From Gulu!

Grey's Quick Reference

Basic Protocols in Paediatrics and Internal Medicine For Resource Limited Settings

By Grey Faulkenberry, MD MPH and Linda Warren, MD

Contents

A WORD OF WARNING: This book was designed as a tool to assist and guide, not as the final decision maker. It should ***never*** replace your clinical judgement. However, we do want to continue to improve its contents, so if you have any feedback, positive or negative, any suggestions, questions or comments, please email: jgfaulkenberry@gmail.com. Good luck!

Acknowledgements

I would like to thank those that have helped author and edit sections of this book.

Linda Warren, MD: wrote and edited all neonatal protocols, the protocols for paediatric sepsis, bronchiolitis, asthma, triage, convulsions, along with the neonatal drug formulary and assisted in editing all other paediatric protocols, emergency protocols and the formulary.

Twalib Aliku, MD, MMed: wrote and edited all paediatric protocols for cardiac conditions.

Kyegombe Willy, MBChB: wrote and edited the poisoning protocols, assisted in editing all internal medicine protocols.

Anjali Saxena, MD: assisted in writing and editing the Internal Medicine Heart Failure protocol.

Kendra Van Kirk, MD MAT, Samantha Gonzalez, MD, Anjali Saxena, Theodora Brandon, MD: wrote and edited the paediatric and adult CPD/advanced life support algorithms.
Stella Kyoyagala, MBChB, MMed: wrote and edited the malnutrition guideline, and assisted in editing paediatric protocols.

Venice Omona, MBChB, MMed: assisted in editing paediatric protocols.

Oriba Dan Langoya, MBChB: assisted in editing paediatric and internal medicine protocols.

Sam Olum, MBChB, MMed: assisted in editing internal medicine protocols.

Adrian Kayanja, MBChB, MMed: assisted in editing internal medicine protocols.

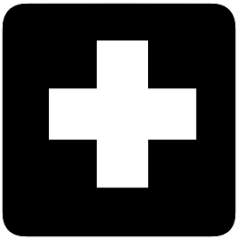
Abigail Link: wrote and edited all drug interactions.

I also need to thank the Emergency Medicine Kenya Foundation. (https://www.emergencymedicinekenya.org/). I have cited their book of protocols throughout this text and borrowed heavily from many of their protocols for the ones developed here.

Thanks also to the WHO and ECGpedia from whom I have reproduced with proper permissions and citations (see references section) images from their publications.

Finally, we would like to thank SEED Global Health for funding the printing of the original edition.

Emergency



Protocols

Paediatric Triage of Sick Children[1]

Emergency Signs

Airway and Breathing:
- Obstructed breathing
- Central Cyanosis
- Severe respiratory distress
- Weak / absent breathing

Circulation
Cold Hands with any of:
- Cap refill > 3sec
- Weak + fast pulse
- Slow (<60bpm) or absent pulse

Disability:
- Coma
- Convulsions
- Confusion: AVPU: 'V', 'P' or 'U'

Severe Diarrhoea with:
- lethargy/unconscious
- unable to drink/drink poorly
- skin pinch goes back slowly
- sunken eyes

1. Call for help
2. Transfer to emergency bed
3. Give oxygen via nasal cannula
4. Start IV
5. Check Vitals (Weight, HR, RR, BP)
6. Draw blood Hb, Malaria, Type&Cross if pale (red and purple tube)
7. D10% 5ml/kg IV
8. If convulsions: Diazepam IV or PR
9. Keep patient warm

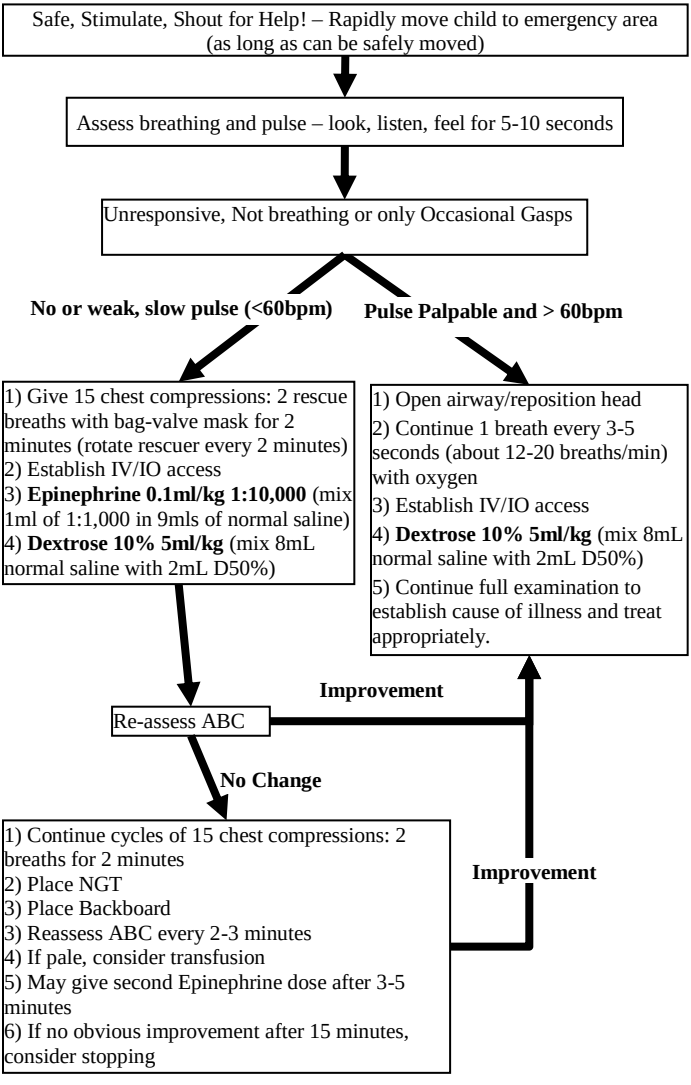
Priority Signs (3TPR-MOB)

- Tiny - Sick infant aged < 2 months
- Temperature – very high, very low
- Trauma – major trauma
- Pain – child in severe pain
- Poisoning – mother reports poisoning
- Pallor – severe palmar pallor
- Restless / Irritable / Floppy
- Respiratory distress
- Referral – has an urgent referral letter
- Malnutrition - Visible severe wasting
- Oedema of both feet
- Burns – severe burns

Front of the Queue:
- Clinical review ASAP
- Weigh
- Baseline observations and vital signs

Non-urgent – Children with none of the above signs

Paediatric Advanced Life Support Algorithm[1,2]



Adult Cardiac Arrest Algorithm[3]

Safe, Stimulate, Shout for Help! – Rapidly move patient to emergency area (as long as can be safely moved)

CHECK PULSE: **DEFINITE** pulse palpated within 10 seconds?

No Pulse

- Perform continues compressions until bag-valve mask available
- 30 compressions: 2 breaths
- Attach O2 to bag-valve mask
- Epinephrine 1mg IV in 10mL NS followed with 20mL NS flush

Every 2 minutes

- Change compressors
- Check pulse for no longer than 10 sec
- Epinephrine 1mg IV in 10mL NS followed with 20mL NS flush

Definite Pulse

- Open, maintain airway
- 1 breath every 6 seconds
- Recheck pulse every 2 min
- Go to Post Cardiac Arrest Algorithm

Identify and treat reversible causes

Hypoglycaemia
Hypovolemia
Hypoxia
Hydrogen ion (acidosis)
Hypo-/Hyperkalaemia
Hypothermia

Tension Pneumothroax
Tamponade, cardiac
Toxins
Thrombosis, pulmonary
Thrombosis, coronary

High-Quality CPR

- **Compression rate** of at least 100/min
- **Compression depth** at least 5cm
- **Allow complete chest recoil** after each compression
- **Minimize interruptions** in chest compressions to < 10 seconds
- **Avoid excessive ventilation** – give just enough volume to produce visible chest rise. Give 2 breaths every 30 compressions or if intubated, 1 breath every 6 seconds

Summary of Steps of CPR for Adults, Children and Infants

Component	Recommendations		
	Adults	**Children**	**Infants**
Recognition	Unresponsive (for all ages) No breathing or only gasping No pulse felt within 10 seconds Newborn: HR < 60		
CPR Sequence	Chest compressions, Airway, Breathing (C-A-B) Newborn: Airway, Breathing, Compression (A-B-C)		
Compression Rate	At least 100/min		
Compression Depth	At least 5cm	At least 1/3 AP diameter About 5 cm	At least 1/3 AP diameter About 4 cm
Chest wall recoil	Allow complete recoil between compressions Rotate compressors every 2 minutes Newborns: 2-thumb circling technique preferred		
Compression interruptions	Minimize interruptions in chest compressions Attempt to limit interruptions to < 10 seconds		
Airway	Head tilt- chin lift (suspected trauma: jaw thrust) Newborn: position, suction only if secretions		
Compression: Ventilation ratio (until advanced airway placed)	30:2 1 or 2 rescuers	30:2 (Single rescuer) 15:2 (2 rescuers) 3:1 (only for Newborns)	
Rescue breaths (unresponsive with pulse)	1 breath every 3-5 seconds (12-20 breaths per minute) Newborns (30-50 breath/min)		
Ventilations with advanced airway (intubated)	1 breath every 6-8 seconds (8-10 breaths per minute)		

Paediatric Emergency Estimation of Child's Weight

All neonates, infants and children should have weights measured on admission. Estimate the weight for age **ONLY** if unstable. Check weight as soon as child is stabilized. (NOTE: outside weight measurements may be used in emergencies, but should not be used if weight can be safely measured).

Child looks well nourished, average size for age

Age	Estimated Weight (kg)
1 – 3 weeks	3
4 - 7 weeks	4
2 - 3 months	5
4 - 6 months	7
7 to 9 months	9
10 to 12 months	10
1 to 2 yrs	11
2 to 3 yrs	13
3 to 4 yrs	15
4 to 5 yrs	17

If the child looks obviously underweight use the weight associated with 2 age-categories younger (e.g. underweight 10-month-old, use weight of 4-6 months)

Child looks well nourished, average size for age[4]

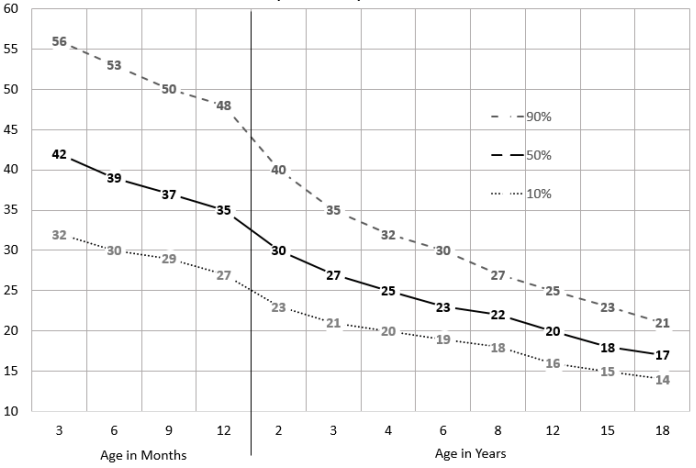
Height Range (cm)	Estimated Weight Range (kg)
50-64.99	4-6
65-73.99	7-8
74-80.99	9-10
81-94.99	11-12
95-106.99	13-15
107-120.99	16-19
121-132.99	20-24
133-137.99	25-28
138-150.00	29-36

If the child looks obviously underweight use the weight associated with 1 height-category above (e.g. underweight 100cm, use weight 11-12kg)

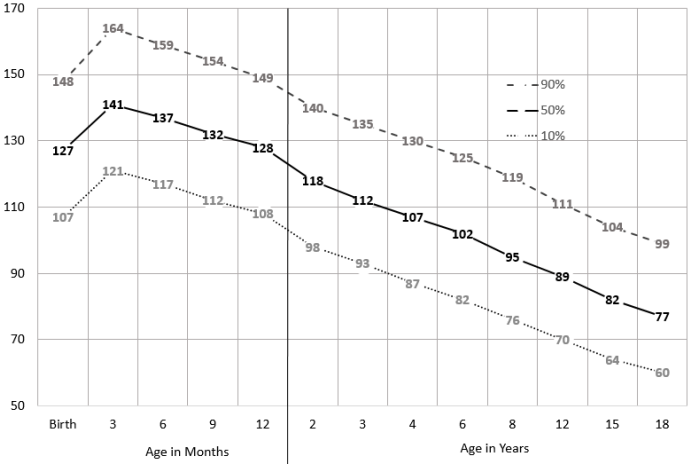
If there is severe malnutrition these charts will be inaccurate.

Standard Vital Signs: Percentiles by Age[143,144]

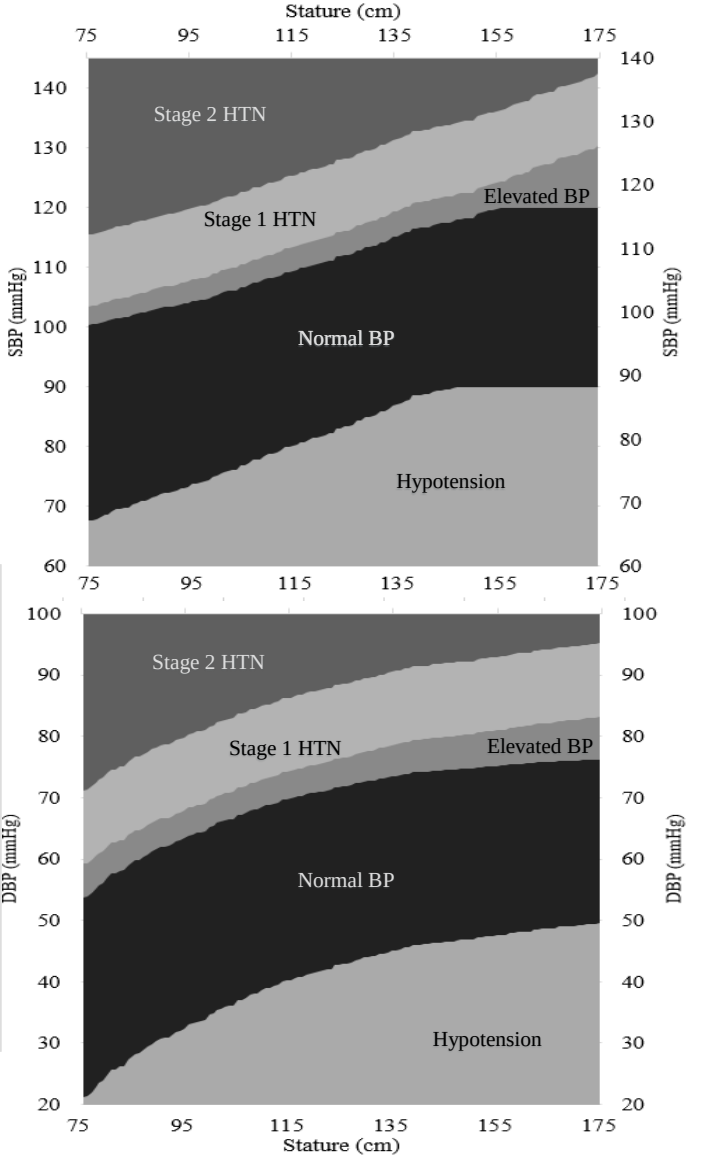
Respirations per minute



Heart rate per minute



1 to 17 years: Girls BP-for-Stature[145–147]



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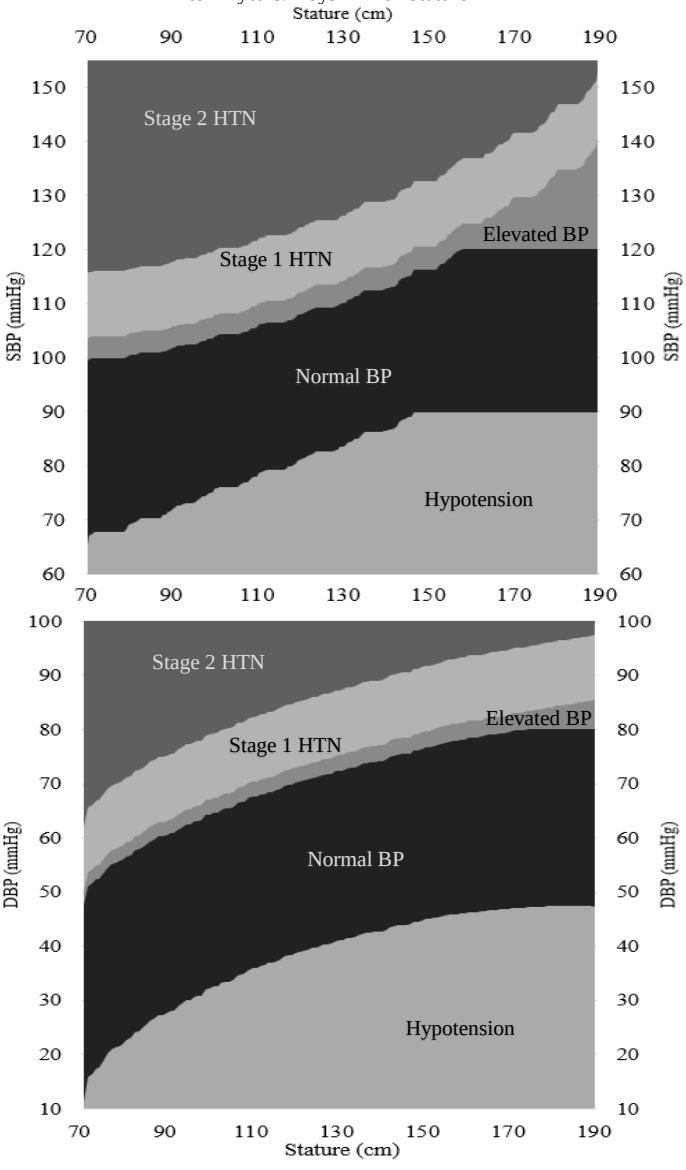


