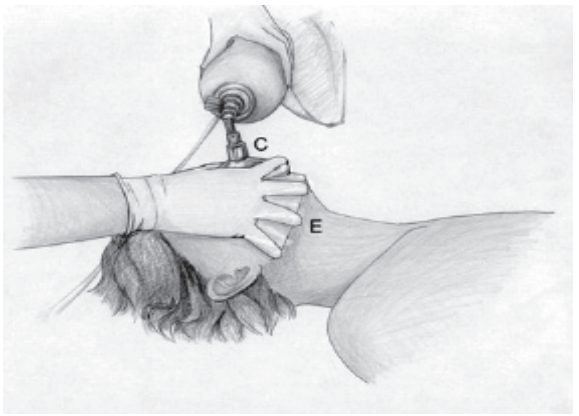


Figure 18
One-person bag mask demonstrating C-E technique

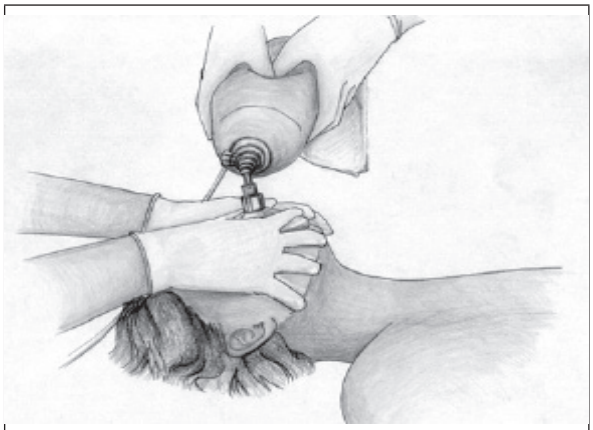


Figure 19
Two-person bag mask technique.

Does the Child Show Central Cyanosis?

Cyanosis occurs when there is an abnormally low level of oxygen in the blood. This produces a bluish or purplish discoloration of the tongue, the inside of the mouth and the skin. 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.

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. Central cyanosis is a sign of deficient oxygenation (desaturation) and these children need oxygen urgently; however, children who are anemic and desaturated may not show cyanosis, but also need oxygen. Many children with severe respiratory distress and with shock are also desaturated or not delivering enough oxygen to the brain and other vital organs and will benefit from oxygen treatment.

Sources of oxygen to treat hypoxemia

There are two possible sources of oxygen: oxygen concentrators (see Figure 20) and oxygen-filled cylinders (see Figure 21)

- **Oxygen concentrators** work by pumping room air through a 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.



Figure 20
Oxygen concentrator



Figure 21
Oxygen Cylinder

Oxygen Delivery

Two methods are recommended for the deliver y of oxygen in an emergency setting: nasal prongs and nasal catheter.

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.

- **Nasal prongs** (see Figure 22) 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 (see Figure 23). Care should be taken to keep the nostrils clear of mucus, which could block the flow of oxygen. Set a flow rate of 0.5-1 liters/min in infants and 1-2 litres/min if older in order to deliver 30-35% oxygen concentration in the inspired air. Prongs come in different sizes for adults and children. If you have only adult-size prongs, and the outlet tubes are too far apart to fit into the child's nostrils, cut the outlet tubes off and direct the jet of the oxygen into the nostrils.
- A **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 (see Figure 24).

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 liters for infants and 1-2 litres/min for older children, which delivers an oxygen concentration of 45-60% in the inspired air.

A Infant size prongs
B Adult size prongs
Note: the distance between the outlet tubes is larger and the tubes are thicker
C Joined prongs for adults with a connector between 2 separate pieces of tubing

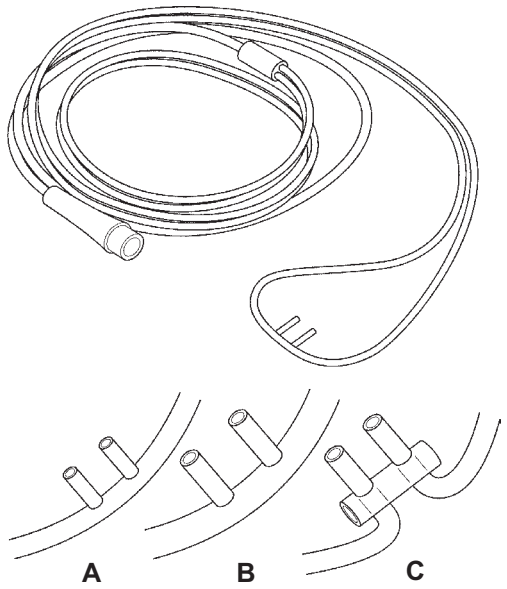


Figure 22
Nasal prongs with tubing
A. Infant size prongs; B. Adult size prongs (Note: the distance between the outlet tubes is larger and the tubes are thicker); C. Joined prongs for adults with a connector between 2 separate pieces of tubing



Figure 23
Nasal prongs correctly positioned and secured

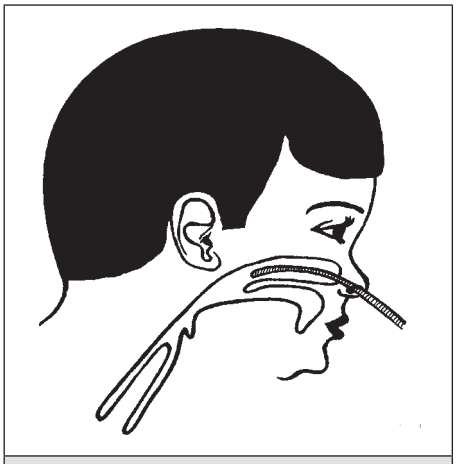


Figure 24
Nasal catheter: correctly positioned and secured

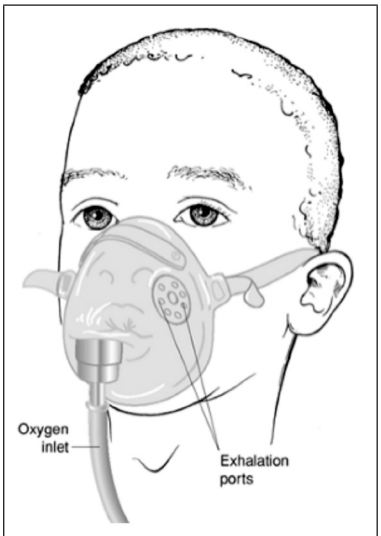


Figure 25
Face Mask: correctly positioned and secured

A nasal catheter device is particularly useful for young infants who are obligate nasal breathers and for whom a properly sized mask may not be available or is poorly tolerated. But nasal catheter system is difficult to deliver oxygen in excess of 3 L/min. also higher flow rates cause irritation of the nasopharynx and is therefore not well accepted by most children. In addition, oxygen delivery could widely vary if the child is crying or the nares are obstructed.

- **Face Mask:** An alternative method in emergency settings is the use of a face mask, which requires higher flow rates (6 liters/ minute to 10liters /minute). It is therefore not suitable for permanent oxygen delivery on the ward, reserved for serious emergency. The mask has openings on each side that serve as exhalation ports. These openings also permit inhalation of room

air if the oxygen flow rate is less than the patient's inspiratory flow rate or if the oxygen source becomes disconnected (see Figure 25). Face mask gives a higher oxygen concentration than nasal cannula, but it may not be as well tolerated. At an oxygen flow rate of 6 to 10 L/min, a simple oxygen mask will deliver an oxygen concentration of between 35% and 60%. A minimum oxygen flow rate of 6 L/min must be used to maintain a higher oxygen concentration and prevent re breathing of exhaled carbon dioxide.

SUMMARY

To assess the airway and breathing you need to know:

- Is the airway obstructed?
- Is the child breathing?
- Is the child cyanosed?
- Are there signs of severe respiratory distress?

If the patient is not breathing you need to:

- Open the airway
- Remove any foreign body
- Ventilate with a bag and mask

In all cases of airway or breathing problems:

- Give oxygen: 0.5-1 litre/min (<1-year-olds) and 1- 2 liters/minute (Older children)

Assessment Questions: Airway and Breathing

Answer all the questions on this page, writing in the given spaces. If you have a problem, ask for help from one of the facilitators.

1. List the three things you do to check airway and breathing:

2. List three signs of severe respiratory distress:

3. Does stridor occur in inspiration or expiration?

4. When opening the airway of an infant (<12 months) who has not been subjected to trauma, name the part of the body that should point upwards.

5. What size of tubing should you use for a nasal catheter?

6. **At what flow (volume/time) should oxygen be started?**

7. **You have successfully removed a coin from the trachea (windpipe) of a three-year old boy by applying Heimlich's maneuver. You checked his respiration and found that he was breathing normally. What do you do next?**

8. **A 4-year old boy hit by a bicycle was carried in on a blanket. The child was unconscious responding only to pain. His breathing was noisy. What do you do?**

9. **A nine-month girl and her older brother have been playing in the emergency department with an old bead necklace, suddenly the child is brought to you by one of the nurses, and the child is choking. What do you do?**

10. **A three-year old boy is carried into the outpatient department in his father's arms. He is pale, floppy and having difficulty breathing. His father says he has been unwell and coughing for 3 days. Weight 14 kg. He breathes fast with heavy severe chest indrawing. The airway is patent. He is alert.**

    How do you triage this child? What do you do?

Module Three

Circulation

Learning Objectives

At the end of this module, you will be able to:

- Assess a child for shock
- Manage a child with shock
- Do intraosseous insertion

A	**A**irway
B	**B**reathing
C	**C**irculation, **C**oma, **C**onvulsion
D	**D**ehydration (severe)
O	**O**thers (immediate Poisoning, Major Trauma with open fracture, Bleeding Child)

The letter C in "ABCDO" stands for Circulation (assessment and management of shock); Assessment and management of coma; and Convulsions.

With experience one can assess these emergency signs very quickly, almost simultaneously. You can recognize some signs immediately, such as coma (unconsciousness) and convulsions.

These assessments are done if the assessment of airway and breathing was normal, or after emergency treatments have been given for any respiratory problems encountered.

In the table below, the signs are listed on the left and the corresponding treatments on the right. Complete the assessment of all the signs on the left before deciding on and initiating treatment. However, because the assessment is done quickly (in less than a minute) there is hardly any delay in beginning the necessary treatment. You always need to check whether the child may have head or neck trauma, because this will affect how you treat the child.

Table 2
Assessment and treatment of circulation

C_1 CIRCULATION	Cold hand with: ■ Capillary refill ≥ 3 seconds, and ■ Weak and fast pulse	**Signs positive** Check for severe malnutrition	■ Stop any bleeding ■ Give oxygen ■ Make sure the child is warm IF NO SEVERE MALNUTRITION: ■ Insert IV and begin giving fluids rapidly. ■ If not able to insert peripheral IV, insert an intra- osseous line or external jugular IF SEVERE MALNUTRITION: ■ Give IV glucose ■ Proceed immediately to full assessment and treatment
Check for head/neck trauma before treating the child; do not move neck if cervical spine injury is possible.			

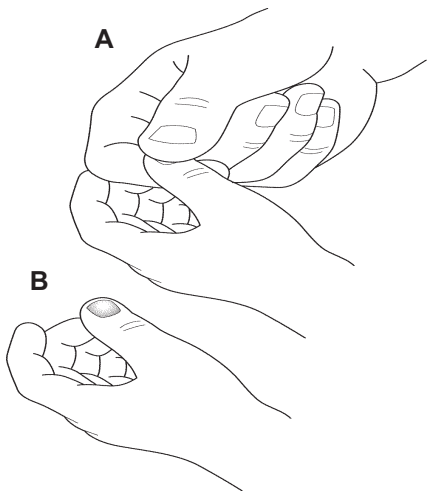
Assess the circulation

First in this section we will look at the assessment of circulation and signs of shock. To assess if a child has a circulation problem you need to know:

- Does the child have warm hands?
- If not, is the capillary refill time ≥ 3 seconds?
- And is the pulse weak and fast?

DOES THE CHILD HAVE WARM HANDS?

If the child's hands are warm, there is no problem with the circulation and you can move to the next assessment. If they are cold, you need to assess the circulation further. If the circulation is poor, as during shock, the blood flow moves to the most important parts of the body. So the hands, feet and skin get less blood and often feel cold.



A. Applying pressure to the nail bed for 3 seconds
B. Check the time to the return of the pink colour after releasing the pressure

Figure 26
Checking capillary refill

To assess the circulation, take the child's hand in your own (use dorsum of your hand). 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 CAPILLARY REFILL TIME ≥ 3 SECONDS?

Capillary refill (see Figure 26) 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. The capillary refill time is the time from release of pressure to complete return of the pink colour. It should be less than 3 seconds. If it is more than or equal to 3 seconds the child may be in shock. 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). The vessels open slowly because of low pulse pressure. This sign is reliable

except when the room temperature is low; a cold environment may also cause vasoconstriction and thus cause a delayed capillary refill.

If capillary refill longer than 3 seconds, the child may have a circulation problem with shock. To confirm, it is necessary to check the pulses.

IS THE PULSE WEAK AND FAST?

The radial pulse (the pulse at the wrist) should be felt. If this is strong and not obviously fast, the pulse is adequate; no further assessment is needed.

If the radial pulse is difficult to find, you need to look for a more central pulse (a pulse nearer to the heart). In an infant (less than one year of age) the best place to look is at the middle of the upper arm, the brachial pulse.

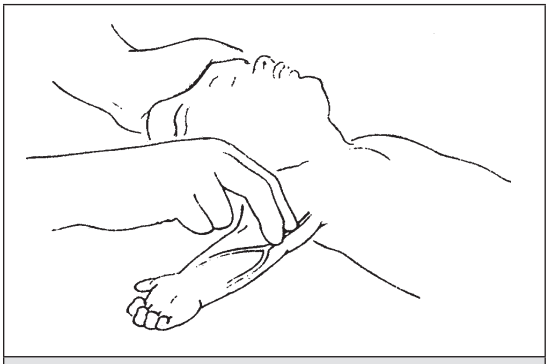


Figure 27
Feeling the brachial pulse in an infant

If the child is lying down you could look for the femoral pulse in the groin. In an older child you should feel for the carotid pulse in the neck. The pulse should be strong. If the more central pulse feels weak, decide if it also seems fast. This is a subjective judgment and an exact count is not taken. If the central pulse is weak and fast, the child needs treatment for shock.

All these procedures can and should be practiced on yourself, your friends, your children and family, and finally on real patients. This is the best way to improve in testing capillary refill and finding pulses.

Note that we do not recommend blood pressure to assess for shock because of two reasons:

1) Low Blood Pressure (BP) is a late sign in children and may not help identify treatable cases and
2) The BP cuff necessary in children of different age groups is mostly unavailable in many district hospitals.

Shock

The most common 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 sepsis or burn. In all cases, it is important to replace this fluid quickly. An intravenous line must be inserted and fluids should be given rapidly in shocked children without severe malnutrition. The recommended volumes of fluids to treat shock depending on the age/weight of child are shown in Chart 7 (see Annex 3).

If the child has severe malnutrition, you must use a different fluid and a different rate of administration and monitor the child very closely. Therefore a different regime is used for these children. Treatment of shock in the malnourished child is shown in Chart 8 (see Annex 3).

To **assess the circulation, you need to know:**

1. Does the child have warm hands?
2. If not, is the capillary refill ≥ 3 seconds?
3. And is the pulse weak and fast?

In other words, is the **child shocked?**

TREATMENT OF SHOCK

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

- If the child has any bleeding, apply pressure to stop the bleeding
- Give oxygen
- Make sure the child is warm
- Select an appropriate site for administration of fluids
- Establish IV or intraosseous access
- Take blood samples for emergency laboratory tests
- Begin giving fluids for shock.
- If the shock is due to Anaphylaxis or Diabetic Ketoacidosis (DKA), follow the recommendation in Annex 4 & 5

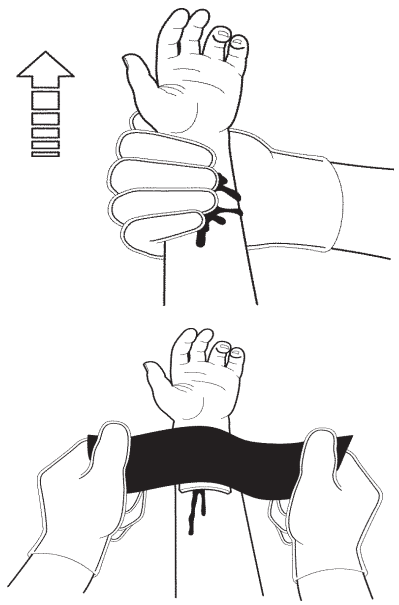


Figure 28
Controlling external bleeding

Stop any bleeding

The best and safest way to stop bleeding is to apply firm and direct pressure to the point that is bleeding with a gloved hand. Do not use a tourniquet.

Give oxygen

All children who are in shock require oxygen. It can be given in any of the ways discussed in the previous section.

Make sure the child is warm

This should be done by ensuring that the child is dry and covered with blankets or warm clothing.

Select an appropriate site for administration of fluids

The most appropriate route for administration is intravenous and a peripheral vein is preferable but not always accessible. Alternatives are Intraosseous infusion or a central vein catheter. Read Annex 1: Practical procedures for establishing IV access.

Give intravenous fluid

Before giving the IV fluid check for **severe malnutrition**

Firstly consider if the child also has severe malnutrition before selecting treatment as shown on Table 3. Children with severe malnutrition are difficult to assess and manage. The malnourished child may appear lethargic and have sunken eyes and a very slow skin pinch as he/she has no subcutaneous fat. Malnutrition not only affects the muscles but also the organs we cannot see. The heart can become very weak and may fail if it has to pump large volumes of fluid. When this happens fluid accumulates in the lungs (lung oedema) and makes breathing difficult with the child getting worse or even death.

Therefore, a child who is severely malnourished should be treated cautiously not by rapid IV infusion of fluids. The signs of dehydration overestimate the degree of dehydration in the severely malnourished child. It is important to involve a senior health worker early in the management of these children.

To check for severe malnutrition:

- **Look for visible severe wasting**

  A child with visible severe wasting has a form of malnutrition called marasmus. To assess for this sign, look rapidly at the arms and legs and pull up the shirt to look at the chest (see Figure 29). The marasmic child does not look just thin, but appears to be all skin and bone. The skin looks too large for the body, there is no fat on the child and you will see the outlines of the ribs. There is also severe muscle wasting of the arms, legs and buttocks. The head may appear relatively large because of wasting of the body.

- **Check for oedema of both feet**

  Oedema is a major sign of kwashiorkor, a severe form of long-standing malnutrition. To assess for oedema you first need to look at the feet after removing the booties or shoes. Press the top of the foot gently with your thumb for a few seconds. Oedema is present if a definite dent is left in the tissues. Look and feel to determine if the child has oedema of both feet. Use your thumb to press gently for a few seconds on the topside of each foot (see Figure 30). The child has oedema if there is an impression when you lift your thumb. Check if the other foot also has oedema. Localized oedema can be due to injury or infection.

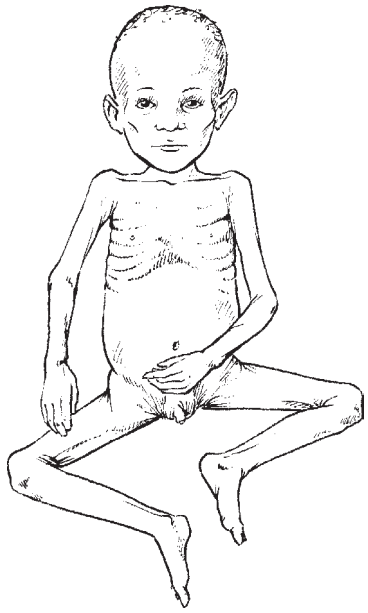
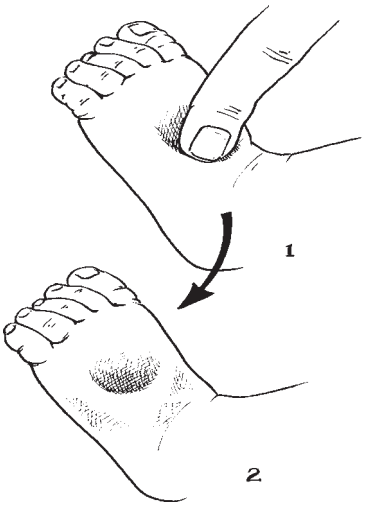


Figure 29
Visible severe wasting (marasmus)



After applying pressure for a few seconds, a pit remains after the finger is removed

Figure 30
Pitting oedema on dorsum foot

The recommended fluids and rates of administration are shown in Charts 7 and 8 (see Annex 3) and summarized in the tables on the next two pages. However, if the child has severe malnutrition, you must use a different fluid and a different rate of administration and monitor the child very closely. Children with severe malnutrition are very delicate and can easily go into congestive heart failure from intravenous fluids. Sometimes children with severe malnutrition have circulatory signs suggesting shock, but have sepsis rather than hypovolemia. It is important to involve a clinician who understands the guidelines for caring a child with severe malnutrition; the clinician should immediately carry out a full assessment to understand the clinical situation of the child. If a malnourished child is in Shock, use normal saline or Ringer lactate with 5% glucose at 15 ml/kg give over 1 hour (if available use half-strength Darrow solution with 5% glucose), but monitor carefully and remove as soon as it is safe to do so. Stay with the child and check the pulse and breathing rate ever y 5 minutes. Discontinue the intravenous infusion if there is development of fluid overload (Increament of pulse rate by 15, respiratory rate by 5/min).

Before giving the IV fluids, check for severe malnutrition. Note the differences in fluid type and volume between the well-nourished and the severely malnourished.

This is a useful guideline in the emergency situation, when you may not have a chance to weigh the child. It may be helpful to put this chart on the wall in your department.

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 (if the child needs) and move onto the next stage of triage.

Table 3

Maintenance fluid calculation in children

Weight	Amount of fluid /kg/day
0-10 kg	100 ml
11-20 kg	50 ml
>20 kg	20 ml

Maintenance fluid calculation in children: for the first 10 kg use 100 ml per kg; for the next 10 kg use 50 ml per kg and for above 20 kg use 20 ml per kg. for each subsequent kg.

For example, an 8-kg infant receives 8 x100 ml = 800 ml per day, a 15 kg child (10 x 100) + (5 x 50) = 1250 ml per day

Table 4

Treatment of shock

If the child has **NO severe Acute Malnutrition**	If the child **HAS Severe Acute Malnutrition**
■ Insert an intravenous line (and draw blood for emergency laboratory investigations). ■ Fix the cannula and immobilize the extremity with a splint. ■ Attach Ringer's lactate or normal saline - make sure the infusion is running well. ■ Infuse 20 ml/kg as rapidly as possible. ■ The circulation should be reassessed as described before. **Improvement:** warmer hands, pulse slows and capillary refill faster. **If there is NO improvement:** ■ Give another 20 ml/kg of Ringer's lactate or normal saline as quickly as possible. Reassess the circulation again, and if there is still no improvement. ■ Give another 20 ml/kg of Ringer's lactate or normal saline, as quickly as possible. The circulation should be assessed again. **If there is still NO improvement:** ■ Consider Blood Transfusion unless there is profuse watery diarrhoea. In this case, repeat Ringer's lactate. The circulation should be assessed again. **If there is still NO improvement:** ■ See inpatient treatment guidelines for underlying condition.	■ Weigh the child. ■ IV Fluid (15ml/kg over 1hr) ■ Fix the cannula and immobilize the extremity with a splint. ■ Give normal saline or Ringer lactate with 5% glucose at15 ml/kg give over 1 hour (if available use half-strength Darow solution with 5% glucose) ■ Stay with the child and check the pulse and breathing rate every 5-10 minutes. ■ Discontinue the intravenous infusion if either of these increase (pulse by 15, respiratory rate by 5/ min). ■ If the child improved, change the Iv fluid with oral intake/ Resomal after 2 hrs **If there IS improvement:** ■ pulse and breathing rate fall. ■ Repeat 15ml/kg over 1 hour. **If there is NO improvement:** ■ Call senior health worker. ■ Give maintenance IV fluid 4ml/kg/hour while waiting for blood. ■ Transfuse fresh whole blood at 10ml/kg slowly over 3 hours (use packed cells if in cardiac failure). ■ Follow National Guideline for Management of SAM

The severely malnourished child is considered to have shock if he/she is **lethargic or unconscious** and has **cold hands plus either:**

- **slow capillary refill** (≥ 3 seconds), **or**
- **weak, fast or absent radial or femoral pulses and**
- **absence of signs of heart failure in an edematous child**

SUMMARY

Assessing all children for shock

- Does the child have warm hands?
- Is the capillary refill time more than 3 seconds?
- Is the pulse fast and weak?

In other words, is the child in shock?

IF IN SHOCK

If the child has NO severe malnutrition	If the child HAS severe malnutrition
■ Stop any bleeding ■ Give oxygen ■ Keep child warm ■ Give IV fluids rapidly	■ Stop any bleeding ■ Give oxygen ■ Keep child warm ■ Give IV fluid cautiously ■ Follow national guideline for management of SAM

Assessment Questions: Circulation

Answer all the questions on this page, writing in the given spaces. If you have a problem, ask for help from one of the facilitators.

1. Define a normal capillary refill time.

2. If you cannot feel the radial pulse in an older child, which pulse should you look for next?

3. Name the two types of fluid you can give to treat shock initially.

4. Which fluid would you give to a child in shock with signs of severe malnutrition?

5. What volume of fluid would you give to a well nourished one-year old weighing 11 kg who is in shock?

6. How many times can you give this bolus of fluid in shock before calling a senior health worker?

7. In triage of a two-year old girl you find her hands are warm, what do you do next?

8. In triage of an 18-month old, well-fed boy, you find his hands are cold. What do you do next?

9. In triage of a 10-year old boy who was rushed to emergency after falling from a tree half an hour earlier, you find his hands are cold and the capillary refill time is longer than three seconds. What do you do next?

10. What are three contra-indications for setting up an intraosseous infusion?

11. Can you give blood through an intraosseous infusion? And antibiotics, in case these are needed?

12. A four-months old baby is brought to hospital with fever, rapid breathing and refusing to breastfeed. She has had 2 episodes of vomiting and watery diarrhoea. Weight 5 kg. Her hands are cold. The capillary refill is 6 seconds. The femoral pulse is palpable but fast and weak. There is no chest indrawing and there are no abnormal respiratory noises. How do you triage the baby? How do you manage the baby?

13. A 10-year-old boy is presented to emergency department after being stung by a bee. He had been well until he was stung on his right forearm, while playing in the yard. He initially complained of localized pain and swelling. Fifteen minutes later, he began to complain of shortness of breath had associated wheezing and has weak and fast pulse.

a. What is the most likely diagnosis?

b. What are the appropriate measures to treat the patient's condition?

c. What are some of the adjunctive therapies for the patient's condition?

14. A 4 yr old boy weighing 20 kg presented to the pediatric emergency OPD with a complaint of excessive thirst and frequent urination of 2 days duration. The airway was patent but the health provider has noticed that the child's breathing is fast and deep with a smell of fruity odor. The hands are cold with a capillary refill time of 4 seconds.

a. What do you think is the child's problem?

b. What amount and type of fluid do you give as a bolus?

c. What investigations do you want to send?

d. Calculate the total amount of fluid to be given over 48 hours?

Module Four

Coma and convulsion

Learning Objectives

At the end of this module, you will be able to:

- Assess and manage coma in a child
- Assess and manage convulsion in a child
- Give rectal diazepam

Here we shall look at the second and third components in which C represents "Coma and convulsion". The following signs indicate impaired neurological status: coma and convulsions.

A	**A**irway
B	**B**reathing
C	**C**irculation, **C**oma, **C**onvulsion
D	**D**ehydration (severe)
O	**O**thers (Bleeding Child, Immediate Poisoning, Major Trauma with open fracture)

Assess the child for coma and convulsion

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

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

A child who is awake and alert, or is playing and talking, obviously does not have a dangerous or disturbed level of consciousness.

Table 5
Assessment and treatment of coma and convulsion

C_m COMA C_n CONVULSION	Coma or Convulsing (now)	**If coma or convulsing**	■ Manage the airway ■ Give oxygen ■ If convulsing, give diazepam rectally ■ Position the child (if head or neck trauma is suspected, stabilize the neck first) ■ Give IV glucose

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.

First, 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 to voice or being shaken or to pain is unconscious. To help you assess the conscious level 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 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.

The assessments and signs discussed above will be illustrated on video. You should also practice your assessment of consciousness on real patients.

Initial assessment of level of consciousness should be done by AVPU, using Glasgow Coma Scale (GSC) is time taking for the initial assessment but can be used for follow up of the child's progress. (the glasgow scale)

Table 6
Glasgow Coma Scale

	Child		Infant
Eye Opening (E)	Spontaneous	4	Spontaneous
	To speech	3	To speech
	To pain	2	To pain
	None	1	None
Verbal (V)	Oriented	5	Coos/Babbles
	Confused	4	Irritable Cry
	Inappropriate	3	Cries/Pain
	Incomprehensible	2	Moans
	None	1	None
Motor (M)	Obeys commands	6	Spontaneous
	Purposeful	5	Withdraws(touch)
	Withdrawals(pain)	4	Withdraws (pain)
	Flexion(pain)	3	Abnormal flexion
	Extension(pain)	2	Abnormal Extension
	None	1	None

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. The child must be seen to have a convulsion during the triage process or while waiting in the outpatient department. You can recognize a convulsion 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. You have to observe the infant carefully.

Treatment of coma and convulsion

Treatment of coma and convulsions have some similarities and will be described together.

COMA	CONVULSION
If the child is unconscious you should: ■ Manage the airway ■ Position the child (if there is a history of trauma, stabilize neck first) ■ Check blood sugar ■ Give IV glucose	If the child is convulsing now you should: ■ Manage the airway ■ Position the child ■ Check the blood sugar ■ Give IV glucose ■ Give anticonvulsant

MANAGE THE AIRWAY

Coma

Managing the airway is done in the same way as treating any child with an airway or breathing problem. This has been discussed in Module 2. You may find it useful to read through this again. Give oxygen for the emergency setting.

Coma is not in itself a disease. It is a state caused by an underlying disease process, which must be addressed quickly to maximize a patient's chance of recovery.

Convulsion

To manage the airway of a convulsing child, do not try to insert anything in the mouth to keep it open. If the lips and tongue are not blue, do not try to manage the airway by lifting the chin or using a jaw thrust.



Figure 31
Positioning the unconscious child (recovery position)

POSITION THE CHILD

Coma

Any unconscious child who is breathing and keeping the airway open should be placed in the recovery position. This position helps to reduce the risk of vomit entering the child's lungs (see Figure 30). It should only be used in children who have not been subjected to trauma.

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 neck and turn the child into the side using log roll method

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 (see Figure 30).

CHECK THE BLOOD SUGAR

Coma and convulsion

Where blood glucose results can be obtained quickly (e.g. with dextrostix), this should be measured immediately. Hypoglycemia is present if the measured blood glucose level is low <2.5 mmol/l (45 mg/dl) in a well-nourished or <3 mmol/liter (54 mg/dl) in a severely malnourished child).

