Treatment Guidelines of Pediatrics

Dr. Mansoor Aslamzai

AFGHANIC

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Nangarhar Medical Faculty
ننګرهارطب پوهنځی

Funded by:
Kinderhilfe-Afghanistan

د کوچنیانو د درملنې لارښود

(په انګلیسی ژبه)

دوکتور منصور اسلم زی

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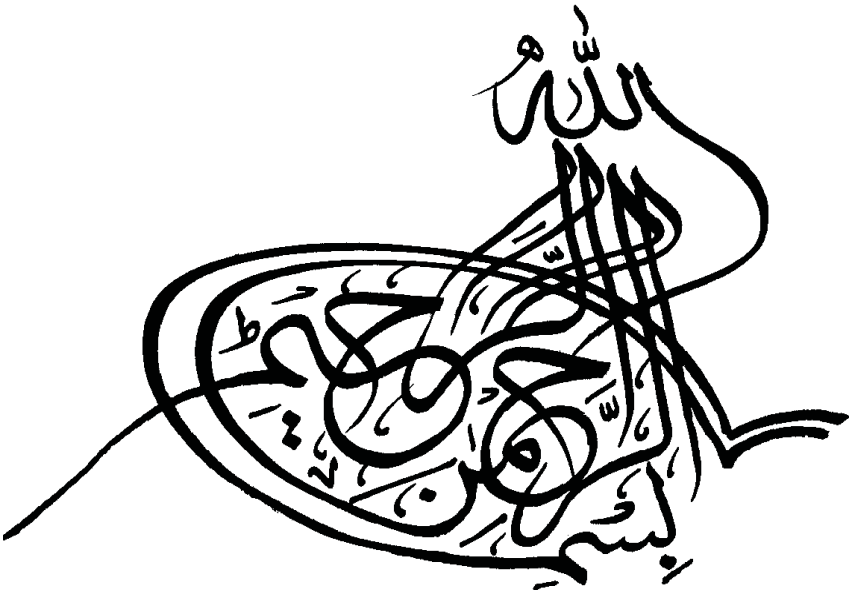

Treatment Guidelines of

Pediatric

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Second Edition 2012

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د کتاب د محتوا او لیکنې مسؤلیت د کتاب په لیکوال او اړونده پوهنځي پورې اړه لري. مرسته کوونکي او تطبیق کوونکي تولنې په دې اړه مسولیت نه لري.

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Contents

Preface to the First Edition

We are proud to write a handbook for the management of common Pediatric diseases, which accepted as the first therapeutic protocol in the Pediatric Department of Nangarhar Medical Faculty. Afghanistan has the second highest mortality rate of children in the world, so the best management of the Pediatric diseases is highly required. In the field of medicine, every hospital or department needs to have written protocols to treat effectively the common illnesses. Fortunately, now we have a handbook that contains the guidelines for the treatment of common pediatric aspects.

This handbook includes; Pediatric Emergencies, Neonatology, Respiratory diseases, Diarrheal and Infectious Diseases, Fluid and Nutritional Disorders, Hematological Disorders and Renal Disorders. During the writing, we hardly work to describe the management of the mentioned topics in such a way that have up-to-date, enough, easy and step by step information for doctors and medical students.

Since this is the first therapeutic handbook which is written in English by us, so we shall be extremely happy to receive valuable comments and criticism from our dear colleagues and readers.

Best wishes

Dr.Mansoor (Aslamzai), MD

Associate Professor of Pediatric, Department of Pediatrics

Nangarhar Medical Faculty and University Hospital

Preface to the Second Edition

I am pleased to present the second edition of Treatment Guidelines of Pediatrics by the help of God. This book is more focused on the managements of common pediatric diseases; necessary for the medical students, trainee doctors of DCH program and other pediatricians.

Since a lot of medical managements' words and drugs names are English, hospitals' treatment sheets are written by English and now this language is popular for most medical practitioners in Afghanistan; so English language is accepted for the writing of this book.

The second edition of Treatment Guidelines of Pediatrics recognized and revised from the previous edition. Some very interesting topics are new to this edition. Part 1 now includes Pediatric Bradycardia, Pediatric Tachycardia, Pediatric Cardiac Arrest, Liver failure and a lot of change in other topics. The very important and practical Part "Neonatology" is thoroughly updated and has new topics; Neonatal Seizure, Neonatal Hypoglycemia, Neonatal Hypocalcemia, Neonatal Hypomagnesemia, Idiopathic Respiratory Distress syndrome and NEC. Tuberculosis, Acute Otitis Media, Acute Pharyngitis, Pertusis and Chickenpox are added to the Part of Infectious Diseases. The references are also updated.

I would like to thanks from Dr. Yahya Wardak and Afghanic association for the publication of this book.

At the end, any suggestions and comments about this book are kindly accepted by me.

Dr.Mansoor (Aslamzai), MD
Associate Professor of Pediatric, Department of Neonatology
Kabul Medical University and Ataturk Hospital

Forward

It is a pleasure to write a forward for this book " Treatment Guidelines of Pediatrics". Since Afghanistan has the second top mortality rate of children in the word, so the detail managements of Pediatric diseases are very essential for the medical students and doctors.

This book has seven parts including, Pediatric Emergencies, Neonatology, Respiratory diseases, Diarrheal and Infectious Diseases, Fluid and Nutritional Disorders, Hematological Disorders and Renal Disorders. Every topic has step by step and useful information about the managements of common practical aspects of pediatrics which are included in the medical faculties' curricula.

Reading of the references gives us the message that Dr. Mansoor uses majority of update and international books. He must be congratulated on the publication of this book. I wish him more success for the future.

Dr. Zmarai Hassin MD
Professor of Pediatric
Head Department of Neonatology
Kabul Medical University and Ataturk Hospital

Part 1

Pediatric Emergencies

Cardiopulmonary Resuscitation (CPR)

A (Airway Patency):

- If the child is unresponsive, he/she should be place on a hard surface in supine position.
- Place the head in the sniffing position. The neck should be slightly flexed and the head gently extended so as to bring the face forward. In infant and children younger than 8 years, the relatively large occipitus causes significant neck flexion and poor airway position. This is relieved by placing a towel rolled under the shoulder.
- If airway obstruction is present, quickly inspect the pharynx. Clear secretion or vomitus by brief suction.
- Maintain the airway with backward head tilt, chin left or forward jaw thrust.

B (Breathing):

- If adequate spontaneous ventilation does not resume, give 1 breath every 3-5 sec by bag and mask or mouth.
- **Oxygen** 100% should be given 6-10 lit/min.

C (Circulation):

Start cardiac compression over the lower sternum if:

- Pulse is not palpable.
- Pulse is less than 60/min with poor perfusion**.**

Place the patient on a firm surface and depress the lower sternum one third the dept of the chest (4cm in infant and 5cm in children) 80-100/min. Compression-ventilation rate for one rescuer is 30:2 and for two rescuer 15:2. Children ≤ 8 yr get more benefit from the second rate. Cardiac compression performed as follow:

- Newborns or infants less than 1 year: Tow thumb technique in which the hands encircle the chest.
- Children 1-8 y old: The heel of one hand.
- Children more than 8y: The tow- handed technique

D (Drugs):

- **Adrenaline** 0.01mg/kg (0.1ml/kg of 1:10000) is indicated intravenously if there is no pulse. It can be repeated every 3 min or increase to 0.1-0.2mg/kg, if the first dose is ineffective.
- **Atropine** 0.02mg/kg IV can be used for bradycardia. Repeat once if needed.
- **Calcium gluconate 10%** for Hypocalcemia. 1-2ml/kg of Calcium gluconate 10% should be diluted with equal amount of sterile water or 5 % dextrose and administered intravenously over 5-10 min. Parenteral calcium (8ml/kg/day) should be gradually tapered over 2 day and oral calcium be started for 2 days.
- **Glucose 10%** 2ml/kg IV for Hypoglycemia.

- **Sodium bicarbonate** 1-2mEq/kg diluted with double volume of sterile water and administered slowly through intravenous for acidosis.
- **N/S or Ringer lactate** 20ml/kg if shock is developed.
- **Amiodarone, Procainamide, Lidocaine** and **DC** shock are useful for ventricular tachycardia and ventricular fibrillation.

Management of Pediatric Bradycardia

Pediatric Bradycardia with a pulse and poor perfusion should be managed as follow:

1. Identify and treat underlying cause.
2. Maintain patent airway; assist breathing as necessary.
3. Oxygen must be given.
4. Cardiac monitor to identify rhythm; monitor blood pressure and oximetry.
5. IV/IO (Intravenous or Intraosseous) access should be established.
6. 12-lead ECG is useful if available; don't delay therapy.

Assess cardiopulmonary compromise (hypotension, acutely altered mental status and signs of shock)

1. If HR is less then 60/min with poor perfusion despite oxygenation and ventilation then do cardiac compression as described under CPR.

2. For persistent bradycardia despite above management the following drugs are given:

   A: Epinephrine (Adrenalin) 0.01mg/kg (0.01ml/kg of 1:10000 concentration) IV or IO. Repeat every 3-5 min. if IV or IO access not available but endotracheal tube (ET) in place, may give ET dose 0.1mg/kg or 0.1ml/kg of 1:1000 solution).

   B: Atropine IV/IO 0.02mg. May be repeated once. Minimum dose is 0.1mg and maximum dose is 0.5mg.

3. If pulseless arrest develops, go to cardiac arrest management.

Management of Pediatric Tachycardia

Pediatric Tachycardia with a pulse and poor perfusion should be managed as follow:

1. Identify and treat underlying cause.
2. Maintain patent airway; assist breathing as necessary.
3. Oxygen must be given.
4. Cardiac monitor to identify rhythm; monitor blood pressure and oximetry.
5. IV/IO (Intravenous or Intraosseous) access should be established.
6. 12-lead ECG is useful if available; don't delay therapy.

Evaluate QRS duration

A. If QRS > 0.09 sec then Ventricular Tachycardia is possible.

1. For Ventricular Tachycardia with cardiopulmonary compromise (hypotension, acutely altered mental status and signs of shock) Synchronized Cardioversion is effective. Begin with 0.5-1 J/kg; if not respond increase to 2 J/kg. Sedate if needed, but don't delay cardioversion.
2. For Ventricular Tachycardia without cardiopulmonary compromise consider one of the following drugs; if rhythm is regular and QRS monomorphic:

a. Adenosine IV/IO first dose 0.1mg/kg rapid bolus (maximum 6mg) and second dose 0.2mg rapid bolus (maximum 12mg).

b. Amiodarone IV/IO 5mg/kg over 20-60 minute.

c. Procainamide IV/IO 15mg/kg over 30-60 minute.

B. If QRS ≤ 0.09 sec then Sinus Tachycardia or Supraventricular Tachycardia is probable.

1. Sinus Tachycardia has the following features:

- Compatible history consistent with known cause.
- P waves present/normal.
- Variable R-R; constant PR interval.
- Infants; HR usually < 220/min.
- Children; HR usually < 180/min.

For Sinus Tachycardia search and treat the cause.

2. Supraventricular Tachycardia has the following features:

- Compatible history is nonspecific. History of abrupt rate change.
- P waves absent/abnormal.
- HR not Variable.
- Infants; HR usually ≥ 220/min.
- Children; HR usually ≥ 180/min.

For Supraventricular Tachycardia:

- If IV/IO access present give Adenosine.
- If IV/IO access not available or Adenosine is ineffective, do synchronized cardioversion.

Pediatric Cardiac Arrest

1. Start CPR; initial step is to restore ventilation and oxygenation (See A and B parts of resuscitation). If the child is pulseless, chest compression should be initiated (See part C of resuscitation).
2. Give oxygen.
3. Attach monitor/defibrillator.

Evaluate the rhythm

4. If Ventricular Fibrillation (VF) or Ventricular Tachycardia (VT) be observed; managed as follow:

- Shock (Defibrillation) first 2 J/kg, second 4 J/kg and subsequent shocks ≥ 4 J/kg, maximum 10 J/kg.
- After each shock; CPR must be performed for 2 minutes.
- IV/IO access.

Evaluate the rhythm

If VF or VT remains; do the following steps:

- Shock should be done.
- CPR for 2 minutes.
- Epinephrine is administered every 3-5 min with CPR. Defibrillations can be alternated with epinephrine.
- Amiodarone IV/IO 5mg/kg over 20-60 minute.
- Treat reversible causes (hypovolemia, hypoxia, acidosis, hypoglycemia, hypothermia,

hypo/hyperkalemia, cardiac temponade, tension pneumothorax etc)

5. Asystole without VF/VT managed with:
   - CPR for 2minute.
   - Epinephrine is administered every 3-5 min followed by CPR in each cycle.
   6. Treat reversible causes (hypovolemia, hypoxia, acidosis, hypoglycemia, hypothermia, hypo/hyperkalemia, cardiac temponade, tension pneumothorax, etc)

Management of Shock

7. **Stabilize** ABC (Air way, Breathing, Circulation) of resuscitation. (See resuscitation)
8. **Give O_2** (O_2 saturation should be keep 95-99 %).
9. **Management of specific types**:

A: **Hypovolumic, Septic and Anaphylactic shocks:**

- **I.V Fluid** (N/S or Ringer lactate) 20 ml /kg is administered as a bolus over 5- 20 min. IF pulse, capillary refill, urine output and sensorium not improved repeat fluid for up to 60- 80 ml/ kg in 1- 2 hours.
- **Dopamine or Dobutamine** are effective vasopressor drugs that given in fluid resistant shock. Dosage is 3-10 µg/kg/min by IV infusion over 60 minutes (1cc Dopamine add with 100cc 1/5 N/S + D/W 5% then 1drop /kg /min of this solution should be used until improvement of shock).
- **Epinephrine (Adrenalin)** as IV infusion of 0.05- 0.3 µg /kg /min is administered for Dopamine or Dobutamine resistant cold shock.
- **Norepinephrine** as IV infusion of 0.05- 0.1 µg /kg /min is administered for Dopamine or Dobutamine resistant warmth **shock**.
- **Hydrocortisone** replacement may be beneficial in pediatric shock. In the cases of Adrenaline resistant

septic shock (after 60 min) give Hydrocortisone 50mg/kg bolus then 50mg /kg /day IV.

- In catecholamine resistant cold or warmth shock; fluid and Epinephrine or Norepinephrine should be titrated (increased until response) respectively.

