Fahims Aids *To* Paediatrics

5.1

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PEDIATRICS

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Fluid Calculations

Age	(ml/Kg/Day)
D_1	60
D_2	80
D_3	100
D_4	120
D_5	140
D_{6-7}	150
Upto 9 months	150-160
upto 12 months	120-150
upto 2 yrs	100-120
upto 4 yrs	90-100
upto 8 yrs	70-90
upto 12 yrs	60-70

+20 ml if Preterm

We can write the order as follows:

Inf. 10% DA (.....ml)
IV $\frac{ml}{25}$@µd/min stat & daily

According to Weight

100ml/Kg for 1st 10Kg+
50ml/Kg for next 10Kg+
20ml/Kg for rest

Types of Fluid

D_{1-2}	10% DA
D_3-1 year	5%-10% DA in 0.225% NS
1-10 yrs	5% dextrose in 0.45% NS e.g. Libott-S Jr
>10 yrs	5-10% DA in 0.9% NaCl (DNS)

If we plan to give the fluid daily:

10 drops/min = 1 Litre/ day
1 µdrops/min = 25 ml/day

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Blood And Blood Product Transfusion

We need to remember that blood products are immunologically active. So, when a transfusion is made it may be complicated by acute, chronic immune reactions, or transmission of infection. So, blood or blood product transfusion is avoided if possible.

Whole blood: 20ml/Kg = 1 unit, over 2-4 hours
in cases of
- acute blood loss (loss of >25% blood volume, >15ml/Kg considering total blood volume of 60ml/dL)
- neonatal sepsis
- DIC

Packed RBC: 10-15ml/Kg (usually 10ml/Kg). If >15ml/Kg is required, use separate aliquots should be used.
Indication and level:
In Neonates:
Baby on mechanical ventilation – Hb <13g/dL or PCV <40%
Baby on CPAP: Hb <11g/dL or PCV <35%
Baby on supplemental oxygen (>21%): Hb <8g/dL or PCV <25%
Post-surgical state, poor weight gain, unexplained persistent tachycardia – Hb <10g/dL or PCV <30%
Stable: Hb <7g/dL or PCV <20%
In infants and young children:
Perioperatively- maintain Hb ≥7g/dL
Iron deficiency anemia – only if there is impending heart failure. And must be given very slowly.
Expected rise: for 1 unit of pRBC with 70% Hct- 3gm/dL (Neonatology Protocol, BSMMU)
In <50Kg patients: 10-15ml/Kg RBCs will increase Hb levels between 2 and 3gm/dL.

Fresh Frozen Plasma: Frozen within 18 hours of collection. It contains albumin, immunoglobulins and clotting factors.
Dose: 10-20ml (15ml/Kg). Larger volume is preferred to avoid repeated exposure.
Type: Same ABO group of recipients or of AB blood group (plasma contain neither anti-A nor anti B antibody).
Indication:

- Vitamin K deficiency bleeding (Hemorrhagic Disease of Newborn – HDN)
- DIC
- Inherited clotting factor deficiency (Hemophilia, vWD)
- Before performing invasive procedure in presence of coagulopathy

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In patient <50Kg, 10-20ml FFP should increase most coagulation factors by 15-20% (Philips 6e, p705)

Platelet concentrate:

Thrombocytopenia <150,000/cmm; severe thrombocytopenia <50,000/cmm

Neonate:

- Count <30,000/cmm – transfuse all neonates
- Count 30000 to 50000/cmm - consider transfusion in
- Clinically unstable
  - Concurrent coagulopathy
  - Newborn <1000gm and <1 week of age
  - Platelet count falling and likely to fall below 30000.
  - Previous major bleeding (IVH grade 3-4)
  - Requiring surgery or exchange transfusion
- Count >50,000 to 99,000/cmm: transfuse only if there is active bleeding.

Sodium level in different fluids
5% DNS ----------154mmol/L
Normal saline ----------154mmol/L
Libott-S Junior----------77mmol/L
Electrodex-10----------42mmol/L
0.3% Normal saline -----51mmol/L
Hartman's ----------131mmol/L
Cholera Saline ----------134mmol/L

Children:

- ITP: No treatment is needed until platelet count is less than 20000/cmm. Platelet is transfused only if there is major bleeding.
- Leukemia
- Aplastic anemia

Type: ABO identical or compatible

Dose: 10-20ml/Kg. Predicted rise is about 20,000 to 60,000/cmm

5-10ml/Kg dose should increase platelet count by 50,000-100,000/cmm (Philips 6e, p706)

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Nutritional Disorders

Severe Acute Malnutrition (SAM)

In 6-60 months:

Indicator	Measure	Cut-off
Severe Wasting	Wt-for-Height	<-3SD
Do	MUAC	<115mm
Bilateral edema	Clinical sign	

Any one is diagnostic.

In <6 months:

- Visible wasting.
- Weight for Height Median (WHM) <70% or <-3 SD
- Bipedal edema

℞ on admission on *date* at *time*

1. **Inf. 10% DA** 50 ml PO/by NG tube or 5ml/Kg IV Stat.
2. **Feeding:** F-75 as per WHO chart. Or using homemade formula.
   11ml/Kg 2 hourly 12 feed day & night

   [Each feed contains-
   Water = ml
   Milk powder = tsf
   Sugar = tsf
   Soyabin oil = drops]

If there is edema, give 100ml/day, & protein 0.9gm/Kg/day (max.).

If no edema, you may increase upto 130ml/Kg/day & 1.5g of protein/Kg/day

see below for detail instruction in Bangla

3. **Inj. Ceftron (1gm/10ml)**
   0.5-1ml/Kg IV stat & daily
   ±
   Inj. Gentin (20mg/2ml) *[7.5mg/Kg/day]*
   0.75ml/Kg IV stat & once daily

4. **Syp. Potassium** (7.6 mmol/5 ml)/**KT/Electro K** *[2-4 mmol/Kg/D]*
   If around 5Kg, $\frac{1}{2}$ tsf PO BD; If around 10Kg, 1 tsf PO BD
5. **Syp. Zinc** (10mg/5ml)/**Zesup/Nid/Xinc** *[2mg/kg/d]*
   If age <6 mo- $\frac{1}{2}$ tsf PO BD, if age >6 mo 1 tsf PO BD;
6. **Tab. Folison** (5mg)
   1 tab PO stat on D_1, then
   $0+\frac{1}{4}+0$
7. **Cap. Retinole Forte**(50,000 IU): *[1 cap= 0-5mo; 2 cap for 6-12 mo; 4 cap for >12mo]*
   1 cap PO stat
8. **Inj. $MgSO_4$** (2.47mg/5ml) *[0.1 ml/Kg once daily for 7 days]*

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0.1ml/Kg IM stat & daily

9. **Syp. V-plex** *[$\frac{1}{2}$ tsf for <6mo; 1 tsf for 6mo-2yrs; 2 tsf >2yrs)- once daily]*
   1 tsf PO OD [do not start until diarrhoea stops]

If diarrhoea: ReSoMal (Water 850 ml + 1 pack ORS + Sugar 4 tsf + Syp. KT 3 tsf): 5ml/Kg PO/NG tube for every 30 min for 2 hours then every alternate hours for 4-10 hours.

If shock N/saline 15ml/Kg for 1 hours then assess.

Few important points regarding management of SAM:

4 don'ts of SAM patient:

1. Never give IV fluid in a case of SAM; may lead to heart failure
2. Never give diuretics; may worsen electrolyte imbalance
3. Never give iron therapy in stabilization phase; may promote bacterial infection
4. Never give high protein formula in stabilization phase, may lead to heart failure

Blood Transfusion in SAM: Be cautious regarding blood transfusion in SAM patients. Indication of BT is severe anemia with Hb% <5gm/dL. If there is respiratory distress, <7gm/dL. If indicated give BT slowly and give Inj. Lasix (20mg/2ml) 0.1ml/Kg before starting. Give whole blood 10ml/Kg or packed cell 5-7ml/Kg (if signs of heart failure is there).

উদাহারণঃ SAM এর বাচ্চার খাবারের হিসাব

শুরুতে F75 ডায়েট দেয়া হয়। সাধারণ হিসাব ২ ঘন্টা পর পর দিলে ১১মিলি/কেজি, ৩ ঘন্টা পর পর দিলে ১৬মিলি/কেজি, এবং ৪ ঘন্টা পর পর দিলে ২২মিলি/কেজি করে দেয়া হয়। আমরা ২ ঘন্টা পর পর (১১ মিলি/কেজি) দিয়ে শুরু করি। এক্ষেত্রে মনে রাখতে হবে, প্রোটিন আমরা ০.৯ গ্রাম/কেজি/দিন দিব এবং প্রতি ১০০ মিলি দুধে ৭৫ কি.ক্যা. এনার্জি থাকে। এখন কিভাবে হিসাব করবো। উদাহারণ হিসেবে একটা ৫ কেজির বাচ্চার হিসাব করি।

শিশুকে শুরুতে আমরা ৫×১১=৫৫ মিলি খাবার ২ ঘন্টা পর পর দিব। তাহলে, পানি নিতে হবে ৫৫ মিলি। এইটুকু খাবারে ক্যালরি থাকবে ৫৫×০.৭৫ = ৪১.২৫ কি.ক্যা. । প্রথমেই আমরা খাবারে প্রোটিনের পরিমাণ হিসাব করবো। ০.৯ গ্রাম × ৫ = ৪.৫ গ্রাম প্রোটিন আমরা সারাদিনে দিতে পারব। কাজেই, ৪.৫÷১২= ০.৩৭৫ গ্রাম/ প্রতি ফিডএ দেয়া যাবে। আমরা জানি, গুড়াদুধে ১ চামচে মোটামুটি ১ গ্রাম প্রোটিন এবং ২০ কি.ক্যা. এনার্জি থাকে। এখানে আমরা $\frac{১}{৩}$ চামচ দুধ দিলে কাছাকাছি চলে আসে (০.৩৩৩ গ্রাম)। কাজেই, আমরা $\frac{১}{৩}$ চামচ গুড়াদুধ দিব (= ২০÷৩= ৬.৬৬ কি.ক্যা. এনার্জি)। বাকি ক্যালরি (৪১.২৫-৬.৬৬= ৩৪.৫৯ কি.ক্যা.) ক্যালরি আমরা চিনি (চা চামচ = ২০ কি.ক্যা.) এবং সয়াবিন তেল (১মিলি = ১৫ ফোটা = ৯ কি.ক্যা.) দিয়ে পুরণ করবো। চিনি (বা কার্বোহাইড্রেট) প্রায় ৮৫% (দেড় চামচ চিনি = ৩০ কি.ক্যা.) এবং প্রায় ১৫% সয়াবিন তেল (০.৫মিলি= ৮ ফোটা= ৪.৫ কি.ক্যা.) দিলে প্রয়োজনীয় ক্যালরি নিশ্চিত হয় (৩০+৪.৫ = ৩৪.৫) । সুতরাং, প্রতি ফিডে আমরা ৫৫ মিলি পানি, $\frac{১}{৩}$ চামচ গুড়াদুধ, দেড় চামচ চিনি, ৮ ফোটা সয়াবিন তেল দিয়ে খাবার বানাব।
এক নজরে,
প্রতি ফিড = ৫×১১=৫৫ মিলি

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ক্যালরি ৫৫×০.৭৫ = ৪১.২৫ কি.ক্যা.

সারাদিনের প্রোটিন, ০.৯ গ্রাম × ৫ = ৪.৫ গ্রাম।

সুতরাং ৪.৫÷১২= ০.৩৭৫ গ্রাম/ প্রতি ফিড = $\frac{১}{৩}$ চামচ গুড়াদুধ = ৬.৬৬ কি.ক্যা. এনার্জি।

বাকী রইলো, ৪১.২৫-৬.৬৬= ৩৪.৫৯ কি.ক্যা.

দেড় চামচ চিনি = ৩০ কি.ক্যা. [বাকি রইলো ৪.৫৯ কি.ক্যা.]

সয়াবিন তেল, ৮ ফোটা (= ৪.৫ কি.ক্যা.)।

বিঃ দ্রঃ একবারে নিখুত করার প্রয়োজন নাই। মাপগুলো কাছাকাছি থাকলেই হবে। খাবার কিভাবে বানাতে হবে এটা মাকেও শিখিয়ে দিতে হবে। হিসাব বেশি জটিল করলে মাকে বোঝানো সম্ভব হবে না। তবে, প্রোটিনের পরিমাণ যেন বেশি না হয় সেদিকে নজর রাখতে হবে (এজন্যেই প্রোটিনের হিসাবটা সবার আগে করা হয়)।

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Rickets

Treatment:

1. **Vitamin D supplements**
   Stoss therapy: Inj. Cholecalciferol 2 lac unit (D-Rise/ Defrol/ Calciferol/Osteo D/D-balance 200000IU) 3-6 lac orally stat or
   IM in 2-4 divided dose
   May be repeated after 6-8 weeks based on radiography
   Alternatively,
   Cap. D-Balance 2000IU
   0+1+0---------- 4-6 weeks
   Then, maintenance dose of Vitamin D (400IU if <1 yr of age; 600IU if > 1 yr of age)
2. **Calcium supplementation (350-1000mg)**

If there is symptomatic hypocalcemia,
Cap. 1, 25 di (OH) cholecalciferol (0.25microgram) 0.05mcg/Kg/day orally for few days
+ Inj. Calcium gluconate (10%) 5ml ampule
0.5-1ml/Kg, IV, slowly over 5-10 minutes using microburet set/infusion pump

3. **Adequate calcium rich diet, exposure to sunlight**

Drugs:
Tab. Calbo 500mg = Calcicar 500= Acical 500
Tab. Calbo D (500mg + 200IU) = Acical D = Calcin D = Coralcal D (Radiant)
Tab. Calbo D Vita (600mg+ 400IU)= Coralcal DX(radiant)= Ostocal DX=Oscal D Forte
Tab. Calbo JR (250mg) = Acical JR = Calcicar 250
Inj. Rocaltrol/Dicaltrol (0.25mcg) = 1, 25 di (OH) Cholecalciferol
Vitamin D – Cap. D-Rise 40000IU or 20000IU or 2000 IU; D-Balance 40000IU or 20000IU or 2000IU (square)

To prevent Rickets of Prematurity: 400IU/day up to weight of 3-3.5Kg

Clinical Features:

General features: Short stature, listlessness, protruded abdomen, muscle weakness

Head: box like squared head, hot-cross-bun appearance of skull, soft skull bones, delayed closure of fontanels and sutures

Teeth: delayed dentition, dental caries and impaired enamel formation

Chest: pigeon chest deformity, painless rachitic rosary at costochondral junction, Harrison sulcus

Spine: deformities like scoliosis, kyphosis, lordosis

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Limbs: widening of wrist and ankle, valgus and varus deformity, anterior bowing of the legs, coxa vara, fracturs and pain, gait deformity

X-ray of long bones show widening, cupping, fraying of metaphysis. Wide gap between epiphyses and metaphysis. Density of shaft of bone is reduced (osteopenia), deformity of long bones. Greenstick fracture may be present. CXR show chondral ends of ribs are expanded, cupped and indistinct. Rachitic rosary may be identified.

Blood biochemistry: S. calcium normal/low, S. Alkaline phosphatase – high, S parathormone-high, Vitamin D- low or normal.

S. creatinine high & S. electrolyte altered in CKD & Renal tubular acidosis

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Scurvy

Treatment:

Tab. Ascorbic Acid 200mg (Tab. Ceevit/Vasco 250)

0+1+0 by chewing for several weeks

Recovery, clinical 24-48 hours & radiological few weeks. Treatment should be continued for 3 months or more.

Clinical Features

Mostly present around 6-24 months, with Irritability and loss of appetite, Crying on handling e.g. during dressing, bathing etc.

Generalized tenderness especially in legs (pseudoparalysis, frog position), Bluish purple, spongy swelling of gum mucosa. Sharp, painful scorbutic rosary palpable and depression of sternum

Skin bleeding- perifollicular petechial hge, echymoses.

Hematuria, malena, orbital hge may be found. Delay in wound healing

X-ray shows: generalized osteopenia, ground glass appearance, Frankel's line of calcification, ringing of epiphysis, corner sign/spur, and pencil thin cortex.

Acrodermatitis Enteropathica

Treatment: Elemental Zinc 3mg/Kg/day lifelong.

Clinical Feature: Erythromatous scaly patches and plaques, most often around the mouth and anus; rare congenital form accompanied by diarrhoea and alopecia.

Xerophthalmia

Treatment: 30-60mg of Retinol (100,000-200,000IU/child)

Generally,

Cap. Retinol Forte (50,000IU): D1, D2, D14

Up to 6 months: 1 capsule

6 months to 1 year: 2 capsules

> 1 year: 4 capsules if not given within

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Anemia

Treatment:

Tab. Folic Acid 5mg on D1, then ¼ tablet once daily for 3 months

Tab. Folison 5mg Or,

Folinic Acid (active form of Folic Acid): Tab. Folita 5(Square), Tab. Biofol 5 (Incepta), Tab. Folinic (Renata)

Elemental Iron 3mg/Kg/day for 3 months;

Compiron drop 55mg/ml or Syp. Compiron 55mg/5ml

Loss of appetite

Common causes of loss of appetite:

1. Nutritional deficiency:
    a. Protein deficiency: Give appropriate dietary advice
    b. Iron *See above*
    c. Zinc *See above*
    d. B1 & B12, Folate (B9) deficiency *See above*
    e. Vitamin C deficiency *see above*
    f. Vitamin D deficiency *see above*
2. Antibiotic: Usually temporary
3. Teething or mouth issues: look for oral thrush or ulcers
4. Infections like colds, flu, or stomach
5. Constipation *See below*
6. Reflux *See below*
7. Lactose intolerance *see below*

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Respiratory System

Severe Pneumonia

℞ on admission on *date* at *time*

1. NPO till F/O if RR ↑↑.
2. O_2 inhalation stat & SOS.
3. Nebulization with Windel Plus/Sulprex (0.04% IB+ 0.12% Salb) - stat & 6 hourly.
4. Appropriate infusion if on NPO order.

5. **Inj. Ceftazidime/Tazid** (250mg/5ml) *[100mg/Kg/D 12 hourly.]*
   1ml/Kg IV stat & 12 hourly
   +
   Inj. Gentamicin/Gentin (20mg/2ml) *[2.5mg/Kg 12 hourly]*
   0.25ml/Kg IV stat & 12 hourly

   or (if age >3 mo)
   Inj. Ceftriaxone/ Ceftron (1gm/10ml) *[50-100mg/Kg/D daily]*
   0.5-1ml/Kg IV stat & daily

   To see details see, click ***A.*** *Antibiotics in* RTI
6. **Syp. Paracetamol /Ace/Napa/Renova(120mg/5ml)**
   1 tsf/8 Kg PO 6 hourly.
7. **Syp. Zinc/Zesup/Pep-2/Nid/Xinc**10mg/5ml
   1 tsf PO 2 hourly for 7 days
8. **Solo/Norsol Nasal Drop**- 3-4 drops in each nostril 6 hourly.

If there is lesion in CXR, add:
Inj. Flucloxacillin/Fluclox/Phylopen (500mg/5ml) *[25mg/Kg 6 hourly]*
0.25ml/Kg IV stat & 6 hourly

If nebulization is not possible, add:
Syp. Brodil 2mg/5ml/ Sultolin (Square), **Bronkolax** (Beximco) *[0.1mg/Kg 8 hourly]*
$\frac{0.25ml \times wt}{5}$ tsf PO 8 hourly

[Note: Nebulize child if wheeze present and tachycardia, fever absent. Remember main treatment of pneumonia is antibiotic]

Nebulized Salbutamol:
0.15-0.3mg/Kg/Dose;
1 nebule(3ml)= 2.5mg;
1 ml respirator solution= 5mg

Recurrent pneumonia- ≥2 episodes in a single year or ≥ 3 episode ever, with radiologic clearing between occurrences.

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DDs: TB, Foreign body aspiration, GERD, Ciliary dysfunction (primary ciliary dyskinesia, Kartagener Syndrome), Cystic fibrosis, sickle cell disease.

Bronchiolitis

In Pediatrics, we give treatment of pneumonia to all babies coming with fever, cough, and respiratory distress. We perform CBC, CXR. If these indicates bronchiolitis, we modify treatment (ensure oxygen, start feeding if possible and discharge early).

- 6 months: peak
- <2 years of age
- More in winter & early spring.

General Measures:

1. Propped up position.
2. Humidified O_2 therapy.
3. Correction of dehydration, orally or by IV fluid.
4. Maintenance of nutrition orally or by NG tube.
5. Nebulization with salbutamol+ Ipratropium bromide.
6. Oral prednisolone for 3 days.

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Severe Acute Bronchiolitis

℞ on admission on *date* at *time*

Nebulized Salbutamol:
0.15-0.3mg/Kg/Dose;
1 nebule(3ml)= 2.5mg;
1 ml respirator solution= 5mg

1. NPO till F/O if RR ↑↑.
2. NP and OP suction - SOS
3. Humidified O_2 inhalation stat & SOS. Target saturation >90%
4. Nebulization with Windel Plus/Sulprex (0.04% IB+ 0.12% Salb) stat & 6 hourly.

   Alternative drugs: 3% NaCl/Normal saline/Salbutamol/Budesonide.
5. Inf. 10% BS or Inf. Libott-S Jnr if on NPO order.
6. Inj. Ceftriaxone (1gm/10ml) *[50-100mg/Kg/day 12 hourly]*
   0.5-1ml/Kg IV stat & daily

7. Inj. Dexa 5mg/1ml (severe cases): *[0.08-0.3mg/Kg/day 6-12 hourly]*
   (0.016-0.6)ml/Kg IV stat & 6-12 hourly

8. Supportive treatment
   a. Propped up position
   b. Normal Feeding
   c. Cleaning nose with Normal Saline drop (3-4 drops in each nostril 6 hourly)
   d. Bathing with lukewarm water.

[Remember main management of bronchiolitis is supportive (humidified oxygen, maintenance of hydration, maintenance of nutrition etc.)
Highest risk of further respiratory compromise is in 1st 72h after onset of cough & dyspnea.]

Note

Corticosteroid (oral/inhaled), albuterol, other bronchodilator, racemic epinephrine, hypertonic saline etc. are largely proven to be ineffective.

Ribavirin, antiviral agent targeting RSV, not currently recommended because it is costly, difficult to administer and has minimal effect on the disease.

Palivizumab – decreased risk of hospitalization with RSV infection. But it is costly and cannot prevent bronchiolitis caused by other viruses. May be considered in patient suffering from neuromuscular disease and immunosuppressed person.

Fifty percent (50%) children never wheeze in their childhood. Another 50% have 3 patterns of wheezing:

- **Transient early wheezing** (20%) – born with lower lung function which improves gradually resulting in resolution by the age of 3 years.

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- **Persistent wheezing** (14%) – declining lung function before and beyond age of 3 years
- **Late onset wheezing** (15%) – wheezing episodes begins after 3 years of age

Prevention of bronchiolitis: Meticulous hand hygiene.

<2 m: above signs +

1. Fast breathing (60 or more/min)
2. Grunting,
3. Fever
4. Chest in drawing
5. Stridor in calm child
6. Unable to feed/drink
7. vomits everything

If not severe pneumonia, give outdoor management. Choose from following options according to patients' presentation:

Treatment options for outdoor management

A. Antibiotics in RTI:

Up to 3 months:

Cefaclor (2nd generation Cephalosporin)

20-40mg/kg/day bd

100 ml Suspension= 201 BDT: 1 tsf= 125 mg (1ml/Kg/day BD)

15ml Drop = 135 BDT: 1 ml = 100mg (3-6 drops/Kg/day BD)

Loracef (Square)/ Cefticlor(Renata)/ Oticlor(Incepta)

3-6 months:

Cefpodoxime proxetil

Dose: 10 mg/kg/day, BD

Vanprox (Sq)/ Trucef(R)/ Rovantin(O):

15ml Pediatric drop = 60 BDT. 1ml= 20mg; 0.5ml/Kg/day BD

50ml Suspension = 99 BDT. 1 tsf=40mg; 1.25ml/Kg/day BD

Cefixime

Dose: 8mg/Kg/day; Susp. 1 tsf= 100 mg; Drop. 25mg/ml

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Rofixim (Rad)/ Cef-3(Sq)/ Triocim(B)/ Denvar(HP)/ Emixef(I)/Afix(Ar)/ Ceftid(O)/ /Fix A(Ak)/ Orcef(R)/ Roxim(sk)/ T-Cef(DI)/ Cefim-3(A)

For older ones:

Syp. Azithromycin Acos (Radiant)/ Zimax(Sq)/ Rozith(HP)/ AZ(Ar)/ Odazyth(A)/ Zithrin(R)

1 tsf = 200mg, 10 mg/kg/day, OD for 5days

Alternative drugs are:

1. **Susp. Amoxicillin**: Fimoxyl(SA)/Moxacil(Sq)/Moxin(O)
   syrup: 1 tsf= 125 mg; drop 1ml=100mg; Cap. 250mg
   Dose: 25-50 mg/kg/day, BD/TDS for 7-10 days. 80-90mg/Kg/day for OM.

2. **Amoxicillin+ clavulanic acid:** susp. Moxaclav, Fimoxyclav, Tyclav, Clamox (125mg+31.5mg), Moxaclave Forte/Tyclav BID (400mg+57.5mg), Fimoxyclav ES (600mg+42.9mg)
   Dose: 25-45 mg/kg/day, BD/TDS for 7-10 days. 80-90mg/Kg/day for OM.

3. **Susp. Cotrim** (sulfamethoxazole 200mg+ trimethoprim 40mg)
   6-20mg of TMP/Kg/D 12 hourly (1 tsf BD = 16mg/Kg/day 5Kg)

   Pneumocystis carinii pneumonia: 15-20mg TMP/kg/24 hr divided q12h PO or IV
   P. carinii **prophylaxis**: 5 mg TMP/kg/24 hr or 3 times/wk PO

Antipyretics in children

B.

1. **Paracetamol**: Napa (Bex), Ace (Square), Renova (Opsonin), Fast (Acme), Reset (Incepta) Susp. 5ml=1 tsf = 120mg; Drop = 1ml = 80mg; Supp. 60mg/125mg/250mg/500mg

Dose: 15mg/Kg/dose 4-6 hourly

2. **Ibuprofen**: Susp. Inflam (Synovia), Advel (Ops), Bufen (Drug), Flamex (ACI), Profen(Acme), Reumafen(Bex), Serviprofen (Novartis). Susp.100 mg/5ml & 200mg, 300mg, 400mg tablet

Dose: 5-10mg/Kg/dose 6-8 hourly (for pain, fever) after meal. For a 10Kg child, 1 tsf TDS max.

3. **Diclofenac Sodium**: Clofenac(Square), Voltalin(Novartis), A Fenac (Acme), Diclofen(Opsonin), Ultrafen (Bex). 12.5mg, 25mg, 50mg, 100mg suppository. 25mg, 50mg, 100mg SR Tablet. Voligel(1%) gel, Voligel Max(2%) gel, Clofenac gel. Injection 75mg/3ml

Dose: 2-3mg/kg/day divided in 2 or 3 doses

Maximum daily dose: 150 mg

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Bronchodilators in children

C. If wheeze, use **bronchodilators**:

Salbutamol: Sultolin (Square), Azmasol (Bex), Salmolin (Acme), Brodil (ACI), Salbu (Bio)

1 tsf= 2 mg; ½ tsf 8 hourly for 10kg child

Dose: 0.1mg/kg/dose, 8 hourly [= 0.5ml/Kg/dose]

Levosalbutamol: safe from 2 years and above, though use from earlier age is also practiced.

Trade Names: 1mg/5ml syrup & 1mg, 2mg tablet. Levostar (Square), Salmolin L(Acme), Salbu L(Bio), Brodil Levo (ACI)

6-11years- 1 tsf TDS; Lower dose for younger children

1 tsf = 1mg; Tab. 1mg, 2mg

Doxofylline: Doxoven (Beacon), Brezofil (incepta), Docopa (Aristopharma), Dophylin (Acme)100mg/5ml

An alternative to and safer than theophylline. A bronchodilator, with mild anti-inflammatory actions.

Dose: 6-9mg/Kg/dose BD; For a child of 10Kg, 3ml BD. Not recommended for <6 yrs old.

Theophylline: Not used in children now-a-days. Because of side effects.
Thenglate 120mg/5ml. Unilin, Unilin CR (200mg/300/400)
1.5-6 months: 10mg/Kg/day in divided dose
6-12 months: 12-18 mg/Kg/day extended release
1-9 yrs: 8mg/Kg/day in divided doses
9-12 years: 6.4mg/Kg PO
Dose: Loading dose in acute asthma: 5mg/Kg (if not administered in previous 24h) or 2.5mg/Kg

Nebulization:

Windel Plus/ Sulprex/ Ipsavent [0.5mg of salbutamol +2.5mg of ipratropium bromide)/3ml) ampule

Salbutamol Respirator Solution: Sultolin 5mg/ml 0.5-1ml + 3ml of Normal Saline

Ipratropium bromide Respirator solution- Iprex Solution (0.25mg/ml)

<6 yrs 0.125-0.25mg= 0.5-1ml + 3 ml Normal Saline 6-8 hourly

Budesonide Nebulizer Suspension (0.5mg/2ml = 0.25mg/ml) 2ml ampule

Dose: <6 months or more, 1ml- 4ml daily (max. twice daily

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!!!!Warning!!!! Salbutamol causes tremor, ttachycardia, and hypokalemia. If there is already tachycardia, avoid.

D. Norsol (Normal Saline) Nasal Drop (it cleanses nasal cavity)/N-sol, Solo, Nosomist etc

1 drop in each nostril 4 hourly

***Note: - Newborn babies are obligatory nasal breathers. If nose is blocked, they have difficulty feeding.

In the case of sepsis, babies are usually reluctant to feed i.e. they do not attempt to feed. We need to differentiate between these two situations.

E. Ambroxol HCl: Ambrox/Boxo/Lytex etc. 6mg/ml drop, 15mg/5ml

Pediatric Drops:
0-6 months: 0.5 ml 2 times a day (8 drops PO 12 hourly)
6-12 months: 1 ml 2 times a day (16 drops PO 12 hourly)
1-2 years: 1.25 ml 2 times a day (20 drops PO 12 hourly)
Syrup:
2-5 years: 2.5 ml (½ teaspoonful) 2-3 times a day
5-10 years: 5 ml (1 teaspoonful) 2-3 times a day
10 years and adults: 10 ml (2 teaspoonful) 3 times a day.

Acute Pharyngitis

Treatment:

Supportive management:

1. Avoid cold water or other drinks, ice cream.
2. Mouth wash: if age > 6 years. Rinse with 10ml water for about 1 min BD.
    a. Chlorhexidine mouthwash (0.2%): Oral-C mouthwash (Uni), Oralon Solution (ACI), Ororinse mouthwash
    b. Povidone-iodine mouthwash: Povidon MW(SK), Povisep (Jayson), Viodin MW(Square)
3. Paracetamol: Napa (Bex), Ace (Square), Renova (Opsonin), Fast (Acme), Reset (Incepta)
   Susp. 5ml=1 tsf = 120mg; Drop = 1ml = 80mg; Supp. 60mg/125mg/250mg/500mg
   Dose: 15mg/Kg/dose 4-6 hourly

Antibiotics:

1. **Amoxycillin**: Fimoxyl(SA)/Moxacil(Sq)/Moxin(O)
   Syrup: 1 tsf= 125 mg; drop 1ml=100mg; Cap. 250mg

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Dose: 25-50 mg/kg/day, BD/TDS for 7-10 days. 80-90mg/Kg/day for OM.
Combination with clavulanic acid:
Moxaclav, Tyclav, Fimoxyclav, Moxaclav Forte, Tyclav BID, Fimoxyclav ES

2. Oral **Penicillin**: Phenoxymethylpenicillin 50mg/Kg/day 6 hourly for 10 days
   Syp. 125mg/5ml, 250mg/5ml Forte. 250mg tablet, 500mg DS tablet
   Trade names: Penvik (Square), Oracyn K(Synovia)
3. Oral **cephalosporins**:
   Oral Cefixime: Cef-3, Rofixim, Denvar etc.
   Dose: Oral 8 mg/kg/24 hr divided q12-24h (Nelson 22nd edition. Higher dose is commonly prescribed in BD)
   Oral Cefuroxime: Cefotil, Rofurox, Furotil. 125, 250mg tablet, 125mg/5ml suspension, 1.5gm, 750mg Injection
   Dose: Oral: 20-30 mg/kg/24 hr divided q8-12h
   IV or IM: Neonates: 40-100 mg/kg/24 hr divided q12h; Children: 200-240mg/kg/24 hr divided 8h

Click here for dosage of other antibiotics

Note: Most common cause of pharyngitis is viral. But Streptococcal pharyngitis leads to risk of acute rheumatic fever. So, treat with antibiotics if symptoms persist for more than 2 days or investigations suggest a bacterial infection.