This test is easy to perform. Your department will require a supply of dextrostix. You will need a drop of blood, taken from the heel of a young infant or by finger prick from an older infant or child, or from blood obtained at the insertion of an intravenous line.

When the blood glucose cannot be measured, hypoglycaemia should be assumed to be present in all children in coma or having a convulsion and should be treated

When the blood glucose cannot be measured, hypoglycaemia should be assumed to be present in all children in coma or having a convulsion AND should be treated

Blood glucose level can be determined by using different type of glucose sticks (glucose sticks with color scale or using a reading machine). See Figure 32 A and 32 B.

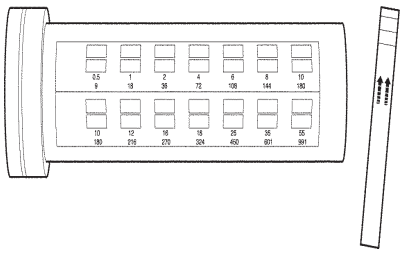


Figure 32 A
Blood glucose stick with color scale printed on the box

Remember that the blood sugar in a malnourished child is already between 2 and 4 mmol/l (from 36-72 mg/dl). It is better to treat a child whose sugar is borderline than to withhold it. Malnourished children have no energy stores, so, unlike well- nourished children, they cannot maintain their blood sugar in a crisis. ***Note that 1mmol/l glucose is equal to 18mg/dl.***

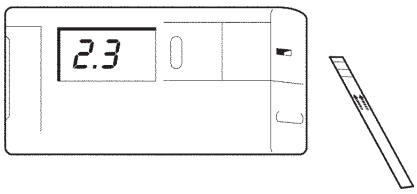


Figure 32 B
Blood glucose stick with a reading machine

GIVE IV GLUCOSE

Coma and convulsion

- Insert an IV line and draw blood for emergency laboratory investigations.
- Give 5 ml/kg of 10% glucose solution rapidly by IV infusion (including dilutions of 40% glucose to make 10% solution and (Chart 10 of Annex 3).
- Recheck the blood glucose in 30 minutes. If it is still low, repeat 5 ml/kg of 10% glucose solution.
- Feed the child as soon as conscious.



Figure 33
Suitable areas for a heel stab in a young infant

If the child is not able to feed and there is a danger of aspiration, give:

- Milk or sugar solution via nasogastric tube.
- Maintenance IV fluid containing 5-10% glucose (dextrose)

To make sugar solution, dissolve four level teaspoons of sugar (20 grams) in a 200-ml cup of clean water.

This is a useful guideline in an emergency situation when you may not have a chance to weigh the child. It may be helpful to put it on the wall in your department.

Table 7
Amount of glucose to give by age

Age/weight	Volume of 10% glucose solution to be given as bolus (5 ml/kg)	To make up 10% glucose using 40% glucose solution	
		Volume of 40% glucose	Volume of water
Less than 2 months (<4 kg)	15 ml	4 ml	11 ml
2 - <4 months (4 - <6 kg)	25 ml	6 ml	19 ml
4 - <12 months (6 - <10 kg)	40 ml	10 ml	30 ml
1 - <3 years (10 - <14 kg)	60 ml	15 ml	45 ml
3 - <5 years (14 - <19 kg)	80 ml	20 ml	60 ml

Note: If you have a 50% glucose solution; to make it 10% uses 1 part 50% to 4 part of sterile water or normal saline. 10% solution can also be prepared from 85% of 5%DW and 15% of 40% D of the calculated volume.

GIVE AN ANTICONVULSANT

Convulsion

Diazepam is a drug to stop convulsions (anticonvulsant). It is the first drug to use if the child is convulsing in front of you. No drug should be given if the convulsion has stopped. Diazepam can be given by the rectal or intravenous route. Rectal diazepam acts within 2 to 4 minutes. In an emergency it is easier and quicker to give it rectally than intravenously, unless an intravenous line is already running. The dose is 0.5mg/kg (0.1 ml/kg) rectally or 0.25mg/kg (0.05 ml/kg) intravenously. Estimated doses of rectal diazepam, lorazepam and midazolam are shown in Table 7 below. This is a useful guideline in an emergency situation when you may not have a chance to weigh the child. It may be helpful to put it on the wall in your department.

Table 8
Diazepam, lorazepam and midazolam dosages by weight/ age for the treatment of convulsions

Weight/Age	Diazepam		Lorazepam	Midazolam	
	Diazepam given rectally (10 mg/2ml solution) Dose 0.1ml/kg	Diazepam given IV (10 mg/2ml solution) Dose 0.05ml/kg	IV/ Buccal (4mg/ml ampoule) 0.1mg/kg (0.025ml/kg)	IV (5mg/5ml ampoule) 0.25mg/kg (0.25ml/kg)	Buccal (5mg/1ml)0.5mg/kg Volume=0.25ml/kg
4 kg (<2 mon)	0.4ml	2ml	0.1ml	1ml	0.2ml
6 kg (2-6mon)	0.6ml	0.3ml	0.15ml	1.5ml	0.3ml
8 kg (6-8mon)	0.8ml	0.4ml	0.2ml	2ml	0.4ml
10 kg (8-10mon)	1ml	0.5ml	0.25ml	2.5ml	0.5ml
12 kg (10-12mon)	1.2ml	0.6ml	0.3ml	3ml	0.6ml
14 kg(1-3yrs)	1.4ml	0.7ml	0.35ml	3.5ml	0.7ml
16 kg(4-5yrs)	1.6ml	0.8ml	0.4ml	4ml	0.8ml
18 kg(5-6yrs)	1.8ml	0.9ml	0.45ml	4.5ml	0.9ml
20 kg (6-7yrs)	2ml	1ml	0.5ml	5ml	1ml

Base the dose on the weight of the child, where possible. Draw up the dose from an ampoule of diazepam into a tuberculin (1 ml)[1] syringe. Then remove the needle. Insert the syringe 4 to 5 cm (about the length of your little finger) into the rectum and inject the diazepam solution. Hold the buttocks together for a few minutes. If you already have intravenous access, you can give the correct volume of drug directly, but slowly, in at least one full minute.

Phenobarbital is the drug of choice in infants <2 weeks of age to control convulsions

Reassess the child after 10 minutes.

If still convulsing, give a second dose of diazepam, rectally or, even better, give lorazepam (or diazepam intravenously slowly over 1 minute if an IV infusion is running). If the convulsion continues in spite of this second dose, a third dose can be given. After the third dose consider giving phenytoin 20mg/kg IV/IO over 20 min (1mg/kg/min) monitor heart rate for arrhythmia. Alternatively phenobarbital 15-20 mg /kg IV or intraousues can be used if phenoytoin not available.

1 A 2 ml syringe can be used if a tuberculin syringe is not available.

At this stage, a senior health worker should be involved.

Diazepam and phenobarbital can affect the child's breathing, so it is important to reassess the airway and breathing regularly and a bag and mask should be ready.

Table 9
Dose of phenobarbital for young infants(phenobarbital 200mg/ml solution)

Weight of infant	2 kg or less	2-3 kg
Loading dose of phenobarbital, 20mg/kg,	0.2 ml	0.3 ml
Reload if convulsions continue with 10mg/kg	0.1 ml	0.15 ml

In a child having a convulsion the blood sugar can be checked immediately and glucose can be given. If checking glucose is going to take time, glucose can be given with the first dose of diazepam.

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).

You can practice the recovery position on real patients, as well as checking blood sugars on any blood samples obtained during the practical sessions.

SUMMARY

COMA	**CONVULSION**
If the child is unconscious, you need to: ■ Manage the airway ■ Check the blood sugar ■ Position the child	If the child is convulsing, you need to: ■ Manage the airway ■ Check the blood sugar ■ Give diazepam ■ Position the child
If the child does not have shock, and is not unconscious or convulsing, quickly continue the assessment for emergency signs. If the child is unconscious or is convulsing, you should initiate appropriate treatment, and then quickly resume the assessment.	

Assessment Questions: Coma and convulsion

Answer all the questions on this page, writing in the given spaces. If you have a problem, ask for help from one of the facilitators.

1. What do the letters AVPU stand for?

2. What is the cut-off level for low blood sugar?

3. How much 10% glucose would you give to a six-month-old weighing 8 kg and having a low blood sugar? How do you prepare from 40%?

4. A child who is unconscious, with no history of trauma, but maintaining the airway should be put in which position?

5. How much rectal diazepam (in ml of the 10mg/2ml solution) would you give to a four-year old weighing 15 kg who is having a convulsion? How long should you wait before giving a second dose if the convulsion does not stop?

6. A 15-month old girl has been sleeping all day. She does not answer to a call from her mother. But she responds to a pinch on her chest. What stage of AVPU do you assign her? While on examination, she started to move her limbs abnormally and her eyes rolled sideways and there were frothy secretions in her mouth. What is the most appropriate measure to take?

7. **A two-year old boy is carried in by his grandmother. He weighs 12 kg. He is hot and having a seizure. What are the next steps to stop the convulsion? And when the convulsion stops, what do you do?**

8. **A three-year old girl was brought in because she was abnormally sleepy and not responding at all. The father said he took her to a nearby clinic for cough and vomiting and he was being given tablets. She did not take any food. What is the next most appropriate step?**

9. **An 18-month old boy has been unwell and feverish for two days. He complains of abdominal pain and his mother has noticed that he has fast breathing. He weighs 11 kg. His airway is fine, and he has no chest indrawing. There is no history of diarrhoea. However, the boy started to convulse while being examined. What are the most appropriate measures?**

10. **A 10-week old baby was brought in. His mother says he will not suckle today because he is crying a lot. He feels very hot on touch. He weighs 3.5 kg. Airway, breathing and circulation are normal. There is no history of diarrhoea and no dehydration. How do you triage the baby? What are the next steps?**

11. **A 14-month old girl has been sleeping all day. She is irritable when awoken, but rouses to loud voice or shaking her arm. Her hands are warm but look a bit pale. The mother says she has no diarrhoea or vomiting. Her breathing is deep and her lower chest wall goes in when she breathes in. How do you Triage this child? What are the next steps?**

Module Five

Dehydration

Learning Objectives;

At the end of this module, you will be able to:

- Assess a child for Severe Dehydration
- Manage a child with Severe Dehydration

The letter D in the ABCDO stands for Dehydration. These assessments can take place if those for A B and C were all normal, or if emergency treatments have been given for any problem encountered. If there are no signs of dehydration, you can move on to look for other emergency signs and then for priority signs.

A	**A**irway
B	**B**reathing
C	**C**irculation, **C**oma, **C**onvulsion
D	**D**ehydration (severe)
O	**O**thers (immediate Poisoning, Major Trauma with open fracture, Bleeding Child)

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.

DOES THE CHILD HAVE DIARRHOEA?

This information comes from the parent or guardian. If the child has no diarrhoea, do not check for dehydration and you can move to the next assessment.

Assess for severe dehydration

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

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

In Table 9 below, the signs are listed on the left and the corresponding treatments on the right. Complete the assessment of all the signs on the left before deciding on and initiating treatment.

Table 10
Severe dehydration

D SEVERE DEHYDRATION (in child with diarrhoea)	Diarrhoea plus any two of these: ■ Lethargy ■ Sunken eyes ■ Unable to drink?[1] ■ Very slow skin pinch	**Diarrhoea plus 2 positive signs**	**IF NO SEVERE MALNUTRITION:** Insert IV line and begin giving fluids rapidly following Plan C. **IF SEVERE MALNUTRITION:** Do not insert IV, but proceed immediately to assessment and treatment.

[1] checking for drinking by giving water may take time and not useful for emergency assessment, just we can ask the mother whether the child is able to drink or not and decide accordingly

Given below are step-by-step descriptions of how to assess each of these signs. If the child has diarrhoea, assess the following signs to determine if the child has severe dehydration.

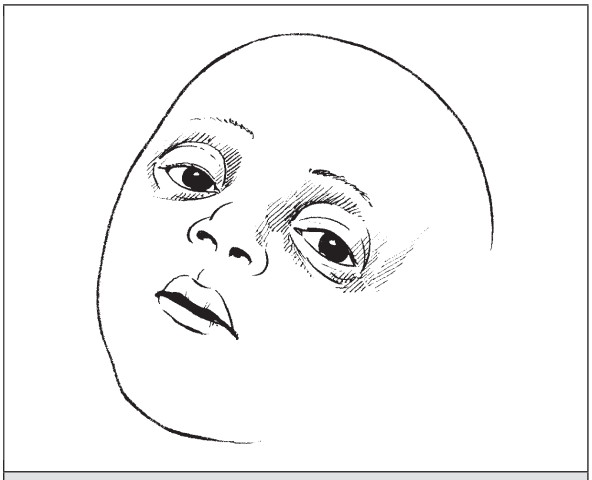


Figure 34
Sunken Eyes

IS THE CHILD LETHARGIC?

In the older child lethargy is quite easy to assess. You have already assessed the state of consciousness of the child using the AVPU scale. Now observe if the child appears drowsy and does not show interest in what is happening around him/her. A lethargic child may not look at the mother or watch your face when you talk. The child may stare blankly and appear not to notice what is going on around him/her.

Does the child know his/her name and answer questions sensibly? If the child responds to voice but remains drowsy, he/she is lethargic. In the younger child, signs of lethargy are harder to assess.

DOES THE CHILD HAVE SUNKEN EYES?

Look at the child's eyes to determine if they appear unusually sunken in their sockets (see Figure 34). Ask the mother if the child's eyes are more sunken than usual, or if the skin around them appears darker than usual.

IS THE CHILD UNABLE TO DRINK?

Offer clean water and see how the drinking ability is. If the child is not able to drink, this is a sign of severe dehydration.

DOES A SKIN PINCH GO BACK VERY SLOWLY (LONGER THAN 2 SECONDS)?

This is a simple test to look at how elastic the skin is. If the child is not dehydrated, the skin will be elastic and, when pinched and released, will return to normal straight away. Try this on yourself. The dehydrated child will have lost fluid. The body moves fluid from less important places, such as the skin, to maintain the circulation. The skin becomes less elastic and, when pinched, is slow to return.

Locate the area on the child's abdomen halfway between the umbilicus and the side of the abdomen. Avoiding using your fingertips, as this is painful. Pinch the skin in a vertical (head to foot) direction and not across the child's body. You should pick up all the layers of the skin and the tissue underneath. Pinch for one second and then release. See whether the skin goes back very slowly (≥ 2 seconds) (Figure 35).

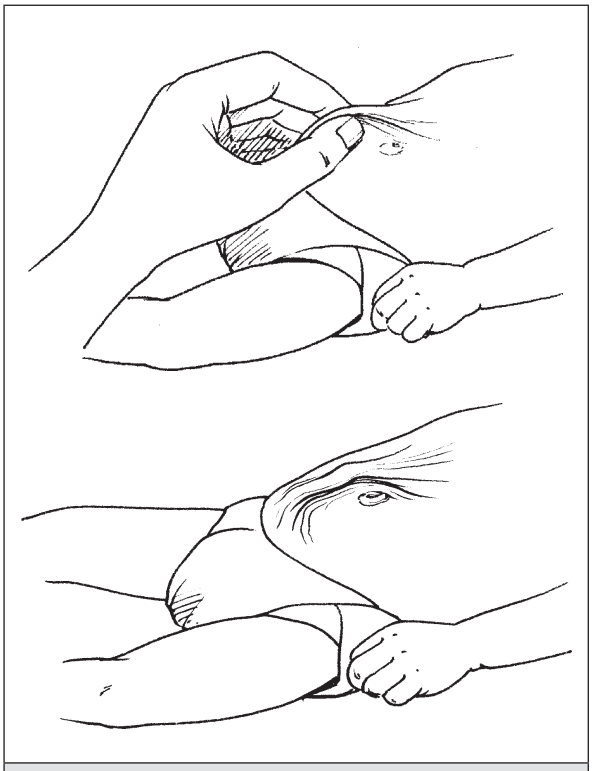


Figure 35
Skin pinch

Severe dehydration is present if the child has a history of diarrhoea plus any two of the following signs:

- lethargy
- sunken eyes
- unable to drink
- skin pinch goes back very slowly (≥ 2 seconds)

If the triage assessment determines that a child has severe dehydration, you must also check for severe malnutrition, as it is difficult to assess dehydration in a child with severe malnutrition.

The assessment and signs discussed above are clearly illustrated on video. You should now watch the section entitled "Assessment of Dehydration". If you do not have a video player, the photographs supplied illustrate sunken eyes and the skin pinch. As in previous sections you will get the opportunity to see all the signs on real patients.

Treatment of severe dehydration in an emergency setting

If the child has shock, treat this first (see Module 3: Circulation).

SEVERE DEHYDRATION (WITHOUT SHOCK OR SEVERE MALNUTRITION)

Give the child a large quantity of fluids quickly. The fluids replace the body's large fluid loss. This is shown in Diarrhoea Treatment Plan C (Chart 11 in Annex 3). The first portion of the IV fluid (30 ml/kg) is given over 1 hour for infants and over 30 minutes for older children. This will restore the blood volume and prevent death from shock. Then 70 ml/kg is given more slowly to complete the rehydration. In all cases the fluid of choice is Ringer's lactate.

Give oral fluids

As soon as the child can drink you should give oral fluids in addition to the drip. Use ORS and give 5 ml/kg every hour.

Example

The following example describes how to treat a child with SEVERE DEHYDRATION according to Plan C.

A six-month old (9 kg) girl, Eleni, had diarrhoea with SEVERE DEHYDRATION. She was not in shock and did not have severe malnutrition. She was not able to drink. The health worker decided to treat the infant with IV fluid according to Plan C.

The health worker gave Eleni 270 ml (30 ml x 9 kg) of Ringer's lactate by IV during the first hour. Over the following five hours, he gave her 630 ml of IV fluid (70 ml x 9 kg), approximately 125 ml per hour. The health worker assessed the infant's hydration status every 1-2 hours (that is, he assessed for dehydration). Her hydration status was improving, so the health worker continued giving Eleni the fluid at a steady rate.

After 4 hours of IV treatment, Eleni was able to drink. The health worker continued giving her IV fluid and began giving her approximately 45 ml of ORS solution to drink per hour.

After Eleni had been on IV fluid for 6 hours, the health worker reassessed her dehydration. She had improved and was reclassified as SOME DEHYDRATION. The health worker chose Plan B to continue treatment. The health worker stopped the IV fluid. He began giving Eleni ORS solution as indicated in Plan B.

GIVE FLUIDS BY INTRAOSSEOUS IF SETTING AN IV LINE IS NOT POSSIBLE.

Give Fluids by Nasogastric Tube if You Cannot Set Up Both Intravenous and Intraosseous Infusion.

Sometimes it can be very hard to set a drip. In this case call for help and while waiting, start nasogastric fluid replacement. Use Oral Rehydration Solution (ORS) in all cases. Give 20 ml/kg every hour for six hours.

The above example describes the entire rehydration according to Plan C. When you give emergency treatment to a child with severe dehydration, you will begin the initial rehydration1[1]. Determine the age and weight of the child. Determine the initial amount of fluid to give the child. Insert an IV line and start giving fluids.

1 *You or other staff will continue giving the child fluids, reassessing periodically and completing the rehydration. However, continuing the treatment is not described here as part of emergency treatment.*

Table 11
Fluid management after the first bolus for severe dehydration

Age	< 12 Months				1 year to 5 years			
			Drops per minute[2]				Drops per minute	
Weight	Total volume	Per hour	Pediatric	Adult	Total volume	Per hour	Pediatric	Adult
<4 kg	200	40 ml	40	13				
4 - <6 kg	350	70 ml	70	23				
6 - <10 kg	550	110 ml	110	37	550	220	220	73
10 - <14 kg	850	170 ml	170	57	850	340	340	113
14 - <19 kg	1200	240 ml	240	80	1200	480	480	160

Reassess the child every hour. If the hydration status is not improving, give the IV drip more rapidly. Also give ORS solution (about 5ml/kg/hour) as soon as the child can drink; this is usually after 3-4 hours (in infants) or 1-2 hours (in children).

Table 12
Volume of ORS to be given every hour (once child is able to drink) while the child is being treated with IV fluid for severe Dehydration

Weight	Volume of ORS solution per hour
<4 kg	15 ml
4 <6 kg	25 ml
6 <10 kg	40 ml
10 <14 kg	60 ml
14 <19 kg	85 ml

Reassess after 6 hours (infants) and after 3 hours (children). Classify dehydration. Then choose the appropriate diarrhoea treatment plan to continue treatment.

If possible, observe the child for at least 6 hours after rehydration to be sure that the mother can maintain hydration by giving the child ORS solution by mouth.

2 *The number of drops to be given per minute is based on the assumption that droppers in IV sets provide a fixed number of drops per ml. Micro droppers for infants give 60 drops per ml. The number of drops per minute is therefore equal to the number of ml per hour (60 drops divided by 60 minutes). IV sets for adults in most countries give 20 drops per ml. The figures in the table are based on this number. In case IV sets are used that give larger drops, e.g. 15 per ml, the number of drops per minute have to be adjusted.*

DEHYDRATION IN SEVERELY MALNURSHED CHILD

Do NOT give IV fluids if possible.

Give ReSoMal which can be made (see below for recipe) or is commercially available. The ReSoMal rehydration fluid should be given orally or by nasogastric tube, much more slowly than you would when rehydrating a well-nourished child.

When assessing the blood sugar in a malnourished child, remember that a low blood sugar level is below 3 mmol/L (54mg/dl). It is better to give 10% glucose to a child whose sugar is borderline than to withhold it. As these children have no energy stores, they cannot, unlike well-nourished children, maintain their blood sugar in a crisis.

Table 13
ReSoMal Recipe

INGREDIENT	AMOUNT
Water	2 L
WHO-ORS	One-1L packet[a]
Sucrose (household sugar)	50g
Electrolyte/mineral solution[b]	40ml

[a] 2.6 g sodium chloride, 2.9 g trisodium citrate dihydrate, 1.5 g potassium chloride, 13.5 g glucose

[b] See below for the recipe for the electrolyte/mineral solution. If you use a commercially prepared electrolyte and mineral powder, follow the manufacturer's instructions. If these cannot be made up, use 45 ml of potassium chloride solution (100 g potassium chloride in 1 liter of water) instead.

ReSoMal contains approximately 45 mmol sodium, 40 mmol potassium and 3 mmol magnesium per liter.

Table 14
Treatment of severe dehydration

If the child has NO severe malnutrition	If the child HAS severe malnutrition
Does the child have shock? If **YES** ■ See TREATMENT OF SHOCK (Table 3) in Module 3: Circulation\ If **NO**, Treat as Plan C (Chart 11) ■ Give Ringer's lactate ■ For infants: – 30 ml/kg in the first hour – 70 ml/kg in the next 5 hours ■ For children(> 1 year of age:) – 30 ml/kg in the first 30 minutes – 70 ml/kg in the next 2.5 hours ■ Assess the child every 1- 2 hours If the signs of dehydration are not improving: ■ give fluid more rapidly ■ inform doctor or senior staff As soon as the child can drink: ■ give oral fluids in addition to the drip ■ give ORS 5 ml/kg every hour	**Does the child have shock?** If **YES** ■ See TREATMENT OF SHOCK in Module 3: Circulation If **NO** ■ Do not give IV fluids For all children: ■ Give ReSoMal 5ml/kg every 30 minutes for the first 2 hours ■ Then 5-10ml/kg/hour for the next 4-10 hours ■ Give more ReSoMal if child wants more or large stool loss or vomiting ■ Check blood glucose and Treat if <54mg/dl For further treatment see national guideline on Severe Acute Malnutrition

If the child does not have diarrhoea or is not dehydrated, quickly continue the assessment for other emergency signs. If the child is dehydrated, you should initiate appropriate treatment, and then quickly resume the assessment.

SUMMARY

In a child with severe dehydration WITHOUT severe malnutrition:

- Treat shock if present
- Give intravenous or nasogastric fluids
- Start oral fluids as soon as possible

In a child with severe dehydration WITH severe malnutrition:

- Treat shock if present
- Give oral or nasogastric fluids

Assessment Questions: Dehydration

Answer all the questions on this page, writing in the given spaces. If you have a problem, ask for help from one of the facilitators.

1. An abnormal skin pinch takes _____ seconds to go back in severe dehydration.

2. An eight-month old weighing 6 kg is severely dehydrated. How much fluid would you give in the first hour? For how long would you give the remaining fluid in the same child?

3. A three-year old weighing 15 kg is severely dehydrated. He has received 450 ml of fluid in 30 minutes. How much fluid are you going to give him next, and over what period of time?

4. If you cannot set up a drip, how much ORS (ml/kg) through nasogastric tube should you give a child in an hour?

5. Behailu is three-years old and weighs 15 kg. His mother said that his diarrhoea started yesterday. The health worker's assessment found that Behailu was not in shock and that he was breathing adequately. He was lethargic and not able to drink, had sunken eyes and a skin pinch went back very slowly. He was not severely malnourished but had diarrhoea with severe dehydration. How should the health worker treat Behailu's dehydration?

What amount of fluid should Behailu be given initially?

6. Asmamaw is two-year old and weighs 8 kg. He is breathing comfortably and not in shock, but has diarrhoea. A health worker finds Asmamaw is lethargic. His eyes are sunken, and a skin pinch goes back very slowly. The health worker decides that Asmamaw has diarrhoea with severe dehydration, then checks for severe malnutrition and sees visible severe wasting. What is the appropriate treatment for Asmamaw 's dehydration?

7. Daniel is eight months old and weighs 6 kg. He has had diarrhoea for a week and is very sick. He is breathing adequately and is not in shock. The health worker sees that Daniel 's eyes are sunken. When encouraged, Daniel is able to take a sip of water, but drinks poorly. A skin pinch goes back very slowly. The health worker finds Daniel has diarrhoea with severe dehydration. He is not severely malnourished. How much IV fluid should be given to Daniel in the first hour?

Should the health worker give Daniel ORS solution? If so, how much?

8. Sara is nine months old and weighs 7 kg. Her mother brings her to the clinic because she has had diarrhoea for a week. The mother tells the health worker that Sara is no longer breastfed, and is too tired to drink from a cup. The health worker assesses Sara. He finds that she is breathing adequately. Her hands are cold and her pulse is weak and fast. She is lethargic, has sunken eyes, and a skin pinch goes back very slowly. The health worker decides that she is in shock. She is not malnourished. What emergency treatment should the health worker give Sara?

9. Regassa, a 12-month-old boy weighing 8 kg, is brought to the small hospital very late at night. The health worker assesses the boy and finds that he is alert and crying and not in shock. He can drink, but very poorly, and a skin pinch goes back very slowly. The health worker decides the child has diarrhoea with severe dehydration. He is not malnourished.

The child needs fluid for severe dehydration given according to Plan C, but the health worker is not trained to give IV therapy. The last nurse has left for the night and no other nurses will come in for several hours. The health worker is trained to give nasogastric therapy and has ORS available. How should Regassa be rehydrated?

How much fluid should the health worker give initially?

10. A one-year old girl has a two-day history of diarrhoea and vomiting. Her weight is 6.5 kg. She is restless and irritable. Her airway and breathing are OK. AVPU=voice. Skin pinch lasts 4 seconds. Her eyes are sunken and the mother confirms this fact. How do you manage her?

Module Six

Cardiopulmonary Resuscitation in the Newborn and Children

Learning Objectives

At the end of this module, you will be able to:

- Give Cardiopulmonary Resuscitation
- Do Neonatal Resuscitation

Cardiopulmonary Resuscitation (CPR)

INTRODUCTION:

Cardiopulmonary /cardiac arrest is the cessation of circulation of blood as a result of absent or ineffective cardiac activity. In contrast to adults, sudden cardiac arrest in children is uncommon rather it is more often caused by progression of respiratory failure or shock than by primary cardiac arrhythmias.

The most important action of preventing death due to cardiac arrest is anticipation and prevention of the occurrence of cardiac arrest by intervening when a child manifests in respiratory distress or early stages of shock. This can prevent deterioration to full-blown arrest.

The goal in pediatric resuscitation is to maintain adequate oxygenation and perfusion of blood throughout the body An orderly sequence of events should be instituted immediately beginning with the ABCs(airway, breathing, and circulation). In addition to airway, "A" also represents assessment of responsiveness (eg" Are you all right?" call the baby or stimulate), and activation of the emergency response system.

MANAGEMENT OF CARDIAC ARREST

Step 1: Check patient responsiveness

- Attempt to rouse the patient with verbal or painful stimuli
- If no response, assume that the brain is no longer receiving adequate oxygen and continue down management pathway for cardiac arrest

Step 2: Assessment and Management of airway

- To assess for a patent airway, use the look/listen/feel approach:

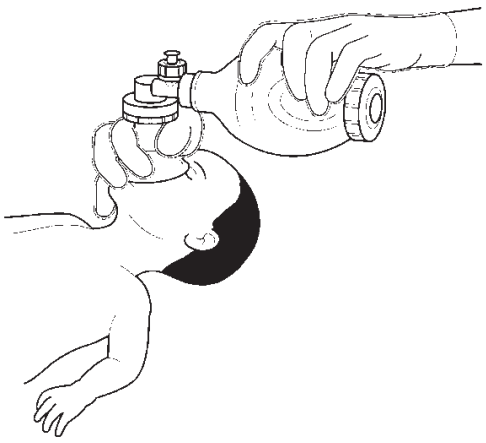


Figure 36
Bag mask technique



Figure 37
Mouth to Barrier device to give rescue breath

Step 3: Giving rescue breaths

- If the airway is patent and spontaneous respiration is not observed or the child is not breathing adequately, then artificial ventilation should be initiated.
- Using a bag mask device, give 2 breaths in quick succession and observe for chest rise(Figure 36).
- If bag mask is not available, perform mouth-to-barrier using a plastic barrier device (Figure 37).
- You should be able to observe chest rise with these breaths. If no chest rise is seen, reposition the head and re-attempt breaths.
- After two breaths are delivered, assess for a pulse.
- In an infant or small child, the pulse should be palpated in the brachial artery. In an older child, the carotid or radial artery may be assessed.
- If no pulse is felt after 10 seconds, chest compressions should be initiated.

Step 4: Chest compressions

- To find the correct hand position in an older child, palpate the xiphoid process and place hands directly above this area on the sternum (Fig 38).
- In older children, place one hand on top of the other and push down onto the chest, making sure to keep your shoulders directly over your hands and elbows remain locked (Fig 38).
- In younger children (<8 years old), hand position is the same as an older child although only 1 hand is needed for compressions (Figure 39).
- In infants, use 2 fingers in the center of the chest just below the nipples in one rescuer (Figure 40) in the presence of two rescuer in circling method is preferable (Figure 41).

The basic principle behind high-quality CPR is that adequate chest compressions are performed.

- The key to adequate compressions is as follows:
  - push fast (rate of 100/min)

- push hard (about 1/3 to 1/2 of antro-posterior chest diameter)
- allow for full chest recoil in between compression and minimize interruptions
- rotate rescuers ever 2 minutes or sooner when tired (see the algorithm for the basic principle of CPR).