Resuscitation Medications

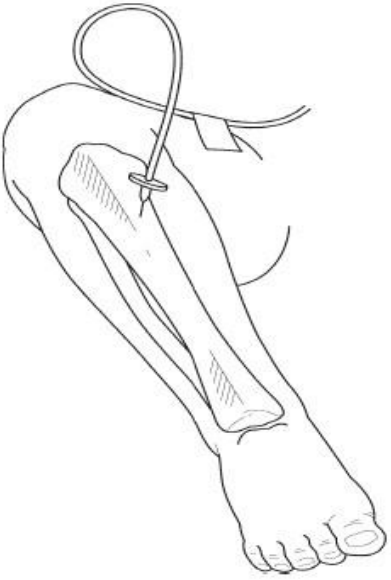
	Children
Epinephrine (Adrenaline)	**0.1ml/kg 1:10,000** IV (mix 1ml of 1:1,000 in 9mls of normal saline) Flush with 10mL NS
Dextrose 10%	**5ml/kg** IV (mix 8mL normal saline with 2mL D50% or 4mL of D5% with 1mL of D50%)
Diazepam PR ~2.5mg suppository	1) <10kg: 1 supp (**DO NOT USE** in neonates) 2) 10-15 kg: 2 supp 3) 15-20 kg: 3 supp 4) 20-25 kg: 4 supp
Diazepam IV	0.3mg/kg slowly over 1 minute
Phenobarbitone/ Phenobarbital	Loading dose: 15 mg/kg or 20mg/kg in Neonates IM/IV (if IV, give over 20 mins) Maintenance dose: 5mg/kg IM/IV/PO OD
Packed Red Blood Cells (PRBCs)	10mL/kg (raise Hgb 1g/dL)
Whole Blood (WB)	20mL/kg (raise Hgb 1g/dL)

	Adults
Epinephrine (Adrenaline)	1mg IV in 10mL NS Flush with 20mL NS flush
Dextrose	50mL IV of 50% (1 amp)
Diazepam PR 2.5mg suppository	4 suppositories PR
Diazepam IV	0.15 mg/kg IV slowly over 1 minute
Phenobarbitone/ Phenobarbital/	Loading dose: 15mg/kg IM/IV (if IV, give over 20 mins) Maintenance dose: 5mg/kg IM/IV/PO OD
Packed Red Blood Cells (PRBCs)	1 Unit (raise Hgb 1g/dL)
Whole Blood (WB)	2 Units (raise Hgb 1g/dL)

Use of intra-osseous lines[1]

Use IO for all children in shock if no IV access to avoid delays in initiation of fluid therapy

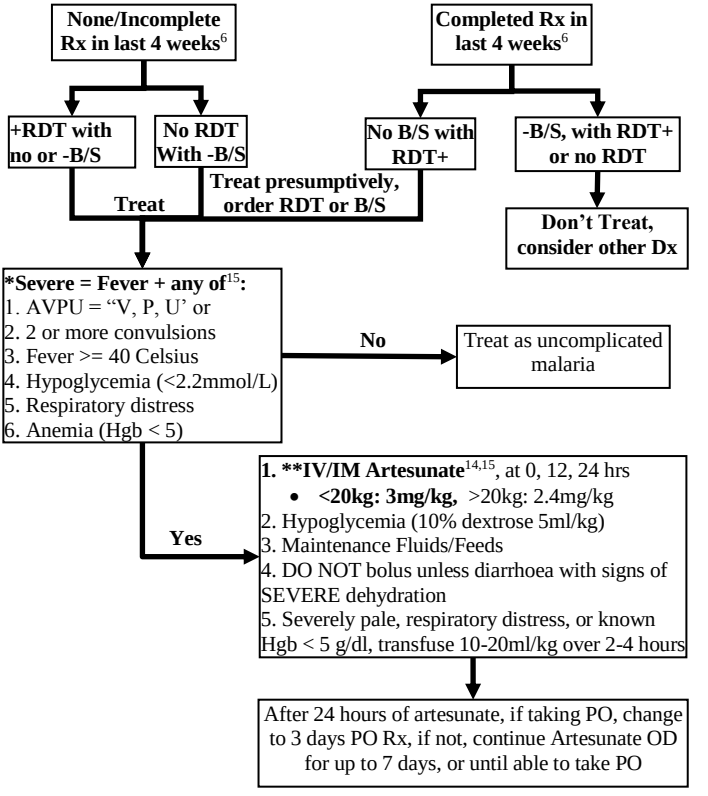
- Use IO or bone marrow needle 15-18G if available or 16-21G hypodermic needle
- Clean after identifying landmarks, use sterile gloves and sterilize site
- Sterility - Use antiseptic and sterile gauze to clean site (alcohol 70% or iodine or chlorhexidine)
- Site – Middle of the antero-medial (flat) surface of tibia at junction of upper and middle thirds – bevel to toes and introduce vertically (90°)- advance slowly with rotating movement
- Stop advancing when there is a 'sudden give' – then aspirate with 5mls needle
- Slowly inject 3mls N/Saline looking for any leakage under the skin – if OK attach iv fluid giving set and apply dressings and strap down
- Give fluids as needed – a 20mls / 50mls syringe will be needed for boluses
- Watch for leg / calf muscle swelling
- Replace IO access with iv within 8 hours



Malaria

*If blood slide is **positive**, treat, if RDT is **negative**, do not treat*[5,6]

Regardless of testing, if patient has signs or symptoms of severe malaria, treat presumptively and test afterwards to confirm



*Severe malaria may also include SBP < 70 with cold, clammy skin, abnormal bleeding/DIC, renal failure (anuria by history, or Cr > 3 mg/dL), macroscopic hemoglobinuria, hyperbilirubinemia (>3mg/dL) with B/S MPS +++

**This is treatment for all adults and children, including infants, pregnant women in all trimesters and lactating women

Complications

a) Coma: maintain airway, place patient on side, exclude other causes (hypoglycemia, meningitis)
b) Hyperpyrexia – tepid sponging, paracetamol
c) Convulsions: see general convulsion treatment
d) Acute kidney injury
   i) Exclude pre-renal causes,
   ii) Check fluid balance
   iii) If decreasing urinary output, add Lasix 1mg/kg/dose every 6 to 12 hours, **<u>the most important part of treatment is to maintain a normal urinary output</u>**
e) Anemia – if Hgb < 9, start on iron and folic acid for 14 days initially
f) Treatment Failure
   i) Consider other causes of illness/co-morbidity
   ii) A child on PO antimalarials that develops signs of severe malaria should be changed to IV artesunate
   iii) If a child on PO antimalarials has fever and a **positive blood slide** after 3 days (72 hours), then check compliance with Rx and if treatment failure proceed to second line Rx
g) Delayed haemolysis
   i) ~7% of children with hyperparasitemia
   ii) All children with severe malaria should have control CBC 2 weeks after discharge

Co-infection – no good clinical or laboratory finding to differentiate bacterial infection from malaria[7,8], and children with current or recent malaria are at higher risk of invasive bacterial infections and have higher mortality rates[9–13]

a) Pneumonia – treat if concern for and meet WHO criteria for pneumonia
b) Septicemia – treat if concern for and meets SIRS criteria
c) Meningitis – treat if concern for and meets WHO criteria, get LP before beginning antibiotics

Malaria Medications (all parenteral regiments should be followed by 3 days of oral therapy once tolerating PO)

a) 1st Line: Artesunate[14,15]
   i) 3mg/kg for < 20kg, 2.4mg/kg > 20kg IV/IM at 0, 12 and 24 hours
   ii) Parenteral Rx for at least 24 hours then daily until tolerating PO then
b) 2nd Line: Artemeter
   i) 3.2mg/kg IM on admission
   ii) 1.6mg/kg IM daily until able to take oral medication then
c) 3rd Line: Quinine
   i) Loading dose 20mg/kg - **<u>DANGER:</u>** rapid administration is dangerous, mix with 10mL/kg of 5% dextrose & run over 2-4 hours, DO NOT exceed 5mg/kg/hr followed by
   ii) 10mg/kg (run over 2 hours) every 8 hours followed by
   iii) If no improvement in 48H, decrease to 10mg/kg every 12 hours

Uncomplicated Malaria

a) Relevant investigation:

i) Blood slide (BS) for malaria parasites

ii) +/-Haemoglobinestimation

b) **Treatment** (Treat as outpatient)

-this is the same regimen that complicated malaria should end with

-treat infants weighing < 5 kg as children weighing 5 kg[15]

i) 1st line Antimalarial: Artemether/Lumefantrine (Coartem®)

Weight (kg)	Regimen for 3 days*	Colour code
5-14	1 tab twice a day	Yellow
15-24	2 tabs twice a day	Blue
25-34	3 tabs twice a day	Brown
>35	4 tabs twice a day	Green

*first two doses would ideally be given 8 hours apart

ii) Alternative antimalarial: Artesunate /Amodiaquine

Weight (kg)	Artesunate + amodiaquine dose (mg) given for 3 days	Colour code
4.5 to < 9	25/67.5mg (Blister - 3 tablets) 1 tab daily	Yellow
9 to < 18	50/135mg (Blister - 3 tablets) 1 tab daily	Blue
18 to < 36	100/270mg (Blister - 3 tablets) 1 tab daily	Brown
>36	100/270mg (Blister - 6 tablets) 2 tabs daily	Green

iii) Alternative antimalarial: **Dihydroartemisinin/Piperaquine**

Weight (kg)	Dihydroartemisinin/Piperaquine Dose (mg) daily x 3 days
5 to <8	20/160
8 to < 11	30/240
11 to <17	40/320
17 to <25	60/480
25 to < 36	80/640
36 to < 60	120/960

High fat meals should be avoided with dihydroartemisinin/Piperaquine

Altered Mental Status and the Neurologic Assessment

I. Monitor, support the ABCs

II. Look for life-threatening injuries (if signs of head injury, immobilize cervical spine)

III. Check vital signs (BP, PR, RR, spO2, Temp, Weight) – Cushing's Triad: bradycardia, respiratory depression & hypertension is an ominous finding

IV. Physical Exam (done at the same time as history if possible)
   a. Neurologic Exam
      i. Brief and to the point
      ii. Differentiate structural from non-structural causes (usually suggested by focal findings)
      iii. Assess: Level of consciousness/responsiveness, Motor responses, Brainstem reflexes
         1. Progressive deterioration +/- focal neuro signs or fixed dilated pupils: request emergent surgical consult
         2. Perform Neurological Assessment Scales (AVPU, BCS or GCS – see next page)
         3. Meningismus / Nuchal Rigidity (meningitis, subarachnoid hemorrhage)
            a. Brudzinski's sign - Involuntary hip & knee flexion with forced neck flexion
            b. Kernig's sign - involuntary knee flexion with forced flexion of the hip
         4. Fundoscopy
            a. Papilledema suggests increased ICP of more than several hours duration.
            b. Retinal hemorrhages in an infant are a sign of non-accidental trauma
            c. Unilateral, fixed, dilated pupil: 3rd nerve compression
            d. Bilateral, fixed, dilated pupils: brainstem pathology
            e. Bilateral small pupils: opioids, organophosphates, pontine hemorrhage
   b. Skin exam: bruising may suggest trauma, rashes may suggest infection
   c. Always consider: anemia, dehydration or malnutrition in children

NEVER assume mental status change is due solely to intoxication until alternatives have been ruled out

History

I. AMPLE History

A llergies
M edications
P ast medical history
L last meal
E vent – circumstances surrounding, what happened?

- Rapid or gradual?
- Preceding symptoms, neuro, headache?
- Ingestions
- Vague/inconsistent history – non-accidental trauma?

Neurological Assessment Scales

I. AVPU

- A – Alert
- V – responds to Verbal commands
- P – responds to Painful stimulus (press down firmly on the middle fingernail with a pen, rub your knuckles on the sternum)
- U – Unconscious

II. Blantyre Coma Scale (BCS) - if pre-verbal

Best Motor Response	Best Verbal Response	Best Eye Movement	Points
Localizes pain	Cries normally to pain		2
Withdraws from pain	Moans or abnl cry to pain	Watches/follows	1
None or inappropriate	No verbal response	No eye movement	0

III. Glasgow Coma Scale (GCS)

Best Motor Response	Best Verbal Response	Eye Opening	Points
Follows commands			6
Localizes pain	Oriented		5
Withdraws from pain	Confused	Spontaneous	4
Flexor posturing	Inappropriate words	To voice	3
Extensor posturing	Unintelligible sounds	To painful stimuli	2
None	None	None	1

COMA: GCS ≤ 8 or BCS ≤ 2 – should generally be intubated for airway protection

Ingestions

Anaphylaxis

And Bites

Poisoning/Ingestion Algorithm[3]

Suspected acutely poisoned patient[79]

1. If **ANY** concern for residue on skin or clothing – use personal protective equipment (gloves, gowns, masks), remove/bag/discard clothing, wash patient/area thoroughly with soap and water (clothing and PPE hazardous waste, dispose properly)
2. Monitor and support ABCD
3. Check vital signs (BP, PR, RR, sp02, Temp)
4. If sp02 < 94% or **ANY** concern for respiration, start 100% O2 via facemask
5. Bedside RBS and treat hypoglycemia
6. Place large bore IV line
7. Perform brief, targeted history, physical exam, pay attention to mental status
   a. What was taken, how long ago, volume/how much, immediate effects
8. Beware occult trauma
9. Obtain labs: CBC, Renal Functions, Electrolytes, Liver Functions
10. 12-lead ECG
11. Seizures are a neurological emergency and should be treated promptly with diazepam.
12. Gastric Lavage: almost NEVER INDICATED[80–86]
13. Indications for ICU Admission
    a. Need for ETT and Mechanical Ventilation
    b. GCS<12/AVPU=U/ status epilepticus
    c. Toxins with potential of respiratory depression (e.g. Amitraz Poisoning)
    d. Acid base imbalances
    e. Unclear/unpredictable clinical course of poisoning (i.e. Poorly studied)
14. Common Toxidromes and Antidotes:
    a. See specific protocol for: Organophosphates/Carbamates/Cholinergics, Hydrocarbons/Paraffin/Kerosene, Benzodiazepines/Opiates, Paracetamol, Ethanol
    b. Adrenergic/Sympathomimetics
       i. Cocaine, Amphetamines (crystal meth, Adderall), Pseudoephedrine
       ii. Presentation: HTN, tachycardia, mydriasis, anxiety, delirium, delusions
       iii. Rx: supportive (IVF, benzodiazepines, ant-hypertensives)
    c. Anticholinergic/Tricyclic antidepressants (TCA)/antihistamines
       i. Presentation: Hyperpyrexia, cutaneous vasodilation (flushing), decreased saliva, mydriasis, urinary retention, dysrhythmias
       ii. Rx:
          1. Physostigmine – avoid in TCA, only if persistent tachyarrhythmias or convulsions. Call anesthetist prior to administering.
          2. NaHCO3 for TCA
    d. Methanol
       i. Presentation: delirium, loss of vision
       ii. Rx: oral by NGT 1.8ml/kg of 43% ethanol or 40ml shots of vodka in a 70kg, maintenance is 0.2-0.4mls/kg/hour of 43% ethanol.

Organophosphate/Carbamate (insecticides/nerve gas)[87,88]

Children: common accidental ingestion[182–186]
Adults: common purposeful ingestion[187]

Diagnosis is on a Clinical Basis
Presentation (SLUDGE-BBB):
S alivation
L acrimation
U rination
D iarrhoea
G astric cramping
E emesis
B ronchorrhea
B ronchospasm
B radycardia
Also; profuse sweating, convulsions and coma, fasciculations, constricted pupils

Treatment: Atropine Bolus
Children: 0.02mg/kg IV
Adults: 2mg IV

Double previous dose and repeat every 5 minutes until atropinisation[88,188]

- Pulmonary secretions dry
  - Improved oxygenation
  - Breathing easier
- Pulse > 80/min
- SBP > 80mm/Hg

Convulsions: Rx Diazepam
Children
1) Rectal Diazepam 2.5mg suppository
   a) <10kg 1 suppository
   b) 10-15 kg: 2 suppositories
   c) 15-20 kg: 3 suppositories
   d) 20-25 kg: 4 suppositories
2) IV diazepam 0.2mg/kg

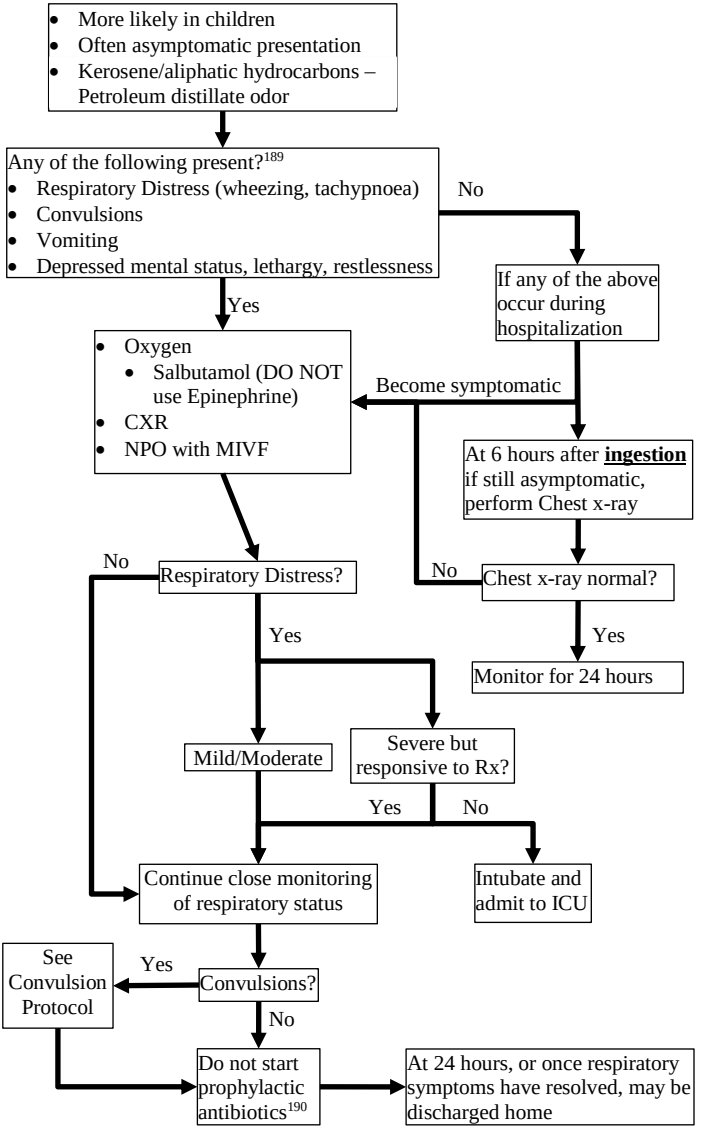
Adults: 10mg IV

Repeat as necessary if convulsions occur

Maintenance after atropinisation:
- mix total amount of atropine used as boluses into NS or D5%, in the following volumes
- For Patients <25kg: use 250mL, run at 50mL/hr
- For Patients >25kg: use 500mL, run at 100mL/hr
- Monitor hourly for signs of recurrent symptoms or over atropinization, and adjust rate accordingly