B: **Cardiogenic shock:**

- **Dopamine or/and Dobutamine** are the drugs of choice for cardiogenic shock. Dosage is 3-10 μg/kg/min by IV infusion (1cc Dopamine add with 100cc 1/5 N/S + D/W 5% then 1drop /kg /min of this solution should be used until improvement of pulse, capillary refill, urine output and sensorium).
- **Milrinone** 0.25-0.75 mg/kg/min intravenously is added for Dopamine or Dobutamine resistant cardiogenic shock.
- **Diuretics** can be administered to reduce pulmonary edema.

C: Antibiotics for Septic shock: Early administration of antibiotics is a key factor in improving outcome. Antibiotics are given as follow:

- **Infants less than 2month: Ampicillin** (200mg/kg/day) + third generation cephalosporin (Ceftriaxone 100mg/ kg/ day or Cefotaxime 150mg / kg / day). For dosage of neonates see NNSepsis.

- **Infants > 2 month old and children**: third generation cephalosporin as above dosage.

In suspected meningitis or staphylococcal infection add vancomycin (60 mg/kg/day 8-12hrly IV infusion over 30 minutes). Each 5mg of vancomycin is diluted in 1ml of normal saline

D: **Other managements of Anaphylactic shock:**

- **Adrenalin** 0.01mg/kg (0.01ml of 1:1000 solution) IM is the first line treatment for anaphylactic shock**.** Repeat every 10 minutes up to the dose of 0.03mg/kg.
- **Antihistaminics**: For anaphylactic shock administer:

a. **Diphenhydramine or phenerami**ne (Avil) 1-2mg/kg IM for 3days.

b. **Ranitidine** 1mg /kg / IV BD for 3days for Anaphylaxis. 10 – 5 mg /kg /day for stress ulcer.

c. **Corticosteroid:** Give **Hydrocortisone** 5mg /kg / IV every 6 hours for 2- 3 day.

10. Blood Transfusion (Fresh) If Hb is < 10 g/d or bleeding is present.

11. Vit K can be used if bleeding is observed. For infants 1mg, for children 2-3mg, for Adolescents and adults 5-10mg is administered once intravenously.

12. Treat Hypoglycemia and Hypocalcemia if present or suspected:

- **Hypoglycemia** (Blood glucose less than 50mg/dl): Give 2ml/kg of Dextrose 10%, followed by a continuous infusion of glucose at 6-8mg/kg/min (0.06-0.08ml/kg/min of dextrose 10%). If hypoglycemic seizure is observed the loading dose of Dextrose 10% should be 4ml/kg.
- **Hypocalcemia** (Serum calcium less than 7mg/dl)**:** 1-2ml/kg of Calcium gluconate 10% should be diluted with equal amount of sterile water or 5 % dextrose and administered intravenously over 5-10 min. Parenteral calcium (8ml/kg/day) should be gradually tapered over 2 day and oral calcium be started for 2 days.

Management of Coma

1. Stabilize ABC of Resuscitation.(see resuscitation)
2. O_2 Therapy.
3. Position should be turned every 2 hour.
4. Repeated suction of air way is useful.
5. Nutrition: If there is no danger of aspiration due to convulsions and fast breathing; feed through NGT otherwise keep NPO and maintain IV fluid therapy.
6. DO LP if indicated.
7. Find underlying cause and treat it.
8. Determine Glasgow coma scale.
9. Management of unknown coma : All of the followings drugs should be given:
   - **A. D/W 10%** 5ml/kg or D/W 25% 1-2 ml/kg IV.
   - **B. Antibiotic** as for meningitis.
   - **C. Naloxan** 0.1mg/kg or 0.4-2mg IV.
   - **D. Quinine DHC** in high risk area of malaria as describe for severe malaria.
   - **E. Anti viral: Acyclovir** 30 mg/kg/day is administered in 3 divided doses for 10 days; if Encephalitis is suspected.

10: For suspected ICH treat as the following:

A. Intubation and Mechanical ventilation to prevent aspiration and induce hyperventilation for the management of cerebral edema.

C. Sedation, Analgesia and elevate head of the bed (15- 30 degree).

D. Manittol 5 cc /kg IV over 30 minutes is useful. It may be repeated 6-8 hourly for 6 doses, if needed. Or/and

E. 3% Saline 0.1-1ml/kg/hr intravenously.

F. **Lasix** 1 mg/kg/day IV can be added.

G. Phenobarbital with a loading dose of 5-10 mg/kg over 30 minutes followed by 5mg/kg every hour for 3 doses and then infusion of 1mg/kg/hr is useful for refractory cases.

Signs of suspected ICH are:

- Decreased level of conscious.
- Repeated convulsions.
- Vomiting.
- Cardiac arrhythmia.
- Focal Neurological deficit.
- Headache.
- Papilledema (Old child).

Management of Seizure

1. ABC of resuscitation should be stabilized.
2. O_2 therapy.
3. Open IV rout.
4. Do LP if indicated.
5. Find the cause and treat it.
6. **Anticonvulsive and other drugs**:

A. **For Newborn :** Give the following drugs step by steps:

a: Glucose 10% 5-10ml/kg as a IV bolus.

b: Calcium gluconate 10% 2cc /kg diluted with equal volume water and injected slowly in 5-10 minute through IV.

If seizures not controlled then give the below mentioned anticonvulsants.

c: Phenobarbital loading dose 20 mg /kg is administered slowly IV over 20 minutes. If there is no response in 15 minutes, additional doses 10mg/kg every 15 minutes are given intravenously till the seizures are

controlled, totally upto 40mg/kg. If convulsions are still uncontrolled, add Phenytoin. Maintenance dose of Phenobarbital is 5mg /kg/day usually in one or 2 divided doses.

d: Phenytoin or Fosphenytoin is administered intravenously in a loading dose of 15-20 mg /kg. Phenytoin is diluted in normal saline (not glucose containing solution) and given slowly over 10 minutes or at a rate of 1mg/kg/min. Assess control after 30 minute, if seizures persist then repeat 10mg/kg (may repeat totally up to the dose of 30mg/kg). Maintenance dose is 5mg /kg/day in one or 2 divided doses. For refractory cases give Lorazepam.

e: Lorazepam in a dose of 0.05-0.1mg/kg slowly IV over 2-5 minutes q 8-12hr.

f: Diazepam 0.1-0.3mg/kg is given intravenously over 3-5 minutes. Repeat every 15-30 minutes if not respond.

g: Midazolam 0.05-0.15 mg/kg IV bolus, followed by continuous infusion of 1µg/kg/min.

h: **Pyridoxine** 50-100mg IV is useful in refractory cases.

B: For Infant and children: Give the following drugs step by steps:

a: **Diazepam** 0.2- 0.5mg/kg IV over 1- 5 min; if do not respond in 5-20 minute repeat for up to 3 doses.

b: **Phenobarbital** 5 – 20 mg /kg IV loading. In refractory case repeat 10mg/kg. Maintenance dose is 3-5 mg /kg/day

c**: Phenytoin** 10-20 mg / kg IV loading over 5-20 minutes. In refractory case repeat 10mg/kg. Maintenance dose is 10 mg /kg/day

d: **Midazolam** 0.05-0.2 mg/kg IV bolus, followed by continuous infusion of 1-2μg/kg/min, is effective for persistent seizures.

7. Antipyretic and **sponging** are indicated for febrile convulsion (See FWF).

8. Suspected ICH: Should be treated as mention under the management of coma.

Management of Heart Failure

1. Bed rest and restriction of activities are advised.
2. Propped up position (about 30 degree) is effective.
3. **O_2** therapy.
4. IV fluid should be restricting to 2/3 of maintenance.
5. Nutrition should be high calorie. If rapid respiration and extreme fatigue is present feed by NGT.
6. **Diuretics :**
   - **Lasix 1-2 mg/kg** IV should be repeated every 12 hour until toleration of oral intake then 2-4 mg/kg /day orally 1-4 divided doses.
   - **Spironolactone** administered 2-3mg/kg/day orally in 2-3 divided doses
7. **Digoxin** : Orally TDD(Total Digitalization Dose) is as follow:

For neonates less than 1 week 0.04mg/kg, for 1week -2 years old 0.06mg/ kg and for < 1 w or > 2 y old 0.0 5mg /kg.

½ TDD is used first, ¼ TDD at 6 hour, 12hour intervals. ¼ TDD is given 24 hours after initial dose. For IV administration give 2/3 of oral dose.

8. **Dopamine:** IF shock is present treat as cardiogenic shock.
9. **Morphine** 0.1-0.2mg/kg/dose sc q 2-4hr for anxious patient and pulmonary edema.
10. **Afterload –Reducing Agents:** If Diuretic and Digoxin do not control the CHF; or cardiomyopathy, severe mitral or aortic insufficiency is the cause give one of the followings should be added :

- **Captopril** 0.1-0.5mg/kg/day for infants 0.1-2mg/kg/day for children in 2 divided doses.
- **Enalapril** 0.08-0.5mg/kg/dose q 24hr.

11. **Antibiotics** to treat infection as mentioned forpneumonia.
12. **Phosphodiestrase inhibitor (Amrinone, Milrinone)** and **β-Blockers (Carvidilol, Metoprolol)** may be used.
13. Find and treat precipitating factors like infection, anemia, and arrhythmia.

Management of Hepatic Failure

A. General Measures:

1. CPR is essential.

2. Intubation and Mechanical ventilation is required for comatose patients to prevent aspiration and induce hyperventilation for the management of cerebral edema.

3. Oxygen therapy is often necessary.

5. Apply NGT and do regular gentle saline lavage to detect upper GI bleeding.

6. Hemoglobin should be maintained above 10gr/dl to provide maximum oxygen delivery to tissue.

7. Maintenance fluid should be 75% of normal.

8. Adequate glucose is used (6-8mg/kg/min).

9. Protein intake should be restricted in patient with more than grade 2 encephalopathy.

10. Manage ICH. (See under coma)

11. Shock must be treated properly.

12. Lactulose should be given 1-2ml/kg 6-8hrly orally or via NGT to cause diarrhea. It probably lowers blood ammonia level.

13. Seizures are treated with Phenytoin or Phenobarbital.

14. Antibiotics:

A. Oral antibiotic may be more effective than Lactulose in lowering serum ammonia level. For this purpose Metronidazol or Neomycin is used.

B. Parenteral antibiotics are used empirically to treat sepsis, pneumonia, peritonitis, UTI and other infections. A combination of third generation cephalosporin and cloxacillin are used. Aminoglycosides are administered if renal function are normal. If there is no improvement within 72hr, it is prudent to step up antibiotic to cover Pseudomonas aeruginosa, anaerobic organism and/ or fungi.

15. Vitamin K 5-10mg IV or SC, fresh blood, fresh frozen and platelets transfusion are used to treat coagulopathy (clinically significant bleeding, DIC, PT > 30 sec and INR>2).

16. Prophylactic use of proton pump inhibitors, H_2 blockers or antacid should be considered because of the high risk of GI bleeding.

17. Liver transplantation can be live saving in patient who reaches advanced stage.

B. Specific:

N- acetylcystin is given for Acetaminophen over dosage, corticosteroid for Autoimmune Hepatitis and Acyclovir for Herpes simplex and CMV.

Management of Acute bacterial Meningitis

1. Stabilized ABC of resuscitation if need.
2. Open IV line.
3. Lumber puncture should be done. Contraindications for an immediate LP are:
   - Evidences of increased ICH (other than a bulging fontanel) such as papilledema, 3rd or 6th nerve palsy with a depressed level of conscious or hypertension and bradycardia with respiratory abnormalities.
   - Severe cardiopulmonary compromised.
   - Infection of the skin overlying the site of LP.
   - Thrombocytopenia is a relative contraindication.
4. Manage convulsions (see management of seizures).
5. O_2 therapy if needed.
6. Treat ICH (see under coma).
7. Antibiotics:

A. For neonates and infants up to 2 month:

Ampicillin (200-400mg/kg/day) **+ third generation cephalosporin** (**Ceftriaxone** 100mg/kg/day or **Cefotaxim**e 150-200mg/kg/day) can be used for 21 days in neonate and 10 days in older. The dosage for neonates is mentioned under NNSepsis.

B. For older than 2 month :

Third generation cephalosporin (**Ceftriaxone** 100mg / kg/ day or **Cefotaxim**e 150-200mg/kg/day) is administered for 10 days.

C. In resistant case to above drugs, vancomycin (60mg /kg /day IV infusion over 30-60min) is indicated.

8. Dexamethazone 0.15mg/kg every 6hr for 2-4 days can be used in infant older than 6 weeks; specially for Meningitis due to H. influenza type b. It appears to have maximum effect if given 1-2hr before initiated antibiotics. It also maybe effective if given concurrently with or soon after the first dose of antibiotics.

Management of Poisonings

General Managements

1- **ABCs of Resuscitation** should be established.(See Resuscitation)

2- **Shock** and **convulsions** are generally managed as mentioned in related topics.

3- If the level of conscious is depressed and a toxic substances is suspected, **10% Dextrose** 2-4ml/kg, **Naloxan** 0.4 -2mg and **100% oxygen** should be administrated.

4- **Decontamination:**

A. Gastrointestinal decontamination : Most liquid drug products are almost completely absorbed within 30-45min of ingestion and most solid forms are absorbed within 1-2hrs.Complete intestinal absorption of large overdosage of solid form drugs (tablets and capsules) can be delayed as much as 3-6hrs and for drugs or toxins with anticholinergic properties absorption can be delayed by up to 8-12hrs. The following managements can be used to prevent the absorption.

- **Activated Charcoal:** It is more efficacious than emesis or gastric lavage and is currently regarded as a universal antidote. Usually a dose of 1-2g/kg is recommended. Repeated doses may be useful for those agents that have

slow passage through gastrointestinal tract (Phenobarbital, Thiophylline, Quinine, Cyclic antidepressants, Digoxin and Carbamazepin) every 2-4 hrs or 0.25g/kg/hrly. A Cathartic should be used only with the first Charcoal dose. Activated charcoal is more effective when it is administrated within the first 30 min after exposure. Beyond 60min of exposure it is less effective. Charcoal is known to be ineffective against caustic or corrosive agents, hydrocarbon, heavy metals (arsenic, lead, mercury, iron, lithium) glycol and water-insoluble compounds. Patients with paralytic ileus should not receive activated charcoal.