Figure 38
Hand placement in an older child



Figure 39
Hand placement in an younger child

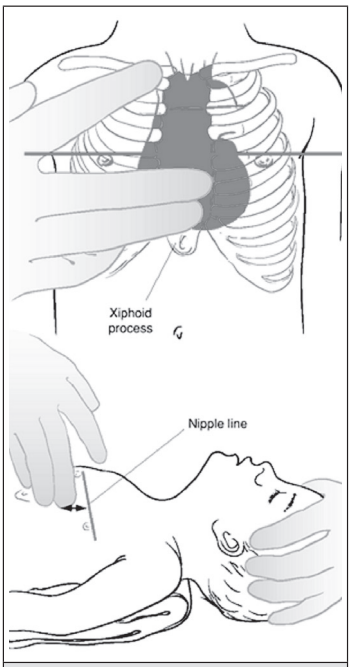


Figure 40
Hand placement in Infant

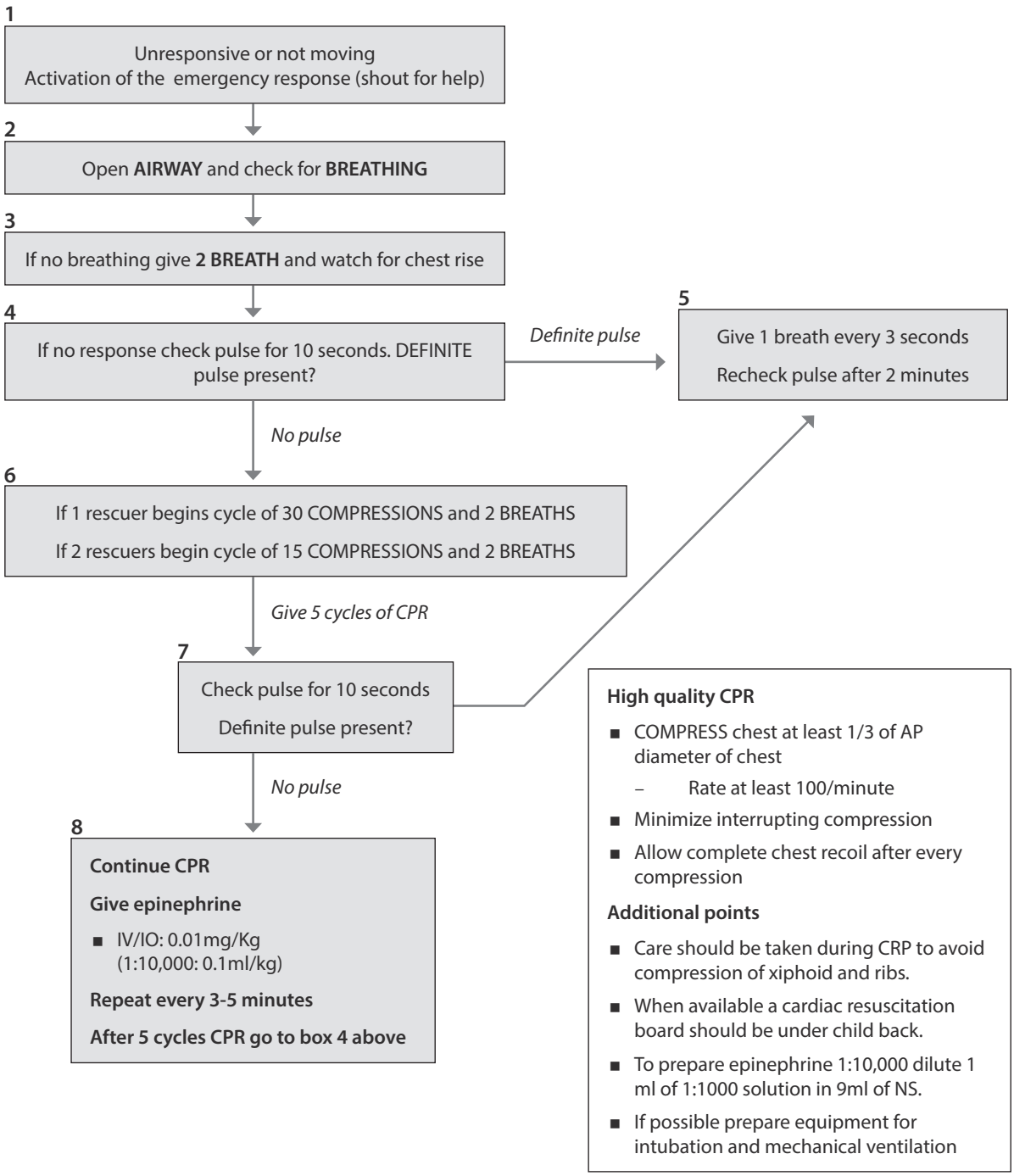


Figure 41
In infants use 2 fingers

Deciding to Terminating Resuscitative Efforts:

In the majority of situations, prolonged resuscitative efforts for children are unlikely to be successful and can be discontinued if there is no return of spontaneous breathing after 20 minutes of proper CPR.

CHART 12. Cardio Pulmonary Resuscitation



Neonatal resuscitation

Most babies require basic essential newborn care at and after delivery. Only few need extra support and resuscitation.

Risk factors are poor predictors of birth asphyxia. Up to half of newborns who require resuscitation have no Identifiable risk factors before birth. Therefore preparation for neonatal resuscitation for any delivery is the key to save lives. Hypothermia is one of the major problems which contribute for death and poor response for resuscitation so we have to keep the environment warm during transport and resuscitation. Make sure that the windows and doors are closed and pre-warm the environment with radiant warmer.

Resuscitate the newborn under strict infection prevention.

DRYING AND KEEPING THE BABY WARM

The initial step of neonatal resuscitation are drying and stimulating the baby if there is no meconium (suck the mouth and the nose if there is meconium). Remove the wet towel and cover both the baby and mother with warm towel.

Immediately, after drying and stimulating, assess the baby for Breathing?

- If the baby is not crying, cyanosed, gasping or not breathing at all, stimulate the baby by rubbing the back, soles, palm and suck the mouth and the nose. If no response immediately cut the cord and take the baby to the area where you can start resuscitation.

Do not suck right down the throat as this can cause apnoea/ bradycardia

Inform the mother that the baby needs resuscitation.

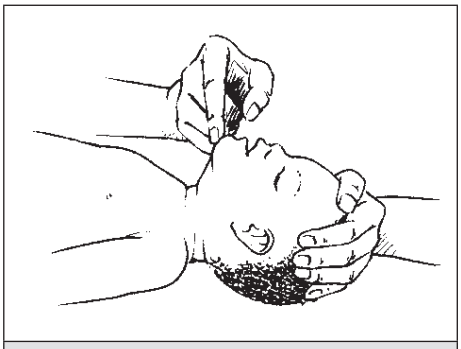


Figure 42
Neutral position to open the airway

Airway

- Keep the baby's head in slight extension position to open the airway figure 42

Breathing

- Start bag and mask ventilation with room air. Don't waste time checking pulse and respiratory rate.
- Choosing mask size which fits over nose and mouth (see Figure 17 on page 26): Size 1 for normal weight baby, size 0 for small (less than 2.5 kg) baby
- Ventilation with bag and mask at 40 - 60 breaths/minute (count breath to squeeze then -two-three while releasing the bag)
- Make sure the chest moves up with each press on the bag.

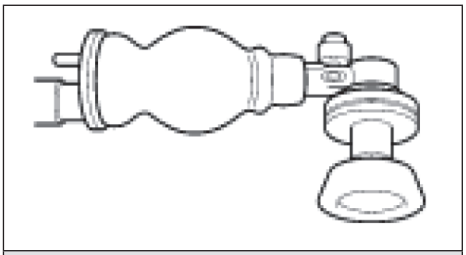


Figure 43
Neonatal self-inflating resuscitation bag with round mask

While ventilating a neonate with bag mask, pull the jaw forward towards the mask with the third finger of the hand holding the mask. Do not hyperextend the neck. If you hear air escaping, the most important leak is between nose and the check (see Figure 44).

If the baby is not responding after one minute of bag and mask ventilation, consider improved ventilation.

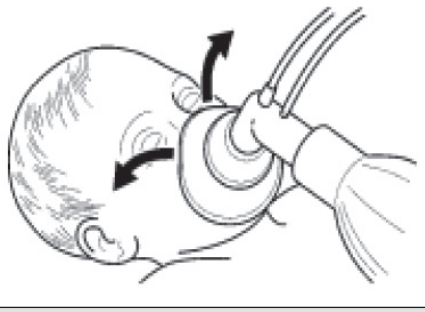


Figure 44
Improperly placed facemask

- Call for help
- If you don't see a good chest rise the most important reasons could be inappropriate technique, try repositioning and with good sealing.
- If secretions blocking the airways , clear the airway, check if the ambu bag is working increased pressure on the bag

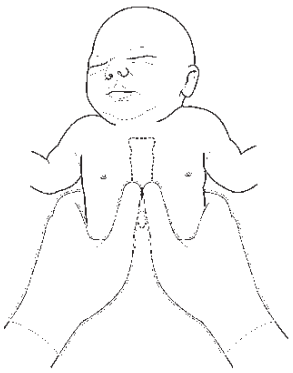


Figure 45
Chest compression methods

Circulation

- Start chest compressions if HR <60/min after one minute of improved ventilation with adequate chest movements. Ninety compressions coordinated with 30 breaths /min (3 compressions and one breath: one-and-two-and-three-and-breath).
- Place thumbs just below the line connecting the nipples on the sternum (see Figure 45). 2-thumb, encircling-hands method) is preferred but this needs a presence of two people. Compress 1/3 to 1/2 the AP diameter of the chest.

If bag and mask ventilation is required for longer than several minutes, an orogastric tube should be inserted as distended stomach will occur and this limits effective ventilation. The infant should be reevaluated after 30 seconds of bag mask ventilation check for spontaneous respirations and heart rate. If the infant has begun breathing and the heart rate is >100 slowly discontinue ventilation.

- If the baby is not breathing spontaneously and the heart rate is between 60-100/min continue ventilating the baby and stop chest compression.

Drugs

If the heart rate remains below 60 beats per minute, continue chest compression and epinephrine should be given. dose of epinephrine therapy in neonates is 0.01 to 0.03 mg per kg of a 1:10,000 concentration, or 0.1 to 0.3 mL per kg (to prepare 1:10,000 mix 1ml of epinephrine with 9ml saline of 1:1000 adrenaline).

- Use umbilical catheterization (See Annex 1)
- Emergency volume expansion may be accomplished with a normal saline or ringer lactate 10 ml /kg

Post resuscitation stabilization

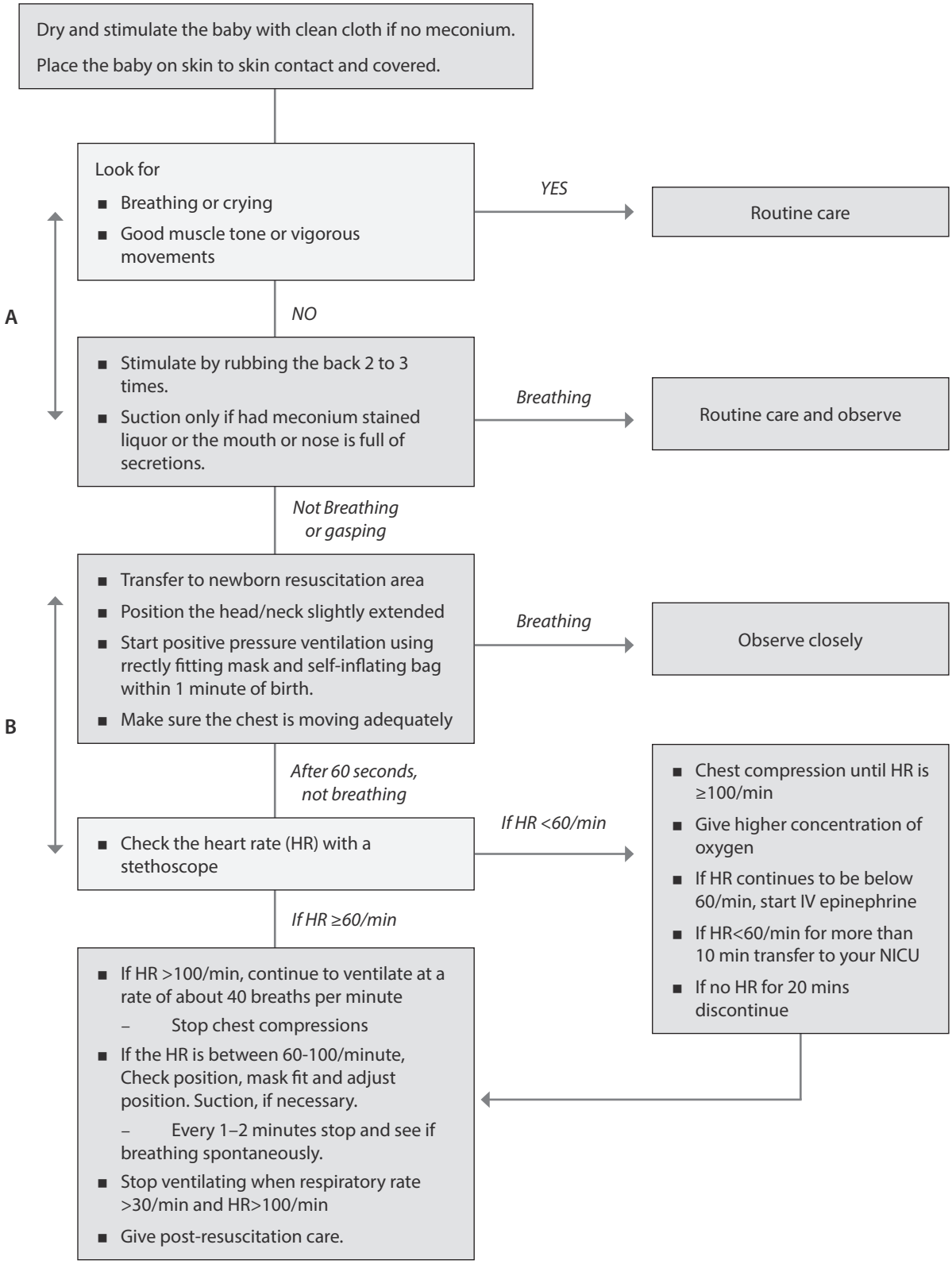
Continue monitoring, keep the newborn warm and prevent hypoglycemia and immediately transfer the newborn to neonatal ward.

Cessation of resuscitation

If after 20 minutes of resuscitation the baby is:

- Not breathing and heart rate is absent: consider stopping efforts.
- Explain to the mother that the baby has died, and give to her to hold if she wishes

CHART 13: Neonatal Resuscitation



SUMMARY

- Cardiac Arrest in children are commonly due to Respiratory problem
- Early identification and treatment of respiratory distress will prevent development of cardiac arrest

Cardiopulmonary Resuscitation will be effective:

- If initiated early
- Done in a systematic way
- Done in a team approach

Neonatal Resuscitation is done immediately for newborns with asphyxia

Anticipation of complicated labor is a key point to be ready for resuscitation and save neonatal life

Assessment Questions: Cardiopulmonary Resuscitation and Neonatal Resuscitation

Answer all the questions on this page, writing in the given spaces. If you have a roblem, ask for help from one of the facilitators.

1. What is the correct ratio for compression to ventilation in a 3-year-old child with 1 rescue?

2. What are the characteristics of adequate chest compressions?

3. What is the recommended number of compressions per minute in a child?

4. How often should you assess for a pulse during chest compressions?

5. What is the emergency dose of epinephrine for a 10 kg child?

6. Which newborns need Immediate Resuscitation?

A. Baby with strong cry
B. Baby breathing 40 per minute
C. Baby whose whole body is blue
D. Baby with gasping type of breathing
E. Baby only whose extremities are blue

7. What is the appropriate airway position in Neonatal Resuscitation?

8. After how many minutes do we stop resuscitation if no response?

Module Seven

Common Respiratory Emergencies in Children

Learning Objectives:

After this session, you will be able to:

- Assess and manage a child with stridor
- Manage a child with croup
- Assess a child with wheezing
- Manage a child with acute bronchial asthma

WHAT IS STRIDOR?

Stridor is a harsh, high-pitched respiratory sound, which is usually inspiratory but can be biphasic and is produced by turbulent airflow; it is not a diagnosis but a sign of upper airway obstruction. If the obstruction is below the larynx, stridor may also occur during expiration. Your instructor will show you a video on Stridor.

Causes of stridor in children

Febrile child	**Afebrile child**
Croup	foreign-body aspiration or trauma
Bacterial tracheitis	Burn
Epiglottitis	Hypocalcemic tetany
Retropharyngeal abscess	Tetanus
	Laryngomalcia

- The most common acquired cause of Stridor during childhood is croup.

What is Croup?

The term croup refers to a heterogeneous group of mainly acute and infectious processes that are characterized by a bark-like or brassy cough and may be associated with hoarseness, inspiratory stridor, and respiratory distress. Croup is a viral infection of the upper airway. Croup typically presents with fever and an upper respiratory tract prodrome, with the characteristic signs of a "barking" cough and stridor developing 1-3 days later. Stridor is typically worse at night and is provoked with agitation or crying. Children between the ages of 6 months and 3 years are most often affected.

Clinical Manifestations

The severity of croup is variable, there are mild and severe forms of croup:

- Mild croup is characterized by stridor that is heard only when child is agitated. On auscultation, mild stridor may be the only finding. Although rhonchi and wheezes can be present.
- Severe croup is characterized by stridor that is heard only when child is at rest in addition to signs of severe respiratory distress like chest wall retractions, cyanosis, decreased air entry, tachycardia, hypotonia and change in mental status.

Croup is a clinical diagnosis and does not routinely require a neck radiograph. Radiographs may show subglottic narrowing (known as a "steeple" sign, as a result of soft tissue swelling), although most radiographs are normal.

If a child presents with toxic features, consider alternative diagnoses such as epiglottitis or retropharyngeal abscess and radiographs should be considered only after airway is secured.

How do you manage croup?

Mild croup

Requires only supportive care. Such as:

- Antipyretics
- Oral hydration, and
- Observation at home.
- Any conditions that may distress the child should be avoided
- Dexamethasone 0.6 mg/kg IM/IV stat or PO if able to take.

Severe croup

- Oxygen
- Dexamethasone (0.6mg/kg IM/IV stat or PO if able to take it)
- An alternative drug option is a single oral dose of prednisolone 1 mg/kg
- Epinephrine by nebulization as soon as possible (0.25ml of epinephrine mixed with 3 to 5ml of saline). Effectiveness is immediate and lasts for up to 2 hours, so patients should be observed for at least 3 hours post-treatment to be certain that the respiratory symptoms do not recur. If this shows no improvement, repeat epinephrine every hourly as needed.
- Admission is recommended for patients who require more than one dose of nebulized epinephrine or who continue to have significant respiratory distress following steroid and epinephrine administration
- In a child with severe croup who is deteriorating and has signs of impending complete airway obstruction, intubate the child immediately. If intubation is not to be done soon, do Criocothyroidotomy (see Annex 1)

Wheezing in Children

Wheeze is a high-pitched whistling sound near the end of expiration. It is caused by obstruction of intrathoracic airways. To hear a wheeze, even in mild cases, place the ear next to the child's mouth and listen to the breathing while the child is calm, or use a stethoscope to listen. It must be distinguished from stridor. In infants and

young children, wheezing is common owing to unique age-specific anatomic and physiologic properties.

The etiology of wheezing involves any pathophysiologic process resulting in impaired airflow mediated by a reduction in airway diameter. This pathophysiologic end-point encompasses a variety of causes and therefore poses diagnostic difficulties in the evaluation of the young wheezing child younger than age 5 yr.

The most common causes of infantile wheezing are viral respiratory infections and asthma. In the first 2 years of life, wheezing is most often caused by acute viral respiratory infections such as bronchiolitis or common cold. After 2 years of age, most wheezing is due to asthma.

What is asthma?

Asthma is a chronic inflammatory condition with reversible airways obstruction. It is characterized by recurrent episodes of wheezing, often with cough, which respond to treatment with bronchodilators and anti-inflammatory drugs. Factors contributing to the development of asthma in early wheezing children are poorly understood. Some risk factors of developing asthma in a child with Wheezing include:

- Genetic predisposition
- Environmental exposure, and
- Allergic sensitization

Triggering agents may be nonspecific and include acute viral infection, allergy, weather change, sinusitis, otitis media, drugs, inhaled irritants, exercise, and cold air. It is important to always consider pneumonia as a diagnosis if the child has fever, as this may also present with wheezing.

Management: The management of asthma typically depends on the severity of symptoms at the time of presentation.



Figure 46
Mother using locally-made spacer

Rapid Acting Bronchodilators:

Bronchodilators such as salbutamol are the first line treatment for asthma exacerbations. Salbutamol is available in different preparations and can be delivered in several methods including metered-dose inhaler and nebulized solution.

Introduce two puffs of salbutamol into the spacer chamber. Then place the child's mouth over the opening in the spacer and allow normal breathing for 3-5 breaths (Figure 46). This can be repeated in rapid succession until 6 puffs have been given for the child under 6 years or 12 puffs for over 6 years of age. If a commercial spacer device is not available, one can be prepared from a plastic cup or a 1-litre plastic bottle (see Figure 47). See chart 14 for the managment of asthma.

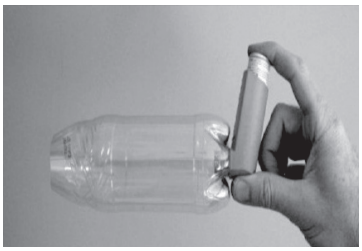


Figure 47
Locally made spacer from plastic material

Most wheezing is due to asthma. Those children presented with first attack of wheeze and signs of respiratory distress may not require bronchodilator. Bur those with signs of respiratory distress irrespective of the cause of the wheeze give rapid acting bronchodilator and assess after fifteen minutes. The response to rapid acting bronchodilator helps to determine the underlying diagnosis and treatment.

CHART 14. Asthma Treatment Algorithm

Mild Asthma	Moderate Asthma	Severe Asthma
Normal mental state Talks in sentences Little or no accessory muscle use SPO2>95% Wheeze + normal breath sounds	Normal to agitated mental state Talks in phrases Mild to moderate accessory muscle use SPO2 90-95% Wheeze +reduced breath sounds	Agitated or confused mental state Talk in single word or unable to talk Significant accessory muscle use SPO2<90% Wheeze +significantly reduced breath sounds
Note; If patient has sign or symptoms from two different categories, always treat according to the most sever feature		
Administer Oxygen via nasal cannula or face mask if SPO2< 90% or there are signs of respiratory distress		
Bronchodilators Via Meter Dose Inhaler(MDI) +spacer <6years >6 years Salbutamol 6puffs 12 puffs (repeat every 20 minutes as needed)	**Bronchodilators;** Via MDI +spacer <6years >6 years Salbutamol 6puffs 12 puffs (repeat every 20 minutes as needed) **Corticosteroids (PO or IV):** Po: Predinsolone 1-2mg/kg/day (max. 6omg), for 3-5 days in a single or 2 divided doses IV: Hydrocortisone 4-5mg/kg Q 6 hours (max 250 mg)	**Bronchodilators;** Via MDI +spacer <6years >6 years Salbutamol 6puffs 12 puffs (repeat every 20 minutes as needed) **If absent air entry at onset, consider;** IM/SC: epinephrine 0.01ml/kg(1:1000) (max. 0.4ml) **Corticosteroids:** IV: Hydrocortisone 4-5 mg/kg Q6 hours(max 250mg) OR IV: dexamethasone 0.3mg/kgQ12 hours (max 20mg) **If no response, consider IV agents:** 1st: IV magnesium sulfate 50%* 0.1mg/kg over 20 minute 2nd: IV aminophyline 3-5mg/kg over 1 hour can repeat every 6 hours
Response after 20 minutes? **Good:** 1. Discharge on salbutamol 2-6 puff every 4-6 hours as needed	**Response after 20 minutes?** **Good:** 1. Observe for additional hours 2. Discharge on salbutamol 2-6 puff every 4-6 hours as needed 3. Continue Pridinsolone 1-2mg/kg/day for 3-5 days in a single or 2 divided doses	**ARRANGE FOR ADMISSION**
Prior to discharge ■ Arrange for follow up appointment ■ Review correct use of inhaler ■ Give clear instruction on when to return if asthma worsen		

SUMMARY

Stridor and wheezing are common pediatric respiratory emergencies

- Croup is common cause of acquired stridor in children
- Giving Nebulized Epinephrine and Steroid is an emergency medical treatment in a child with severe croup
- Wheezing in younger children is commonly due to viral infections or Asthma
- Giving Salbutamol and Steroid are cornerstone of treatment in a child with Acute Asthma

* *For children use 10% magnesium sulfate for IV management. 10 % magnesium sulfate can be prepared by 1 part of 50% magnesium sulfate and 4 part of 5% DW or normal saline. Use 20% magnesium sulfate for IM management.*

Assessment Questions: Child presenting with stridor

Answer all the questions on this page, writing in the given spaces. If you have a problem, ask for help from one of the facilitators.

1. Describe what stridor is?

2. What are the differential diagnosis of stridor ?

3. How do you assess the severity of croup?

4. A 5 year old presented with stridor at rest with chest in drawing and cyanosis? what are the things you do immediately?

Assessment Questions: Wheezing

1. What are common risk factors for developing asthma?

2. Which symptoms are used to classify asthma severity?

3. What is the first line medication for an acute asthma exacerbation?

4. A 10-year-old boy named Fitsum with a history of asthma presents to the emergency room with rapid breathing, audible wheezes, moderate work of breathing, and he can only talk in short phrases. How do you classify his asthma and which medications would you provide immediately?

Module Eight

Pediatric Trauma

Learning Objectives;

At the end of this module, you will be able to:

- Assess a child with Trauma
- Assess and manage immediate complications of trauma
- Do life saving procedures in a child with trauma (needle thoracostomy, cricothyroidotomy)

Evaluation of trauma patients

Globally road traffic accident is estimated to cause 1.2 million deaths and 50 million injuries per year. Pre-hospital care should focus on rapid assessment and management of the airway, breathing, and circulation as well as spinal immobilization. It's also becoming common in developing countries associated with increasing rates of road traffic accidents.

In evaluating trauma patients, a standardized systemic approach reduces morbidity and mortality. The steps are as follows:

- Primary survey (rapid primary evaluation) and resuscitation of vital functions; this is usually done simultaneously.
- Utilization of adjuncts to the primary survey and resuscitation
- Secondary survey (detailed history and head to toe examination)
- Transition to definitive care

PRIMARY SURVEY

Identify and treat immediate life threatening conditions. This should be performed in a stepwise approach as follows:

A	Airway maintenance with cervical spine protection
B	Breathing and ventilation
C	Circulation with hemorrhage control
Ds	Disability (evaluation of neurologic status)
O/E	Exposure and environmental control

A - AIRWAY MAINTENANCE WITH CERVICAL SPINE PROTECTION

Is the airway open?

Airway obstruction with hypoxia and inadequate ventilation is the most common cause of pediatric cardiac arrest following trauma. Initial assessment should not take more than a minute. Start by asking a simple question "What is your name?" If crying or responding, go to Breathing. If no response:

- **Look**
  for secretions and foreign material obstructing the airway or any evidence of facial/mandibular or tracheal/laryngeal fractures with potential for an unstable airway,
- **Listen**
  for air moving in and out (stridor)
- **Feel**
  for air movement

B - IS THE BREATHING NORMAL?

To assess breathing, inspect:

- The neck and thorax
- Tracheal deviation
- Abnormal chest wall movement
- The use of accessory muscles
- Crepitus or flail chest
- Contusions or lacerations of the thorax or neck

Management of common breathing problems:

- Administer a high concentration of oxygen.
- Deliver bag-valve-mask ventilation in cases of inadequate respiratory effort as per CPR (see Module 6).
- In the presence of chest trauma with, pneumo/hemothorax, see chest (thoracic) trauma section

C - ASSESS CIRCULATION

Hypovolemia is the most common cause of shock in the pediatric trauma patient; therefore, the primary survey should always include assessment of pulse, skin temperature and color, capillary refill time, mental state and blood pressure. It is important to remember that in children, tachycardia is an early sign of shock, while low BP is a late sign of shock.

Causes of shock in Trauma:

- External bleeding (e.g. large vessel injury, limb amputation, large scalp laceration)
- Significant chest trauma (e.g. tension pneumothorax, internal bleeding of the chest),
- Abdominal or pelvic trauma leading to massive internal bleeding, or
- Spinal cord injury with neurogenic shock (hypotension with bradycardia).

Management of Circulation

- Apply external pressure and elevation if any external bleeding is present.
- Secure IV or IO
- Rapid infusion of normal saline or lactated Ringer solution at 20mL/kg. Repeat if no response.
- Give 20mL/kg of whole blood if perfusion does not normalize after two crystalloid bolus infusions. For every milliliter of external blood loss, 3mL of crystalloid solution (normal saline or lactated Ringer) should be administered. If the patient remains unstable following fluid bolus and blood administration, consider operative management.
- For suspected internal bleeding, transport patient to a facility where surgery is available.

$C_{m,n}$ – ASSESS CONSCIOUSNESS (C_m)AND CONVULSION (C_n)

- Assess using AVPU or Glasgow Coma Score (GCS)

D_s - DISABILITY

- Assess for disability: check for movement of the extremities and other nurologic deficit (pupillary size and reflexes, posture and signs of increased ICP)
- Random blood sugar (dextrose) can also be assessed

O - ASSESS FOR OTHER EMERGENCIES (ABNORMALITIES)

Look for spinal injury, check themprature, look for any visible bone or deformities:

- Completely undress the patient to identify any potential injuries
- Log roll the patient with cervical spine immobilization to fully assess the back, flank, and spine
- Remember to keep the patient warm throughout the initial trauma assessment
- Hyperthermia can adversely affect outcomes in children with acute brain injuries, so maintain normal body temperatures

Adjuncts to primary survey:

- Consider laboratory studies that need to be done – Hct/Hgb, blood group and Rh, random blood sugar, urinalysis to look for hematuria, and liver enzymes (raised liver enzymes may indicate intrabdominal liver injury)
- Urinary catheter should be placed to monitor urine output as well as an NG tube (children's stomachs should be assumed to be full)
- If bedside ultrasound is available, consider performing FAST (Focused Assessment with Sonography for Trauma) exam to assess for conditions such as intrabdominal bleeding or cardiac tamponade

Secondary survey

Should include a complete head to toe evaluation including

- history
- complete examination
- laboratory studies
- radiographic studies
- problem identification

It is essential to determine the mechanism of injury, time, status at scene, changes in status, and complaints that the child may have

Use the mnemonic 'AMPLE' to assist in taking history in trauma patients

A	Allergies
M	Medications
P	Past medical and surgical history
L	Time of the child's last meal
E	Events preceding the accident

After the patient has been assessed, resuscitated, and stabilized the patient should receive ongoing care related to their injuries

Common Conditions Presenting with Trauma:

ASSESSING THE CHILD WITH HEAD TRAUMA

Overview of pediatric head trauma

Traumatic brain injury is the leading cause of death and disability in pediatric trauma. The most common cause of head injury in children is falls; however, more severe injuries are most likely to be caused by motor vehicle collisions, bicycle collisions, and assaults, including child abuse. Head Injury can be primary (closed or penetrating) and secondary brain injury (cascade vs. events).