Clinical Feature:

1. Fever,
2. Sore throat,
3. Pain during deglutition,
4. Nasal discharge,
5. Throat discomfort etc.

[Exudate of pharynx with enlarged lymph node & absence of nasal discharge indicates bacterial infection]

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Common cold

Viral infection of the upper respiratory tract (also called an **upper respiratory infection or URI**). Colds usually last less than a week and are caused by different respiratory viruses (Rhinoviruses commonest. + human coronaviruses, parainfluenza viruses, adenoviruses, enteroviruses and human metapneumovirus).

Differential Diagnoses:

Mild to moderate:

1. Allergic rhinitis
2. Middle ear infections (infection behind the ear drum)
3. Sinus infections

Potentially severe:

1. Asthma attacks (wheezing, difficulty breathing)
2. Bronchiolitis (infection of the small airways)
3. Bronchitis (infection of the large airways)
4. Pneumonia (infection of the lungs)

Treatment: Mostly supportive.

Common measures:

1. Get plenty of rest.
2. Drink plenty of fluids.
3. Use a clean humidifier or cool mist vaporizer.
4. Use saline nasal spray or drops.
5. For young children, use a rubber suction bulb to clear mucus.
6. Use honey to relieve cough for adults and children at least 1 year old.
7. Babies younger than 1 year old should not be given honey.

For Fever,
Paracetamol 15mg/Kg/dose 4-6 hourly
Susp. 5ml=1 tsf = 120mg; Drop = 1ml = 80mg.
Suppository 60mg/125mg/250mg/500mg
Napa (Bex), Ace (Square), Renova (Opsonin), Fast (Acme), Reset (Incepta)

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Allergic rhinitis

C/F: Sneezing, nasal blockage, and clear rhinorrhea. Sniffing, snorting and rubbing nose (allergic salute), nasal crease. Nasal congestion and blockage may cause sleep disturbance.

May be seasonal (hay fever) or "perennial= recurrent or present at all seasons of the year."

Co-morbidities: Asthma, sinusitis, allergic conjunctivitis and otitis media.

Investigations:

Serum IgE: may be high

CBC: Eosinophilia. Neutrophilia suggests bacterial infection.

Treatment:

- Avoid allergens. Common allergens: pollen, dander, dust, fungal spore
- Topical cromolyn sodium (2% for ophthalmic use or 4% for nasal use): Mastguard, Cromolin, Opsochrome
  For nose: For Child and Adult: 1 drop to each nostril 2 to 3 times daily.
  If perennial, start 2-3 weeks before allergy season and continue till the end of season.
- Intranasal Steroid spray
- Oral montelukast
- **Antihistamines:**
  - **Cetirizine** = Alatrol, Atrizin, Rhinil, Nosemin
    Drop. 2.5mg/ml, Syp. 5mg/5ml, Tab. 10mg
    Dose: 6 months to 2 yrs: 2.5mg once daily, 2 – 5 yrs : 2.5mg once daily to max 2.5mg 12 hourly
  - **Levocetrizine**= alcet (HC), seasonix (IBN Sina)
    Tab. 5mg, syp. 2.5mg/5ml
    6ml- 2yrs: half tsf once daily
    2-5 yrs: 1 tsf = half tab. Once daily
    5yrs and above: 5mg (=1 tab = 2 tsf) once daily
  - **Diphenhydramine:** Adryl, Pedeamin, Phenadryl,Rymin, Dorenta
    Syp. 10mg/5ml
    Children under 2 years: 2.5 mL every 4 to 6 hours.
    Children 2 to under 6 years: 5 mL every 4 to 6 hours.
    Children 6 to 12 years: 10-20 mL every 4 to 6 hours.
    Adults and children≥12 years: 10-20 mL every 4 to 6 hours.
  - **Chlorpheniramine maleate:** Histacin, Histalex, Histal
    Syp. 2mg/5ml
    Dose: Child-
    6-12ears: 2 mg every 4-6 hours, maximum 12 mg daily.

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6-13 2-5 years: 1 mg every 4-6 hours, maximum 6 mg daily.
1-2 years: 1 mg twice daily.
Below 1 year the use of Chlorpheniramine Maleate is not recommended.

- **Bilastine:** Biltin, Beltas, Bilan
  Syp. 12.5mg/5ml, Tab. 10mg, 20mg
  Children between 6 to 11 years: Max.10 mg Bilastine mouth dissolving tablet (1 tablet).
  Children between 2 to 11 years: 4 ml once daily.

- Topical Decongestant (try to avoid, if necessary, give for 7 days and then 2-3 weeks of gap) for children 0.025%, for adult 0.05%.
  - Oxymetazoline: Afrin (Aristo), Azolin (Acme), Rynex (incepta), Xylocon (Square), Zoli (HC)
  - Xylometazoline (0.05%): Antazol (Square), Rhinozol (Acme) 2 drops per nostril 2-3 times per day 7 days

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Bronchial Asthma

Diagnose as: **mild/moderate/severe** acute exacerbation of **intermittent/mild persistent/moderate persistent/severe persistent asthma**

	Daytime Symptoms	**Nighttime Symptoms**	**FEV_1 or PEF**
Intermittent	Asymptomatic. ≤ 2 days/week & Normal PEF between attacks	≤ 2 times in a month	>80% Predicted Variability <20%
Mild Persistent	> 2 days in a week, but not daily < 2 times in a day	> 2 times in a month, but not weekly	≥80% Predicted Variability <20 - 30%
Moderate Persistent	Daily attacks Affect Activity	> 1 attack/ week, but not nightly	>60 - <80% Predicted Variability >30%
Severe Persistent	Throughout the day	Often every night	≤60% Predicted Variability >30%

Classification of acute exacerbation of asthma:

	C/F	**Mild** Go To Rx	**Moderate** Go To Rx	**Severe** Go To Rx	**Life threatening**
Symptoms	Breathless during	Walking	Talking	Resting	Mute
	Talks in-	sentences	Phrases	Words	Silent
	Consciousness	Alert	Agitated	Agitated	Drowsy or confused
Signs	Body position	Can lie down	Prefers sitting	Sits upright	Unable to recline
	Resp. Rate	<25/min	25-30/min	>30/min	>30/min
	Accessory muscle use	No	Yes	Prominent	Paradoxical
	Wheeze	+	++	+++/silent	absent
	Pulse Rate	<100/min	100-120/min	>120/min	Bradycardia

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	Pulsus paradoxus	Absent	Absent	Present	Absence: suggests resp. Muscle fatigue
Functional assessment	PEF/FEV1 predicted/personal best	≥ 70%	40-69%	<40%	<25%
	PaO_2 (on air, mmHg)	Normal	≥ 60	<60; possible cyanosis	<60; possible cyanosis
	PCO_2(mmHg)	<42	<42	≥42	≥42
	SpO_2(on air)	>95%	90-95%	<90%	<90%

Identify the step for the new case:

Criteria	Score	
	Yes	No
Do you have dyspnea every day?	1	0
Do you have nocturnal attack of dyspnea more than two times per month?	1	0
Have you suffered from dyspnea, which were severe enough to necessitate steroid tablets, nebulize therapy and aminophylline injection	1	0
Do you have persistent dyspnea for last six months or more or are you taking steroid tablets for one year or more	3	0
Is patient's baseline (during asymptomatic stage) PEFR<60% of predicted value? (not applicable for <5ys)	1	0

Score	**Corresponding step**
Score 0	Step 1
Score 1	Step 2
Score 2	Step 3
Score 3-4	Step 4
Score 5-7	Step 5

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Mild Asthma Attack (can be treated at home)

1. Reassurance
2. **Salbutamol = Windel plus/ Sulprex** (salbutamol+ ipratropium bromide)

   Metered Dose Inhaler (MDI) 100µg/puff or

   Nebulize with respirator solution 0.03ml/Kg + 3 ml Normal saline – 6 hourly/

   Nebulize with nebule (1 nebule = 2.5mg) <5yr 0.5ml/dose >5yr 1ml/dose

Or, orally at home, give-

3. Syp. Levosalbutamol/ Brizy/ Brodil Levo/ Levostar (1mg/5ml)

6-11yrs, 1 tst TDS;

>12 yrs, 1-2 tsf TDS

Prevention:

- Using facemask
- Avoid triggers (ASTHMA):
  - Allergens: pollen, dander, dust, fungal spore
  - Sports: exercise, games, travelling
  - Temperature: cold, wet, windy weather
  - Heredity: Environmental factors
  - Mites
  - Anxiety: stress, worries.

Try to avoid or use preventer (inhaled corticosteroid) in advance.

Moderate Asthma Attack (at home)

1. Reassurance
2. **Salbutamol = Windel plus/ Sulprex** (salbutamol+ ipratropium bromide)

   Metered Dose Inhaler (MDI) 100µg/puff or

   Nebulize with respirator solution 0.03ml/Kg + 3 ml Normal saline – 6 hourly/
   Nebulize with nebule (1 nebule = 2.5mg) <5yr 0.5ml/dose >5yr 1ml/dose

Or, orally at home, give-

3. Syp. Levosalbutamol/ Brizy/ Brodil Levo/ Levostar (1mg/5ml)

6-11yrs, 1 tst TDS;

>12 yrs, 1-2 tsf TDS

4. **Syp. Prednisolone /Cortan/ Precodil/ Deltasone (5mg/5ml)**
   1-2mg/Kg/day PO TDS---------- 5 days

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Severe Acute Asthma

℞ on admission on *date* at *time*

1. **NPO till F/O if unable to feed & allow feeding as soon as possible**
2. **Nebulized sulbutamol/Windel/Sultolin**
   0.03-0.06ml/Kg+ 3 ml normal saline every 20 min for 3 times or continuously
   [0.15-0.3mg/Kg/dose]
3. **Propped Up Position.**
4. **O_2 inhalation 4-6 L/min stat and continue**
5. **Inf. Libott S junior (....ml)**
   IV @$\frac{ml}{25}$µd/min stat & daily
6. **Inj. Ceftriaxone (1gm/10ml)**
   0.5-1ml/kg IV stat & once daily
7. **Inj. Hydrocortisone/Cotson (100mg/2ml)** *[3-4mg/kg 4-6 hourly]*
   0.1ml/Kg IV 6 hourly
   or
   Syp. Prednisolone/Precodil (5mg/5ml) or (15mg/5ml)/Cortan/Deltasone *[2mg/Kg/day]*
   $\frac{0.04\times wt}{5ml}$ tsf PO in 2-3 divided dose

   [Use oral tablet if possible, **tab. cortan/pred/deltason** 10mg/20mg, single morning dose, after meal, for 5-7 days as rescue therapy]
8. **Inj. Omeprazole (40mg/10ml)**
   0.2ml/Kg IV stat & once daily

If no improvement:
Add **Ipratropium bromide** (250mcg/ml respirator solution) i.e. use Windel Plus/Sulprex

If no improvement:
Add nebulized **Budesonide** (Budicort Nebuliser Suspension 0.5 0.5mg/2ml) = RESPULES

Order:
Nebulise with Budicort 0.5 (1-2ml + 2ml normal saline)- stat & 12 hourly

If no improvement:
Add Inj. **Aminophylline** (125mg/5ml)

In Neonate, (for apnea of prematurity or bronchospasm), loading dose: 6mg/Kg (0.24ml/Kg); maintenance dose: 2.5-3mg/Kg/dose (0.1ml/Kg/dose) 12 hourly

Order:
Inj. Filin (125mg/5ml)
0.24ml/Kg IV stat & 0.1ml/Kg IV 12 hourly, or
Inj. Filin (125mg/5ml)
0.5ml in each 100 IV fluid

If no improvement-
Nebulization with **Adrenaline** (1:1000), $MgSO_4$

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Order:
Nebulize with inj. Adrenalin (1:1000) 1ml + 2 ml normal saline – stat & 12 hourly

In refractory cases: Mechanical ventilation & ICU support.

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Cardiovascular System

Treatment of hypercyanotic spell

1. Knee-chest position or squatting
2. Bed rest and restriction of activities and keep the child in a calm environment
3. Oxygen inhalation @3-5L/min via face mask/headbox
   If spell persist,
4. Inf. Normal Saline 20ml/Kg bolus
5. Inj. Morphine: 0.1-0.2mg/Kg SC stat (to keep the child calm and to relax muscles of infundibulum)
6. Inj. Sodib (NaHCO3) 7.5%/Sodium bicarbonate Inj. Sodib initial dose 1ml/Kg IV over 30 min

   [Sodib 7.5% 25ml ampule = 0.9mEq/ml] 8.4% solution has 1mEq/ml. Monitor ABG
   In neonate/infant, dilute 1:1 to 0.5mEq/ml using Dextrose solutions (DA) then administer over 2 hours
7. Inj. Propranolol IV 0.1mg/Kg (to relax muscles of infundibulum)
   If spell still persists,
8. Inj. Phenylephrine 10-20microgram/Kg stat S/C or IM &
   0.1-0.5microgram/Kg/min IV infusion. Titrate according to BP, HR.

If no spell in a case of TOF patient:

1. High calorie diet
2. Oral propranolol: 0.25-1mg/Kg/day BD. Trade names: Indever 10mg, 20mg, 40mg tablet.
3. Oral iron: 3-6mg/Kg/day elemental iron
4. Tab. Folison 5m. 1 tablet stat & 0+0+¼ continue

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Heart Failure

Cardinal features of heart failure in children: tachycardia, tachypnea, cardiomegaly and hepatomegaly.

℞ on admission on *date* at *time*

9. Propped up position
10. Bed rest and restriction of activities
11. Salt restriction
12. Maintenance of body temperature
13. NPO till F/O if RR ↑↑. If distress is mild give breast feeding or NG tube feeding
14. Humidified O_2 inhalation stat & SOS. Target saturation >90%
15. Inf. 10% BS or Inf. Libott-S Jnr if on NPO order. (fluid restriction of 30%)
16. Inj. Ceftriaxone (1gm/10ml) *[50-100mg/Kg/day 12 hourly]*
0.5-1ml/Kg IV stat & daily
17. Inj. Lasix (20mg/2ml)
0.1× wt ml IV stat & daily at morning
18. Tab. Captopril/Cardopril 25mg/Acetor(Drug Int)/Captril(Alco) [0.25-6mg/Kg/day in 2-4 dose]
0+¼+¼ (starting dose if wt is 50K, then titrate)
19. Digoxin (Inj. Digoxin 0.25mg/ml 2ml ampule, Tab. Digoxin 0.25mg, Syp. Digoxin 0.25mg/5ml)

[For a 5 Kg child, TDD (IV)= 0.03×5= 0.15mg = 0.15÷0.25= 0.6ml = 60 U (in insulin syringe 1ml = 100U). We can **write order** as follows-
Inj. Digoxin (0.25mg/ml)
30U IV stat, 8 hours later
15U IV stat, 8 hours later, then
15U IV BD]

20. Please maintain pulse-digoxin chart (date, time, pulse, signature)

DIGOXIN (Nelson 22e, p2898, ch 491)
Digitalization (½ initially, followed by ¼ in 12h interval twice × 2)

Premature: 20 µg/kg;
Full-term neonate (up to 1 mo): 20-30µg/kg;
Infant or child: 25-40µg/kg
Adolescent or adult: 0.5-1 mg in divided doses

Maintenance digoxin† 5-10µg/kg/day, divided q12h [5-10µg = 0.005-0.01mg]
Note: These doses are PO; IV dose is 75% of PO dose

1 mg = 1000µg
0.005mg = 5 µg; 0.01mg=10 µg

Syp. Digoxin 0.25mg/5ml
= 0.05mg/ml
= 0.01mg/3drops

Here I have discussed digitalization. To see details of other inotropic agents (e.g., dopamine, dobutamine) click here.

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Digitalization(2)

Routine digitalization PO within 24 hour. Calculate total digitalization dose (TDD) 0.04mg×wt in Kg. Give ½ the dose stat. ¼ of TDD 12 hours later, ¼ of TDD of the dose another 12 hours later. Continue ¼ of TDD 12 hourly, starting from 12 hours after full digitalization.

Rapid digitalization: Intravenous. For infants and childrens with frank heart failures. Dose: 0.03mg/Kg. Perform ECG, (before loading and maintenance dose to get the baseline rhythm and PR interval), S. electrolytes, and S. calcium level.

Slow digitalization: For chronic congestive HF who does not want to be hospitalized. Start and continue ¼ of TDD 12 hourly, starting from 12 hours after full digitalization.

Digoxin toxicity:

Extracardiac manifestations:

- Anorexia, nausea, vomiting, diarrhoea
- Altered color vision
  - ✓ chromatopsia – green/yellow
  - ✓ Blurred vision – photopsia

Cardiac manifestations:

- Bradycardia: the following rates are often taken as a guide to digoxin toxicity:
  - ✓ Infants: below 100/min
  - ✓ Young infants: below 80/min
  - ✓ Older children: below 60/min
- Dysrhythmia: Multiple ventricular ectopics, ventricular bigeminy, paroxysmal atrial tachycardia, ventricular tachycardia, ventricular fibrillation

ECG changes with digoxin toxicity:

- Prolongation of PR interval
- Profound sinus bradycardia or sinuatrial block
- Supraventricular arrhythmias
- Ventricular arrhythmia

The following potentiates digitalis toxicity:

- ✓ Hypokalemia
- ✓ Hypomagnesemia
- ✓ Hypercalcemia
- ✓ Myocarditis and Prematurity

Treatment of Digoxin Toxicity:

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- Stop digoxin, start continuous ECG monitoring
- Check urea, electrolytes, and plasma digoxin level
- Correct hypokalemia and/or dehydration
- Correct bradycardia by using atropine and/or pacing
- Treat atrial tachycardia with beta-blocker
- Treat ventricular tachycardia with lignocaine
- Use antidote digoxin immune fab.

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Shock

℞ on admission on *date* at *time*

Start with ABCs

1. Oxygen inhalation
2. Fluid infusion:
    a. Inf. Normal Saline 20ml/Kg stat infused over 5-10 minutes

[If there is no improvement, repeat the same. May require up to 40-60ml/Kg and maximum up to 200ml/Kg over 1st hour. If no improvement, it is labelled as **fluid refractory shock** and needs **inotropic support**.]

If the requirement is high,

b. Infusion Dextran 40 5ml/Kg/day in infants, 10ml/Kg/day in children for 5 days. Max. 20ml/Kg on D1 Or,
Infusion albumin (5% or 25% in 50ml or 100 bottles): 0.5-1gm/Kg/dose
Trade names: Albutein, Human albumin, Albunorm
Packed RBC can also be given@10ml/Kg to maintain PCV 30% of Hb 10g/dL

3. Inotropic drugs: Ref: Nelson 22nd Ed, p610, Table 85.7
    a. **Inj. Dopamine** (200mg/5ml = 40mg/ml): 2-10µ/Kg/min causes increased cardiac contractility with little peripheral vasoconstriction. >15pg/Kg/min causes peripheral vasoconstriction.
    Calculate daily dose & divide for each 100ml IV fluid. Add the amount to the microburet set.
    For example, for a 10Kg child, total daily dose would be,
    10×10 µg/min = 100×60 (min)×24(hr) µg/day= 144000µg/day= 144mg/day =3.6ml (144÷40=3.6) /day.
    If the child is receiving 500ml of maintenance IVF daily, add 0.72ml in each 100ml IVF & label the microburet set.

    1gm = 1000mg
    1mg = 1000 µg
    1µg = 1000pg

    b. **Inj. Dobutamine** (12.5mg/ml), Ampule =20ml = 250mg
    Dose: Neonate: 3-10µg/Kg/min constant infusion.
    Dobutamin and Dopamine can be used simultaneously to avoid high dose of dopamine.
    c. **Inj. Epinephrine** 0.05-2.0µg/kg/min. 1 amp (1:1000) = 1mg/ml.

4. Acid-base normalization: $NaHCO_3$ [Sodib 7.5% 25ml ampule = 0.9mEq/ml] 8.4% solution has 1mEq/ml. Monitor ABG.
    If pH <7.2, Inj. Sodib initial dose 1ml/Kg IV over 30 min
    In neonate/infant, dilute 1:1 to 0.5mEq/ml using Dextrose solutions (DA) then administer over 2 hours

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Adverse effect: volume expansion (in DKA), hyperosmolality, metabolic alkalosis, hypernatremia, hypokalemia, hypocalcemia. Extravasation leads to tissue necrosis.

5. Correct hypocalcemia and hypoglycemia if present.
6. **Antibiotics**: Appropriate (3rd generation cephalosporin with vancomycin) should be given, especially in septic shock.
7. **Adjunctive therapy:**
   Stress doses of **hydrocortisone** (50-100mg per m^2 per day) can be considered for children with fluid-refractory, catecholamine-resistant shock without a reversible etiology immunotherapy, ECMO
8. Treatment of the cause(s)

Common causes of shock in children:

1. Hypovolemic (decreased circulating blood volume):
   a. Fluid and electrolyte loss: diarrhoea, vomiting, and pathologic renal loss
   b. Blood loss: intracranial and GI bleeding
   c. Plasma loss: Leaky capillaries from sepsis, DSS, 3rd space loss from intestinal obstruction and peritonitis, burns.
   d. Endocrine causes: Diabetes insipidus, adrenal insufficiency
2. Cardiogenic (pump failure):
   a. Myocardial insufficiency: CCF, cardiomyopathies, arrhythmias, myocardial depression due to hypoglycemia.
   b. Outflow obstruction: Cardiac tamponade, tension pneumothorax
3. Distributive shock: Leakage due to endothelial injury.
   a. Sepsis
   b. Anaphylaxis
   c. DSS
   d. Prolonged hypoxia or ischemia

Nelson 22nd edition separately discuss obstructive shock, dissociative shock, septic shock, SIRS, too. Go through chapter 85(p600) for details.

Adequate MAP (mean arterial pressure) is fundamental to ensure adequate perfusion and organ function. Urine output and creatinine clearance can be used as an indicator of adequate perfusion pressure.

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Stages of shock: Few minutes to hours. Three stages- i. Early compensated shock, ii. Decompensated shock, iii. Irreversible shock.

Clinical Parameter	Stage I	Stage II	Stage III
Heart rate	Tachycardia	Marked Tachycardia	Severe Tachycardia Bradycardia
Resp. rate	Normal	Tachypnea	Tachypnea/apnea
BP	Normal	Hypotension	Severe hypotension
Pulse Pressure	Normal	Low	Markedly low
Skin	Cool	Mottled	Cold and cyanotic
Mental status	Anxious	Obtunded	Coma
Urine	Normal	Oliguria	Anuria

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Capillary hemangioma

Most capillary hemangiomas resolve on their own without the need for intervention. The treatment for capillary hemangiomas depends on the size, location, and symptoms.

1. **β-blockers: Oral propranolol** (Tab. Indever 10/20/40mg): start with 0.5 to 1 mg/kg per day, divided into two or three doses & titrate up to 1 to 3 mg/kg per day, divided into two or three doses, based on the patient's response and tolerance.
   Maintenance: Generally, the maintenance dose is 2 to 3 mg/kg per day, divided into two or three doses.
   Monitoring: Before starting treatment, a thorough medical evaluation including cardiac assessment is performed. **BP, HR, RBS**, especially during the initial dosing period and after dose adjustments. **Duration**: Several months, often until the hemangioma completes its proliferative phase and shows signs of involution.
   Timolol Maleate(0.5%): For periocular or facial lesion
   Ophthalmic preparation, Timocare (HC), Timofix(OSL), Intramol (Bex).
   Apply one drop with gloved finger or cotton swab on the hemangioma surface and let it dry. Twice daily. For 3-4 months. Follow up, 2-4 weekly and then monthly.
2. **Corticosteroids**: These can be administered orally or injected directly into the hemangioma.
3. Laser therapy
4. **Surgery**: In some cases, surgical removal might be necessary, especially if the hemangioma is affecting function or causing other complications.

Natural Course: Capillary hemangiomas typically follow a predictable course, which can be divided into three phases:

Proliferative Phase (Growth Phase): Usually occurs within the first few weeks to months after birth. The lesion becomes more prominent and can vary in color from bright red to purplish.

Involution Phase (Regression Phase): Begins around 6-12 months of age and can continue for several years. Shrink and fade. Bright red to grayish or whitish.

Involuted Phase (Final Phase): Typically, by the age of 5-10 years. Becomes much smaller and may leave behind residual skin changes such as telangiectasia (small visible blood vessels), loose skin, or scar tissue.

Indication of propranolol for capillary hemangioma: Propranolol, a beta-blocker, is commonly indicated for the treatment of infantile capillary hemangiomas. The specific indications for propranolol include:

1. Rapidly Growing Hemangiomas
2. Ulceration

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3. Functional Impairment
4. Cosmetic
5. Large or Disfiguring Hemangiomas.

The treatment is usually well-tolerated, but it requires careful monitoring for potential side effects, such as bradycardia (slow heart rate), hypotension (low blood pressure), and hypoglycemia (low blood sugar).

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Alimentary System

Oral Thrush

Treatment**:**

Candex/Nystatin/Nystat(Ak) Oral drop (1 ml contains 1 lakh unit)
Dose: a. Neonate: 1 ml 6 hourly
b. Infant: 2 ml 6 hourly
c. >1 year: 4 ml 6 hourly
This drug must be applied for up to 7 days after healing. Teach the caregiver to apply after feeding drop by drop over lesion, then spread over it by finger.

For infants and older children,

Miconazole oral gel can be applied to 4 times/ day. Example, Micoral, Gelora, Mycon etc.

Oral fluconazole is another option for refractory cases.

Abdominal pain

Recurrent Abdominal Pain (RAP) refers to at least 3 episodes of abdominal pain over a 3-month period, which is significant enough to interfere with child's normal activity.

Acute Abdominal Pain: Sudden. Commonly surgical.

Causes:

Surgical causes:

1. Acute appendicitis
2. Intestinal obstruction
3. Renal Calculi
4. Intussusception
5. Acute Cholecystitis
6. Ovarian torsion/Testicular torsion

Medical Causes:

1. Acute Dysentery
2. Acute Pyelonephritis
3. Acute Pancreatitis
4. Mesenteric lymphadenitis
5. Henoch-Schonlein Purpura (HSP)
6. Basal pneumonia

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Treatment options for abdominal pain:

1. Paracetamol: (Ace/Napa/Renova/Reset, Syp 120mg/5ml, Drop 80mg/ml)
   15mg/Kg/dose 4-6 hourly

2. Ibuprofen (Inflam/Flamex/Adflam 200mg, 400mg tablet & 100mg/5ml)
   10mg/Kg/dose 6-8 hourly

3. Hyoscine Butylbromide (Inj. Butapan, Tab. Butapan 10mg, 20mg; Hysomide)
   Dosing (Pediatric): ≥6 years: 10–20 mg up to 3x/day (oral/IM).
   Safety: Avoid in glaucoma, bowel obstruction, or tachycardia.
   Fewer CNS side effects than hyoscine hydrobromide (scopolamine).

4. Tiemonium methylsulphate Tab. 50mg, Syp. 10mg/5ml, Inj. 5mg/2ml [6mg/Kg/day TDS]
   Algin/Norvis/Onium/Viset/Visral/ Syp. Algin (10mg/5ml)
   2 tsf PO TDS; or,

   Inj. Algin (5mg/2ml)
   1 amp. IV stat TDS

   Safety is not studied sufficiently in children.

5. Dicycloverine Hydrochloride (e.g., Tab. Colicon 10mg, 10mg/5ml/ Cyclopan)

   Dosing (Pediatric): ≥2 years: 5–10 mg every 6–8 hours (max 40 mg/day).
   Safety: Avoid in infants <6 months (risk of apnea, seizures).
   Side effects: Dry mouth, dizziness, constipation.

6. Tramadol HCl (Anadol/Syndol 100mg/2ml injection, 50mg capsule, 100mg SR capsule, 100mg suppository)

   From the age of 1 year, 1-2 mg/kg body weight.

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Outdoor Mx of Acute Diarrhea

Definitions:
Acute Gastroenteritis (AGE): diarrhoea + vomiting ± abdominal pain ± fever
Dysentery: Frequent small stools containing visible blood, accompanied by fever, tenesmus and abdominal pain.
Prolonged Diarrhea: 7-13 days
Persistent diarrhea: lasting 14 days or more
Bloody diarrhea: large volume bloody stool with less systemic illness

Treatment:
Syp. Zinc/ Nid(O)/ Mazic(R)/ Xinc(Sk)/ Zesup(Sq) (10mg/5ml)
<6 month: half tsf, b.d
>6 month: 1 tsf, b.d.

ORS: <2 years: 10-20 tsf >2 years: 20-40 tsf, after each purging.

If bacterial infection suspected,

Susp. Azithromycin /AZ(Ar)/Odazyth(A)/ Zimax(Sq)/ Rozith(HP)/Zithrin (R) 1 tsf = 200mg, 10 mg/kg/day, OD. .....for 5days.

Susp. Nitazoxanide (100mg/5ml)/Zox/Zoana
$Year_{1\text{-}3}$: 1 tsf PO BD for 3 days;
$Year_{4\text{-}11}$: 2 tsf PO BD for 3 days

If amoebic Dysentery (blackish Stool, more mucus, abdominal pain)

Susp. Metronidazole/ Flamyd(I)/ Amodis(Sq)/ Metryl(O)/ Metro(Z)/ Filmet(B)

(200mg/5ml), 7.5mg/kg/dose, tds for 5 days

If bacillary dysentery (more blood, so reddish stool; less mucus, fever, toxic)

Susp. Ciprofloxacin: Ciprocin (Sq)/ Ciprox(O)/ Beuflox(I)/Neofloxin(B) /Cipro-A (Acme)

Syp. 250mg/5ml Inj. 200mg/100ml

IV/Oral dose: 10/mg/kg/dose, b.d for 5-7 days.

If abdominal distension, then (suspect hypokalemia):

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Syp. KT
<1 yr : half tsf, tds

>1 yr: 1 tsf, tds for maximum 5-7 days, as there may develop Hyperkalaemia.

If there is Perianal excoriation:

De Rash Cream (Zinc oxide 40%)

Apply locally TDS over perianal region

If vomiting present:

Syp. Ondansetron (4mg/5ml) /Emistate/Anset/Ofran
0.2mg/Kg (0.25ml/Kg) PO 8 hourly

[or, single sublingual oral dissolvable tablet, 4mg = 4-11Y & 8mg = >11Y. Zofra ODT, Onaseron ODT]

If there is Malnutrition, use ReSoMal,

(Water 850ml+ 3 tsf Syp. KT+ 4 Sugar+ ORS 1 pack)

Add during discharge,

Syp. B-complex (Thiamine Hydrochloride 5mg, Riboflavin 2mg, Pyridoxine hydrochloride 2mg, Nicotinamide 20mg)/5ml

Name: V-plex/B-50 Forte/Aristoplex

Consider **Severe acute malnutrition (SAM)** if one of the following present:

MUAC <115mm or, WHZ <-3SD, or Bipedal edema in case of 6-59months.

In <6months old infant: visible wasting or WHM <70% or <-3SD or Bipedal edema.

If Severe Acute Malnutrition present, click here.

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Acute Watery Diarrhea

Remember: Management of SAM with Diarrhoea is different. Please see Diarrhoea management in SAM in here.

With some dehydration:

Ideally should be treated in ORT with ORS with **75ml/Kg in 4 hours** & then reassessed. But we use modified treatment protocol as follows:

℞ on admission on *date* at *time*

1. Diet: Normal (BF+CF) [**Feeding advice:** Fat and food/drinks with simple sugar to be avoided]
2. Inf. Cholera Saline 75ml/kg in 8-10 hours.
   IV @ $\frac{75\times wt}{hours}$ µd/min stat
3. Inf. Ciprofloxacin (200mg/100ml)/Ciprocin/Neofloxin/Aprocin *[10mg/Kg/dose BD]*
   5×wt ml IV stat & 12 hourly
   OR
   Susp. Azithromycin (200mg/5ml)/Zimax/Zithrox *[10mg/Kg/dose once daily]*
   10mg/Kg PO stat & once daily *[Nelson 21ed: 12mg/Kg/dose on D_1, 6mg/Kg/dose D_2, D_3]*
   OR
   Susp. Nitazoxanide (100mg/5ml)/Zox/Zoana
   $Year_{1\text{-}3}$: 1 tsf PO BD for 3 days;
   $Year_{4\text{-}11}$: 2 tsf PO BD for 3 days
4. Syp. Zinc (10mg/5ml)/Zesup/Nid/Xinc/Pep-e *[2mg/Kg/day]*
   < 6 months- 10mg/day; > 6 months- 20mg/day
   ½ tsf PO BD; 1 tsf PO BD
5. ORS
   < 2 years- 50-100ml
   > 2 years- 100-200ml after each purging

If **vomiting** present:

6. Syp. Ondansetron (4mg/5ml) /Emistate/Anset/Ofran
   0.2mg/Kg (0.25ml/Kg) PO 8 hourly
   Or,
   Inj. Ondansetron (8mg/4ml)
   0.1ml/Kg IV stat & 8 hourly

[or, single sublingual oral dissolvable tablet, 4mg = 4-11Y & 8mg = >11Y. Zofra ODT, Onaseron ODT]

If there is **abdominal distension**:

7. Syp. Potassium (7.6 mmol/5 ml)/KT/Electro K [2-4 mmol/Kg/D]

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If around 5Kg, 1/2 tsf PO BD; If around 10Kg, 1 tsf PO BD

If there is **abdominal pain:** To see all drugs for abdominal pain click here.