Over atropinization
- Urinary retention
- Confusion/Delirium
- Hyperthermia

Hydrocarbon Ingestion (kerosene, paraffin)



Benzodiazepine/Opioid Ingestion

Symptoms Generally Associated With

	Opioids	Benzos
Anterograde Amnesia	✓	✓✓✓
Ataxia/ incoordination	✓	✓✓✓
Slurred Speech	✓	✓✓✓
Confusion	✓	✓✓✓
Stupor Coma	✓✓✓	✓
Respiratory Depression	✓✓✓	✓
Miosis	✓✓✓	✓
Nausea/Vomiting	✓✓✓	✓

Known or More Likely Opioid Overdose

Known or More Likely Benzodiazepine Overdose

- If respiratory depression: Flumazenil
- Children: 0.01mg/kg IV, max as per adult
- Adults: 0.2 mg IV, may repeat for effect (max 1mg), max 3mg/hour
- Generally lasts ~1 hour, may need repeat dosing

Respirations < 12/min
O2sat < 90%

No

Yes

Bag-valve Mask
Naloxone
- Children <5yo or < 20kg: 0.1mg/kg IV
- Children > 5yo or > 20kg: 2mg IV
- Adults: 0.4mg IV

- May repeat q2-3 minutes for response
- After reversal may need to repeat 20-60 minutes later
- Admit to ICU

- Supportive Care
- Pay Specific Attention to Respiratory Status
- Duration depends on agent ingested

Paracetamol/Acetaminophen Toxicity

I. **Populations**
   a. Children: usually accidental ingestion
   b. Older Children/Adolescents/Adults: more likely purposeful ingestion

II. **Inappropriate dosing from:**
   a. Adult doses given to children
   b. Unclear understanding of liquid dosages
   c. Additional doses when parents feel first dose wasn't effective
   d. Consuming multiple products containing acetaminophen (Tylenol, Panadol, acetaminophen, paracetamol, cough/cold medications - Pyridex, antacids, headache medications)

III. **Risk Factors:**
   a. <2 years & dose of 90mg/kg/day acetaminophen or multiple adult doses
   b. Chronic alcohol abuse
   c. Co-ingestion with: rifampin, isoniazid, co-trimoxazole, zidovudine, barbiturates, carbamazepine)
   d. Comorbid conditions: prolonged fasting, prolonged vomiting/diarrhea, eating disorders, malnutrition, malignancy, HIV/AIDS

IV. **Phases**[89–92]
   a. Phase 1: ≤ 24-hours after ingestion
      i. Nonspecific sxs: nausea, vomiting, abdominal pain, anorexia, lethargy, diaphoresis, and malaise
   b. Phase 2: 24-72 hours after ingestion
      i. Increased hepatotoxic risk if presenting > 24 hrs after ingestion
      ii. Sxs may improve or disappear
      iii. Lab abnormalities appear: ↑AST, ALT, bilirubin, PT/INR
      iv. Possible RUQ pain or hepatomegaly
   c. Phase 3: 72-96 hours after ingestion
      i. Death of hepatocytes and timing of peak liver injury
      ii. Nausea and vomiting reappear or worsen
      iii. Malaise, jaundice, coagulopathy, encephalopathy, & CNS symptoms (for example, confusion, somnolence, coma) may also be present
   d. Phase 4: 96 hours-14 days after ingestion
      i. May start improving, full recovery within 3 mos
      ii. May progress to multiorgan failure & death

V. Mental status typically normal in first 48 hrs after overdose, unless affected by co-ingestion

VI. **Possibly Toxic Dosages**[93]

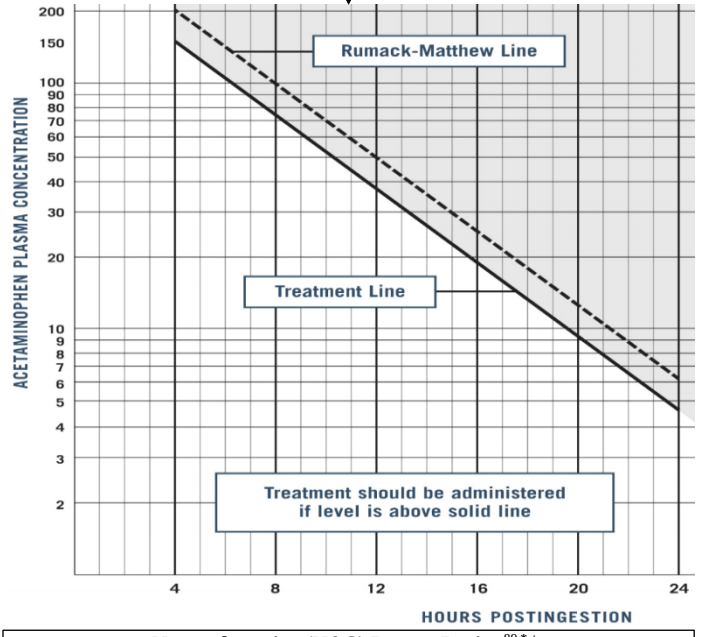
	0-6 years	>6 years
Acute Single Ingestion	≥200mg/kg in < 8 hrs	≥10g or 200mg/kg (whichever is lower) in < 8 hrs
Repeated Supratherapeutic Ingestion (RSTI)	≥200mg/kg in < 24 hrs ≥150mg/kg/day x 48hrs ≥100mg/kg/day x 72 hrs	≥10g or 200mg/kg (whichever is lower) in < 24 hrs ≥6g or 150mg/kg (whichever is lower) per day x 48 hrs ≥4g/day or 100mg/kg (whichever is less) with above risk factor

Paracetamol/Acetaminophen Toxicity Management[94]

Possible Toxic Dose? → No → No Rx necessary

Yes → In children, may consider activated charcoal, if **KNOWN** ingestion of >150mg/kg

- < 4 hrs post ingestion: Paracetamol level at 4 hrs
- 4-8 hrs post ingestion: Immediate Paracetamol level
- >8 hrs: Rx with NAC, Immediate Paracetamol level and ALT



N-acetylcysteine (NAC) Proper Dosing[89,*,+]:

Wt	Loading Dose	Maintenance Dose 1	Maintenance Dose 2
<20kg	150mg/kg into 3mL/kg diluent over 1 hr	50mg/kg in 7mL/kg diluent over 4 hrs	100mg/kg in 14mL/kg diluent over 16 hrs
20-40kg	150mg/kg into 100mL diluent over 1 hr	50mg/kg into 250mL diluent over 4 hrs	100mg/kg into 500mL diluent over 16 hrs
>40kg	150mL/kg in 200mL diluent over 1 hr	50mg/kg into 500mL diluent over 4 hrs	100mg/kg into 1L diluent over 16 hrs

*diluent may be DW, ½NS or sterile water, +if wt > 100kg, Rx as per 100kg

Alcohol Intoxication

Always ensure no other causes of alteration before attributing symptoms solely to alcohol (especially trauma or other ingestion)

Diagnostic Criteria for Acute Alcohol Intoxication[191]

1. Recent alcohol ingestion
2. Maladaptive behavior or psychological changes
   a. Sexual or aggressive behavior
   b. Unstable mood
   c. Impaired judgement
   d. Impaired social or occupational functioning
3. ≥ 1 of the following during/shortly after ingestion

Slurred speech	Stupor/coma
Unsteady gait	Nystagmus
Lack of Coordination	Impaired attention/memory
Symptoms not caused by other medical conditions or mental disorders	

↓

Management[27]

1. Monitor, support ABCs
2. Check vital signs (BP, PR, RR, spO2, Temp, Weight)
3. Assess GCS, hydration status
4. Insert 2 IVs, Start Oxygen if spO2 < 94%

↓

4. Management
   a. Lateral position
   b. Monitor for vomiting/aspiration
   c. IV hydration if necessary

↓

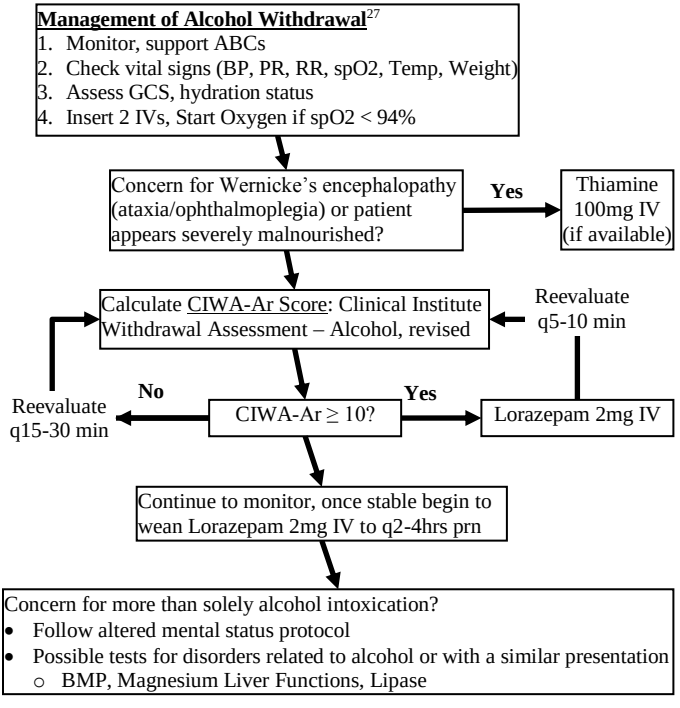
Concern for more than solely alcohol intoxication?

- Follow altered mental status protocol
- Consider tests for disorders related to alcohol or with a similar presentation
  - Glucose
  - BMP
  - Magnesium
  - Lipase
  - Liver functions

Alcohol Withdrawal

Occurs when a patient stops drinking alcohol after a period of drinking large amounts over a prolonged time

A. Stages (not all patients have all stages, stages may not go in order)
   1. Stage 1 – minor symptoms
      a. 6-12 hours after stopping
      b. Tremors, agitation, lack of appetite, nausea, vomiting, anxiety, sweating, restlessness
   2. Stage 2 – alcoholic hallucinosis
      a. 12-24 hours after stopping
      b. Hallucinations may occur
   3. Stage 3 – withdrawal seizures
      a. 24-48 hours after stopping (occasionally sooner)
      b. Usually tonic-clonic
   4. Stage 4 – delirium trements
      a. 3-7 days after stopping (up to 14 days after)
      b. Hallucinations (usually visual), confusion, tachycardia, hypertension, agitation, sweating



CIWA-Ar Scale	
HEADACHE 0. not present 1. very mild 2. mild 3. moderate 4. moderately severe 5. severe 6. very severe 7. extremely severe	**TREMOR** 0. no tremor 1. not visible, can be felt at fingertips 2. 3. 4. Moderate when arms extended 5. 6. 7. severe, even without arms extended
NAUSEA AND VOMITING 0. no nausea and no vomiting 1. 2. 3. 4. intermittent nausea w/ dry heaves 5. 6. 7. constant nausea, frequent dry heaves and vomiting	**ANXIETY** 0. no anxiety, at ease 1. 2. 3. 4. moderately anxious, or guarded 5. 6. 7. acute panic states similar to severe delirium or acute schizophrenia
PAROXYSMAL SWEATS 0. no sweat visible 1. barely sweating, palms moist 2. 3. 4. Obvious sweat on forehead 5. 6. 7. Drenching sweats	**ORIENTATION AND CLOUDING OF SENSORIUM** 0. oriented and can do serial additions (add by 7s) 1. cannot do serial additions 2. disoriented for date by ≤ 2 calendar days 3. disoriented for date by > 2 days 4. disoriented for place and/or person
AGITATION 0. normal activity 1. more than normal activity 2. 3. 4. moderately fidgety and restless 5. 6. 7. constantly paces or thrashes about	**AUDITORY DISTURBANCES** 0. not present 1. very mild harshness/ability to frighten 2. mild harshness or ability to frighten 3. moderate harshness/ability to frighten 4. moderately severe hallucinations 5. severe hallucinations 6. extremely severe hallucinations 7. continuous hallucinations
TACTILE DISTURBANCES 0. none 1. very mild paresthesias 2. mild paresthesias 3. moderate paresthesias 4. moderately severe hallucinations 5. severe hallucinations 6. extremely severe hallucinations 7. continuous hallucinations	**VISUAL DISTURBANCES** 0. not present 1. very mild photosensitivity 2. mild photosensitivity 3. moderate photosensitivity 4. moderately severe visual hallucinations 5. severe visual hallucinations 6. extremely severe visual hallucinations 7. continuous visual hallucinations

Anaphylaxis

I. Common Symptoms
   1) Mucocutaneous: angioedema, hives, pruritis, flushing
   2) Respiratory: dyspnea, wheezing, stridor, hypoxia
   3) GI: nausea/vomiting/diarrhea/abdominal cramping
   4) End-organ dysfunction: syncope, hypotonia

Criteria 1: Acute skin/mucosal tissue signs + 1 of the following: Respiratory compromise, Hypotension, OR Signs of end-organ dysfunction)

Criteria 2: Rapid onset after likely antigen exposure of 2 of the following: Mucocutaneous signs, Respiratory symptoms, Hypotension, OR GI symptoms

Criteria 3: Hypotension after exposure to known allergen
- Adults SBP < 90
- Children age 11-17: SBP < 90
- Children age 1-10: SBP < (70 + [age x 2])
- Children age 1 month to 1 year: SBP < 70
- Term neonate: SBP < 60

Any of the 3 criteria

Epinephrine (1mg/1ml 1:1000)
0.01mL/kg (max dose 0.3mL)
IM anterolateral thigh
Repeat q5-15 minutes if no improvement

1. Monitor, support ABCs
2. Check vital signs (BP, PR, RR, spO2, Temp, Weight)
3. Assess GCS, hydration status
4. Insert 2 IVs, Start Oxygen if spO2 < 94%
5. Draw CBC, malaria, and blood glucose

Wheezing and/or shortness of breath? → Treat as asthma exacerbation

Hypotension? →
I. NS or RL
   a. Children: 30mL/kg in first hour
   b. Adults: 1-2L, 5-10mL/kg in first 5 min
II. May try recumbent positioning or vasopressors prn

Adjunctive treatment →
I. Antihistamines
   a. H1 receptor blocker: Diphenhydramine 1mg/kg IV or PO, max dose 50mg or
   b. H2 receptor blocker: Ranitidine 1mg/kg IM/slow IV (max 50mg) or 4mg/kg PO (max 150mg)
II. Steroids: Hydrocortisone 5mg/kg IM/slow IV (max 200mg)

Animal Bite[3]

I. Mammalian Bites (not human)
   a. Clean wound with soap and water
   b. Debridement of devitalized tissue
   c. Prophylactic antibiotics are controversial, but generally recommended in the following cases
      - Immunocrompromised patients
      - Asplenic patients
      - Advanced liver disease
      - Moderate-severe injury or Crush Injury
      - Oedema at bite site
      - Injuries near hand, close to other bones/joints, especially if penetrating the joint capsule or periosteum

II. Human Bites
   a. Clean wound with soap and water
   b. Debridement of devitalized tissue
   c. All human bites should receive prophylactic antibiotics
   d. Consider post-exposure prophylaxis for HIV, usually low risk, but higher if saliva is contaminated with blood
   e. Hepatitis B vaccine recommended ≤ 24 hrs after bite if not previously immunized

III. Prophylactic Treatment

   a. Amoxicillin-Clavulanate x 5 days
      - Pediatric: 25mg/kg/dose PO BD
      - Adult: 1gram PO BD
   b. Alternative: Ciprofloxacin, Azithromycin or Doxycycline

   c. Tetanus

Previous doses of Tetanus Toxoid	Clean and minor wound		All other wounds	
	Tetanus Toxoid	Human tetanus immune globulin	Tetanus Toxoid	Human tetanus immune globulin
< 3 doses or unknown	Yes	No	Yes	Yes
≥ 3 doses	Only if last dose given ≥ 10 yrs ago	No	Only if last dose given ≥ 5 yrs ago	No

   d. Rabies – assuming not previously vaccinated

Biologic	Schedule
Rabies Immunoglobulin	Total dose: 20 units/kg. Inject as much as possible around the wound, give the rest IM.
Vaccine	Human Ig 20U/kg OR Equine Ig 40U/kg IM (deltoid or anterolateral thigh area), inject once on days 0, 3, 7 and 14*

Suspected Snake bite[95]

Management[27]
Monitor, support ABCs
Check vital signs (BP, PR, RR, spO2, Temp)
Start Oxygen if spO2 < 94%
Perform brief, targeted history, physical exam

Physical Exam[95]
- Airway – check for hypersalivation and ability to clear secretions
- Breathing – watch for respiratory muscle weakness
- Bleeding – monitor for unusual bleeding (haematuria/oozing from wounds)
- Neuro – full exam including cranial nerves
- Neurovascular status of limb, swelling, necrosis

Immobilize body part
-DO NOT apply tourniquet
-DO NOT incise wound
-DO NOT administer antivenom outside of hospital
-DO NOTE treat with ice

Consider the follow labs
- CBC, CMP, PT/INR, PTT, FDP/d-dimer, CPK
- Swab bite area, Snake Venom Detection Kit (SVDK) to be used if available and clinical/lab evidence for envenoming

Has envenomation occurred?