Classification of Head Injuries

- Primary brain injury occurs as a result of direct mechanical damage inflicted during the traumatic event.
- Secondary injuries occur from metabolic events such as hypoxia, ischemia, or increased intracranial pressure

Severity	Mild	GCS 14-15
	Moderate	GCS 9-13
	Severe	GCS 3-8

Management of Head Injury

- Initial evaluation starts with primary survey (A,B,C,D,O/E) and resuscitation with the aim to prevent secondary damage by avoiding events such as hypoxia, hypotension, hypoglycemia, hyperthermia, and increased intracranial pressure

Airway & Breathing management:

- Open the airway with c-spine stabilization, remove secretions and put oral airway if the patient is unconscious (see Module Two: Airway and Breathing)
- Put the patient on oxygen to avoid hypoxia as it causes secondary brain damage

- Children with Head Injury with compromised airway, inadequate breathing, or a GCS ≤8 require early endotracheal intubation and controlled ventilation and therefore need referral or an anesthesia consult
- Elevate the head up to 30º
- Patients with evidence of increased intracranial pressure (deteriorating GCS and neurologic finding and dilated pupil) should receive IV mannitol 0.5 to 1 gram /kg to promote rapid osmotic diuresis with reduction of intracranial pressure.

Circulation management:

- Life-threatening hemorrhage must be controlled and shock managed with normal saline as well as blood products as discussed previously. If the patient has low blood pressure with low pulse think of neurogenic shock in relation to spinal injury
- Hypovolemic shock is rare with isolated head injury, although it does rarely occur in infants and young children from scalp bleeding. In these cases it is therefore important to look for other internal causes of bleeding.
- Maintenance fluids should be DNS for infants and NS for older children. Full maintenance fluid volume should be given as fluid restriction can lead to ischemia and secondary brain injury. For blood sugar persistently greater than 180 mg/dl change the fluid to glucose free.

Coma and Convulsion Management (See module four)

- Assess for seizure and evaluate level of consciousness using AVPU. Management is learned in the Coma & Convulsion section (Module 4). Use anticonvulsants as needed to obtain control of seizures. In cases of severe head injury, give a seven-day course of phenytoin for prophylactic seizure control
- Determine blood glucose and treat hypo- or hyperglycemia accordingly. Maintain blood glucose level preferably below 140 mg/dl. For blood sugars persistently >180 mg/dl, change the fluid to glucose free.

Secondary survey

- Obtain a detailed history on the mechanism, time and location of the injury, loss of consciousness, seizure, vomiting, headache, amnesia, weakness, visual changes, previous seizure history, bleeding tendency, and drug use.
- Perform a head-to-toe physical examination, paying close attention for bulging fontanelle, scalp swelling or depressions, signs of basal skull fracture. A complete neurological evaluation should also be performed.
- Use prophylactic antibiotics for open bone fractures, do not give prophylactic antibiotic for basal skull fracture.
- After the initial assessment and stabilization, consult the neurosurgery or surgery team as soon as possible to transfer the patient for more definitive care.
- Consider blood collection in the head (extradural or subdural) if there is dilated pupil on the side of impact and hemiparesis on the opposite side of the impact. This patient need urgent transfer for possible surgical intervention.

SPINAL CORD INJURY

Is there spinal cord injury?

Consider spinal cord injury in all unconscious patient.

After ABCDO assess for:

- trauma to the back (spinal cord)
- strange feelings or loss of feelings in the extremity
- loss of bowel and bladder control
- look the back for abrasions, swelling, any deformity and local tenderness using log roll,
- shock during the ABCDO (the spinal injury gives shock with bradycardia)

X-ray examination

- Entire spine in unconscious patients with suspected spinal injury
- Symptomatic areas of cervical, thoracic, lumbar spines in conscious patient
- Cervical spine in all patients in high-energy multiple trauma

Management

Entire spine immobilized in neutral position, regardless of neurological status

- Log roll for examination
- Must have IV hydration
- Patients with spine fractures or spinal cord injury should be referred.

Assessing the Child with Thoracic Trauma

Overview of pediatric thoracic trauma:

- The chest wall of a child is more compliant than that of an adult. So significant force is required to cause rib fractures in children. Similarly serious intrathoracic trauma without obvious injuries to the chest wall can occur.
- Most of the chest injuries in children are blunt unless it is in adolescents where penetrating comes into picture.
- Suspected chest injuries require URGENT REVIEW by a surgeon experienced in paediatric surgery. After stabilization urgent transfer is needed to the setting where this advanced care can be sought.

Thoracic Traumas of Importance:

Rib Fracture

Fractured ribs commonly occur at the point of impact and may damage to the underlying lung by causing lung bruising or puncture. Look always associated lung or heart injury. Care is mainly supportive with analgesics. The ribs usually become fairly stable within 10 days to two weeks and firm healing with callus formation is seen after about four to six weeks in children.

Is air in the pleural space?

Tension Pneumothorax

This is caused by air in the pleural space obstructing the chest leading to decreased ventilation and oxygenation of the lung. To assess for a tension pneumothorax the most common clinical findings are a fast heart rate and fast breathing. Physical exam findings may include displacement of the trachea away from the affected side, quieter or absent breath sounds, and hyper-resonance on the affected side. The increased intrathoracic pressure also can obstruct cardiac venous return leading to shock.

It is important to note that a tension pneumothorax is a clinical diagnosis and does not require a chest x-ray. This is a medical emergency that requires immediate intervention with needle decompression (see Annex 1). Oxygen should also be provided to the patient prior to decompression. Seek urgent surgical advice for chest tube insertion.

Open Pneumothorax

This is an open connection of the pleural space with outside atmosphere. To treat an open pneumothorax, use a sterile occlusive dressing on and tape the affected area on three sides for flutter effect for the air to escape on the other side see Figure 49 This allows for the air to escape on one side of the open pneumothorax. If you tape at four sides this will convert an open pneumothorax to a closed pneumothorax which subsequently leads to a tension pneumothorax.

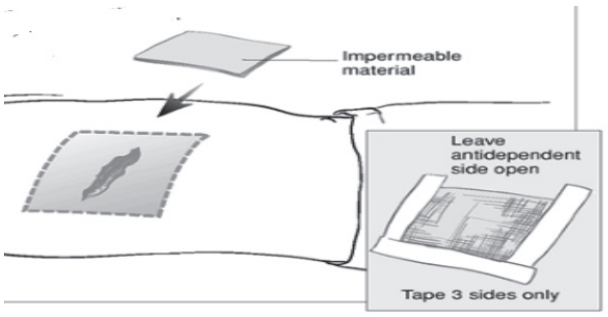


Figure 49
Occlusive tap for dressed on three side

Hemothorax:

This occurs when there is blood in the pleural space. Signs of a hemothorax include respiratory distress, decreased chest movement, and unilateral decreased air entry with dullness and tracheal shift to the opposite side. If there is a massive hemothorax it can lead to shock because of the massive blood lose or because of obstruction of the venous return to the heart.

Management of Hemothorax:

- Give oxygen as near to 100% as possible
- Seek surgical advise for chest tube insertion and possible thoracostomy

Flail Chest

This is caused by multiple rib fractures at two sites (segmental fracture) that lead to asymmetric chest movement. This will be visible on the patient as an area of paradoxic chest wall movement, with signs of respiratory distress due to the altered mechanics of breathing. The patient typically presents with signs of the respiratory distress. Management of flail chest is supportive, with oxygen and analgesics. Stabilizing the chest wall is not priority.

Cardiac Tamponade

This occurs when blood is present in the pericardium. This is a dangerous condition as the pooling of blood in the pericardium can make it difficult for the heart to adequately pump blood and can therefore lead to shock. Physical exam findings may include difficult to hear heart sounds and other signs of shock. As this condition is a medical emergency, treatment involves referral to a specialist or location where pericardiocentesis can be performed.

Assessing the Child with Abdominal or Pelvic Injuries

Overview of abdominal trauma:

- The abdomen is commonly injured in significant traumas; therefore, any child involved in a serious accident should be considered to have an abdominal trauma, particularly as life-threatening blood loss can occur due to internal bleeding.
- Children are at greater risk than adults for intra-abdominal injuries after blunt trauma because of their immature musculoskeletal system and a given force delivered to the abdomen is distributed over a smaller body surface area.

Classification of the abdominal injury

- Abdominal trauma is classified as blunt versus penetrating injury. In addition, injury is distinguished between solid organ (e.g. liver, kidney) versus hollow organ (e.g. stomach and intestines)
- A penetrating wound to the abdominal wall that has entered the abdominal cavity and may cause injury to the intra-abdominal organs. Any penetration of the bowel wall will lead to peritonitis in 1-2 days; therefore, urgent surgical intervention is necessary. Blunt injuries can also damage the intra-abdominal organs.

Approach to the examination of abdominal injury

- Initial examination could be normal, therefore careful serial examinations and a high index of suspicion is necessary.
- If available, ultrasound is useful to investigate for intra-abdominal bleeding and injury to internal organs.

Physical exam should include inspection, auscultation, percussion, and palpation.

Inspection: Examine the lower chest, abdomen, and flanks for bruises, abrasions, lacerations, and penetrating wounds (e.g. seat belt marks, tire tracks). Also check the urine for blood.

Auscultation: All four quadrants of the abdomen should be auscultated for the presence or absence of bowel sounds. A perforated bowel leading to peritonitis can cause absent bowel sounds.

Percussion and palpation: Look for diffuse dullness and rebound tenderness which would suggest peritonitis. Perform a rectal examination as penetrating injury can damage the rectal area. The presence of blood on rectal exam may indicate bowel perforation.

Management of abdominal injury

- Assess the patient for airway and breathing, provide oxygen, assess circulation, and obtain IV access
- Obtain blood for hemoglobin, cross match, and amylase (if available)
- Transfuse as necessary
- Seek urgent surgical advice.

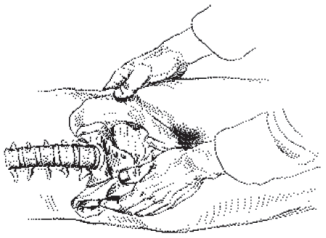


Figure 50
Maneuver to assess for pelvic instability

How to assess a patient for a pelvic fracture?

- Pelvic stability is evaluated by gently compressing and distracting the iliac wing (see Figure 50). If at any time instability is demonstrated, no subsequent maneuver is necessary. Repeated testing for pelvic instability can dislodge clots from coagulated vessels and result in fatal hemorrhage.
- Check for leg length discrepancy
- Check for an open or closed fracture
- Perform a rectal and genitourinary exams in patients with a known or suspected pelvic fracture
  - A boggy or high-riding prostate, blood at the urethral meatus, or a distended bladder may be present with urethral disruption and preclude bladder catheterization until a retrograde urethrogram has been performed.
  - Diminished or absent rectal sphincter tone may indicate a spinal cord injury.



Figure 51
Use of a sheet as a pelvic binder

How to manage patients with pelvic fractures?

At the initial evaluation of the patient, a closed pelvic fracture may cause massive internal hemorrhage and should be considered with "C." Efforts should be made to control hemorrhage with a pelvic wrap while early surgical consultation is obtained. Wrap the pelvis with a sheet or applying a pelvic binder (see Figures 51). A FAST (focused assessment with sonography for trauma) should be done if available.

Musculoskeletal injuries

This section includes fracture and dislocations of the different parts of the upper and lower extremities . Most extremity fractures are associated with injury to the other parts of the body. The most common fracture signs are Pain, swelling, tenderness, deformity, abnormal movement, and loss of function.

Fractures can be classified as:

- Closed-where the skin is intact
- Open-where there is a wound which communicates the fracture with the environment.

As any other emergency start managing with Primary and Secondary survey: as it has been discussed previously

During the Primary Survey –The 3 S's

- Stop bleeding: by direct pressure,
- Splint pelvis: see previous section (see Figure 51)
- Splinting or skin traction (immobilization) the extremity

Any material including cartoon can be used for splinting. Plaster of Paris (POP) slab is the best in emergency room .

Preventing movement of broken bones will decrease internal blood loss, further damage of tissues and pain.

Basic principles of splinting:

- Immobilize the joints above and below the fracture site
- Align the fracture fragments as much as possible (reduction)
- Avoid tight bandages
- Elevate the limb
- Distal pulses should always be checked before and after splint application

Plaster of Paris (POP)

Equipment : cotton, roll bandage. water and Plaster of Paris

Basic Splinting Technique

1. Determine the length of splint material required by using the uninjured extremities
2. Apply cotton padding on the skin which should be appropriate thickness. Additional padding on bony prominces is required
   - Wet the cast material. It is better to use cold water.
3. Apply the splint material and shape it into the form that is needed.
4. Roll the elastic bandage over the splint material. The elastic wrap should only be tight enough to hold the splint in place.
5. Keep the extremity in the correct position until the splint has hardened (30 to 60seconds in most cases)
6. Perform a distal neurovascular examination to assess for circulation.
7. Advise the family and patient for possible splint complication and need for reevaluation with 24hrs.

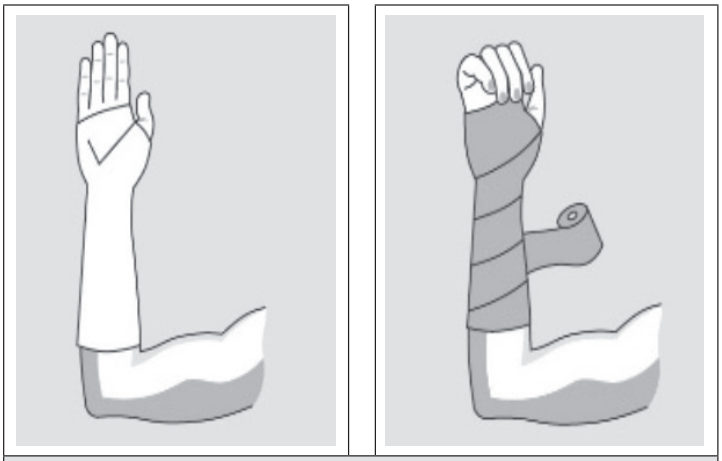


Figure 52
Short arm Slab

Upper limb splinting: long arm slab or gutter (for forearm and elbow fracture) and short arm slab or gutter (for wrist area fractures). Avoid circular cast in emergency (see Figure 52).

For simple and non-displaced fractures apply broad arm sling as in Figure 53.

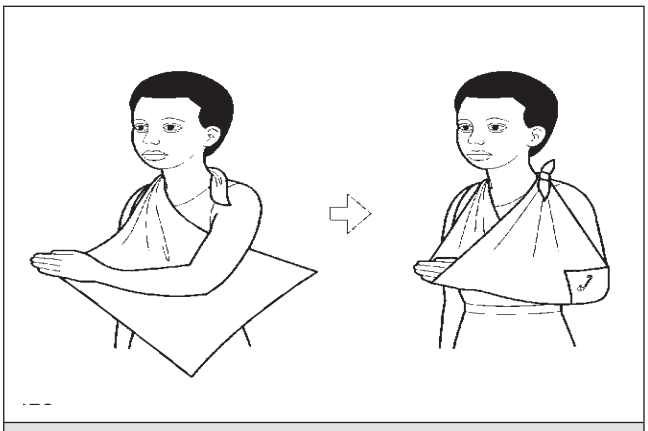


Figure 53
Broad arm sling for simple and non displaced fractures

Lower Limb fractures: long leg (for tibiofibular shaft fractures) and short leg cast (distal tibiofibular, ankle and foot). See Figure 54 and 55.

SKIN TRACTION

Skin traction is used for supracondylar fracture of humerus and femur in children. It is helpful for reduction and maintenance of the fracture, decrease pain and swelling, and avoids complications like compartment syndrome. The major complication of this fracture is constriction of the artery at the elbow, where it can become entrapped. Assess the blood flow to the hand. If the artery is obstructed the hand will be cool, capillary refill will be slow and the radial pulse will be absent. If the artery is obstructed, reduction needs to be done urgently.

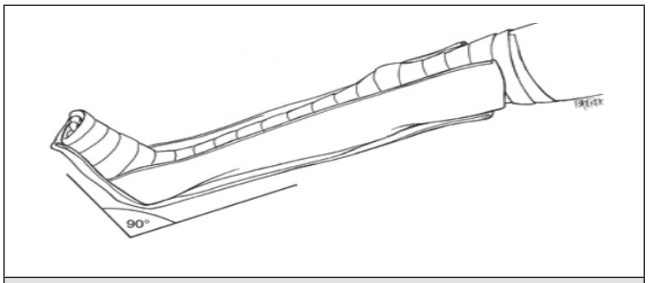


Figure 54
Long leg gutter

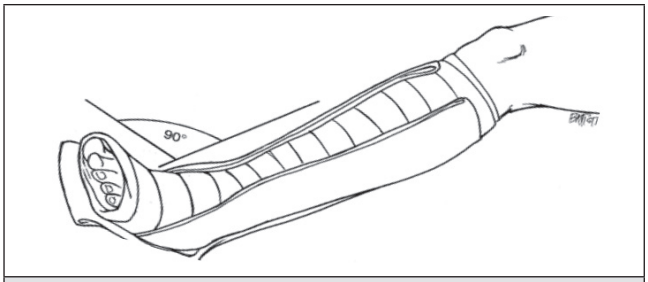


Figure 55
Short leg gutter

How to do skin traction?

Clean limb with soap and water, then dry.

Measure appropriate length of adhesive strapping, place on level surface, adhesive side up

- Place 6 cm square wooden spreader with central hole in middle of strapping (see Figure 56)
- Apply strapping to medial and lateral sides of limb, allowing spreader to project 15 cm below sole of foot (see Figure 57)
- Gently elevate limb off bed while applying longitudinal traction
- Apply traction

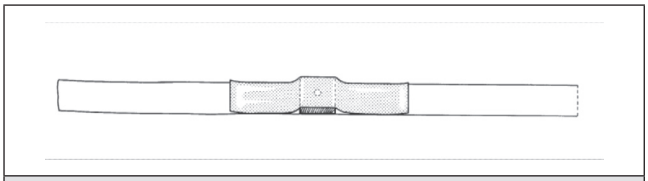


Figure 56
Adhesive strapper with wooden spreader for skin traction

MANAGMENT OF OPEN FRACTURES

Open fractures requires early attention. Assess the extent of soft tissue damage and level of contamination and arrest bleeding, thorough washing and removal of foreign body, early debridement of devitalized tissues, stabilization of fracture and soft tissue coverage.

All attempts should be made to provide definitive care of an open fracture within 6hours.

Open fractures require antibiotics: cloxacillin (25–50 mg/kg orally four times a day), and gentamicin (7.5 mg/kg IM or IV once a day) and meticulous cleaning to prevent osteomyelitis.

Consider referral for review by a surgeon experienced in pediatric surgery for complicated fractures.

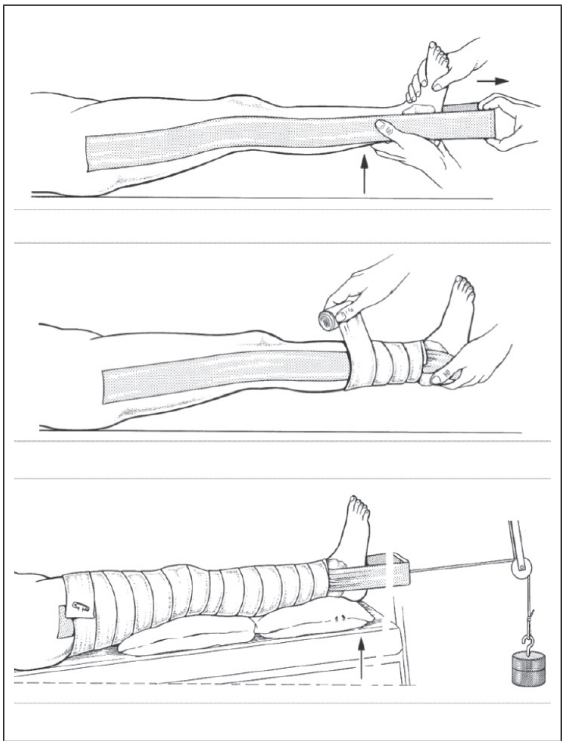


Figure 57
Skin Traction

SUMMARY

- Pediatric trauma is one of the common causes of death
- Immediate assessment and management of a child with trauma is crucial to save life
- Knowing whether there is trauma is there or not is important before managing a child for any emergency
- Doing immediate needle cricothyroidotomy is life saving in a child with trauma and upper airway obstruction
- In a child with tension pneumothorax/hemopneumothorax, needle thoracostomy is life saving

Assessment Questions: Pediatric Trauma

Answer all the questions on this page, writing in the given spaces. If you have a problem, ask for help from one of the facilitators.

1. A 5 year old child who presents with falling accident to your health center 2 hours after the accident. What would you do with this patient?

2. A 10 year old child sustained a hit to his chest by a donkey. Afterwards he is crying and conscious but he has difficulty of breathing. How do you assess and manage this child?

3. A 5 year old male child presented with a falling accident of 2 hours duration. He has gross swelling and deformity over his right elbow. What is the management of this child's injury ?

4. A 6 year old boy sustained a car accident, injured his left leg, there is a wound over distal part of his leg and gross deformity the same location. What would be your approach to this child?

5. A 3yrs old child sustained road traffic accident presented with severe respiratory distress and you assessed him as having tension pneumothorax. Proper surgical management is not possible, what immediate life-saving management do you do?

6. Which once are proper management for a child with severe head injury?

A. Mannitol should be given only when increased ICP is diagnosed
B. IV fluid should be NS/RL during the 1st 24hrs
C. Prophylactic phenytoin should be give for the 1st 7days
D. Prophylactic antibiotic should be given for basal skull fracture
E. Steroids are not important

7. While doing splinting in a child with trauma, which principles are correct?

A. Immobilize the joints above and below the fracture site
B. Align the fracture fragments as much as possible (reduction)
C. Avoid tight bandages
D. Elevate the limb
E. Distal pulses should always be checked before and after splint application

8. What are the 3S's during primary survey of a traumatic child?

Module Nine

Burn Injury

Learning Objectives

At the end of this module, you will be able to:

- Assess a child with Acute Burn Injury
- Mange a child with acute Burn Injury

Burn injury is one of the common injuries in children accompanied by high risk of mortalityand morbidity. The morbidity includes: Acute life-threatening complications (Fluid loss, Blood Loss, airway obstruction, renal failure, Superinfection) and Chronic complications (significant disfigurement, disability and Psychological trauma).

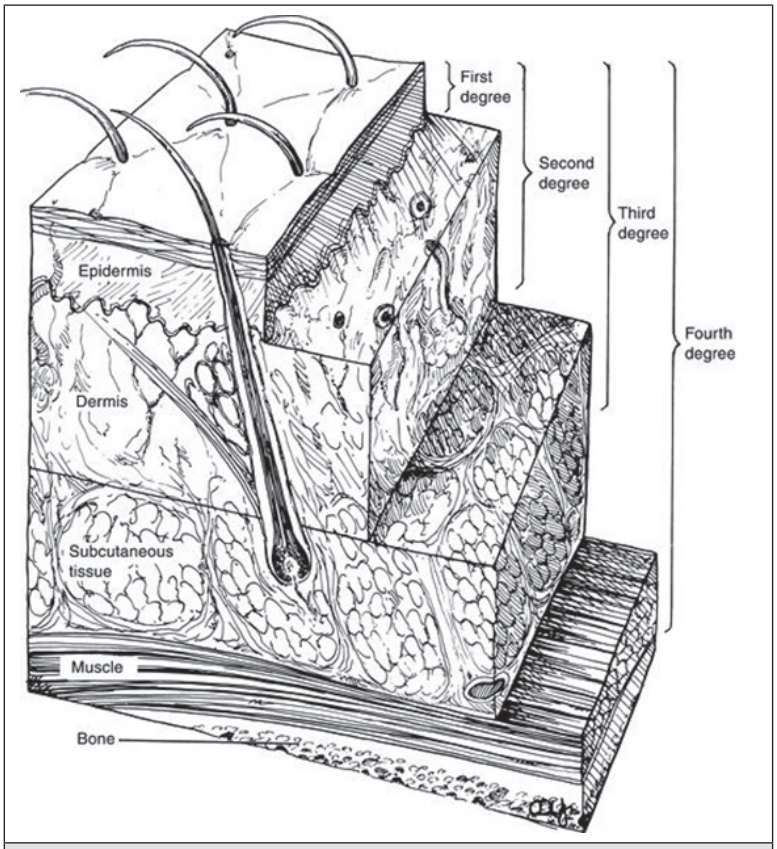


Figure 58
Classification of burn wound based on the depth.

The pathophysiology of burn injury is caused by disruption of the three key functions of the skin:

- regulation of heat loss
- preservation of body fluids, and
- barrier to infection.

CLASSIFICATION OF BURN

Proper triage and treatment of burn injury require assessment of the extent and depth of the injury.

First degree burn (superficial): It affects epidermis and appears as red, sunburn like skin with no blisters and it is very painful and heals without scar.

Second degree burn(partial thickness): in addition to the epidermis, the dermis is involved. It is pink to dark and has blisters. It is still painful and it is blanching.

It heals with a scar after many weeks.

Third degree burn (full thickness): are those full-thickness injuries .it is not blanching, no blister, no pain sensation and have a pale or charred color and a leathery appearance and heals by scarring.

Fourth-degree burns: in addition to the three layers the underlying fascia, muscle, or bone is involved.

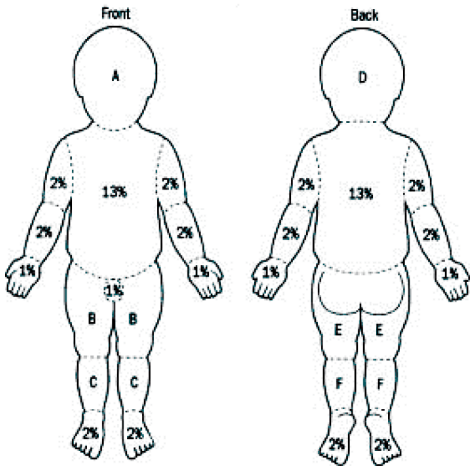
- Fluid losses of 2nd-degree burns are basically the same as those of 3rd-degree burns. Burns may appear to be partial-thickness on immediate evaluation and later may become full-thickness injuries particularly if it is infected.
- Even though third and fourth degree burns are not painful the adjacent area burns may be painful.

Body surface area Estimation

- Estimate the total area burnt by adding the percentage of body surface area affected as shown in the chart

CHART 15. Chart for estimating the percentage of body surface burned

Estimate the total area burned by adding the percentage of body surface area affected as shown in the figure (refer to the table for areas A–F which change according to the age of the child.



By age in years				
Area	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%

MANAGEMENT OF BURN INJURY

Emergency treatment

- Cool the burn area with cold tap water with in 30 min for 20 min this stops the heat as well as decreases the progression of burn, but avoid it for large area burn as it increases hypothermia and also don't use ice as is causes hypothermia.
- Similarly don't use grease (e.g. butter, oil) since it predisposes for infection and doesn't disperse heat. If the burn is caused by hot tar, use mineral oil to remove the tar.
- Remove all clothing and jewelry – especially rings.

Airway & Breathing:

- Manage as trauma patient, since the airway swelling increases in the next 24 hours there is a need of early advanced airway (intubation or tracheotomy).
- Administer 100% Oxygen to displace carbon monoxide during inhalational burn

Circulation:

- • Shock is common in children with burns that involve more than 10% to 12% of the total body surface area.

- Secure urgently an IV line for burns of ≥10% of Body Surface Area (BSA),for all inhalation and electric burns. If possible, IV line should be on the intact skin but access through burned areas may be secured. If IV couldn't be found, use Intraosseous route.
- Don't put adhesive plaster circumferentially to the body as it can cause circulatory insufficiency.
- For children with severe burn (≥ 20% TBSA) give 20 mL per kg of crystalloids till assessment of the extent of the burns and calculation of the rest of the fluid of the 24 hours is completed.
- For most children the Parkland formula is an appropriate starting guideline for fluid resuscitation (4 mL lactated Ringer/kg/% BSA burned) in addition to the patient's calculated maintenance fluids after the 1st bolus is subtracted. Half of the fluid is given in the first 8 hours of the resuscitation and the remaining half over the next 16hrs. (see Module 3, Table 3 for maintenance fluid calculation)
- During the second 24 hr after the burn, patients will begin to reabsorb edema fluid and to diurese. One half of the first day's fluid requirement is infused as lactated Ringer solution in 5% dextrose
- Children younger than 5 yrs of age require the addition of 5% dextrose in the first 24 hr of resuscitation
- Additional fluids may also be necessary when burns are associated with an inhalation injury, fractures or other traumatic lesions causing blood loss.
- Blood may be given to correct anemia or for deep burns to replace blood loss. Packed red cell infusion is recommended if the hematocrit falls to <24% (hemoglobin = 8 g/dL).
- Maintain patient's temperature: Warm the room. Keep patient covered except when it necessary for examination and remove wet clothing
- If patients are not alert and oriented, consider: associated injuries such as: carbon monoxide (CO) poisoning, inhalation injury, hypoxia and preexisting medical condition

Indication for Hospital Admission

- burn is >10% of their body
- Burns over Face ,neck ,hands ,feet ,perineum ,or joint ,
- Circumferential burns
- inhalational and high tension electric burns
- suspected child abuse

MONITORING:

- In children, hypoglycemia is a risk so blood glucose must be monitored
- Early Urinary catheterization is very helpful since urine output monitoring is a very important indicator of hydration status in burn patients.
- Target urine output (Adolescents :05-1.0 mL / kg / hr,Child: 1mL / kg / hr, infant: 2 mL / kg / hr)
- Capillary refill and coldness/warmness of extremities are not reliable for evaluation of hydration status in burn patients.
- Stress induced hyperglycemia may cause an osmotic diuresis. Hence before infusions are decreased in response to excessive urine output, a measurement of blood glucose should be made. If the blood glucose is not high and child has excess urine output, fluid can be reduced.

Prevention and Treatment of Infection

- Infection is one of the commonest cause of mortality in children with burn injury.
- If skin is intact, clean with antiseptic solution without breaking the skin.
- If skin is not intact, (except in very small burns) debride all bullae and excise dead tissue as early as possible. Apply topical antibiotics available in your setting e.g. silver nitrate, silver sulfadiazine,Nitrofurantoin.
- Small burns, burn involving the face and those burns in areas that are difficult to cover can be managed by leaving them open to the air and keeping them clean and dry.
- Prophylactic use of antibiotic is not recommended. Treat secondary infection if present.
- If there is evidence of local infection (pus, foul odor), treat with oral amoxicillin (15 mg/kg orally three times a day) and cloxacillin (25 mg/kg orally four times a day).
- If septicemia is suspected, use gentamicin (7.5 mg/kg IM or IV once a day) plus cloxacillin (25–50 mg/kg IM or IV four times a day).