Tiemonium methylsulphate Tab. 50mg, Syp. 10mg/5ml, Inj. 5mg/2ml [6mg/Kg/day TDS]
Algin/Norvis/Onium/Viset/Visral
Syp. Algin (10mg/5ml)
2 tsf PO TDS; or,

Inj. Algin (5mg/2ml)
1 amp. IV stat TDS

If there is **Perianal excoriation:**
QRash/Happynap/Napgaurd/De Rash Cream (Zinc oxide 40%)
Apply locally TDS over perianal region

With severe dehydration

Inf. Cholera Saline 100ml/Kg

Age of the Child	First, give 30ml/Kg over	Then, 70ml/Kg over
< 12 months	1 hour	5 hours
≥ 12 months	½ hour	2½ hours

Example: For a 10Kg boy, aged > 1 yr;

Inf. Cholera saline 300ml
IV@ $\frac{300}{0.5\times4}$ =150 drops/min (@running) over 30 min,
Then 700ml, IV @ 70drops/min over 2½ hours
Rest: same.

If you suspected *E. histolytica* infection, click amoebiasis

If you suspected *Giardia intestinalis* infection, click giardiasis

Features of dehydration with Na+ deficit/excess

Parameters	**Isonatremic Dehydration** (proportionate loss of water and sodium)	**Hyponatremic dehydration** (loss of sodium in excess of water)	**Hypernatremic dehydration** (loss of water in excess of sodium)
ECF vol	Markedly Decreased	Severely decreased	Decreased
ICF vol	Maintained	Increased	Decreased
Physical signs			
Skin color	Gray	Gray	Gray
Temp.	Cold	Cold	Cold or hot
Turgor	Poor	Very poor	Fair
Feel	Dry	Clammy	Thickened, doughy
Mucous membrane	Dry	Slightly moist	Parched

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Eyeball	Sunken soft	Sunken and soft	Sunken
Fontanel	Sunken	Sunken	Sunken
Psyche	Lethargic	Coma	Hyperirritable
Pulse	Rapid	Rapid	Moderately rapid
BP	Low	Very low	Moderately low

Persistent Diarrhea

Starts acutely and lasting >14 days or more

Two types: Severe Persistent diarrhoea (dehydration present) and Persistent diarrhoea.

Management:

- At first, treat as AWD. If not controlled treat as like as GIARDIASIS.
- If not controlled, consider Lactose Intolerance. Give Lactose free diet. May give 'Gastrofix/Lactofix' formula for 7-10 days. Then, gradually re-introduce milk.
- Syp. Zinc/Nid(O)/Mazic(R)/Xinc(Sk)/Zesup(Sq) 2mg/Kg/day
  Or, use rough formula: <6 month: half tsf, b.d >6 month: 1 tsf, b.d
- Tab. Folison (5mg), 1 tab PO stat on D1, then 0+ 1/4+ 0
- Cap. Retinole Forte(50,000 IU): [1 cap= 0-5mo; 2 cap for 6-12 mo; 4 cap for >12mo]
- Start iron after diarrhea improved.

Dysentery

Consider BACILLARY/AMOEBIC DYSENTRY & Treat accordingly.

Consider other causes like Anal fissure, Rectal Polyp etc.

Amoebic Dysentery

- Blackish Stool
- More mucus
- Abdominal pain

Management:

Susp. Metronidazole/ Flamyd(I)/ Amodis(Sq)/ Metryl(O)/ Metro(Z)/ Filmet(B)

(200mg/5ml), 7.5mg/kg/dose, tds for 5 days

Bacillary Dysentery:

- More blood, so reddish stool
- Less mucus
- Fever
- Toxic

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Management:

Susp. Ciprofloxacin: Ciprocin (Sq)/ Ciprox(O)/ Beuflox(I)/Neofloxin(B) /Cipro-A (Acme)

Syp. 250mg/5ml Inj. 200mg/100ml

IV/Oral dose: 10/mg/kg/dose, b.d for 5-7 days.

HUS (Hemolytic Uremic Syndrome)

Remember: Antibiotic therapy in diarrhoea caused by **Enterohemorrhagic E Coli, Shigella Dysenteriae type 1 (O57:H7), salmonella, campylobacter** may lead to hemolytic uremic syndrome(HUS).

It is one of the common cause of AKI in young children in Bangladesh. (MR Khan 5th p.209).

Characterized by:

- Microangiopathic hemolytic anemia
- Thrombocytopenia and
- Acute renal insufficiency

Symptoms: Here, onset usually preceeded by gastroenteritis, or RTI (less common). After 5-10 days, sudden onset of severe pallor, weakness nad oliguria occurs.

Signs: severe anemia, dehydration, edema, petechiae, hepatosplenomegaly, and hypertension.

Management:

The primary approach that has substantially improved an acute outcome in HUS is-

- Early recognition of the disease,
- Monitoring for potential complications, and
- Meticulous supportive care.

Supportive care includes:

- Careful management of fluid and electrolytes, including prompt correction of a volume deficit, washed RBC to control anemia
- Control of hypertension, and
- Early institution of dialysis if the patient becomes significantly oliguric or anuric, particularly with hyperkalemia.
- Early intravenous volume expansion before the onset of oliguria or anuria may be nephroprotective in diarrhea-associated HUS.

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- Red cell transfusions are usually required because hemolysis can be brisk and recurrent until the active phase of the disease has resolved. Use washed RBC, in pneumococci-associated HUS.
- Platelets should generally not be administered, regardless of the platelet count, to patients with HUS because they are rapidly consumed by the active coagulation and theoretically can worsen the clinical course. Despite low platelet counts, serious bleeding is very rare in patients with HUS.

Constipation

Diet: Plenty of vegetables and water will make stool soft.

Drugs:

Lactulose: Osmolax, Avolac, Lactu, Sinalac (>1 mo). 1-3mL/Kg/day divided in 1-2 doses.

Sodium picosulphate(5mg/5ml) (Sopilax, Abdolax, Clenpic, Ezylife): Stimulant laxative. Colonic bacteria activate. Then, nerve ending stimulated to induce defecation.

Children aged 4-10 years: 2.5-5 ml or half to one teaspoonful per day.

Children from One month to 4 years of age: 0.25 ml/kg body weight per day.

Liquid Paraffin (generally, not recommended under 1 yrs old due to risk of aspiration): 1-4 tsf/day. Not to be used for more than a week.

Magnesium Hydroxide (Milk of Magnesia): 1-3ml/Kg/day divided into 1-2 doses.

2-5 years: 1-3 Teaspoonful with a full glass of water

6-11 years: 1-2 Tablespoonful with a full glass of water

Polyethylene Glycol 3350 (Aqualax) for older children (>1yr), once daily. Start with low dose of ¼th cup. And titrate upward to maintain a soft stool.

For short-term treatment (mo)

Senna (Senokot) syrup, tablets. 1-5 yrs 5ml (1 tablet) with breakfast, max 15ml daily; 5-15 yrs – 2 tablets with breakfast, max 3 tablets daily.

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Anal Fissure

H/O constipation, H/O holding stool, bright red blood on surface of stool. Painful defecation. buttocks are separated to expand the folds of the perianal skin, and the fissure becomes evident as a minor laceration. Often a small skin appendage is noted peripheral to the lesion. This skin tag represents epithelialized granulomatous tissue formed in response to chronic inflammation.

Treatment:

The goal is to ensure that the patient has soft stools to avoid overstretching the anus. The healing process can take several weeks or even several months.

If painful, Anustat ointment apply locally twice daily.

Other options for Chronic anal fissure:
Topical 0.2% glyceryl trinitrate (Tradename: Nitrovas 0.4%) reduces anal spasm and heals fissures, but it is often associated with headaches.

Calcium channel blockers, such as 2% diltiazem ointment (not available in BD) and

0.5% nifedipine cream (not available in BD), are more effective and cause fewer headaches than glyceryl trinitrate.

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Liver Failure

Treatment depends on patients condition. If patient is unable to eat/feed, has malena (bleeding from varices) give following treatment. Discuss with the midlevel doctor if there is any confusion.

℞ on admission on *date* at *time*

1. NPO till F/O
2. **NG tube suction** to empty to stomach (may contain blood)
3. **Inf. Electrodex-10 (X ml)** [Give 30% less than required maintenance fluid]
   IV@ $\frac{X}{100}$ ×4µdrops/min daily
4. **Inj. Cefotaxime (500mg/10ml)**
   1ml/Kg IV stat & 8 hourly
5. **Inj. Metronidazole (500mg/100ml)**
   1.5ml/Kg IV stat & 8 hourly
6. **Inj. K_1 MM 10mg**
   1 ampule IV stat & daily for 3 days
7. **Inj. Omeprazole (40mg/10ml)/Seclo/OP/Omep/Losectil**
   0.25ml/Kg IV stat & once daily
8. **Tab. Rifaximin/Rifagut 200mg**
   10-15mg/Kg/day in 12yrs/12+;
   higher dose in younger children
9. **Syp. Lactulose /Avolac/Osmolax**
   1-2ml/Kg PO or by NG 2-4 hourly

Lactulose: until loose stool is produced, then titrate to keep stool

If patient is stable= conscious, oriented, no hematemesis/malena, no abdominal pain, then start feeding and reduce or stop IV fluid.

Add diet- Protein restricted/no protein based on stage of encephalopathy + **fat** – restricted + **Carb:** Normal/ keep the patient euglycemic

For cerebral edema/raised ICP:

Clinical Features:
Change of consciousness

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Depressed respiration
Worsening headache
Bradycardia
Apnea
Pupillary changes
Posturing, and
Seizure

For coagulopathy:

Inj. K1 MM (for all patient, see above)

+/-

Whole blood transfusion (20ml/Kg)/Fresh Frozen Plasma (15ml/Kg)

Platelet Transfusion (to maintatin PLC > 50,000/cmm)

Treatment of cerebral edema
Elevation of head of the bed
Fluid Restriction

- Inj. Mannitol/Osmosol 20(20%) (50ml) or 1.25-5ml/Kg IV $\frac{1.25-5\times wt}{0.5}$ d/min over 30min; may be repeated every 4-6 hourly
- Inj. Frusemide/Lasix (20mg/2ml) or 0.1-0.2ml/Kg IV stat;
- Tab. Acetazolamide/Acemox 250mg *[8-30mg/Kg/day]*
  ½ to 2 tablet in divided doses

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Neurology & Psychiatric illness

Meningitis/Encephalitis/Cerebral Malaria

For patients with Fever+ Unconsciousness+ Convulsion/History of convulsion

℞ on admission on *date* at *time*

1. O_2 inhalation.
2. NPO till F/O
3. Infusion as appropriate, see here for details. (give $\frac{2}{3}^{rd}$ of daily maintenance)
   [Do not forget to subtract the 300ml given with inj. Jasoquine]
4. Inj. Dexa (5mg/1ml) *[0.15mg/Kg/dose 6 hourly]*
   0.03ml/Kg IV 6 hourly for total 8 doses.
   Dexamethasone should be given 15 mins before antibiotic.
5. Inj. Ceftriaxone (1gm/10ml) *[100mg/kg/day]*
   1ml/Kg IV stat & daily

   [Not recommended in neonate. May displace bilirubin from albumin and cause hyperbilirubinemia. Use Ceftazidime and Amikacin instead]

   If meningitis is the provisional diagnosis, add
   Inj. Ampicillin (500mg/5ml) *[400mg/Kg/day]*
   1ml/Kg IV stat & 6 hourly
6. Inj. Acyclovir (250mg/50ml)/Virux/Xovir/Acerux *[10mg/Kg/dose]*
   2ml/kg IV stat & 8 hourly.
7. Inj. Jasoquine (quinine) 300mg/5ml
   a. 0.34ml/Kg(20mg/Kg) IV stat in 100 ml inf. 10% DA over 4 hours (**loading dose**), then,
   b. 0.17ml/Kg (10mg/kg/dose) IV in 100 ml Inf. 10% DA over 4 hours - 8 hourly for 7 days (**maintenance dose**)
8. Inj. Barbit 200mg/1ml +9ml D/W, then
   give 20mg/Kg (or 1ml/kg IV stat &
   2.5mg/kg ($\frac{1}{8}^{th}$ of loading dose) IV BD
9. Continuous catheterization.
10. Posture change 2 hourly.

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11. Eye care (Iventi E/D 1 drop in each eye 8 hourly if infection)

[Acc to *Nelson Textbook of Pediatrics 21e*

- If meningitis is the strongest suspicion, empirical therapy should be-

  Inj. Ceftriaxone 1gm/10ml ---- 50mg/kg/dose --- BD +

  Inj. Vancomycin 500mg/10ml --- 20mg/kg/dose ----- TDS

- If Listeria monocytogens infection suspected, as in young infants (<02 months) or T-lymphocytic deficiency,

  Inj. Ampicillin (500mg/5ml) 300mg/Kg/day---- QDS

➢ If patient is immunocompromised and gm (-)ve bacterial meningitis is suspected, initial antibiotic may include:

  Inj. Meropenem (500mg/10ml)---- 40mg/Kg/dose TDS or

  Inj. Cefepime 500mg, 1gm, 2gm ---50mg/Kg/dose TDS

  Tetracef(Beximco)/Maxpime (Square)/Zopime(Healthcare)

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Febrile Convulsion

Age: 6 months-5 years, peak 14-18 months.

Seizure: Usually GTCS, single episode, < 5 min, with rise of temp (around 101.8°F).

No residual neurodeficit & Family History: (±).

℞ on admission on *date* at *time*

If there is active convulsion:

Immediate Management:
Inj. Diazepam (10mg/2ml)/Sedil
0.1×wt ml PR stat

Repeat if not controlled by 15 minutes, then give-

1. NPO till F/O
2. O_2 inhalation 2L/min- stat & SOS.
3. Infusion as appropriate.
4. Inj. Ceftriaxone 100mg/Kg/day/Ceftron/Traxon/Dicephin/Oricef
5. Inj. Barbit 200mg/1ml+9ml D/W, then give
   1ml/Kg IV stat & 0.125ml/Kg IV BD
6. Paracetamol Suppository 125mg/250mg/500mg

If there is any suspicion of meningitis or any atypical feature present-

7. Inj. Dexamethasone (5mg/1ml)/Dexa/oradexon
   0.03ml/Kg/dose 6 hourly for total 8 doses. (should be given 15 mins before antibiotics)

Note(4)

CSF study in febrile Seizure: Indications

1. Any doubt of meningitis/encephalitis.
2. First attack is <12 months of age.
3. Age 12-18 months associated with complex seizure/ altered sensorium.
4. If recovery is slow or undue prolongation of post-ictal sleeps.

Prophylaxis:
In general antiepileptic therapy (continuous/intermittent) is not recommended for children with one/more simple febrile seizure.

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In case of frequently recurring FS:

Intermittent prophylaxis during 3 days of any febrile illness-

Oral Clonazepam 0.01mg/Kg TDS (max 1.5mg)

Oral Diazepam 0.33mg/Kg TDS

Continuous prophylaxis:

Oral phenobarbitone 2.5mg/Kg ---BD (Tab. 30mg, 60mg, Elixir 20mg/ml)

Oral Sodium Valproate (Tab. 200mg, Syp. 200mg/5ml)

Risk Factors for Recurrence of Febrile Seizures*

MAJOR	MINOR
Age < 1 yr Duration of fever < 24 hr Fever 38-39°C (100.4-102.2°F)	Family history of febrile seizures Family history of epilepsy Complex febrile seizure Daycare Male gender Lower serum sodium at time of presentation

**Having no risk factors carries a recurrence risk of approximately 12%; one risk factor, 25–50%; two risk factors, 50–59%; three or more risk factors, 73–100%.

Risk Factors for Occurrence of Subsequent Epilepsy After a Febrile Seizure

RISK FACTOR	RISK FOR SUBSEQUENT EPILEPSY
Simple febrile seizure	1%
Recurrent febrile seizures	4%
Complex febrile seizures (>15 min in duration or recurrent within 24 hr)	6%
Fever < 1 hr before febrile seizure	11%
Family history of epilepsy	18%
Complex febrile seizures (focal)	29%
Neurodevelopmental abnormalities	33%

More than one risk factor at least in part additive.

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Status Epilepticus

SE is defined as continuous seizure activity or recurrent seizure activity without regaining consciousness lasting >5 mins.

4 SEQUENTIAL STEPS:

A. Maintenance of airway, breathing and circulation (ABC)
B. Control of convulsion: Based on Nelson 22nd Edition, p3627

1st line

IM midazolam(10mg for >40mg; 5mg for 13-40mg, single dose, or IV Lorazepam(0.1mg/Kg/dose, max 4mg/dose. May repeat once, or IV Diazepam (0.15-0.2mg/kg/dose, max 10mg/dose, may repeat once

If any of the drugs not available,

IV Phenobarbital 15mg/Kg/dose, single dose, or PR Diazepam (0.2-0.5mg/Kg, max: 20mg/dose, single dose, or Trade name: Inj. Sedil 10mg/2ml, Easium Supp 10mg Intranasal Midazolam/buccal midazolam

⬇

2nd line: One of following

IV Fosfen (20mg PE/dose, 1500mg/dose, single dose) IV Valproic Acid (40mg/Kg; max 3000mg/dose, single dose IV Levetiracetam (60mg/Kg, max: 4500mg/dose, single dose

If not available (or already given),

IV Phenobarbital (15mg/Kg)

⬇

3rd line: Choices include repeat 2nd line therapy or anesthetic dose of either thiopental, midazolam, pentobarbital, or propofol (all with continuous EEG monitoring)

Inj. Midazolam 0.2mg/Kg boluses (Max. 2mg/Kg), then 0.05-2mg/Kg/hr
Increase every 15 mins up to 2mg/Kg/hr

Trade names: Inj. Dormicum/Dormitol 15mg/3mol ampule)

Alternatively: IV Load with 0.03ml/Kg (0.15mg/Kg) followed by 1µg/Kg/min continuous infusion (see samle calculation below)

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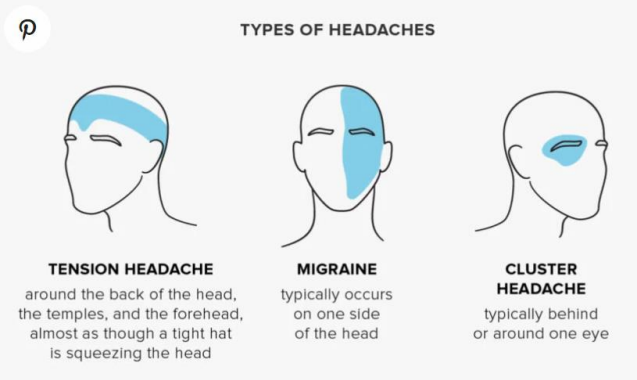
[**Midazolam: Sample calculation** for a 7Kg baby with status epilepticus

0.03 × 7=0.21ml (**loading dose**)

7×24×60µgm in 24 hours = 10,080 µgm in 24 hours = 10.08mg in 24 hours = 2.016 ml in 24 hours. (**Maintenance dose**)

If the baby receives, 600ml IV Fluid in 24 hours, then divide by 6 to find out how much to give in each 100 ml fluid (here, 2.016÷6 =) 0.336ml.



[**Nice to know**, we should calculate the total amount of midazolam in 500ml bag i.e., 1.68ml (= 0.336 × 5) in a 500ml bag. So, put 1.68ml in a 500ml IVF bag and label it properly. Then give it to parent/nurse to use it to refill the microburet set.

Write the order:

Inj. Dormicum (15mg/3ml)
0.21 ml IV stat & then
0.336ml in each 100ml IV Fluid]

* Give IV glucose, Sodibicarb, anti-edema measures (e.g. corticosteroids & mannitol)

If **acidosis** suspected (deep, rapid respiration, peripheral vasodilation, vascular collapse, shock)

Inj. Sodium bicarbonate 7.5%/Sodib/Sodium Bi Carbonate/ **Tablet = 600mg**

If **cerebral edema** is suspected (nausea, vomiting, loss of consciousness, difficulty speaking etc)

- ✓ Inj. Mannitol/Osmosol 20(20%) (50ml)
  1.25-5ml/Kg IV $\frac{1.25-5\times wt}{0.5}$ d/min over 30min; may be repeated every 4-6 hourly
- ✓ Inj. Frusemide/Lasix (20mg/2ml)
  0.1-0.2ml/Kg IV stat;
  Or
- ✓ Tab. Acetazolamide/Acemox 250mg *[8-30mg/Kg/day]*
  ½ to 2 tablet in divided doses

C. Search the cause
D. Prevention of further convulsion

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Epilepsy

Few important Definitions:(4)
Epilepsy is considered present when two or more unprovoked seizures occur in a time frame of longer than 24 hr.

Seizure disorder is a general term that is usually used to include any one of several disorders, including epilepsy, febrile seizures, and, possibly, single seizures and symptomatic seizures secondary to metabolic, infectious, or other etiologies (e.g., hypocalcemia, meningitis).

An **epileptic syndrome** is a disorder that manifests as one or more specific seizure types and has a specific age of onset and a specific prognosis.

An **epileptic encephalopathy** is an epilepsy syndrome in which there is severe EEG abnormality that is thought to result in cognitive and other impairments.

Developmental encephalopathy denotes a disorder in which the underlying etiology (e.g., a specific gene mutation) contributes to a developmental delay independently of the patient's seizure burden and/or EEG abnormalities.

Minimum work-up of first afebrile seizure(2)**:**

1. Fasting glucose,
2. Serum calcium
3. Serum magnesium
4. Serum electrolyte
5. CSF study if a infective process or subarachnoid hemorrhage is suspected

Other investigations include:

1. EEG, skull X-ray,
2. Cranial USG if fontanelle open,
3. CT/MRI if intracranial lesion suspected
4. Functional scans: Positron emission tomography (PET), Single photon emission computed tomography (SPECT) etc.

Management of first seizure(5):

The **first seizure is not designated epilepsy** and management approach is different. First generalized seizure may not recur in 50-60% cases. Anticonvulsant therapy is therefore not indicated for the first generalized seizure. Whether or not the patient will require AED is usually evident within the first year (80% of the recurrences occur within the first year). Predict high recurrence rate (80%) in symptomatic seizures and abnormal EEG vs 40% risk with normal EEG

AED starts after the first episode only if(5):

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1. The first episode is status epilepticus
2. First episode is partial seizure – recurrence risk is high (60-80%) and may be symptomatic.
3. Myoclonic seizure, absence seizure

Acute symptomatic seizures (or, **provoked seizures** occur secondary to an acute problem affecting brain excitability, such as an electrolyte imbalance) lead to epilepsy in 10-15%. AED therapy does not reduce the risk of chronic epilepsy(4,5).

Principles of anti-epileptic therapy(2): In general, the seizure type is the primary determinant of the medications to which the patient is likely to respond, and the epilepsy syndrome determines the prognosis one could expect.

1. Confirm diagnosis of true seizures
2. Establish seizure type and epilepsy syndrome
3. Evaluate need for treatment initiation: first vs. second seizure, widely apart seizure, benign vs malignant epileptic syndromes.
4. Select AED based on seizure type and epilepsy syndromes: considerations are sprectrum, efficacy, adverse reaction, drug interaction, tolerability, compliance, age, sex, weight, lifestyle, psychiatric and other comorbidities.
5. Start monotherapy with chosen first-line drug in low dose, titrate up slowly ("start low, go slow" policy) till seizure control/maximum pharmacologic dose/maximum tolerated dose appears. (Increase slowly over weeks, depending on nature of AED and urgency of situation)
6. If seizure persists:
    a. Switch to another monotherapy (alternative first line or second line) if first drug is ineffective or poorly tolerated.
    b. Add on therapy (combination of different mechanisms of action) with a second drug if the first drug is partly effective and well-tolerated.

Indications of long-term antiepileptic therapy(6):
1. If first seizure suggestive of structural brain lesion
2. After two or more unprovoked seizure
3. Known epilepsy with recurrent seizure

Long-term antiepileptic drugs not indicated(6):
1. Transient seizure resulting from hypoglycemia or hyponatremia, and hypernatremia and other metabolic causes or intoxications
2. Single unprovoked seizure with normal neurological and EEG findings

Choice of AED(5)**:**
Four conventional 1st line AED- phenytoin, phenobarbitone, carbamazepine & valproate.

Sodium valproate: good choice for generalized mixed seizures

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S/E: obesity, alopecia, hepatotoxicity (anorexia, vomiting, icterus)

Phenytoin: drug of choice for the community.

S/E: ataxia, nystagmus

Carbamazepine: choice for partial seizure

Newer Drugs in Epilepsy:

Clobazam:

Four recognized effects: anxiolytic, sedative, myorelaxant and anticonvulsant.

Used in refractory seizures, myoclonic epilepsy and hypsarrythmia.

First choice add-on drug in refractory epilepsy.

Follow up:

Initially after 6 wks and then 3 monthly if seizures are controlled. Check for break through seizures, drug compliance, side effects.

When to discontinue?

Usually, 18-24 months seizure free. Earlier in benign centrotemporal epilepsy, acute symptomatic epilepsy due to inflammatory granuloma.

How to taper?

-counsel parent about risk of possible relapse after tapering (30%)

- taper over 4-12 wks

- if patient is on multiple drugs, taper 1st drug. Wait for 1 month and then taper the next drug.

Can we discontinue AEDs in all epilepsy?

No. Some need lifelong therapy e.g. Juvenile myoclonic epilepsy.

High risk of relapse in:

1. Seizure onset during infancy
2. Seizure with epileptic syndromes e.g. Juvenile myoclonic epilepsy, Lennox Gastaut Syndrome
3. Severe and difficult to control seizures
4. Seizures due to previous serious CNS insults e.g. head trauma, structural malformations, migration defects

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5. Seizure associated with severe neurodevelopmental retardation

How should we treat a relapse?
Treat with same drug to which patient responded. And begin with a low therapeutic range level.

Can we attempt to taper AED again?
Yes, but should wait 2-3 years of seizure free period.

Seizure type	1st line drugs	2nd line drugs	Add on drugs
Partial	Ox-carbamazepine Phenytoin	Gabapentine Lamotrigine	Phenobarbitone
GTCS	Valproate Topiramate	Carbamazepine Phenytoin	Phenobarbitone
Absence	Ethosuximide	Valproic Acid	Clonazepam
Myoclonic	Valproate Levitiracetam	Topiramate	Clobazam

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List of Drugs Used in Neurology and Psychiatry

Drug (Trade names)	Indications	OD/ BD/ TDS/ QDS	Dose (mg/Kg/day)
Aripiprazole (10, 15mg, 5mg/5ml) Aripen (Opso), Aripra (Incep), Ariprex (Square), Ariprazole(Gen), Sizopra (Acme)			
Carbamazepine (Tegretol 100, 200mg, 100mg/5ml Anleptic 100mg/5ml, Anleptic CR 200mg, Epilep 200mg, Epilep CR 200mg, Cabretol)	Simple and complex partial seizure, GTCS	tds	Begin 10mg/Kg/d, increase to 20-30mg/Kg/d
Clonazepam (Rivotril 0.5mg, 2mg Denixil 0.25, 0.5, 1mg, 2mg, Epitra 0.5, 1, 2)	Absence, myoclonic, infantile spasm, partial, akinetic, Lennox-Gastaut	bd/tds	Children <30mg, begin 0.05mg/Kg/d increase by 0.05mg/kg/wk, maximum 0.2mg/kg/d >30Kg, 1.5mg/Kg/d. Max. 20mg/day
Ethosuximide (Serontin 250mg/5ml)	Absence seizure	tds	Begin 20mg/Kg/d and increased to maximum 40mg/Kg/d.
Gabapentin (Gabapen 100, 300mg Gabatin 300, Gabastar 100mg, 300mg)	**Adjunctive therapy when seizures are poorly controlled**	tds	Begin 20mg/Kg/d and increased to maximum 50mg/Kg/d
Lamotrigine (Lameptil 25, 50mg; Lamicet 50mg Lamitrin 25, 50mg tablet & 2, 5mg dispersible tablet)	**Adjunctive therapy when seizures are poorly controlled,** Complex partial, absence, myoclonic, clonic, tonic-clonic, Lennox-Gastaut	od/bd	0.15mg/Kg once daily initially, gradually increasing to the maintenance dose of 1-5mg/Kg/day in 1-2 divided doses -given with sodium valproate (1-5mg/Kg/day)
Levetiracetam (Tab. Citazar 250mg, 500mg Eletam oral soln (500mg/5ml) Tab. Eletam 250mg, 500mg)	Focal onset (age ≥ 1 mo), tonic-clonic (age ≥ 6 years), myoclonic (age 12 ≥ yrs)	bd/tds	20-60
Nitrazepam Epam/Noctin/Octon 5mg tablet	Absence, myoclonic, infantile spasm	tds	Begin 0.2mg/Kg/d, increase to 1mg/Kg/d

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Oxcarbamazepine (Susp. Trileptal (300mg/5ml) Tab. Leptal/Oxetol 150mg, 300mg, 600mg, Oxcarb XR 150, 300, 600mg)	Focal seizure (>2 years)	bd/tds	Start 8-10 bd; increase over 2 wks to max to 60mg/kg/day
Phenobarbitone (200mg/ml inj. Tab. Barbit 30mg, 60mg Barbit Elixir 20mg/5ml Epinal/Barbit/Berdinal)	GTCS, status epilepticus	od/bd	Loading dose: 20mg/Kg IV; Maintenance: 3-5mg/Kg/d
Phenytoin (Susp. Diphedan 30mg/5ml, Tab. Sizatoin100mg Tab. Xentoin 100mg Tab. D-Toin 100mg Inj. Fosfen 150mg/2ml)	GTCS, status epilepticus	bd	3-9mg/Kg/d, increase by 5-10mg/Kg/Wk, usual dose 30-60mg/Kg/day, tds/qds
Piracetam (Susp. Memopil (500mg/5ml), Neurolep, Cetam,)		tds	50; decrease to half
Topiramate (Tab. Etopira 25mg, 50mg Topimax/Topirva/Topmate)	Add-on therapy in refractory partial epilepsy and secondarily generalized seizures Infantile spasm	bd	3-9, slow titration
Vigabatrin (Sabril 500mg, 500mg/sachet)	Infantile spasm, adjunctive therapy when seizures poorly controlled	od/bd	Begin 30mg/Kg/d, increases to 100mg/Kg/d

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Migraine

Acute attack:

Mild:

1. Ibuprofen 7.5-10mg/Kg
2. Naproxen 7.5-10mg/Kg
3. Paracetamol 15mg/Kg
4. Aspirin (>16 years of age)

2-3 times/week is the maximum limit. Otherwise, it may lead to medication over use headache.

Severe attack: add triptans not more than 4-6 times/month

- **Almotriptan** is approved for the treatment of acute migraine in adolescents (ages 12-17 yr).
- **Rizatriptan** (6-17 yrs) (Rizat, Rizamig) 5mg for <40Kg, 10mg
- **Sumatriptan**: Nomigran 25, 50, 100mg orally, 10mg nasally.
- Oral **Zolmitriptan**: Nomi, Zolmit, Zomitan 2.5, 5mg.
- Intranasal **Zolmitriptan** (12 years and over)

Supportive treatment:

- Oral hydration
- Antiemetic

Prophylaxis: If more than one headache per week or disability (causing the patient to miss school, home, or social activities.

For prophylaxis of intractable migraine:
Flunarizine: 5mg at bedtime, may increase up to 10mg
Valproic acid: 5mg/Kg/day, may increase up to 20mg/Kg/day
Levetiracetam: 20mg/Kg/day, may increase up to 60mg/Kg/day bid
Amitriptyline: 1mg/Kg/day, at bedtime, may increase by 0.25mg every 2 weeks
Propranolol: Indever, Propranol. Begin 10 mg/24 hr ↑ 10 mg/wk (contraindicated in asthma and depression)

The goal of this therapy should be to reduce the frequency (to one to two headaches or fewer per month) and level of disability.