No

No skin marks
No symptoms an hour post-bite
Discharge
Instruct to return if symptoms develop

Suspected

Skin marks BUT no symptoms
-Admit overnight for observation
-Elevate effected limb
-If no new symptoms, discharge next day

Yes

Obvious Bite Marks and/or Symptomatic
What Type of Envenomation Syndrome? [3,95]
Severe enough to warrant antivenom?

No

Yes

Administration
-Dilute antivenom in NS (no more than 20mL/500mL bag), give slowly over 30 mins or no more than 1-2mL/min
-Polyvalent: titrate to symptoms, assess q30min
-Monovalent: monitor haematologic response, repeat dose if needed
-Epinephrine ready in case of anaphylaxis: Epinephrine (1mg/1ml 1:1000), 0.01mL/kg (max dose 0.3mL), IM anterolateral thigh, Repeat q5-15 minutes if no improvement
-Antihistamine: have available, not routinely recommended
-Monitor Vital Signs
-Never run medications directly into effected limb

Types of Envenomation[3,95]

I. Neurotoxic
   a. Symptoms: Weakness, paresthesia, ptosis, diplopia, mydriasis, problems swallowing, excessive salivation, difficulty breathing, paralysis and respiratory failure paralysis
   b. Treatment
      - IV placement
      - Monitor oxygenation and breathing
      - Intubation & mechanical ventilation if necessary
   c. Indications for Antivenom (the triad of)
      1. Paraesthesia
      2. Excessive salivation/metallic taste & sweating
      3. Dyspnea in the absence of painful, progressive swelling OR Paresis in the presence of significant swelling
   d. Treatment: Polyvalent Antivenom

II. Cytotoxic
   a. Symptoms: Severe pain, bruising/swelling at site, blisters, severe tissue necrosis, abscess, compartment syndrome, hypotension, shock, rhabdomyolysis, renal failure
   b. Treatment
      - IV placement
      - Analgesia
      - Place limb at heart level
      - IVF for shock/renal failure
      - Supportive care
   c. Indications for Antivenom
      - Progressive swelling $\geq$ 15cm/hr
      - Swelling extending from foot/hand to knee/elbow in 4 hours
      - Entire limb swelling by 8 hours
      - Airway swelling
      - Associated coagulopathy
   d. Treatment: Polyvalent Antivenom

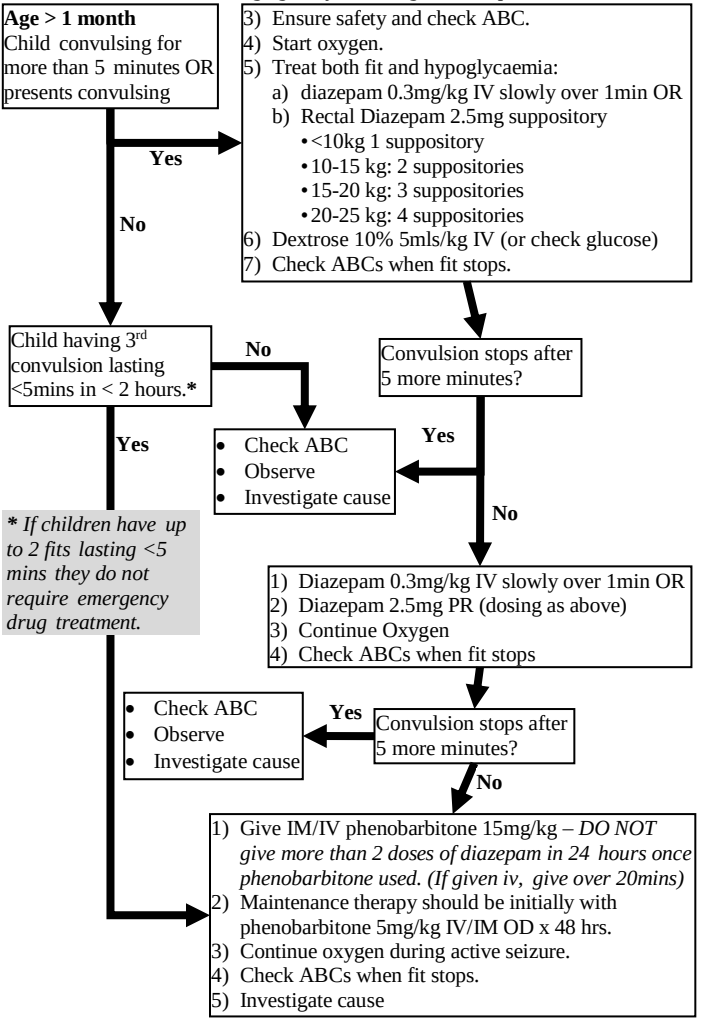
III. Haemotoxic
   a. Symptoms: Bleeding at wound sites (may be minor wounds, lacerations, or puncture sites), Ecchymoses, Haematuria, Renal Failure, DIC
   b. Treatment
      - IV access
      - Blood products as necessary
      - DO NOT give heparin, antifibrinolytics, thrombolytics
   c. Indications for Antivenom
      - Active bleeding
      - Non-clotting blood in clean test tube after 20 minutes
      - Lab evidence of coagulopathy
   d. Treatment: Monovalent Antivenom

Paediatric

Protocols

Treatment of Paediatric convulsions[1,16]

*Convulsions in the 1st **month** of life should be treated with Phenobarbitone 20mg/kg stat, a further 5-10mg/kg can be given within 24 hrs of the loading dose, maintenance dose is 5mg/kg daily. Do not give Diazepam to neonates.*



Paediatric Dehydration Protocol
(EXCLUDING severe malnutrition)[1,16,17]
> 2 months old with History of diarrhoea/vomiting

CHECK for SHOCK.
All four of
- AVPU < A
- Capillary refill > 3 secs
- Cold hands + Temp gradient
- Weak / absent pulse

If Hb<5g/dl transfuse urgently

Yes →
- Ringers 20mls/kg over 15 minutes.
- A second bolus may be given if required before proceeding to PLAN C STEP 2 below
- Treat for hypoglycaemia
- Start ORS 5 mls/kg/hr once able to drink

No ↓

Severe Dehydration (PLAN C)[149,150]
> 2 of the following signs:
- AVPU < A
- Capillary refill >= 2 seconds
- Unable to drink
- Sunken eyes
- Slow skin pinch >= 2 seconds
- Absent tears AND dry mucus membranes

Yes →

PLAN C
STEP 1
- Ringers 30mls/kg over
  - >12 months: 30 minutes
  - < 12 months: 60 minutes
- If no IV access or IVF

STEP 2
- Ringers 70mls/kg over
  - >12 months: 2.5 hours
  - < 12 months: 5 hours
- If no IV access or IVF, use NGT rehydration 100ml/kg ORS
- Reassess Hourly
- After 3-6 hours, reclassify level of dehydration

No ↓

Some Dehydration (PLAN B)
Able to drink but 2 or more of the following signs:
- Restlessness/Irritability
- Sunken eyes
- Slow skin pinch 1-2 seconds
- Dry tongue
- Decreased Tears

Yes →

PLAN B
1) ORS PO at 75mls/kg over 4 hours
2) Continue breast feeding and/or encourage feeding if > 6 months

No ↓

No Significant Dehydration (PLAN A)
Diarrhoea/GE with fewer than 2 of the above signs of

Yes →

PLAN A
1) ORS PO at 10mls/kg after each loose
2) Continue breast feeding and/or encourage feeding if > 6 months

I. **Diarrhoea Adjunctive Rx:**
   a. **All cases to receive Zinc 10-20mg/day x 10-14 days**
   b. Diarrhoea > 14 days may be complicated by ORS intolerance (worsening diarrhoea) – if seen, change to IV regimens
   c. Antibiotics ONLY if bloody diarrhoea (dysentery) [16,18]
      i. First line: Ciprofloxacin 15mg/kg/dose BD x 3-5 days
      ii. Second line (or severely ill): Ceftriaxone 50-80mg/kg/day x 3-5 days
      iii. Alternative: Azithromycin 15mg/kg PO on day 1 then 10mg/kg PO OD days 2-5
      iv. DO NOT USE: aminoglycosides, amoxicillin, ampicillin, chloramphenicol, cotrimoxazole, 1st or 2nd gen cephalosporins, nalidixic acid, nitrofurans, or tetracycline due to resistance
   d. Antibiotics/Antiprotozoals ONLY if persistent diarrhoea AND
      i. proven amoebiasis: Paramomycin, diloxanide, iodoquinol
      ii. proven giardiasis: Tinidazole, Metronidazole, Nitazoxanide (also albendazole, mebendazole, paramomycin)

Paediatric Treatment of Sepsis and Septic Shock

Sepsis Definition: SIRS criteria + proven or suspected infection[19–22]

SIRS Definition: >= 2 of the following abnormal measurements (one must be Temperature or WBC):

Temperature > 37.9 axillary (38.5 core) or < 35.4 axillary (36 axillary)

Age Group	Heart Rate (Beats/Min)[21,23,24]	Respiratory rate (Breaths/ Min)[21,23,25]	Leukocyte Count, (leukocytes x 10^3/mm)[20]	SBP (mmHg)
0-1 week	>180/190 (or <100)	>60	>34	<65
1 wk-1mo			>19.5 or <5	<70
1mo – 1 yr	>180 (or <90)	>50	>17.5 or <5	<75
1 – 5 yrs	>140	>40	>15.5 or <6	<74
5 – 10 yrs	>130	>30	>13.5 or <4.5	<83
> 10 yrs	>110	>30	>11 or <4.5	<90

Suspected/Proven infection + SIRS → **No** → **Don't treat for Sepsis!**

↓ **Yes**

ALL of the following:
Cold extremities
Cap refill > 3 seconds
Fast AND weak pulse

→ **Yes** → **Septic Shock:** consider bolus 10-20mL/kg NS or RL over 30-60 minutes, watch for signs of volume

↓ **No**

1. Airway Breathing: 100% O2, **bag and mask if poor respiratory effort**
2. Treat hypoglycemia: Dextrose 10% 5ml/kg IV push (1mL D50% plus 9mL D5% = 10mL D10%)
3. PRBCs if severe anemia (Hgb < 5)
4. Start Amp/Gent within 1 hour. Ceftriaxone if concerned for meningitis (see medication chart)
5. If no improvement, consider hydrocortisone 50mg/kg/day

Labs: MRDT, RBS, CBC with diff, Blood Culture
Other Tests: Urinalysis, Urine Culture, electrolytes/Urea/Cr/Calcium, LFTs (AST/ALT [GOT/GPT]/Bili), CSF if indicated, CXR, serologic tests for infections

Ampicillin: 50mg/kg/dose IV/IM
First week of life: every 12 hours
Weeks 2-4: every 8 hours
Over 4 weeks: every 6 hours

Gentamicin:
Low Birth Wt: 3mg/kg IM/IV OD
Nrml Birth Wt & > 1week of age (normal renal function): 5mg/kg/OD IM/IV

Ceftriaxone: 1gm/10mL 100mg/kg/OD IV (can give 50mg/kg/12hrs)

Paediatric Pneumonia protocol for children aged 2-59 months[1,16]
(refer to HIV exposed/infected, TB, neonatology or Sickle Cell for special cases)

Cough or difficulty breathing plus any of:
- Central cyanosis or O2sat < 90%
- AVPU = 'V, P or U'
- Inability to breastfeed/drink
- Severe respiratory distress (e.g. grunting, very severe chest indrawing)

No →

Chest indrawing
Breaths/minute
- 2-11 months: > 50
- 1-5 years: > 40

Yes →

Rx for Pneumonia
-Amoxicillin 40mg/kg/dose PO BD x 5 days
-Can be treated at home if no other concerns

Yes ← **No** →

No pneumonia, if only cough, manage supportively for upper respiratory infection

If shortness of breath, look for other causes

Rx for Severe Pneumonia
- Oxygen if hypoxic
- Manage airway prn
- Treat fever
- 1st line: Ampicillin 50mg/kg IM/IV q6hrs
- AND Gentamicin 5mg/kg IM/IV daily
  - if no improvement in 48 hours, and Staph Pneumonia suspected, change Ampicillin to Cloxacillin (same dosing)
- 2nd line: Ceftriaxone 80mg/kg IM/IV daily
- Give antibiotics for at least 5 days

Consider ICU Transfer For:
- Impending respiratory failure/ requires intubation
- Pulse oximetry < 92% on oxygen >=50%
- Recurrent apnea or slow irregular breathing
- Increased RR & HR with severe respiratory distress and exhaustion
- Altered mental status
- Shock/inability to maintain BP without pressors

Discharge criteria:
1. Overall clinical improvement (activity level, appetite, decreased fever) x 24 hours
2. PulseOx > 90% on room air x 24 hours
3. Stable & baseline mental status
4. Tolerating oral medication if needed
5. Tolerating PO to maintain hydration/nutrition

Pediatric Hyperglycemia (RBS > 14mmol/L)[26,27]

History: Polyuria, Polydipsia, Weight loss, Abdominal pain, Tiredness, Vomiting, Confusion
Clinical findings: deep sighing/Kussmaul respirations, smell of ketones, lethargy, vomiting

↓

Management[27]

5. Monitor, support ABCs
6. Check vital signs (BP, PR, RR, spO2, Temp, **Weight**)
7. Assess GCS, hydration status
8. Insert 2 IVs, Start Oxygen if spO2 < 94%
9. Draw renal functions, potassium, CBC, malaria, urinalyis
10. Perform brief, targeted history, physical exam
11. ***DO NOT GIVE INSULIN***

↓

GCS < 9 OR plan to use Insulin drip

Yes → **Transfer to ICU**

No ↓

Ketones in Urine?

Yes → **Diabetic Ketoacidosis:** Identify and treat precipitating illness, consider: sepsis, pneumonia, gastroenteritis

No ↓

- Evaluate and manage dehydration
- Check glucose every 4 hours
  - If hyperglycemia resolves with hydration, monitor every 6 hours x 24 hours
  - If continues to be normal x 24 hours, likely reactive
- Check urine dipstick every 6 hours
- If ketonuria with hyperglycemia, start DKA pathway
- If glucose > 14 for > 6 hours
  - Dx: Type 1 DM without DKA
- Start SC Insulin Usual dose: 0.5-1 IU/kg/day
  - Regular sliding scale every 6 hours
  - Mixtard BD (70% AM, 30% PM) 30 minutes before meals

Pediatric Diabetic Ketoacidosis

Diabetic Ketoacidosis: Identify and treat precipitating illness, consider: sepsis, pneumonia, gastroenteritis

Fluid Protocol:
Total fluid replacement = 80mL/kg - + 2*maintenance – initial bolus

1. Initial bolus
   a. Hypovolemic Shock: 10-20mL/kg NS or RL bolus, repeat until BP improves
   b. Hypovolemic but no Shock: 10-20mL/kg of NS or RL over 1st hr
   c. **DO NOT** give > 40mL/kg in first 4hrs, can cause cerebral edema
2. Replacement fluids: correct the remaining deficit over 48 hours
3. Satisfactory urine output 1-2mL/hr

NEVER alternate D10 & NS/RL this can cause brain oedema

Insulin Protocol: Start after 1-hour IVF
Soluble Regular Insulin Injection
- SC 0.15 IU/kg every 2 hours

Potassium Protocol:
Add 10mEq KCl/500mL bag

DO NOT give potassium if urine output < 1mL/kg/hr (or K > 5.5)

Monitor Neuro Status for:
headache, slowing HR, irritability, incontinence, decreased conscious, focal signs
If any of the above: check/correct hypoglycemia

Not hypoglycemic

Call Senior if neuro changes and concern for increased ICP
Transfer to ICU
Mannitol 0.5-1g/kg or hypertonic saline

When RBS < 14 or RBS drops rapidly, repeat urinalysis

Urine still with ketones

- Keep NPO
- Change IVF to D5 NS/RL
- (50mL D50 + 450mL NS/RL)
- Continue Insulin Regimen until RBS < 14
- Recheck urine for ketones every 4 hours

Urine without ketones

Urine without ketones

- If patient can drink, stop IVF, otherwise continue replacement/maintenance
- Patient is allowed to eat
- Switch to SC Insulin Usual dose: 0.5-1 IU/kg/day
  - Regular sliding scale every 6 hours
  - Mixtard BD (70% AM, 30% PM) 30 minutes before meals

Urinary Tract and Kidney Disorders in Children[28]

Most Common Presenting Symptoms:
1. Fever
2. Dysuria, frequency, nocturia
3. Abdominal pain/discomfort
4. Hematuria (bloody, dark, tea-colored urine)
5. Oliguria/Anuria
6. Swelling – face and extremities

→ 3-24 months: Fever present?

Verbal child: dysuria, frequency, nocturia, or abdominal symptoms?