- **Emesis:** Vomiting can be induced by tickling the fauces with a finger, though rarely used in pediatric due to the danger of aspiration. To prevent aspiration in small children, the head should be kept low. This measure is contraindicated in corrosive or hydrocarbon poisonings, comatose and convulsive patients.
- **Gastric lavage:** It has a limited place in management and indicated in serious poisonings. Gastric lavage is done with 15ml/kg of 0.9% saline through large bore NGT. Contraindications are the same as emesis.
- **Cathartics:** One of the followings cathartics have been used in conjunction with the first dose of activated charcoal.

- Sorbitol 1-2g/kg.
- Magnesium sulphate 250mg/kg.
- Magnesium citrate max 250mg/kg.

- **Whole Bowel Irrigation:** This technique has been successfully used to remove slowly absorbed products, such as iron or sustained-release preparations as well as foreign bodies. WBI is accomplished through rapid and large volume (30ml/kg/hr) administration of polyethylene glycol electrolyte solution into the stomach via NGT.

B- Dermal and Ocular Decontamination: The affected area should be washed with tepid water for 10min in skin and eyes exposure.

C- Blood Decontamination:

- **Urine Alkalinization** with $NaHCO_3$ (2 mEq/kg IV) should be considered for significant Salicylates and Phenobarbital poisonings.
- **Dialysis and Hemoperfusion** Should be undertaken only for toxins that may cause tissue damage. Dialysis (hemodialysis and peritoneal dialysis) may be useful for toxic alcohols, methanol and ethylene glycol as well as large symptomatic ingestion of salicylates, thiophylline or lithium. Hemoperfusion can

successfully treat large ingestion of salicylates and thiophylline.

D-Specific poisons and Antidotal therapy:

- **Acetaminophen:** N-acetyl cysteine (NAC) 140mg/kg PO initial dose (diluted in sweet fruit juice), then 70mg/kg PO q 4h × 17 doses. If the patient is encephalopathic , an initial IV loading dose of 150mg/kg in 5ml/kg of glucose 5% is infused over 15-60min, followed by 50mg/kg over 4hr, then followed by 100mg/kg over next 16hr.
- **Alcohol (Ethanol and Methanol):** For hypoglycemia start D/W 25% 1-2ml/kg IV. Metabolic acidosis is treated with IV sodium bicarbonate at a dose of 1-2 mEq/kg. In the cases of Methanol poisoning give Ethanol loading dose 10ml/kg IV or orally followed by maintenance dose 1-2ml/kg/h IV or orally.
- **Antidepressants (Tricyclic antidepressants and Selective Serotonin-reuptake inhibitors):** Emesis is contraindicated. IV sodium bicarbonate (0.5-1mEq/kg) is one of the most effective therapies in treating and preventing cardiac conduction abnormality. Lidocaine is used to treat dysrhythmias that are unresponsive to serum Alkalinization.
- **Antihistaminic:** Physiostigmin 0.5-2mg IV slowly administrated for anticholinergic effects.

- **Belladonna Alkaloids (Atropine, Scopolamine, Potato leaves Dathura or Jimson weed):** Physiostigmin (0.5-2mg IV, slowly administrated) dramatically reverses the central and peripheral signs of atropinism.
- **Benzodiazepine:** Flumazenil 0.01-0.02mg/kgIV is the antidote.
- **Beta-Blockers:** Atropine, IV fluid, vasopressors, D/W10% and glucagon are the useful agent**,** for the management of bradycardia, hypotension, shock and hypoglycemia. If symptomatic bradycardia is refractory to all of these measures, ventricular pacing should be considered.
- **Calcium Channel Blockers:** Atropine is the drug of choice for symptomatic bradycardia, a pacemaker should be considered for refractory cases. Administration of calcium gluconate 10% (100mg/kg) may reveres myocardial depression, impaired conduction and hypotension.
- **Carbon Monoxide:** Give 100% oxygen or keep in fresh air. Dexamethasone (0.1mg/kg IV or IM every 4-6hrs) should be added if cerebral edema develops.
- **Caustics (Acid and Bases):** Activated charcoal, Emesis and gastric lavage are not indicated. The skin and mucous membranes should be cleaned with

copious amount of water. Water or milk (<15ml/kg) is used to dilute the Acids. For dilution of Bases water is effective. If symptoms of esophageal burn are present, oral fluids or solids should be withheld. Antacid and H_2 blockers are given for 6-8 week to suppressed acid secretion. Antibiotic is used to prevent infection. The use of corticosteroid and esophageal stents are controversial.

- **Digoxin:** Digoxin-specific Fab antibody fragment (digibind) is useful for life-threatening dysrhythmias; 1vial (40mg) neutralizes 0.6mg Digoxin. In the absence of digibind, ventricular ectopy should be treated with Phenytoin 15mg/kg IV then 2mg/kg q 8hr. Atropine is the standard therapy for symptomatic bradycardia.
- **Hydrocarbons (Benzene, Kerosene, Charcoal, Gasoline, Petroleum distillates):** Emesis and gastric lavage are usually contraindicated. Activated charcoal is not useful. Oxygen and mist are helpful. Antibiotic should be reserved for patient with infection.
- **Iron:** Deferoxamine 15mg/kg/hr in 5% dextrose should be given IV if the patient is symptomatic (shock) and the serum iron determination cannot be obtained. Discontinue Deferoxamine therapy 24hrs after urine loses vin rose (pink to red orange) color. GI bleeding,

shock, metabolic acidosis, hypoglycemia and coagulopathy should be corrected.

- **Isoniazid:** Pyridoxine (Vit.B_6) should be used equal to the amount of Isoniazid ingested, up to 250mg/kg.
- **Mushrooms:** Give Atropine 0.02-0,05mg/kg IM and repeat every 30min, when cholinergic effects are present.
- **Opoids** (Codeine, Heroin, Morphine, Methadone, and Propoxyphene): Naloxan is the antidote. For infants younger then 1year, 0.4mg should be given initially, if there is no response, 2mg should be used rapidly. Older children should be given 0.4-0.8mg, followed by 2-4mg if there is no response.
- **Organophosphate insecticides (Malathion, Parathion, clorothion**): Decontamination of skin, nails, hair and clothing with soapy water is extremely important. Atropine plus Pralidoxime is the antidote. An appropriate starting dose of Atropine is 0.05mg/kg slow IV. Repeat the dose every 10-15min until atropinization (clearing of secretion, dry warm skin and mydriasis) is achieved. Maintain atropinization with repeated dosage of 0.02-0.05mg/kg/IV for 2-12hrs or longer depending on the severity of poisoning. Pralidoxime should also be given immediately in severe case and repeated every 6-12hrs as needed. The

dosage is 25-50mg/kg diluted to 5% concentration with N/S and infused over 30min at a rate of no more than 500mg/min.

- **Phenothiazines (Chlorpromazine, Prochloperazine and Trifluoperazine):** Extrapyramidal signs are alleviated within minutes by the slow IV administration of Diphenhydramine, 1-2mg/kg or Benztropine mesylate, 1-2mg/kg IV.

Envenomations

Snake Bite

1. **ABC** of resuscitation should be undertaken.
2. **Immobilize** the bitten extremities with bandage.
3. Always premedicate the patient with **Adrenaline** 0.005-0.01mg/kg (0.05-0.1ml/kg SC of 1:10000 or 0.005-0.01ml/kg of 1:1000 solutions) before Antivenom therapy.
4. **Antivenom:** Antivenom is most effective if given within 4hr of the bite and is of little value if administration is delayed beyond 12hr. Dilute Antivenom 1:4 with 0.45N/S and administer 20ml/kg/h. The dosage that mentioned below should be repeated every 2hr if symptoms persist.

- **Minimal Envenomation** (swelling, erythema or ecchymosis confined to the site of the bite): Required 5vials (50ml) of reconstituted Antivenom.
- **Moderate Envenomation** (progression of swelling, erythema or ecchymosis beyond the site of the bite; mild systemic symptoms like nausea, vomiting, perioral paresthesias, mild hypotension, mild bleeding and mild laboratory abnormalities): This type require 10vials (100ml) of reconstituted Antivenom.
- **Severe Envenomation**(Rapid swelling, erythema or ecchymosis involving the entire body part; severe S/S like hypotension, altered sensorium, tachycardia, tachypnea, respiratory distress, bleeding and platelet count less than 20000/mm^3): For this type 15vials (150ml) of reconstituted Antivenom is required.

5. **Antibiotics** can be used for anaerobic and Gram negative bacteria.
6. **Tetanus** prophylaxis if indicated.
7. A course of **Prednisolon 1mg/kg/day** orally for 2-5days may prevent serum sickness which may occur after Polyvalent Antivenom.

Scorpion Sting

1. Stabilize ABC of resuscitation if needed.
2. Localized pain can be treated with application of ice and analgesics. Pain usually diminished within 24hr.
3. **Autonomic Storm** (Tachycardia, cool extremities, systolic BP>130mm or <70mm and restlessness) should be treated with all of the following:
   - **Prazosin** 30μg/kg/dose administer orally or by NGT (if vomiting is present). It is repeated at the end of 3hrs according to clinical response and later every 6hrs till extremities are warm. No more than four doses have been required in majority of cases.
   - **Diazepam** 0.5- 2mg/kg/dose orally or IM.
4. **Myocardial dysfunction** (Tachypnea, ice cold extremities, palmoplantar sweating, S_3 gallop and altered conscious) should be managed with all of the following:
   - **Oxygen** 2lit/min.
   - IV fluid.
   - **Prazosin** as mentioned above.
   - **Diazepam** 0.5-2mg/kg IV.

5. Antivenom is reserved for severe cases (cardiopulmonary compromise).

Part 2

Neonatology

Resuscitation of the Newborn

Indications for resuscitation in newborn babies are:

- Apnea
- No cry after birth
- Irregular respiration
- Cyanosis
- Limpness
- HR<100/min
- Meconium stain
- Preterm

ABCDs of Resuscitation

A (Airway Patency): 1st step in first 30 sec

1- **Provide warmth**: Neonates should be kept under radiant warmer.

2- **Dry the newborn** to avoid hypothermia.

3- **Position**: Keep the baby in supine position with neck slightly extended. Place a rolled towel under the shoulder to elevate 1 inch.

4- **Suction**: initially mouth then nose, do not insert NGT very deep.

5- **Tactile stimulation**: Slapping the foot or rubbing the back for a few seconds

Evaluate Respiration, HR and color

If cyanosis, HR <100/min, apnea or irregular respiration present go to 2nd step otherwise continue to observation care.

B (Breathing Initiation): 2nd step in second 30 sec.

Give just O2 (concentration up to 100%) if only cyanosis is observed but respiration is normal and HR is >100/min.

Bag and mask ventilation 40-60/min with 100% or room air oxygen is useful for apnea, irregular respiration, HR<100/min and persistent cyanosis after O2 therapy.

Evaluate Respiration and HR

If HR is less than 60/min go to 3rd step

C (Circulation maintenance): 3rd Step in third 30 sec.

Positive Pressure Ventilation (PPV) or bag and mask ventilation should be continuing. and

Chest compression should be done 120/min. The ration of compression and ventilation is 3:1, with tow thumb on mid sternum and hand encircle the thorax

If after 30 second HR remains below 60 / min, then go to 4th step.

D (Drugs): 4th Step

1. **Adrenalin** 0.1 –0.3 ml /kg of 1:10000 solution is administered through umbilical vein. May be repeated every 3-5 min if the response is poor.
2. **NaHCO3** 2 -3 mEq /kg of 7.5% diluted with equal volume of distilled water or double volume of 5% glucose solution should be used IV slowly (1 ml /min) for neonate with prolong birth asphyxia (neonate needed bag and mask ventilation even at 5 minute) or suspected metabolic acidosis.
3. **Fluid** (ringer lactate or N/S) 10-20 cc/ kg or 0 – ve blood (in acute hemorrhage).
4. **Naloxan HCL** 0.1mg/kg should be administered via umbilical vein if the mother has history of narcotic analgesic administration within 4hr prior to delivery. It can be repeated after every 2-3 minutes.

Indications for indotrachial intubations

1. For tracheal suctioning in meconium stained.
2. If prolong PPV is required.
3. Ineffective bag and mask ventilation.
4. Diaphragmatic hernia.
5. Extremely preterm baby (< 28 weeks or < 1000gr).
6. Neonates requiring administration of surfactant.

Perinatal Asphyxia

1- **Stabilized ABCs** of the resuscitation.(See resuscitation of the newborn)

2- **NBM** (Nothing by Mouth) if the neonate is critical ill, convulsive or has apnea.

3- Maintenance fluid should be reduced to 2/3 of normal.

4- Treat the following conditions if present :

- **Hypoglycemia** (Blood glucose < 50mg/dl): Give 2ml/kg of D/W 10% bolus IV and then 6-8mg/kg/min to maintain normal blood glucose)
- **Hypocalcemia** (Blood calcium < 7mg/dl): For symptomatic (irritability, seizure, apnea, tetany) cases give 1-2ml/kg calcium gluconate 10% IV over 5min.(See management of Neonatal Hypocalcemia)
- **Seizure** (see management of Neonatal Seizure)
- **Acidosis**(see under resuscitation)
- **Shock** (see management of shock)

5- **Antibiotics:** For suspected NNSepsis, history of PROM in mother, foul smelling amniotic fluid and antepartum fever in mother give first line antibiotic as mention under NNSepsis.

6- Prophylactic Vit k 1mg IM within 2hr of birth.

Management of Neonatal Seizure

1. ABC of resuscitation should be stabilized.
2. O_2 therapy.
3. Open IV rout.
4. Find the cause and treat it
5. **Anticonvulsive and other drugs**: Give the following drugs step by steps:

A: Glucose 10% 5-10ml/kg as an IV bolus for hypoglycemia.

B: Calcium gluconate 10% 2cc /kg diluted with equal volume of 5% glucose or distilled water and injected slowly in 5-10 minute through IV for hypocalcemia.

If seizures aren't controlled; give the below mentioned anticonvulsants.

C: Phenobarbital loading dose 20 mg /kg is administered slowly IV over 20 minutes. If there is no response in 15 minutes, additional doses 10mg/kg every 15 minutes are given intravenously till the seizure are

controlled for total dose of 40mg/kg. If convulsions are still uncontrolled, add Phenytoin. Maintenance dose of Phenobarbital is 5mg /kg/day usually in one or 2 divided doses.

D: Phenytoin or Fosphenytoin is administered intravenously in a loading dose of 15-20 mg /kg. Phenytoin is diluted in normal saline (not in glucose containing solution) and given slowly over 10-20 minutes or at a rate of 1mg/kg/min. Assess control after 30 minute, if seizure persist then repeat 10mg/kg (may repeat totally up to the dose of 30mg/kg). Maintenance dose is 5mg /kg/day in one or 2 divided doses. For refractory cases give Lorazepam.