Prophylactic agents should be given **at least 4-6 mo** at an adequate dose and then weaned over several weeks.

Additional Therapy:
Prochlorperazine used to treat nausea, migraines, schizophrenia, psychosis and anxiety.

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Trade name: Tab. Stemetil 5mg/Tab. Vergon 5mg/Inj. Stemetil 12.5mg/ml, Vergon 12.5mg/ml; 1ml ampule

Children (not recommended in children <10 kg or <2 years): 0.15mg/Kg IV
10-14 kg: 2.5 mg every 12-24 hours as needed; maximum: 7.5 mg/day
15-18 kg: 2.5 mg every 8-12 hours as needed; maximum:10 mg/day
19-39 kg: 2.5 mg every 8 hours or 5 mg every 12 hours as needed; maximum: 15 mg/day.
Adults: 5-10 mg 3-4 times/day; usual maximum:40 mg/day

Additional options:
Metoclopramide is used to treat nausea, vomiting, gastroparesis, and gastroesophageal reflux disease. Used in the treatment of **acute migraine attacks**, primarily due to its ability to relieve both pain and nausea associated with migraines.
Dose: 0.2mg/Kg IV; 10mg Max.
Trade name: Meclid (10mg/2ml) - Jayson, Metocol 5mg/5ml syrup, Metocol PD 1mg/ml (Opsonin), Motilon (Synovia)

Ketorolac is a NSAID used to treat moderate to severe pain.
Dose**:** 0.5mg/Kg IV; 15mg max dose. Inj. Torax 30mg/ml, 60mg/2ml
Trade name: Rolac (Renata), Torax (Square), Xidolac (Bex)

Tension Type Headache

Acute attack:

Paracetamol
Ibuprofen

Prophylaxis:
Amitriptyline

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Autism

[If possible, refer to a pediatric neurologist]

Treatment:

The primary treatment for ASD is done outside the medical setting and includes developmental and educational programming.

Long term collaborative relationship with the family needed. It is helpful to maintain an active role in long-term treatment planning, providing family support, and navigating the healthcare and educational systems.

Psychosocial Interventions

Structured behavioral, educational, and communication interventions are effective for many children with ASD and are associated with better outcomes.

Communication is generally addressed in coordination with the speech-language pathologist.

Children with ASD need a structured educational approach with explicit teaching.

Pharmacotherapy

The FDA has approved **risperidone** (ages 5-16 yr) and **aripiprazole** (ages 6-17 yr) for the treatment of irritability in ASD, as evidenced by physical aggression, self-injury, and severe tantrum behavior.

Risperidone: Weighing < 20 kg, initial dose-0.25 mg/day; target dose-0.5 mg/day (max 3 mg/day)
Weight ≥ 20 kg, initial dose-0.5 mg/day; target dose 1 mg/day (max.3 mg/day)

Aripiprazole:

Intranasal oxytocin (IO) is a novel approach to treating ASD. IO leads to increased social interactions, better speech comprehension, reduced repetitive behaviors, and functional MRI evidence of improved social attunement.

Methylephenidate is promising option for treatment of hyperactivity

Prognosis- lifelong condition. A minority respond well to treatment. Most will make progress but continue to have some impairment in social and behavioral function as adult.

Note

Autism is a neurodevelopmental disorder characterized by (1) persistent deficits in social communication and social interaction across multiple contexts and (2) restricted, repetitive patterns of behavior, interests or activities which present in early developmental age and cause clinically significant impairment in social, occupational, or other important areas of current functioning while these are not better explained by intellectual disability or global developmental delay.

Epidemiology: Prevalence in US 1 in 59 persons. Male: Female = 4:1. Incidence is increase in sibling (10% recurrence rate). In Bangladesh, Prevalence of the ASD in rural community was found 0.075% (IPNA/Institute of Pediatric Neurodisorder & Autism, BSMMU). Prevalence is 0.15%-0.84% in Bangladesh, 3% in Dhaka city (Autism Spectrum disorders (ASD) in South Asia:

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a systematic review (BMC Psychiatry. 2017; 17: 281)- author include PG Datta, Sayema Wazed Hossain, Waziul Alam Chy.

DSM-5 (Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition) Criteria

A	Persistent deficits in social communication and social interaction across multiple contexts, as manifested by the following, currently or by history: 1. Deficits in social-emotional reciprocity. 2. Deficits in nonverbal communicative behaviors used for social interaction. 3. Deficits in developing, maintaining, and understanding relationships.
B	Restricted, repetitive patterns of behavior, interests, or activities, as manifested by at least two of the following, currently or by history: 1. Stereotyped or repetitive motor movements, use of objects, or speech. 2. Insistence on sameness, inflexible adherence to routines, or ritualized patterns of verbal or nonverbal behavior. 3. Highly restricted, fixated interests that are abnormal in intensity or focus. 4. Hyper- or hyporeactivity to sensory input or unusual interest in sensory aspects of the environment.
C	Symptoms must be present in the early developmental period (may not become fully manifest until social demands exceed limited capacities or may be masked by learned strategies in later life).
D	Symptoms cause clinically significant impairment in social, occupational, or other important areas of current functioning.
E	These disturbances are not better explained by intellectual disability (intellectual developmental disorder) or global developmental delay.

ASD is not a degenerative disorder and it is typical for learning and compensation to continue throughout life.

Aberrant development of social communication and impaired ability to engage in reciprocal social interactions are **hallmark** symptoms of ASD.

Specifiers/Associated Features (Need to mention with diagnosis)

1. Developmental disorders (intellectual disability ~45%, ADHD ~ 28-44%, Tic disorders - 14-38%, motor abnormality ~ 79%)
2. General Medical Disorder (epilepsy 8-35%, GI 9-70%)
3. Psychiatric disorders (anxiety ~ 40%, depression 12-70%, OCD 7-24%, substance use disorders ~ 16%)
4. Personality disorders (paranoid personality disorders, schizoid personality disorder)
5. Behavioral disorder (aggressive behavior, self-injurious behavior, pica 36%)

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Etiology/Risk factors: Multifactorial

1. **Genetic**: high recurrence risk (2-19%) for ASD among siblings, as well as a higher concordance rate (37-90%) in twin studies.
2. Closer spacing of pregnancies,
3. Advanced maternal or paternal age
4. Maternal obesity
5. Extremely premature birth (<26 wk gestational age)
6. Family members with learning problems, psychiatric disorders, and social disability
7. Environmental factors in 1st trimester: thalidomide, misoprostol, cytomegalovirus infection, rubella infection, valproic acid, and the organophosphate insecticide chlorpyrifos.

AAP recommended screening for all children 18-24 months using ***Modified checklist for autism, revised/follow up interview (MCHAT-R/FU)***. Assessment is done using ***autism diagnostic observation schedule, second edition (ADOS-2), Autism Diagnostic Observation Schedule, Toddler Module (ADOS-T)***

ADHD

[If possible, refer to a pediatric neurologist]

Treatment:

A. **Psychosocial Treatment:** Should try to improve interpersonal relationships, develop study skills, and decrease disruptive behavior
Parent support group and appropriate professional support would be helpful

Behaviorally Oriented Treatment:
In a timeframe of 8-12 sessions. The goal for clinicians is to identify behavior that impairs child's life and for child to improve in that particular area.

B. Medications: Presynaptic dopaminergic agonist (psychostimulant)
1st choice: Methylphenidate – 4 weeks.
2nd Choice: Amphetamine compound – 4 weeks.
3rd choice: atomoxetine, Amphetamine & dextroamphetamine

Optimal response: (methylephenidate)
25% on low dose (<0.5mg/Kg/day), 25% on moderate 0.5-1.0mg/Kg/day,
25% on high dose (1.0-1.5mg/Kg/day), 25% does not respond or have significant side effects

Over the 4 wks physicians should increase dose as tolerated and regular medication F/U 4 times per year.

Complication of treatment: increased risk of adverse CV events⇨ sudden cardiac death, myocardial infarction, stroke in young adult and rarely in children.

Note

Etiology: No single factor determines expression of ADHD. ADHD may be a final common pathway for a variety of complex brain developmental process. There is strong genetic component.

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Risk factors:

1. Genetic DAT1 (dopamine transporter gene 1) & DRD4 (dopamine receptor 4) Toxemia
2. Lengthy labor
3. Complicated delivery
4. Maternal drug use, alcohol, smoking
5. Lead exposure
6. Mercury exposure
7. Abnormal brain structure
8. Head trauma
9. Psychosocial family stressor – poverty, exposure to violence, undernutrition to malnutrition

Epidemiology: About 5-10% of school age children worldwide. About 2% present in adult.
Pathogenesis: Not yet clearly established. MRI findings- loss of normal symmetry in the brain, smaller brain volume (5-10% reduction) in specific part of brain – prefrontal cortex, basal ganglia
Dopamine Hypothesis: which postulates that disturbances in the dopamine system is the cause of ADHD.
Clinical manifestation: DSM 5 criteria

1. There must be persistent pattern of inattention and/or hyperactivity- impulsivity that negatively impacts directly on social and academic/occupational activities.
2. Behavior must be developmentally inappropriate.
3. Must begin before 12 years of age.
4. Must be present at least for 6 months.
5. Must be present in two or more setting.
6. Must not be secondary to any other disorder.

Types: (according to DSM-5, 3 patterns of presentation)
Type I: Predominantly inattentive type (more common female, high rate of internalizing symptoms – anxiety & low mood)

Type II: Predominantly hyperactive-impulsive type.
Type III: Combined type. } More common in male

According to severity:
Mild: Few, if any extra feature other than minimum diagnostic criteria, is present.
Moderate: Features are mild and severe.
Severe: Many symptoms more than minimum diagnostic criteria present & marked impairment of social or occupational functioning present

ADH/attention-deficit/hyperactivity disorder (DSM5) = HKD/hyperkinetic disorder (ICD10)

(European) ICD-10, International Classification of Diseases, 10th edition
(American) DSM-5, Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition;

Behavior Rating Scale: Behavior rating scales are useful in establishing the magnitude and pervasiveness of the symptoms but are not sufficient alone to make a diagnosis.
Example: The Vanderbilt ADHD diagnostic rating scale, The ADHD index and the Swanson, Nolan and Pelham Checklist (SNAP)

Screening tool: Conner's Rating scale, ADHD rating scale, Vanderbilt ADHD rating scales, child behavioral checklist

Comorbidities of children with ADHD:

- 15-25% have learning disability
- 30-35% developmental language disorder
- 15-20% mood disorder

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- 20-25% anxiety disorder

Others- sleep disorder, memory impairment, decreased motor skills

Prognosis:
60-80% continue to experience symptom in adolescence
Upto 60% of adolescent exhibit sign symptoms of ADHD well in to adulthood

Prevention:
1. Avoidance of risk factors.
2. Parent training can lead to significant improvement in oppositional behavior.

Medications used in ADHD:
1. Methylphenidate, dextromethylphenidate
2. Amphetamine compound (, Dextroamphetamine, Mixed amphetamine
3. Amoxatine- noradrenergic reuptake inhibitor
4. TCA- imipramine, desipramine, nortriptyline (rarely used for risk of sudden death)
5. α- agonist- clonidine, Guanfacine (have better effect if there is co-morbid tic)

Nocturnal Enuresis

- Seventy percent have a positive family history. 40% have NE if one parent and 70% if both parents have NE.
- Exclude and /or treat OSA, UTI, overactive bladder.
- There may be ↓ADH at nighttime leading to ↑Urine output.
- There may be associated ADHD, increased water/caffeinated drink intake and carbonated drinks.

Treatment of Nocturnal Enuresis:

Two 1st line treatment of NE:

1. Desmopressin acetate is a synthetic analog of arginine vasopressin, the naturally occurring ADH. Indicated in Primary NE, nocturia and central DI.

Dosage:

- Tab. Enurex (200mcg), Nocpress 100mcg, 200mcg (dosage, 0.2–0.6 mg)
- Fast-melting oral lyophilisate (Melt; dosage, 120–360 µg) Minirin Melt 60mcg, 120mcg
- The latter is a recommended formulation for all children and is preferred by children under 12 years.

Method: Tablets are given 30-60 minutes before bedtime. Initial dose 0.2 mg, increase the dose to 0.4mg after 10-14 days if necessary. Response to therapy should be assessed within 2 weeks and then should be continued for 3 months. After 3 months, the dose should be tapered.

2. Bedwetting alarm: 75% success rate if used properly.

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Overactive bladder (diurnal urge Syndrome)

Typically exhibit urinary frequency, urgency, and urge incontinence. Often a female will squat down on her foot to try to prevent incontinence (termed **Vincent's curtsy**). The bladder in these children is functionally (but not anatomically) smaller than normal and exhibits strong uninhibited contractions.

The overactive bladder nearly always resolves, but the time to resolution is highly variable, occasionally not until the teenage years.

Treatment:

Treat UTI and constipation first if present.

Initial therapy is timed voiding, every 1.5-2 hours.

Biofeedback, in which children are taught pelvic floor exercises (**Kegel exercises**), because daily performance of these exercises can reduce or eliminate unstable bladder contractions. Biofeedback often consists of 8-10 1-hour sessions and may include participation with animated computer games. Biofeedback also may include periodic uroflow studies with sphincter

electromyography to be certain that the pelvic floor relaxes during voiding, and assessment of postvoid residual urine volume by sonography.

Anticholinergic therapy: Often is helpful if bowel function is normal.

- Oxybutynin chloride: Adequate hydration should be emphasized to combat constipation as oxybutynin can induce constipation
- Tolterodine
- Hyoscyamine,
- Trospium,
- Solifenacin, and mirabegron

Treatment with an α-adrenergic blocker such as terazosin or doxazosin can aid in bladder emptying by promoting bladder neck relaxation; these medications also have mild anticholinergic properties. If pharmacologic therapy is successful, the dosage should

be tapered periodically to determine its continued need. Children who do not respond to therapy should be evaluated with urodynamic studies to rule out other possible forms of bladder or sphincter dysfunction.

In refractory cases, other procedures such as **sacral neuromodulation** (InterStim), percutaneous tibial nerve stimulation, and intravesical botulinum toxin injection have been effective in children.

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Nephrology & Urology

Nephrotic Syndrome

$$\text{BSA} = \frac{(Wt \times 4) + 7}{wt + 90}$$

℞ on admission on *date* at *time*

1. Physical Activity: as tolerated, bed rest discouraged.
2. Diet: Protein rich, salt restricted
3. Fluid: BSA×400ml + Previous day's output
4. Inj. Ceftriaxone (1gm/10ml)
   0.5-1ml/Kg IV stat & daily
5. Inj. Lasix (20mg/2ml) [only if there is gross edema causing discomfort]
   0.1× wt ml IV stat
6. Tab. Fusid Plus (20/50) *[1mg/Kg/day PO/IV]*
   1+0+0 (if weight is 20Kg)
7. Maintain intake output chart
8. Measure BSUA and record

Advice for investigations: *see below*

Specific treatment

Always start after controlling infections

Specific Rx for **Initial Attack:**
Oral Prednisolone 60mg/M^2/day in single for 4-6 wks. Then, give 40mg/M^2 as single dose in alternate days for 8 weeks- 5 months including tapering.

Specific Rx for **Relapse Case**:
Oral Prednisolone 60mg/M^2/day in single untill remission (BSUA nil for 3 consecutive days). Then, give 40mg/M^2 as single dose in alternate days for next 6 wks. Then, it is tapered over 4-8 wks.

General Principles of management:

- **Diet:** Protein rich diet (1.5- 2 gm/Kg, 2-2.5gm/Kg if persistent proteinuria). Not >30% from fat. No salt restriction unless there is marked edema or ascites.
- **Fluid:** Normal in mild edema. 400ml/M^2+ previous days output if marked edema or ascites.
- **For Edema:** Oral Frusemide (1-3mg/Kg/D) if persistent edema and weight gain of 7-10%. K-sparing diuretic (Spironolactone 2-4mg/Kg/D) if high dose or long therapy is needed. In **refractory**

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edema, 20% albumin 0.5-1 g/Kg over 2-4 hour followed by administration of Frusemide (1-2mg/Kg IV).

- **Antacid or H_2-blocker (Ranitidine** 1-5mg/Kg/day 8 hourly) for GI discomfort.
- **Calcium** supplement if treated for > 3 months with prednisolone.
- **Antibiotic**: Daily oral penicillin (50mg/Kg/D) till massive edema persist (10-14 days). If patient is febrile, ampi+genta or ceftriaxone may be started.
- **Physical Activities:** As tolerated; may attend school.

Investigations: For Nephrotic syndrome 1st attack:

1. Urine R/E
2. Serum albumin
3. Serum cholesterol
4. Spot urinary protein-creatinine ratio
   Urine protein (mg)/Urine creatinine (mg) ratio >2 suggests NS
5. Complete blood count
6. Blood for HBsAg, anti HCV, TPHA, VDRL
7. X-ray chest

Investigation: For relapse cases:

1. Urine R/E & C/S
2. X-ray chest
3. Complete blood Count

If massive edema and/or hypotension:

4. Serum albumin

Classification	Definition
Nephrotic syndrome	Edema, uPCR ≥2000 mg/g (≥200 mg/mmol), or ≥300 mg/dl, or 3+ protein on urine dipstick, hypoalbuminaemia ≤2.5 g/dl (≤25 g/l)
Complete remission	uPCR <200 mg/g (<20 mg/mmol) or o1+ of protein on urine dipstick for 3 consecutive days
Partial remission	Proteinuria reduction of 50% or greater from the presenting value and absolute uPCR between 200 and 2000 mg/g (20–200 mg/mmol)
No remission	Failure to reduce urine protein excretion by 50% from baseline or persistent excretion uPCR >2000 mg/g (>200 mg/mmol)
Initial responder	Attainment of complete remission within initial 4 weeks of corticosteroid therapy
Initial nonresponder/ steroid resistance	Failure to achieve complete remission after 8 weeks of corticosteroid therapy
Relapse	uPCR ≥2000 mg/g (≥200 mg/mmol) or ≥3+ protein on urine dipstick for 3 consecutive days
Infrequent relapse	One relapse within 6 months of initial response, or one to three relapses in any 12-month period
Frequent relapse	Two or more relapses within 6 months of initial response, or four or more relapses in any 12-month period

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Steroid dependence	Two consecutive relapses during corticosteroid therapy, or within 14 days of ceasing therapy
Late nonresponder	Persistent proteinuria during 4 or more weeks of corticosteroids following one or more remissions

5. Serum electrolyte

uPCR= urine protein: creatinine ratio.

Acute Postinfectious Glomerulonephritis

℞ on admission on *date* at *time*

1. NPO till F/O- only if there is H/O convulsion with last few hours
2. **Bed rest**
3. **Diet:** protein (0.5gm/Kg/day), salt, fruit restriction
4. **Fluid:** BSA×400ml + Previous day's output
5. Tab. Pen V (250mg) /Penvik (Square)/Pen VK(Renata) *[50mg/Kg/day 6 hourly for 10 days]*
   1+1+1+1
6. Inj. Lasix (20mg/2ml)
   0.1× wt ml IV stat & daily
7. Tab. Nifidipine/Nidipin SR (20mg) *[0.25-0.5mg/Kg/day in 2-4 dose]*
   0+¼+¼ (starting dose if wt is 40Kg, then titrate)
   Or,
   Tab. Captopril/Cardopril 25mg/Acetor(Drug Int)/Captril(Alco) *[0.25-6mg/Kg/day in 2-4 dose]*
   0+¼+¼ (starting dose if wt is 50K, then titrate)
   Labetolol if needed see below.

8. Please maintain intake/output chart
9. Please monitor blood pressure

If **hypertensive encephalopathy** present (blurred vision, severe headache, altered mental state, nausea, vomiting, new seizure). Add-
If active convulsion,

- Inj. Sedil (10mg/2ml) *[0.5mg/Kg/dose]*
  0.1×wt(Kg) ml PR stat

Maintain with (start with if no convulsion)

- Inj. Phenobarbitione (200mg/1ml) + 9ml D/W, then *[2.5mg/Kg/dose]*
  $\frac{wt(Kg)}{8}$ ml IV stat & 12 hourly

If **Heart failure** with/without shock present (Cough, respiratory distress, orthopnea, gallop rhythm, decreased breath sound, rales, or hypoxemia), add-

- Propped up position
- O_2 inhalation
- Inj. Lasix (20mg/2ml) ------- [5mg/Kg is effective]
  Inj. Digoxin may be needed
- Antihypertensive if needed (see above)

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[Remember when shock is corrected, hypertension may reappear]

If there is hyperkalemia, see **management of hyperkalemia**

Investigation:

- Urine R/E
- CBC with PBF
- Renal function:
  - Serum electrolyte
  - Serum creatinine
- Spot urinary protein: creatinine ratio (exclude Nephrotic Syndrome)
- ASO titre (evidence of Streptococcal infection)
- Serum C_3 level (highly suggestive if other features match with AGN clinically)

Note

Nelson chapter 472, p2490

National High Blood Pressure Education Program (NHBPEP):

Normal BP: BP <90th percentile for age, sex, and height; or <120/<80(systolic/diastolic) mm Hg for adolescents ≥13 yr old

Elevated BP: BP reading ≥90th percentile and <95th percentile for age, sex, and height; or 120-129/<80 mm Hg for adolescents ≥13 yr old

Hypertension: BP >95th percentile for age, sex, and height; or ≥130/80 mm Hg for adolescents ≥13 yr old. Hypertensive-level BP is further staged as follows:

Stage 1 hypertension: BP >95th percentile for age, sex, and height up to the 95th percentile + 11 mm Hg; or 130-139/80-89 mm Hg for adolescents ≥13 yr of age

Stage 2 hypertension: BP ≥95th percentile + 12 mm Hg for age, sex, and height; or >140/90 mm Hg for adolescents ≥13 yr of age.

When hypertension is the result of another disease process, it is referred to as **secondary hypertension**. When no identifiable cause can be found, it is referred to as **primary hypertension (**rare in children**)**.

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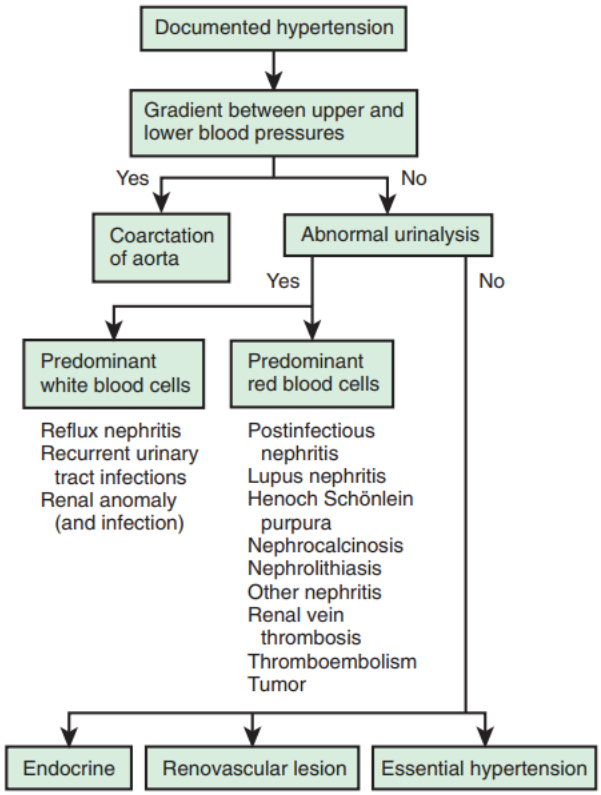
Acute severe hypertension, sometimes referred to as *accelerated hypertension* or *hypertensive crisis*, is defined as severe hypertension (often with BP values well in excess of stage 2 hypertension) accompanied by symptoms such as headache, dizziness, or nausea/vomiting, and in more severe cases, retinopathy, encephalopathy, cardiac failure, renal injury, and seizures. **Hypertensive encephalopathy** is a manifestation of acute severe hypertension. Acute severe hypertension may also manifest with decreased vision (cortical blindness) and papilledema, congestive heart failure, or accelerated deterioration of renal function.



- Too rapid a reduction in BP may interfere with adequate organ perfusion, a stepwise reduction in pressure should be planned.
- BP should be reduced by no more than 25% of the planned reduction over the 1st 8 hr, with a gradual normalization of BPs over next 24-48 hr.
- **Drug choices** include
  - Labetalol
    Inj. 5mg/ml; 100, 200mg tablet (Labecard, Labegest – tablet and injection, Labeta – only tablet 100, 200mg)
    Loading 0.2-1mg/Kg (20mg Max.) stat,
    Maintenance: 0.4-1mg/Kg/hour (3mg/Kg max.)
    Routine dose:
  - nicardipine, and
  - sodium nitroprusside.

For patients with less severe symptoms, such as headache or nausea/vomiting,

- oral medications such as **clonidine= Clonipress 0.5mg/Noflash 0.5mg (5-10microgram/Kg/day BD/TDS)** or **isradipine** can be used if the patient can tolerate oral medications. Short-acting IV medications such as hydralazine or labetalol are acceptable if the patient cannot take oral drugs.

Hypertensive encephalopathy (generalized or posterior reversible encephalopathy syndrome) is suggested by the presence of headache, vomiting, temperature elevation, visual disturbances, ataxia, depressed level of consciousness, imaging abnormalities, and seizures.

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UTI

Dribbling, prolonged voiding, straining, crying during micturition, and poor stream- distal UTI

Diurnal incontinence, urgency, frequency, and squatting – voiding dysfunction

Dysuria, frequency, and hypogastric pain- cystitis

Fever, chills & rigor, flank pain- renal parenchymal involvement.

Fever >39° C, marked toxicity, persistent vomiting, dehydration and renal angle tenderness- complicated UTI (needs parenteral antibiotic & hospitalization)

Treatment of uncomplicated UTI: 10-14 days for infant & complicated UTI. 7-10 days for uncomplicated infections.

Amoxicillin (50mg/kg/day tds)

Co-amoxiclav (do)

Cefaclor/Loracef(Sq)/Cefticlor(R)(1 tsf= 125 mg)

20-40mg/kg/day bd

Paediatric drop: 15 ml (1ml=100mg)

Cephalexin (50mg/kg/day tds)

Cefixime (10mg/kg/day bd)

Norfloxacin & **ciprofloxacin** (20mg/kg/day bd) should be reserved for serious infection.

General Measures:

Increased fluid intake, local toilet, regular bowel habit with avoidance of constipation, and complete bladder emptying. Anal wiping for girls should be anterior to posterior to avoid soiling of periurethral area.

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Phimosis

Clinical Feature:

- Inability to retract the foreskin of penis
- Discomfort at urination
- Ballooning at the tip of penis

Treatment:

- Stretch the foreskin twice daily
- Susp. Cefixime (100mg/5ml):
- Topical steroid (Betamethasone, Mometasone furoate): twice daily for 4-6 weeks.

  Betamethasone (Bet A Cream)

  Betamethasone + Clotrimazole + Gentamicin: Aristoderm, Bet CG, Combiderm

Paraphimosis

Entrapment of a retracted foreskin behind the coronal sulcus.

Engorgement may lead to compromised arterial supply, painful swelling of the glans penis. May eventually lead to gangrene or autoamputation.

Immediately refer to pediatric surgeon.

Painful Testicular Swelling

Epididymo-orchitis:

Organisms responsible for UTI + viruses e.g., mumps, coxsackie, echovirus and adenovirus.

Clinical Feature:

- Painful swelling developed over a few days with increasing intensity. It may begin at flank and subsequently migrate to scrotum
- Fever, dysuria, urinary frequency, urgency or incontinence. Scrotum warm and tender
- Tender inguinal adenopathy

Testicular/Spermatic cord Torsion

Clinical Feature:

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Sudden, severe painful, scrotal swelling. If necrosis sets in, pain is decreased. Testis often higher up in scrotum.

Nausea, vomiting, abdominal pain.

Exquisitely tender testis. Manual **detorsion** results in dramatic relief of pain. Lifting of affected testis does not relieve pain in torsion (negative Prehn's sign) but does relieve pain in epididymitis (positive Prehn's sign).

Investigations:
Urine RE: To detect UTI.
Urine C/S: To detect the likely pathogen.
USG of inguinoscrotal area: To exclude testicular torsion.

Treatment: If testicular torsion, urgently refer to a hospital/pediatric surgeon equipped to operate on short notice. Manual detorsion may be attempted if pain is <4 hours. Following detorsion scrotal orchiopexy should be done.

Treatment of Epididymo-orchitis:

- Antibiotics e.g., Ceftriaxone for 7-10 days
- Paracetamol to relieve pain
- Other supports as for UTI

Painless Testicular Swelling

Inguinal Hernia:
Painless, inguinoscrotal swelling may become painful if strangulated. May lead to intestinal obstruction.
Treatment: Surgical. Needs to be urgent if strangulated.

Hydrocele:
Collection of fluid within with processus vaginalis that produces swelling in scrotum.
Transillumination test: Positive (light shines through).
Treatment: Usually, spontaneous resolution occurs 18 hours. Follow up. Otherwise, surgery.

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Endocrinology

Hypothyroidism

May be at birth (Congenital Hypothyroidism) or any time during childhood or adolescence (Juvenile hypothyroidism)

Etiology:

Primary hypothyroidism:

- Thyroid agenesis/dysgenesis is the primary cause of congenital hypothyroidism.
- Defective biosynthesis of thyroid hormone (frequently resulting in goitre).
- Transient congenital hypothyroidism.
- Maternal iodine deficiency.

Secondary hypothyroidism: Hypopituitary hypothyroidism.

Investigations:

Newborn Screening:

Thyroid hormone levels:

Hormone Assay	Result	
Serum FT4, FT3	Low	Low
Serum TSH	High	Low
Interpretation	Primary Hypothyroidism	Secondary Hypothyroidism

Assessment of Skeletal age:

At birth, X-ray of Knee joint: absent lower femoral & upper tibial epiphyses suggest IU hypothyroidism

Thyroid Scintigraphy: ^{99m}Tc Thyroid scan. NPO for at least 4 hours. IV administration of Tc-99m pertechnetate. Obtain images after 20 minutes. Area of radiolabeled tracer uptake indicates presence of dysgenesis, agenesis, or ectopic thyroid tissue.

ECG: Bradycardia, Low voltage of P and T waves with diminished amplitude of QRS complexes and suggest poor left ventricular function and pericardial effusion.

The QRS is said to be low voltage when:

- The amplitudes of all the QRS complexes in the limb leads are < 5 mm; or
- The amplitudes of all the QRS complexes in the precordial leads are < 10 mm

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Other ECG changes that may be seen include:

- QT prolongation
- First degree AV block (disease of the electrical conduction system of the heart in which the PR interval is lengthened beyond 0.20 seconds. Usually asymptomatic.)
- Interventricular conduction delay

Management:

Goal: To maintain serum FT4, FT3 in the upper half of reference range and serum TSH within reference range, especially 0.5-2mU/L.

Dosage: Levothyroxine (L-T4) = Thyrox (Tablet 25, 50, 75, 100mcg), Thyrin, Thynor, Synthrox

Initial dose is 10-15µg/kg/day (37.5-50µg/day for most term infants), and within this range the starting dose can be adjusted based on the severity of hypothyroidism.

Newborns with more severe hypothyroidism, as judged by a serum T4 <5 µg/dL and/or imaging studies confirming aplasia, should be started at the higher end of the dosage range.

Lower doses of l-T4 (8-10 mcg/kg/day) may be considered for infants with mild hypothyroidism (mildly elevated TSH and normal free T4) (Ref: Nelson 22nd edition)

Follow up: Every 1-2 months in the 1st 6 months. Then, every 2-4 months between 6months and 3 years of age.

What to follow up?

Clinical: Overdose manifestation (restlessness, sleeplessness, diarrhea, tremor, arrhythmia, weight loss, craniosynostosis). Growth and neurological development 2 monthly for 2 years.

Biochemical: Serum FT4, FT3, TSH 03 monthly.

Radiological: Done annually. Bone age should match chronological age.

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Juvenile Hypothyroidism

Symptoms appear after the 1st year of life.