→ Go To Urinary Tract Infection and Pyelonephritis Algorithm

Obtain bedside urine dipstick, are any of the following present?
1. Hematuria (gross or microscopic)
2. Proteinuria
3. Oliguria/anuria
4. Edema

No → Consider other causes

Yes →

Obtain:
1. Renal Functions
2. Electrolytes (Na+, K+, Cl-)
3. Albumin, Protein
4. CBC

→ Evaluate and Treat other factors:
1. Malaria
2. Sepsis
3. Dehydration
4. Heart Failure
5. Malnutrition

Are all of the following present?
1. Proteinuria
2. Edema
3. Hypoalbuminemia
4. No other diagnosis or history of gross hematuria, or increased Cr

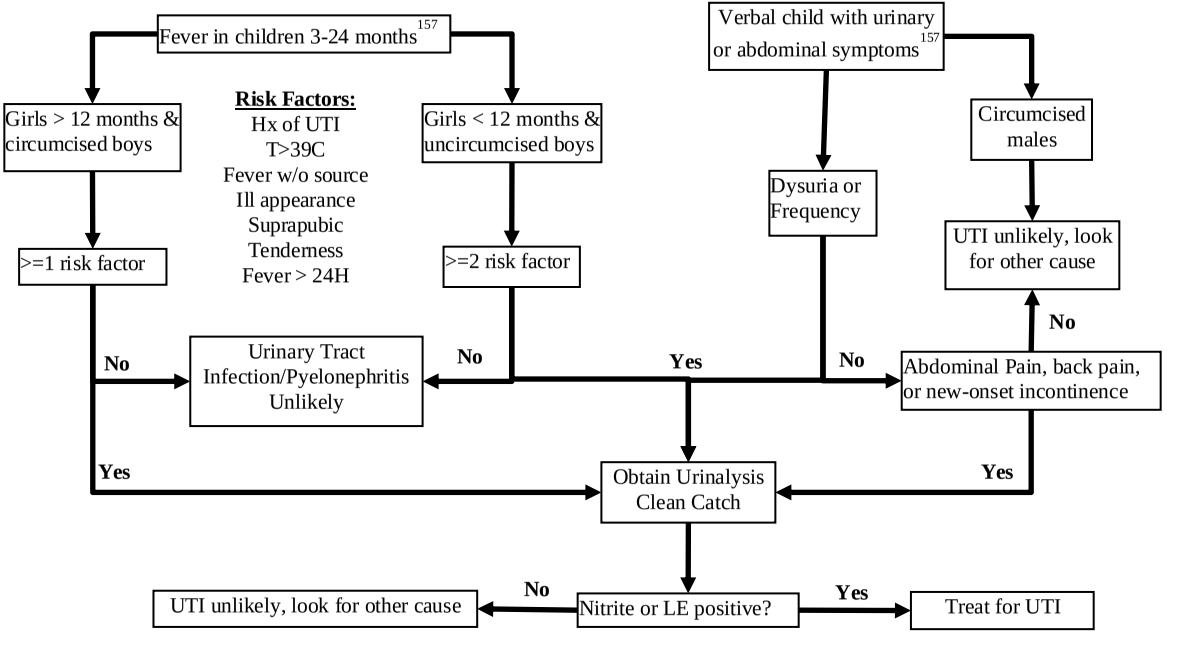
No → Supportive Care

Yes → Treat as Nephrotic Syndrome: Prednisone 2mg/kg/day x 4 weeks (will require taper) → Supportive Care

Supportive Care:
1. Oliguria/Anuria: **MOST IMPORTANT** if urine output drops (after correcting any prerenal causes), start Lasix 1mg/kg IV/dose BD, and consider IV hydration (1/2-2/3 MIVF, watch for fluid overload)*
2. Hypertension (> 95%[151]): (if not controlled with Lasix[152]) Amlodipine 2.5mg OD-BD
3. Edema: Lasix 1mg/kg/dose IV OD-BD
4. Monitor UOP/Volume status: may need to place foley catheter (goal UOP: 1mL/kg/hr)
5. Hx of pharyngitis/skin infection: consider Penicillin V 250mg TID for strep eradication
6. Treat infections (avoid gentamicin, ibuprofen, and other nephrotoxic drugs)
7. Treat malaria (consider confirming eradication with control RDT&B/S)

REMEMBER: may be intravascularly depleted even with edema

Urinary Tract Infection/Pyelonephritis in Children – Work-Up



Urinary Tract Infection/Pyelonephritis in Children – Treatment

Treatment for lower UTI (7 day course)[29]
Outpatient treatment (for those non-toxic and able to tolerate):
Nitrofurantoin 6mg/kg PO divided every 6 hours[26] (not if < 1 year old)
Amoxicillin/Amoxicillin-Clavulanate 50mg/kg PO divided every 12 hours[16,26,30,31]

Treat for upper UTI (Pyelonephritis) if the following are present:

I. < 2 years[32]
   a. Age <2 months
   b. Clinical urosepsis (e.g. toxic appearance, hypotension, poor capillary refill)
   c. Immunocompromised patient
   d. Vomiting or inability to tolerate oral medication
   e. Lack of adequate outpatient follow-up (e.g. no telephone, live far from hospital)
   f. Failure to respond to outpatient therapy
II. > 2 years, at least 2 of the following[33]: Fever, Chills, Flank Pain

Pyelonephritis Treatment (7-14 days):
Inpatient treatment, Labs: CBC, renal fxn (Bld Cx if concern for sepsis)
IV antibiotics for 48-72 hours until clinical improvement, then switch to PO
Cefotaxime 150mg/kg/day IV/IM divided every 8 hours[30,34]
Ceftriaxone 75mg/kg IV/IM daily[30,31]
Ampicillin 50mg/kg IV/IM every 6 hours[16]
IV hydration if unable to tolerate PO, monitor urine output

Imaging[29]

I. Renal/Bladder Ultrasound: all febrile infants with UTI, within 48 hours if severe, otherwise after resolution of acute illness
II. VCUG[35] for any of: abnormalities on ultrasound, recurrent febrile UTI, Temp > 38 axillary AND a pathogen other than E. Coli, failure to thrive or hypertension

Admission of Wheezing Child[1,16]

Wheeze + history of cough or difficult breathing:
Likely Bronchiolitis: < 2 year, febrile, crackles
Likely Asthma if: > 2 years, hx of recurrent wheeze, or family atopic hx
DO NOT USE antibiotics for either of the above unless patient ALSO has pneumonia, see pneumonia pathway for guideline

Bronchiolitis Management

- Monitor, support ABCs
- Check vital signs (PR, RR, spO2, Temp, Weight)
- Assess AVPU/GCS, hydration status
- Start Oxygen if spO2 < 94%, insert IV if needed
- Perform brief, targeted history, physical exam

Consider CBC, CXR in premature <12 weeks, CHD, immunodeficiency and chronic neurological disease

Severe Bronchiolitis?
1. spO2 < 90%
2. apnea
3. Persistently increased respiratory effort (tachypnea, nasal flaring, subcostal/suprasternal retractions, accessory muscle use, grunting)

Mild Bronchiolitis?
1. No hypoxia
2. No Apnea
3. No respiratory distress

Rx at Home
1. Nasal Saline
2. Oral Hydration
3. Paracetamol for fever
4. **NO Cough or Cold medicine**

Treatment (mostly supportive):
1. Oxygen if spO2 < 94%
2. Nasal saline and bulb suction
3. PO Hydration or NGT/IVF if not tolerating oral feeds
4. Paracetamol for fever
5. Steroids & Antibiotics ineffective
6. Salbutamol: if over 9 months may give **ONE** nebulization, must examine before and after, stop if no improvement, if notable improvement, may continue every 4 hours

CPAP trial if impending respiratory failure

Discharge Criteria:
1. O2sat > 94% x 12 hours
2. Notably improved respiratory rate
3. Able to take fluids to stay hydrated
4. Caretaker instructed in use of nasal saline
5. Counsel cough may persist 1-2 weeks

Acute Asthma Management

Severe: Wheeze PLUS
- SpO2 < 90%
- Lower chest wall indrawing
- Inability to breastfeed/drink
- Inability to talk
- Lethargy
- Peak flow < 50%

No →

Mild/Moderate: Wheeze PLUS
- Fast breathing
  - Age 2 – 12 months: RR ≥ 50
  - Age >12 months: RR ≥ 40
- Peak flow 50-80%
- Adequate air exchange
- SpO2 > 90%

Yes ↓

Place on Oxygen

Management

1. Salbutamol every 15 minutes x 3 doses via:

Nebulizer	OR	MDI+spacer+mask
< 2 years: 2.5mg in 3mL NS		5-10 kg: 4 puffs
> 2 years: 5mg in 5mL NS		10-20 kg: 6 puffs
		> 20 kg: 8 puffs

Oral salbutamol is ineffective

2. Dexamethasone 0.6mg/kg PO or IV (if not drinking) x 1 dose or Prednisolone 1-2mg/kg PO x 1 dose

Reassess after 30-60 minutes
Was the patient initially mild/moderate and has shown marked improvement?

No →

Admit
- **Severe:** continue oxygen, 1-4 hourly salbutamol, early review
- **Mild/Moderate:** 4 hourly salbutamol
- Prednisolone 1-2mg/kg OD x 3 days
- Ensure adequate hydration, maintenance fluids via NGT/IV if necessary

Yes →

Discharge Criteria:
1. O2sat > 92%
2. Able to take fluids to stay hydrated
3. Requires salbutamol no more than every 6hrs

- Give education on use & importance of inhaler, spacer + mask, signs of asthma, danger signs, and avoidance of triggers (smoke, etc.)
- Discharge on Salbutamol MDI every 6 hours for no more than 5 days
- If did NOT receive 3 days of steroids, complete Prednisolone 1-2mg/kg PO OD x 3 days total
- Consider inhaled steroids if recurrent episodes of wheezing

Pediatric Meningitis[1,16,36]

1. Symptoms are often nonspecific, if unclear treat for Meningitis **AND** other diagnosis (malaria, TB meningitis, etc.) until definitive tests.
2. There is **NO WAY** to rule in or rule out meningitis without a lumbar puncture

Symptoms that **MAY** be present in Infants and Children

Symptom**	Infant	Children
Fever	Neonates: not always (may have hypothermia)	✓
Headache	✓	✓
Neck Stiffness/ Kernig's/Brudzinski's	Less common	✓
Poor feeding/ vomiting/diarrhea	✓	✓
Altered Mental Status	Lethargy/Irritability	Confusion/Lethargy/Irritability
Convulsions	More concerning < 6 months	More concerning > 6 years
Focal Neuro Signs	✓	✓
Respiratory distress/ apnea	✓	uncommon
Bulging Fontanelle	✓	
Photophobia	Unable to confirm	✓
Cushing triad	no	Late and Ominous Sign (HTN, bradycardia, irregular breathing)

**Children with ≥ 1 of: neck stiffness, cyanosis, impaired consciousness, partial convulsions or convulsions older than 6 years old have a much higher rate of meningitis[37]

I. If any concern for Tuberculous Meningitis, see Tuberculosis Protocol
II. If culture reveals meningococcus needs prophylaxis for close contacts
III. If < 1-month old, see Neonatal Protocols
IV. Steroids no longer recommended in low-resource countries[38–41]
V. If any of the following present, treat with full course of antibiotics
   a. Lumbar Puncture with either
      i. Bacteria on Gram Stain, positive CSF culture OR
      ii. Gram Stain: > 9 WBC (< 3months), >6 WBC (> 3months)
   b. AVPU = 'P or U'
   c. Stiff neck/Kernig's/Brudzinski's
   d. Bulging fontanelle in sick child
   e. Evidence of partial seizures
   f. If not, may consider stopping antibiotics at 48 hours if CSF culture negative

Pediatric Meningitis Rx ≥ 1 month

Management

- Monitor, support ABCs
- Check vital signs (PR, RR, spO2, Temp, Weight)
- Assess AVPU/GCS, hydration status
- Start Oxygen if spO2 < 94%, insert IV
- Perform brief, targeted history, physical exam

Does the patient have one of?:

- AVPU = 'P or U'
- Inability to drink / feed
- Stiff neck/Kernig's/Brudzinski's
- Bulging fontanelle
- Convulsions if <6 months or > 6 yrs
- Evidence of partial seizures
- Any altered mental status (agitation/irritability) AND convulsions

No → Look for other source of symptoms

Yes ↓

Does the patient have any contraindication?:

- Require CPR
- Shock
- Signs of increased ICP (GCS ≤8, changing mental status, focal or changing neuro signs, pupils unresponsive, papilloedema)
- Skin infection at LP site
- Actively convulsing
- Coagulation abnormalities (known bleeding disorder, platelets < 100)

Yes → **NO LP currently**
If contraindication resolves < 24-48 hours after starting antibiotics, perform at that time[153,154]

No → Perform LP: send for glucose, protein, cell count, gram stain and culture

Treatment (IV Antibiotics x 10 days) – start within 1 hour:

< 3 months:

- Cefotaxime 100mg/kg IV 8hourly (max dose 2g/day)

AND

- Ampicillin 50mg/kg IV 6hourly (max dose 12g/day)

> 3 months:

- Ceftriaxone 100mg/kg IV OD

↓

Follow Convulsion Protocol if applicable

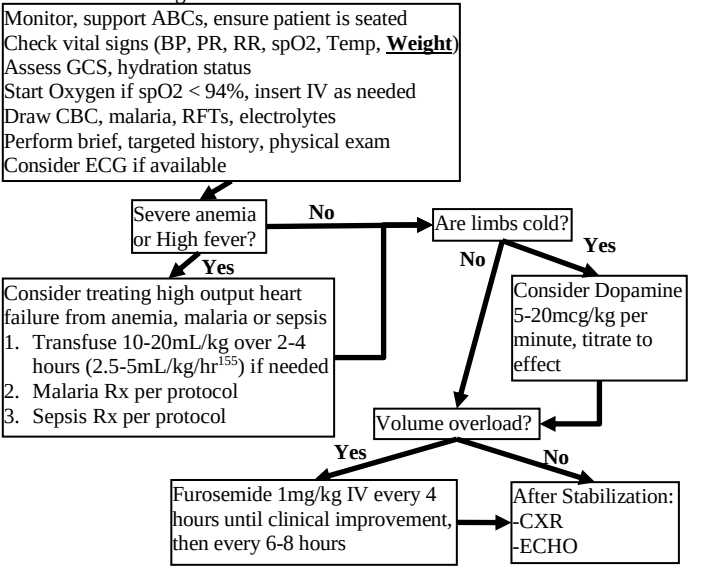
Pediatric Cardiac Protocols

I. Heart Failure

a. Most Common Symptoms
   i. Infants: difficulty feeding, easy fatigability, failure to thrive
   ii. Young children: GI sxs, failure to thrive, easy fatigability, recurrent or chronic cough with wheezing (must differentiate from asthma)
   iii. Older children: exercise intolerance, anorexia, abdominal pain, wheezing, dyspnea, edema, palpitations, chest pain or syncope[42]

b. Physical exam findings[43]
   i. Tachycardia, gallop rhythm
   ii. Poor perfusion – cool/mottled extremities, decreased cap refill, decreased peripheral pulses, lowered systemic BP
   iii. Pulmonary findings – tachypnea, retractions, accessory respiratory muscle use, grunting/nasal flaring in infants, wheezes and rales (more in older children)
   iv. Systemic congestion – hepatomegaly, jugular venous distension (rare in infants and young children), peripheral edema
   v. Hypertension in upper extremities or weak pulses in lower extremities
   vi. Grade III+ murmur, precordial thrill or heave
   vii. Neonatal screening (>24 hrs old): check preductal (R. hand) & post-ductal (either foot) SpO2: positive screen if a) SpO2 differs by >3% btw upper and lower extremities on 3 measurements separated by an hour each, b) SpO2 <90% any extremity, or c) SpO2 <95% in upper and lower extremities on 3 measurements separated by an hour each

c. Acute Management



II. **Chronic Medications & Dosages**[44]

a. Diuretics
   i. Furosemide 1mg/kg/dose OD or BD
   ii. Spironolactone 1mg/kg/day divided OD-BD up to 3.3-6mg/kg/day divided OD-BD (not to exceed 100mg/day)

b. ACE Inhibitors/ARBs
   i. Captopril 0.3-2.5mg/kg divided BD, titrate up as needed, max dose 6mg/kg/day
   ii. Lisinopril/enalapril 0.1mg/kg OD
   iii. Losartan 0.5mg/kg/day (not to exceed 12.5-25mg/day), up to 1.4mg/kg/day (not to exceed 150mg/day)

c. Digitalis/Digoxin 5-15mcg/kg/day divided BD up to 20-30mcg/kg/day divided BD
   i. Especially useful in the setting of atrial arrhythmias

d. Beta Blockers
   i. Propranolol 1-3mg/kg/dose BD-TID
   ii. Carvedilol 0.1mg/kg/day divided BD (not to exceed 3.125mg/day), up to 0.8-1mg/kg/day divided BD (not to exceed 25mg BD)

e. Generally recommended order of medications in left ventricular dysfunction
   1. Furosemide – for patients with or history of fluid retention
   2. ACEI/ARBs – everyone without specific contraindication, especially with valvular (notably regurgitant mitral or aortic valvular) disease

   WARNING! ***Before starting either of the following medications, must have ECHO, potassium level and have consulted with senior***
   3. Spironolactone – for patients on Furosemide that continue with fluid retention, especially in patients that are more symptomatic
   4. Digoxin – for those with low ejection fraction

III. **Rx for Specified Conditions**

a. Acyanotic Congenital Heart Disease: Left to Right Shunts (VSD/PDA most common) – standard order of medications

b. Cyanotic Congenital Heart Disease: Tetralogy of Fallot
   i. Heart failure symptoms rare
   ii. Treat Tet Spell
      1) Knee-chest position
      2) Oxygen
      3) Morphine 0.1 mg/kg/dose IV
      4) Normal Saline 10-20mL/kg IV slow bolus
      5) Propranolol 0.1mg/kg/dose IV or 0.5mg/kg/dose PO

c. Dilated Cardiomyopathy
   i. Order of Rx: standard
   ii. Digoxin (especially in the setting of atrial arrhythmias)

Acute Rheumatic Fever (ARF)

I. Diagnosis Initial ARF: (evidence of preceding group A Streptococcus infection) + (2 major) or (1 major + 2 minor criteria)