E: Lorazepam in a dose of 0.05-0.1mg/kg slowly IV over 2-5 minutes q 8-12hr.

F: Diazepam 0.1-0.3mg/kg is given intravenously over 3-5 minutes. Repeat every 15-30 minutes if not respond.

G: Midazolam 0.05-0.15 mg/kg IV bolus, followed by continuous infusion of 1µg/kg/min.

H: **Pyridoxine** 50-100mg IV is useful in refractory cases.

I: **Magnesium sulfate** should be administered 0.2ml/kg of 50% solution intramuscularly in 2 doses 12hr apart and be followed by maintenance oral dose of 0.2ml/kg of 50% solution once daily for 3 days. It is recommended for unresponsive hypocalcemia, suspected or proved hypomagnesaemia (serum level < 1mEq/l).

Duration of Anticonvulsive therapy:

The duration of anticonvulsive therapy is guided by neurological status, cause of the seizure and EEG findings. All anticonvulsants are stopped except Phenobarbitone when seizures are controlled. At discharge, if CNS examination is normal Phenobarbitone may be stopped. Phenobarbitone is continued if there are any CNS abnormalities at the time of discharge and baby is re-assessed at one month. If there is no recurrence of seizures; normal CNS examination, EEG, CT scan and or MRI, Phenobarbitone is tapered over next 2 weeks. When Phenobarbitone is continued, infant is evaluated at the age of 3 months and treated as a case of epilepsy.

Neonatal Sepsis

1. ABCs of resuscitation should be stabilized if needed.
2. Warmth the baby.
3. Open IV line.
4. Infuse D/W 10% 2 ml/kg intravenously.
5. **NBM** is indicated for very sick neonates, RR >80/min, convulsion or apnea attacks. In such condition give maintenance IV fluid.
6. **Antibiotics :**

A: first line: **Ampicillin + gentamicin**.

If the child is critically ill or do not respond in 48 hours, start second line antibiotics:

B: second line: **Ampicillin + 3rd generation cephalosporin.**

C: In resistant cases; **cloxacillin, vancomycin** or **Ceftazidim**e administration should be evaluated.

Dosages of antibiotics are as follow:

- **Ampicillin:** 50mg/kg BD for less than 7 days old or less than 1200g, 50mg/kg TID for 7 days or older and more than 1200g. **For meningitis double the dosages.**
- **Gentamicin:** 2.5mg/kg for less than 7 days old or less than 1200g, 2.5mg/kg TID for 7 days or older and more than 1200g.
- **Cefotaxime:** 50mg/kg BD for less than 7 days old or less than 1200g, 50mg/kg TID for 7 days or older and more than 1200g. **For meningitis double the dosages.**
- **Ceftazidime:** 50mg/kg BD for less than 7 days old or less than 1200g, 50mg/kg TID for 7 days or older and more than 1200g.
- **Cloxacillin**: 25mg /kg BD for less than 7 days old or less than 1200g, 25mg/kg TID for 7 days or older and more than 1200g.

- **Vancomycin**: 15mg/kg OD for less than 1200g, 15mg/kg BD for less than 7 days or less than 2000g. 15mg/kg TID for 7 days or older and more than 2000g. Each 5mg is diluted in 1ml of normal saline and the whole dosage infuse intravenously over 30 min

Duration of treatment is 10-14 days in Sepsis, Pneumonia and UTI and for 21days in Meningitis.

7. IVIG 750mg/kg in critically preterm baby and 1gr/kg in term baby for a single dose improved survival.

Management of Neonatal Hyperbilirubinemia

Management of Indirect Hyperbilirubinemia:

Management of Physiologic Jaundice:

- Does not need any specific therapy.
- Frequent breast feeding should be continued.
- The Baby must be watched closely for the severity of jaundice.
- Any feeding change to the mother should be inhibited, keeping the mothers on a specific diet (like tea and bread) which is a part of our culture; have no scientific basis.

Management of Pathologic Jaundice:

1. Supportive measures:

- Early and frequent breast feeding should be encouraged.
- Maintenance of adequate hydration is useful. If the patient need phototherapy, increase 12-24ml/kg/day to IV fluid.
- Hypoxia, hypothermia, hypoglycemia, acidosis and infection should be managed properly.
- Aspiration of cephalhematoma is indicated if bilirubin level is 18mg/dl or more in association with cephalhematoma.

2. **Phototherapy:** See table-1 and table-3 for indications of phototherapy.
3. **Exchange Blood Transfusion (EBT):** The indications are shown in table-2 and table-4. For this invasive procedure the following points should be undertaken.
   - The equipment and medication that need for resuscitation should be immediately available.
   - Equipment for umbilical vein catheterization (UVC or NGT No 6, 7 or 8) and disposable Exchange Transfusion tray are needed.
   - NGT for evacuating the stomach before beginning the transfusion and should be left in place to maintain gastric decompression, prevent regurgitation and aspiration of gastric contents.
   - The room of procedure should be warmed.
   - An EBT should take 45min-2hr duration.
   - 170ml/kg fresh (<72hrs old) and warmed (37˚C) blood is needed. The blood type are as follow:

   - For Rh incompatibility use O-ve blood or Rh negative with ABO compatible to the baby.

   - For ABO incompatibility use O with Rh compatible to the baby.

   - For Rh and ABO incompatibility O-ve blood should be used.

- In the absence of incompatibility, ABO and Rh compatible to the baby blood is given.

- EBT should be performed in Push-Pull method. Blood that used in each aliquots of push or pull is shown in table-5.
- After each 100-200 of EBT, administration of 1-2ml Calcium gluconate 10% maybe useful.

4. **Drugs:** The following drugs can be used.
   - **Phenobarbital** utility in NNJ is prophylactic rather than therapeutic; it takes 3-7 days to become effective. It can be given in a single dose of 10mg/kg intramuscular or 5mg/kg/day in 2 divided doses orally for 3 days in the following conditions:
     - Crigler-Najjar syndrome type 2.
     - Gilbert syndrome.
     - Early onset of jaundice due to any cause.
     - Cord serum Bilirubin > 2.5mg/dl.
     - Difficult or instrumental oxytocine-induced delivery with bruising and cephalhematom.
     - G-6-PD deficiency.
   5. **Albumin infusion** 0.5-1g/kg over 2hr maybe effective if bilirubin level is more than 20mg/dl and serum albumin level is < 3g/dl.
   6. **Intravenous Immune Globulin (IVIG)** decreased the need for EBT in Rh and ABO incompatibility. It is

recommended if the TSB is rising despite intensive phototherapy or a TSB is within 2-3 mg/dl of exchange level. Dose 0.5-1gr/kg over 2hr.

Table-1: Guideline for Phototherapy in Neonates of Normal Birth Weight (≥2.5kg).

Age(hrs)	SBR or TSB (mg/dl)		
	Neonates of 35-37w plus risk factors*	Neonates of ≥38wk plus risk factors* or 35-37w and well	Neonates of ≥38wk and well
Birth	>4	>5	>6
12hrs	>6	>7	>9
24 hrs	>8	>9	>11
48 hrs	>11	>13	>15
72 hrs	>14	>15	>17
96 hrs	>15	>17	>20
≥5days	>15	>18	>23

Table-2: Guideline for Exchange Blood Transfusion in Neonates of Normal Birth Weight (≥2.5kg).

Age(hrs)	SBR or TSB (mg/dl)		
	Neonates of 35-37w plus risk factors*	Neonates of ≥38wk plus risk factors* or 35-37w and well	Neonates of ≥38wk and well
Birth	>12	>14	>16
12hrs	>13	>15	>17
24 hrs	>15	>16	>19
48 hrs	>17	>19	>22
72 hrs	>18	>21	>24
96 hrs	>19	>22	>25
≥5days	>19	>22	>25

* Risk Factors include perinatal asphyxia, significant lethargy, sepsis, acidosis, temperature instability, G6PD deficiency, Rh and ABO groups' incompatibility.

Table-3: Guideline for Phototherapy in Low Birth weight Neonates.

Age(hrs)	SBR or TSB (mg/dl)		
	Weight<1500g	Weight=1500-2000g	Weight >2000g
< 24	>4	>4	>5
25-48	>5	>7	>8
49-72	>7	>9	>12
> 72	>8	>10	>14

Table-4: Guideline for Exchange Blood Transfusion in Low Birth weight Neonates.

Age(hrs)	SBR or TSB(mg/dl)		
	Weight <1500g	Weight =1500 - 2000g	Weight >2000g
< 24	>10	>15	>16
25-48	>10	>15	>16
49-72	>10	>16	>17
> 72	>15	>17	>18

Table-5: Aliquots usually used Neonatal Exchange Transfusion

Neonates weight	Aliquots(ml)
> 3kg	20
2-3kg	15
1-2kg	10
850g-1kg	5
< 850g	1-3

Management of Direct Hyperbilirubinemia (Direct Bilirubin> 20% of TSB)

Direct hyperbilirubinemia has no need to Phototherapy and EBT, just treat the etiologic cause. In the cases of mixed type hyperbilirubinemia, direct bilirubin level should not subtract from TSB until it exceeds 50% of TSB, for the indications of phototherapy and EBT.

Management of Neonatal Hypoglycemia (Blood Sugar < 40mg/dl)

1. Symptomatic Hypoglycemia:

- In a symptomatic neonate with seizure, give 5-10 ml/kg of 10% dextrose intravenously as a bolus. In the absence of seizure, bolus of 2ml/kg of 10 % dextrose IV is effective.
- After bolus dose, a continuous infusion of 10 % dextrose at a rate of 6-8mg/kg/min is maintained, preferably with the help of infusion pump.
- Blood glucose is monitored hourly till euglycemia and then 6 hourly.

A. If blood glucose is less than 40mg/dl the following steps should be considered.

- Repeat bolus and increase glucose infusion by 2mg/kg/min every 6 hour till a maximum infusion rate of 12mg/kg/min is reached or the blood glucose has crossed the level of 40mg/dl.
- Start the following drugs if hypoglycemia not resolved by day 7 or baby need > 12mg/kg/min glucose infusion:

- **Hydrocortisone sodium succinate** 5mg/kg IV every 12hr or Prednisolone 2mg/kg/day orally.

- **Glucagon** 100-300 mcg/kg/dose upto 3 doses IM and or Epinephrine, in baby with hypoglycemia due to erythroblastosis or maternal diabetes mellitus. These agents are not recommended for malnourished or preterm babies.

- **Diazoxide** 10-25 mg/kg/day in 3-4 divided doses slow IV or orally.

B. If blood glucose is ≥ 40mg/dl:

- Continue 6-8mg/kg/min glucose infusion for 24hr. If blood glucose is stable then wean infusion by 2mg/kg/min every 6hr and start oral feeds.
- Stop glucose infusion when baby is stable at 4mg/kg/min for 12hr.

2. Asymptomatic Hypoglycemia:

A. If blood glucose is < 20 mg/dl:

- Start infusion of 10% glucose at a rate of 6-8 mg/kg/min. Monitor blood glucose hourly till euglycemia and then 6 hourly.
- If not improved, increase glucose infusion by 2mg/kg/min every 6 hour till a maximum infusion rate of 12mg/kg/min is reached or the blood glucose has crossed the level of 40mg/dl.

- Start drugs that mentioned above if hypoglycemia not resolved by day 7 or baby need > 12mg/kg/min glucose infusion.

B. **If blood glucose is 20-40 mg/dl:**

- Sugar fortified oral feeds along with breast feeding.
- Monitor blood sugar.

1- If blood sugar is still < 40mg/dl;

- Start infusion of 10% glucose at a rate of 6-8 mg/kg/min. Monitor blood glucose hourly till euglycemia and then 6 hourly.
- If not improved, increase glucose infusion by 2mg/kg/min every 6 hour till a maximum infusion rate of 12mg/kg/min is reached or the blood glucose has crossed the level of 40mg/dl.
- Start drugs that mentioned above if hypoglycemia not resolved by day 7 or baby need > 12mg/kg/min glucose infusion.

2- If blood sugar is still ≥ 40mg/dl;

- Continue oral feeds. Monitor blood glucose for 48hr.
- Stop complementary feeds if blood glucose > 50mg/dl.

Management of Neonatal Hypocalcemia (Serum calcium < 7mg/dl or Ionized Ca<4mg/dl)

A. Asymptomatic Hypocalcemia:

1. If baby is orally feed, 10% Calcium gluconate solution 2ml/kg (20mg elemental calcium/ml) every 6 hourly for 48hr can be given through oral rout.
2. For babies can't feed orally, give 10% Calcium gluconate solution 2ml/kg (maximum 10ml for full term and 5ml for preterm) intravenously after dilution with equal volume of 5% dextrose or distilled water and administered 1 ml/min (5-10min) every 6 hourly for 48hr or when ECG return to normal.
3. Monitor heart rate during IV administration of Calcium.
4. Calcium solution should never be given through umbilical vein or intramuscularly because of hepatic and tissue necrosis; it should not be added to solution containing sodium bicarbonate due to risk of precipitate of calcium carbonate.

B. Symptomatic (irritability, convulsion, apneic attack, tetany) Hypocalcemia:

1. Calcium gluconate solution 2ml/kg (maximum 10ml for full term and 5ml for preterm) should be given intravenously after dilution with equal volume of 5 % dextrose and

administered 1 ml/min (5-10min). It is followed by 8 ml/kg/day as a constant infusion for at least 48hr after ECG had returned back to normal.

2. If hypocalcemia is unresponsive to calcium therapy, Magnesium sulfate should be administered 0.2ml/kg of 50% solution intramuscularly in 2 doses 12hr apart and be followed by maintenance oral dose of 0.2ml/kg of 50% solution once daily for 3 days.

C. Prophylactic management:

Baby at increased risk to developed hypocalcemia (preterm<1500gr, birth asphyxia, IDM) should received Calcium gluconate 10% solution 1ml/kg/dose intravenously after dilution with equal volume of 5% dextrose or distilled water should be administered 1 ml/min (5-10min) every 6 hourly for 48-72 or till oral feeds with supplements of calcium are started.

Management of Hypomagnesemia (Serum Mg < 1mEq/L)

Magnesium sulfate should be administered 0.2ml/kg of 50% solution intramuscularly in 2 doses 12hr apart and be followed by maintenance oral dose of 0.2ml/kg of 50% solution once daily for 3 days. It is recommended for unresponsive hypocalcemia, suspected or proved hypomagnesaemia (serum level < 1mEq/l).