Etiology:

1. Most commonly autoimmune destruction of the thyroid is secondary to chronic lymphocytic thyroiditis (Hashimoto's thyroiditis).
2. Other causes include ectopic gland, thyroid dysgenesis, goitrogens (e.g., iodide cough syrup, anti-thyroid drugs)
3. Iodine deficiency
4. Surgical or radioactive iodine ablation for treatment hyperthyroidism

Clinical Features:

Symptoms: slow linear growth is the Hallmark. Delayed puberty (may be paradoxically precocious)

Other:

- Cold intolerance
- Gradual weight gain
- Lethargy
- Constipation
- School performance may or may not be impaired

Signs:

- Coarse, puffy facies with a flattened nasal bridge
- Immature body proportion (short stature, US:LS ratio infantile)
- Paucity of speech & movement
- Bradycardia
- non-putting myxedema
- thin hair and dry skin
- Delayed relaxation of deep tendon reflex (DTR)
- Goiter may or may not be present

Chronological order of appearance of osseous centres:

At birth:

- Knee (epiphysis of lower end of femur and upper end of tibia
- Foot: Cuboid, talus, calcaneus

3 months: Head humerus
4 months: Hamate
6 months: Capitate
9 months: Head of femur
1 years: Lateral cuneiform, epiphysis at the lower end of tibia

Calculations from carpal centres:

Two centre are present in the 1st year.
3rd centre appears in the 2nd year.
And then one centre each year.
Except the last centre (Pisiform) that appears by 10th to 12th year.

Bone age = Number of carpal ossification center - 1

Investigation:

- Serum FT4 level low & serum TSH level high.
- Skeletal maturation: Markedly delayed.
  - X-ray of wrist joint for bone age
  - X-ray of L1, T12 vertebrae (anterior beaking)
  - X-ray of skull (for intersutural Wormian bones, elongated Sella)
- Presence of autoantibodies (Anti-TPO, anti-thyroglobulin etc)

Management:

Goal: To maintain serum FT4, FT3 in the upper half of reference range and serum TSH within reference range, especially 0.5-2mU/L.

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Dosage: Levothyroxine (L-T4) = Thyrox (Tablet 25, 50, 75, 100mcg), Thyrin, Thynor, Synthrox
Initial dose is 3-5µg/kg/day and within this range the starting dose can be adjusted based on the severity of hypothyroidism.
Newborns with more severe hypothyroidism, as judged by a serum T4 <5 µg/dL and/or imaging studies confirming aplasia, should be started at the higher end of the dosage range.
Lower doses of l-T4 (8-10 mcg/kg/day) may be considered for infants with mild hypothyroidism (mildly elevated TSH and normal free T4) (Ref: Nelson 22nd edition)

Follow up: Every 1-2 months in the 1st 6 months. Then, every 2-4 months between 6months and 3 years of age.

What to follow up?
Clinical: Overdose manifestation (restlessness, sleeplessness, diarrhea, tremor, arrhythmia, weight loss, craniosynostosis). Growth and neurological development 2 monthly for 2 years.
Biochemical: Serum FT4, FT3, TSH 03 monthly.
Radiological: Done annually. Bone age should match chronological age.

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Diabetic Ketoacidosis

Send for RBS, S. electrolyte, Urine for ketone bodies, venous BG analysis, HbA_{1C}, ABG analysis

And start **TREATMENT OF DIABETIC KETOACIDOSIS** as follows:

℞ on admission on *date* at *time*

- ✓ NPO till further order
- ✓ O2 inhalation – SOS
- ✓ Start infusion as follows(9):
- ✓ Inf. Normal Saline 100ml + Inj. Actrapid (100U/ml) 0.24ml, then

Channel 1

IV@4microdrops/min stat and daily

- ✓ Inf. Normal Saline 200ml
  IV@50drops/min stat over 1 hour
  Then,
  Inf. Normal Saline 130ml
  IV@32drops/min in every hour until BG <16.67mmol/L
  +
  Inf. KT (20mmol/10ml) [start after bous is finished]
  2amp in each litre of IV fluid

Channel 2

  [then,
  Inf. Libott S Junior 130ml
  IV@32drops/min in every hour until BG <11.111mmol/L, then
  Inf. Normal Saline 65ml + Inf. 25% DA 65ml (=130ml)
  IV@32drops/min in every hour until resolution of DKA]

- ✓ Inf. Ceftriaxone (1gm/10ml)
  0.5-1ml/Kg IV stat and once daily
- ✓ Inj. Omeprazole (40mg/10ml)
  0.2ml/Kg IV stat & once daily
- ✓ Please maintain intake output chart
- ✓ Continuous catheterization

Assumed weight 20Kg

$\frac{(dose \times wt) \times hour}{U/ml}$ ml/day

$\frac{(0.05 \times 20) \times 24}{U/ml}$ ml/day $== \frac{1 \times 24}{100}$ ml/day

$= 0.24$ml/day

$\frac{(85 \times 20) + (10 \times 100 + 10 \times 50) - 200\ (bolus)}{23}$

$= \frac{1700 + 1500 - 200}{23}$

= 130ml/hour

=32drops/min ≈30drops/min

1st hour:

CHANNEL 1: Insulin drip at 0.05 to 0.10 Units/Kg/Hr

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[We should calculate the amount of insulin and add it to 100ml normal saline. We should use infusion pump. Alternatively, we can use microburet set (insulin+100ml normal saline). Then, continue @4µdrop/min.]

CHANNEL 2: ***Bolus***10-20ml/Kg/hour IV bolus of 0.9% NaCl or LR (repeat if needed)

(Until BG <16.67mmol/L & HR, RR, BP- improves, then switch to Inf. Libott S Junior; when falls below 11.11mmol/L switch to)

2nd hour to until DKA resolution (total CO2 >15mEq/L, pH >7.3, S. Na^+ stable between 135-145mEq/L, no emesis, conscious, alert)

CHANNEL 1: Insulin drip at 0.05 to 0.10 Units/Kg/Hr

CHANNEL 2: Inf. Libott S Junior (0.45% NaCl+ 5% glucose) + (Inj. KPhos 20mEq/L+ KAc 20mEq/L, **we generally use KCl**)

IV rate (ml/hour) = $\frac{85ml \times Wt\ (Kg) + maintenance\ fluid - bolus}{23\ hour}$

NB. This is the rate per hour. Time to full correction is not fixed.

Potassium chloride (Inj. KCl, KT, Electro K) is easily available. Each 10ml ampule contains 2 mmol=mEq of KCl/1ml. 1 amp = 10ml

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Post Acidosis Management

Switch to long-acting S/C insulin (Glargine = Lantus = Larsulin) after oral feeding is tolerated.

Basal-bolus regimen is recommended. A slow-onset, long-duration background is given insulin once/twice. And a rapid acting insulin is given before meals to provide carbohydrate coverage and correct hyperglycemia.

0.05-1IU/Kg/day twice daily; 2/3rd before breakfast and 1/3rd before dinner.

Stop IV drip 30min after the patient receives meal and S/C insulin

- ✓ Dietary advice:
  - **Number**: 3 meals, 2 snacks.
  - **Calorie requirement:** 1000 Kcal at 1 yr + 100Kcal/year until puberty
  - **Composition**: 60% Carbohydrate + 30% fat + 10% protein; more dietary fibre and less animal fat
- ✓ Exercise is encouraged
- ✓ Patient and family education

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Hyperhidrosis (Increased sweating)

Common causes:

Primary Focal Hyperhidrosis: Unknown. Often begins in childhood or adolescence. May be linked to genetics. Another cause may be-

1. Stress and Anxiety
2. Hormonal Changes: Hormonal fluctuations, such as those during puberty, pregnancy, or menopause, can lead to increased sweating.
3. Hyperthyroidism
4. Medications: Some medications, such as antidepressants, antipsychotics, or drugs for high blood pressure, can cause excessive sweating as a side effect.
1. Obesity: Excess body weight can lead to increased sweating, including in the hands and feet.

Secondary Hyperhidrosis: This is excessive sweating caused by an underlying medical condition, such as heart disease, cancer, or infections (such as tuberculosis or endocarditis).

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Acid base & electrolyte disorders

Hyponatremia (Na+ <135 mmol/L)

℞ on admission on *date* at *time*

Fluid management of hyponatremia

In asymptomatic or chronic hyponatremia: Do not correction more than 0.5-1mmol/L/hr or 10-12mmol/L per day.

- Encourage ORS intake
- Cholera saline or normal saline if needed e.g., patient with diarrhoea.

In acute symptomatic (severly lethargic or having convulsion or severe hyponatremia/<120mmol/L):

Formula = body weight (Kg) × 0.6 × (135[desired Na^+ level]-Serum Na^+[mmol/L]) + maintenance (2-3mmol/Kg/day) for 2 days

Step 1: Calculate Na^+ deficit = body weight (Kg) × 0.6 × (135[desired Na^+ level]-Serum Na^+[mmol/L])

For example,
If weight = 8 Kg, Na^+ = 115mmol/L; age = 1 year;
Na^+ deficit = 8 × 0.6 × (135-115) = 96mmol

Step 2: Add maintenance Na^+ requirement (2-3mmol/Kg/day for 2 days)

96mmol + 2×8×2 (= 32mmol)= 128mmol (to be given over 2 days) = 64mmol/day

Step 3: Calculate total fluid requirement over 2 days

8 × 100ml = 800ml/day

Step 4: Select IV fluid type based on calculated Na^+ concentration

64mmol in 800ml = $\frac{64}{0.8}$ = 80mmol/L;

We should choose Inf. Libott-S Junior as it has 77mmol/L Na^+

Step 5: Calculate rate of IV infusion

Order:

Infusion Libott S Junior (800ml)

IV @ 32µdrops/min stat & daily for 2 days (upto xx/xx/20xx)

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Hypernatremia (Na+ >145 mmol/L)

Immediate Management:

- Restore **intravascular volume** (IVV) &
- Send for **investigations** (s. electrolyte, s. calcium, CBC, S. creatinine)
- **Inf. Normal Saline 20ml/Kg**- stat over 20 minutes, repeat if needed until IVV restored. (↑BP, ↓RR, ↓HR, ↓CRT, better urine output, more alert)

Routine Management:

Total water deficit =body wt ×0.6× $\frac{(current\ Na-145)}{145}$, divide it by number of days for correction.

Number of days = $\frac{current\ sodium\ level-145}{12}$ days.

Choice of fluid: Inf. D5+ $\frac{1}{2}$NS. (**Libott-S Junior**)

Inf. D5 + $\frac{1}{4}$ **NS**, if insensible loss is high (fever, tachypnea) **(Baby Saline)**

Administer the fluid at constant rate.

Amount of IV fluid:

D1: Maintenance + Ongoing loss + (deficit – bolus given).

D2 & onwards: Maintenance + Ongoing loss + Deficit

If possible, correct ongoing loss orally, & omit it from IVF amount.

Add KCl, 20mEq/L in IV fluid (1 ml = 2 mEq)

If urine output and serum creatinine levels are normal

There may be **hypocalcaemia** and **hyperglycemia**, but usually does not require treatment

Monitor:

S. electrolyte: At least daily.

Vital signs: Pulse, blood pressure

Intake output: fluid balance, urine output

Physical examination: weight, clinical signs of depletion or overload

Note

Acute hyponatremia

Clinical features (most commonly present with dehydration)

Most of the body tissue somehow copes with the cell swelling but the brain cells are badly affected leading to cerebral edema. Therefore, symptoms are primarily neurologic and their severity is dependent upon the rapidity of onset and decrease in sodium concentration.

Initially (Na+ decrease starting), asymptomatic or complain nausea and malaise

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Later, headache, lethargy, confusion and obtundation (less than full alertness). Cramps and muscle weakness may ocasionally be seen.

Later (usually when Na+ <120mmol/L)- hyperexcitability, agitation, muscle twitching, irritability, decreased reflexes, seizures and coma. Sometimes, hypothermia and Cheyne-Stokes respiration.

(**Cheyne–Stokes** respiration is an abnormal pattern of breathing characterized by progressively deeper, and sometimes faster, breathing followed by a gradual decrease that results in a temporary stop in breathing called an apnea. The pattern repeats, with each cycle usually taking 30 seconds to 2 minutes.)

Chronic hypernatremia: May remain asymptomatic even at serum Na^+ <110mmol/L. Symptoms may be lethargy, confusion, stupor and coma.

Features of dehydration with Na+ deficit/excess

Parameters	**Isonatremic Dehydration** (proportionate loss of water and sodium)	**Hyponatremic dehydration** (loss of sodium in excess of water)	**Hypernatremic dehydration** (loss of water in excess of sodium)
ECF vol	Markedly Decreased	Severely decreased	Decreased
ICF vol	Maintained	Increased	Decreased
Physical signs			
Skin color	Gray	Gray	Gray
Temp.	Cold	Cold	Cold or hot
Turgor	Poor	Very poor	Fair
Feel	Dry	Clammy	Thickened, doughy
Mucous membrane	Dry	Slightly moist	Parched
Eyeball	Sunken soft	Sunken and soft	Sunken
Fontanel	Sunken	Sunken	Sunken
Psyche	Lethargic	Coma	Hyperirritable
Pulse	Rapid	Rapid	Moderately rapid
BP	Low	Very low	Moderately low

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Hypokalemia (K+ <3.5 mmol/L)

Both hypokalemia and hyperkalemia affect heart rhythm. ECG can help determining the effects. **Hypokalemia ECG change:** T wave depression> Flat T wave > ST depresion > U wave > Ventricular fibrillation

Hyperkalemia ECG change: Peaked T wave < ST depression < Wide QRS complex < Absent P wave and ventricular fibrillation

K+ deficit = (Desired -existing K+ levels)×body weight×0.3

Easy way to correct hypokalemia:

Serum K+ level (mmol/L)	Amount to be added in 100ml IV fluid (Inj. KCl)
3.5-4.5	1 ml = 2 mmol
3.0-3.5	1.5 ml = 3 mmol
2.5-3.0	2 ml = 4 mmol
2.0-2.5	3 ml = 6 mmol
<2.0	KCl drip 0.5-1mmol/Kg/hour under close cardiac monitoring

Important notes:

- Oral correction should be continued after acute management for 5-7 days
- IV correction is avoided if possible
- IV correction can not be given if there is renal failure
- Concomitant hypcalcemia and acidosis management must be delayed untill hypokalemia correction is complete

Common causes of hypokalemia:

- PEM
- Diarrhoea, nasogastric loss, persistent vomiting
- Long term use of diuretics (thiazides), laxatives, steroids, digoxin, amphotericin B, mineralocorticoids
- Intrinsic renal disease e.g. Bartter syndrome
- Cushing syndrome, DKA

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Hyperkalemia (K+ >5.5 mmol/L)

Mild hyperkalemia (>5.5-6mmol/L):

Restrict extra potassium intake through food/fruit/fluid

Moderate to severe hyperkalemia (>6mmol/L)

Inj. Calcium gluconate (10%) 0.5-1ml/Kg IV slowly over 5-10 minutes	For myocardial cell membrane stabilization
Insulin (short acting)/ Actrapid/Maxsulin R 0.1U/Kg IV in 10% DA@5ml/Kg over 30minutes	Redistribution of ECF K+ in to ICF
Sulbutamol nebulization (1ml resp. soln. = 5mg)/Windel Dose: 2.5mg in <25Kg, 5mg in >25Kg mixed with normal saline (3ml) stat	
Inj. Sodium Bicarbonate(7.5%) 1ml=0.9mmol=0.9mEq 1-2mmol/Kg IV over 10-15 minutes	
Sodium polystyrene sulfonate resin (Kayexalate) Give orally in 1-18month olds, rectally in neonate 125-250mg/Kg (max. 15g) in 15-30ml 70% sorbitol, for 3-4 days Rectal: 125-250mg/Kg, dilute each gram resin in 5-10ml methylecellulose or water, repeated as necessary, every 6-8 hourly	Enhance elinination through gut
Renal replacement therapy in refractory cases ▪ Peritoneal dialysis ▪ Haemodialysis	Other ways

Common causes of hyperkalemia:

- Haemolysis, rhabdomyolysis
- Renal failure e.g. acute or chronic
- Mineralocorticoid deficiency, Addison's disease

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Infectious Diseases

Mumps

Painful enlargement of salivary gland (mainly parotid). Initially unilaterally and become bilateral in about 70% of cases. Regression needs 6-7 days.

Symptoms of viral infections + obliteration of angle of mandible by enlarged parotid (uni/bilateral) + medial displacement of tonsil may be.

The opening of the Stensen duct may be red and edematous.

Hatchcock's sign is a clinical sign in which upward pressure on the angle of the mandible causes pain due to parotitis in mumps, but no pain in adenitis.

Treatment:

Paracetamol,

Local application of warmth,

Warm saline gurgling

Complications

Common: Meningitis, with or without encephalitis, and gonadal (orchitis, oophoritis)

Uncommon: conjunctivitis, optic neuritis, pneumonia, nephritis, pancreatitis, mastitis, and thrombocytopenia.

Complications can occur in the absence of parotitis, especially in immunized individuals, and overall complication rates in immunized individuals are lower than in unimmunized and are shifted toward the adult populations.

Maternal infection with mumps during the first trimester of pregnancy results in increased fetal wastage.

If orchitis ()

- Bed rest,
- Local support,
- prednisolone (40mg daily for 4 days) to reduce pain and swelling.

No role of steroid as per Davidson's.

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Measles

Prodromal period: cough, coryza, conjunctivitis 4-6 days. Koplick's spot at the start.

Exanthematous phase: appear with the peak of fever. Maculopapular rash starts from behind the ear, cephalocaudal, then to extremitis in 3-4 days.

Contagious: 4+1 rash+ 4 days.

Treatment:

2. Isolation
3. Supportive: Bed rest, Paracetamol, more fluid & calorie intake.
4. Treat superinfection with broad spectrum antibiotic.
5. Vitamin A: < 1 year 100,000 Unit & > 1 year 200,000 Unit.

Chicken Pox & Varicella Zoster

Varicella (Chicken pox): Pruritic rash. Highly contagious and primarily occurs in less than 10 years old.

Incubation period: 10-21 days, prodrome begins with mild fever, malaise, anorexia and occasionally morbilliform rash.

Clinical Feature: Tear drop vesicle that are approximate 1-2mm in diameter with an erythematous base. 'Dew drops on rose petal'. Widely scattered crops so that several stages of the lesions are usually present at the same time.

Infectious period: 24h before and until all lesions are crusted.

Zoster (Shingles): Reactivation of varicella infection, occurring predominantly in adults who previously had varicella.

Clinical Features: Attacks of Zosters may begin with pain along the affected sensory nerve that is accompanied by fever and malaise. Eruption clears in 7-14 days but rash may remain for 4 weeks. Lesions are infectious. Post-zoster neuralgia is common in the elderly but rarely occurs in children.

Treatment:

1. Isolation to avoid spreading.
2. Antipruritic medication (anti histamine)
3. Immunocompromised person: Prophylaxis after exposure. If varicella develops, treat with IV Acyclovir (250mg/M^2) 8 hourly over one hour for 10 days.
4. Disseminated varicella (pneumonia, thrombocytopenia, hepatitis etc.): IV 10mg/Kg/dose 8 hourly for 7-10 days or 48 h after no new lesion has appeared.

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5. Oral Acyclovir (20mg/Kg 6 hourly for 5 days. 800mg Max.) is given in adolescent and adults as they have an increased risk of serious disease. Treatment should be started within 24hours of exanthem. After 72 hours, this is less effective (Nelson 22nd Ed).

Valacyclovir or famciclovir may be given to older children who can swallow tablets. These drugs are highly active against VZV by the same mechanism as acyclovir and are better absorbed by the oral route than acyclovir. Valacyclovir (20 mg/kg/dose; maximum: 1,000 mg/dose, administered 3 times daily for 5 days) is licensed for treatment of varicella in children 2 to <18 years of age, and both valacyclovir and famciclovir are approved for treatment of herpes zoster in adults.

Tradenames: These are expensive drugs.

Valacyclovir: Ovalac 500mg (Bex), Revira 500mg, 1gm (Square), Zostiva (500mg, 1gm)

Famciclovir: Famvir 125mg, 250mg (Novartis), Filovir (Beacon)

Complications:

Most common:

- Encephalopathy
- Cerebellitis
- GBS
- Aseptic meningitis
- Pneumonia
- Reye's syndrome
- Hepatitis
- Thrombocytopenic purpura
- Purpura fulminans
- Cellulitis
- Abscess formation and arthritis.

Progressive varicella (with meningoencephalitis, pneumonia and hepatitis) occurs in immunocompromised children and is associated with 20% mortality.

Maternal varicella during 1st trimester may be associated with congenital malformation (limb anomaly, cortical atrophy) in 1% to 2% of patients.

Treatment of Zoster:
Oral Acyclovir (20mg/Kg 6 hourly for 5 days. 800mg Max.) is given in adolescent and adults as they have an increased risk of serious disease. Treatment should be started within 24hours of exanthem. After 72 hours, this is less effective

In healthy adults, **acyclovir** (800 mg 5 times a day PO for 5-7 days), **famciclovir** (500 mg tid PO for 7 days), and **valacyclovir** (1,000 mg tid PO for 7 days) reduce the duration of the illness but do not prevent development of postherpetic neuralgia. (Nelson 22nd Ed).

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Rubella

Rebella = 3-day measles = German Measles. **Most important aspect is to prevent congenital rubella syndrome.**

Clinical features: mild constitutional symptoms, lymphadenopathy (sub-occipital, post-auricular and posterior cervical) and maculopapular rash of 3-5 days duration. Arthralgia may be present.

Congenital Rubella Syndrome (CRS)

Triad of malformation: Cataract, Sensorineural hearing loss and PDA.

Common manifestation of CRS:

- 50-85% growth retardation, <2500gm at birth, microcephaly.
- 35% congenital cataract, 90% hearing loss, 5% congenital glaucoma.
- 10-20% active meningoencephalitis
- 30% have cardiac defects (PDA, pulmonary artery stenosis, VSD)
- Others: pneumonitis, hepatitis, purpura, infantile autism, diabetes or thyroid dysfunction, progressive rubella encephalitis.

Treatment of Rubella:

- Postnatal infection:
- No specific treatment. Symptomatic.
- Arthritis usually responds to analgesic

Treatment of congenital infections:

- **Immunoglobulin** may be effective in preventing the disease, if administered within 72 hours of exposure. Dose: 55mL/Kg IM (Nelson 22nd Ed). It may reduce the risk but does not guarantee prevention of fetal infection.
- **Termination of pregnancy:** Should be considered for serologically confirmed Rubella infection in early pregnancy.
- Most babies with congenital rubella are contagious and should be isolated. Some may excrete viruses for more than one year.

Prevention:
EPI: MR at the end of 9 months and at the end of 15 months.
MMR (Priorix = measles, mumps, rubella), Rubavax-M (Rubella, Measles)
1st dose at 12-15 months of age (95% efficacy), 2nd dose at 4-6 years.

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Hand Foot Mouth Disease

Organisms: Coxsackie (commonly, A16) and Enterovirus (commonly, 71). Others: Picorno, Echo virus.

Clinical features: Commonly presents in outbreak. Transmitted by direct contact.

Begins with prodrome ch. By low grade fever, feeling unwell, sore throat. This is followed by development of ulcers/blisters in the oral cavity (mostly on the posterior aspect), papulovesicular skin rah on the palms and soles and less commonly on buttocks, knees, elbows and genital areas.

Treatment: Supportive.

Complications: Loss of toenails or fingernails. Rare, aseptic meningitis, encephalitis, polio-like paralysis, myocarditis and respiratory distress.

Differential diagnosis:

- Chicken pox
- Herpangina
- Herpetic gingivostomatitis
- Aphthous ulcer
- Insect bite allergy

Infectious Mononucleosis (Glandular fever)

Caused: >90% cases caused by Epstein Barr Virus. Rest is unknown.

Characterized by fever, sore throat, lymphadenopathy, splenomegaly, atypical lymphocytosis, and presence of heterophil antibody. Palatal petechiae at the junction of hard and soft palate are frequently seen.

Primary EBV infection (in 30-50% cases) manifests as **classic triad** of **fatigue, pharyngitis and generalized lymphadenopathy**.

Diagnosis:
>50% mononuclear cells, >10% atypical lymphocytes and elevated levels of serum transaminases. Positive serological tests- Paul- Bunnel – Davidson Test is an extension of classic Paul Bunnel Test: detects heterophil antigen.

Monospot test (Commercial heterophil antibody kits): about 80% of patients have positive test. Usually positive within the 1st week of illness and remain positive for months.

Antibodies to EBV: Viral capsid Ag (VCA), Epstein Barr Nuclear Antigen (EBNA) and EBV induced early Antigen (EA).

Treatment:

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- In most cases, rest is the only necessary treatment. Fatigue may wax & wane over weeks to months.
- Paracetamol for fever
- Convalescence may take weeks to months

Ask to avoid contact sports or strenuous activity for 2-4 weeks to avoid splenic rupture or as long as spleen is palpable.

Ampicillin rash appear after treatment with ampicillin or amoxicillin (other beta lactums). It is morbilliform vasculitic rash and does not require any specific treatment.

Corticosteroids generally are used in patients with:

- Impending airway obstruction
- Severe thrombocytopenia
- Hemolytic anemia

Complications:

- Splenic rupture: rare complication.
- Airway obstruction due to tonsillar or pharyngeal hypertrophy is also rare.
- **Neurologic complications:** self-limited and reversible. Aseptic meningitis, encephalitis, myelitis, peripheral neuropathies, and GBS. Corticosteroids may be effective.
- **Alice in Wonderland syndrome:** distortion of perception of time, size, shape and spatial aspects.
- Icteric hepatitis
- **Other rare complications:** autoimmune hemolytic anemia, thrombocytopenia, acute renal failure, complete heart block, pericarditis, pneumonia.

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Scarlet Fever

Group A Streptococcus (GAS), also known as Streptococcus pyogenes.

Distinct clinical entities (**scarlet fever and erysipelas**), as well as **streptococcal toxic shock syndrome** and **monomicrobial necrotizing fasciitis**.

Other illness: Upper respiratory tract (pharyngitis), and the skin (impetigo, pyoderma) in children.

Less common: Perianal cellulitis, vaginitis, septicemia, pneumonia, empyema, endocarditis, pericarditis, osteomyelitis, suppurative arthritis, myositis, cellulitis, omphalitis, and other infections.

Two potentially serious **nonsuppurative complications**: rheumatic fever (see Chapters 229.1 and 487) and acute glomerulonephritis (see Chapter 559.4).

Treatment:

Antibiotics(choices): Very important to complete course to prevent risk of ARF.

- Oral penicillin V (250 mg/dose 2 or 3 times daily [bid-tid] for children weighing ≤60 lb and 500 mg/dose bid-tid for children >60 lb) is recommended but must be taken for a full 10 days.
- Single intramuscular (IM) injection of benzathine penicillin G (600,000 IU for children weighing ≤60 lb and 1.2 million IU for children >60 lb)
- Once-daily amoxicillin (50 mg/kg, maximum: 1,000 mg) for 10 days. Works comparable to multiple dose regimen.
- If penicillin allergy, oral cephalosporin for 10 days.
- Other alternative: Clarithromycin, Cotrimoxazole for 10 days. Azithromycin for 5 days.

+ supportive therapies: Paracetamol for fever/pain, antihistamine etc.

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Tuberculosis

Definitions: contact

Contact: Any person who has been exposed to an index case.

Index Case: Index case is the initially identified person of any age with new or recurrent TB in a specific household or other comparable setting in which others may have been exposed. An index case is the person on whom a contact investigation is centered but is not necessarily the source.

Close contact: A person who is **not in the household** but who shared an enclosed space, such as a social gathering place, workplace, or facility, with the index case for extended daytime periods **during the 3 months before the start of the current treatment episode.**

Household contact: A person who shared the **same enclosed living space** as the index case for **one or more nights or for frequent or extended daytime period** during the 3 months before the start of current treatment episode.

Revised definitions of tb in children

Presumptive TB: a patient who presents with the symptoms or signs suggestive of TB (previously known as TB Suspect).

Bacteriologically confirmed case: is a patient from whom a biological specimen is positive byWHO-approved rapid diagnostics (eg. Xpert-MTB/RIF), smear microscopy or culture.

Clinically diagnosed TB case: is a patient who does not fulfill the criteria of bacteriological confirmation or smear not done; but diagnosed as active TB by a clinician and decided (BOX-iv) to have a full course of anti-TB treatment.

These cases are diagnosed as active TB on the basis of X-ray abnormalities or suggestive histology or extrapulmonary cases without bacteriological confirmation.

Status/Settings	TB cases	Regimen	
		Intensive Phase (IP)	Continuous Phase (CP)
Low HIV Prevalence and Low INH Resistance	▪ Smear negative pulmonary TB ▪ TB lymph node (intrathoracic and peripheral)	2(HRZ)	4(HR)
	▪ Smear positive pulmonary TB ▪ Extensive pulmonary disease, Severe EPTB (except TBM and Osteoarticular)	2(HRZE)	4(HR)
Any status/settings	TB meningitis Osteoarticular TB	2(HRZE)	10(HR)

*For children with TB meningitis and osteo-articular tuberculosis, treatment may be extended up to 12 months based on clinical judgment.
***INH resistance is 35.8% among previously treated cases in Bangladesh (DRS-2011)
NB: Where treatment failure is in doubt, DR-TB should be considered and managed accordingly.

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Pyridoxine

Pyridoxine should be given along with isoniazid in HIV infected and severely malnourished children to prevent isoniazid associated neuropathy. A dose of 12.5 mg/day is recommended for children 5 to 11 years of age, and 25 mg/day for children ≥12 years.

Pyridoxine is not used in general treatment initiation plan , but if any child after treatment, shows symptoms of neuropathy, then it is recommended to include.

Corticosteroids

Corticosteroids may be used for the management of some complicated forms of TB (See box).

Indications for oral steroids in children with TB:

01. CNS TB including TB meningitis
02. TB pericarditis (reduces the risk of restrictive pericarditis)
03. Adrenal TB

In cases of advanced TB meningitis, corticosteroids have been shown to improve survival and decrease morbidity and thus are recommended in all cases of TB meningitis. As rifampicin is a powerful inducer of prednisolone metabolism hence high dose of prednisolone is required28. Sudden withdrawal can cause serious side effects such as adrenal crisis.

Dose: Pednisolone- 2-4 mg /kg/day (max. 60mg) for 4 weeks; - then tapered over 1-2 weeks.

Follow Up: Monthly basis for the 1st 3 months. Sputum positive cases should be followed up at the end of month 2, 5, and 6.

Recommended daily dose of 1st line anti-TB drugs for children:

Drugs	
Isoniazid (H) 10 (7-15) [maximum 300mg]	Isoniazid (H) 10 (7-15) [maximum 300mg]
Rifampicin (R) 15 (10-20) [maximum 600mg]	Rifampicin (R) 15 (10-20) [maximum 600mg]
Pyrazinamide (Z) 35 (30-40) [maximum 2000mg]	Pyrazinamide (Z) 35 (30-40) [maximum 2000mg]
Ethambutol (E) 20 (15-25) [maximum 1200mg]	Ethambutol (E) 20 (15-25) [maximum 1200mg]

Formulations available

FDC tablet	Current FDC	Previous FDC
3	R75, H50, Z150	R60, H30, Z150
2	R75, H50	R60, H30

Dosage in children:

Weight Bands (Kg)	Number of tablets		
	Intensive Phase (IP)		Continuation Phase (CP)
	RHZ (mg)	E(mg)	RH (mg)
	75/50/150 per tablet	100 per tablet	75/50 per tablet

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2-3.9	½	½	½
4-7	1	1	1
8-11	2	2	2
12-15	3	3	3
16-24	4	4	4
25+	Adult dosage and preparations		

Weight Bands (Kg)	Tab. Levofloxacin 250mg
5-6	½ tablet/day
7-9	¾ tablet/day
10-15	1-1½ tablet/day
16-23	1½-2 tablet/day
24-30	2-2½ tablet/day
31+	Follow adult schedule (up to 1.5g/day)

Adult Regimens:

Standardized treatment regimen for each diagnostic category (adults)

TB diagnostic category	Type of Patient	Treatment regimen	
		Intensive phase (Daily)	Continuation Phase (Daily)
New Cases (never been treated for TB or have taken ATT for < 1 month)	Bacteriologically positive PTB patients	2 (HRZE)	4 (HR)
	Bacteriologically negative PTB patients		
	Extra-pulmonary TB*		
	TB/HIV co-infected		
Previously Treated Cases (received ≥ 1 month of ATT in the past) **	If no resistance to TB drugs (both H and R sensitive P and EP TB Cases)	6 HRZE	
	Clinically diagnosed PTB	6 HRZE	
	Complicated EP cases (TB meningitis, Neurological TB, Bone TB, non-resolving lymph node)	12 HRZE-Lfx	
	If Rif susceptible and INH resistant or unknown in bacteriologically confirmed PTB & EP-TB	6 (H)REZ- Lfx	

** Treatment for certain EP TB may be prolonged till 12 months if non-resolving lymph nodes at 6 months; 12 months in case of CNS, TB meningitis, bone TB etc.*

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Dosage for adults:

weight (kg)	Intensive Phase	Continuation Phase	INH Resistant	
	4FDC daily (first 2 months)	2FDC daily (next 4 months)	4FDC (6 month)	Levofloxacin (Lfx) 250 mg (6 month)
30-37	2 Tablets	2 Tablets	2 Tablets	2 Tablets
38-54	3 Tablets	3 Tablets	3 Tablets	3 Tablets
55-70	4 Tablets	4 Tablets	4 Tablets	4 Tablets
> 70	5 Tablets	5 Tablets	5 Tablets	5 Tablets

Treatment of MDR-TB

Target groups for DR TB and First-line DST:

If available, rapid DST will be offered to all presumptive TB cases. If not following groups will be prioritized for DST (Presumptive DR TB):

- All previously treated (Retreatment) cases at diagnosis
  - ✓ Failure of Cat-1 and retreatment regimen
  - ✓ Relapse
  - ✓ Treatment after loss to follow-up
- Non-converter
- Close contacts of DRTB patients with symptoms
- HIV infected person, with or without TB S/S
- Bacteriologically negative PTB turning positive at 2 months or EPTB patients showing deterioration or no signs of clinical improvement, despite treatment as per NTP guidelines.