Table 15

Check tetanus vaccination status: Tetanus Prophylaxis in burn/wound management.

High risk is regarded as heavy contamination with material likely to contain tetanus spores and/or extensive devitalized tissue.

History of Tetanus Immunization Doses	Clean, Minor Wounds		All Other Wounds[1]	
	Tetanus Toxoid[2]	TIG/TAT	Tetanus Toxoid[2]	TIG/TAT
Uncertain or < 3 doses	Yes	No	Yes	Yes
3 or more doses	No[3]	No	No[4]	No

1 *Such as, but not limited to, wounds contaminated with dirt, feces, soil, and saliva; puncture wounds; wounds from crushing, tears, burns, and frostbite.*

2 *Tetanus toxide in this chart refers to tetanus toxoid-containing vaccine. For children < 7 years of age, DTaP (If DT, pertussis vaccine is contraindicated) is preferred to tetanus toxoid alone. For children ≥ 7 years old and adults, Td preferred to tetanus toxoide alone; DTaP may be preferred if the patient has not previously been vaccinated with DTaP.*

3 *Yes if ≥ 10 years since last dose*

4 *Yes if ≥ 5 years since last dose*

- Tetanus-prone wounds include:
  - wounds or burns that require surgical intervention delayed for more than six hours
  - wounds or burns that show a significant degree of devitalized tissue or
  - a puncture-type injury, particularly where there has been contact with soil or manure
  - wounds containing foreign bodies
  - wounds or burns in patients who have systemic sepsis.

- If the wound or burn fulfils the above criteria and is considered to be high risk, IM human tetanus immunoglobulin should be given for immediate protection, irrespective of the tetanus immunization history of the patient. (if IM TIG cannot be sourced, human normal immunoglobulin for subcutaneous use (Subgam) may be given intramuscularly as an alternative).
- All non-minor wounds require human TIG except those in a fully immunized patient. In any other circumstance (e.g., patients with an unknown or incomplete immunization history; crush, puncture, or projectile wounds; wounds contaminated with saliva, soil, or feces; avulsion injuries; compound fractures; or frostbite), TIG 250 U should be given intramuscularly, with 500 U for highly tetanus-prone wounds (i.e., unable to be debrided, with substantial bacterial contamination, or >24 hr since injury). If TIG is unavailable, then use of human IGIV may be considered.
- If neither of these products is available, use equine or bovine-derived TAT may be given intramuscularly after testing for hypersensitivity (Dose: Newborn-750U, Todllers-1500U and Older Children-3000U).

Pain control

- The simple measure of wrapping burns with a clean sheet and developmentally
- appropriate verbal reassurance can decrease pain.
- Pain should be controlled during change of dressing. Intravenous analgesics is preferable than IM injections or PO doses because with significant burns circulation to muscle and gut is reduced, and absorption of medication erratic, additionally intramuscular injections are painful.

Nutrition

- During the acute phase, oral feeding may not be tolerated for which IV fluids as maintenance is used. When acute conditions get resolved and start to tolerate oral feeds, IV fluids will be decreased.
- In general, burn patients should get a high calorie, protein, and vitamins particularly vitamin B group, vitamin C, vitamin A, mineral zinc and iron supplements.

Addressing Different Types of Burns

Electrical burn:

- Significantly deep and internal injuries may occur with small external burns.
- Fluid requirements are higher than those predicted by formulas based on percent of BSA because mostly the injury is internal.
- Minor electrical burns usually occur as a result of biting on an extension cord which causes injury to the corner of the mouth and lip.
- Treatment with topical antibiotic creams is sufficient but needs follow up in the outpatient since it has tendency to bleed after weeks.
- Injuries resulting from high voltage particularly at high-voltage installations or lightening causes Cardiac arrhythmias and renal damage.

Inhalational injury:

This injury is serious in the infant and child, particularly if pre-existing pulmonary conditions are present. Evaluation aims at early identification of inhalational airway injuries. These may occur from (1) direct heat (greater problems with steam

burns), (2) acute asphyxia, (3) carbon monoxide poisoning, and (4) toxic fumes, including cyanides from combustible plastics.

Chemical Burns:

Caustic chemicals on the skin cause a prolonged period of burning compared with most thermal injury regardless of the substance involved. caustic chemicals need copious irrigation to dilute and remove the chemical.

Circumferential Extremity Burns

Edema formation in the underlying tissues is often caused from deep burns. Circumferential burns, especially in the extremities, may produce significant vascular and neurologic compromise if not recognized and treated in a timely manner. The first sign of compromise is pain upon passive stretch of the involved extremity. Other indications of decreased blood flow are slowing of capillary refill, diminished pulses, numbness, tingling, pain, paralysis and coolness. Repeated pulse checks are essential. If these problems are suspected, urgent surgical consultation is vital.

Child Abuse in Burn Injuries:

Burn is one the mechanisms of child abuse. Suspect child abuse if the burn is:

- Not proportional with the child's developmental milestone
- Incompatible with the history
- Deep and localized
- Glove and stock type
- Cigarette burn

The ultimate goal in the management of child abuse is the protection of the child from further injury and the initiation of therapeutic measures to restore the family to a stable and healthy environment

SUMMARY

In a child with acute burn:

- Immediate assessment of ABC is vital to save life
- Assessment of surface area of Burn is important for management
- In a burn injury of BSA >10%, securing IV line and giving RL by the Parkland Formula (4ml/%BSA/kg over PLUS maintenance fluid over 24hrs, 50% over the 1st 8hrs and remaining 50% over the last 16hrs) is important
- Considering the wound, tetanus prophylaxis should be done
- Early nutrition prevention of infection, pain control and psychological support is part of the burn management

Assessment Questions: Burn Injury

Answer all the questions on this page, writing in the given spaces. If you have a problem, ask for help from one of the facilitators.

1. How do you assess the extent of burn?

2. How do you manage a child whom you saw catch on fire?

3. How do you manage a 10 year old who sustained a burn from a house fire on his face and both thighs anteriorly and posteriorly? (weight = 30 kgs)

4. What do you do for a child presented with electrical burn?

5. A four years old child who sustained scald burn injury was referred from the nearby health center after he received the initial bolus fluid and antipain. His body weight is 22 kgs and with a working diagnosis of 21% second degree burn. He is immunized for his age. How do you manage this child?

Module Ten

Common Childhood Poisoning

Learning Objectives:

At the end of this module, you will be able to:

- Assess a child with Acute Poisoning
- Apply gastrointestinal, skin, eye decontamination procedures in acute poisoning
- Assess and manage a child with common specific poisoning
- Give antidote for specific poisons
- Asses and manage a child with snake bite
- Asses and manage a child with drowning

Suspect poisoning in any unexplained illness in a previously healthy child. The principles of management of common poisons are discussed in this module.

If the child arrives within 1hr of ingestion of poisons he/she will be taken as an emergency because this needs urgent treatment.

Primary survey: Assess ABCDO with additional consideration of the poisoning agent

Airway: Remove excessive secretions, look for any inhalational injury that might potentially worsen with time. Check for signs of burns in or around the mouth or of stridor (upper airway/laryngeal damage) suggesting ingestion of corrosives. Consider consultation for early intubation, if the patient has severe airway compromise.

Breathing: Look for signs of respiratory distress and give oxygen if indicated (see module 2).

Circulation: Check the pulse, capillary refill and skin color. If there is shock treat accordingly (see module 3, Circulation)

Coma: check the AVPU and pupillary response

- Determine blood sugar and give Dextrose if hypoglycemic or if the child has reduced level of consciousness treat as if hypoglycaemic.

Dehydration: Assess hydration status (dry tounge, buccal mucosa and sunken eyeball)

Exposure: Remove all clothing and wash with soap and water and check body temperature

Secondary survey: more specific evaluation with history and physical examination and laboratory to identify the exact cause and extent with simultaneous detoxification of the patient

History and physical examination:

History

- Find out full details of the poisoning agent
- Attempt to identify the exact agent involved requesting to see the container, where relevant
- Try to find the best estimate of the agent dose or amount (keep in mind one pill can kill)
- The route of exposure (inhalation, injection, ingestion, contact)
- The time of ingestion to presentation (important for the management of the child)
- Check that no other children were involved.

Physical exam

Do detailed examination which help to identify the causes: breath odor, temperature, eye sign(dilated vs. constricted pupil), skin (hot flushed, dry) and bowel sound.

General Principles of Management

Management of a child with acute poisoning includes four principles:

- Decontamination (GI, skin, eye)
- Enhancing elimination
- Giving antidote and
- Supportive care

GASTROINTESTINAL DECONTAMINATION

This is most effective if done within one hour of ingestion, and after this time there is usually little benefit, except with agents that delay gastric emptying, sustained release preparations and massive pill ingestions.

Methods of gastrointestinal tract (GIT) decontamination includes ipecac induced vomiting, use of cathartics, gastric lavage, activated charcoal and whole bowel irrigation (WBI)

Syrup of ipecac and cathartics are not recommended to manage children with acute poisoning

Gastric emptying with lavage

- Gastric lavage is useful only if it is done within one hour of ingestion of poisons (specially liquid)

During the procedure:

- 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 24–28 French gauge tube through the mouth into the stomach (as a smaller size nasogastric tube is not sufficient to let particles such as tablets pass)
- Ensure the tube is in the stomach by aspiration
- Perform lavage with 15 ml/kg/cycle body weight of normal saline (0.9%) maximum 200 to 400ml
- The volume of lavage fluid returned should approximate to the amount of fluid given
- Lavage should be continued until the recovered lavage solution is clear of particulate matter.

Contraindications to gastric lavage are:

- Ingestion of corrosives or petroleum products
- unconscious child with unprotected airway

Activated charcoal

- It is more effective if used with in 1 hour may be given as late as 4 hours if the toxic agent causes delayed intestinal movement.
- The usual dose of activated charcoal is 1 g per kg; adolescents should receive maximum of 50 g
- The amount of water is 8-10 times of the amount of the charcoal, 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.
- It can be mixed with caffeine free diet cola or juice to improve the child intake
- Don't force the child, you can insert NG tube to facilitate intake

Toxins poorly or not adsorbed by charcoal are:

- Caustics (alkali and acids)
- hydrocarbons
- alcohol
- heavy metals (lead)
- iron and lithium

Whole bowel irrigation (WBI)

- WBI is administration of large volume of polyethylene glycol solution with balanced electrolyte.
- Usually given by NGT
- Effective after ingestion of slowly absorbed substances, substances poorly adsorbed to activated charcoal (lithium, iron) and pills
- For children 35ml/kg/hr can be given and adolescents can take 1-2 lts per hour

SKIN DECONTAMINATION

- 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 apron.
- Removed clothing and personal effects should be stored safely in a see-through plastic bag that can be sealed, for later cleansing or disposal.

EYE DECONTAMINATION

- Rinse the eye for 10–15 minutes with clean running water or saline, taking care that the run-off does not enter the other eye by lying on the side and running into the inner canthus and out of the outer canthus.
- Evert the eyelids and ensure that all surfaces are rinsed.
- Where possible, the eye should be thoroughly examined under fluorescein staining for signs of corneal damage.
- If there is significant conjunctival or corneal damage, the child should be seen urgently by an ophthalmologist.

DECONTAMINATION FOR INHALED POISONS

- Remove from the source of exposure.
- Urgently call for help
- Administer supplemental oxygen, if there is respiratory distress or cyanosis or oxygen saturation ≤90%
- Inhalation of poisonous gases may cause swelling and upper airway obstruction, bronchospasm and delayed pneumonitis

Multiple-Dose Activated Charcoal

- This method enhances poison elimination by interfering with enterohepatic recirculation GI dialysis
- Give 0.25 to 0.5 g/kg every 3 to 4 hour until the patient condition is improved
- Considered in drug poising including phenobarbital, carbamazepine, phenytoin, digoxin, salicylates, and theophylline

Further Management of the Poisoned Child

- Give specific antidote if this is availble and indicated
- Keep the child under observation for 4–24 hours depending on the poison swallowed
- Keep unconscious children in the recovery position.
- Refer the child to the next level health facility, only when appropriate and where this can be done safely
- If the child is unconscious or has deteriorating conscious level, has burns to mouth and throat, is in severe respiratory distress, is cyanosed or is in heart failure, stabilize him/her before referral

Specific poisons

1. **Corrosive compounds**

- Acid and alkali corrosives are common household agents which causes immediate severe burning of exposed surfaces, usually with intense difficulty

of feeding. Eg. sodium hydroxide, potassium hydroxide, acids, bleaches or disinfectants

- Do not induce vomiting or use activated charcoal or gastric lavage when corrosives have been ingested as this may cause further damage to the mouth, throat, airway, lungs, esophagus and stomach.
- Give milk or water within 30 minutes to dilute the corrosive agent. This is only recommended as first aid in mildly symptomatic children.
- In the event of esophageal injury or perforation, fluids may extravasate from the esophagus to the mediastinum.
- Don't try to neutralize with acid/alkaline as this occur exothermic reaction may occur that also can worsen esophageal injury
- Secure IV line. Do not give anything by mouth and arrange referal for surgical review.

2. Hydrocarbons

These are highly volatile substances which can cause comical pneumonitis even after ingestion of small volume

Eg. kerosene, turpentine substitutes, petrol, benzene

Do not induce vomiting or give activated charcoal or gastric lavage as this increases aspiration.

Specific treatment includes oxygen therapy if in respiratory distress, do chest X-ray on presentation and after 6 hours as the first could be normal.

If clinically stable after 6 hours consider discharge.

Don't give steroid or prophylactic antibiotic unless the patient develops signs of infections.

3. Organophosphate and carbamate poisoning

These are commonly used insecticides and herbicides

- Eg. organophosphorus (malathion, parathion, TEPP, mevinphos/Phosdrin) and carbamates (methiocarb and carbaryl)
- These compounds can be absorbed through the skin, ingested or inhaled.
- The child may complain central nervous system symptoms (dizziness, headache, ataxia, convulsions, and coma)
- Muscarinic effects of these poisons can be memorized with mnemonic **"DUMBBELLS"**
  - Diarrhoea
  - Urination
  - Miosis
  - Bradycardia
  - Bronchorrhea
  - Emesis
  - Lacrymation
  - Salivation

Management

- Remove poison by irrigating eye or washing skin (if in eye or on skin) as you learnt before.
- Give activated charcoal within 1 hours of ingestion, however it could be given up to 4 hours after ingestion of the poison.
- In a serious ingestion where activated charcoal cannot be given, consider careful aspiration do gastric lavage (the airway should be protected).
- After decontamination, antidotal therapy begins with administration of atropine sulfate
- Give a dose of 0.05 to 0.1 mg per kg to children and 2 to 5 mg for adolescents IV or IM. This dose should be repeated every 10 to 30 minutes or as needed until chest secretions and pulmonary rales cleared.
- Therapy is continued until all absorbed organophosphate has been metabolized and may require 2 mg to more than 2,000 mg of atropine may be required for a few hours to several days.
- If muscle weakness develops after atropinization, give pralidoxime (cholinesterase reactivator) 25–50mg/kg diluted with 15 ml water by IV infusion over 30 minutes repeated once or twice, or followed by an intravenous infusion of 10 to 20 mg/kg/hour, as necessary.

4. Paracetamol

Paracetamol is administered about 15-20mg/kg/dose and ingestion of 150-200mg/kg will cause toxicity in children

- Give activated charcoal within 4 hours of ingestion
- Decide if antidote is required to prevent liver damage: ingestions of 150 mg/kg or more, or toxic 4 hour paracetamol level where this is available.
- Antidote is more often required for older children who deliberately ingest paracetamol or when parents overdose children by mistake.
- If within 8 hours of ingestion give oral methionine or IV acetylcysteine.
- Methionine can be used if the child is conscious and not vomiting (<6 years: 1 gram every 4 hours for 4 doses; 6 years or older: 2.5 grams every 4 hours for 4 doses).
- If more than 8 hours after ingestion, or the child cannot take oral treatment, give IV acetylcysteine.
- For children <20 kg give the loading dose of 150 mg/kg in 3 ml/kg of 5% glucose over 15 minutes, followed by 50 mg/kg in 7 ml/kg of 5% glucose over 4 hours, then 100 mg/kg IV in 14 ml/kg of 5% glucose over 16 hours. The volume of glucose can be scaled up for larger children.
- Continue infusion of acetyl cysteine beyond 20 hours if late presentation or evidence of liver toxicity.
- If liver enzymes can be measured and are elevated, continue IV infusion until enzyme levels are falling.

5. Phenobarbital Poisoning

- Phenobarbital is primarily used as anticonvulsant
- It's overdose results in central nervous depression with respiratory distress and suppression of skeletal, cardiac and smooth muscles.
- Poisoned child may present with, accompanied by respiratory depression and deranged vital signs (hypotension, bradycardia and hypothermia)
- Pupils may constrict early but dilate later

Management

- Initial management of Phenobarbital poisoning is supportive and stabilization of ABC (see module 2 and module 3)
- Check blood glucose and treat if hypoglycemic
- Give activated charcoal in a dose of 1g/kg for a child (for adolescents give 50g).
- For patients who have a compromised airway, endotracheal intubation is advised prior to giving charcoal.
- With very large overdoses, antecedent gastric lavage may be considered.
- The therapeutic range for phenobarbital is generally considered 15 to 40 μg/mL.
- Since Phenobarbital undergoes enterohepatic circulation, multiple dose activated charcoal(MDAC) should be given to decrease the half life of the drug and increase its clearance.

6. Carbon monoxide poisoning

- Remove patient from the source
- Give 100% oxygen to accelerate removal of carbon monoxide (note patient can look pink but still be hypoxaemic) until signs of hypoxia disappear.

7. 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.

- The child may present with local signs or systemic signs
- Local signs include pain, swelling, frang marks, tender lymphnode enlargement and local bleeding.
- Initial systemic signs include nausea, vomiting, abdominal pain and headache.
- Specific signs depend on the venom and its effects. These include:
  - shock-tachycardia, hypotension
  - 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
  - coagulopathy-epistaxis, gumbleeding, bleeding from venopuncture sites, echymosis, bruising, hemoptysis
- Check haemoglobin and if possible, blood clotting should be assessed.

Management

First aid

- Assess and manage the ABCDO of life includes treatment for shock and respiratory arrest
- Splint the limb below the level of the heart to reduce movement and absorption of venom
- Apply a firm bandage to affected limb from fingers or toes to proximal of site of bite
- Irrigate and dress the wound
- Avoid cutting the wound or applying tourniquet
- Paralysis of respiratory muscles can last for days and requires intubation and mechanical ventilation or manual ventilation (with a mask or endotracheal

tube or tracheostomy bag-valve system) by relays of staff and/or relatives until respiratory function returns.

Antivenom

- If there are systemic signs or severe local signs (swelling of more than half of the limb or severe necrosis) refer the child to hospital where anti-venom is available.
- Prepare IM epinephrine (adrenaline) 10 micrograms/Kg IM (i.e 0.1ml/kg of 1 in 10,000 IM) and IV chlorpheniramine, be ready if allergic reaction occurs
- Give polyvalent anti-venom if the species is not known
- Follow the directions given on the anti-venom preparation
- The dose for children is the same as for adults
- Dilute the anti-venom in 2–3 volumes of 0.9% saline and give intravenously over 1 hour
- Give more slowly initially and monitor closely for anaphylaxis or other serious adverse reactions
- Before we give the anti-venom perform skin test with 0.02 to 0.03 ml in 1:10 dilution
- If itching/urticarial rash, restlessness, fever, cough or difficult breathing develop, then stop anti-venom and give epinephrine (adrenaline) 10 micrograms/Kg
- More anti-venom should be given after 1–2 hr if the patient is continuing to bleed briskly or has deteriorating neurotoxic or cardiovascular signs.
- Start giving the anti-venom with minimal dose for mild cases with a minimal dose of 22-40 ml and give a maximum of 200-400 ml (see standard pediatric text book for specific indication of the anti-venom)
- Blood transfusion should not be required if anti-venom is given
- Clotting function returns to normal only after clotting factors are produced by the liver
- Response of abnormal neurological signs to anti-venom is more variable and depends on type of venom

Surgical Management

- 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
- Keep a close record of fluid intake and output.
- Provide adequate pain relief
- Elevate limb if swollen
- Give prophylaxis for tetanus
- 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 envenomination can develop

8. Drowning

- Initial treatment should be geared towards ensuring adequate airway, breathing, circulation and consciousness (ABCs).
- Check if there are any injuries especially following diving or an accidental fall.
- Facial, head and cervical spine injuries are common.
- Give oxygen and ensure adequate oxygenation
- Remove all wet clothes
- Use nasogastric tube to remove swallowed water and debris from the stomach
- Bronchoscopy for removal of foreign material, such as aspirated debris or vomitus plugs from the airway where necessary
- Warm the child externally if core temperature is > 32 ºC by using radiant heaters or warmed dry blankets
- If core temperature is < 32 ºC use warmed IV fluid (39 ºC) or do gastric/ lavage with warmed 0.9% saline
- Check for hypoglycaemia and electrolyte abnormalities especially hyponatraemia - this will increase the risk of cerebral oedema
- Give antibiotics for possible infection if there are pulmonary signs.

SUMMARY

- Accidental Poisoning is common in children so suspecting and checking poisoning is useful in children with atypical presentations
- Rather than trying to identify the poison, supportive treatment should take priority in a child with acute poisoning
- Removal of the poison from the body contact (when possible) is more important than giving antidotes

Assessment Questions: Common Childhood Poisoning

Answer all the questions on this page, writing in the given spaces. If you have a problem, ask for help from one of the facilitators.

1. Three years old boy was brought by his mother to emergency room after ingestion of liquid from a container. What measures do you take in the right chronological order?

_____ Take targeted history about ingested substance

_____ Secure IV line and start resuscitation

_____ Assess airway and breathing and give oxygen if in distress

_____ Remove clothes and keep them in plastic container

_____ Check AVPU

_____ Do physical examination

_____ Look for convulsion

_____ Assess circulation

2. Which of the following are methods of decontamination?

A. Single dose activated charcoal

B. Urinary alkalization

C. Induction of emesis

D. Whole bowel irrigation

E. Gastric lavage

F. Multiple dose activated charcoal

G. Use of cathartics

H. Antidotes

3. List contraindications of gastric lavage in a child with poisoning.

4. Mention substances/poisons that are not adsorbed by activated charcoal.

5. Describe procedure for skin decontamination.

6. Describe procedure of eye decontamination

7. Which are features of Organophosphate poisoning?

A. Excessive bronchial secretions
B. Salivation
C. Constipation
D. Vomiting
E. Lacrimation
F. Slow pulse
G. Wide pupils
H. Urination
I. Bronchial constriction

8. Antidotes for organophosphate poisoning?

A. Pralidoxime
B. Naloxone
C. Atropine
D. N-Acetylcystine
E. Deferoxamine

9. What is the antidote for CO poisoning?

A. 50% NO
B. Cyanide
C. 60% CO2
D. 100% O2
E. O3

10. Common problem associated with hydrocarbon poisoning?

A. Coma
B. Aspiration
C. Convulsion
D. Shock
E. Pulmonary edema

Module Eleven

Pain Management in Children

Learning Objectives:

At the end of this module, you will be able to:

- Assess pain in different age groups
- Manage pain in children

Pain is an unpleasant sensory and emotional experience usually characterized in terms of tissue damage, which is signaled by some form of visible or audible behavior.

Attending to pain is highlighted as the "fifth vital sign" to monitor in medical care. However, it is not readily evident how pain should be monitored. Untreated pain may have long-term n and permanent repercussions on pain sensitivity, immune functioning, neurophysiology, and health care behavior. It can affect all aspect of life including appetite, mood, self-esteem, relationship, etc.

Barriers for pain management in children

Some of the possible reasons for inadequate pain control in pediatrics are:

- Inability of young children to cooperate or provide good verbal description of pain. This makes pain assessment in children difficult
- Misconception that infants cannot feel pain or will not remember pain.
- Lack of education of health care professionals on pain (physiology, pharmacology, assessment and management of pain)
- Unfamiliarity of health care professionals with analgesics and their dosages and fear of the side effects of the drugs like respiratory depression, addiction, etc.
- Absence or unaware of pain assessment tools

Ways of assessing level of pain in children

Good pain assessment contributes to the prevention and/or early recognition of pain as well as its effective management. In order to assess pain, effective communication should occur between the child (whenever feasible), their family or caregivers, and the health professionals.

There are many pain assessment tools. There use depends on the age and cognition of the child. The three fundamental approaches of pain assessment are:

1. **Physiological**: primarily measuring physiological arousal consequent to pain. This include increase in heart rate, blood pressure , respiratory rate, autonomic symptoms like; vomiting, sweating, etc. But they are nonspecific and can be signs of other common childhood illness, so usually not used for pain assessment
2. **Behavioral-Observation**: measuring behavioral distress associated with pain. It mostly emphasized on facial expression, crying and body movement. Facial expression measurements are most useful and specific. We can use FLACC pain scales for age up to 3 years. (see Table 16)

Table 16
Behavioral Observation Pain Rating Scale (FLACC scale)

Catagories	Scoring		
	0	1	2
Face	No particular expression or smile; disinterested	Occasional grimace or frown, withdrawn	Frequent to constant frown clenched jaw, quivering chin
Legs	No position or relaxed	Uneasy, restless, tense	Kicking, or legs drawn up
Activity	Lying quietly, normal position, moves easily	Squirming, shifting back and forth, tense	Arched, rigid, or jerking
Cry	No crying (awake or asleep)	Moans or whimpers, occasional complaint	Crying steadily, screams or sobs, frequent complaints
Consolability	Content, relaxed	Reassured by occasional touching, hugging, or talking to. Distractible	Difficult to console or comfort
Each of the five categories (F) Face; (L) Legs; (A) Activity; (C) Cry; (C) Console ability is scored from 0-2, which results in a total score between 0 and 10. Scoring: Mild 0-3; Moderate 4-7; Severe 8-10.			

3. **Self-report (measuring expressed experience of pain)**: mostly children who are less than 3 years old cannot express their experience of pain. Whenever feasible, it is preferred to try to get the level of pain from the patient her/himself and trust patients pain, as pain is a subjective experience. It is the Best and golden standard approach.

   3.1 **For children between 3-8 years**: they can quantify their pain and re able to translate it to visual representation. Therefore we use the visual analog which quantifies pain based up on a series of faces in different phases of happiness and crying. Wong Baker FACES Pain Rating Scale allows ranking the level of pain by observing the child's face (see Figure 59)

   3.2. **For children 8 years and above**: Usually have a word for pain and can articulate more detail about the presence and location of pain. Therefore verbal rating scale can be used: this is categorical scale for rating pain based on the patient's description. The response ranges: none, mild, moderate, or severe.

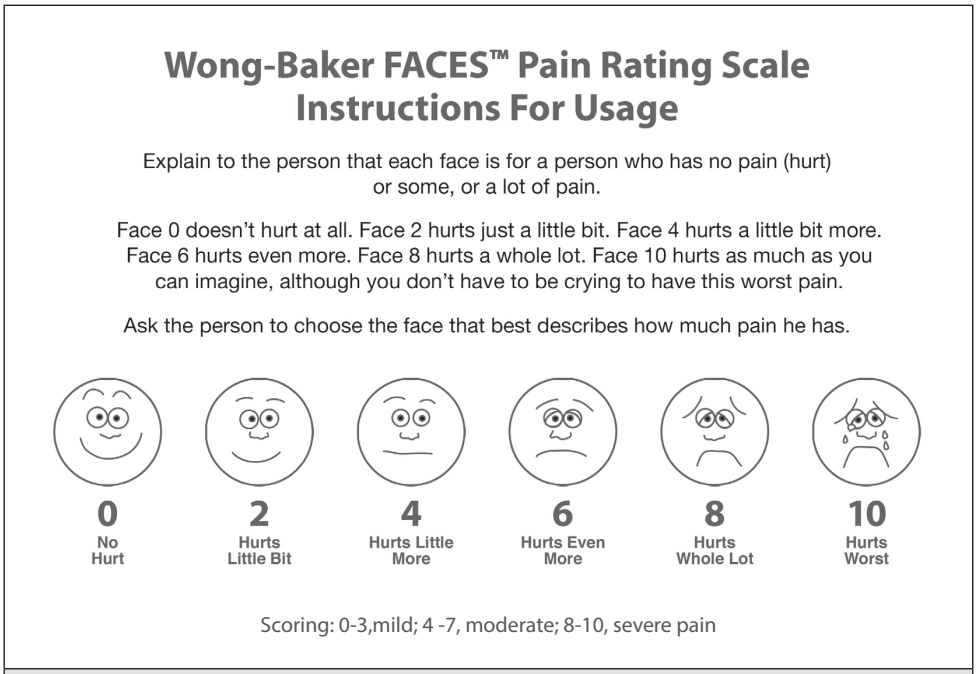


Figure 59
Pediatric face scale to rate the intensity of pain

MANAGEMENT OF PAIN

An optimal management of pain in children begins with an accurate and thorough assessment of pain. Following the assessment, a treatment plan is developed, including pharmacological and non-pharmacological interventions.

Non-Pharmacological Management of Pain

This method used to decrease the child's fear and include the family into the therapeutic objectives. They can be used alone or as adjunct treatment to pharmacologic therapy. (see Annex 6)

Some of the non-pharmacologic methods that can be applied in children may include:

- Distraction: this is shifting the child attention from painful stimuli. e.g. looks to painting wall, pop up books, to TV etc…
- Reinforcement: e.g. saying that s/he did a great job and giving stickers
- Family member presence during painful procedures,
- Gentle reassurance and carefully chosen words to reduce fear and pain during procedure and allowing the parents to be in the room during the procedure
- Deep breath or blowing bubbles (for younger ones) are some of the methods you can use.
- Splinting, putting ice or elevation in dislocation or fracture
- For newborns and infants kangaroo mother care, swaddling, and using pacifiers and glucose will help in the pain management.

Glucose analgesia:

Administering 2 ml of 25 %Sucrose (glucose) solution orally using a pacifier or a syringe decrease the pain during procedures. Apply 1 mL glucose solution orally

to each cheek, 2 minutes before the painful procedure. Generally, glucose analgesia is:

- Safe and effective in managing procedural pain, such as heel sticks and injections.
- It iseffective in newborns and the effectiveness decreases gradually over the first 6 months of life.

Pharmacologic Treatments of pain

According to the severity of pain, WHO recommends treatment of pain in children in two steps.

Step 1: is for mild pain. The medicines used are non-opioid analgesics like Paracetamol and Ibuprofen.

Step 2: is for moderate to severe pain. Strong opioids are used, e.g. morphine.

In general, Opioids should be administered at regular intervals and not on an "as needed" basis. Oral administration of opioids is preferred. Treatment with strong opioids needs to be individually adjusted and there is no fixed maximum dosage.

local anesthetics

- Local anesthetics may be administered by local infiltration or topically.
- Tips to make lidocane injection less painful are:
  - make it warm,
  - use smallest needle
  - buffer 10:1 lidocane to bicarbonate and inject slowly

NB. In the new guidelines, WHO recommends that codeine no longer be used for children. The effects of codeine are unpredictable because of intra individual metabolic differences and therefore pose a safety risk.