II. Diagnosis Recurrent ARF: (h/o ARF) + (2 major) or (1 major + 2 minor) or (3 minor criteria)

III. 2015 Jones criteria for the diagnosis of rheumatic fever for moderate to high-risk populations[45–50]

a. Clinical Manifestations for Major Criteria
   - Carditis and valvulitis (clinical and/or subclinical)
     - Manifestations: fever, new murmur, chest discomfort or pleuritic chest pain, malaise, tachycardia, heart failure
   - Arthritis
     - Manifestations: fever, migratory polyarthritis affecting large joints (knees, elbows, ankles, wrists) but also monoarthritis or polyarthralgia, lower extremity affected first, more in adolescents, asymmetric
   - Central nervous system involvement (e.g. Sydenham Chorea)
     - Manifestations: fever, grimacing, fidgeting, clumsiness, emotional lability, difficulty with handwriting), gait imbalance, may resolve while sleeping
   - Subcutaneous nodules
   - Erythema marginatum

b. Clinical Manifestations for Minor Criteria
   - Monoarthralgia or polyarthralgia
   - Fever (≥37.5 °C axillary)
   - ↑↑ ESR (≥30 mm/hr) and/or ↑↑ CRP (≥3.0 mg/dL)
   - Prolonged PR interval, after accounting for age variability (unless carditis is a major criterion)

IV. Evaluation

a. CBC and ESR/CRP when available
b. ECHO, ECG if available

V. Treatment

a. Streptococcal Pharyngitis antibiotic regimen (regardless of whether patient currently has pharyngitis
b. Arthritis: Aspirin 20-25mg/kg/dose q6hrs
c. Secondary prophylaxis
   1. Benzathine Penicillin G (BPG) IM qmonth
      a. ≤27kg = 600,000 IU
      b. >27kg = 1.2 million IU
   2. Penicillin V 250mg PO BD
   3. Erythromycin 250mg PO BD
      a. Only if PCN allergic

Sickle Cell Disease

I. Admit any child with a diagnosis of Sickle Cell Disease and any of the following conditions:
   a. Pain: moderate to severe
   b. Severe pallor, Hgb < 5, symptomatic with Hgb < 7 or 2+ drop in Hgb from baseline
   c. Fever with tachycardia, tachypnea, hypotension or >38.0 C
   d. Chest pain, difficulty breathing
   e. Acute (0-7 days) abnormal CNS signs (e.g. headache, drowsiness, paralysis or limb weakness)
   f. Priapism (>4 hours)
   g. RDT or B/S + for Malaria
   h. Diarrhea and/or vomiting with abdominal pain, distension or inability to drink enough to stay hydrated
   i. Neutropenia (granulocytes < 1000) and fever

II. Home Medications at time of Discharge[26]
   a. Folic Acid 5mg PO QD
   b. Penicillin VK
      1. <3yo: 125mg PO BD
      2. 3-5yo: 250mg PO BD
   c. Malaria Prophylaxis
      1. Sulphadoxinepiremetamine
         a) 2-5yo: ½ tab monthly
         b) 5-10yo: 1 tab monthly
         c) 10-15yo: 2 tabs monthly
         d) >15yo: 3 tabs monthly
      2. Sulfur allergy: Consider erythromycin 250mg PO q12hrs
   d. Hydroxyurea
      1. Should ideally be managed by specialized treatment centre
      2. Indications
         a) Frequent crises: > 5/year
         b) Abnormal Transcranial Doppler (TCD) Ultrasonography velocity >200cm/s
         c) H/o of Acute Chest Syndrome
         d) H/o Stroke
      3. Likely beneficial in all children with Sickle Cell Disease, although larger studies are still pending[51]
      4. Start after 9 months old
      5. Starting Dose: 20mg/kg PO QD

Sickle Cell Acute Management

- Monitor, support ABCs
- Check VS (BP, PR, RR, spO2, Temp, Wt)
- Assess GCS, hydration status
- Insert IV, Start Oxygen if spO2 < 94%
- Draw CBC, retic count, malaria, Tbili/Dbili if jaundiced
- Perform brief, targeted history, physical exam

↓

Focal Neurologic findings?[156,157] (Hemiparesis, focal neurologic deficit, speech disorder) → **Yes** → **Treat for Stroke**

↓

Meets criteria for pneumonia or has moderate to severe chest pain? → **Yes** → **Treat for Acute Chest Syndrome**

↓

Sudden Splenic Enlargement with drop in Hgb > 2g/dL from baseline? (usually with abdominal pain and < 5yo → **Yes** →

a. Hgb may continue to drop, monitor carefully
b. May require more aggressive transfusions than normal crisis

↓

Vaso-occlusive Crisis or Moderate to Severe pain? → **Yes** → Treat aggressively, **see pain management protocol**

↓

Fever? → **Yes** →

- Blood Cultures
- Ceftriaxone: 100mg/kg/OD IV (can give 50mg/kg/12hrs)
- If evidence of sepsis, **use sepsis protocol**

↓

Hypotensive or dehydrated? → **Yes** → **Treat with dehydration protocol**

↓

Supportive Care

I. Hydration[158–161]: if mildly dehydrated or poor PO intake, may consider 1.5 x MIVF for 24hrs, goal is Euvolemia, and ideally overall intake (IV and PO) should be full maintenance, watch carefully for volume overload (DO NOT BOLUS if not hypotensive)
II. Feeding
III. Malaria

Sickle Cell Stroke

New Neurologic Findings: hemiparesis, focal neurologic deficit, speech disorder
OR
High Clinical Suspicion

↓

Monitor, support ABCs
Check vital signs (BP, PR, RR, spO2, Temp, Weight)
Start Oxygen if spO2 < 94%
Assess GCS
Assess hydration status
Insert IV, Draw CBC, malaria, RBS
Perform brief, targeted history, physical exam

↓

Does the patient have any contraindication?:

	Children	Adults
Fever: Paracetamol	15mg/kg PO q6hrs	650mg PO q6hrs
Hypoglycemia	Dextrose 10% 5ml/kg (mix 8ml NS with 2ml Dextrose 50%)	1 amp (50ml) of Dextrose 50%
Convulsions	See Convulsion Protocol	
Anemia: Transfusion	Simple transfusion, PRBCs, to Hgb > 9[156,162]	
Infection: Antibiotics	Cefotaxime IV 50mg/kg every 8 hours (max dose 2g) May substitute Ceftriaxone 80mg/kg IV daily (max dose 2g)	
Hydration	Dehydrated: see dehydration recommendations MIVF if hydrated[163,164] Encourage feeding	

↓

Monitoring
1. Daily neuro checks
2. Physiotherapy as soon as acute issues resolved

↓

Discharge Plan
1. Hydroxyurea
2. F/U in Sickle Cell Clinic

Sickle Cell Acute Chest Syndrome

Meets criteria for pneumonia OR has moderate to severe chest pain

↓

Monitor, support ABCs
Check vital signs (BP, PR, RR, spO2, Temp, Weight)
Assess GCS, hydration status
Start Oxygen if spO2 < 94%
Insert IV, Draw CBC, malaria, transfuse for Hgb<9
Perform brief, targeted history, physical exam

↓

Clinical Respiratory Score[165]			
	0	**1**	**2**
RR (>12mo)	<30	30-40	>40
Auscultation	Good air mvmt, minimal wheezing/creps	Decreased air mvmt, insp&exp wheezing	Severely diminished/absent sounds, severe wheezing
Retractions or nasal flaring	Mild	Moderate	Severe
Mental Status	Normal/mildly irritable	Irritable, restless	Lethargic
O2sat	>95%	90-95%	<90%
Color	Normal	Pale	Cyanotic, dusky

↓

If available, consider ICU admission for CRS >=6

↓

Start Antibiotics[163–165]

1. Cefotaxime IV 50mg/kg every 8 hours (max dose 2g)
    a. May substitute Ceftriaxone 80mg/kg IV daily (max dose 2g)
2. Azithromycin
    a. Day 1: 10mg/kg (max/adult dose 500mg)
    b. Day 2-5: 5mg/kg (max/adult dose 250mg)

↓

General Supportive Care:

1. Aggressive pain management
2. Encourage feeding, IVF if not eating (but TOTAL fluid intake should be no more than maintenance)

↓

Discharge Criteria[165]

1. Improved symptoms
2. Afebrile x 24hrs
3. Good PO intake
2. pO2 >94% on room air
4. Hgb > 5
5. Pain controlled without morphine

Severe Acute Malnutrition in Children

Nutritional Assessment

- **Mid upper arm circumference** (MUAC) in cm.
  - Measures wasting/muscle mass in children older than 6 months
  - Correlates significantly with risk for death
  - Easy screening tool in the community
  - Used in very ill patients who cannot have weight/length measured
- **Body weight** (in kg to the nearest 0.1 kg)
  - weigh as soon as arrival to hospital
  - take one hour before or after a meal
  - remove clothes, jewelry, diapers, etc.
  - keep child warm with a blanket as you wait to measure
- **Length/height**
  - Length (child laying down): <2yrs, or < 87cm if age unknown
  - Height (child standing up): ≥ 2yrs, or ≥ 87cm if age not known
  - If ≥ 2yrs & can't stand, take length and subtract 0.7 cm
  - Child should be barefoot, no head gear
  - Shoulders, buttocks and heels should touch the board
  - Measure to the nearest 0.1 cm.

Making sense of the measurements

- Use Weight-for-Length/Height (WFL/WFH) if <6 years (59 months)
- Use BMI/age if ≥ 6 years
- Plot measurements (use growth charts) and obtain Z-score
- Classify the degree of malnutrition

Classification of acute malnutrition

Age category	Nutritional indicator	Moderate Acute Malnutrition (MAM)	Severe Acute Malnutrition (SAM)
< 6 months	WFL	≥ -3SD & < -2SD	< -3SD
	Oedema	Absent	Present
6 to 59 months	WFL/WFH	≥ -3SD & < -2SD	< -3SD
	Oedema	Absent	Present
	MUAC	≥11.5 cm &< 12.5cm	<11.5cm (red)
5 to 19 years	BMI/ age	≥ -3SD & < -2SD	< -3SD
	Oedema	Absent	Present
5 to < 10 yrs	MUAC	≥13.5 & <14.5cm	< 13.5 cm
10 to < 15 yrs	MUAC	≥16.0 & < 18.0 cm	< 16.0 cm
15 to 19	MUAC	≥ 16.5 & < 21.0 cm	< 18.5 cm

Complicated SAM includes any of the following: hypoglycemia, hypothermia, infections, severe dehydration, shock, Hgb < 4, cardiac failure, corneal ulceration, severe dermatoses, or IMCI danger signs like anorexia, intractable vomiting, convulsions, lethargy/LOC, inability to feed or breast feed, fever >39.

Criteria for admission with Severe Acute Malnutrition (any)

- Patients with SAM & severe oedema
- Children < 6 months with SAM
- Patients with complicated SAM

Uncomplicated SAM (no admission criteria) manage from outpatient therapeutic care (OTC) with ready to use therapeutic feeds (RUTF)

Check for all of the following after admission

1. **Hypoglycemia:** blood glucose < 3mmol/L, 54mg/dL, treatment:
   a. Can drink: 50mls of 10% dextrose or sugar water (1 spoon of sugar + 50mls of water)
   b. Can't drink: Dextrose 10% IV 5mls/kg, followed by Dextrose 10% 50mLs or sugar water by NGT
2. **Hypothermia:** < Axillary temperature <35 or rectal < 35.5, treatment:
   a. Actively warm (kangaroo, cover head, no water bottles as skin is already fragile, away from windows or draughts, keep room warm, change wet clothes, keep covered all time & at night)
   b. Must also treat for hypoglycemia and infection
3. **Shock:**

   Both AVPU < A AND cold extremities
   plus one of
   Capillary refill >3 secs OR weak/fast/absent pulse

   a. Oxygen
   b. Keep warm
   c. IV fluids: 15mls/kg/hour (may repeat once)
   d. Choice of fluids: RL+D5% or ½NS+D5%, add 20mmol/L KCL
   e. If no improvement after first bolus, assume septic shock, give whole blood 10mL/kg
4. **Dehydration:**

> 2 of the following signs	
AVPU < A	Absent tears
Capillary refill >= 2 seconds	Dry mucus membranes
Unable to drink	Recent/frequent diarrhea
Sunken eyes	Vomiting
Slow skin pinch >= 2 seconds	

   a. Use rehydration solution for malnutrition (ReSoMal)
      i. 5mls/kg PO q30min x 2 hrs THEN
      ii. 5-10mls/kg/hr, alternate ReSoMal one hour then F-75 the next x 10 hrs
      iii. Monitor for improvement or over hydration
      iv. If improved, give ReSoMal only after each loose stool
5. **Severe Anemia**

   Hgb < 4g/dl, <6g/dl with heart failure, or (if no Hgb), pallor with heart failure symptoms (tachypnea, tachycardia, engorged neck veins, cold extremities, cyanosis of fingertips or tongue)

   a. Stop all oral feeds and IV fluids for 24 hours, check for heart failure
   b. No heart failure: 10mls/kg whole blood over 3hrs
   c. Heart failure: 5-7mls/kg of packed RBCS

6. **Cardiac Failure**
   Common causes: over hydration, overfeeding, blood transfusion, high sodium diet, severe anemia, severe pneumonia.
   Signs: deterioration with weight gain, reappearance of edema, sudden DIB, prominent neck veins, cold extremities, tender liver, cyanosis.
   a. Oxygen
   b. Stop all IV fluids & feeds
   c. Lasix 1mg/kg IV
   d. Do not use digoxin in newborns
7. **Eye signs of Vitamin A deficiency/Corneal ulceration/purulent ocular discharge, treatment:**
   a. Vitamin A on day 1, 2 and 15
   b. 1% atropine to relax the eye
   c. Gentamycin or chloramphenical eyedrops
8. **Severe dermatosis:** Peeling with cracking and ulceration of the skin
   a. Sponge affected areas with 0.01% potassium permanganate or gentian violet.
9. **Infection Control (for complicated SAM), treatment:**
   a. Ampicillin 50mg/kg IV q6hrs x 2 days
   b. Switch ampicillin to amoxicillin if there is improved after 2 days
   c. Gentamicin 5mg/kg/day x 7 days
   d. Check mom for HIV if < 18 months, otherwise check patient
10. **Micronutrient deficiency**
   a. No supplements necessary (all micronutrients already included in F-75, F-100)
   b. Add CMV (Combined mineral and vitamin) mix to the milk if making own feeds.
   c. If no formula feeds or CMV, then supplement with multivitamin drops for all the stages of management. However, start iron in the rehabilitation phase.

Feeding in Severe Acute Malnutrition

Stabilization

- Use F-75 only
- If oedema: 100mls/kg/day
- If no oedema: 130mls/kg/day
- Do not change the total daily volume of milk, even when they lose or gain weight.
- Initially 2 hourly feeds for at least 48 hrs.
- If stable, then go to 3 hourly, or 4 hourly feeds.
- Child should complete at least 80% of the feeds offered.
- Use NGT if not finishing at least 80% of the feeds on 2-3 consecutive feeds
- **Vomiting**: reduce feeds to 1 hourly or estimate the vomited milk and offer it again.

When to transition?

- Return of appetite
- Reduced edema or minimal edema
- Child may smile at this point
- Resolved medical complications
- Passes acceptance/appetite test (eats a third of the 92g sacket of plumpy nut).
- NB. Can transition to ready to use therapeutic feeds (RUTF/Plumpy nuts) or F-100.

Transitioning to RUTF

- Offer the RUTF in a hygienic and Playful environment
- Provide the RUTF with plenty of safe water to drink.
- If not completing but finishing > half of the RUTF, then supplement with F-75.
- If taking < a half, go back to stabilization F-75

Transitioning to F-100

- For the first 2 days, give the same volume as F-75.
- On day 3, add 10mls/feed to a maximum of 220ml/kg/day or until the child is unable to finish
- Start iron supplementation on day 3 of transition

When to switch back to stabilization

- Re-occurrence of medical complications
- Loss of appetite (taking < 80% of feeds consecutively)
- Development/increasing of edema
- Deteriorating medical condition
- Signs of fluid overload
- Re-feeding diarrhea

Epistaxis*

Management

- Monitor, support ABCs
- Have patient lean forward, pinch nose closed (**DO NOT** tilt head back)
- Check vital signs (PR, RR, spO2, Temp, Weight)
- Assess AVPU/GCS, hydration status
- Start Oxygen if spO2 < 94%, insert IV if needed
- Perform brief, targeted history, physical exam
  - Nasal Trauma (nose picking) most common cause (especially in children)
- Continue pinching the nose closed for **15 MINUTES**
- **Do not order coagulation labs during this time**
- **Do not use packing during this time**

After 15 minutes of nose pinching, has bleeding stopped?