Mono resistant TB: where mono resistance to **isoniazid** is known or suspected the is-

6 (H)RZE-Lfx

For patients with more extensive disease, consideration should be given to prolonging the treatment to a minimum of **9 months**.

Mono resistance to Rifampicin cases should be treated using MDR-TB regimen

Treatment of MDR-TB: MDR-TB are treated in a similar way to adults with MDR-TB. One practical difference is that confirmation and DST may not be possible, so that empirical treatment is often required for children with suspected MDR-TB.

Treatment Regimen:

<3 years:

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FLQ-R: Lzd-Cfz-Cs; add one of **Dlm, PAS or Eto** additional drugs if needed.
FLQ-S: Lfx-Lzd-Cfz-Cs additional drugs if needed **Dlm, PAS** and **Eto**

<6 years:
FLQ-R: **Lzd-Cfz-Cs-Dlm**; add one of **PAS** or **Eto** additional drugs if needed.
FLQ-S: **Lfx-Lzd-Cfz-Cs** additional drugs if needed **Dlm, PAS**

>6 years:
FLQ-R: **Bdq-Lzd-Cfz-Cs;** additional drugs if needed **Dlm** and **PAS**
FLQ-S: **Bdq-Lfx-Lzd-Cfz** additional drugs if needed **Cs** and **Dlm**

Weight band for Hr-TB:

Weight bands	**Number of Tables**		
	6 (H) RZ + E + Lfx		
	RHZ (75/50/150)	E (100)	Lfx(100)
4-7 kg	1	1	1
8-11 Kg	2	2	2
12-15 Kg	3	3	3
16-24 Kg	4	4	4
25+ Kg	Use adult dosages and preparations (up to 1.5g/day)		

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Typhoid & Paratyphoid

Enteric fever: Caused by Salmonella typhi, paratyphi A, B, C

Infectious dose 10^5-10^9. **Incubation period** 4-14 days.

MDR- Typhoid: Resistant to 3 of the 1st line drugs suggested by WHO- Ampicillin, Cotrim, Chloramphenicol

XDR- Typhoid: Resistant to 3 previously mentioned drug + 3rd generation cephalosporins (ceftriaxone & full or partial resistant to ciprofloxacin.

Treatment:

Optimal therapy				Alternative Effective Drug		
Susceptibility	Antibiotics	mg/kg/day	Days	Antibiotic	mg/kg/day	Days
Uncomplicated typhoid fever						
Fully sensitive	Chloramphenical Amoxicillin	50-75 75-100	14-21 14	Flouroquinolone Or Ciprofloxacin	15	5-7
MDR	Flouroquinolone/ cefixime	15 15-20	5-7 7-14	Azithromycin cefixime	8-10 15-20	7 7-14
Quinolone Resistant	Azithromycin Ceftriaxone	8-10 75	7 10-14	cefixime	20	7-14
Severe typhoid fever						
Fully sensitive	Flouroquinolone	15	10-14	Chloramphenical Amoxicillin	100 100	14-21
MDR	Flouroquinolone	15	10-14	Ceftriaxone Cefotaxime	60 80	10-14 10-14
Quinolone Resistant	Ceftriaxone Cefotaxime	60 80	10-14 10-14	Azithromycin Flouroquinolone	10-20 20	7 7-14

Clinical Feature:
High grade fever, coated tongue, anorexia, vomiting, hepatomegaly, diarrhea, toxicity, abdominal pain, pallor, splenomegaly, constipation, headache, jaundice, obtundation, ileus and intestinal perforation.

Diagnosis:

CBC: Leukopenia with relative lymphocytosis. Eosinophilia is present in 80% of cases. In younger children, leukocytosis is a common association and may reach 20,000-25,000/cmm. Thrombocytopenia may be a marker of severe illness and may accompany DIC.

Cultures: Bacteriologic. Bone marrow culture is most sensitive (85-90%) and blood culture is positive in 40-60% of cases. Stool and urine cultures become positive after the 1st week. Although, stool culture may be positive in incubation period (Nelson 22nd Edition).

Widal Test: It measures antibodies against Somatic (O) and flagellar (H) antigens of *S. typhi & S. paratyphi.*

- No single titre is diagnostic.

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- In the non-immunized child, anti- O titre >1:160 is suggestive.
- Rising titre is suggestive.
- High anti- O and low anti- H: active infection
- Low anti- O and High anti H: anamnestic reaction
- Anti Vi (polysaccharide capsule antigen) suggests carrier state (usually, titre >1: 25)

Treatment with antibiotics may depress an antibody response. Widal test may be false positive and false negative.

Plain X-ray abdomen A/P view in erect posture: Crescentic gas shadow under the domes of diaphragm.

Liver Function Test:

Pertusis

Treatment:

Admission for-

- infants younger than 3 months,
- infants with 3-6 months with severe paroxysm and
- children with complications

1. Isolation for 5 days after initiation of erythromycin therapy.
2. Antibiotic:
    a. Erythromycin: 40-50mg/Kg/day QDS for 14 days (may cause pyloric stenosis in under <1months, so avoid).
    Tradename: Eromycin (125mg/5ml), Etrocin, A Mycin (50mg/1.25ml), Mac
    b. Clarithromycin: 10mg/Kg/day BD for 7 days
    Trade name: Klabid (125mg/5ml), Remac, Binoclar
    c. Azithromycin: 10mg/Kg/day once daily for 5 days
    Trade name: Acos (200mg/5ml), Zimax (200mg/5ml), Tab. Acos 250mg/500mg
3. Steroid: Prednisolone 1mg/Kg/day in divided dose. Syp. Procodil (5mg/5ml), Cortan, Deltasone. Tablet 5mg, 10mg, 20mg.
4. Bronchodilator:

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Salbutamol: Sultolin (Square), Azmasol (Bex), Salmolin (Acme), Brodil (ACI), Salbu (Bio)
1 tsf= 2 mg; ½ tsf 8 hourly for 10kg child
Dose: 0.1mg/kg/dose, 8 hourly [= 0.5ml/Kg/dose]
Levosalbutamol: safe from 2 years and above, though use from earlier age is also practiced.
Trade Names: 1mg/5ml syrup & 1mg, 2mg tablet. Levostar (Square), Salmolin L(Acme), Salbu L(Bio), Brodil Levo (ACI)
6-11years- 1 tsf TDS; Lower dose for younger children
1 tsf = 1mg; Tab. 1mg, 2mg

If needed nebulization,

5. **Windel Plus/ Sulprex/ Ipsavent** [0.5mg of salbutamol +2.5mg of ipratropium bromide)/3ml) ampule
   Salbutamol Respirator Solution: Sultolin 5mg/ml 0.5-1ml + 3ml of Normal Saline
   Ipratropium bromide Respirator solution- Iprex Solution (0.25mg/ml)
   <6 yrs 0.125-0.25mg= 0.5-1ml + 3 ml Normal Saline 6-8 hourly
   Budesonide Nebulizer Suspension (0.5mg/2ml = 0.25mg/ml) 2ml ampule
   Dose: <6 months or more, 1ml- 4ml daily (max. twice daily

!!!!Warning!!!! Salbutamol causes tremors, tachycardia, and hypokalemia. If there is already tachycardia, avoid.

Diagnosis:
Suspect if child presents with cough with paroxysms more than 2 weeks with post-tussive emesis.
Clinical feature:
Caused by Bordetella Pertussis. Incubation period: 7-15 days. Phases: catarrhal phase: 7-10 days. URTI. Cough does not improve with passage of time. Paroxysmal phase: 2-3 weeks. Cough with whoop leading to subconjunctival he, ulceration of frenulum of the tongue. Convalescent phase: 2-3 weeks. gradually improve.

Investigation:
CBC: Leukocytosis (15,000-100000/cmm) with absolute lymphocytosis is characteristics.
CXR: Atelectasis with perihilar infiltrate. Consolidation indicates secondary bacterial infection. Occasionally, pneumothorax, pneumomediastinum.
Identification of *B. pertussis*: Nasopharyngeal swab for Culture in Bordet-Gengou media during the first 3 weeks of illness or, PCR.

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Few Common Childhood Infestations

General Guidelines for deworming

- Start deworming from 1 year of age, continue every 6 months.
- Do not give anthelminthic before 1 year unless there is worm in stool.

Giardiasis

- Bloating
- Fat malabsorption occurs
- Stool is frothy
- Stool floats on water

Complications:

- Malabsorption syndrome
- Reiter's syndrome
- Reactive arthropathy
- Liver granuloma
- Deficiency of Vitamin A, B_{12}
- Lactose intolerance

Management:

Drug of choice:
1. **Tinidazole** (>3 years): 50mg/Kg/day, single dose. Tab. Tinizol 500mg/1gm
2. **Nitazoxanide**:
   a. 12-48 months: 100mg (1 tsf) BD for 3 days
   b. 4-12 years: 200mg BD 3 days
   c. >12 years: 500mg BD 3 days
3. **Susp. Metronidazole**/ Flamyd(I)/ Amodis(Sq)/ Metryl(O)/ Filmet(B) (200mg/5ml) 15mg/kg/day, tds for 5-7 days

Alternative treatment: Albendazole: 400mg once a day for 5 days

Add: Vitamin A, Zinc, Folic acid, B-complex

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Amoebiasis

Caused by: Entamoeba histolytica

Feature: 90% asymptomatic. acute dysentery, nondysenteric diarrheas, chronic amoemic colitis. RAP.

Treatment:

Asymptomatic:
Diloxanide Furoate 20mg/Kg/day in 3 divided doses for 10 day. [Tab. Diloxide 500mg, Susp. Dilanide 250mg/5ml] OR

Paromomycin 25-35mg/Kg/day in 3 divided doses for 7 day.

Iodoquinol 30-40mg/Kg/day in 3 divided doses for 10 day.

Intestinal amebiasis or hepatic abscess:
Liver abscess characterized by high grade fever, constant dull aching right upper abdominal pain/ epigastric pain and enlarged tender liver. Usually, jaundice is absent.
Metronidazole 35-50mg/Kg/day in 3 divided dose for 7-10 days OR
Tinidazole 50-60mg/Kg, single dose for 3 days (for colitis) or 5 days (for liver abscess) [Tab. T-zol 500mg, Tab. T-zol 1gm, Tab. Tinizol DS 1gm]

Followed by:
Paromomycin 25-35mg/Kg/day in 3 divided doses for 7 day OR

Iodoquinol 30-40mg/Kg/day in 3 divided doses for 20 day

Intestinal perforation and toxic megacolon: Surgery

Complications:

Intestinal

- Necrotizing colitis with perforation
- Toxic megacolon
- Perianal ulceration

Hepatic: Ruptured liver abscess may lead to-

- Granuloma cutis
- Hemoptysis of anchovy sauce pus
- Empyema thoracis
- Generaized peritonitis

Metastatic lesions:

- Pulmonary amoebiasis
- Right sided pleural effusion and collapse

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- Cerebral amoebiasis
- Cutaneous amoebiasis
- Splenic abscess
- Fatal purulent pericarditis

Ref: AMH p250

Enterobiasis (Pinworm/Threadworm)

Clinical Feature:

- Perianal pruritus, especially at night is the most common symptom.
- GIT symptoms like abdominal pain, nausea, vomiting, diarrhoea.
- Visible worms in stool.

Treatment:

Albendazole: <2 years 200mg; >2 years 400mg single dose. Susp. Alben 200mg/5ml, Tab. Alben 200mg, Alben DS (400mg). Tab. Almex 400mg

Repeat after 2 weeks.

Mebendazole: 100mg single dose. Tab. Solas 100mg, Susp. Solas 100mg/5ml

Pyrantel pamoate: 11mg/kg/dose. Tab. Delentin 125mg, Tab. Melphin 125mg. 250mg/5ml suspension.

Generally intractable. Hence, repeated doses and personal hygiene advice should be given.

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Few Common Gynecological Problems in Childhood

Leukorrhea

Physiologic Leukorrhea

Neonates and peripubertal children can present with a white, clear, or mucus discharge, which is physiologic in nature and secondary to exposure to estrogen. Some patients may complain of the moisture and mucus. Hygiene measures, including plain warm water baths, may help decrease symptomatology, but education should also be provided to reassure the patient and their parents.

Pathologic

Vulvitis refers to external genital pruritus, burning, redness, or rash. **Vaginitis** denotes inflammation of the vagina, which can manifest as a discharge with or without an odor or bleeding. If these occur simultaneously, the term **vulvovaginitis** is used.

Causes of infectious vulvovaginitis: Escherichia coli, Streptococcus pyogenes, Staphylococcus aureus, Haemophilus influenzae, Enterobius vermicularis and, rarely, Candida spp.

Treatment: choose antibiotic as per Suspected infection: (Nelson 22nd)

S. pyogens, S. pneumonae

- Amoxicillin, 50 mg/kg/day (max: 500 mg/dose) PO divided tid × 10 days
- Erythromycin ethyl succinate, 30-50mg/kg/day (max: 400 mg/dose) PO divided qid
- TMP-SMX, 6-10 mg/kg/day (TMP component) PO divided bid × 10 days
- Clarithromycin, 7.5 mg/kg bid (max: 1 g/day) PO × 5-10 days

Staphylococcus aureus:

Topical mupirocin 2% tid to the affected skin area

Amoxicillin-clavulanate, 45 mg/kg/day (amoxicillin) PO divided bid-tid × 7 days

Haemophilus influenzae:

Amoxicillin, 40 mg/kg/day PO divided tid × 7 days

Pinworms (Enterobius vermicularis):

Mebendazole, 100 mg chewable tablet once, repeated in 2 wk or

Albendazole, 200 mg PO for child younger than age 2 yr or 400 mg PO for older child once, repeated in 2 wk

Pyrantel pamoate 11 mg/kg PO once (max 1 g), repeated in 2 wk

Candida spp.:

Topical Nystatin:

Topical clotrimazole:

Topical miconazole.

Oral therapy with a single dose of fluconazole (12 mg/kg/day) is also effective.

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Labial Adhesion

May be asymptomatic or can cause vulvitis, urinary dribbling, urinary tract infection, or urethritis.

Treatment: Does not require treatment if the patient is asymptomatic.

Symptomatic patients:
Topical estrogen cream or **betamethasone** ointment applied alone or in combination daily for 6 wk directly to the line of adhesion, using a cotton swab while applying gentle labial traction.
Topical estrogen cream: Femastin Cream (Square), Gynest(Acme), Ovestin(Nuvista), SRT (Healthcare)

Betamethasone dipropionate 0.05% ointment: Betameson, Betson

The adhesions usually resolve in 6-12 wk; unless good hygiene measures are followed, recurrence is common.

To decrease the risk of recurrence, an emollient (petroleum jelly, A and D ointment) should be applied to the inner labia for 1 mo or longer at bedtime.

Note: Estrogen should be interrupted if breast budding occurs. Mechanical or surgical separation of the adhesions is rarely indicated.

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Musculoskeletal System

Arthritis is a specific sign indicating objective inflammation of the joint and can be defined as (1) swelling of the joint or (2) limitation of motion combined with one of the following: **tenderness**, **warmth**, or **pain on motion**.

ARTHRITIS	ARTHRALGIA
Prominent swelling	Minimal or no swelling
Morning stiffness	No morning stiffness
Symptoms improve with activity	Symptoms are exacerbated by activity
Stiffness follows rest	Pain constant or improves with rest
Limited range of motion	Normal or excessive range of motion
Warmth of joint	No warmth
Symptoms usually daily, consistent with minor variation	Symptoms variable, constant, or intermittent

Extremity Pain differential diagnoses based on presence of arthritis:

ARTHRITIS	NO ARTHRITIS
Common Septic arthritis Reactive arthritis Rheumatic disease Uncommon Malignancy Metabolic disease Hemophilia	Common Orthopedic or traumatic disorder Viral illness Pain syndrome Uncommon Malignancy Benign bone lesion Metabolic disease

Nocturnal pain that wakes children from sleep may be seen in conditions such as

- leukemia,
- bone tumors, or
- infections,

but may also occur with less critical conditions such as

- growing pains,
- muscle cramps, or

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- psychogenic pain.

Children with benign causes of nocturnal pain will lack systemic symptoms, are well during the day, and have normal physical examination findings, whereas those with inflammatory illnesses typically have additional signs and symptoms.

Differential Diagnoses of Monoarticular Vs Polyarticular Arthritis

Usually, **MONOARTICULAR**	Often **POLYARTICULAR**
Infectious arthritis • Bacterial • Mycobacterial • Fungal Avascular necrosis Hemarthrosis Trauma/overuse Oligoarticular JIA Congenital hip dysplasia Stress fracture Osteomyelitis Metastatic tumor (neuroblastoma, leukemia)	Polyarticular JIA Psoriatic arthritis Reactive arthritis Enthesitis-related arthritis • Ulcerative colitis • Crohn disease Serum sickness Henoch-Schönlein purpura Systemic lupus erythematosus Viral arthritis Hemoglobinopathies

DD of Limping

Painful Limp	**Painless Limp**
• Septic arthritis, osteomyelitis, myositis • Iliopsoas abscess • Testicular torsion • Ovarian torsion • Transient synovitis • Malignancy • JIA • Rheumatic disorders • Trauma • Slipped capital femoral epiphysis: acute; unstable • Osgood-Schlatter disease	• Developmental dysplasia of the hip • Legg-Calvé-Perthes disease • Lower extremity length inequality • Neuromuscular disorder • Cerebral palsy • Stroke • Lower extremity length inequality • Slipped capital femoral epiphysis: chronic; stable

ACUTE RHEUMATIC FEVER

Treatment:

- Bed rest
- Monitor for features of carditis

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- Antibiotics:
  - Phenoxymethylpenicillin 50mg/Kg/day 6 hourly for 10 days
  - Amoxicillin 25-50mg/Kg/day 8 hourly for 10 days
- If allergic to penicillin:
  - Erythromycin 40mg/Kg/day 6 hourly 10 days
  - Azithromycin for 5 days
  - Clindamycin for 10 days
- Anti-inflammatory drugs:

Category	Anti-inflammatory agents	Dose & Duration
Patients with • Polyarthritis • Isolated carditis without cardiomegaly or CCF	Aspirin	50-70mg/Kg/day QDS 3-5d then, 50mg/Kg/day QDS 3 wks then, 25mg/Kg/day QDS 2-4 wks
Patients with • carditis and cardiomegaly or CCF	Prednisolone	2mg/Kg/day QDS for 2-3 weeks then, 1mg/Kg/day QDS for 2-3 weeks then, taper by 5mg every 2-3 days
		When prednisolone is tapered, aspiring should be started at 50mg/Kg/day QDS for 6 weeks to prevent rebound of inflammation.

In heart failure of Rheumatic carditis, Digoxin can be used cautiously to avoid arrhythmia.

Treatment of Sydenham's Chorea:

- Phenobarbitone (16-32mg every 6-8 hours orally): drug of choice.

If ineffective,

- Haloperidol (0.01-0.03mg/Kg/day BD 12 hourly
  Trade name: Tab. Halop, Halopid 5mg, IM Inj. Halopid 5mg/ml
- Chlorpromazine (0.5mg/Kg every 4-6 hourly orally)
- Trade name: Opsonil 50mg, 100mg, IM Inj. Opsonil 50mg/2ml

Duration: Increased until response. Then, tapered gradually

Anti-inflammatory agents are not recommended.

Prevention:
Primary prevention: Treatment of streptococcal sore throat with phenoxymethyl penicillin or erythromycin for 10 days.

Prevention of subsequent attack (**Secondary Prevention**):

Drugs	Dose	Route
Benzathine penicillin	1.2 million units if >30Kg; 6-9 lac if <30Kg every 3-4 weekly	IM
Penicillin V	250mg BD (>30Kg)	Oral

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	125mg BD (<30Kg)	
Erythromycin	250mg BD (>30Kg) 125mg BD (<30Kg)	Oral
Sulfadiazine/Sulfisoxazole	0.5mg once daily	Oral

Duration of prophylaxis:

Category	Duration after last attack
RF without carditis	5 years or until 21 years of age (whichever longer)
RF with carditis but no residual HD i.e. no valvular disease (clinical or echocardiographic evidence)	10 years or until 21 years of age (whichever longer)
RF with carditis and residual HD i.e. perstistent valvular disease	10 years or until 40 years of age (whichever longer) Sometimes, life long.

Oligoarthritis (Oligoarticular JIA)

Arthritis of four or fewer joints within the first 6 months.

Common causes of oligoarthritis:

Treatment:

Naproxen 15mg/Kg/day BD, max 500mg

Trade names: Susp. Naprosyn (125mg/5ml), Tab. Naprosyn 250mg, 500mg. Napro A (Acme), Nuprafen (Bex), Napryn (HC)

Tab. Calcium. Tab. Calbo Jnr

Tab. Folision 5mg: 1mg after the weekly dose of methotrexate

Indication of Intraarticular steroid:

- Oligo articular JIA – not responding to adequate dose and duration of NSAIDs
- Oligo JIA – with severe muscle wasting
- Oligo JIA – with deformity
- Poly JIA – development of target joint, with severe arthritis

Polyarthritis (Polyarticular JIA)

DDs of polyarthritis:

1. Infection

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   a. Pyogenic e.g. Staphylococcal, meningococcal, bacterial endocarditis
   b. Viral e.g. glandular fever
   c. Post- infective reaction e.g. Salmonella, Shigella
2. Allergic: HSP, serum sickness
3. Trauma
4. Chronic inflammation
   a. Rheumatic fever
   b. JIA
   c. Ankylosing spondylitis
   d. SLE
   e. Crohn's disease
   f. Ulcerative colitis
5. Hematological: sickle cell disease, hemophilia and Christmas disease
6. Gout

Generally, needs admission and complete evaluation.

Ocular Problems in Children (EYE)

Conjunctivitis

Types: **bacterial, viral, allergic**, irritants, toxins & systemic diseases.

Ophthalmia neonatorum: <4 wks of age. May be caused by *C. trachomatis, P. aeruginosa, N. gonorrhoea*). Neonatal conjunctivitis may be a component of systemic infection.

1. Irrigate eye with normal saline initially every 10-30 min, gradually increaseing to 2 hourly until eyes are clear of purulent discharge.
2. If gonococcoi suspected,
   a. Inj. Ceftriaxone 50mg/Kg single dose not exceeding 125mg. Or
   b. Inj. Cefotaxine 100mg/Kg single dose.
   c. Extend treatment if extraocular sites are involved (meningitis, arthritis).

Bacterial Conjunctivitis:
Redness, pain, photophobia, watering more than allergic Conjunctivitis.
Purulent discharge present.

Management:
Chloramphenicol Eye Drop (0.5%
Trade Names: Chloramex (Renata)/ A-Pnenicol(0.5%) (Acme), Icol(A)/ SQ-Mycetin(Sq) eye drop

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1 drop in each eye 2 hourly on the first day (as there is more purulent discharge in first day), then 6-8 hourly. This drug is cheap. Now-a-days, newer drugs are more used. **Followings are newer drugs:**
For neonates,
Tobramycin 0.3%: Tobracin (Opso saline)/ T-mycin (Aristopharma) eye drop:
1drop in each eye 2 hourly in first day (as there is more purulent discharge in first day), then 6 hourly.
For older ones, Moxifloxacin (0.5%), Iventi (Sq), Optimox (Aristpharma), Floxalone (Drug), Moxibac (Incepta).
1 drop in each eye 2 hourly in first day (as there is more purulent discharge in first day), then 6-8 hourly
Above 1 yr, Lomefloxacin 0.3%: Lomeflox (Aristopharma), Mexlo (Sqr)
2-3 times daily on affected eye. More frequent initially.
4. For more older ones, Ciprofloxacin eye drop 0.3%= Ciprocin E/D. 4 hourly. Initially more frequently.

Allergic Conjunctivitis

6. Itching present.
7. Less redness & photophobia.
8. No purulent discharge, but watering present.

Management:

Dexonex (steroid) eye drop

1-2 drop each eye qds initially then taper slowly.

Caution!!!!! Always search for corneal ulcer as steroid is contra-indicated in corneal ulcer/other corneal lesions.

Viral conjunctivitis: Redness, photophobia, watering etc. Seasonal. Contagious. Not related to any allergic substance. self limiting.

If dimness of vision is present:

Cap. Vitamin A /Retinol Forte (50,000 IU)

Stat dose:
0-6 m: 1 capsule
6m-1yr: 2 capsules
1yr- 2yr: 4 capsules

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Sinusitis

Acute sinusitis is defined by a duration of <30 days, **subacute** by a duration of 1-3 months, and **chronic** by a duration of longer than 3 months. (Nelson 22nd Ed)

Ethmoidal & maxillary develop early. Involved in infancy and early childhood. Commonly together.

Frontal sinus is involved only after 4-5 years.

Presentation: Typically follows viral rhinitis. Nasal discharge, nasal congestion, moderate fever, foul breath(halitosis), cough & postnasal discharge.

Children seldom complain of headache & facial pain but adolescents might.

Investigation: X-ray PNS OM (occipital-mental) view.

Normal PNS X-ray OM view

PNS X-ray OM view showing Lt. sided maxillary sinusitis indicated by opacity (from thickening of mucosa or collection of fluid)

Treatment: Amoxycillin (50mg/kg/day tds) for 10 days. 2nd line- amoxiclav, clarithromycin [15mg/kg/day bd (Klaricin125mg/5ml, Binoclar), cefuroxime [30mg/kg/day tds 1 tsf=125mg (Cefotil, Furocef etc.)]

Frontal Sinusitis: should start IV drug to avoid intracranial infection.

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Otitis media

ASOM:

Management:

- Susp. Amoxicillin/Moxin(O)/Fimoxyl(SA)/Moxacil(Sq): 25-50 mg/kg/dose, tds, for 10-14 days
  syrup: 1 tsf= 125 mg; drop 1ml=100mg; Cap. 250mg
- Amoxicillin+ clavulanic acid: Susp. Moxaclav, Fimoxyclav, Tyclav, Clamox (125mg+31.5mg), Moxaclave Forte/Tyclav BID (400mg+57.5mg), Fimoxyclav ES (600mg+42.9mg)
- Syp. Ibuprofen/ Inflam (SA) (100 mg/5ml)
  5-10mg/Kg/dose 6-8 hourly (for pain, fever) after meal

3. If discharge present (which indicates perforation), then

Ciprocin ear drop (1 drop in infected ear 6-12 hourly) tds for 7days,

& advise the following-

1. Do not bathe in the pond/ river by immersing or diving, use mug while bathing.
2. Close your ears by cotton before bathing.
3. Wicking to dry the ear is helpful.

If there is repeated attack (CSOM), ENT referral needed to exclude formation of cholesteatoma.

Nasal polyp

Nasal Decongestant: Oxymetaoline/Xylometazoline

Nasal spray:

1. **Fluticasone Propionate (50mcg/spray):** (also used in seasonal allergic rhinitis including hay fever and perennial rhinitis.) Perinase (Beximco), Flonaspray (Square)

   Adults & children over 12 years: 2 sprays in each nostril once a day preferably in the morning. In some cases 2 sprays into each nostril twice daily, not exceeding 4 sprays.
   Children under 12 years (4-11 years): 1 spray in each nostril once a day. The maximum total daily dosage should not exceed 4 sprays. For perennial rhinitis in children, there are insufficient clinical data to recommend its use.

   Not to be used in <4yrs

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2. **Mometasone Furoate (50mcg/spray):** Momeson (Incepta), Metaspray (Square), Nasomet (Beximco)
   Indication:
   Allergic Rhinitis (2 yrs and older): 2-11 yrs: 1 spray OD; 2 spray OD
   Nasal polyp (18yrs and older) 2 sprays per nostril BD
3. **Budesonide:** Budicort (100mcg/spray) for children 6 years and older
   Budesonide nasal spray is indicated in-
   - Prophylaxis and treatment of seasonal and perennial allergic rhinitis.
   - Prophylaxis and treatment of vasomotor rhinitis.
   - Symptomatic relief of nasal polyposis.
   - Prevention against nasal polyps after polypectomy.

   Dose: 1 spray per nostril OD

Duration: 4 weeks or more depending on patients condition

Oral Prednisolone: Cortan, Precodil, Cortisol, Deltasone

Dose: 1mg/Kg/dose; 2 weeks

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Dermatology

Impetigo

Bulous or non-bullous: Patients with a few superficial, isolated lesions and no systemic signs can be treated with topical antibiotics.

Mupirocin ointment: Bactrocin, Trego, Mupi etc. 12/8 hourly.

If there are widespread lesions or systemic signs, oral therapy with coverage for both GAS and S. aureus is needed.

- **Cefixime**: Cef-3, Rofixim, Denvar etc.
  Dose: Oral 8 mg/kg/24 hr divided q12-24h (Nelson 22nd edition. Higher dose is commonly prescribed in BD)
- **Cefuroxime** is an effective treatment of perianal streptococcal disease e.g. Cefotil, Rofurox, Furotil. 125, 250mg tablet, 125mg/5ml suspension, 1.5gm, 750mg Injection
  Dose: Oral: 20-30 mg/kg/24 hr divided q8-12h
  IV or IM: Neonates: 40-100 mg/kg/24 hr divided q12h; Children: 200-240mg/kg/24 hr divided 8h

Anti-staphylococcal antibiotic:

- Susp. **Flucloxacillin** (125mg/5ml), Capsule 250mg, 500mg.
  Trade names: Phylopen, Fluclox, Flubex, Flux
  Dose: 50-100 mg/kg/24 hr divided q6h PO

Antifungal medications in pediatrics practice:

Topical antifungals:

- **Terbinafine**: Terbex (Bex) cream, Telfin (Uni), Xfin (Square)
- **Naftifine**: T-cure 2% cream, Nafgal 2% cream
- **Miconazole**: Fungidal Cream (Square), Miconex(ACI), Micoderm (Drug), Topicazole (Incepta), Unigal (Opsonin)
- **Clotrimazole:** Afun 1% (Square), Triderm, Trimazole, Neosten (Bex)
- **Topical Ciclopirox 8% lacquer**: Candirox (8%). Twice daily for 4 weeks.
- **Amorolfine 3% lacquer:** Clinail nail lacquer, Curafin cream, Amofun cream
- **Bifinazole-urea 1%/40% ointment:** Not available in BD

Systemic antifungals:
Oral:

- **Itraconazole:**
  Dose: 2.5mg/Kg/dose BD

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Tradenames: 100mg, 200mg capsule/Tablet. Itra (Square), Itrader, Itrader SB 65mg (Uni), Sporagin (Ibn sina), Subazol
Sporagin oral solution: 50mg/5ml
Note: Acidic beverages such as colas or cranberry juice can enhance absorption. Administration with food significantly increases the absorption of the capsule formulation, but the oral suspension with a cyclodextrin base is better absorbed on an empty stomach.