Table 17
Pharmacologic Management of Pain

Severity of Pain	Drugs	On set	Duration of Action	Pediatric Dose	Comments
Mild	Paracetamol	PO: <60min	4-6hr	15mg/kg	Liver toxicity if overdosed
Mild	Ibuprofen	PO: 30-60min	4-6hr	8-10mg/kg	Gastrointestinal irritation
Mild	Tramadol	PO: 1hr	9hr	1-2mg/kg	Flushing, headache, nausia
Moderate-Severe	Morphine	PO: 30min IV:10min	4hr	0.3mg/kg PO 0.1mg/kg parental	Respiratory Depression, Hypotension

Assessment Questions: Assessment and management of pain

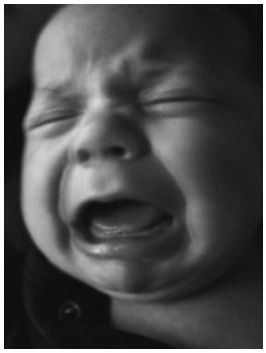
Answer all the questions on this page, writing in the given spaces. If you have a problem, ask for help from one of the facilitators.

1. What is pain?

2. What are the barriers for management of pain?

3. Mention different ways of assessing pain?

4. Assess the level of pain in the picture below. What drug and how much of it would use?



Module Twelve

Case management scenarios

This module will give you an opportunity in different role plays all you have learned so far. You will work in a team and practice the skills of triage and emergency management. It gives you an opportunity to internalize the knowledge, and to ask questions about items which are not clear.

Module Thirteen

Implementing ETAT

When you complete this course, your work to implement ETAT will just begin. As we discussed in the first session, ETAT is the first component in the WHO referral care manual entitled "Management of the Child with Serious Infection or Severe Malnutrition: Guidelines for care at the first-referral level in developing countries". Thus, depending upon your position, you may choose to implement ETAT as a single initiative or as the first component of an overall effort to improve the quality of care of seriously ill children in your hospital, including inpatient care of serious infections and severe malnutrition. Likewise, your hospital may choose to implement ETAT on its own, or it may become part of a multiple-hospital quality improvement collaboration to implement ETAT, or to improve the quality of care of hospitalized children, sharing experiences and results to rapidly learn the best way to successfully implement ETAT and decrease hospital mortality and morbidity of sick children.

Whatever your choice, one thing is clear – ETAT is not simply a matter of training, it will require that you and your colleagues change the system of care for children presenting with emergency conditions. Staff knowledge and skills are necessary but not sufficient for successful implementation of ETAT.

This chapter will help you prepare for implementation based on whichever choice is right for your hospital:

- Implementation of ETAT in one hospital alone or
- Implementation of ETAT in a multiple hospital collaborative effort
- Implementation of ETAT as a single component or
- Implementation of ETAT as the first component of a more comprehensive effort to improve the quality of care of hospitalized children with serious infections or severe malnutrition (improve care according to the guidelines)

Objectives of the chapter/session

By the end of this session on implementation of ETAT, you will be able to:

- Understand and explain the role of ETAT within the overall management of the child with serious infection or severe malnutrition
- Describe why both knowledge/skills and system changes (process improvement) are needed to successfully implement ETAT
- Make a plan to train key staff in ETAT (at one hospital or multiple sites/ regionally)

- Develop action plans to initiate the system changes (improvement process) needed to implement ETAT in his/her hospital
- Decide how to know that ETAT is successfully implemented in your hospital (or within a collaboration of hospitals implementing ETAT)
- Describe the value of working collaboratively across hospitals to improve the care of children with emergency conditions (and with serious infections or severe malnutrition)
- Describe and understand how ETAT training fits into wider context of improvement initiatives in place in your country which address the quality of care for children in hospital.

Implementing ETAT in your hospital

This consists of the following steps:

- Baseline assessment of current practices – focused on ETAT or as part of PHI assessment; select indicators for ongoing measurement of improvement
- Flow diagram of care – where are children with emergency conditions seen now?
- Statistics of care – hospital under 5five death rates overall and by condition, within first 24 hours of admission; on ward after 24 hours
- Identify the staff involved in ETAT and your ETAT improvement team
- Skills and knowledge development – plan how to transfer ETAT
- training from TOT course to your onsite staff
- Use results of assessment to identify key changes you need to make to implement ETAT guidelines.

Implementation of ETAT is in the first place a matter of management and decision-making. Cost and benefits are most important aspects of the decision making process. You can assist managers in this process by providing information.

Why? What arguments can you give to decision-makers to implement ETAT in your working place? (advocacy)

Who? What staff categories should be involved in ETAT?

Where? Where should it take place?

When? When should it be done? (Patient flow and tasks)

What? What extra equipment and suppliers are needed, which are not yet available now? (material resources)

Advocacy

Consider preventable death, death within 24 hours after admission, delay in treatment waiting, time doctor's delay, ethics, professional standards, human suffering. Brainstorm on the importance of these factors in your working situation. List your arguments in a convincing form.

Patient flow and tasks

It can be helpful to draw a floor map of the emergency and/or paediatric departments. Where are the largest members of patients waiting? Is it possible to involve ancillary staff in emergency assessment (gate keepers, watchmen, clerks)?

Is it feasible to allocate space for emergency management near the waiting room?

Material Resources

Annex 2 contains a list of requirements for ETAT (equipment and supplies). Check if each of the items is available in the hospital and in the emergency department. List the items not available.

Prepare a summary of your findings in the form of recommendations to the hospital superintendent or the hospital management board.

Developing individual plans of actions

- Plan framework

Table 18
Developing individual plans of Actions
Hospital Name _____Date ____ / ____ / ____

No.	Objectives	Activities	Responsible	Resources	Time Frame			
					Q_1	Q_2	Q_3	Q_4

Annex One

Practical procedures

Giving Parenteral fluids

VASCULAR ACCESS

Select a suitable vein to place the cannula (22 or 24 gauge) or butterfly needle (gauge 21 or 23). Suitable sites are shown in Figure 60.

PERIPHERAL VEIN

Identify an accessible peripheral vein. In young children aged >2 months, this is usually the cephalic vein, in the antecubital fossa or the fourth interdigital vein on the back of the hand.

- An assistant should keep the position of the limb steady and should act as a tourniquet by obstructing the venous return with his fingers lightly closed around the limb. Alternatively, use a rubber glove or tubing as a tourniquet.
- Clean the surrounding skin with an antiseptic solution (such as spirit, iodine, isopropyl alcohol, or 70% alcohol solution), then introduce the cannula into the vein and insert most of its length. Fix the cannula securely with tape. Apply a splint with the limb in an appropriate position (e.g. elbow extended, wrist slightly flexed). See Figure 61.

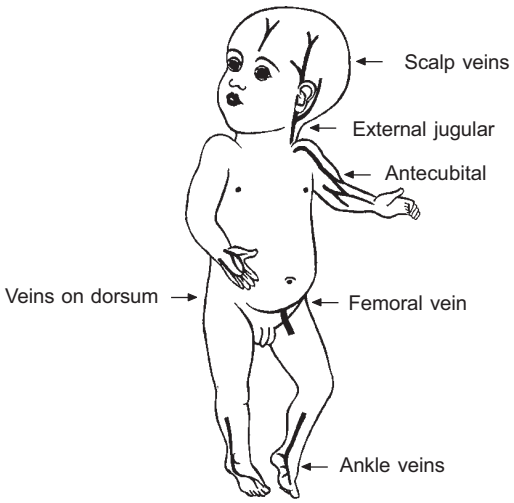


Figure 60
Sites for IV access in infants and children

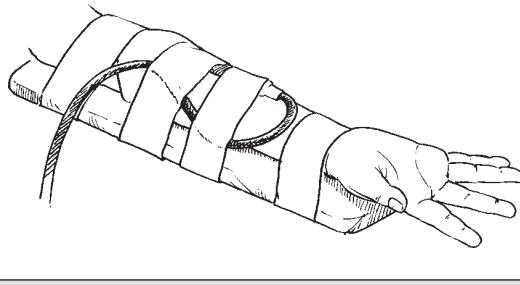


Figure 61
Splinted arm for IV infusion

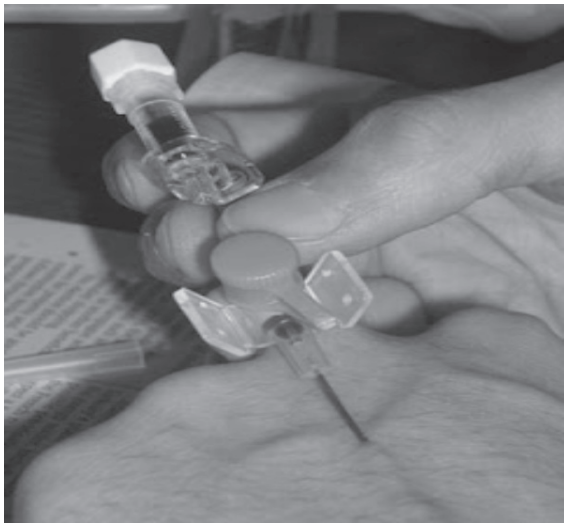


Figure 62
Inserting a cannula needle in a scalp vein

SCALP VEINS

These are often used in children aged <2 years but work best in young infants. The frontal superficial, temporal posterior, auricular, supra-orbital and posterior facial veins can be used. Scalp vein infusions have the advantage of not greatly restricting the child's movements.

- Find a suitable scalp vein (usually in the midline of the forehead, the temporal area, or above or behind the ear).
- Shave the area and clean the skin with an antiseptic solution. The assistant should occlude the vein proximal to the site of puncture. Fill the butterfly set tubing with saline either by attaching it to the infusion-giving set and then disconnecting it or by flushing the butterfly set. Disconnect the syringe and leave the end of the tubing open. Introduce the butterfly needle as described above. Blood flowing back slowly through the tubing indicates that the needle is in the vein. See Figure 62.
- Use adhesive plaster and a gauze pad under the needle to secure the needle at an angle to the scalp. Care should be taken not to cannulate an artery, which is recognized by palpation. If there should be a pulsatile spurt of blood, withdraw the needle and apply pressure until the bleeding stops; then look for a vein.

CARE OF THE CANNULA

Secure the cannula when introduced. This may require the splinting of neighbouring joints to limit the movement of the cannula. Keep the overlying skin clean and dry. Clean it daily with an antiseptic solution.

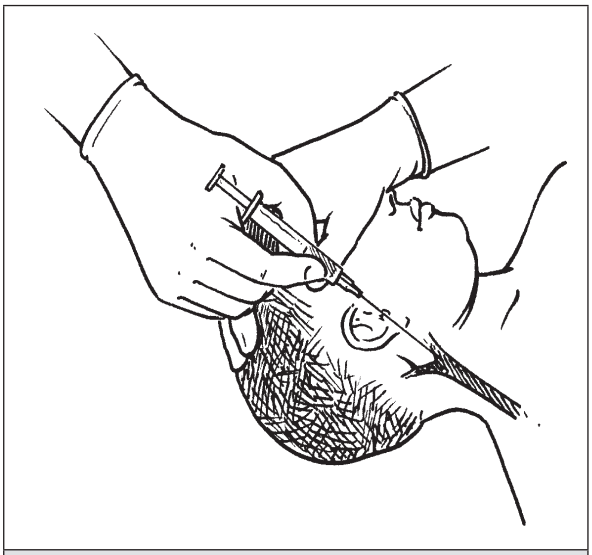


Figure 63
Inserting a cannula into the external jugular vein

To minimize the risk of infection, the cannula should not be kept in the same site for longer than necessary, and should be removed if complications develop.

EXTERNAL JUGULAR VEIN

- Hold the child securely, with the head turned to one side away from the puncture site and slightly lower than the body (15-30 degree head-down position). The vein will fill in this position and should be visible as it travels towards the clavicle in the supraclavicular fossa (See Figure 63). Restrain the child as necessary in this position.

INTRAOSSEOUS NEEDLE INSERTION

When carried out by a well-trained and experienced health worker, intraosseous infusion is a simple and reliable method of giving fluid and drugs in an emergency. The method is safe if the needle is left in place no longer than 6-8 hours. All parenteral fluids and drugs recommended in these guidelines can be given by this route.

In an emergency this may be the first choice if access to a peripheral vein does not appear to be obtainable. It takes 1-2 minutes to establish intraosseous access. The procedure is painful, but no anaesthetic is required as it should only be used in an emergency (e.g. when a child is in shock).

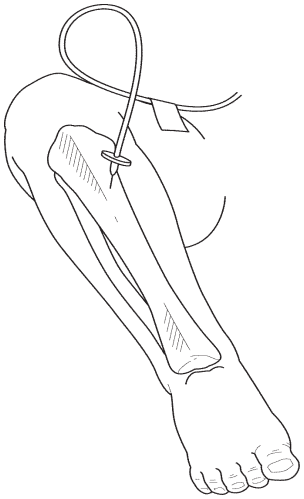


Figure 64
Intraosseous infusion. Infusion needle in place in the proximal medial part of the tibia

Contra-indications:

- Infection at the intended puncture site
- Fracture of the bone (relative contraindication, not for shock, only for dehydration)
- Failed intraosseous needle puncture on the same bone

Recommended sites for intraosseous needle insertion are proximal tibia, distal femur and distal tibia respectively

The first choice for the puncture is the proximal tibia (See Figure 64). The site for needle insertion is in antero-medial surface of the tibia, 1-2 cm below the tibial tuberosity (2 finger breadths in children, 1 finger breadths in infants). An alternative site for needle insertion is the distal femur, 2 cm above the lateral condyle.

- Prepare the necessary equipment:
  - Bone marrow aspiration or intraosseous needles (15-18 gauge or, if not available, 21 gauge; if no special needles are available, large-bore (21 FG) hypodermic or butterfly needles can be used in young children)
  - Antiseptic solution and sterile gauze to clean the site
  - A sterile 5-ml syringe filled with normal saline
  - A second sterile 5-ml syringe filled with normal saline
  - IV infusion equipment
  - Sterile gloves.
- Select the site for cannulation:
  - First, palpate the tibial tuberosity
  - Then, locate one finger's breadth below and medial to the tuberosity (the bone can be felt under the skin at this site).
- Wash the hands and put on sterile gloves.
- Clean the skin over and surrounding site with an antiseptic solution.
- Stabilize the proximal tibia with the left hand (this hand is now not sterile) by grasping the thigh and knee above and lateral to the cannulation site, with the fingers and thumb wrapped around the knee but not directly behind the insertion site.
- Palpate the landmarks again with the sterile glove (right hand).

- Insert the needle at a 90° angle to the bone with the bevel pointing towards the foot. Advance the needle using a gentle but firm, twisting or drilling motion.
- Stop advancing the needle when you feel a sudden decrease in resistance. The needle should be fixed in the bone.
- Remove the stylet if present.
- Aspirate 1 ml of the marrow contents (looks like blood), using the 5 ml syringe, to confirm that the needle is in the marrow cavity.
- Flush the needle with 5 ml of infusion solution
- The fluid infusion can be started.

Note: While the fluid is being infused, only a slight resistance should be felt, and there should be no visible or palpable infiltration in the area of infusion. Failure to aspirate marrow contents does not mean that the needle is not correctly placed.

- Apply dressings and secure the needle in its place.
- Monitor the infusion by the ease with which the fluid flows and by the clinical response of the patient.
- Check that the calf does not swell during the infusion and the toes remain pink.
- If the child cries inconsolably, check the toes and calf.

Stop the intraosseous infusion as soon as venous access is available. In any case, it should not continue for more than 8 hours.

Complications

- Incomplete penetration of the bony cortex
- Penetration of the posterior bone cortex (more common)
- Infection
- Necrosis and sloughing of the skin at the site of the infusion (this occurs specially when drugs such as adrenaline and calcium pass into the tissue)

IV DRUG ADMINISTRATION THROUGH AN INDWELLING CANNULA

Attach the syringe containing the IV drug to the injection port of the cannula and introduce the drug. Once all the drug has been given, normal saline or 5% glucose solution can be infused.

Insertion of a nasogastric tube

A nasogastric tube (size 8 French gauge for children) for fluids or food may have to be passed into the child's stomach, e.g. to feed a severely malnourished child who is anorexic, or to give fluids (e.g. glucose) to an unconscious child.

Holding the tip of the tube against the child's nose, measure the distance from the nose to the ear lobe, then to the xiphisternum (epigastrium). Mark the tube at this point. See Figure 65.

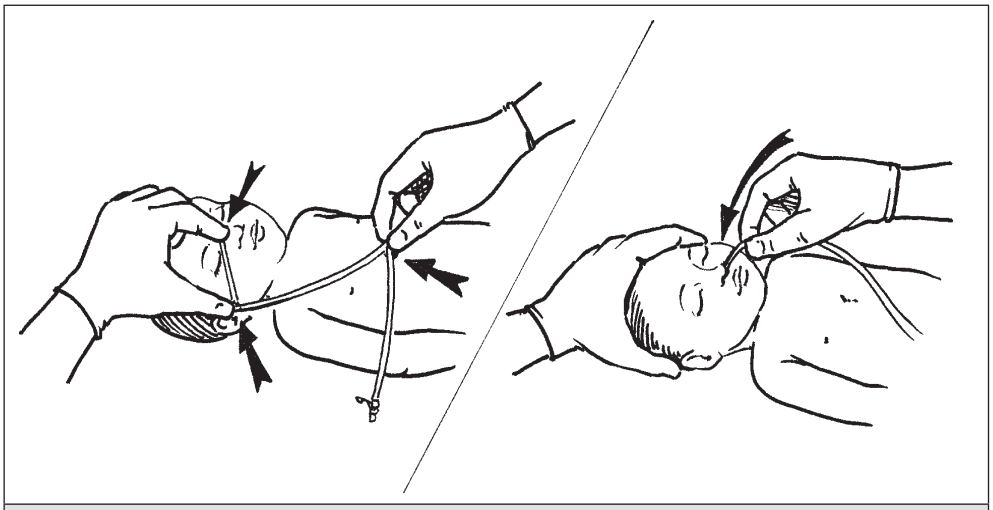


Figure 65
Inserting a nasogastric tube. The distance is measured from the nose to the ear and then to the epigastrium, and then the tube is inserted to the measured distance

Hold the child firmly. Lubricate the tip of the catheter with water and pass it directly into one nostril, pushing it slowly in. It should pass easily down into the stomach without resistance. When the measured distance is reached, fix the tube with tape at the nose.

Aspirate a small amount of stomach contents with a syringe to confirm that the tube is in place (check that it turns blue litmus paper pink). If no aspirate is obtained, inject air down the tube and listen over the abdomen with a stethoscope (note, however, that the latter method can lead to errors if not carried out carefully). If the tube is in the stomach, air can be heard entering the stomach.

If the tube is not in the stomach, any aspirate obtained will not turn blue litmus paper pink and the sound of injected air will not be heard over the abdomen. If there is any doubt about the location of the tube, withdraw it and start again. The major complication is when the tube inadvertently passes into the trachea. This leads to distress in the child, an abnormal cry in infants, or cyanosis. If this happens, remove the tube immediately and try again to pass it into the stomach after the child has recovered. When the tube is in place, fix a 20 ml syringe (without the plunger) to the end of the tube, and pour food or fluid into the syringe, allowing it to flow by gravity. The nasogastric tube can be left in position for several days. If there is doubt about the position of the tube, check that it is correctly in place before giving the feed.

Obstruction of nasal breathing can cause distress in some young infants. If oxygen therapy is to be given by nasopharyngeal catheter at the same time, pass both tubes down the same nostril and try to keep the other nostril patent by wiping away crusts and secretions.

Contraindications:

Diverticula, Caustic ingetsion, Maxilofacial Trauma

Needle chest decompression / Needle thoracostomy

- It is life-saving for patients with tension pneumothorax.
- If there is high clinical suspicion of a tension pneumothorax, emergent needle thoracostomy should be performed. i.e. if
  - Mechanism of injury suggests the likelihood of pneumothorax
  - Patient is in respiratory distress with decreased breath sounds on the side of the pneumothorax, low pulse oximetry despite supplemental oxygen, & shift of the mediastinal structures to the contralateral side, and
  - Hemodynamic instability (sign of shock) with tachycardia, capillary refill delay and hypotension shock is present.

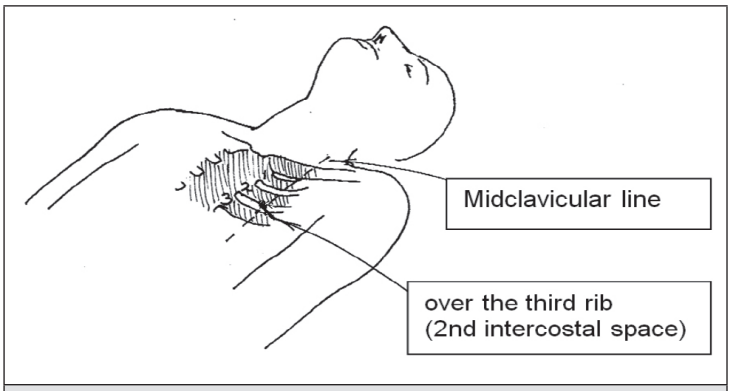


Figure 66
Acceptable sites for Needle thoracostomy

Needle thoracostomy: Procedure

- The skin should be cleaned with antiseptics prior to insertion of the needle.
- Acceptable sites for insertion of a 14-gauge venous canula or widebore needle is at the second intercostal space in the midclavicular line (see Figure 66)
- If there is a tension pneumothorax, an immediate release of air should be noted.
- If positive, the needle decompression is only a temporizing measure and must be followed by tube thoracostomy.
- Chest x-ray is only performed after the insertion of the chest tube and should not be used to diagnose a tension pneumothorax in the symptomatic patient.
- If a significant air leak continues after chest tube placement, a tracheobronchial rupture must be considered

Needle cricothyroidotomy

Procedure (Wire-Guided Technique)

Indications:

- severe blunt or penetrating maxillofacial trauma;
- laryngeal foreign bodies that cannot readily be removed;
- severe swelling of the upper airway from infection (e.g., epiglottitis),
- an allergic process (e.g. angioedema, snakebite),
- local trauma (e.g., airway thermal or chemical burns); and
- Congenital anomalies such as Pierre Robin syndrome .

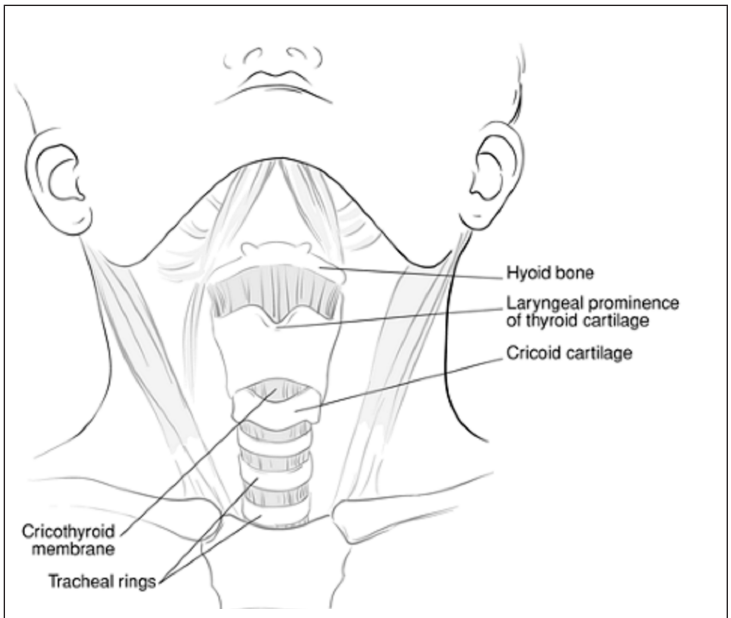


Figure 67
Cricothyroid Membrane

Contraindication: it should not be performed when there is known damage to the cricoid cartilage or in the setting of tracheal rupture.

Younger children needle cricothyroidotomy should always be considered before surgical cricothyroidotomy because it is associated with far fewer complications and can be completed in a much shorter period of time.

Equipment setups

- Three way stop cock
- 14 gauge stop angiocath / over needle intravenous catheter attached 5 or 10 ml syringe
- 8 or 3 endotracheal tube ventilator adaptor
- oxygen adopter and oxygen bag
- high pressure oxygen source

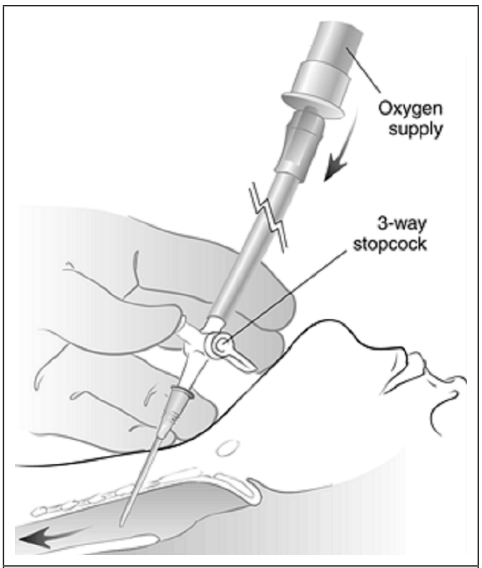


Figure 68
Needle Cricothyroidotomy

Technique

1. Position the patient supine with extended neck putting towel under the shoulder in non trauma patient but with precaution to the cervical spine stabilization with neutral position in a trauma patient
2. Identify the anatomy.
3. Then with your thumb and index finger stretch the skin laterally and insert a 14 gauge catheter with the needle aiming to 30 degree to 45 degree to the plane of the neck. Advance the catheter with a negative pressure through the syringe and by the time you found air remove the syringe and the needle
4. Replace the syringe with a 3 ETT adapter ventilation and attach this end with the bag and mask or with oxygen. Run O2 at 1 litre/min per year of age.

Useful for obstruction in the larynx or above, but not if there is obstruction in the trachea or bronchi. It improves oxygenation slightly, and buys 10-15 minutes' time for help to arrive, and for the establishment of a definitive airway.

Complications:

- Asphyxia
- Aspiration
- Cellulitis
- Oesophageal perforation
- Haemorrhage
- Haematoma
- Posterior tracheal wall perforation
- Subcutaneous and/or mediastinal emphysema
- Thyroid perforation
- Inadequate ventilation leading to hypoxia and death

The main problems of needle are:

- Failure to enter the trachea: hold the trachea firmly and stay in the midline.
- Bleeding: Apply pressure with a swab. Tie off large bleeders.
- Damage to local structures (oesophagus, pleura causing pneumothorax, arteries, veins, nerves).

Splinting Techniques

APPLICATION OF SKIN FRACTION

Equipment: spreader (flat wooden material 6 * 6 cm with central hole)

- The spreader can be prepared from cartoon
- Adhesive type
- Roll bandage
- Rope (nylon or can be made from roll bandage)
- Weight from ½ Kilo – 2 Kilo (according to the patients age and weight, the maximum weight is 3 kg.)

We use traction for both reduction and maintenance

Technique: The tip of adhesive tape should be distal from the fracture

- Needs counter fraction (Child's body /upper part/and gravity)
- For this purpose elevate the bed from foot side
- Consider direction of the limb to overcome the deforming forces
- Don't put heavy weight to avoid skin blister(see Figure 69)

POP CAST APPLICATION

Equipment:

- Cotton pad
- Plaster of Paris
- Roll bandage
- Water (cold or warm) in a vase

Technique:

- Align fracture site as much as possible
- Immobilize both proximal and distal joints from the fracture
- Keep both joints in functional position,
  - Elbow and ankle in 90^{o} flexion
  - Wrist in extension, knee 15^{o} flexion.
- Keep the metacarpo phalangeal (MCP) joint and fingers free in long arm and short arm casts.
- Keep the toes and fingertips free to see swelling and blood supply to the distal part.
- Add additional cotton pad on bonny prominences like malleoli
- Don't apply very loose or tight bandage
- Elevate limb to avoid swelling – compartment syndrome.

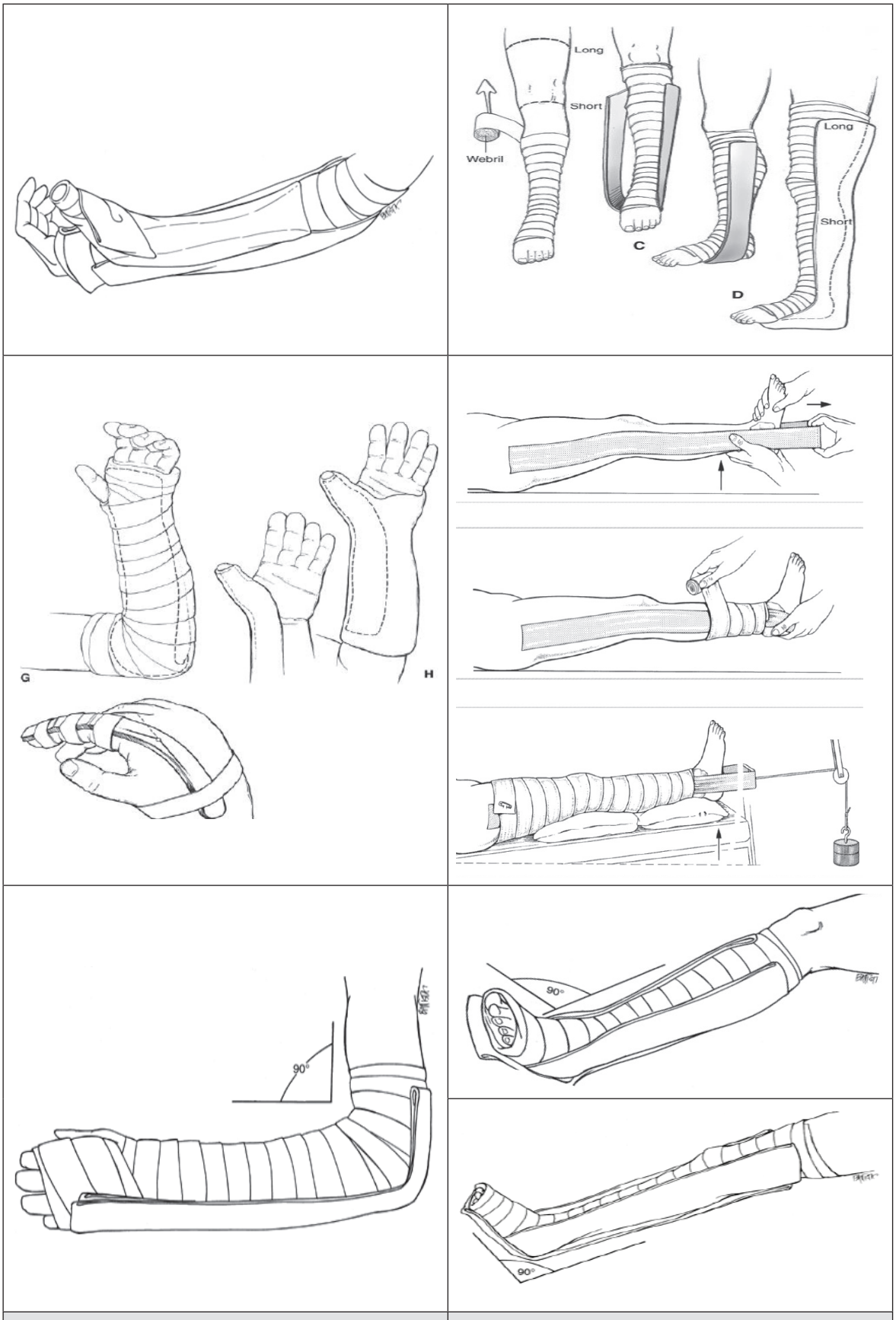


Figure 69
Splinting Techniques: Splint of the arm

Splint of the leg

Nebulizer Use

Starting with a clean medication reservoir, the clinician measures the correct amount of normal saline (usually 3 mL) and places it in the reservoir, then adds the measured amount of medication to the saline. Once the medication is in the reservoir, the reservoir can be attached to its jet source (air compressor or oxygen line) using gas tubing. The T-connector mouthpiece or the face mask is attached to the other end of the medication cup. It is better to use a T-connector and mouthpiece than a face mask if the patient is able to cooperate with the breathing in of the medication.