Management of Prematurity and Low Birth Weight

1. Most healthy near term or borderline preterm baby with a birth weight of 1800gr or more and gestational maturity of 35 or more can be managed at home.
2. ABC of resuscitation should be established if needed.
3. Keep the baby warm.
4. Incubation care are indicated if:
   - Birth weight is less than 1.8 kg.
   - Gestational age is less than 34wk.
   - Hypothermia
5. Indications for transferring out of incubator are all of the followings:
   - The baby who is feeding well.
   - Is reasonably active.
   - With a stable body temperature at an environmental temperature of < 30 Cº for 12hr.

When facilities are enough it well be better to reach baby weight to 1600-1800gr otherwise mentioned criteria is irrespectively of body weight.

6. Manage infection properly. See NNSepsis.
7. Feeding:

A. Method of feeding:

- NPO: In the following conditions neonates should be kept NPO and intravenous infusion (10% glucose solution in babies > 1000gr and 5% glucose solution in babies < 1000gr until stabilization, totally for upto 3-4days) should be started :

  Critically ill, suspected or proved NEC, ileus, intestinal obstruction, recurrent seizure, esophageal atresia, RR>80/min, apneic attacks, birth weight less than 1200gr and severe birth asphyxia.
- Total Parenteral Nutrition (TPN) is considered if intravenous infusion exceeding 4-5 days in above conditions.
- Intravenous Glucose Infusion:

  Babies who are NPO, their all maintenance fluid should be administered as intravenous infusion of 10% glucose solution for babies > 1000gr and as 5% glucose solution in babies < 1000gr with Na and K. (see fluid therapy)

  For neonates who feed through NGT the amount of milk is subtracted from the maintenance fluid and the remainder is given as intravenous infusion that mentioned above.
- Feeding via NGT (Gavage feeding): Weak sucking, RR>70/min, stable neonates with gestational age

between 30-34 weeks and birth weight less than 1500gr are the indications for gavage feeding.

There is no need to burp tube feed babies.

Preparation for breast feeding should begin in all neonates irrespective of their gestation, by promoting rooting reflex and by putting them to breast for non-nutritive sucking before expressing the breast milk.

B. Amount and frequency of feeding:

- As a general rules start 10-20ml/kg/day of Expressed Breast Milk (EBM) 2-3hrly then increases 10-20ml/kg/day every day, if the patient tolerate. The total daily amount should be gradually reached to 150-170 ml/kg/day. Or give EBM as follow:

  - Birth weight less than 1000gr; start EBM 1ml/2hrly and increase 1ml/2hrly every day.

  - Birth weight less than 2000gr; start EBM 2ml/2hrly and increase 2ml/2hrly every day.

  - Birth weight 2000gr or more; start EBM 2-5ml/kg/2hrly and increase 2-5ml/kg/2hrly every day.

C. Tolerance of feeds:

Increased abdominal girth by 2cm, abdominal distention, emesis and nonbilous gastric aspirate exceeds 50% of the last feeding are the early markers of feed intolerance.

Gastric bilious residuals, occult blood and reducing substances in stool are the signs of NEC, intestinal

obstruction, meconium plug, meconium ileus and Hirschsprung disease.

A. Gastric nonbilious residual should be managed as follow:

- If aspirates containing undigested formula and the amount is more than 50% of the last feeding;

  - Increase feeding interval to 3hrly and an abdominal film must be taken.

  - Reposition the baby to elevate the head and upper body, with right side posture.

  - Metochlopramide and Erythrocin are used to stimulate gastric emptying and decrease gastric residual volume.

  - Enema (1-2ml glycerine) can be given to treat constipation.

- If aspirate containing digested formula and mucus and the amount is more than 50% of the last feeding;

  - Discarded the aspirate.

  - Reposition the baby to elevate the head and upper body with right side posture.

  - Continue to feeding and aspiration of stomach contents.

  - If elevated aspiration continues, an abdominal film must be taken and oral feeding should be discontinuing for a time to let the gut rest.

  - Considered above drugs.

B. Gastric bilious residual should be managed as follow:

- Making the neonate NPO.
- Decompress the gut via NGT.
- Evaluate the causes.

8. The maintenance fluid should be considered. (See Fluid Therapy)

9. Nutritional supplements:

- **Vit. K** 0.5-1mg intramuscularly or orally to all preterm babies are needed to prevent hemorrhagic disease of the newborn.
- **Water soluble vitamins (Vidyalin drop)** are administered to VLBW(<1500gr) after full enteral feeds are established (after 2 weeks of age) and continued till the post conceptional maturity of 38 weeks or body weight of 2000gr.
- **Calcium** 160mg/kg/day and **Phosphorus** 80mg/kg/day are given by a suitable oral preparation to VLBW and receiving EBM to prevent osteopenia of prematurity. The supplement should be continued till the post conceptional maturity of 38 weeks or body weight of 2000gr. The IV preparation is started after 48-72hr of age.
- **Iron** 2-4mg/kg/day supplement is provided when full enteral feeds are established and baby is gaining weight to prevent late iron deficiency anemia. Usually it starts

on 6-8 weeks of ages and continued upto the age of one year.

10. Treatment of complications:

- Apnea:
  - Keep the baby warmth.
  - Make sure the position of the neonate does not compromise respiration.
  - Avoid triggers such as vigorous suctioning.
  - Olfactory stimulation (pleasant odor like vanillin) in incubator decreased apnea unresponsive to caffeine and Doxapram.
  - Gentle tactile stimulation is often adequate therapy for mild and intermittent episodes.
  - Neonates with recurrent and prolong apnea may require suctioning, positioning, bag and mask ventilation.
  - Oxygen should be administered in a low concentration to treat hypoxia.
  - **Caffeine citrate** 20mg/kg (10mg caffeine base/kg) intravenously over 30min or orally is followed after 24hr by a maintenance dose of 5-10mg/kg IV or orally in single or 2 divided doses.
  - **Loading dose of Aminophylline** 5mg/kg IV or **Theophylline** orally should be followed by 2mg/kg every 8hrly through IV or oral routs.

Therapy can be discontinued by post conceptional age of 35-37 weeks or if the baby is free of apnea for 5-7days.

- Hypoglycemia, Hypocalcemia, Hypothermia, Jaundice and Respiratory distress syndrome must be managed properly.(See related topics)

Idiopathic Respiratory Distress syndrome (Hyaline Membrane Disease)

1. ABC of resuscitation should be done.
2. It is advisable to keep the baby NPO to prevent aspiration and start intravenous infusion, preferably through prepheral vein.
3. In infant of requiring prolong NPO and ventilation; NGT feeding or total parenteral nutrition is needed to prevent tissue catabolism.
4. **Oxygen** is administered through head box to relieve the cyanosis and keep arterial oxygen saturation between 90-95%. The ambient oxygen saturation should be 5-10 % higher than the cyanotic threshold (usually less than 50% oxygen concentrations is enough to prevent its toxicity).
5. **Warmth and Humidity:** The neonates should be nursed in a thermoneutral environment and with skin temperature around 36.5C°. Humidity must be maintained above 60 %.

6. **Antibiotics** are used routinely. (see NNSepsis)
7. **Vit E** may be recommended 100iu/kg/day intramuscularly for low birth weight baby receiving oxygen therapy to prevent oxygen toxicity (BPD and Retinopathy of Prematurity).
8. **Surfactant** is indicated in premature infant ≥ 28 weeks gestational age with RDS needing CPAP with ≥ 50% oxygen or assisted ventilation. It is administered intratracheally by instillation via endotracheal tube. The dose is 100mg/kg divided into four equal aliquots and is given during four different positions. Adequate oxygenation, ventilation, perfusion and monitoring should be established before starting treatment of HMD with surfactant.
9. **Nonsteroidal Anti-inflammatory Drugs (NSAID)** has been used for pharmacological closure of Patent Ductus Arteriosus. Commonly NSAID are:
   - **Indomethacin** is administered in a dose 0.2mg/kg orally or preferably intravenously every 12 hourly for a total of three doses. Or
   - **Ibuprofen** 10mg/kg stat followed by 5mg/kg at 24hr and 48hr can be given orally or intravenously.
10. **Continuous Positive Airway Pressure (CPAP)**.
11. **Assisted Ventilation**.

Necrotizing Enterocolitis (NEC)

1. Stabilized ABC of resuscitation.

2. The baby should be kept NPO for 7 – 10 days and gastric aspiration by slow continuous suction is advised.

3. Intravenous line must be established to administer fluid, electrolytes and drugs.

4. If there is any umbilical catheter it should be removed.

5. The fluid requirements are markedly increased due to abdominal fluid sequestration, peritonitis and septic shock.

6. TPN is useful if indicated.

7. Antibiotics can be used. (See NNSepsis)

8. Metronidazol 15mg/kg is administered IV as a loading dose followed by 7.5 mg/kg every 12hrly for anaerobic infections.

9. Fresh frozen plasma 10ml/kg is recommended every alternate day to complement, humoral immune factors, coagulation factors, and to improved blood volume to correct shock.

10. EBM is started in small amounts if the following conditions have achieved:

- When abdominal distension disappears.
- Gastric aspirate is negligible.

- Intestinal peristalsis is audible.

- There is no occult blood in stool.

11. Surgery:

NEC should be managed under closed guidance and supervision of pediatric surgeon. Most cases of NEC can be managed conservatively; but surgery is indicated in the following conditions:

- Bowel perforation as evidenced by pneumoperitoneum or portal venous gas on plain abdominal radiography.
- Peritonitis as suggested by ascites, abdominal mass, induration and erythema of abdominal wall and localized abdominal rigidity.
- Full thickness necrosis of bowel wall with impending perforation as evidenced by dilated loop of intestine that remains unchanged in position and shape for more than 24hr on serial radiography.

Part 3

Respiratory Diseases

Pneumonia

Indications for Admission are:

- Sever Respiratory distress.
- Cyanosis.
- Altered conscious.
- No improvement in home treatment.
- Vomiting / poor intake.
- Multiple lobe involvement.
- Dehydration.
- Age less then 2 month.

Management

1- Slightly propped up position is effective.

2- Give **humidified 25- 100% oxygen** 4- 6 liter / minute in neonates and 2- 4 lit / mint in infants and older children. Keep O_2 Saturation > 92%.

Indications for humidified oxygen:

1. **Respiration distress**
2. **Cyanosis**

3. **Increased R R** (>70/min in infants less than 2month, >60/min in infants aged 2-12months and >50/min in children older than one year)

3- Nutrition and maintenance fluid should be undertaken.

4- **Zinc** 20mg/day orally helps accelerate recovery from severe pneumonia.

5- Antibiotics:

A: **For infant less than 2 m**:

a: First line: Ampicillin (100-200mg/kg/day) **+ gentamicin** (5-7.5mg/kg/day).

b: Second line: If the patient has critical condition or above mention antibiotics do not respond in 48 hour, start **Ampicillin** 100-200mg/kg/day **+ 3rd generation cephalosporin** (**Ceftriaxone** 50 -75mg/kg/day or **Cefotaxime** 100mg /kg /day). For dosage of neonates see NNSepsis.

B: **For 2 m -5 y old children:**

a: First line: **Ampicillin** (or other penicillin) as above dosage.

b: **Second line**: **Ceftriaxone or cefotaxime**.

C: **For children older than five year:**

a- First line: macrolids **(Erythrocine** 50mg /kg/day**, clarithromycine** 15mg/kg/day**, Azithromycin** 10mg/kg 1st day then 5mg/kg/day**).**

b- Second line: **Ceftriaxone or cefotaxime**.

D: **Third line antibiotic in all ages:** For suspected cases of staphylococcal pneumonia which not improve in 48 hour with above mention antibiotics, add **cloxacillin** (50-100mg/kg/day) or **vancomycin** (40mg/kg/day 8hrly by IV infusion over 30min).

Duration of antibiotic therapy is 7-10 days. Treatment of suspected staphylococcal pneumonia should be 2-6 weeks till all clinical and radiological evidences of the disease disappear.

Bronchiolitis

Indications for hospital admission are:

- Age < 6M.
- Respiration distress.
- Cyanosis.
- Poor oral intake.
- Apnea.
- CHD& CHF.
- Underling lung diseases.

Management

1. **Propped up position** is effective.

2. Give **humidified and cold oxygen** 25- 50 % 2-4 lit/min. keep O_2 saturation >92%.

Indications for O_2 therapy are:

- **severe respiratory distress**
- **cyanosis**
- **Increased R R** (>70/min in infants less than 2month, >60/min in infants aged 2-12months and >50/min in children older than one year)

3. **Nutrition and maintenance fluid** should be undertaken.

4. Nebulization of ventolin or Adrenalin: 0.5ml of Ventolin or Adrenaline + 2-3ml N/S should be repeated after 20 min for three doses. If responses have been achieved then give 4- 6 hourly until improvement.

5. Corticosteroid: **Hydrocortison** or **Prednisolon** can be used in resistant cases.

6. Antiviral: Ribavirin can be administered as a mist, 12-20hrs daily for 3-5 days. Indications are:

- Age < 2month
- CHD (congenital Heart Disease)
- Bronchopumonary dysplasia
- Hyaline membrane disease
- Severe or complicated illness
- Mechanical ventilated infant

7. Antibiotics: First line antibiotics that mentioned for pneumonia should be used.

Br. Asthma

Management of life threatening attack (Cyanosis, silent chest, poor respiratory effort & altered sensorium)

All of the following should be used

1. **O_2 therapy**: Give humidified 3 - 6 lit / min to keep O_2 saturation more than 92 %.
2. **Adrenalin** (1:1000) 0.0ml/kg SC or IM.
3. **Nebulization of ventolin** (0.5%) 0.15mg /kg or 0.5cc + 2-3cc N/S can be repeated after each 20 min for three doses.
4. **lpratropium bromide** 2 puffs every 20 min for 3 doses.
5. **Methylprednisolon** 1mg/kg/dose 6 hourly **or Hydrocortisom** 10mg/kg/dose IV 6 hourly.

Reassess after one hr

A: If the responses are good, continue all of the following drugs.

a. **Nebulization** of ventolin every 3- 4 hr for 48 hours.

b. **Ipratropium bromide** every six hours for 48 hours.

c. Methylprednisolon 1mg/kg/dose **or Hydrocortison** 10mg/kg /dose 6 hourly for 48 hour then Prednisolon 1-2 mg/kg /day for 3-7 days.