- **Fluconazole**: 3-6mg/Kg/day
  Trade names: Capsule 50mg, 150mg, 200mg, Susp. 50mg/5ml, 200mg/100ml IV. Flugal (Square), Lucan-R(Renata), Omastin(Bex), Flucoder (SKF)
- **Terbinafine**: 3-6mg/Kg/day
  Trade names: Derbicil (Incepta), Elvina 250mg (HC), Telfin 250mg (Uni), Terbex 250mg (Bex), Xfin 250mg (Square)
- **Voriconazole:** Expensive, do not prescribe unless there is no other option.
  Dose: 9mg/Kg/dose BD oral maintenance.
  Tradenames: 50mg (50 BDT), 200mg tablet (130 BDT) Vori (Square), Vivori (Bex) 50, 100, 200mg, Vorifast (HC), Verifend.
  Susp. 200mg/5ml (40ml bottle = 1000 BDT) = Progil Sus, Vcand(Biopharma), Viera (Beacon), Voricon (General), Voriderm (Incepta), Vorifast (HC)

Intravenous Antifungal:

- Amphotericin B deoxycholate: 1mg/kg/day
- Fluconazole: 12mg/Kg/day. Loading dose of 25mg/Kg is recommended in neonate (and children)- according to Nelson 22nd edition
  Trade name: Flugal 200mg/100ml infusion, Omastin IV
- Voriconazole: 8mg/Kg/dose BD IV; 9mg/Kg/dose BD oral maintenance. Voriderm 200mg/vial (Incepta), Vorifast 200mg/vial (HC), Voritec (Ziska), Vorizol (Drug)
- Lipid Amphotericin B formulations: 5mg/Kg/day

Ringworm (Taeniasis)

Mild cases (single lesion): Topical Miconazole/Clotrimazole apply locally for 2-4 weeks
Extensive cases (multiple lesion): Topical plus Systemic Fluconazole/Itraconazole/Terbinafine 3-5mg/Kg/day for 2-4 weeks

Duration of treatment:

- Tinea corporis, cruris: 1 to 2 weeks
- Tinea pedis: 1 week
- Cutaneous candidiasis: 2 weeks

Another guideline is to continue medication for a few days after lesion is clear.

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Onychomycosis

From Nelson 22nd Paronychia and onychomycosis may be caused by **Candida**, although **Trichophyton** and **Epidermophyton** are more common causes. **Candida onychomycosis** differs from tinea infections by its propensity to involve the **fingernails** and not the toenails and by the associated paronychia.

The drug of choice for onychomycosis is terbinafine. In cases where terbinafine is not suitable, such as in patients with liver disease, other options like itraconazole or fluconazole may be considered.

Topical Azoles:

- **Clotrimazole:** Afun 1% (Square), Triderm, Trimazole, Neosten (Bex)
- **Topical Ciclopirox 8% lacquer**: Candirox (8%). Twice daily for 4 weeks.
- **Amorolfine 3% lacquer:** Clinail nail lacquer, Curafin cream, Amofun cream
- **Bifinazole-urea 1%/40% ointment:** Not available in BD.

Oral:
Itraconazole: Itra 200mg
Terbinafine: 1 week of each month for 3-4 months or
250 mg per day for 6 weeks for fingernail infections and 12 weeks for toenail infections.
Trade names: Derbicil (Incepta), Elvina 250mg (HC), Telfin 250mg (Uni), Terbex 250mg (Bex), Xfin 250mg (Square)
In the case of candida onychomycosis: **Once-weekly fluconazole** for 4-12 months is an effective treatment strategy with low toxicity.

Tinea versicolor (also pityriasis versicolor)

Caused by: *Malassezia*
Treatment: (Nelson 22nd)
Counselling: Regardless of the agent chosen, recovery time can be prolonged, with repigmentation not occurring for several months.

Characteristic hypopigmented scaling macules of Pityriasis Versicolor

Topical:

- **Selenium sulphide** 2.5% applied to affected areas for 10 minutes daily for a week.
  Tradename: Selsun Blue/Selsun shampoo
- **Ketoconazole 2% shampoo**: Applied daily for 3 days
  Trade name: Select PLUS 1.9%, Dancel 2% shampoo (Incepta), Ketocon 2% shampoo(Opsonin), Ketozol 2% shampoo(Aristopharma), Nizoder 2% shampoo(Uni)
- **Terbinafine 1% Cream:** 1-2 times daily for 1-2 weeks
  Trade name: Derbicil (Incepta), Elvina (HC), Telfin (Uni), Terbex (Bex), Xfin (Square)
- If only it involves head & neck, one of the following can be used:
  1% ciclopirox cream: Candirox 0.77% cream (Incepta), Cicloderm 1% cream (Popular), Ciclorox 1% cream (Opsonin), Clopirox 1% cream (Square), Fungirox 1% cream (Renata), Tinactin 1% cream (HC), **OR**
  Ketoconazole Shampoo: Select Plus 1.9% shampoo (Square), Dancel 2% shampoo (Incepta), Ketocon 2% shampoo (Opsonin), Ketozol 2% shampoo(Aristopharma), Nizoder 2% shampoo(Uni)

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[Continued application of topical treatment on a weekly or monthly basis is frequently recommended to prevent relapse.]

Oral Therapy: More expensive, has higher side effect risks, and may be less effective than topical therapy(Nelson 22nd).

- **Fluconazole**: 300mg weekly for 2-4 weeks
  Trade names: Capsule 50mg, 150mg, 200mg, Susp. 50mg/5ml, 200mg/100ml IV. Flugal (Square), Lucan-R(Renata), Omastin(Bex), Flucoder (SKF)
- **Itraconazole**: 200mg for 5-7 days or 100mg daily for 2 weeks
  Tradenames: 100mg, 200mg capsule/Tablet. Itra (Square), Itrader, Itrader SB 65mg (Uni), Sporagin (Ibn sina), Subazol
  Sporagin oral solution: 50mg/5ml
  Note: Acidic beverages such as colas or cranberry juice can enhance absorption. Administration with food significantly increases the absorption of the capsule formulation, but the oral suspension with a cyclodextrin base is better absorbed on an empty stomach.

Vaginal Candidiasis

Clinical manifestations: Include pain or itching, dysuria, vulvar or vaginal erythema, and an opaque white or cheesy exudate.

More than 80% of cases are caused by C. albicans.

Vaginal creams or troches of nystatin, clotrimazole, or miconazole.

Oral therapy with a single dose of fluconazole is also effective.

Scabies

Benzyl Benzoate: Ascabiol, Scabisol
After a hot bath and drying, it is applied (diluted with an equal quantity of water for older children and with three parts of water for babies) to the whole body except the head and face. A second application is made within 5 days of the first.

For Pediculosis: The affected region is coated with Scabisol followed by a wash 24 hours later with soap and water. In severe cases this procedure may need to be repeated two or three times. An examination should always be made a week after the last treatment to confirm disinfestation.

Topical permethrin 5%**:** Scabex, Permin, Lorix, Elimate
For adults and children over 2 years: Apply the cream to the whole body from the neck down (for babies under 2 years: apply to the face, neck, ears and scalp as well, only avoiding the area immediately around the eyes and mouth). Leave cream on for at least 8 hours, before washing off. Use again after 7 days.
Combination: Lorix Plus/Elimate Plus/Unix-C
Ora Ivermectin: Alice, Scabo, Ivera, Ivactin

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0.2mg/Kg/dose. D1 & D7/D14. With food.
Possible interaction with azithromycin, cetirizine, cotrim.

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Accidents and Poisonings

A table of poisons and antidotes is available. Click Appendix to see it. Reference: Nelson 22nd Edition, chapter 94.

OPC Poisoning

First Aids:

- ABC(Airway, Breathing, Circulation)
- **Prevention of further exposure** by removing clothes, washing of body with soap water or gastric lavage as appropriate.

℞ on admission on *date* at *time*

1. **NG suction** if patient arrived before 2 hours
2. NPO till F/O
3. **Inf. baby saline/ED-10/libott S junior** (.....ml)
   IV @ $\frac{ml}{25}$ µd/min stat & daily
4. **Inj. Atropine 0.6mg/ml-**
   0.05mg/Kg IV stat (1amp/12Kg)
   then 0.02-0.05mg/Kg (½-1amp/12Kg) every 10-30 minutes till atropinization (max. 2-5mg).
5. **Inj. Pralidoxime (1000mg/20ml)/ Pradox (Beacon), Pralidox (Incepta), Pralidot (Globe):**
   25-50mg/Kg over 15-30 minutes. May be repeated after 1-2 hours.
6. **Inj. Ceftriaxone** (1gm/10ml)
   0.5-1ml/Kg IV stat & once daily.
7. **Inj. Omeprazole 40mg/vial**
   0.6-0.7mg/Kg/D IV/PO daily
8. **Continuous Catheterization:** (specially in male)

Keep atropinized for 2-3 days. Then reduce gradually.

Signs of Atropinization: High body temperature, Fully dilated pupil, tachycardia/pulse >70/min, dry mouth, retention of urine
Treatment of Atropine Toxicity: Inj. Diazepam 10mg/2ml- 0.05-0.3mg/Kg/dose may repeat every 30 min (max. total dose 5-10mg) (0.01ml-0.06ml/Kg)

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Rat Killer Poisoning

Rodenticide: available in the market as **Lanirat** (Bromadiolone). It is a second-generation coumarin derivative, often called a "**super-warfarin**" for its added potency and tendency to accumulate in the liver of the poisoned organism. It works by disrupting the vitamin K cycle in rodents, leading to internal bleeding and eventual death.

Toxic Dose: 0.17 mg/kg body weight. 100gm of packet. Usually, 55mg of Bromadiolone/Kg. Try to confirm the amount of bromadiolone ingested.

Investigations: The coagulation profile in bromadiolone poisoning typically shows prolonged prothrombin time (PT), activated partial thromboplastin time (APTT), and an elevated international normalized ratio (INR).

Clinical Feature: Includes dizziness, unsteady gait, hemorrhagic manifestations. Accumulate in liver and may cause effect even after 5 days, with toxic effects persisting for more than 3 weeks. Repeated measurement of coagulation profile may be required.

Antidote: Vitamin K1.

Paracetamol Poisoning

Toxic dose: 100mg/Kg

Clinical Feature:

Phase I: Usually begins 30-60 minutes after ingestion and last for about 12-24 hours. Moderate to severe poisoning leads to GIT (anorexia, nausea and vomiting) as well as pallor and diaphoresis.

Phase II: Occurs 24-4 8 hours after ingestion. Clinically asymptomatic and mild right upper abdominal pain.

Investigations: PT, serum bilirubin, SGPT

Phase III: Occurs 3-5 days after ingestion. S/S related to hepatotoxicity. May be limited to anorexia, nausea, malaise and abdominal pain. Severe cases may progress confusion and stupor as well as sequelae related to hepatic toxicity, including jaundice, coagulation defects, hypoglycemia, and encephalopathy. Renal failure and myocardiopathy may also occur.

Cause of death: Irreversible hepatotoxicity.

Treatment:

Syrup of ipecac:

Activated charcoal:

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N-acetylecysteine: Loading dose: 140mg/Kg body weight, maintenance dose: 70mg/Kg 4 hourly (up to 17 doses).

In hepato-renal failure:

- 10% DA to prevent hypoglycemia
- FFP to maintain PT <60 seconds.10-20ml (15ml/Kg). Larger volume is preferred to avoid repeated exposure. **Type:** Same ABO group of recipients or of AB blood group (plasma contain neither anti-A nor anti B antibody).
- IV mannitol 1gm/Kg in hepatic encephalopathy. Tradename: Mannitol, Osmosol, Manisol (20%)

OCP Poisoning

Oral Contraceptive Pills & Trade names:

Estrogen	Progestogens	Trade Names
Ethinylestradiol	Norgestrel	Femicon, Conrena – R, Noret 28
	Lynestrenol	Ovacon Gold, Lynes, Ovostat Gold, Regumen
	Levonorgestrel	Femipil, Lyta-28, Mayapill
	Drospirenone	Novelon, Novelon Lite, Rosen 28, Valentino
Emergency CP	Levonorgestrel	Norix 1, I-Pill, Emcon, Norpill

Progestogens, also sometimes written progestins, progestagens or gestagens= Norgestrel, Lynestrenol, Levonorgestrel, Drospirenone.
Progestogens Overdose: Relatively safe. But general principles of management of acute poisoning should be followed. Investigate and monitor.

Estrogen/Ethinylestradiol overdose: Acute poisoning with ethinylestradiol results in mild, self-limiting effects, usually involving the gastrointestinal tract. Nausea, vomiting, and occasionally vaginal breakthrough bleeding may occur.

Management: There is no established guideline. In general, the management of acute poisoning involves supportive care, including anti-emetic medication and intravenous fluids for rehydration if vomiting is excessive. For chronic toxicity, patients should discontinue ethinylestradiol under the guidance of a healthcare provider.

Sedative Poisoning

Toxic Doses of Selected Benzodiazepines in Children (Source: Internet) See also ***PoisonsAntidotes***

Benzodiazepine	Toxic Dose (Single Ingestion)	Onset of Effects	Clinical Effects of Toxicity	Key Management Notes
Midazolam	>0.3 mg/kg (or >5 mg in toddlers)	5–15 min (IV/IM); 20–30 min (PO)	Rapid sedation, apnea (especially IV), paradoxical agitation	**Priority: Airway support.** Flumazenil high-risk due to rapid onset/seizure risk.

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Bromazepam	>0.5 mg/kg (or >10 mg in toddlers)	30–60 min	Sedation, ataxia, respiratory depression (rare in isolated cases), paradoxical agitation	Supportive care; consider flumazenil only for severe respiratory depression (controversial in mixed ingestions).
Clonazepam	>0.1 mg/kg (or >2 mg in toddlers)	20–60 min	Prolonged sedation, hypotonia, respiratory depression (uncommon), risk of aspiration	Monitor airway; flumazenil rarely needed (high seizure risk if child is chronic user or has co-ingestants).
Diazepam	>0.5 mg/kg (or >10 mg in toddlers)	15–30 min	Drowsiness, slurred speech, respiratory depression (rare unless combined with other CNS depressants)	Activated charcoal if recent ingestion; prioritize supportive ca

Naphthalene Poisoning

Types of Mothballs: Naphthalene: Highly toxic (white, pungent odor) & Para-dichlorobenzene (PDB): Less toxic (blue/white, milder odor).

Toxic Dose: >1 mothball (200 mg) in toddlers; severe toxicity >2 mothballs or 50 mg/kg

Mechanism of toxicity: Hemolytic anemia (oxidative damage to RBCs) + direct CNS toxicity (lipid solubility)

Key Symptoms:

Early (1-4 hr): Nausea/vomiting, diarrhea, abdominal pain
24-48 hr: Hemolysis (pallor, jaundice, dark urine), lethargy, seizures (rare)
High-Risk Groups: G6PD deficiency (extremely high hemolysis risk), infants <6 months

Management:

1. Decontamination:
   - Activated charcoal (if <1 hr post-ingestion);
   - Avoid fats/oils (enhance absorption)
2. Hemolysis Monitoring:
   - CBC
   - Reticulocytes
   - Haptoglobin
   - bilirubin
   - UA for hemoglobinuria
   - Coombs test: Negative (intravascular hemolysis).
3. Treatment:
   - IV fluids + urine alkalinization (if hemoglobinuria)
   - Blood transfusion if severe anemia

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- Methylene blue contraindicated in G6PD deficiency

Admission:

- Symptomatic patients
- G6PD deficiency
- Ingestion >200 mg/kg

Burn

Outdoor management: <10%, superficial burn

- Do not rupture blister
- Silver Sulfadiazine: Burna, Burnsil, Silcream
  Apply locally BD

If more than 5 years have elapsed since completion of TT course.

- Inj. Vaxitet 0.5ml IM stat.

If infection is suspected, start antibiotic (Cefixime ±flucloxacillin)

- **Cefixime**: Cef-3, Rofixim, Denvar etc.
  Dose: Oral 8 mg/kg/24 hr divided q12-24h (Nelson 22nd edition. Higher dose is commonly prescribed in BD)
- **Flucloxacillin** (125mg/5ml), Capsule 250mg, 500mg. Phylopen, Fluclox, Flubex, Flux
  Dose: 50-100 mg/kg/24 hr divided q6h PO

Admission criteria:

- Burns covering >10% TBSA,
- burns associated with smoke inhalation,
- Burns resulting from high-tension (voltage) electrical injuries and
- burns associated with suspected child abuse or neglect.

℞ on admission on *date* at *time*

- First aid, including washing of wounds and removal of devitalized tissue.
- Airways:
  - Start 100% oxygen and measure carboxyhemoglobin (CO) levels as well as blood gas (Cutaneous oxygen saturations are not accurate in CO poisoning).
  - Assess for laryngeal edema (examine mouth, assess for stridor, retraction) and intubate for evidence of significant airway compromise.

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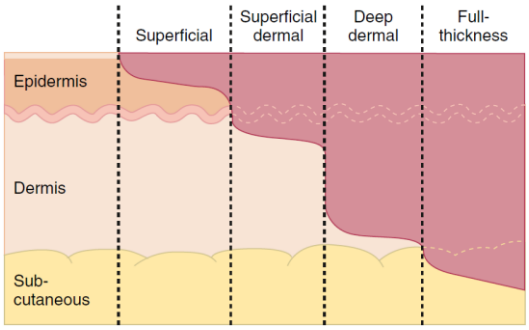
- Circulation: Children with burns >15% TBSA require,
    - NPO (as gastric distension may occur). NG tube to prevent aspiration.
    - Intravenous (IV) fluid resuscitation to maintain adequate perfusion (Ringers Lactate 10-20ml/Kg/hr, if not available, use NS).



- Catheterization to monitor urine output.
- Control of pain. *See below*
- Prevention of infection. Wound should be wrapped with a clean sheet or dressing.
- Early excision and grafting
- Prevention of excessive metabolic expenditures
- Control of bacterial wound flora
- Early mobility, range of motion, and strength exercises

Note:

- Significant large-burn injury (>15% TBSA) decreases body temperature control so the use of cold water is contraindicated. Cover the burned area with clean, dry sheeting or dressing. Avoid using tape.
- If IV access is not possible, intraosseous (IO) line may be placed on Tibia. IO line should be replaced with CV line in timely fashion.
- For patients with circumferential burns of the extremities, elevate the extremities and monitor perfusion (Capillary refill time, pulse). May develop compartment syndrome and require escharotomy.
- Cervical spine precautions should be taken if there is H/O fall until associated injuries are rule out.
- High voltage (>1000 volts) may lead to ventricular fibrillation(VF) and require CPR. And should start cardiac monitoring.

Treatment, complications depend on size and depth of burn. The rule of nine does not apply to children under 14 years of age.

Thumb rule for children: Palm of the hand of the child (from base of palm to fingertip) = 1%. Compare with own hand and measure the size of burn. (Nelson 22nd edition)

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Table 89.5 Categories of Burn Depth

	FIRST-DEGREE BURN	SECOND-DEGREE BURN (PARTIAL THICKNESS)	THIRD-DEGREE BURN (FULL-THICKNESS)
Surface appearance	Dry, no blisters Minimal or no edema Erythematous Blanches, bleeds	Moist blebs, blisters Underlying tissue is mottled pink and white, with fair capillary refill Bleeds	Dry, leathery eschar Mixed white, waxy, khaki, mahogany, soot-stained No blanching or bleeding
Pain	Very painful	Very painful	Insensate centrally, edges (usually less deep) may still have sensation
Histologic depth	Epidermal layers only	Epidermis, papillary, and reticular layers of dermis May include domes of subcutaneous layers	Through all layers of the skin to subcutaneous tissue (loss of muscle, bone is fourth-degree burn)
Healing time	2-5 days with no scarring	Superficial: 5-21 days with no grafting Deep partial: 21-35 days with no infection, but scar is expected; if infected, converts to full-thickness burn	Large areas require grafting, but small areas may heal from the edges after weeks

First Aid Measures:
Acute care should include the following measures:

1. **Extinguish flames** by rolling the child on the ground; cover the child with a blanket, coat, or carpet.
2. **Remove smoldering clothing** or clothing saturated with hot liquid. Jewelry, particularly rings and bracelets, should be removed or cut away to prevent constriction and vascular compromise during the edema phase in the first 24-72 hours after burn injury.
3. In cases of **chemical injury**, brush off any remaining chemical. If **powdered or solid**, then use copious irrigation or wash the affected area with water. Wash the burned area with soap and cool running water. For burns on less than 10% of the body, irrigate with cool tap water for 10-20 minutes.
4. If the burn is caused by **hot tar**, cool the burn and then use mineral oil to remove the tar.
5. Administer analgesic medications.

Analgesia in children: (Ref: p681 Nelson 22nd edition)

Medication	Dosage	Trade names	Comments
Non-opioid analgesic			
Acetaminophen	10-15mg/Kg 4-6 hourly Maximum dose: 75 mg/kg/24 hr (children) 60 mg/kg/24 hr (<2 yr) 30-45mg/kg/24 hr (neonates)	Napa, Ace, Renova, Reset, Fast Syp. 120mg/5ml Drop 80mg/ml	Minimal anti-inflammatory action; no antiplatelet or adverse gastric effects; overdosing can produce fulminant hepatic failure.
Ibuprofen	8-10 mg/kg PO q6h 10 mg/kg IV q4-6h to maximum of 400 mg. Maximum daily dose: 2,400 mg	Flamex, Inflam, Reumafen, Advel Susp. 100mg/5ml Tab. 200mg, 400mg	Anti-inflammatory; transient antiplatelet effects; may cause gastritis; extensive pediatric safety experience.
Naproxen	5-7 mg/kg PO q8-12h Maximum daily dose: 1,000 mg	Susp. Naprosyn (125mg/5ml), Tab. 250mg, 500mg	Antiinflammatory; transient antiplatelet effects; may cause gastritis; more prolonged duration than that of ibuprofen.

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Ketorolac	Loading dose 0.3 mg/kg, then 0.25-0.3 mg/kg IV q6h to a maximum of 5 days maximum single dose 15 mg for those < 50 kg and 30 mg for those ≥ 50 kg	Tablet 10mg, IV 30mg/ml, 60mg/2ml Trade name: Rolac, Torax, Zeropain, Xidolac	Anti-inflammatory; reversible antiplatelet effects; may cause gastritis; useful for short-term situations in which oral dosing is not feasible.
Diclofenac Sodium	2-3mg/kg/day divided in 2 or 3 doses Maximum daily dose: 150 mg	Clofenac tablet 50mg, 100mg(SR) Voltalin/Clofenac Supp. 12.5mg, 25mg, 50mg Injection 75mg/3ml	Antiinflammatory; reversible antiplatelet effects; lower risk of gastritis and ulceration compared with other NSAIDs.
Celecoxib	Not available commonly	In Bangladesh	
Opioid analgesic			
Tramadol	In children from the age of 1 year Tramadol hydrochloride can be given in a dose of 1-2 mg/kg body weight. However, suppository (100 mg Tramadol Hydrochloride) should not be administered in children and adolescents below the age of 14 years.	Syndol, Anadol 50mg, 100mg SR Inj. Anadol 100mg/2ml	Regardless of route of administration, the site of action is at mu (μ) opioid receptors in the peripheral nervous system, spinal cord, brainstem, and higher CNS centers. Opioids' respiratory depressant effects result from infants' lower metabolic clearance of opioids and higher blood levels with frequent dosing.
Nalbuphine	0.2-0.5mg/Kg every 3-6h SC, IV, IM 0.2mg/kg body weight, given preferably by IV/IM injection. Maintenance doses may be given at intervals of 4 to 6 hours Children from 18 months to 15 years old	Nalbun 20mg/2ml	

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Rabies (Dog Bite)

Caused by: Rabies virus
Source: Rabid canine animals include mostly Dog; in very few cases other animals are Cat, Fox(খেঁকশিয়াল ; পাতিশিয়াল), Jackal (শেয়াল ; ফেউ, শৃগাল), Mongoose (বেজি, নেউল, নকুল), Monkey and other Wild animals.

Post-Exposure Prophylaxis: Unimmunized People

Intramuscular (IM) Regimen (commonly followed in BD)

Dose	Route	Duration	No. of injection sites per clinic visit	sites
Entire vial (1 ml)	Intramuscular (IM)	14-28 days	4 doses, 1-1-1-1 (D0, D3, D7, D14)	Deltoid region (above 2 yrs.) Or Antero-lateral thigh (if ≤ 2 yrs.)

Intradermal (ID) Regimen (better but requires training and expertise. So, less used)

Dose	Route	Duration	No. of injection sites per clinic visit	sites
0.1 ml each site	Intradermal (ID)	1 week (Day 0, Day 3, Day 7)	2-2-2-0-0	Deltoid region (above 2 yrs.) Or Antero-lateral thigh (if ≤ 2 yrs.)

Prophylaxis in Re-exposure: Previously vaccinated person

Dose	Route	Duration	No. of injection sites per clinic visit	sites
Entire vial (1 ml)	Intramuscular (IM)	03 days (D0, D3)	2 doses, 1-1-0-0	Deltoid region (above 2 yrs.) Or Antero-lateral thigh (if ≤ 2 yrs.)

Rabies Vaccine (2.5IU/ml): Trade name: Rabix VC(Incepta), Rabivax(Popular), Verorab(Synovia)

Rabies Immunoglobulin (1000 IU/5 ml): Trade name: Rabix IG(Incepta), Favirab(Synovia), Rabivax-IG(Popular)

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Table 2: Category of exposure/wound and recommended measures (WHO customized for Bangladesh, Annex 1).[1]

Category	Type of contact	Recommended treatment
I	▪ Touching or feeding of animals ▪ Licks on intact skin	▪ Wash the site with soap and water only
II	▪ Minor scratches or abrasions without bleeding	▪ Wound management ▪ Anti-Rabies vaccine (ARV) as soon as possible on 1st visit
III	▪ Single or multiple transdermal bites or scratches with active bleeding ▪ Licks or broken skin, contamination of mucous membrane with saliva (i.e. licks) ▪ Exposure to bats *	▪ Wound management ▪ Administer Anti-Rabies vaccine immediately ▪ Administer rabies immunoglobulin (RIG) and ▪ Prophylactic antibiotics if required ▪ Anti-tetanus vaccination if required

Fig. 4: Category II

Fig. 5: Category III

Fig. 6: Category III

National Guideline 2021

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Kerosene Poisoning

℞ on admission on *date* at *time*

[Note: Do not give NG suction. Do not induce vomiting]

1. **NPO till F/O**
2. **O_2 inhalation** stat & SOS
3. **Inf. baby saline/ED-10/libott S junior** (.....ml)
   IV @ ml/25 µd/min stat & daily [Give 30% less than required amount.]
4. **Inj. Ceftriaxine (1gm/10ml)**
   0.5-1ml/Kg IV stat & daily
5. **Paracetamol Suppository** (60/125/250/500mg)
   1 stick P/R SOS if fever

If chest/abdominal pain/irritability:

6. **Inj. Omeprazole (40mg/10ml)**
   0.2ml/Kg IV stat & once daily
7. **Inj. Tiemonium methylesulphate/Algin/Norvis /Onium/Visral/Xelcom (5mg/2ml)**
   1 amp. IV stat & TDS

Principles of management:

- **Asymptomatic patients:** Admit for 24 hours and discharge if no symptom appears.
- Evaluate & maintain ventilatory status of the patient:
  - Oxygen for all patient.
  - Intubation & ventilatory support if needed.
- Prevent further exposure- remove clothes, wash with copious water.
- Routine use of Antibiotic is not recommended. Occurence of secondery infection is readily detected by re-appearance of fever on 3rd-5th days.
- Nutritional support.
- Corticosteroid, activated charcoal, cathartics, mineral oil & olive oil have no beneficial effect.

Complications:

a. **Immediate:** Pneumothorax, subcutaneous emphysema, empyema, Pneumatocele (developes in recovery phase & may take 6-9 months) & secondery infection with bacteria or virus.
b. **Long Term:** Persistent cough or frequent respiratory infection & increased risk for developing chronic lung disease.

Investigation:

- **X-ray chest:** pneumonitis in 62-89% cases. As early as 30 min & as late as 6-12 hours.
  i. Grade 0: Normal X-ray.
  ii. Grade 1: Minimal unilateral perihilar infiltration.
  iii. Grade 2: Bilateral infiltration.
  iv. Grade 3: Confluent fluffy shadows on one or both sides.
  v. Grade 4: Extensive bilateral infiltration with consolidation &/or pleural effusion.
- **Pulse Oxymetry:** oxygen saturation.
- **TC-WBC:** Leukocytosis.

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Poisonous Snake Bite

First Aid

01. Reassurance
02. Immobilization of biten limb (with splint and sling)
    a. If bite is in the lower limb, donot allow to walk
    b. If bite is in the upper limb, do not allow to move it.

[Ideally pressure immobilization method (by simple crepe bandage or any long strips of clothes (গামছা, লুংগি, ওরনা ইত্যাদি) can be helpful.]

03. Transfer quickly to nearest health facility where treatment is available (anti snake venom, ICU etc.)

[Assess the vital parameters e.g. respiration, cyanosis, pulse, BP, CRT etc]

Relevant investigation:

1. 20-minute whole blood clotting test (to exclude presence of Hemotoxin) **bedside test**
2. ECG
3. CBC

Required for sea snake which releases myotoxin/nephrotoxin:

4. Blood urea, s. creatinine (to check for AKI)
5. S. CPK (to exclude presence of myotoxin manifested by severe bodyache)

℞ on admission on *date* at *time*

1. NPO till F/O
2. Infusion (just to keep the channel open)

3. Inj. TT
1 amp IM stat

4. Inj. TIG
1 amp IM stat

5. Inj. Polyvalent antivenom (if indicated)
IV@ 10 drops/min for 10 min then@ 50drops for the rest if no reaction occurs

For neurotoxic signs:
Inj. Atropine 0.6mg/ml (600µg/ml) 15 µgm /Kg IV, then
Inj. Neostigmine 0.5mg/ml (500µgm/ml) SC 50-100 µgm/Kg 4 hourly, until neurotoxic features are overcome.

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If **coagulopathy** present:
Fresh blood transfusion
Care of the bitten part-

- Wash with antiseptic solution/soap
- Debridement and skin grafting if needed

[**Indication of antivenom:**

1. Neurotoxic signs
    a. Generalized muscle weakness e.g. lethargy, ptosis; paralysis of eye ball muscles
    b. broken neck sign
    c. Difficulties in speech
    d. Difficulties in opening of mouth/protrusion of tongue
    e. Shallow respiration)
2. Rapid extension of local swelling
3. Acute renal failure
4. Acute circulatory failure
5. Bleeding abnormality
6. Hemoglobinuria/ myoglobinuria

Prepare antivenom: 10 vials, irrespective of age and sex. Dilute each vial with 10 ml D/W (=100ml) + 100ml IV fluid e.g., DA/DNS/NS. (=200ml)]

Before initiating antivenom, prophylactic subcutaneous adrenaline (dose- adult 0.25 ml of 0.1% solution and in children 0.005 mg/kg) should be given to the victim.

Inj. Adrin/Adrenalin (1mg/ml= 1:1000)

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NEONATOLOGY

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Criteria of a normal baby

- Birth weight: 2500 to <4000gm
- Length: Around 50 cm
- OFC: 35±2 cm
- Color: Pink, but mild peripheral cyanosis may be present after birth
- Breathing: spontaneous, regular and rate is 30-60/min
- Heart rate: 100-160/min
- Axillary temp: 97.5°F – 99°F
- Pass stool by 24 hours
- Pass urine by 48 hours
- Sleep: around 18 hours a day
- Primitive reflexes: Good & stable
- No congenital anomaly
- Baby is active

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admission criteria of newborn

- May vary according to institutional policy.
- Birth weight: <1800gm
- Gestational age <34 weeks
- Major congenital anomalies
- Babies with asphyxia (needing bag and mask ventilation)
- Babies with breathing difficulties
- Suspected early onset neonatal sepsis
- Neonatal jaundice requiring phototherapy or exchange transfusion
- Infant of Diabetic Mother who need IV glucose infusion
- Postoperative Newborn
- Newborn referred from other centers

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Choice of antibiotics in neonatology

1st line	Ampicillin + Gentamicin
2nd line	Ceftazidime + Amikacin
3rd line	Meropenem, Ciprofloxacin, Vancomycin, Cefepime, Clarithromycin, Netilmicin, Imipenem, Piperacillin + Tazobactam, Colistin
In suspected meningitis	Cefotaxime+ Amikacin or Meropenem + Amikacin

In Department of Neonatology, Mymensingh Medical College Hospital, we use **Ceftazidime** + **Amikacin** as first line drugs (based on local infection pattern and their sensitivity)

Ceftriaxone is avoided in neonatal period

Oral drugs are not absorbed properly in newborns and their use is discouraged.

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Perinatal asphyxia

There are a lot of features of perinatal asphyxia. But we are most concerned with hypoxic ischemic encephalopathy (*HIE*) for its association with both short- and long-term poor prognosis.

HIE has 3 stages (*Sarnat & Sarnat* staging) which can be differentiated by several features. Extensive list can be found in textbook. Practically we look for History of delayed crying (*HIE stage I*) with convulsion (*HIE Stage II*) or with shock or organ failure (*HIE stage III*).