Face masks deposit a large portion of the aerosol on the face and in the nasopharynx. T-connectors with a mouthpiece waste less medication than face masks and are the device of choice in cooperative patients.

- Once the mask is placed around the face or the T-connector mouthpiece set is placed in the mouth, the clinician turns on the jet source at 8 L/min flow. Taking deep breaths, the patient inhales slowly (over 6 seconds if possible) and then holds each breath as long as is comfortable (up to 10 seconds). The patient continues inhaling in this manner until all fluid is gone from the reservoir. After the treatment is completed, the compressed air or oxygen is turned off.



Figure 70
Face mask

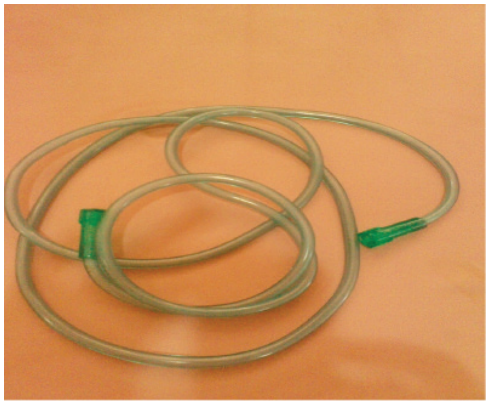


Figure 71
Oxygen connecter

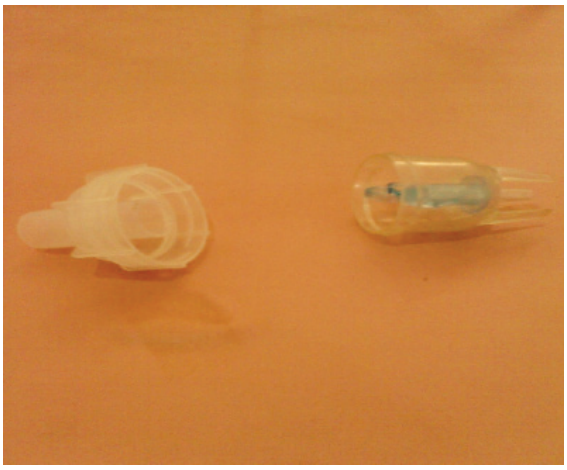


Figure 72
Container to put the drug and saline



Figure 73
Drug to be nebulized and connected with oxygen

Umbilical Catheterization

Umbilical vein catheterization may be a life-saving procedure in neonates who require vascular access and resuscitation. The umbilical vein remains patent and viable for cannulation until approximately 1 week after birth. After proper placement of the umbilical line, intravenous fluids and medication may be administered to critically ill neonates.

When critically ill newborns present to the emergency department, peripheral access is preferred. If this is impossible, umbilical vein catheterization may be attempted.

Indication

- The principal indication for umbilical vein catheterization is to gain vascular access during emergency resuscitation.
- Alternative uses of the umbilical vein may include exchange transfusions and central venous access.

Contraindication

Absolute contraindications to umbilical vein catheterization include the following:

- Omphalitis
- Peritonitis
- Necrotizing enterocolitis

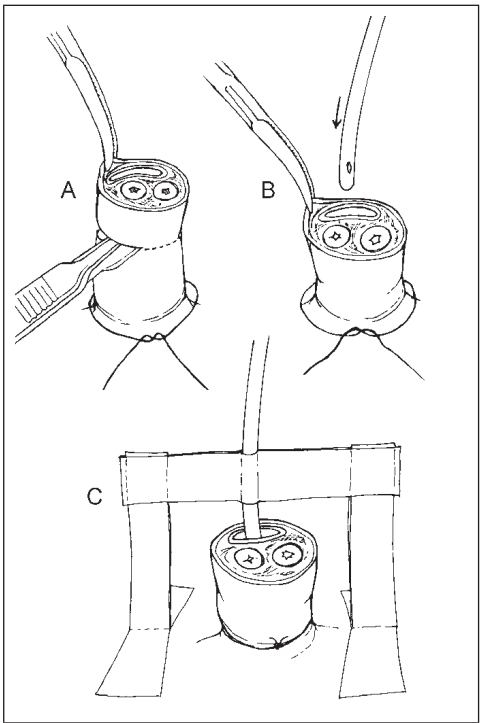


Figure 74
Inserting an umbilical vein catheter

Equipment

Before initiating the procedure, a radiant warmer should be obtained, and the patient should be connected to a cardiac monitor. Necessary equipment includes the following:

- Personal protective equipment (i.e., sterile gown, gloves, mask)
- Sterile drapes
- Umbilical catheter, 3.5F or 5F (See the images below.) 5F umbilical catheter. Note proximal attachment for stopcock. Close-up of umbilical catheter.
- Iris forceps without teeth
- Small clamps
- Scalpel
- Scissors
- Needle holder
- Silk suture (3-0) or umbilical tape
- Intravenous tubing and 3-way stopcock
- Infusion solution (dextrose 5% in water or 0.9% sodium chloride [NaCl] with heparin 1 U/mL solution)

Technique

- Umbilical vein catheterization typically requires no anesthesia.
- The umbilical cord stump and surrounding abdomen should be sterilized with a bactericidal solution. Sterile drapes should be placed.

- A purse-string suture or umbilical tape is tied around the base of the stump to provide hemostasis and to anchor the line after the procedure.
- Using the scalpel, the cord is cut horizontally, approximately 1.5-2 cm from the abdominal wall. Two thick-walled small arteries and one thin-walled larger vein should be identified. The umbilical vein may continue to ooze blood. See the images below. Figure 9: Umbilical stump illustrating arteries and vein.
- Illustration of umbilical vein and arteries.

Complications of umbilical vein catheterization include the following:

- Infection
- Hemorrhage
- Vessel perforation
- Creation of a false luminal tract
- Hepatic abscess or necrosis
- Air embolism
- Catheter tip embolism
- Portal venous thrombosis
- Dysrhythmia and pericardial tamponade or perforation (if the catheter is advanced to the heart)

Orogastric tube

It is the insertion of tube from the oropharynx to the gastric for the purpose of diagnostic or therapeutic purpose

It is used in conscious child in case of poisoning for gastric lavage or in awake child intubated.

The pain is better tolerated than NG tube.

Distance from ear to the lip then the xyphoid.

Indication

- For feeding
- For decompression of the stomach during resuscitation or in a patient with obstruction
- For rehydration during dehydration
- For gastric lavage during poisoning
- Mid facial injuries, basak skull fracture, coagulopathy, epistaxis, nasal obstruction, difficult nasal passage, and small nares for the required gastric tube size are indication of orogastric versus nasogastric tube

Contraindication

- Caustic ingestion.
- High esophageal foreign bodies
- Depressed gag reflex because of risk of aspiration.

Equipment

- Gastric tube
  - Nasogastric tubes can be used as Orogastric tubes in the pediatric patient. 8 French feeding tube may be substituted for nasogastric tube sizes 5 to 8 French
- Personal protective equipments
- Adhesive tape
- Suction
- Topical lubricant
- Stethoscope

Technique

- Measure the distance to be inserted Measure length mark
- Lubricate the gastric tube and if possible anesthesia the oropharynx with lidocaine sprays.
- Gently push the tube through the oropharynx so that not to provoke gag reflex and reach to the pre marked distance
- A cooperative conscious child can repeatedly swallow during the procedure in order to facilitate the esophageal passage.

Confirmation that it is in the stomach

- A child talking or crying it is unlikely it will be in the trachea.
- Aspirate gastric content
- Push 10 -20 mlof air and if you hear a gurgling sound on the epigastrium, it is in the right

Annex Two

Resources required to implement emergency care of children in hospitals

The following list gives you equipment which is needed to implement emergency care in your emergency or outpatient department, and to train staff in performing the emergency management. After training, you should have these items available in the emergency area of the outpatient department as well as in the ward. While you are checking for its availability, find out whether it is available elsewhere in the hospital, and you can make it available where you need it. Therefore, there is another column provided which is labeled "hospital" in the check list.

Equipment	Emergency department	Paediatric ward	Hospital
Infant sized doll			
Child sized doll			
Nebulizer			
Spacer			
Orophargngeal (Guedel) Airways: at least 3 different sizes			
Self-inflating bags: adult			
Self-inflating bags: children			
Masks: 3 sizes for children			
Electric (or foot) suction pump			
Suction catheters: size 15 FG.			
Oxygen concentrator or oxygen cylinder with regulator, pressure gauge and flow meter			
Oxygen tubing, nasal prongs or catheters			
Sandbags			
Blankets			

Consumables	Emergency department	Paediatric ward	Hospital
Adhesive tape, at least 2 different sizes			
Cotton wool			
Cardboard to make splints			
IV Infusion sets			
Scalp vein needles (size 21 or 23 G)			
IV Cannulae (size 22 or 24 G)			
Needles for intraosseous insertion (size 21G)			
Tuberculin syringes (if not available 2 cc syringe)			
Test strips and scale for blood sugar			
Adhesive tape			
Suction			
Umbilical catheter, 3.5F or 5F			
Iris forceps without teeth			
Small clamps			
Scalpel			
Scissors			
Three way stop cock			
14 gauge stop angiocath / over needle intravenous catheter attached 5 or 10 ml syringe			
8 or 3 endotracheal tube ventilator adaptor			
oxygen adopter and oxygen bag			
high pressure oxygen source			
Fluids and drugs			
Ringer's lactate or normal saline			
Normal saline with 5% glucose solution or half-strength Darrow's with 5% glucose solution			
Glucose 10% or 50% glucose			
ORS			
ReSoMal (commercially bought or prepared)			
Diazepam IV or Lorazepam			

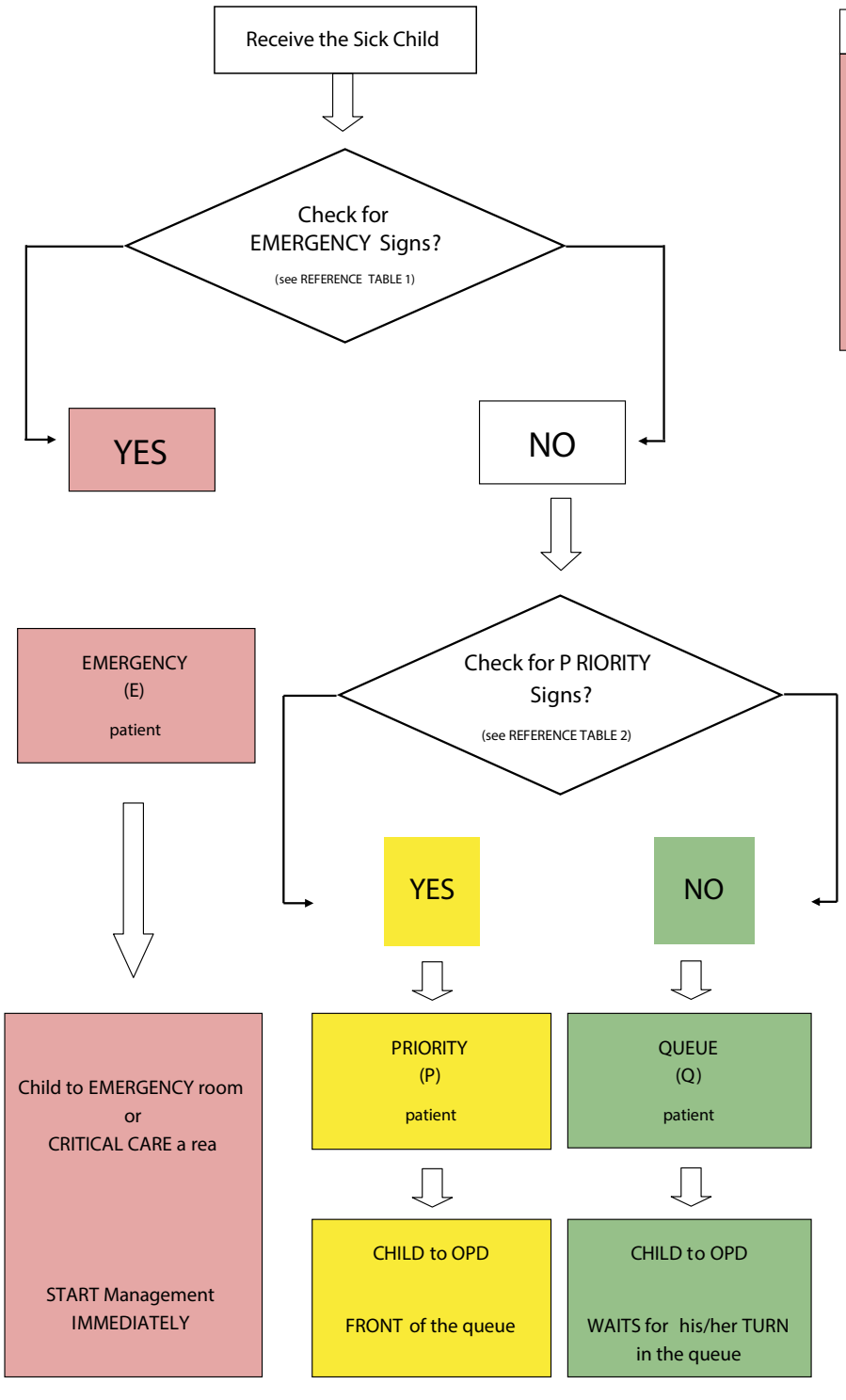
After you have checked for the availability, list requirements here in order of priority.

Equipment	Consumables
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.
7.	7.
8.	8.
9.	9.
10.	10.

Annex Three

ETAT charts

CHART 1. Sick Children Triage



REFERENCE TABLE 1

Emergency Signs

A: Airway problem
B: Breathing problem
C: Circulation or shock
Cm: Coma or Unconscious
Cn: Convulsion
D: Dehydration, Severe
Ds: Disability
O: Bleeding child, poisoning (immediate) open fracture.

REFERENCE TABLE 2

Priority Signs "3TPR - MOB"

Tiny baby (sick child < 2 months)

Temperature (child is very hot/cold)

Trauma or other urgent surgical condition

Pallor (severe)

Poisoning (history of)

Pain (severe)

Respiratory distress

Restless, irritable, or lethargic

Referral (urgent)

Malnutrition (visible severe wasting)

Oedema (of both feet)

Burn

CHART 2. Emergency Management of Triaged Children

EMERGENCY(E) SIGNS: If any sign positive: give treatment(s) for ABCDO, call for help, draw blood for emergency laboratory investigations (glucose, malaria smear, Hb and cross match if necessary)

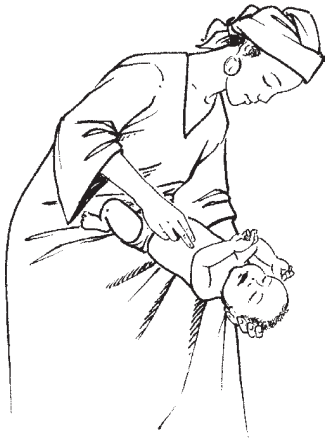
		TREAT
1. ASSESS: AIRWAY AND BREATHING ■ Obstructed or absent breathing ■ Central cyanosis ■ Severe respiratory distress	**Any Sign Positive**	■ Do not move neck if cervical spine injury possible. ■ If foreign body aspiration: manage airway in choking child ■ If no foreign body aspiration: manage airway ■ Give oxygen
2. ASSESS: CIRCULATION ■ Cold skin with: – Capillary refill longer than 3 seconds, and – Weak and fast pulse	**Signs Positive** **Check for Severe Malnutrition**	■ Stop any bleeding ■ Give oxygen ■ Make sure child is warm **If no severe malnutrition:** – Insert an IV and begin giving fluids rapidly – If not able to insert peripheral IV, insert an intraosseous or external jugular line **If severe malnutrition:** ■ If lethargic or unconscious: – Give IV glucose – Insert IV line and give fluids ■ If not lethargic or unconscious: – Give glucose orally or by NG tube – Full assessment and treatment
3. ASSESS: COMA/ CONVULSION ■ Coma **OR** ■ Convulsing (now)	**If the Child is in Coma or Convulsing**	■ Do not move neck if cervical spine injury possible ■ Manage airway – If convulsing, give diazepam rectally – Position the unconscious child (if head or neck trauma is suspected, stabilize the neck first ■ Give IV glucose

CHART 2. Emergency Management of Triaged Children		
4. ASSESS: SEVERE DEHYDRATION (In a child with diarrhoea) Diarrhoea plus any two of these signs: ■ Lethargy ■ Sunken eyes ■ Very slow skin pinch ■ Unable to drink	**Two Signs Positive** **Check for Severe Malnutrition**	■ Make sure child is warm **If no severe malnutrition** ■ Insert an IV line and begin giving fluids rapidly **If severe malnutrition:** ■ Do not insert IV ■ Proceed immediately to full assessment and treatment
5. OTHERS: MAJOR TRAUMA, IMMEDIATE POISONINGS ■ Immediate poisoning, actively bleeding child, compound fracture	**Any Sign Positive**	■ Manage ABC ■ Airway Protection ■ Arrest bleeding ■ Decontaminate acute poisoning ■ Stabilize fracture
Proceed with assessment and further treatment according to the child's priority		
PRIORITY(P) SIGNS: These children need prompt assessment and treatment ■ Tiny baby (<2 months) ■ Temperature very high ■ Trauma or other urgent surgical condition ■ Pallor (severe) ■ Poisoning (history of) ■ Pain (severe) ■ Respiratory distress ■ Restless, continuously irritable, or lethargic ■ Referral (urgent) ■ Malnutrition: visible severe wasting ■ Oedema of both feet or face ■ Burns (major)	**Any Sign Positive**	**Move a child with any priority sign to the front of the queue** **Note:** If a child has trauma or other surgical problems, get surgical help or follow surgical guidelines
NON-URGENT(Q)		■ The child can wait her/his turn in the queue for assessment and treatment

CHART 3. How to manage a choking child

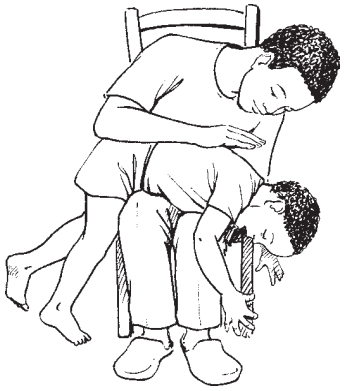


Back slaps

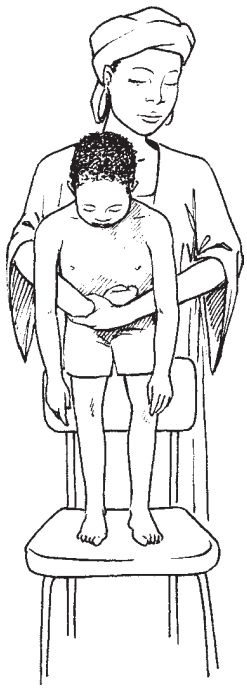


Chest thrusts

- Lay the infant on your arm or thigh in a head down position
- Give 5 blows to the infant's back with heel of hand
- If obstruction persists, turn infant over and give 5 chest thrusts with 2 fingers, one finger breadth below nipple level in midline (see diagram)
- If obstruction persists, check infant's mouth for any obstruction which can be removed
- If necessary, repeat sequence with back slaps again



Slapping the back to clear airway obstruction in a choking child



Heimlich manoeuvre in a choking older child

- Give 5 blows to the child's back with heel of hand with child sitting, kneeling or lying
- If the obstruction persists, go behind the child and pass your arms around the child's body; form a fist with one hand immediately below the child's sternum; place the other hand over the fist and pull upwards into the abdomen (see diagram); repeat this Heimlich manoeuvre 5 times
- If the obstruction persists, check the child's mouth for any obstruction which can be removed
- If necessary, repeat this sequence with back slaps again

CHART 4. How to manage the airway in a child with obstructed breathing (or who has just stopped breathing)

NO NECK TRAUMA IS SUSPECTED



Neutral position to open the airway in an infant



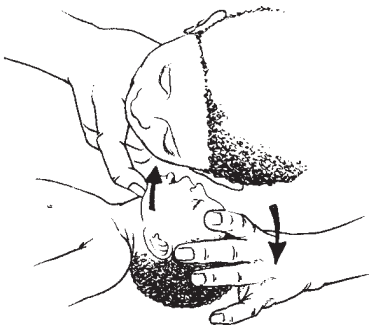
Sniffing position to open the airway in an older child

Child conscious

- Inspect mouth and remove foreign body, if present
- Clear secretions from throat
- Let child assume position of maximal comfort

Child unconscious

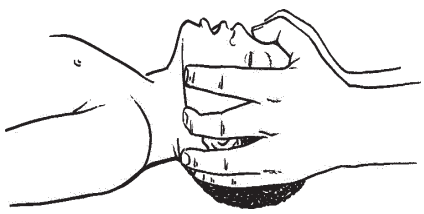
- Tilt the head as shown
- Inspect mouth and remove foreign body, if present
- Clear secretions from throat
- Check the airway by looking for chest movements, listening for breath sounds and feeling for breath
- Follow guidelines in Chart 6



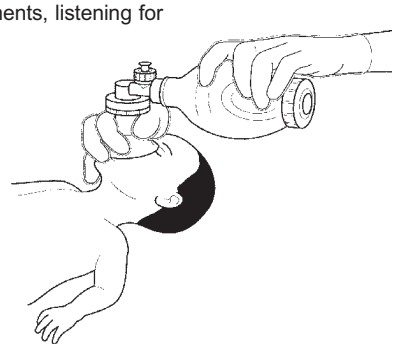
Look, listen and feel for breathing

NECK TRAUMA OR POSSIBLE CERVICAL SPINE INJURY IS SUSPECTED

- Stabilize the neck, as shown in Chart 6
- Inspect mouth and remove foreign body, if present
- Clear secretions from throat
- Check the airway by looking for chest movements, listening for breath sounds, and feeling for breath



Use jaw thrust without head tilt. Place the 4th and 5th finger behind the angle of the jaw and move it upwards so that the bottom of the jaw is thrust forwards, at 90° to the body



If the child is still not breathing after carrying out the above, ventilate with bag and mask

CHART 5. How to give oxygen

Give oxygen through nasal prongs, nasal catheter and face mask

Nasal Prongs

- Place the prongs just inside the nostrils and secure with tape



Nasal Prongs

Nasal Catheter

- Use an 8 FG size tube
- Measure the distance from the side of the nostrils to the inner eyebrow margin with the catheter
- Insert the catheter to this depth
- Secure with tape

Start oxygen flow at 1-2 liters per minute



Nasal Catheter

Face Mask

- Place the mask

Start oxygen flow at 5-6 liters per minute



Face Mask

CHART 6. How to position the 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 cheek on one hand
- Bend one leg to stabilize the body position
- If neck trauma is suspected:
- Stabilize the child's neck and keep the child lying on the back

Stabilizing the neck when trauma is suspected

- Tape the child's forehead to the sides of a firm board to secure this position. Prevent the neck from moving by supporting the child's head (e.g. using litre bags of IV fluid on each side)
- If vomiting, turn on the side, keeping the head in line with the body

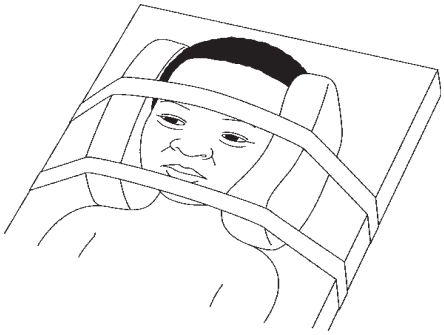


CHART 7. How to give IV fluids rapidly for shock in a child without severe malnutrition

- If the child is severely malnourished the fluid volume and rate are different, so check that the child is not severely malnourished
  Shock in child without severe malnutrition — Chart 7
  Shock in child with severe malnutrition — Chart 8
- Insert an intravenous line (and draw blood for emergency laboratory investigations)
- Attach Ringer's lactate or normal saline—make sure the infusion is running well
- Infuse 20 ml/kg as rapidly as possible

Age/weight	Volume of Ringer's lactate or normal saline solution (20 ml/kg)
2 months (<4 kg)	75 ml
2–<4 months (4–<6 kg)	100 ml
4–<12 months (6–<10 kg)	150 ml
1–<3 years (10–<14 kg)	250 ml
3–<5 years (14–19 kg)	350 ml

Reassess child after appropriate volume has run in

Reassess after first infusion:	If no improvement, repeat 20 ml/kg as rapidly as possible
Reassess after second infusion:	If no improvement, repeat 20 ml/kg as rapidly as possible
Reassess after third infusion:	If no improvement, give blood 20 ml/kg over 3 hours, unless the child has profuse diarrhoea
Reassess after fourth infusion:	If no improvement, see disease specific treatment guidelines. You should have established a provisional diagnosis by now.

After improvement at any stage (pulse slows, faster capillary refill), go to Chart 11 if the child has diarrhoea.

CHART 8. How to give IV fluids for shock in a child with severe malnutrition

Give this treatment only if the child has signs of shock and is lethargic or has lost consciousness:

- Insert an IV line (and draw blood for emergency laboratory investigations)
- Weigh the child (or estimate the weight) to calculate the volume of fluid to be given
- Give IV fluid 15 ml/kg over 1 hour. Use one of the following solutions (in order of preference) according to availability:
  - Ringer's lactate with 5% glucose (dextrose); or
  - Normal saline with 5% glucose (dextrose); or
  - half-strength Darrow's solution with 5% glucose (dextrose); or, if these are unavailable,
  - Ringer's lactate.

Weight	Volume IV fluid Give over 1 hour (15 ml/kg)	Weight	Volume IV fluid Give over 1 hour (15 ml/kg)
4 kg	60 ml	12 kg	180 ml
6 kg	90 ml	14 kg	210 ml
8 kg	120 ml	16 kg	240 ml
10 kg	150 ml	18 kg	270 ml

- Measure the pulse and breathing rate at the start and every 5-10 minutes.

If there are signs of improvement :
- give repeat IV 15 ml/kg over 1 hour; then
- switch to oral or nasogastric rehydration with ReSoMal, 10 ml/kg/h up to 10 hours; then
- initiate refeeding with starter F-75.

If the child fails to improve after the first 15ml/kg IV , assume the child has septic shock:
- give maintenance IV fluid (4 ml/kg/h) while waiting for blood;
- when blood is available, transfuse fresh whole blood at 10 ml/kg slowly over 3 hours (use packed cells if in cardiac failure); then
- initiate refeeding with starter F-75 .
- start antibiotic treatment.

If the child deteriorates during the IV rehydration (breathing increases by 5 breaths/min or pulse by 15 beats/min), stop the infusion because IV fluid can worsen the child's condition.

CHART 9. How to give anticonvulsant for a convulsing child (Dose of diazepam, lorazepam and midazolam by age and weight)

Weight/Age	Diazepam		Lorazepam	Midazolam	
	Diazepam given rectally (10 mg/2ml solution) Dose = 0.1ml/kg	Diazepam given IV (10 mg/2ml solution) Dose = 0.05ml/kg	IV/ Buccal (4mg/ml ampoule) Dose = 0.1mg/kg Volume = (0.025ml/kg)	IV (5mg/5ml ampoule) Dose = 0.25mg/kg (0.25ml/kg)	Buccal (5mg/1ml) Dose = 0.5mg/kg Volume = 0.25ml/kg
4 kg (<2 mon)	0.4ml	0.2ml	0.1ml	1ml	0.2ml
6 kg (2-6mon)	0.6ml	0.3ml	0.15ml	10.5ml	0.3ml
8 kg (6-8mon)	0.8ml	0.4ml	0.2ml	2ml	0.4ml
10 kg (8-10mon)	1ml	0.5ml	0.25ml	20.5ml	0.5ml
12 kg (10-12mon)	10.2ml	0.6ml	0.3ml	3ml	0.6ml
14 kg(1-3yrs)	10.4ml	0.7ml	0.35ml	30.5ml	0.7ml
16 kg(4-5yrs)	10.6ml	0.8ml	0.4ml	4ml	0.8ml
18 kg(5-6yrs)	10.8ml	0.9ml	0.45ml	40.5ml	0.9ml
20 kg (6-7yrs)	2ml	1ml	0.5ml	5ml	1ml

Give diazepam rectally:

- Draw up the dose from an ampoule of diazepam into a tuberculin (1 ml) syringe. Base the dose on the weight of the child, where possible. Then remove the needle.
- Insert the syringe into the rectum 4 to 5 cm and inject the diazepam solution.
- Hold buttocks together for a few minutes.
- If convulsion continues after 10 minutes, give a second dose of diazepam rectally (or give diazepam intravenously (0.05 ml/kg) if IV infusion is running). If convulsion continues after another 10 minutes, give a third dose of diazepam or give lorazepam rectally (or phenobarbital IV or phenytoin IV/IO 15-20 mg/kg).

If 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).
- Use phenobarbital (200 mg/ml solution) in a dose of 20 mg/kg to control convulsions in infants <2 weeks of age:

Weight 2 kg-initial dose: 0.2 ml, repeat 0.1 ml after 30 minutes
Weight 3 kg-initial dose: 0.3 ml, repeat 0.15 ml after 30 minutes
} If convulsions continue

CHART 10. How to give IV glucose

- Insert IV line and draw blood rapidly for emergency laboratory investigations
- Check blood glucose. If low (<2.5 mmol/litre (45 mg/dl) in a well nourished or <3 mmol/litre (55 mg/dl) in a severely malnourished child) or if dextrostix is not available:
- Give 5 ml/kg of 10% glucose solution rapidly by IV injection infusion

Age/weight	Volume of 10% glucose solution to give as bolus (5 ml/kg)
Less than 2 months (<4 kg)	15 ml
2–<4 months (4–<6 kg)	25 ml
4–<12 months (6–<10 kg)	40 ml
1–<3 years (10–<14 kg)	60 ml
3–<5 years (14–19 kg)	80 ml

- Recheck the blood glucose in 30 minutes. If it is still low, repeat 5 ml/kg of 10% glucose solution.
- Feed the child as soon as conscious.