B: If no or partial responses are observed, continue to above treatment. And add:

a. Aminophyllin 5-6 mg/kg 10 loading IV infusion over 30 min then 0.5mg/kg/min.

b. Give IV fluid and correct acidosis.

C: If not respond after 2-4 hours then give:

a. Magnesium sulphate 50 mg/kg +50 CC 1/5 saline +D/w 5% over 30 min.

b. Mechanical ventilation, Hiliox and in resistant case general anesthesia.

Management of Moderate to sever attack

(Fast breathe chest, in drawing, wheezing, difficult in speech and feeding, paradoxical pulse)

Give all of the following

1. **O2 therapy**.
2. **Nebulization of ventolin** or **Adrenalin** sc.
3. **Methyl Prednisolon or Hydrocortison or Prednisolon**

Assess after one hour

A: if no responses have been occurred then add.

a. Ipratropium bromide.

b. Aminophyllin.

B: If not respond in 2 -4 hours then add **Magnesium sulfate**.

Management of Mild attack

(Fast breathe, wheezing no chest in drawing).

1. **Nebulization of ventolin**: Should be repeated after each 20 min for three doses if the response is poor. If the symptoms resolved, keep the patient for 4 hours and then discharge.
2. If do not improved after one hour treat **as moderate asthma**.

Antibiotic: First line antibiotic that mentioned for pneumonia are useful to treat infection.

Croup

Indications for admission are:

- Stridor at rest
- Cyanosis
- Respiratory distress
- Drooling
- High grade fever
- Depressed mental status
- Poor oral intake

Management

A: viral Croup and Spasmodic Croup

1- **ABCs** of resuscitation should be done.

2- **Nebulized adrenaline** 5ml of 1:1000 solution is useful.

3- Give **humidified oxygen** 25- 50 % 2-4 lit/min. Keep O2 saturation above 92%.

4- **Dexamethasone** 0.6mg/kg IM for single dose. Or oral Dexamethazone 0.15mg/kg appears equally effective.

5- I.V maintenance fluid is given, if needed.

6- Antibiotic: Ampicillin 100-200mg /kg/day for 7-10 days to treat secondary bacterial infection.

B: Acute Epiglottitis

1. Stabilize ABCs of resuscitation.
2. Indotrachial Intubation should be done.
3. Maintenance IV fluid.
4. Antibiotic: Ceftriaxone 100mg/kg/day is given for 10days.

Part 4

Diarrheal and Infectious Diseases

Acute diarrhea

Indications for hospital admission are:

- Sever dehydration.
- Shock
- Persistent vomiting
- Metabolic Acidosis
- Paralytic ileus.

Management

A - Fluid therapy: Asses hydration state and follows dehydration treatment. (See management of dehydration)

B - Nutritional management: should be done according to plan A rehydration (See management of dehydration).

C - Zinc: For infants < 6m old 10mg/day and for infants > 6m old 20mg/day should be given for 10-14 days.

D - Chemotherapy (Antibiotics and Anti parasitic)

1- Antibiotics:

Indications: Bloody diarrhea, suspected cholera, Infant less than 6 months, malnutrition, suspected bacteremia and immunodeficiency.

One of the following antibiotics can be used:

- **Cotrimoxazol:** 10mg/kg/day Trimethoprim in 2 divided doses for 5 days.
- **Nalidixic acid:** 50-60mg/kg/day in four divided doses for five days.
- **Ampicillin (parentral):** 100 -200mg /kg/day in four divided doses for five days (In persistent vomiting).
- **Third generation cephalosporin:** If dysentery or suspected bacteremia is present and above antibiotic didn't respond in 48 hours give **Ceftriaxone** 50-75 mg /kg/day or **cefixim** 10 mg/kg/day in single or 2 divided doses for five days.
- **Suspected Cholera** should be treated with one of the below mentioned antibiotics:

  - Tetracycline 50mg/kg/d in four divided doses for 3 days.

  - Doxycycline 5mg/kg/d in single dose. These tow antibiotic are used in over 9y old children.

  - Azithromycine 10mg/kg/d in one dose for 1-5 days.

  - Cotrimoxazol: As above dosage for 3 days.

  - Furazolidone 6mg/kg/day in four divided doses for 3 days.

  - Erythromycine 50mg/kg/day in four divided doses for 3 days.

  - Ciprofloxacine 10 - 20mg/kg/day IV or 20 - 30mg/kg/day orally in 2 divided doses for 3 days.

2- Anti parasitic:

a - For Amebiasis: Give one of the following:

- **Metronidazole :** 35- 50mg/kg/day in three divided doses for 7 - 10 days plus **Iodoquinol** 30-40mg/kg/day in three divided doses for 20 days or plus **Diloxanide furoat** 20 mg/kg/day in three divided doses for 7 days .
- **Tinidazole:** 50mg /kg once daily for three days plus diloxanide furoat or iodoquinol .
- **Secnidazole:** 25mg/kg OD for 3 days.

b- For Giardiasis: Give one of the following.

- **Metronidazole:** 15 mg/kg/day in three divided doses for five days.
- **Tinidazole :** 50mg/kg once.
- **Secnidazole:** 25mg/kg once.

c- For Ascariasis: Give one of the following.

- **Albendazole 400mg** single dose or 200mg in children 1-2 year of age.
- **Mebendazole** 100mg BID for 3 days or 500mg once.
- **Pyrantel Pamoat** 11mg/kg a single dose.

d – For Hookworm : Give one of the following.

- **Albendazole 400mg** single dose or 200mg in children 1-2 year of age.

- **Mebendazole** 100mg BID for 3 days or 500mg once **Pyrantel Pamoat** 11mg/kg OD for 3 days.

c – For Enterobiasis: Give one of the following:

- **Albendazol** 400mg single dose for all ages repeated in 2w.
- **Mebendazole** 100mg single dose repeated in 2w.
- **Pyrantel Pamoat** 11mg/kg single dose repeated in 2w.

d – For Trichuriasis: Give one of the following:

- **Albendazole 400mg** single dose or 200mg in children 1-2 year of age.
- **Mebendazole** 100mg BID for 3 days or 500mg once**.**

e – Hymenolepiasis(H.nana): Give one of the following**:**

- **Praziquantel** 25mg/kg once.
- **Niclosamide** 50mg/kg once.

f- T. saginata : Give one of the following**:**

- **Praziquantel** 25mg/kg once.
- **Niclosamide** 50mg/kg once.

E – Management of vomiting:

a: Stop ORT for 10 minutes and then restarts cold water or ORS by spoon, slowly.

b: If vomiting is persistent **Metochlopramide** (0.1 – 0.2mg/kg I M) are given.

c: If persistent vomiting isn't stopped with above management give required fluid through I.V.

F- Management of Abdominal distension:

a: If bowel sounds are present and abdominal distension is mild no specific treatment is needed.

b: If bowel sounds are not present and abdominal distension is gross, manage as follow:

- Oral intake should be stopped (NPO).
- Put NGT and aspirate stomach intermittently.
- **KCL** (1-3mEq/kg) or (1-3cc/kg) should be diluted in IV fluid (3-4mEq/100cc) and administered no faster than as rate of 0.5mEq/kg/hr.
- Suspected septicemia should be treated with appropriate antibiotic.

G - Management of suspected symptomatic metabolic acidosis:

a: $NaHCO_3$: 1-3mEq/kg (1-3ml/kg of 7.5% $NaHCO_3$) with I.V fluid over 8-12 hour.

b: In severe cases $NaHCO_3$ 1-2mEq/kg/dose should be diluted 1:1 with sterile water and give over 5-10 min (1ml/min).

c: Don't add **$NaHCO_3$** with **calcium** containing solution (like Ringer lactate).

Malaria

Indications for hospital admission are:

- **Altered conscious and behavior.**
- **Convulsion.**
- **Difficulty in breathing.**
- **Sing of shock.**
- **Decreased urine, dark or red color urine.**
- **Sever pallor.**
- **Spontaneous bleeding**
- **vomit every think**

A – Management of Uncomplicated Malaria

1. **P.vivax: Chloroquine phosphate** should be used 10mg base /kg orally, follow by 5mg base/kg at 6 hour, 24hours, 48 hour or 10 mg base /kg on day 1, 10mg base /kg on day 2 and 5mg base /kg on day 3.

Alternatively: Amodiaquine can be used as **Chloroquine.**

2. **P. falciparum** or **Chloroquine resistant** P.vivax one of the following regimes:

a : Quinine sulphate: 10mg/kg TID for 7days **plus** one of the following .

- **Doxycycline:** 4mg/kg /day BID for 7 Days . Indicated in children older than 8 y .
- **Tetracycline**: 25mg /kg /Day QID for 7 Days. Indicated in children older than 8y
- **Clindamycin :** 20mg /kg /day TID for 7 Days.
- **Fansider :** Pyramithamine 1mg/kg once

b: Mefloquine : 15mg /kg orally follow 10mg/kg 12hour later.

c: Arthemeter : 3.2mg/kg /day for one day follow by 1.6mg/kg for 5-6 days.

Severe and complicated Malaria:

Definition of sever malaria: one or more of the following in the presence of asexual malarial parasitemia.

- Cerebral malaria.
- Sever anemia (HB<5g/dL).
- Hypoglycemia (blood glucose <40 mg/ dL).
- Repeated generalized convulsion (2 or more episodes a day).
- Shock.
- Acidosis.

- A.R.F.
- Hemoglobinuria.
- Pulmonary edema.
- DIC.

B-Management of Severe and Complicated Malaria

- **QUININE DHC:** 20mg /kg (loading dose) should be diluted in 10 ml /kg 5% or 10% D/W I.V and given over 4 hour; follow 8 hour after starting the loading dose with 10mg/kg in 10ml/kg 5% or 10% D/W over 4 hour; repeat 8 hourly until the child can swallow oral Quinine sulphate (10mg /kg TID) to completed 7 days treatment. If coma continues more than 48 hours reduce Quinine DHC dose to 7mg /kg/day.

Plus one of the drugs which mentioned under **Quinine sulfate**.

- **ARTHEMETER:** 3.2mg/kg IM follow by 1.6mg/kg daily for six days.

Supportive treatment of Malaria:

For the treatment of fever, convulsion, coma, shock, dehydration and other see related topics.

Enteric Fever (Typhoid Fever)

Indications for hospitalization and parenteral antibiotic therapy are:

- Persistent vomiting

- Sever diarrhea
- Abdominal distention
- Other complications

Management

1. Bed rest may be required.
2. Low residue, soft and easy digestible diet should be continued unless the patient has abdominal distention or ileus.
3. Adequate hydration.
4. Management of fever.(See FWF)
5. Antibiotics:
   - For Uncomplicated Typhoid Fever give one of the following:
     - Chloramphenicol 50-75mg/kg/day for 14 days or Amoxicillin 75-100mg/kg/day for 14 days are used in fully sensitive case.
     - Ciprofloxacin, Ofloxacin 15mg/kg/day for 5-7 days or Cifixime15-20mg/kg/day for 7-14days are used in multidrug resistant case.
     - Azithromycin 8-10mg/kg/day for 7days or Ceftriaxone 75mg/kg/day 10-14days are given in flouroquinolone resistant case.
   - For Severe Typhoid Fever give one of the following:
     - Ampicillin 100mg/kg/day for 14 days or Ceftriaxone 75mg/kg/day 10-14days are given in fully sensitive case.

- Flouroquinolone for 10-14 days in multidrug resistant case.
- High dose Ciprofloxacin or ofloxacin (20-30mg/kg/day), Azithromycin or 3rd generation cephalosporin for 14days are effective in flouroquinolone-resistant case.

Management of Tuberculosis

1. Latent TB (Positive skin test, no symptoms and normal chest radiography) should be treated with 9 month of Isoniazid 10mg/kg/day orally.

2. Pulmonary TB and/ or Hilar lymphadenopathy should be manage by 2 month of Isoniazid 10 - 15mg / kg / day orally, Rifampin 10–20 mg/kg/day orally, Pyrazinamide 20-40 mg/kg/day orally and Ethabutol 20mg/kg/day orally followed by Isoniazid and Rifampin for another 4 month. (2HRZE/4HR).

3. CNS, Disseminated, Bone and Join TB are treated by 2 month of Isoniazid orally 10 - 15mg / kg / day, Rifampin 10–20 mg/kg/day orally, Pyrazinamide 20-40 mg/kg/day, Ethabutol 20mg/kg/day orally and Sreptomycin 20-40 mg/kg/day IM followed by Isoniazid and Rifampin for another 7-9 month. (2HRZES/7-9HR).

4. Corticosteroid: Prednisolone 1-2kg/kg/day is administered in 1-2 divided doses orally for 4-6 weeks, followed by gradually tapering. It is indicated in the following conditions:

- TB Meningitis
- Miliary TB
- TB pleural effusion
- Endobroncheal TB
- TB Pericardial effusion

3. TB chemoprophylaxis:

A. Infant born to mother of TB:

If signs/symptoms, skin test and chest film are normal; give Isoniazid 5mg/kg/day for 6month.

B. Children in contact with active adult TB case:

It is suggested that children below 5 years of age in contact with adult sputum positive TB should receive 6 month of Isoniazid 5mg/kg/day.

Management of Acute Otitis Media

A. Pain Management:

1. Acetaminophen or Ibuprofen is effective.

2. **Topical anesthetic drops** should be added if tympanic membrane is not perforated.

3. **Tympanocentesis** should be considered, if severe pain is present

B. Antibiotic Therapy:

First-line therapy:

1. Amoxicillin 90mg/kg/d upto 4gr/day. For children over age 2 year give for 5 day; under age 2y for 10days.

2. If Amoxicillin has caused a rash, give Cefuroxime, Cefdinir or Cefpodoxime.

3. If urticaria or other IgE mediated events have occurred, give Trimethoprim-Sulphamethoxazole or Azithromycin.

Second-line therapy:

1. Amoxicillin-Clavulanate (Augmentin) Amoxicillin at 90mg/kg/day. It can be the first-line drug for patient whose body temperature is ≥ 39Cº or / and have sever otalgia.

2. If Amoxicillin cause allergic symptoms, see recommendations above.

Third-line therapy:

1. Tympanocentesis is recommended to determine the cause.

2. Ceftriaxone two doses given IM 48hr apart, with option of third dose.

Management of Acute Pharyngitis

A. Symptomatic Therapy:

1. **Acetaminophen or Ibuprofen** can relieve fever and sore throat.
2. Gargling with warm salt water is often comforting.
3. Anesthetic spray and lozenges can provide local relieve.