We can write **TREATMENT OF PERINATAL ASPHYXIA** as follows:

℞ on admission on *date* at *time*

- ✓ NPO till F/O
- ✓ O2 inhalation stat & SOS
- ✓ Inf. 10% DA/Libott-10 (……ml)
  IV @$\frac{ml}{25}$ µd/min stat & daily
- ✓ Inj. Ceftazidime (250mg/5ml)/Tazid/Cefazid
  1 ml/Kg IV stat & 12 hourly
- ✓ Inj. Amikacin (100mg/2ml)/Kacin + 8ml D/W (so, 1ml=10mg), then
  $0.75 \times wt(Kg)\ ml$ IV stat & 12 hourly after passage of first urine
- ✓ Inj. K_1MM/Konakion 2mg
  1 ampule IV stat
- ✓ Please keep the baby warm
- ✓ Please monitor the vital signs

If there is convulsion/ history of convulsion, give:

- ✓ Inj. Barbit 200mg/1ml + 9ml D/W, then
  1ml/Kg IV stat & then, $\frac{wt}{8}$ ml IV 12 hourly

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Treatment algorithom for neonatal Convulsion

Ref: Nelson 22nd edition: p3623, chapter 633

1st line therapy: Inj. Phenobarbitone 20mg/Kg (Max 1g)@rate ≤ 1mg/Kg/min (inj. Barbit/Berdinal 200mg/1ml ampule)
(max 100mg/min) or over 20 mins.

↓

2nd line therapy: IV Phenytoin drip 20mg/Kg (Max 1500mg/24hrs) (Inj. Fosfen 150mg/2ml=100mg Phenytoin ampule)
@rate ≤1mg/Kg/min (Max 50mg/min) or over 20 mins

↓

2nd/3rd line therapy: IV Levetiracetam (40-60mg/Kg/day, TDS)

↓

Inj. Midazolam 0.2mg/Kg boluses (Max. 2mg/Kg) (Inj. Dormicum/Dormitol 15mg/3mol ampule)
then 0.05-2mg/Kg/hr
Increase every 15 mins up to 2mg/Kg/hr

Other drug: Lorazepam (0.1 mg/kg and then 0.05 mg/kg (range: 0.02-0.10mg/kg) every 4-8 hour. Quick onset of action. Does not cause hypotension or respiratory depression

↓

Inj. Propofol/Intubation under GA

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Neonatal sepsis

Write **TREATMENT OF NEONATAL SEPSIS** as follows:

℞ on admission on *date* at *time*

- ✓ NPO till F/O if there is fast breathing, cyanosis, lethargy, convusion etc.
- ✓ O_2 inhalation stat & SOS
- ✓ Inf. 10% DA/Libott-10 (……ml) [change fluid according to age. See Fluid]
  IV @$\frac{ml}{25}$ µd/min stat & daily
- ✓ Inj. Ceftazidime (250mg/5ml)/Tazid/Cefazid
  1 ml/Kg IV stat & 12 hourly
- ✓ Inj. Amikacin (100mg/2ml)/Kacin + 8ml D/W (so, 1ml=10mg), then
  $0.75 \times wt(Kg)\ ml$ IV stat & 12 hourly after passage of first urine
- ✓ Inj. K_1MM/Konakion 2mg (if not received after birth)
  1 ampule IV stat
- ✓ Please keep the baby warm
- ✓ Please monitor the vital signs

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Neonatal Jaundice

Write **TREATMENT OF NEONATAL JAUNDICE** as follows:

℞ on admission on *date* at *time*

- ✓ NPO till F/O
- ✓ O_2 inhalation stat & SOS
- ✓ Inf. 10% DA/Libott-10 (……ml) [change fluid according to age. See Fluid]
  IV @$\frac{ml}{25}$ µd/min stat & daily
- ✓ Inj. Ceftazidime (250mg/5ml)/Tazid/Cefazid
  1 ml/Kg IV stat & 12 hourly
- ✓ Inj. Amikacin (100mg/2ml)/Kacin + 8ml D/W (so, 1ml=10mg), then
  $0.75 \times wt(Kg)\ ml$ IV stat & 12 hourly after passage of first urine
- ✓ Inj. K_1MM/Konakion 2mg
  1 ampule IV stat
- ✓ Start phototherapy ± Prepare for exchange transfusion
- ✓ Please keep the baby warm
- ✓ Please monitor the vital signs

[Check for Rh incompatibility or ABO incompatibility. Send for **Blood grouping & Rh typing, S. bilirubin (Total, Direct, Indirect)**]

First, we need to determine if jaundice is physiological or pathological. If in doubt, we should always check.

Physiological jaundice:(1)

- Appears on 2^{nd} -3^{rd} day of life.
- Reaches its peak by 5^{th} – 6^{th} day
- Declines by 7^{th} – 8^{th} day of age (term) & 10^{th} -11^{th} day (preterm)

Pathological jaundice:(1)

- Appears on the 1^{st} day of life
- Lasts longer than 14 days in term & 21 days in preterm babies.
- Rate of rise of serum bilirubin of > 0.5mg/dl/hour or ≥10mg/dl/day
- Jaundice with signs of sepsis/sickness
- Jaundice extended up to palms and soles
- Jaundice with pale stool & yellow urine

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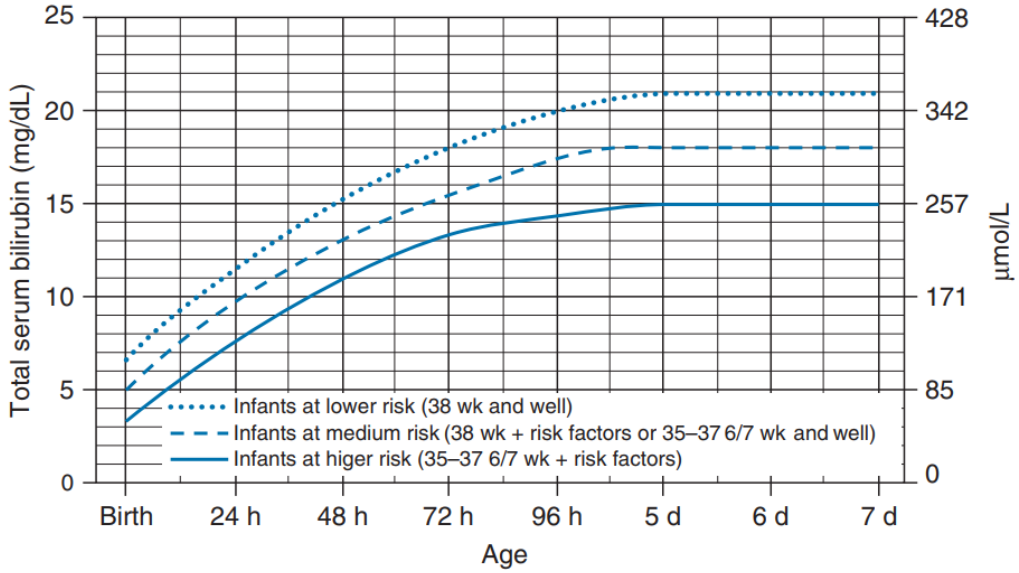
General Guideline with level of total bilirubin (10)

Area of body	Level of bilirubin
Face	4-6mg/dL
Chest, upper abdomen	8-10mg/dL
Lower abdomen, thighs	12-14mg/dL
Arms, lower legs	15-18mg/dL
Palms, soles	≥20mg/dL

Guidelines for phototherapy in hospitalized infants of ≥35 weeks' gestation.(11)



- Use total bilirubin. Do not subtract direct reacting or conjugated bilirubin.
- Risk factors–isoimmune hemolytic disease, G6PD deficiency, asphyxia, significant lethargy, temperature instability, sepsis, acidosis, or albumin <3.0 g/dL (if measured).
- For well infants 35–37 6/7 wk can adjust TSB levels for intervention around the medium risk line. It is an option to intervene at lower TSB levels for infants closer to 35 wks and at higher TSB levels for those closer to 37 6/7 wk.
- It is an option to provide conventional phototherapy in hospital or at home at TSB levels 2–3 mg/dL (35–50 mmol/L) below those shown, but home phototherapy should not be used in any infant with risk factors.

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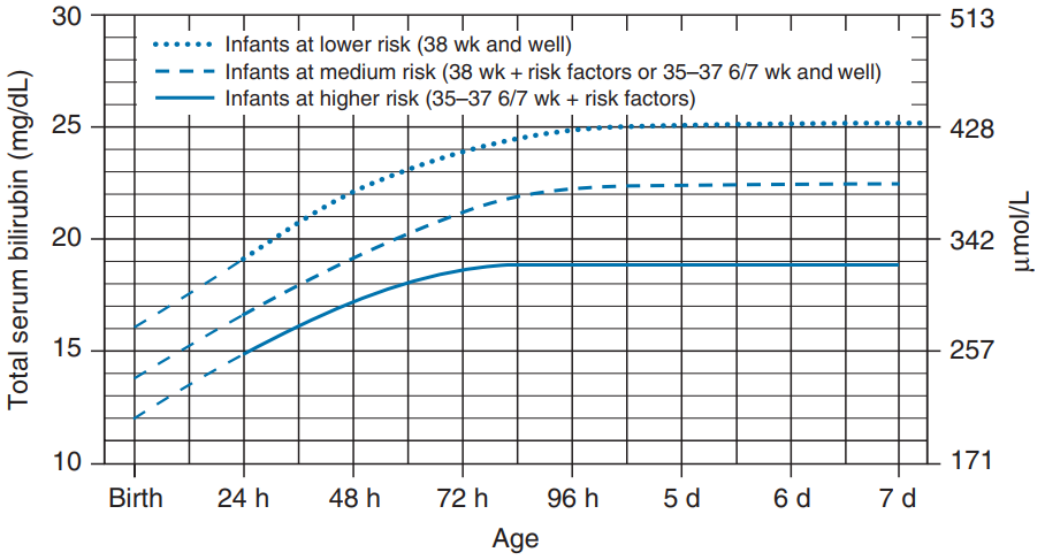
Guidelines for exchange transfusion in infants ≥35 weeks' gestation.(11)



- The dashed lines for the first 24 h indicate uncertainty due to a wide range of clinical circumstances and a range of responses to phototherapy.
- Immediate exchange transfusion is recommended if infant shows signs of acute bilirubin encephalopathy (hypertonia, arching, retrocollis, opisthotonos, fever, high-pitched cry) or if TSB is 5 mg/dL (85 µmol/L) above these lines.
- Risk factors: isoimmune hemolytic disease, G6PD deficiency, asphyxia, significant lethargy, temperature instability, sepsis, acidosis.
- Measure serum albumin and calculate B/A ratio (see legend).
- Use total bilirubin. Do not subtract direct reacting or conjugated bilirubin.

Exchange Transfusion: Decide based on above charts. If confused, following general rules can be used.

Indication:(2)

- Cord Hb 10g/dL or less
- Cord bilirubin 5mg/dL or more
- Unconjugated serum bilirubin of >10mg/dL within 24 hours or rate of rise >0.5mg/dL/hr.
- Exchange lower bilirubin levels in presence of perinatal risk factors (PNA, respiratory distress, sepsis, hypothermia etc.)
- Unconjugated serum bilirubin of 20mg/dL or more in term baby.
- In preterm baby, serum bilirubin of >1mg/100gm of weight of the infant (i.e. 10mg/dL for 1000gm and 15mg/dL for 1500gm and so on).

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Amount of blood needed:

Twice the amount of blood volume of baby = (85×2) × weight in Kg

Type of blood needed:

Incompatibility	Type of blood
Rh incompatibility	Rh negative and same ABO group as the infant; crossmatched with baby's serum O(-)ve blood is commonly used
ABO incompatibility	Group O with same Rhesus group (positive or negative)

Tests to be sent:

Pre-transfusion: Hb%, serum bilirubin (direct, indirect, total)

Post-transfusion: Hb%, serum bilirubin (direct, indirect, total), serum calcium

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Preterm Low Birth Weight

Write **TREATMENT OF PRETERM LOW BIRTH WEIGHT** as follows:

℞ on admission on *date* at *time*

- ✓ NPO till F/O
- ✓ O_2 inhalation stat & SOS
- ✓ Inf. 10% DA/Libott-10 (……ml) [change fluid according to age. See Fluid]
  IV @$\frac{ml}{25}$ µd/min stat & daily
- ✓ Inj. Ceftazidime (250mg/5ml)/Tazid/Cefazid
  1 ml/Kg IV stat & 12 hourly
- ✓ Inj. Amikacin (100mg/2ml)/Kacin + 8ml D/W (so, 1ml=10mg), then
  $0.75 \times wt(Kg)\ ml$ IV stat & 12 hourly after passage of first urine
- ✓ Inj. K_1MM/Konakion 2mg
  1 ampule IV stat
- ✓ Please keep the baby warm
- ✓ Please monitor the vital signs

[Note: In case of Preterm Extremely Low Birthweight(ELBW) babies, start with Infusion 5% DA]

Supplements on discharge for preterm infants <35 wks and/or <1500g(10)

1. Multivitamin Pediatric Drops/V-plex drop- 5 drops OD from 2 wks of age and/or when full feeds have been achieved; continue after discharge till 6 months of age
2. Tab. Folic Acid 5mg: Dose 50µgm/day (¼ tab)- every alternate day for 6 months
3. Iron/Compiron (1ml=15 drops=50mg; 1 drop= 3.3mg)
   a. 1 drop OD (~2mg/Kg/day) at 4 wks of age for 2 wks, then
   b. 1 drop BD (~4mg/Kg/day) for 2 wks, then
   c. 2 drops BD (~ 5-6mg/Kg/day) at 1.8 Kg and continue till 6 months of age

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Neonatal Tetanus

Consider neonatal tetanus when – baby is well for 1st 2 days of life. Then, feeding difficulty i.e. cannot suckle and there is facial grimacing (rhesus sardonicus), stiffness and backward bending of the body (opisthotonos) on stimulation. Check for history of: lack of tetanus vaccination of mother, poor umbilical cord care (use of unsterile blade, application of dirt/cow dung etc.)

Write **TREATMENT OF NEONATAL TETANUS** as follows:

℞ on admission on *date* at *time*

- ✓ NPO till F/O
- ✓ O2 inhalation stat & SOS
- ✓ Inf. 10% DA/Libott-10 (……ml) [change fluid according to age. See Fluid]
  IV @$\frac{ml}{25}$ µd/min stat & daily
- ✓ Inj. Benzyl Penicillin (500,000IU/5ml)
  Wt×0.25 ml IV stat and 6 hourly (if penicillin is not available/allergen give metronidazole)
- ✓ Inj. Metronidazole/Filmet/Amodis (500mg/100ml)
  1 ml/Kg IV stat & 12 hourly
- ✓ Inj. Amikacin (100mg/2ml)/Kacin + 8ml D/W (so, 1ml=10mg), then
  $0.75 \times wt(Kg)\ ml$ IV stat & 12 hourly after passage of first urine
- ✓ Inj. TT/Vaxitet (Incepta)/TT vax(popular) 40IU/0.5ml
  1 amp IM stat on anterolateral aspect of right thigh
- ✓ Inj. Human TIG /Tetagum-P (CSL Behring)/Protet-IG (incepta) (250mg/ml)
  1 amp IM stat on anterolateral aspect of left thigh
- ✓ Inj. K_1MM/Konakion 2mg
  1 ampule IV stat
- ✓ Inj. Diazepam 10mg/2ml/ Sedil
  0.1ml/Kg/day in IV fluid continuously

  [For example, if a 3 day old, term, 3Kg baby is receiving 200ml IV fluid daily(3kg×100ml = 300ml – 90ml (300ml×30%) = 210ml ≈ 200ml)
  So, total dose = (0.1×3 = 0.3ml)÷ 2 (to find out amount for each 100ml) = 0.15ml
  We can write order as:
  Inj. Diazepam (10mg/2ml)
  0.15ml in 100ml IV fluid continuously]
- ✓ Please keep the baby warm
- ✓ Please monitor the vital signs
- ✓ Keep the baby in isolation room.

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Infant of Diabetic Mother

Write **TREATMENT OF INFANT OF DIABETIC MOTHER** as follows:

℞ on admission on *date* at *time*

- ✓ Exclusive Breastfeeding
- ✓ O_2 inhalation - SOS
- ✓ Inf. 10% DA/Libott-10 (……ml) [change fluid according to age. See Fluid]
  IV @$\frac{ml}{25}$ µd/min stat & daily [May not be needed if sufficient BF possible]
  [Monitor blood glucose 4 hourly]
- ✓ Inj. Ceftazidime (250mg/5ml)/Tazid/Cefazid
  1 ml/Kg IV stat & 12 hourly
- ✓ Inj. Amikacin (100mg/2ml)/Kacin + 8ml D/W (so, 1ml=10mg), then
  $0.75 \times wt(Kg)\ ml$ IV stat & 12 hourly after passage of first urine
- ✓ Inj. K_1MM/Konakion 2mg
  1 ampule IV stat
- ✓ Please keep the baby warm
- ✓ Please monitor the vital signs

[Monitor blood sugar in regular interval. Can be discharged after blood sugar level is stable (usually by 72 hours)]

Infusion rate (mg/Kg/min) = $\frac{IV\ rate\left(\frac{\frac{ml}{Kg}}{day}\right) \times \%\ of\ dextrose}{144}$

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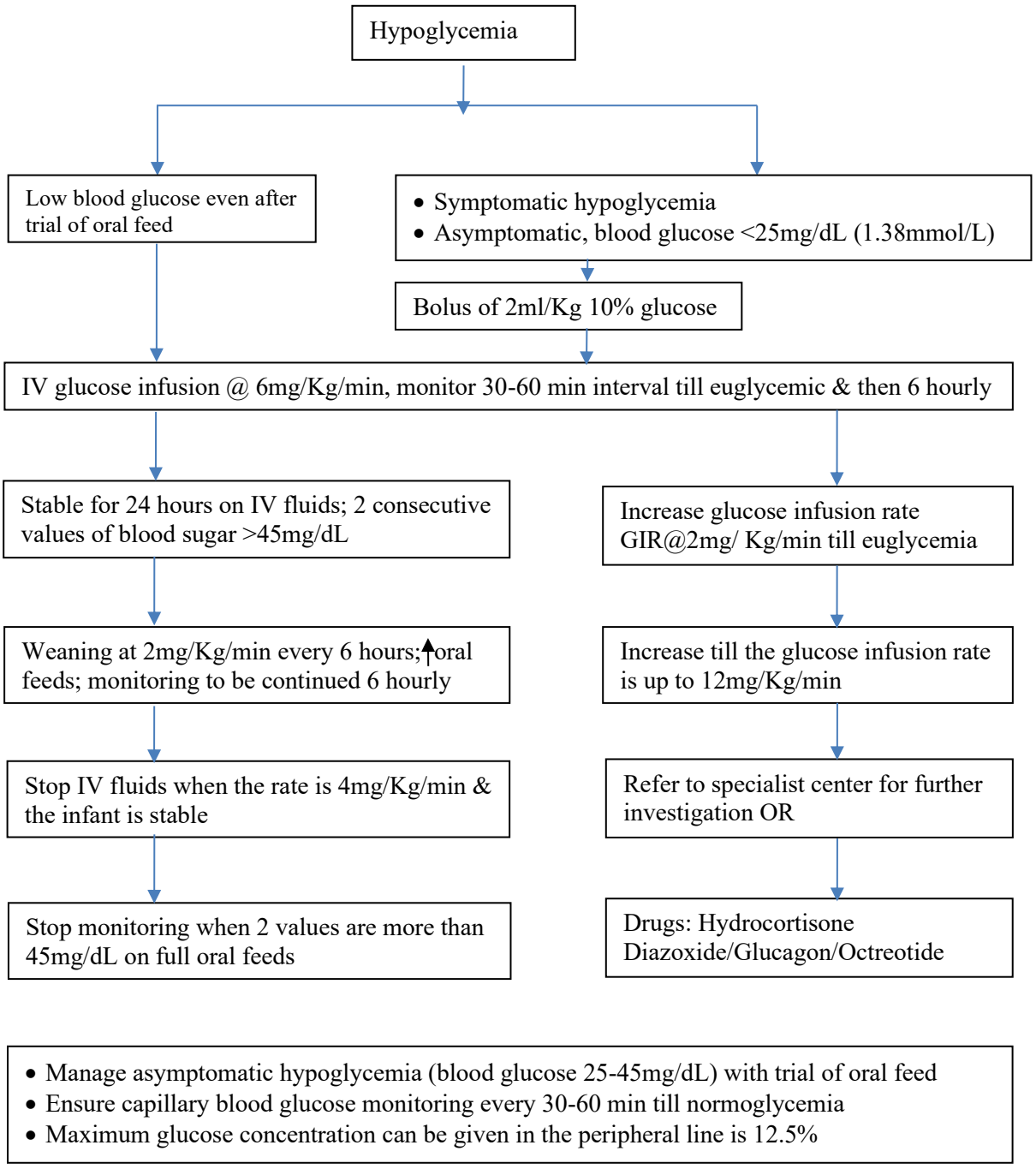
Management of Hypoglycemia (<2.6mmol/L or 45mg/dL, acc to WHO)



- Manage asymptomatic hypoglycemia (blood glucose 25-45mg/dL) with trial of oral feed
- Ensure capillary blood glucose monitoring every 30-60 min till normoglycemia
- Maximum glucose concentration can be given in the peripheral line is 12.5%

Indication of IV glucose infusion:

- Symptomatic hypoglycemia
- Blood glucose value <1.7mmol/L
- Inability to tolerate oral feeding (vomiting) or contraindication for oral feed
- Persistent hypoglycemia despite adequate feed

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Indication of IV bolus glucose:

- Symptomatic hypoglycemia
- Blood glucose <1.4mmol/L

Infant of HB_sAg (+) VE mother

Write **TREATMENT OF A BABY OF HBsAg (+)ve MOTHER** as follows:

℞ on admission on *date* at *time*

- ✓ Inj. Hepatitis B Vaccine/Engerix B/ Hepa B
  0.5ml IM on anterolateral aspect of left thigh
- ✓ Inj. Hepatitis B Ig (Hepabig)
  0.5ml IM stat on anterolateral aspect right thigh
- ✓ Inj. K_1MM/Konakion 2mg
  1 ampule IV stat or orally

[Administer the drugs and discharge the baby]

[Breastfeeding can be continued after vaccination. Ask the parent to complete EPI vaccination schedule. Check HBsAg and Anti-HBs status at 9 month of age. If -

- HBsAg Negative, Anti HBs >10mIU/ml - Immune from Hepatitis B
- HBsAg Negative, Anti HBs <10mIU/ml – revaccinate for hepatitis B
- HBsAg Positive, Anti HBs negative, refer to pediatric gastroenterologist

In preterm infants weighing <2000gm, this initial dose of vaccine should be counted as zero dose(0 dose) and should receive 3 doses of vaccine starting at 30 days of age.

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Undescended Testis

Singular Testis, plural testes. Usually, both testes are found in scrotal sac. If either of them absents in the sac, look in the inguinal area. Perform USG of Whole Abdomen & Inguinoscrotal region to locate missing testis.

Management: Refer to Paediatric Surgery. If intra-abdominal, testicular tissue is destroyed by heat.

Infantile colic

Why?

Poor attachment leads to the entry of air with the breast milk. Abdomen is distended and intraabdominal pressure is raised. This leads to-

- Frequent regurgitation (especially soon after the meal);
- Abdominal pain (colic)

Pain usually starts around 3rd week, more commonly in the evening. Baby is otherwise normal. Especially, exclude history of delayed cry after delivery (PNA?). Excessive cry is one form of neonatal seizure.

Rule of "3": Last about 3 hours/day, around 3 days/week, for about 3 weeks.

Management:

- Reassure that this usually goes away by around 3 months of age. And that infantile colic does not cause any permanent damage to the baby.
- Correction of position and attachment
- Burping (keep your baby upright for few minutes after each feeding.
- Pharmacotherapy:
    - Simethicone (Flacol, Flatunil, Gasnil etc): Commonly used with limited success. 5 drops 6 hourly
    - Gripe water: No evidence that it is effective. Not FDA approved. Not recommended.
    - Domperidon: Does not work
    - Famotidine/PPI: Does not work
    - Antispasmotics are contraindicated in neonates.

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Umbilical Sepsis

i.e “Infection of only Umbilicus"

Mx:-

a. Clean the Umbilicus by Hexisol.

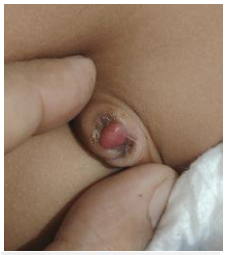
b. Since neonates are the sufferers, give

!!!!Warning!!!! If there is Peri-umbilical Redness, then suspect "Septicemia".

Mx is immediate hospitalization.

Umbilical Granuloma

A fleshy, moist structure from the remnant of umbilical stump.



Treatment:

Copper Sulphate (CuSO4): ডুতে। Press a piece of $CuSO_4$ on umbilical granuloma 10-15 seconds each time for a few times per day 7-10 days. Usually, the lesion dries up.

May apply local antiseptic like povisep/bactrocin after application of copper sulphate.

Other treatment options:

- Silver nitrate
- Table Salt

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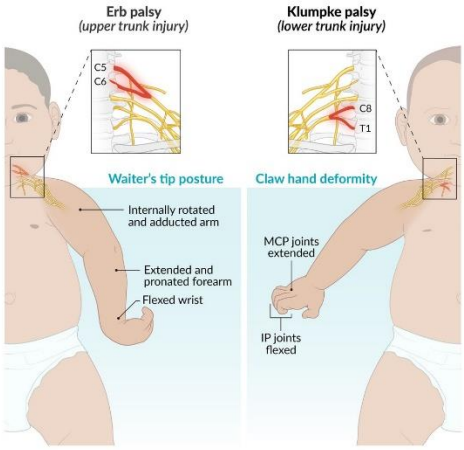
Birth Injuries

Erb's palsy (Erb-Duchenne paralysis)

Klumpke paralysis (Klumpke's palsy)- rare, involves lower trunk.

Treatment of brachial plexus injury: Gentle massage and range-of-motion exercises may be started by 7-10 days of age.

Infants should be closely monitored with active and passive corrective exercises. If paralysis persists without improvement for 3 mo, neuroplasty, neurolysis, end-to-end anastomosis, and nerve grafting offer hope for partial recovery.



Diaper Rash

A well-demarcated area covered by diaper is usually involved. Skin folds may also be involved. Contact dermatitis from elastic bands may be there.

Treatment:

1. Cool wet compression- clothe soaked with 1 tsf salt in a pint of water. For 2-3 days intermittently.
2. Zinc Oxide Paste: QRash/Happynap/Napgaurd/DeRash
3. Castor oil + Zinc oxide: Softi cream

If there is inflammation (pain and redness) 0.5-1% hydrocortisone. If there is fungal infection, add antifungal drugs:

- Clotrimazole (1%) + Hydrocortisone (1%): Neostan HC, H Trimazole (if there is fungal infection)
- Miconazole + Hydrocortisone: Fungidal HC Cream, Micosone cream, Unigal HC cream

Antibiotic cream or lotion: Bacitracin+Neomycin (Bivacyn, Nebanol, Neobacrin)
Ointment should not be used.

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Appendix I: Common **poisons and antidotes**

Poison	Antidote	Dosage	Route	Adverse effects, warnings, comments
Acetaminophen	N-Acetylcysteine (Mucomyst)	140 mg/kg loading, followed by 70 mg/kg q4h for 17 additional doses (total of 72 hr)	PO	Vomiting (patient-tailored regimens are the norm)
	N-Acetylcysteine (Acetadote)	150 mg/kg over 1 hr, followed by 50 mg/kg over 4 hr, followed by 100 mg/kg over 16 hr	IV	Anaphylactoid reactions (most commonly seen with loading dose). Higher doses often recommended depending on acetaminophen level or degree of injury.
Anticholinergics	Physostigmine	0.02 mg/kg over 5 min; may repeat q5-10 min to 2 mg max	IV/IM	Bradycardia, seizures, bronchospasm. Relatively contraindicated if conduction delays on ECG.
Benzodiazepines	Flumazenil	0.2 mg over 30 sec; if response is inadequate, repeat q1 min to 1 mg max	IV	Agitation, seizures from precipitated withdrawal (doses over 1 mg). Relatively contraindicated for unknown or polypharmacy ingestions.
β Blockers	Glucagon	0.15 mg/kg bolus followed by	IV	Vomiting, relative lack of efficacy.

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Appendix I: Common **poisons and antidotes**

Poison	Antidote	Dosage	Route	Adverse effects, warnings, comments
		infusion of 0.05-0.15 mg/kg/hr		
Calcium channel blockers	Insulin	1 unit/kg bolus followed by infusion of 1-10 units/kg/hr	IV	Hypoglycemia. Follow serum potassium and glucose closely.
Carbon monoxide	Calcium salts	Dose depends on the specific calcium salt	IV	
	Oxygen	100% FiO_2 by non-rebreather mask (or ETT if intubated)	Inhalation	Some patients may benefit from hyperbaric oxygen.
Cyanide	Hydroxocobalamin (Cyanokit)	70 mg/kg (adults: 5 g) given over 15 min	IV	Flushing/erythema, nausea, rash, chromaturia, hypertension, headache.
Digitalis	Digoxin-specific Fab antibodies (Digibind, DigiFab)	1 vial binds 0.6 mg of digitalis glycoside; #vials = digitalis level × weight in kg/100	IV	Allergic reactions (rare), return of condition being treated with digitalis glycoside.
Ethylene glycol, methanol	Fomepizole	15 mg/kg load; 10 mg/kg q12h × 4 doses; 15 mg/kg q12h until ethylene glycol level is <20 mg/dL	IV	Infuse slowly over 30 min. If fomepizole is not available, can treat with oral ethanol (80 proof).

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Appendix I: Common **poisons and antidotes**

Poison	Antidote	Dosage	Route	Adverse effects, warnings, comments
Iron	Deferoxamine	Infusion of 15 mg/kg/hr (max: 6 g/24 hr)	IV	Hypotension (minimized by titrating dose up slowly).
Isoniazid (INH)	Pyridoxine	Empirical dosing: 70 mg/kg (max dose = 5 g). If ingested dose is known: 1 g per gram of INH.	IV	May also be used for Gyromitra mushroom ingestions.
Lead and other heavy metals (e.g., arsenic, inorganic mercury)	BAL (dimercaprol)	3-5 mg/kg/dose q4h, for the first day; subsequent dosing depends on the toxin.	Deep IM	Local injection site pain and sterile abscess, vomiting, fever, salivation, nephrotoxicity. Caution: Prepared in peanut oil; contraindicated in patients with peanut allergy.
	Calcium disodium EDTA	35-50 mg/kg/day × 5 days; may be given as a continuous infusion or 2 divided doses/day.	IV	Vomiting, fever, hypertension, arthralgias, allergic reactions, local inflammation, nephrotoxicity (maintain adequate hydration; follow UA and renal function).
	Dimercaptosuccinic acid (succimer, DMSA, Chemet)	10 mg/kg/dose q8h × 5 days, then 10 mg/kg q12h × 14 days.	PO	Vomiting, hepatic transaminase elevation, rash.

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Appendix I: Common **poisons and antidotes**

Poison	Antidote	Dosage	Route	Adverse effects, warnings, comments
Methemoglobinemia	Methylene blue, 1% solution	0.1-0.2 mL/kg (1-2 mg/kg) over 5-10 min; may be repeated q30-60 min.	IV	Vomiting, headache, dizziness, blue discoloration of urine.
Opioids	Naloxone	1 mg if patient not likely to be addicted; 0.04-0.4 mg if possibly addicted; repeated as needed; may need continuous infusion; higher and prolonged dosing is required for novel potent opioid overdose.	IV, intranasal, IO, IM, nebulized	Acute withdrawal symptoms if given to addicted patients. May also be useful for clonidine ingestions (typically at higher doses).
Organophosphates	Atropine	0.05-0.1 mg/kg repeated q5-10 min as needed.	IV/ET	Tachycardia, dry mouth, blurred vision, urinary retention.
	Pralidoxime (2-PAM)	25-50 mg/kg over 5-10 min (max: 200 mg/min); can be repeated after 1-2 hr; then q10-12h as needed.	IV/IM	Nausea, dizziness, headache, tachycardia, muscle rigidity, bronchospasm (rapid administration).
Salicylates	Sodium bicarbonate	Bolus 1-2 mEq/kg followed by continuous infusion.	IV	Follow potassium closely and replace as necessary. Goal urine pH: 7.5-8.0.

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Poison	Antidote	Dosage	Route	Adverse effects, warnings, comments
Sulfonylureas	Octreotide and dextrose	1-2 µg/kg/dose (adults 50-100 µg) q6-8h.	IV/SC	
Tricyclic antidepressants	Sodium bicarbonate	Bolus 1-2 mEq/kg; repeated bolus dosing as needed to keep QRS <110 msec.	IV	Indications: QRS widening (≥110 msec), hemodynamic instability; follow potassium.

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The End

- Any suggestion and/or correction will be highly appreciated.
- You can send any feedback to drfahim38@gmail.com
- If you think any topic should be included in this document, i will be happy to do that.

THANK YOU