If not able to feed without danger of aspiration, give:

- milk or sugar solution via nasogastric tube (to make sugar solution, dissolve 4 level teaspoons of sugar (20 grams) in a 200-ml cup of clean water), or
- IV containing 5-10% glucose (dextrose)

Note : 40% glucose solution is the same as 40% dextrose solution or D40. If only 40% glucose solution is available: dilute 1 part 40% glucose solution to 3 parts sterile or distiled water, or dilute 1 part 40% glucose solution to 9 parts 5% glucose solution.

Note : For reliable results, take great care with the dextrostix test. The strip must be stored in its box, at 2-3 °C, avoiding sunlight or high humidity. A drop of blood should be placed on the strip (it is necessary to cover all the reagent area). After 60 seconds, the blood should be washed off gently with drops of cold water and the colour compared with the key on the bottle or on the blood glucose reader. (The exact procedure will vary with different strips.)

Chart 11. How to treat severe dehydration in an emergency after initial management of shock

For children with severe dehydration but without shock, refer to diarrhoea treatment plan C.

If the child is in shock, first follow the instructions in Charts 7 and 8. Switch to the chart below when the child's pulse becomes slower or capillary refill is faster.

▶ Give 70 ml/kg of Ringer's lactate (Hartmann's) solution (or, if not available, normal saline) over 5 h to infants (aged < 12 months) and over 2.5 h to children (aged 12 months to 5 years).

	Total volume IV fluid (volume per hour)	
Weight	Age < 12 months Give over 5 h	Age 12 months to 5 years Give over 2.5 h
< 4 kg	200 ml (40 ml/h)	–
4–6 kg	350 ml (70 ml/h)	–
6–10 kg	550 ml (110 ml/h)	550 ml (220 ml/h)
10–14 kg	850 ml (170 ml/h)	850 ml (340 ml/h)
14–19 kg	–	1200 ml (480 ml/h)

Reassess the child every 1–2 h. If the hydration status is not improving, give the IV drip more rapidly.

Also give oral rehydration salt (ORS) solution (about 5 ml/kg per h) as soon as the child can drink, usually after 3–4 h (in infants) or 1–2 h (in children).

Weight	Volume of ORS solution per hour
< 4 kg	15 ml
4–6 kg	25 ml
6–10 kg	40 ml
10–14 kg	60 ml
14–19 kg	85 ml

Reassess after 6 h for infants and after 3 h for children. Classify dehydration. Then choose the appropriate plan A, B or C to continue treatment.

If possible, observe the child for at least 6 h after rehydration to be sure that the mother can maintain hydration by giving the child ORS solution by mouth.

CHART 12. Cardio Pulmonary Resuscitation

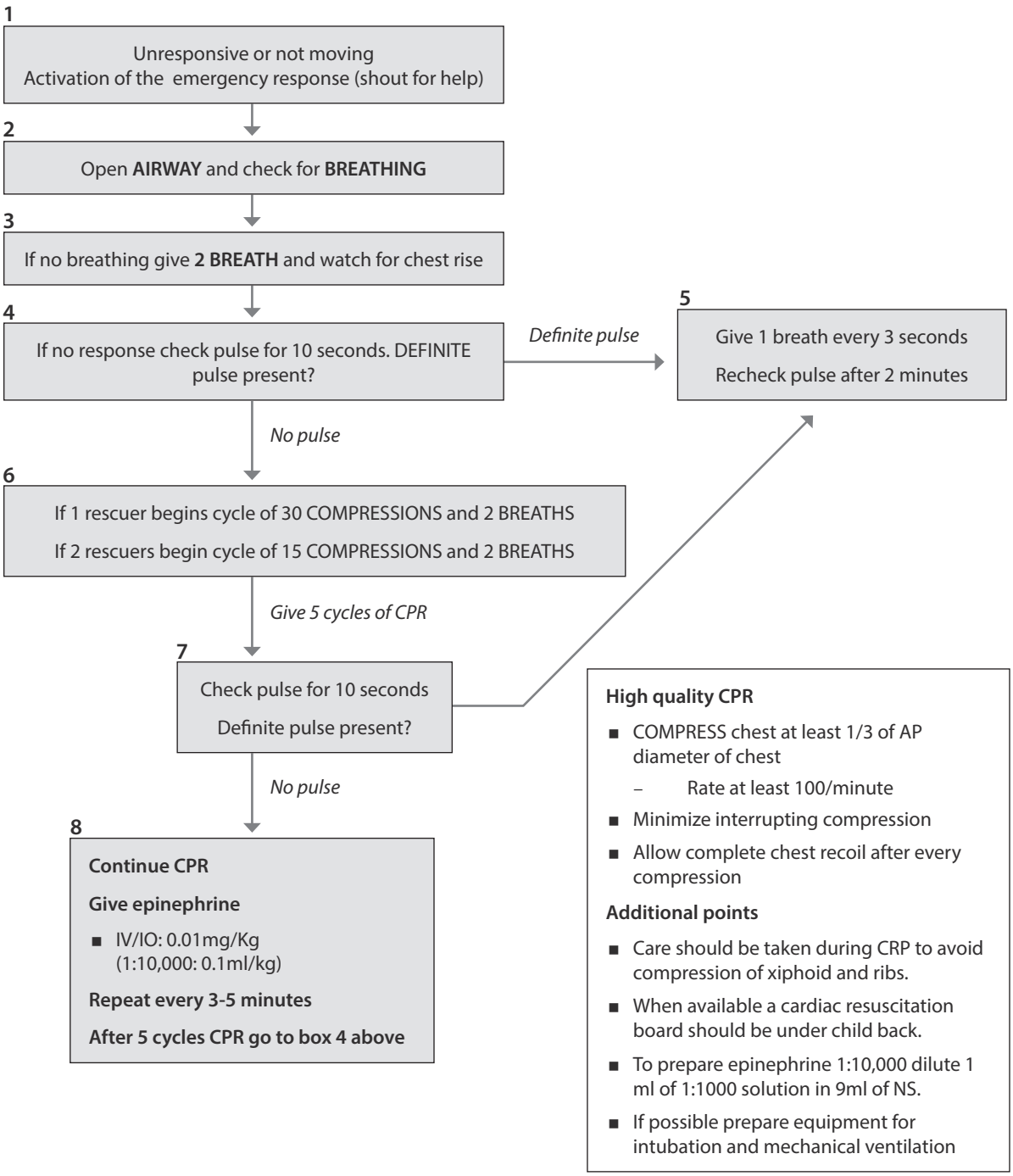


CHART 13: Neonatal Resuscitation

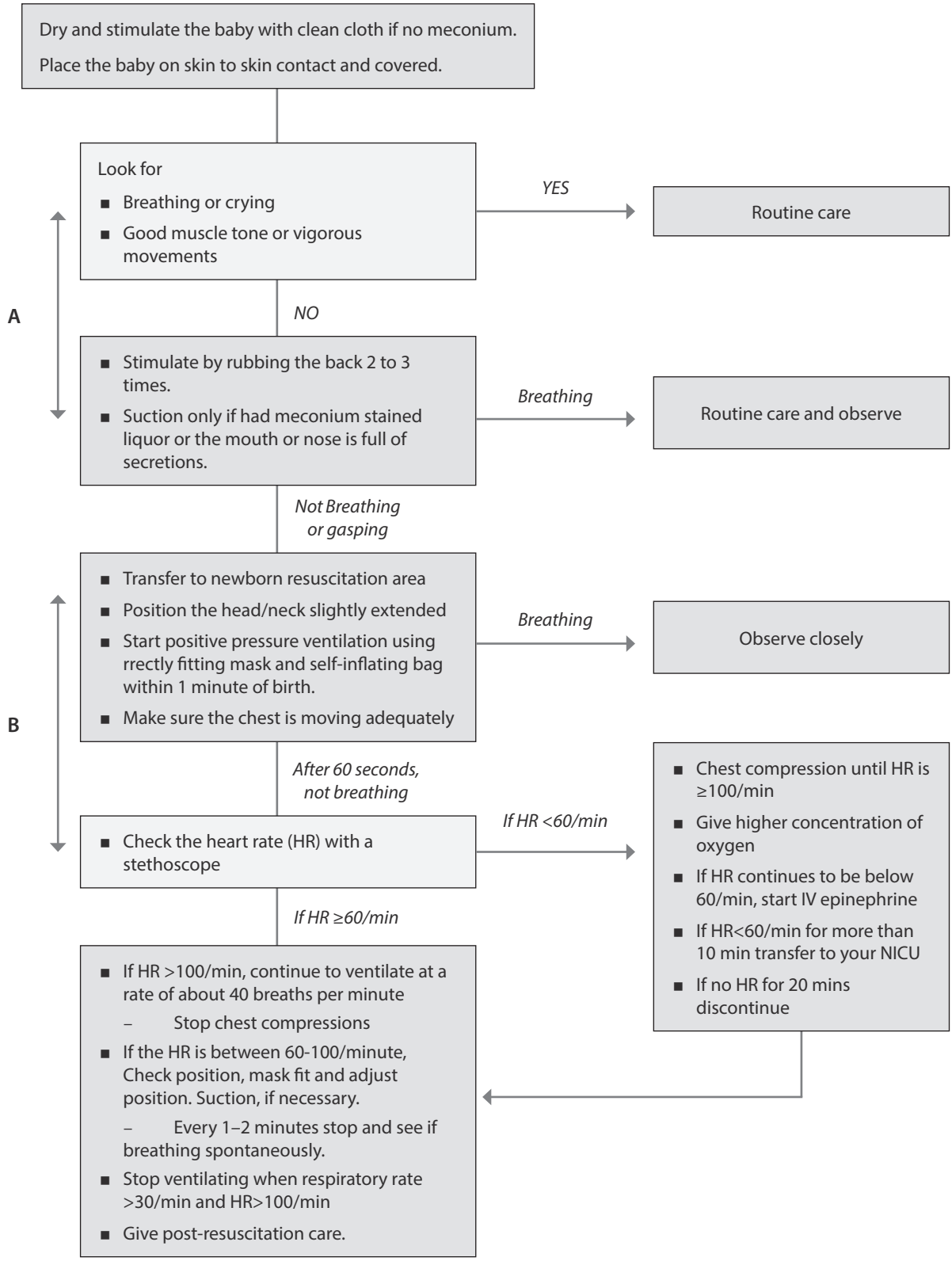


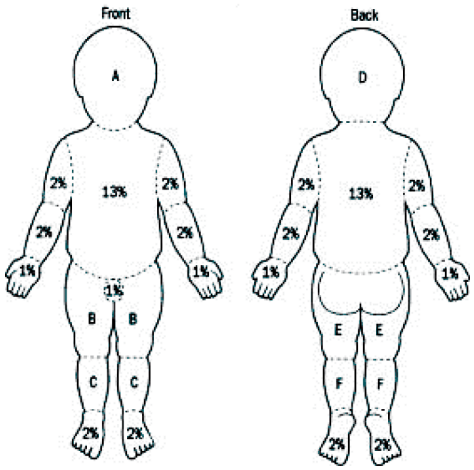
CHART 14. Asthma Treatment Algorithm

Mild Asthma	Moderate Asthma	Severe Asthma
Normal mental state Talks in sentences Little or no accessory muscle use SPO2>95% Wheeze + normal breath sounds	Normal to agitated mental state Talks in phrases Mild to moderate accessory muscle use SPO2 90-95% Wheeze +reduced breath sounds	Agitated or confused mental state Talk in single word or unable to talk Significant accessory muscle use SPO2<90% Wheeze +significantly reduced breath sounds
Note; If patient has sign or symptoms from two different categories, always treat according to the most sever feature		
Administer Oxygen via nasal cannula or face mask if SPO2< 90% or there are signs of respiratory distress		
Bronchodilators Via Meter Dose Inhaler(MDI) +spacer <6years >6 years Salbutamol 6puffs 12 puffs (repeat every 20 minutes as needed)	**Bronchodilators;** Via MDI +spacer <6years >6 years Salbutamol 6puffs 12 puffs (repeat every 20 minutes as needed) **Corticosteroids (PO or IV):** Po: Predinsolone 1-2mg/kg/day (max. 6omg), for 3-5 days in a single or 2 divided doses IV: Hydrocortisone 4-5mg/kg Q 6 hours (max 250 mg)	**Bronchodilators;** Via MDI +spacer <6years >6 years Salbutamol 6puffs 12 puffs (repeat every 20 minutes as needed) **If absent air entry at onset, consider;** IM/SC: epinephrine 0.01ml/kg(1:1000) (max. 0.4ml) **Corticosteroids:** IV: Hydrocortisone 4-5 mg/kg Q6 hours(max 250mg) OR IV: dexamethasone 0.3mg/kgQ12 hours (max 20mg) **If no response, consider IV agents:** 1st: IV magnesium sulfate 50%* 0.1mg/kg over 20 minute 2nd: IV aminophyline 3-5mg/kg over 1 hour can repeat every 6 hours
Response after 20 minutes? **Good:** 1. Discharge on salbutamol 2-6 puff every 4-6 hours as needed	**Response after 20 minutes?** **Good:** 1. Observe for additional hours 2. Discharge on salbutamol 2-6 puff every 4-6 hours as needed 3. Continue Pridinsolone 1-2mg/kg/day for 3-5 days in a single or 2 divided doses	**ARRANGE FOR ADMISSION**
Prior to discharge ■ Arrange for follow up appointment ■ Review correct use of inhaler ■ Give clear instruction on when to return if asthma worsen		

* *For children use 10% magnesium sulfate for IV management. 10 % magnesium sulfate can be prepared by 1 part of 50% magnesium sulfate and 4 part of 5% DW or normal saline. Use 20% magnesium sulfate for IM management.*

CHART 15. Chart for estimating the percentage of body surface burned

Estimate the total area burned by adding the percentage of body surface area affected as shown in the figure (refer to the table for areas A–F which change according to the age of the child.



By age in years

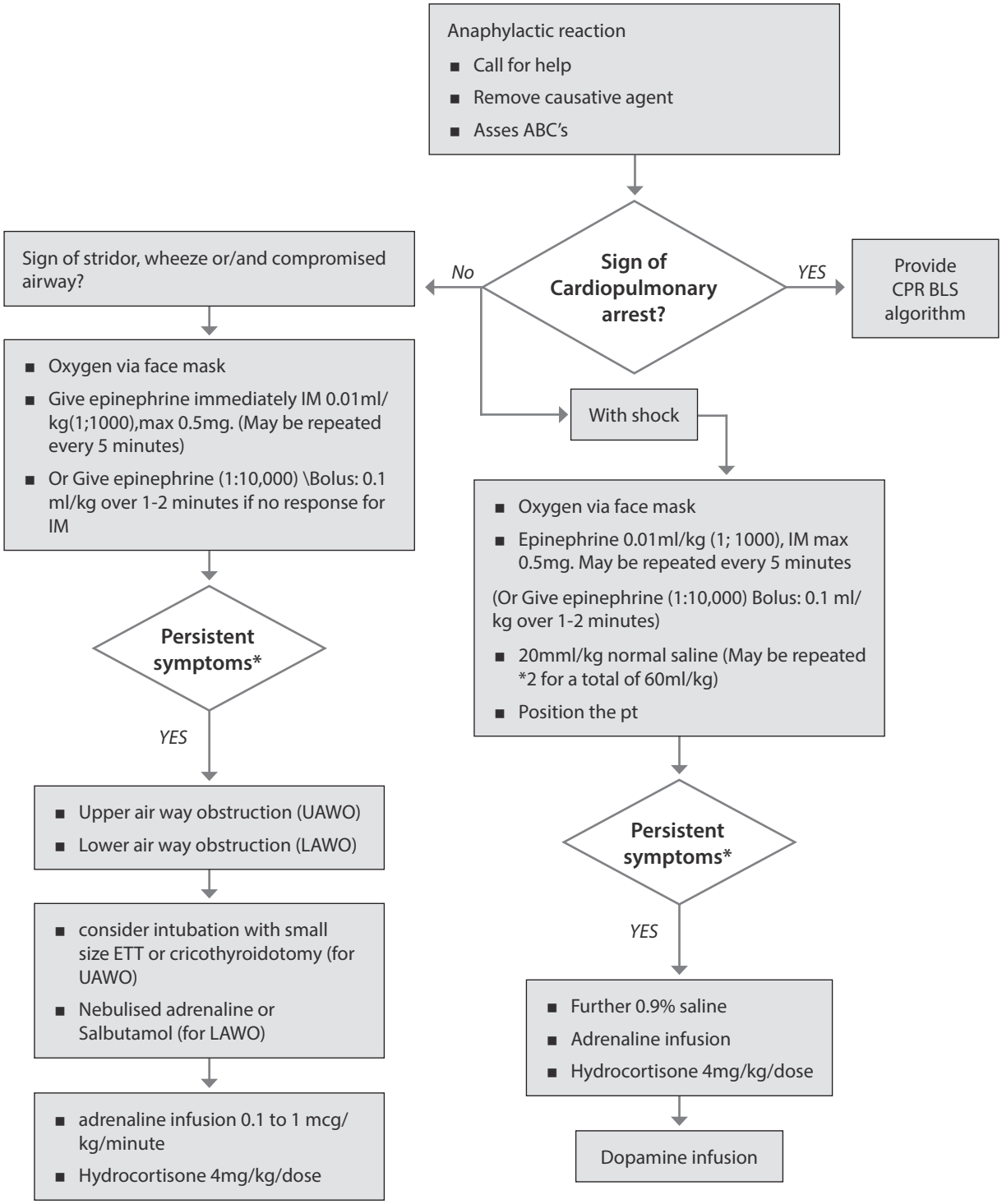
Area	0	1	5	10
Head (A/D)	10%	9%	7%	6%
Thigh (B/E)	3%	3%	4%	5%
Leg (C/F)	2%	3%	3%	3%

Annex Four

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.
- Clinically it is classified as mild, Moderate or severe form of illness.
- For mild cases (just rash and itching), give oral antihistamine and oral prednisolone at 1 mg/kg.
- For moderate cases with stridor and obstruction or wheeze: Give adrenaline at 0.15 ml of 1:1000 IM into the thigh (or subcutaneous);the dose may be repeated every 5–15 min.
- Once severe anaphylaxis is diagnosed early administration of adrenaline (epinephrine) is essential. Give adrenaline 0.01 mg/kg IM (1:1000)/0.01 ml/kg (max 0.5 mg) into the thigh. This dose may be repeated every 5-15 minutes for persistent or recurrent symptoms.
- Manage airway and breathing as this child may need advanced airway management (endotracheal intubation or cricothyroidotomy)
- If complete airway obstruction signs are present, prepare for immediate intubation or call for assistance to provide advanced airway support in parallel to the rapid IM administration of epinephrine. If intubation is not possible, consider performing an emergency cricothyroidotomy. If patient is no longer breathing or becomes pulseless, start basic life support
- Administer 100% oxygen with bag-valve-mask ventilation when indicated.
- If signs of severe airway obstruction or bronchospasm, treat with epinephrine or salbutamol using a metered dose inhaler or nebulizer (epinephrine 0.5 ml in 2.5 ml saline).
- If the patient is in shock, place them in the Trendelenburg position and give 20ml/kg of NS or Ringer lactate via IV or IO. See module 3.
- For itching or urticaria, give diphenhydramine 1 mg/kg IM or IV (max 50 mg). If the patient is stable, oral administration is preferred.
- Also consider cimetidine (5 mg/kg PO; maximum 300 mg) which may work synergistically with diphenhydramine.
- Systemic steroid should be considered. As these are predicted to reduce the probability of a late-phase reaction and can be administered IV or orally. Options include dexamethasone 2 mg/kg PO/IV (max 50 mg) or prednisolone 1-2 mg/kg PO (max 80 mg).

CHART 16. Anaphylaxis Algorithm



IM epinephrine preparation

- *If the patient is above 20 kg give 0.1ml/kg IM of 1:1000IU*
- *If patient is less than 20 kg give 0.1ml/kg IM of 1:10000(to make 1:10000 dilute 1ml of 1:1000 epinephrine in 9mlof NS and*

IV epinephrine drip preparation

- *Take 0.6*patient wt(kg). Add this amount (in mg) of epinephrine with NS to equal 100ml*
- *When the resulting solution is infused at rate of1ml/hr, it will deliver a dosage of 0.1mcg/kg/min*

* *If the symptom doesn't persist monitor patient for possible late phase reaction*

- *Consider steroid Predinsolone Po 2mg/kg(max 80mg) or Dexamethasone po/Im/IV;2mg/kg(max 50mg)*
- *Consider h2 blocker: Cimitidine Po 5mg/kg(300mg)*
- *For urticaria, consider antihistamine*

Annex Five

Management of Diabetes Ketoacidosis

Diabetes ketoacisosis (DKA): is an acute complication of Diabetes mellitus due to insulin deficiency or ineffectiveness. The diagnosis is clinical and biochemical.

Classification of DKA: is classified based on the clinical presentation, PH and bicarbonate. Clinically it is classified as mild who are alert but fatigued and no Kussmaul respirations (deep and fast breathing), Moderate (oriented but sleepy and has Kussmaul respirations); Severe DKA (has Kussmaul breathing or depressed respiration with coma). Biochemical criteria to diagnose DKA are: Blood glucose >200mg/dl, Urine ketone.

Principles of management of DKA: include as follows

- Resuscitation (ABCD), Potassium replacement therapy, Insulin therapy, Monitoring, Treatment of precipitating factors and Treatment of complications (eg cerebral edema).
- Check for shock and if the child is in shock give 20ml/kg as fast as possible see chart 7
- After the initial fluid resuscitation the 48 hour fluid is calculated as below

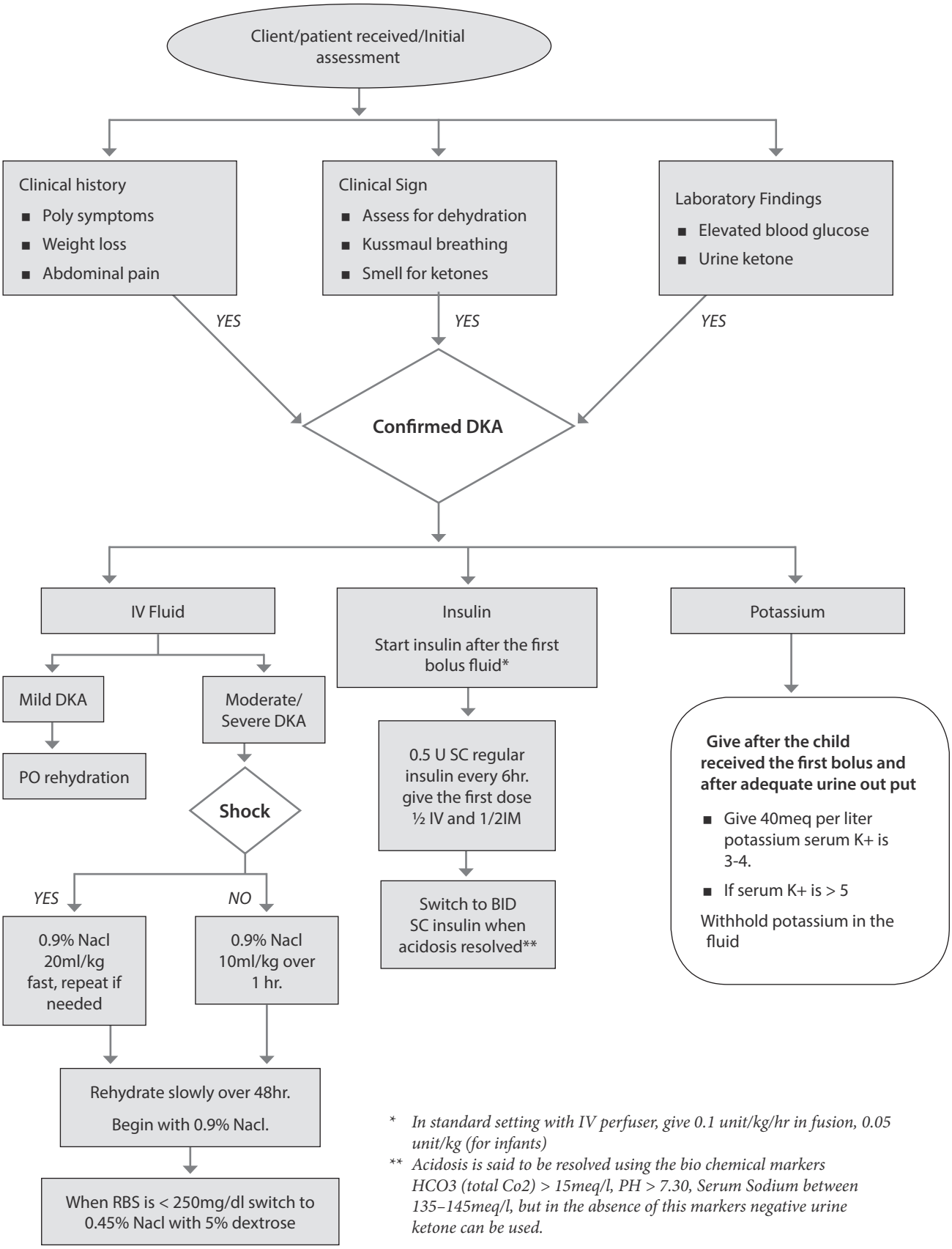
$$\frac{\text{85ml/kg (which is the deficit) +maintenance fluid –bolus given in the first hour}}{\text{48hr}}$$

- Initial fluid is normal saline and Change fluid to 5% DW in ½ NS (mix ½ NS with ½ DW) or use DNS when blood glucose drops below 250mg/dl. Fluid less than the 0.45NS (½ strength saline) should not be used. Oral fluids should be introduced only when substantial clinical improvement has occurred.
- Give insulin every 6 hours (0.5 iu/kg) Subcutanously except the first dose which should be given ½ IM and ½ IV
- If the random blood glucose drops, adjust the decline by changing the fluid rather than decreasing the dose of insulin. However, if there is a rapid decline in glucose levels (100 mg/hr.), you can reduce SC insulin by 50 % (i.e. 0.25 Iu/Kg) every 6 hourly to keep blood glucose about (200 mg/dl) until resolution of DKA.
- In the area with limited care and when IV fluids are unavailable, arrange urgent transport to a facility that can provide IV fluid
- Give little sips (or small volume thorough a syringe) of Oral Rehydrating Solution (ORS) as frequently as possible (if there is no vomiting). If vomiting

does not occur after 1-2 hours give ORS at a rate of 5 ml per kg body weight per hour.

- In some cases it may be possible to insert a nasogastric tube and slowly rehydrate with ORS at 5ml per kg body weight per hour
- If the child cannot be transported (eg. roads blocked), give oral rehydration as above and SC insulin 0.05 units/kg every 1-2 hours.
- Insulin should be started after an hour of fluid resuscitation. Refer the algorithm for the detail
- Start potassium after the patient passed urine. The maximum recommended rate of Iv potassium replacement is usually 0.5mmol/kg/h. If hypokalemia persists despite a maximum rate of potassium replacement, then the rate of insulin infusion can be reduced.

CHART 17. Management Algorithm of Diabetes Ketoacidosis



* *In standard setting with IV perfuser, give 0.1 unit/kg/hr in fusion, 0.05 unit/kg (for infants)*

** *Acidosis is said to be resolved using the bio chemical markers HCO3 (total Co2) > 15meq/l, PH > 7.30, Serum Sodium between 135–145meq/l, but in the absence of this markers negative urine ketone can be used.*

Annex Six

Pain Assessment and Management

Children upto 3 years

Table 16
Behavioral Observation Pain Rating Scale (FLACC scale)

Catagories	Scoring		
	0	1	2
Face	No particular expression or smile; disinterested	Occasional grimace or frown, withdrawn	Frequent to constant frown clenched jaw, quivering chin
Legs	No position or relaxed	Uneasy, restless, tense	Kicking, or legs drawn up
Activity	Lying quietly, normal position, moves easily	Squirming, shifting back and forth, tense	Arched, rigid, or jerking
Cry	No crying (awake or asleep)	Moans or whimpers, occasional complaint	Crying steadily, screams or sobs, frequent complaints
Consolability	Content, relaxed	Reassured by occasional touching, hugging, or talking to. Distractible	Difficult to console or comfort
Each of the five categories (F) Face; (L) Legs; (A) Activity; (C) Cry; (C) Console ability is scored from 0-2, which results in a total score between 0 and 10. Scoring: Mild 0-3; Moderate 4-7; Severe 8-10.			

Children 3- 8 years

Wong-Baker FACES™ Pain Rating Scale Instructions For Usage

Explain to the person that each face is for a person who has no pain (hurt) or some, or a lot of pain.

Face 0 doesn't hurt at all. Face 2 hurts just a little bit. Face 4 hurts a little bit more. Face 6 hurts even more. Face 8 hurts a whole lot. Face 10 hurts as much as you can imagine, although you don't have to be crying to have this worst pain.

Ask the person to choose the face that best describes how much pain he has.



0	2	4	6	8	10
No Hurt	Hurts Little Bit	Hurts Little More	Hurts Even More	Hurts Whole Lot	Hurts Worst

Scoring: 0-3,mild; 4 -7, moderate; 8-10, severe pain

Figure 59
Pediatric face scale to rate the intensity of pain

Table 19
Methods of management of Pain in Children

Non Pharmacologic Management of Pain

Method	Age	Description (examples)
Talking	All	Form of distraction (explanation)
Distraction	All	Toys, books, music, talking…
Parental presence	All	Reassurance and familiarity
Patient Control	>3y	Retains self control
Imagery	>3y	Imagining being elsewhere
Truth	>5y	Be honest (this needle will hurt a bit)
Explanation	>5y	Removes the fear of unknown & announces what to expect

When non-pharmacologic interventions are not enough?

- Reassessment of pain
- Pharmacologic interventions
  - Continued moderate to severe pain (score ≥ 4)
- Morphine
  - Gold standard
  - IM/IV/SQ
- Assessment: 0-10 faces scale
- Interventions: non-pharmacological
- If pain score > 4, morphine 0.1 mg/kg
- May repeat every 10-15 min up to 10 mg
- Only if SBP > 80 in children
- Medical control for additional doses

Pharmacologic Management of Pain

Drug list	Onset	Duration	Dose form	Usual dose	Adverse reactions
Morphine	PO - 30 min IV – 10 min	4 hour	Oral/IV/IM	0.1-0.2 mg/kg	Hypotension, headache, Constipation, urinary retention
Pethidine	PO – 15 min IV – 5 min	2-4 hour	Oral/IV/IM	1.1-1.8 mg/kg	Bradycardia, cardiac arrest, drowsiness, paralytic illness, respiratory depression
Tramadol	PO -1 Hr	9 hour	Oral/IV/IM	1-2 mg/kg	Flushing, headache, pruritis, constipation, nausea, weakness
Paracetamol	PO – < 1hr	4-6 hour	Oral/IV/rectal	15 mg/kg	Rash, nausea, vomiting, pancytopenia, hepatotoxicity, nephrotoxicity
Ibuprofen	PO – 30-60 min	4-6 hour	Oral	4-10mg/kg	Nausea, vomiting, anemia, hypoglycemia, Skin irritation



World Health Organization



Ethiopian Pediatric Society