B. Antibiotic Therapy: Give one of the following:

1. Penicillin V 50-75mg/kg/day in 3 divided doses for 10 days.
2. Amoxicillin 50mg/kg/day (750mg fixed dose maximum 1gr) once daily for 10 days.
3. Azithromycin 12mg/kg once daily for 5 days.
4. Cephalexin 25-50mg/kg/day in divided doses for 10 days.
5. Benzathin penicillin 600000 U for children < 27kg, 1.2million U for larger children and adult as a single intramuscular dose.

Pertusis (whooping cough)

Indications for Hospital admission are:

1. Life threatening paroxysms that has the following features:
   - Duration more than 45 sec.
   - Blue color change.
   - Bradycardia.
   - Low oxygen saturation not resolves spontaneously at the end of paroxysm.
   - No whoop at the end of paroxysm.
   - Post-tussive unresponsiveness.
4. Apnea
5. Cyanosis
6. Seizure
7. Encephalopathy
8. Complications

Management

1. General Measures:

- Providing adequate nutrition and hydration. Small feeding, tube feeding and TPN may be needed.
- Avoid factors aggravating cough.
- Cough suppressants are of little benefits.

- Corticosteroids reduce the severity disease but may mask signs of bacterial superinfection.
- Albuterol 0.3-0.5mg/kg/day in four doses has reduced the severity of illness but tachycardia is common when the drug is given orally, and aerosol or nebulization may precipitate paroxysms.

2. Specific Measures:

An antimicrobial agent is always given when pertusis is suspected or confirmed, primarily to limit the spread of infection and secondarily for possible clinical benefit.

- Azithromycin (for infants less than 6month the dose is 10mg/kg/day in a single dose for 5days; for ≥ 6month 10mg/kg/day on day 1 then 5mg/kg/d on day 2-5) is the preferred agent for most patients particularly neonates.
- Erythromycin 40-50mg/kg/d in 4 divided doses for 7-14days. It is not preferred for neonates.
- Clarithromycin 15mg/kg/day in 2 divided doses for 7 days. It is not recommended for neonates
- TMP-SMZ (Co-trimoxasole)TMP 8mg/kg/day in 2 divided doses for 14 days. Contraindicated at age <2m.

Management of Chickenpox (Varicella)

1. General Measures:

- Maintenance of hydration.
- Antipyretics to relieve fever and pain. Aspirin is contraindicated due to the risk of Reye syndrome.
- Antihistaminic: Diphinhydramin 1.2mg/kg every 6 hr or Hydroxyzine 0.5mg/kg every 6hr for the management of itching.
- Good hygiene: keep nails trimmed and skin clean.
- Topical or systemic Antibiotic may be needed for bacteria superinfection.
- The child should not attend school until no new lesions appear and all lesions have crusted.

2. Specific measures:

Oral Acyclovir 20mg/kg/dose four times a day for 5days; preferably within 24hr of the onset of exanthemas is recommended in the following conditions:

- Chronic cutaneous or pulmonary disorders.
- Individuals receiving corticosteroid therapy.
- Individuals receiving salicylate therapy.
- Possibly secondary case among household contact.
- Complicated cases.

Fever without focus (F.W.F)

1. Manage fever as follow :

A: **Antipyretic**: If temperature is ≥ 39º C or irritability is observed give:

- **Paracetamol** 15 mg /kg /dose every4- 6 hourly. **or**
- **Ibuprofen** 10mg/kg 6-8hrly.

B: Sponging is recommended for febrile convulsion, febrile delirium and temperature more than 40º C.

C: Cold water immerse is indicated if Temperature ≥ 41ºC.

2. **Antibiotics:** Give the following antibiotics according to the patients' ages. The dosages are mentioned under the management of Pneumonia.

A: **Ampicillin + gentamicin:** For infants < 3m old if the temperature is > 39º C.

B: **Ampicillin** or **Ceftriaxone**: For Infants ≥ 3m old in the following condition:

a: Toxic appearance .

b: Temperature ≥ 39º C and one of the following :

- TLC ≥ 15000 /mm^3.
- WBC >10 HPF in urine.

3. Antimalarial drugs: According to the protocol of Malaria.

Part 5

Fluid and Nutrition disorders

Maintenance Fluid Therapy

1- Amount of maintenance fluid for Neonates:

A. Neonates > 1500gr Birth weight:

1st day ---------- 60ml/kg/day

2nd day ---------- 75ml/kg/day

3rd day ---------- 90 ml/kg/day

4th day ---------- 105 ml/kg/day

5th day ---------- 120 ml/kg/day

6th day ---------- 135 ml/kg/day

7th day and more -------- 150 ml/kg/day

B. Neonates > 1500gr Birth weight:

1st day ---------- 80ml/kg/day

2nd day ---------- 100ml/kg/day

3rd day ---------- 120 ml/kg/day

4th day ---------- 130 ml/kg/day

5th day ---------- 140ml/kg/day

6th day ---------- 150 ml/kg/day

7th day and more -------- 160 ml/kg/day

2- Composition of maintenance fluid for Neonates: N/5 + 10% or 5 % D/W is adequate IV fluid. Also we can use Prep solution.

All of the following should be add to prepare a solution named (Prep Solution) and administered every 4hr:

- **0.9% N/S 21ml/kg/day (Na=3mEq/kg/day)**
- **7.46%KCL 2ml/kg/day (K=2mEq/kg/day)**
- **10% D/W for > 1000gr birth weight and 5 % D/W for < 1000gr birth weight should be contained the remainder of fluid.**

Note: Neonates up to 48hr after birth don't need to Na, K and Calcium, so maintenance fluid should be contained of 10% D/W for > 1000gr birth weight and 5% D/W is preferred for < 1000gr birth weight .

3- **Amount of maintenance fluid for older infants and children:** The fluid should be calculated according to the body weight as the following:

- 3-10 kg ---------- 100ml/kg/day
- 10-20kg ---------- 1000ml + 50ml/kg/day for extra kg from 10kg.
- More than 20kg ---------- 1500 + 20ml/kg/day for extra kg from 20kg.

4- **Composition of maintenance fluid for older infants and children:**

- 1/5N/S (0.18% NaCl) + 5%D/W.
- 7.46% KCL 2ml/kg/day or 2ml per 100ml of maintenance fluid.

5. Conditions Affecting Maintenance Fluid Therapy:

A. Increase requirement:

- Phototherapy; fluid must be increased 20-40ml/kg/day.
- Radiant warmer; fluid requirement should be increased 40-80ml/kg/day.

B. Decrease requirement: Maintenance fluid can be decreased to 2/3 of normal in the following conditions:

- Birth asphyxia
- Pneumonia
- HMD
- CHF
- Meningitis

Management of Dehydration

Indications for admission or IV fluid administration are:

- Sever dehydration
- Shock
- Persistent vomiting
- Paralytic ileus
- Metabolic acidosis

Treat Mild, Moderate and Severe dehydration according to Plan A, B and C:

Plan (A): For the management of Mild dehydration:

Counsel the mother on the 4 rules of home treatment:

Give extra fluid, continue feeding, when to return and give zinc supplement.

1. Give extra fluid (as much the child will take)
   - Breast feed frequently and for longer at each feed.
   - If the child is exclusively breastfed, give ORS or clean water in addition to breast milk.
   - If the child is not exclusively breast fed, give one or more of the following: ORS solution, food based fluids (such as soup, rice water, and yoghurt drinks), or clean water.

It is especially important to give ORS at home when:

- The child has been treated with plan B or plan C during this visit.
- The child cannot return to a clinic if the diarrhea gets worse

➢ **Teach the mother how to mix and give ORS .Give the Mother 2 packets of ORS to use at home.**

➢ **Show the mother how much fluid to give in addition to the usual fluid intake:**

Up to two years..... 50 to 100 ml after each loose stool.

2 years or more .....100 to 200 ml after each loose stool.

Tell the mother to:

- Give frequent small sips from a cup.
- If the child vomits wait 10 minutes then continues but more slowly.
- Continue giving extra fluid until the diarrhea stops.

2. **CONTINUES FEEDING.**
3. **WHEEN TO RETURN.**
4. **Give Zinc Supplementation.**

Plan B: For the management of the Moderate or Some dehydration give ORS or IV fluid as below in 4hrs:

- The approximate amount of ORS or IV fluid is 75ml/kg.

- Use the children age according to the following chart only when you do not know the weight.

DETERMINE AMOUNT OF ORS TO GIVE DURING FIRST FOUR HOURS.

AGE	Up to 4 months	4month up to 2 years	12months up to 2years	2years up to 5 years
Weight	< 6kg	6 - <10kg	10- <12kg	12 – 19 kg
In ml	200 – 400	400 - 700	700 - 900	900 – 1400

- If the child wants more ORS than shown give more.
- For infants under six months who are not breastfed also give 100 – 200 ml can clean water during this period.

➢ SHOW THE MOTHER HOW TO GIVE THE ORS SOLUTION :

- Give frequent small sips from a cup.
- If the child vomits wait 10 minutes then continue but more slowly.
- Continue breastfeeding when ever the child wants.

➢ **AFTER FOUR HOURS :**

- Reassess the child and classify the child for dehydration.
- Select the appropriate plan to continue treatment.
- Begin feeding the child in clinic.

➢ **IF THE MOTHER MUST LEAVE BEFORE COMPLTING TREATMENT:**

- Show her how to prepare ORS solution at home.
- Show her how much ORS to give to finish four hour treatment at home.
- Give her enough ORS packets to complete rehydration also give her two packets as recommended in plan A.
- Explain the four rules of home treatment.

1. GIVE EXTRA FLUID.
2. CONTINUE FEEDING.
3. WHEN TO RETURN.

} See plan A for

4. Give Zinc

Plan C: For the Treatment of Severe dehydration quickly :

- Follow the arrows. IF Answer is YES GO ACROSS. IF NO GO DOWN.

START HERE:

Can you give intravenous (IV) Fluid immediately?

- Yes → Start IV fluid immediately. If the child can drink gives ORS by mouth while the drip is set up give 10 ml/kg ringers lactate solution (or if not available, normal saline), Divided as follows:

AGE	First give 30ml/kg in :	Then give 70ml/kg in :
Infants (under 12months).	One (1) hours.	Five (5) hours.
Children 12months up to five (5) years.	Thirty (30) minutes.	2 ½ hours

Repeat once if radial pulse is still very weak or not detectable.

- Reassess the child every 1- 2 hours. If hydration status is not improving, give the IV drip more rapidly.
- Also give ORS (a bout five (5) ml /kg /hour) as soon as the child can drink: Usually after 3-4 hours (Infants) or 1-2 hours (Children).
- Reassess an infant after six (6) hours and a child after three (3) hours. Classify dehydration. Then choose the appropriate plan (A, B. or C) to continue treatment.

No

IS IV treatment available nearly within thirty30minuts?

YES → **Refer urgently to hospital for IV treatment.** If the child can drink provide the mother with ORS solution and show her how to give frequent sips during the tripe.

NO

Are you trained to use a naso gastric (NG) tube for rehydration?

Yes →

Start rehydration by tube (or mouth) with ORS solution give 20 ml/hour for six hour (total of 120 ml/kg).
Reassess the child every 1-2 hours.
If hydration status is not improving after 3 hours send the child for IV therapy.
After 6 hours reassess the child classify dehydration then choose the appropriate plan (A, B or C) to continue treatment.

Severe Malnutrition

Criteria of admission:

1- Infants less than 6 month of age or < 65cm length:

- Weight /Height (W/H) % < 70 %
- Bilateral edema
- W/H % < 80 % and one of the followings :
  - Difficulties of breastfeeding
  - Too weak to suckle
  - Not gaining weight at home

2- Children equal to or more than 6 month of age or ≥ 65 cm length:

- W/H % < 70 %
- Bilateral edema
- Mid Upper Arm Circumference(MUAC) less than 110 mm

Management of Severe Malnutrition

1- Infants less than 6 month of age or < 65cm length:

A- Phase – 1(Rehabilitation Phase)

- **Start feeding :** Give F-75 130ml/kg/24hr by divided feed every 3 hr. NGT should be used when a patient takes less than 3/4 of feed or has pneumonia with rapid respiration , painful lesion of the mouth , cleft palate and disturbances of consciousness.

- **Systemic Antibiotics:** the following antibiotics should be given to severe malnourished child for 10 days.
  - First line antibiotic: Ampicillin or Amoxicillin.
  - Second line antibiotic: Add Chloramphenicole or Gentamicin or Third Generation Cephalosporin.
- Give the following medicines :

  - Vit A: single dose of 50000IU for infants less than 6month, 100000IU for infants 6-11 month and 200000IU for children age 1year or more.
- **Treat Hypoglycemia** (Blood sugar < 56mg/dl) :
  - Patients who are conscious and able to drink should be given 50ml of 10% sugar or F-75 diet.
  - Patients losing consciousness should be given 50ml of 10% sucrose by NGT. They should also be given 5ml of Glucose 10% intravenous.
  - Second line antibiotics for bacterial infections.

- **Treat Hypothermia** (Rectal Temperature < 35.5 ˚C and under arm Tem <35˚C) :
  - Warmed the patients using kangaroo technique, warm cloths, blanket or incandescent lamp.
  - Treat Hypoglycemia.
  - Give second line antibiotics.
- **Treat dehydration :**

  In Marasmic patients:

- ReSoMal 50 – 100 ml /kg over 12 hr: 5ml/kg every 30 min for 2hrs and then 5-10 ml per hr for 10 hrs orally or by NGT.
- IV fluid (Ringer lactate + D/W 5% or 1/2 N/S + D/W 5%) : for patients who has all of the following :

  Semi-conscious or unconscious state, rapid weak pulse and cold hands and feet.

  Give 15ml / kg IV fluid over the first hr. If there is improvement repeat the 15 ml/ kg over the next hr if there is no improvement then assume that the child has septic shock.

In Edematous patients:

- ReSoMal 30 ml per watery stool.
- Hypovolemia should be manage as septic shock (see below)

- **Treat Septic Shock :**
  - IV fluid (Ringer lactate + D/W 5% or 1/2 N/S + D/W 5%): Give 15 ml / kg over the first hr if the patient is unconscious.
  - Second and first line antibiotics.
  - Be kept warm.
  - Give 10 % sucrose orally or by NGT.
- **Treat Paralytic ileus** (Absent bowel sound , abdominal distention and intestinal splash) :

- Give a single IM injection of Magnesium sulfate (2ml of 50% solution).
- Pass an NGT aspirate the contents of stomach and then irrigate it with 50ml isotonic clear fluid repeatedly until the content become clear.
- Give Metronidazole 10mg/kg every 8hr by NGT.
- For candidiasis give oral nystatin.
- Keep the child warm.
- If the child's level of consciousness is poor give IV glucose (see Treatment of Hypoglycemia).