No

Insert into bleeding nostril, a cotton pledget soaked in the following, in order, each for **10 minutes**, stop at any point if bleeding is controlled (note, this is **NOT PACKING**):

1) Injectable tranexamic acid (500mg in 5mL NS)
2) Epinephrine/adrenaline (1mg in 5mL)

Bleeding has stopped

Yes

- Repeat vital signs (PR, RR, spO2, Temp)
- Repeat GCS
- Remove any packing
- Monitor for at least 60 minutes
- Education about cause
- Vaseline/Petroleum Jelly should be applied TID for 7-10 days

Bleeding continues

Perform the following in order, stop at any point if bleeding is controlled:

1) Pack the bleeding nostril with a tampon or gauze that has been soaked in bacitracin or K-Y jelly
2) Pack the contralateral nostril with a tampon or gauze that has been soaked in bacitracin or K-Y jelly
3) Pass a lubricated foley catheter through the bleeding nostril into the nasopharynx, fill with NS and pull forward, placing light traction against the posterior nasal choana
4) Pack the bleeding nostril around the foley catheter with a tampon or gauze that has been soaked in bacitracin or K-Y jelly

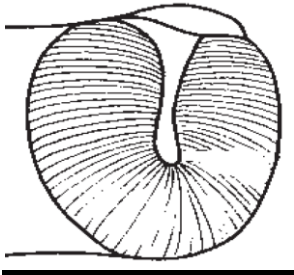
Bleeding has stopped

Repeat vital signs (PR, RR, spO2, Temp, BP)
Repeat GCS
IV access
Labs: CBC, LFTs, Coagulation Studies
Consider keeping packing in place for 12-24 hours

Ear, Nose and Throat Infections

I. Otitis Media
   a. Presentation
      i. **Most common parental complaints:** restless sleep, irritability, ear rubbing (appears to be the most useful symptoms to aid diagnosis), ear pain, severe or prolonged rhinitis or cough, fever
      ii. Acute onset, possibly preceded by upper respiratory symptoms
      iii. More likely if smoking at home or formula feeding
   b. Examination
      i. Perform Otoscopy (examine Tympanic membrane with otoscope – ideally with an insufflator bulb)
      ii. Remove cerumen if necessary for visualization
   c. Diagnosis: Any of the following on exam[16,52]
      i. Moderate-to-severe bulging of tympanic membrane (TM)
      ii. Mild bulging of TM & < 48 hrs of ear pain or intense erythema of TM
      iii. TM is red, bulging and opaque
      iv. New otorrhea not due to Otitis Externa
      v. TM is perforated with discharge
   d. Treatment (max/adult dose for below is 875mg/dose PO BD)
      i. 1st line: Amoxicillin 45mg/dose PO BD
      ii. 2nd line: Amoxicillin/Clavulanic Acid 45mg/dose PO BD
   iii. Duration: 10 days if < 2 years old, 7 days > 2 years old

Normal TM



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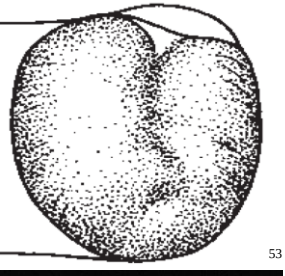
Acute Otitis Media



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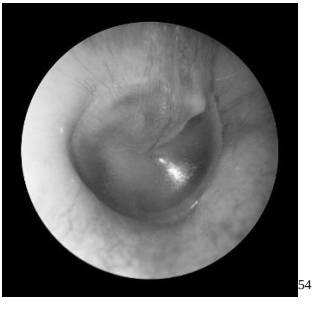

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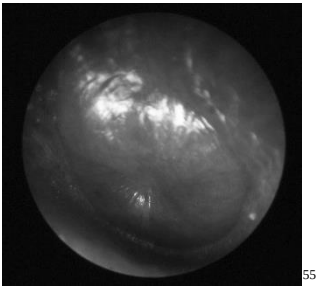

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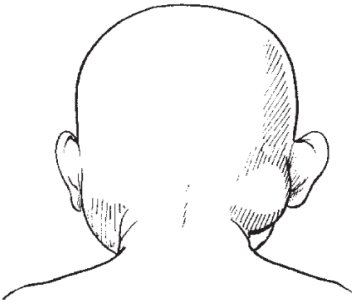
II. Otitis Externa
   a. Presentation
      i. Otalgia, pruritus, pressure/fullness of ear canal, hearing loss, jaw pain, discharge, redness/erythema, swelling/edema
   b. Examination (need to perform otoscopy as well)[56,57]
      i. Pain with tragus/pinna movement
      ii. Erythema/edema of ear canal
      iii. Cellulitis
      iv. Discharge from canal
      v. Generally, manipulation of external ear is painful in Otitis Externa but not in Otitis Media
   c. Treatment
      i. Topical Antibiotic
         1. Neomycin/Polymyxin B/Hydrocortisone (Cortisporin Otic) 3-4 drops to affected ear 8 hourly x 7-10 days
         2. Educate about keeping ear dry

III. Mastoiditis
   a. Presentation/Examination findings[58,59]
      i. Risk factor is current or recent diagnosis of acute otitis media
      ii. Signs of local inflammation over mastoid
         1. Protruding ear
         2. Postauricular erythema, swelling or pain
         3. Systemic signs, fever or malaise
   b. Treatment
      i. Children
         1. Ampicillin-Sulbactam IV 50mg/kg 8 hourly
         2. Cloxacillin or Flucloxacillin IV 50mg/kg 6 hourly
         3. If no response within 48 hours or child deteriorates, refer to a surgical specialist to consider incision and drainage
      ii. Adults
         1. Ceftriaxone 2g IV BD or Cefotaxime 2g IV 8 hourly
         2. With intracranial complications
   a. Ceftriaxone 2g IV BD or 8 hourly plus Vancomycin 2g in 2-4 divided doses



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IV. Pharyngitis

a. Strep pharyngitis usually presents with sore throat, fever, headache or stomach ache, but **NOT** with viral sxs like cough, coryza, conjunctivitis
b. Remember, ONLY Streptococcal Pharyngitis should be treated with antibiotics, all others should only be treated with supportive care
c. Streptococcal Pharyngitis Diagnosis (Modified Centor Score)

Criteria	Points
Age Range	
3-14 years	+1
15-44 years	0
>= 45 years	-1

Criteria	Points
Tonsillar Exudates	+1
Tender/swollen anterior lymph nodes	+1
Febrile	+1
Cough absent	+1

d. Scoring

Child Scoring	**0-1 points**	**2 points**	**3+ points**
	No treatment required	Ideally rapid test/culture, may use clinical judgement to start Rx	Start Rx presumptively

Adult Scoring	**0-2 points**	**3+ points**
	No Treatment Required	Start Treatment Presumptively

e. Treatment

Drug	**Paediatric Dose (≤27kg)**	**Adult Dose (>27kg)**
Penicillin VK PO	250mg PO BD x 10 days	500mg PO BD x 10 days
Benzathine Penicillin G IM	600,000 IU	1.2 million IU
Amoxicillin PO	25mg/kg/dose (max 1g) BD x 10 days	
Clindamycin PO	7mg/kg (max 300mg) 8 hourly x 10 days	

V. Sinusitis

a. DOES NOT require antibiotics unless bacterial
b. Diagnosis of Acute Sinusitis: 2 major or 1 major & 2+ minor symptoms[60]

Major Symptoms	**Minor Criteria**
Nasal congestion or obstruction	Headache
Purulent nasal discharge	Ear pain, pressure or fullness
Hyposmia or anosmia	Halitosis
Facial congestion or fullness	Dental pain
Facial pain or pressure	Cough
Fever	Fatigue

c. Diagnosis of **BACTERIAL SINUSITIS**[60,61]
   i. Signs/symptoms above lasting ≥ 10 days
   ii. Worsening or new onset of signs/symptoms following initial improvement, typically after 5-6 days (double sickening)
   iii. Severe symptoms with concurrent fever (>38.5 axillary) & purulent nasal discharge or facial pain lasting ≥ 3 days
d. Treatment for **BACTERIAL SINUSITIS** (must meet above criteria)
   i. Amoxicillin 45mg/kg/dose BD[62–65] x 7 days if > 2 years, mild-moderate, uncomplicated disease
   ii. Amoxicillin/Clavulanic Acid 45mg/kg/dose BD x 7 days if < 2 years, moderate-severe illness, attending daycare, or antibiotic exposure in last 4 weeks
   iii. If no improvement in 72 hours, consider changing antibiotics

Paediatric Tuberculosis

VII. **Consider Tuberculosis with the following**

a. Chronic cough
b. Chronic fever
c. Pneumonia not improving on treatment
d. Wasting
e. Lymphadenopathy
f. Ascites
g. Heart failure/pericardial effusion
h. Refusal to bend a painful joint
i. Irritability, meningeal signs
j. Haematuria, sterile pyuria

VIII. **General considerations making tuberculosis more likely**

a. Prolonged course of cough, fever, sweats
b. Patient's disease symptoms don't improve with expected treatment
c. Weight loss/malnutrition, especially if no improvement after 4 weeks
d. Large, painless lymphadenopathy
e. Close contact with someone with tuberculosis within last 2 years

IX. Diagnosis

a. In children especially difficult, <5yo cannot produce sputum
b. <5yo or cannot produce sputum, Gastric Aspirate
   i. perform on different days, 3 times total, early morning prior to the child eating or ambulating (ideally would wake patient up after sleeping prone all night)

X. **Scoring Systems – Systemic Tuberculosis**

Keith Edwards Score for Diagnosis of Tuberculosis in Children[66–68]					
Feature/score	**0**	**1**	**2**	**3**	**4**
Length of illness (weeks)	<2	2-4	-	>4	-
Nutrition (% wt for age)	>80	60-80	-	<60	-
Family h/o TB	None	Reported	-	Proven	-
Unexplained fever not responding to malaria drugs	-	-	Positive	-	-
Tuberculin test	-	-	-	Positive	-
Painless lymphadenopathy with or without sinus	-	-	-	Positive	-
Malnutrition not improved after four weeks	-	-	-	Positive	-
Joint/bone swelling, sinuses	-	-	-	Positive	-
Unexplained abdominal mass or ascites	-	-	-	Positive	-
CNS: changes in temperament, fits or coma	-	-	-	Positive	-
Angle deformity of spine	-	-	-	-	Positive

Scores of ≥7 indicative of tuberculosis

XI. **Scoring Systems – Pulmonary Tuberculosis**

8-point Risk Score for children in contact with infected persons[69]					
Feature/score	**0**	**1**	**2**	**3**	**4**
Tuberculin Test (mm of induration)	<10		10-14	15-19	≥20
Smear positive source case		Present			
Source case lives in high incident area*			Present		
Source case is female		Present			

*in initial study this incidence was 277/100,000, if unsure of your local incidence, may assume high if in Africa or South-East Asia[70]

New modified Edwards' score[66–68]				
Feature/score	**0**	**1**	**2**	**3**
Duration of illness/weeks	<2	2-4	-	>4
Nutrition (% wt-for-lt)	>80	60-80	-	<60
Family h/o TB	None	Reported by family	-	Proved sputum +ve
Tuberculin test	-	-	-	Positive
Malnutrition	-	-	-	Not improved after 4 weeks
Unexplained fever (>2 weeks)	-	-	No response to treatment	-

Scores of ≥7 indicative of tuberculosis

Brazilian Ministry of Health Scoring System[68,71]	**Points**
Clinical Symptoms	
Fever or sxs such as cough, fatigue, wt loss, sweating for > 2 weeks	+15
Asymptomatic or symptomatic < 2 weeks	0
Improvement in respiratory infection w/o antibiotics or with antibiotics for common germs	-10
Radiologic Findings	
CXR with hilar lymph node enlargement, military pattern, condensation or infiltrate for > 2 wks, with worsening sxs or lack of improvement with antibiotics for common germs	+15
Condensation or infiltrate < 2 weeks	+5
Normal CXR	-5
Contact with Adult TB patient	
Close contact within last 2 years	+10
Occasional or negative	0
Tuberculin skin test	
> 10mm in child given BCG > 2 years ago or never vaccinated	+15
>15mm in children given BCG vaccine within last 2 years	+15
≥ 5mm and ≤ 9mm	+5
< 5mm	0
Nutritional Status	
Weight < 10th percentile	+5
Wt ≥ 10th percentile	0

Points - ≥40: highly likely ≤39 and ≥ 30: possible ≤ 29: unlikely

Treatment for Pediatric Tuberculosis*

Check LFTs**

ALT > 3 x upper limit of normal? **Yes** → Consult senior about possible alternate regimen

No

Abnl LFTs but ALT< 3 x upper limit of normal? **Yes** → Recheck LFTs qmonth**

No

First 2 months treatment[78,181]

Drug	Recommended Daily dose	Range	Max Dose
Isoniazid	10mg/kg	7-15mg/kg	300mg/day
Rifampicin	15mg/kg	10-20mg/kg	600mg/day
Pyrazinamide	35mg/kg	30-40mg/kg	1.5g/day
Ethambutol	20mg/kg	15-25mg/kg	1.6g/day

Are any of the following present? [78]
- TB meningitis
- Pulmonary TB with respiratory distress
- Pulmonary TB w/ airway obstruction from hilar lymph nodes
- Severe military TB
- Pericardial effusion

Yes →

Add Prednisone
- 2mg/kg (max 6mg/day) x 4 weeks
- Followed by: 1mg/kg x 1 week
- Followed by: 0.5mg/kg x 1 week

No →

After 2 months:
- Cerebral TB requires 10 more months of treatment
- Pulmonary TB requires 6 more months of treatment

Drug	Recommended Daily dose	Range	Max Dose
Isoniazid	10mg/kg	7-15mg/kg	300mg/day
Rifampicin	15mg/kg	10-20mg/kg	600mg/day

*Throughout treatment patient should receive Pyridoxine

Weight (kg)	**Number of tablets pyridoxine (50mg)**
5-7	Quarter tablet daily
8-14	Half tablet daily
≥ 15	One full tablet daily

**If liver tenderness, hepatomegaly or jaundice recheck LFTs. Do not change regimen unless LFTs > 5 x upper limit of normal

Anaemia

History: Sleepiness, anorexia, dysphagia, fatigue, dyspnea on exertion, syncope
Clinical findings: pallor, tachycardia, stomatitis, koilonychia, angular stomatitis, glossitis, esophageal/pharyngeal webs, heart failure symptoms

↓

Management[27]

12. Monitor, support ABCs
13. Check vital signs (BP, PR, RR, spO2, Temp, **Weight**)
14. Assess GCS, hydration status
15. Insert 2 IVs, Start Oxygen if spO2 < 94%
16. Draw CBC, malaria, consider blood cultures if concern for sepsis
17. Type and cross if tachycardic, tachypneic, or severe pallor
18. Perform brief, targeted history, physical exam

↓

Is there a possibility of bleeding?

- Ask about recent trauma
- Clinically significant GI bleeding should be visible as hematemesis, coffee ground emesis, melena, or hematochezia
- 4 locations in body may hide active bleeding: thorax, abdomen, retroperitoneum/pelvis, thigh

↓

Consider empirically treating for Malaria and Sepsis if appropriate, remember there is NO way to clinically differentiate between malaria and sepsis

↓

Transfuse in the following cases

High Malaria Areas:

- Low blood supply
  - <4g/dL or <5g/dL and unstable
- Good blood supply
  - <5g/dL
- Low Malaria Areas:
  - <7g/dL or <10g/dL and unstable

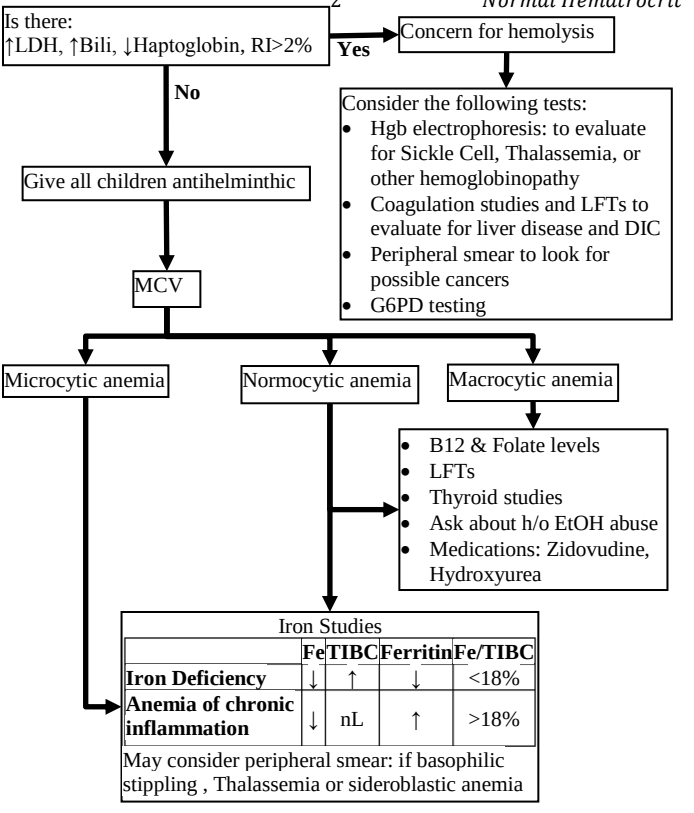
↓

Evaluate for Cause of anemia

Evaluation for Cause of Anemia[72]

Workup after stabilization (and rule-out of malaria & sepsis), using labs: CBC, LDH, bilirubin, haptoglobin, reticulocyte index (RI)

$$reticulocyte\ index = \frac{Reticulocyte\ percentage}{2}\ x\ \frac{Hematocrit}{Normal\ Hematrocrit}$$



I. Iron supplementation
   a) Children: 1-2mg/kg/dose PO q8hrs of elemental iron
   b) Adults: 50mg/dose PO q8hrs of elemental iron
II. Folate (Folic Acid) supplementation
   a) Children: 1mg PO daily
   b) Adults: 1-5mg PO daily (depending on severity)
III. B12 (Cyanocobalamin)
   a) Children: 1mg PO daily
   b) Adults: 1-2mg PO daily

Transfusions[15,16,73]