  Don't start IV fluid at this stage. Monitor the child for 6 hr.
- If there is intestinal improvement (decrease in distention, return of bowel sound and visible peristalsis) then give F75 by NGT.
- If there is no improvement after 6hr then give IV fluid contain KCL 20mmol /L or Ringer lactate with D/W 5% .The amount should not be more than 2-4ml/kg/h.
- Give second line antibiotic.

- **Treat Congestive Heart Failure :**
  - No food and fluid should be given until the heart failure has improved even if this takes 24- 48hrs.
  - Give a diuretic: Furosemide 1mg/kg IV.

- Digoxin 5 µg/kg can be given in a single dose. Don't give loading dose.

- **Treat severe anemia (Hb level Less than 4g/dl) :**
  - Blood transfusion
- **Treat Dermatosis of Kwashiorkor :** If Cadidiasis is present manage as follow:
  - Diaper area should be uncovered.
  - Nystatin ointment twice daily for 2 week.
  - Oral Nystatin 100000IU four times daily.

In other affected area Zinc ointment or Paraffin relieve pain and prevent infection.

Criteria to pass the patient from Phase 1 to Transmission Phase:

- The return of appetites
- Visible reduction in the amount of edema that not judged by loss of weight alone.

B - Transmission Phase:

- Give F-100; 130 ml/kg /24hr in 8 divided feed.

Criteria to pass the patient from Transmission Phase to Phase 2:

- Marasmic patients spend a minimum of 2 days in Transmission Phase and pass to Phase 2 when they are completing the diet with a good appetite.

- Edematous patients should remain in Transmission Phase until they have completely loss all their edema and are completing the diet.

C – Phase 2 (Rehabilitation Phase):

- Give F-100; 130 – 200ml/kg/24hr in 6 divided feed.
- The following medicines should be administered:
  - Iron: Add one crushed tablet of ferrous sulfate (200mg) per F-100 package.
  - Mebendazole: 100mg BID for 3 days (Not used below 1year) or
  - Albendazole a single dose of 400mg, or 200mg for children 1-2 year of age.

Management of Vit A deficiency (Xerophthalmia)

Specific treatment consist of oral vitamin A in a dose of 50000, 100000, 200000 IU in children aged < 6month, 6-12 month and >

1y respectively. The same dose is repeated next day and 4 weeks later.

Management of Vit D deficiency (Rickets)

There are 3 strategies for the administration of Vit D:

1. 300000 – 600000 IU of vitamin D are administered orally or intramuscularly as a single or 2-4 doses over one day.

2. 600000 IU over 10 days (60000 IU/day for 10 days) is given orally.

3. 2000 – 5000 IU/day over 4-6 weeks.

- Either strategy should be followed by daily vitamin D intake of 400 IU/day if patient is < 1y old or 600 IU if age > 1y, typically given as a multivitamin.

- It is important to ensure that children receive adequate dietary calcium and phosphorus; usually provided by milk, formula and other dietary product.

- Patient with vitamin D deficiency rickets show evidence of radiological healing within 4 weeks of therapy. Reduction of blood

alkaline phosphatase and resolution of clinical signs occur slowly. If no healing can be demonstrated with 2 mega doses of vitamin D, patient should be evaluated for refractory rickets.

Managements of Iron, vitamin B_{12}, folic acid and vitamin K deficiency are mentioned under the topic of Blood Disorders.

Part 6

Hematological Disorders

Management of Iron Deficiency Anemia (Microcytic-Hypochromic Anemia)

1- Orally Elemental iron 2-6 mg/kg /day TID should be continued for 8week after the blood values become normal.

2- **Parenteral Iron** is indicated in the following conditions :

- Intolerance to oral iron.
- Poor compliance by the patient.
- Chronic diarrhea.
- Bleeding from GI tract which is aggravated by oral iron therapy.
- Sever bleeding when hemoglobin level can not be maintained with oral iron.

Iron requirement are determined from the following equation:

$$\text{Iron (mg)} = \text{Wt (kg)} \times \text{Hb deficit (g/dl)} \times 4$$

This amount is given as Iron Dextran or Iron Sorbitol (Jectofer) which daily dose should be limited to 50mg in infant and 100mg in adult intramuscularly.

3- **Blood Transfusion:** When the Hb level is below 4g/dl packed RBC should be used 2-3 cc/kg slowly along with IV Furosemide 1-2mg/kg.

4- Milk consumption should be limited to 500cc/day or less.

Management of Megaloblastic Anemia

Vit B_{12} and Folic acid should be used together in suspected cases or if there is no facility to determine the level of them in the blood, otherwise give separately:

- **Vit B_{12}:** 1mg/day intramuscularly for 2-3 weeks. If there are neurological manifestations, pernicious anemia and ileum resection, Vit B_{12} should be injected 1mg/monthly throughout the patient live.
- **Folic acid:** 1-5mg /day for 3-4 week.

Management of β- Thalassemia Major and intermedia

1- **Blood transfusion:** Packed RBC 10-15 cc/kg should be transfused every 2- 4week to keep the pretransfusion level of Hb more than 9.5g/dl and less than 10.5g/dl.

2- **Folic acid should** be given 1mg /day.

3- **Chelating Therapy:** One of the following chelating agents should be start by 10-15th transfusion.

- **Deferoxamine:** 25-50mg/kg/day over 8 – 12 hours as continuous subcutaneous infusion at least 5-6 nights per week. Vit C 100mg/day can increase the chelating and excretion of iron.
- **Deferiprone:** 75-100mg/kg/day orally in 2-3 divided doses.
- **Deferasirox:** 30 mg/day orally before meal.

4- **Splenectomy** is recommended in cases when the transfusion requirement exceed 250ml/kg/ year or Hypersplenism be developed. Splenectomy should be done beyond the age of 6y.

5- **Bone Marrow Transplantation:** If HLA donor is available and the patient has young age, well-chelated, with no hepatomegaly and hepatic fibrosis ; BMT is indicated**.**

Management of Immune Thrombocytopenic Purpura (ITP)

1- Supportive treatment: Restriction of physical activity, and avoidance of drugs which disturbs platelet function (Aspirin, Heparin etc).

2- Drugs: One of the following drugs should be used if platelet count is less than 20000/mm^3 or bleeding be observed.

- **Prednisolon:** 1-4 mg/kg/day for 2-3 weeks than tapered over the next 1-2 weeks.
- **Intravenous Immune Globulin (IVIG) :** Total dose of 2g/kg is given , either 0.4g/kg for 5days or 1g/kg for 2days .
- **Anti-Rh (Anti-D) Therapy:** For Rh positive patients give 50-75µg/kg Anti-D intravenously.

3- Splenectomy: Recommended for Chronic ITP and whose symptoms are not controlled with above therapy.

Management of Disseminated Intravascular Coagulation (DIC)

1- Treat the cause.

2-Treat the exaggerated factors (Shock, Acidosis, Hypoxia, Hypothermia and Electrolyte Disturbances).

3-If bleeding is observed **Transfuse fresh whole blood, Platelet or Cryoprecipitate.**

4- In the presence of **Fulminant Purpura, Heparin** should be given 10-15 IU/kg/hr by continuous IV infusion or 50-70 IU/kg every 6 hourly.

5- Corticosteroid is effective if Fulminant **Purpura** be developed**.**

6- Vit K: For infants 1mg, for children 2-3mg, for Adolescents and adults 5-10mg once intravenously.

Blood transfusion

Indications for Transfusion of Whole Blood:

1- Acute massive blood loss (> 17cc/kg or > 25% in less than 24hrs).

2- Exchange Transfusion in neonates (< 72hrs old blood).

3- Cardiovascular bypass surgery.

Indications for Transfusion of Packed RBC:

1- Infants within the first 4 month of life:

- Hb < 13g/dl and sever pulmonary disease.
- Hb < 10g/dl and moderate pulmonary disease.
- Hb < 13g/dl and sever cardiac disease.
- Hb < 10g/dl and major surgery.
- Hb < 8g/dl and symptomatic anemia.

2- Children and adolescents:

- Acute blood loss of > 25% of circulating blood volume.
- Hb < 8g/dl in the preoperative period.
- Hb < 13g/dl and sever cardiopulmonary disease.

- Hb < 8g/dl and symptomatic chronic anemia.
- Hb < 8g/dl and marrow failure.

Amount of the blood: If cardiovascular status is stable give 10-20 ml/kg over 2-4hrs. If unstable use smaller volume.

Patients with iron-deficiency anemia are often treated successfully with oral iron alone, even at Hb level < 5g/dl. When the Hb level is below 4g/dl packed RBC should be used 2-3 cc/kg slowly along with IV Frusemide 1-2mg/kg.

Management of the Blood Transfusion Complications

1- Hemolytic Reactions:

- Stop Blood transfusion.
- Give IV fluid and Diuretic (Frusemide) to maintain normal renal output.
- $NaHCO_3$ should be used intravenously if hemoglobinuria be developed.
- Shock should be managed as Anaphylactic Shock. (See management of Shock).
- Treat DIC if present.
- For severe case transfuse compatible blood.

2**- Allergic Reactions:**

- For mild and moderate cases give **Diphenhydramine** 5mg/kg/day TID or **Pheneramine** 0.5-1mg/kg/day TID.
- **Adrenalin** SC and **Hydrocortison** intravenously should be used for severe cases (Anaphylaxis).See Anaphylactic Shock.

3- Febrile reactions:

- **Antihistaminics, Antipyretics** and **Hydrocortison** are effective.

Part 7

Renal Disorders

Management of Acute renal failure

1. Determine and treat the causes.
2. Put urine catheter for urine out put determination.
3. Give **N/S 20 ml/kg** in 30 min if there is no evidence of overload or Heart Failure. For dehydration treat as dehydration protocol**.**
4. **Lasix 1mg/kg** should be used IV if urine out put remain low (<0.5 ml/kg/hr) in one hour. Lasix may be given up to 5mg/kg for second doses.
5. Maintenance fluid: **D/W 10 %**(30-40cc/kg + amount of urine out put).
6. **$NaHCO_3$** for sever Metabolic acidosis and Hyperkalemia (in consultation with senior doctor).
7. **Calcium gluconate** 10% 1cc /kg in 3-5min for hyperkalemia and Hypocalcemia in consultation with senior doctor.
8. **Nifedipine 2.5-5mg/d** is given orally for Hypertension. In the presence of overhydration intravenous Frusemide should be also used.
9. **Indications for dialysis are:**

a. Severe hyperkalemia (>8mg/kg/lit).

b. Volume overload, refractory to diuretic.

c. C.N.S symptoms of uremia.

d. Severe metabolic acidosis unresponsive to treatment.

e. BUN > 100 - 150 mg/dl.

Urinary Tract Infection (UTI)

Indications for admission are:

Dehydrated, unable to drink, vomiting, less than 1 month, toxic and suspected sepsis.

Management

A. OPD management for suspected cystitis: Give one of the following :

1. **Amoxill** 50 mg /kg /day.
2. **Septran** 10mg/kg/day of **Trimethoprim.**
3. **Nitrofurantoin** 6mg/kg/day.

Duration of treatment: 7 – 10 days.

B: IPD management for suspected pyelonephritis.

Fist line: **Ampicillin** (100-200mg/kg/day) **+ Gentamicin** (5-7.5 mg/kg/day).

Second line: **Third generation cephalosporin** (Ceftriaxone 50 - 75 mg/kg/day) in consultation to senior doctor.

Duration of treatment: 10 – 14 days.

Nephrotic Syndrome

Indications of admission are:

- Large Pleural Effusion.
- Ascites.
- Sever genital edema.

Management of Initial Episode

1. A high protein and low salt diet is recommended as long as proteinuria is present.
2. **Diuretic** use should be reserved for severe symptomatic edema. For such cases Frusemide (1-4mg/kg/d in 2 divided doses) alone or with Spironolactone (2-3mg/kg/d in 2 divided doses) are administered.
3. **Prednisolon** is started for children with onset of Nephrotic syndrome between one and 8yr of age without renal biopsy. The dosage is 2mg/kg/day in 2-3 divided doses for 6wk, then 1.5mg/kg/d on alternate days as a single morning dose for another 6wk. The alternate-day dose is then slowly tapered over the next 2months.
4. If serum albumin level are below 1g/dl with marked edema, infusion of **human albumin** (0.5-1g/kg) followed by IV Frusemide (2-3mg/kg) is indicated.

Management of Relapses

Definitions:

- **Relapse:** 3-4+ proteinuria with edema is called Relapse. In a year, if the episodes are 3 or less it is **Infrequent Relaps**e and 4 or more attacks is termed **Frequent Relapse**.
- **Steroid Dependant:** The patient who relapse on alternate-day steroid therapy or within 28 days of stopping Prednisolon.
- **Steroid Resistant:** Patient who fail to respond on Prednisolon therapy within 8wk.

A. Management of Infrequent Relapses:

1. Diet and diuretics indications are the same as initial episode.
2. Prednisolon should be used 2mg/kg/day in 2-3 divided doses until the urine become trace or negative for protein for 3 consecutive days. Then the doses change to alternate-day dosing (1.5mg/kg/day) and tapered over 1-2month.

B. Management of Frequent Relapses and Steroid Dependant Nephrotic Syndrome:

One of the following regimes can be used:

1. Following completion of treatment for a relapse, alternate-day Prednisolon is slowly tapered to a minimum maintenance dose (0.3-0.7mg/kg) and continues this dose for 9-12month.

2. **Cyclophosphamide:** 2-3mg/kg/day is given as a single oral dose for 8-12wk. Alter-day Prednisolon therapy is often continued during the course on Cyclophosphamide administration.
3. **Methylprednisolon:** High dose pulse Methylprednisolon is given as a 30mg/kg bolus (max 1000mg), with the first 6 doses administered every other day and followed by a tapered regime for up to 18month.
4. **Cyclosporine:** 3-6mg/kg/day divided q 12hr for 1-3y of Cyclosporine is given along with Alter-day Prednisolon therapy for 8-16wk.

C. Management of Steroid Resistant Nephrotic Syndrome:

After renal biopsy; Cyclophosphamide, Cyclosporine or Methylprednisolon can be used.

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