A. When to transfuse
   a. High Malaria Areas
      i. Low blood supply: <4g/dL or <5g/dL and unstable
      ii. Good blood supply: <5g/dL
   b. Low Malaria Areas
      i. <7g/dL or <10g/dL and unstable
B. General considerations about transfusions
   a. 10mL PRBCs = 20mLs WB
   b. If in shock, give WB for extra volume
   c. If no shock and concern for volume overload (malnourished, heart failure, give PRBCs
   d. 10-15mL/kg PRBCs raises child's Hgb an average of 2-3g/dL
   e. Usual range for children 10-20mL/kg
   f. 1 Unit PRBCs raises adults Hgb average 1g/dL
   g. Normal volume for adults 1-2 units
   h. Usually run 10mL/kg / 1 Unit over 3-4 hours
C. Calculate Transfusion Volume
   a. Paediatric:
      i. <1yo: 10mL/kg PRBCs or 15mL/kg WB
      ii. >1yo: 10mL/kg PRBCs or 20mL/kg WB
      iii. Malnourished: 5mL/kg PRBCs or 10mL/kg WB (do not repeat transfusion)
      iv. Adult: 1-2 units PRBCs
D. Complications
   a. Acute hemolytic transfusion reaction (AHTR) – w/in 24hrs
      i. Sxs: fevers, chills, rigors, pain at infusion site, chest/back/abdominal pain, low BP, shortness of breath
      ii. Treatment: stop transfusion, send back to lab to recheck compatibility, aggressive IVF hydration, maintain UOP with Lasix and/or dopamine
   b. Febrile nonhemolytic – w/in 6 hrs
      i. Sxs: fevers, chills, tachypnea, headache, vomiting, BP change
      ii. Treatment: stop transfusion, send back to lab to recheck compatibility (important to differentiate Hemolytic from Nonhemolytic), draw blood cultures, give Acetaminophen (may consider meperidine)
   c. Delayed Hemolytic Reaction – w/in 5-7 days
      i. Sxs: fever, anemia, mild jaundice
      ii. Treatment: screen for new antibodies, no specific treatment
   d. Allergic/urticarial/anaphylaxis
      i. Sxs: bronchospasm, laryngeal edema, hypotension
      ii. Treatment: Urticaria: diphenhydramine, Anaphylaxis (see protocol): epinephrine, diphenhydramine, H2-blocker, glucocorticoids
   e. Transfusion-related lung injury (TRALI)
      i. Often w/in 1-2 hours, sxs w/in 6 hrs, usu. improves 48-96 hrs
      ii. Sxs: fever, bilateral pulmonary edema, hypoxemia, respiratory failure, hypotension
      iii. Treatment: supplemental oxygen & respiratory support, CXR, evaluate for possible volume overload (presents with similar features)

Pain Management

Evaluation based on age, use appropriate scoring system

Neonatal Infant Pain Score (NIPS)[74,75] - < 1 year old

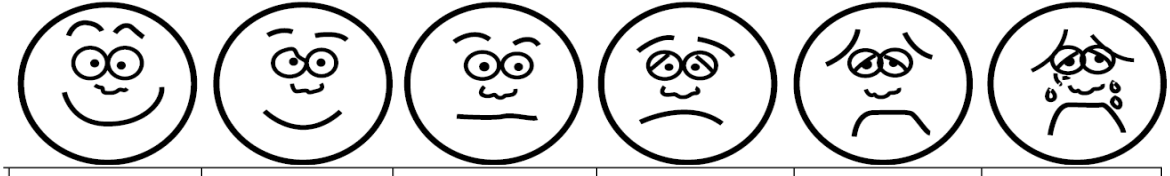
Variable	Finding	Points
Facial expression	Relaxed (Restful face, neutral expression)	0
	Grimace (Tight muscles, furrowed brow/chin/ jaw)	1
Cry	No cry (Quiet, not crying)	0
	Whimper (Mild moaning, intermittent)	1
	Vigorous crying (Loud scream, shrill, continuous). If intubated, score silent cry based on facial movement.	2
Breathing pattern	Relaxed (Usual pattern for this infant)	0
	Change in breathing (Irregular, faster than usual, gagging, breath holding)	1
Arms	Relaxed (No muscular rigidity, occasional random movements of arms)	0
	Flexed/extended (Tense, straight arms, rigid and/or rapid extension, flexion)	1
Legs	Relaxed (No rigidity, occasional random movements)	0
	Flexed/Extended (Tense, straight legs, rigid and/or rapid extension, flexion)	1
State of Arousal	Sleeping/Awake (Quiet/peaceful/sleeping or alert and settled)	0
	Fussy (Alert, restless and thrashing)	1
Heart Rate	Within 10% of baseline	0
	11-20% of baseline	1
	>20% of baseline	2
O2 Saturation	No additional O2 needed to maintain O2 saturation	0
	Additional O2 required to maintain O2 saturation	1

How to Score
0-3 Mild Non Pharmacologic (primary method)
-Pacifiers, sucrose, hand-to-mouth, non-nutritive sucking
-Swaddling, nesting, holding
-Position changes, correct positioning for procedures
-Decrease environmental stimuli (light, noise, abrupt movements)
-Decreased handling with rest periods between procedures
-Comfort measures noted to be effective with individual neonate
-Soothing vocalizations, recorded intrauterine sounds
Pharmacologic -Acetaminophen (Tylenol™)
4-6 Moderate
Non Pharmacologic
-See above Pharmacologic: (primary method) -Narcotic bolus
7-10 Severe
Pharmacologic: (primary method) -Narcotic intermittent bolus
-Consider narcotic drip

r-FLACC Scale (Revised Face, Legs, Activity, Cry, Consolability)[76,77] – 2 months to 7 years old

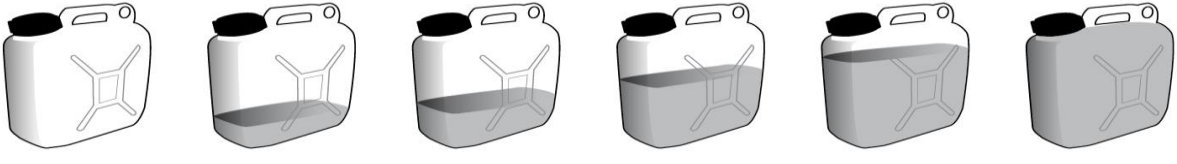
Variable	Finding	Points
Face	No particular expression or smile	0
	Occasional grimace or frown, withdrawn or disinterested; appears sad or worried	1
	Consistent grimace or frown; frequent/constant quivering chin; clenched jaw; distressed-looking face; expression of fright or panic	2
Legs	Normal position or relaxed; usual tone & motion to limbs	0
	Uneasy, restless, tense; occasional tremors	1
	Kicking, or legs drawn up; marked increase in spasticity, constant tremors or jerking	2
Activity	Lying quietly, normal position, moves easily, regular & rhythmic respirations	0
	Squirming, shifting back/forth, tense or guarded movements, mildly agitated, shallow splinting respirations, intermittent sighs	1
	Arched, rigid or jerking, severe agitation, head banging, shivering, breath holding, gasping or sharp intake of breaths, severe splinting	2
Cry	No cry/verbalization	0
	Moans or whimpers, occasional complaint, occasional verbal outburst or grunt	1
	Crying steadily, screams or sobs, frequent complaints, repeated outbursts, constant grunting	2
Consolability	Content or relaxed	0
	Reassured by occasional touching, hugging or being talked to, distractible	1
	Difficult to console or comfort, pushing away caregiver, resisting care or comfort measures	2

Wong-Baker Faces Scale: 4 – 12 years old (can be used up to 18)[178–180]



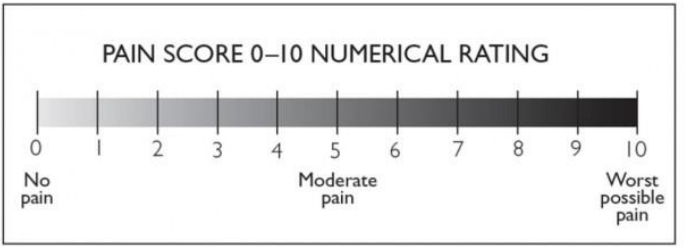
0	2	4	6	8	10
No Hurt	**Hurts a Little Bit**	**Hurts Little More**	**Hurts Even More**	**Hurts Whole Lot**	**Hurts Worst**

Jerry Cans for Scoring if Unable to Understand Faces[177]



0	2	4	6	8	10
No Pain	**Mild Pain**	**More Pain**	**Moderate Pain**	**Severe Pain**	**Overwhelmign Pain**

Adults and Children Able to Understand Numeric Scores



How to Score – All of the above scales have outcomes graded the same
0: relaxed and comfortable
1 – 3: mild discomfort
4 – 6: moderate pain
7 – 10: severe pain

Treatment: WHO Analgesic Ladder – graduated approach to pain control

Step 1: Pain score 0-3
Non-opioid
Paracetamol 10-15mg/kg q4-6hrs (adults 650mg PO q4-6hrs)
Ibuprofen 10mg/kg q6-8hrs (adults 400-800mg PO q6-8hrs)
If alternate paracetamol & ibuprofen can give patient one or the other pain medication every 3 hours (e.g. paracetamol now, ibuprofen in 3 hours, paracetamol 3 hours after that, etc.)

Step 2: Pain score 4-6
Oral Opioids preferred
Morphine preferred over Codeine if available
Children: Morphine 0.2-0.5 mg/kg/dose PO q4-6hrs prn
Adults: Morphine 2-10mg/kg/dose PO q2-4hrs prn

Step 3: Pain score 7-10
Intravenous Opioids preferred
Children: Morphine 0.1-0.2 mg/kg/dose IV q2-4hrs prn
Adults: Morphine 1-2 mg/dose IV q2-4hrs prn

<u>Notes</u>
It is often beneficial to use non-opiates with opiates

When beginning opioids, use high enough dose to control pain and monitor respirations q1hr to avoid respiratory depression

Neonatal

Protocols

Newborn Feeding/Fluid Requirements

	<1500g	>1500g
D1 (D10%)	**80**	**60**
D2 (D10%)	**100**	**80**
D3 (MRL)	**120**	**100**
D4 (MRL)	**140**	**120**
D5 (MRL)	**160**	**140**
D6 (MRL)	**180**	**160**
D7+ (MRL)	**180**	**160-180**

Total Fluids Calculations:

- Day 1 refers to 1st day of life – there is no day 0. The total volume of fluids is calculated for 24 hours and is composed of both enteral (PO/NG) and IV fluids.
- Use Birth Weight for calculations until BW exceeded. Or use highest weight.
- If IV fluids given, use D10% for days 1 & 2. Change to MRL on Day 3. Maximum IVF 150ml/kg/d. Give via paediatric infusion set (1 ml=60 drops) and replace fluid bag every 24 hours.
- Perinatal asphyxia: NPO for 24 hours after birth and IVF at 50ml/kg/day
- Occasionally VLBW babies need 200-220 ml/kg/d to gain weight.
- Monitor weight daily for all infants in newborn nursery.

Well baby >34 weeks gestation and/or >1500 g:

- LBW infants who are able to breastfeed should be put to the breast as soon as possible after birth when they are clinically stable.
- Feed on demand, at least every 3 hours (at least 8 feeds per day). In babies >1500 g who are not sick and are breastfeeding, it is not necessary to perform fluid calculations.
- If sick and not able to breastfeed, start EBM using enteral feed calculations below

Newborn Feeding/Fluid Requirements

Enteral feeding:

- Neonates < 32-34 weeks or <1500 g often have trouble coordinating suck and swallow. Expressed breast milk should be obtained and given to infant by cup, spoon or oral/nasal-gastric tube. Bottle feed not recommended.
- Feed EBM every 2 hours (12 feeds per day). May put to breast after EBM.
- Neonates unable to BF should be kept NPO for day 1. On day 2 start EBM at 10ml/kg/day, with the remaining fluid requirement met by intravenous fluids.
- Increase EBM by 30ml/kg/day every 24 hours and decrease IV fluids to keep within daily fluid requirement until IVF stopped. Monitor carefully for feeding intolerance (vomiting, apnea, gastric residuals).
- When enteral feeding volume reaches 100ml/kg/day and baby tolerating enteral feeds, the IV infusion may be stopped. Aim to stop IVF by day 7-8 of life to reduce risk of infection.
- Newborns lose weight the first week of life but should not lose more than 10% body weight.
- Newborns should be back to birthweight by 2 weeks of age. After infant regains BW, the goal is to gain 20-30 grams a day during the first 6-8 weeks of life

Indications for OGT or NGT:

- All neonates <1300 grams until gaining weight steadily.
- Premature or VLBW (<32-34 wks or <1500 g) with poor suck, ineffective suck/swallow coordination (coughs or vomits with feed), fatigues easily.
- Respiratory distress –risk aspiration. All newborns on CPAP.
- Sick newborns (asphyxia, meningitis, seizures) – poor suck
- Poor/no weight gain for 1 week on EMB/BF alone.

VLBW infants (<1500g) Vitamin supplementation (when tolerating full feeds):

- Vitamin D supplements at a 400 I.U. per day until 6 months of age.
- Iron supplementation 2-4 mg/kg per day starting at 2 weeks until 6 months of age

Continuous Positive Airway Pressure (CPAP)[78]

(For maximum benefit start as soon as symptoms are identified)

Newborn with severe respiratory distress with all of these:
Weight of >1000gm,
APGAR score of ≥ 4 at 5 minutes and
Respiratory distress defined as a
Silverman Anderson Score of ≥ 4*

↓

Initiate CPAP

↓

Monitor **every three hours**
- Vital signs - Temperature, heart rate and respiratory rate
- Pulse Oximetry
- Silverman Anderson Scoring
- Need of nasal clearing/suction

Worsening signs & score ↓

- Ensure the CPAP seal and equipment is working well. Adjust FiO2 pressure.
- Senior review.

Improving signs & score ↓

Continue CPAP and Monitor until Silverman Anderson score of <4

↓

Transition from CPAP to oxygen by nasal prongs

Silverman-Anderson Score

Feature	Score 0	Score 1	Score 2
Chest Movement	Equal	Respiratory Lag	Seesaw Respiration
Intercostal Retraction	None	Minimal	Marked
Xiphoid Retraction	None	Minimal	Marked
Nasal Flaring	None	Minimal	Marked
Expiratory Grunt	None	Audible with Stethoscope	Audible

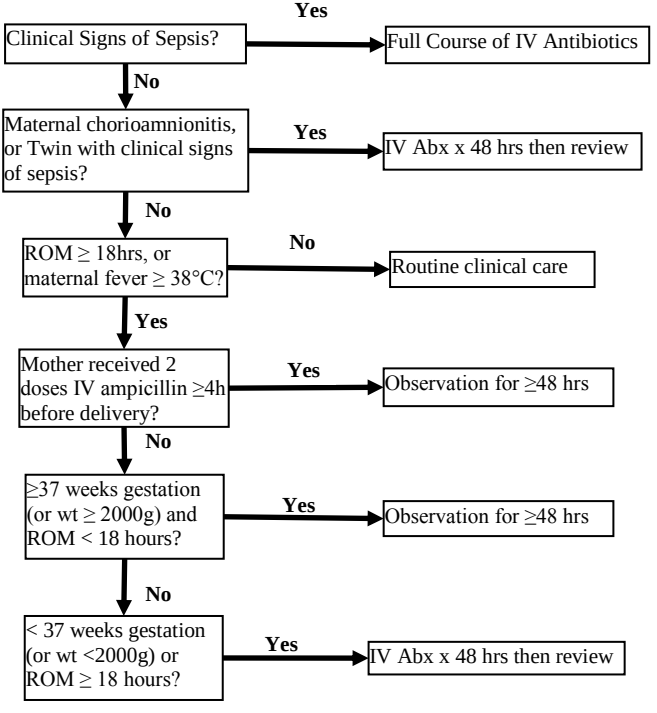
Score of >6 initiate CPAP as you prepare for transfer for mechanical ventilation

Early Onset Neonatal Sepsis (<7 days)

Risk Factors:

- Prolonged rupture of membranes (>18 hours)
- Prolonged labour
- Maternal fever (≥ 38°C) or other evidence of infection
- Foul smelling amniotic fluid or malodourous baby
- Prematurity (< 37 weeks)
- Low birth weight (<2000g)
- Birth outside health facility
- Some traditional practices (such as application of cow dung to cord)
- 5-minute APGAR score < 6

Prevention (in settings without laboratory)[192]



Neonatal Sepsis (<28 days) Treatment

Clinical Signs of sepsis?
- Lethargy
- Bulging fontanelle
- History of convulsions
- Feeding Difficulty
- Temperature >38 or < 35.5
- Respiratory rate > 60bpm
- Severe chest wall indrawing, grunting, apnea or cyanosis
- PROM > 18 hrs *if aged <7 d*

Yes

1) Blood cultures
2) Do LP if meningitis suspected
3) Check for hypoglycaemia, treat if unable to measure glucose
4) Give oxygen if cyanosed / respiratory rate > 60 bpm
5) Give Vitamin K and Tetracycline Eye Ointment (TEO) if born at home or not given at maternity
6) Keep warm
7) Maintain feeding by mouth or ng, use iv fluids only if respiratory distress or severe abdominal

1) Antibiotic Treatment*
   a. Ampicillin 50mg/kg q8hr (q12hr if in 1st week) PLUS Gentamicin 5mg/kg OD (3mg/kg OD if <2kg in 1st week or birth asphyxia)
   b. If concern for soft tissue infection: Cloxacillin PLUS Gentamicin (same dosing as above)
   c. If concern for meningitis: Ampicillin 100mg/kg q8hr (q12hr if in 1st week) PLUS Cefotaxime* 50mg/kg q8hr (q12hr if in 1st week)

   *may substitute Ceftriaxone (but risk for jaundice)

No`

Is there
Pus from the eye;
• Pus from the ear;
• Pus from umbilicus and redness of abdominal skin; or
• Few **large**, pus-filled blisters / septic spots.

DECIDE - does the baby need fluids, feeds or blood

Any of the following symptoms?
- Jaundice
- Capillary refill
- Severe pallor
- Localized severe infection - joints, abdominal distension
- Weight loss

Where appropriate:
1) Treat for neonatal ophthalmia
2) Treat with oral antibiotic – one that covers Staph aureus if large, pus-filled septic spots
3) Give mother and advice and arrange review

Duration of Treatment for Neonatal Sepsis

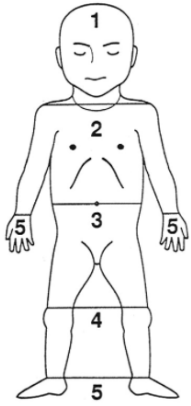
Problem	Days of Treatment
Signs of severe neonatal sepsis	• Blood culture should be done • IV/IM antibiotics should be continued for a minimum of 7 days or until completely well if the LP is clear.
Mild signs of neonatal infection or R/O sepsis in child with risk factors – ONLY if blood culture done	• Antibiotics could be stopped after 48 hours if all signs of possible sepsis have resolved, child feeding well and LP, if done is negative. Blood Culture negative.
Neonatal Meningitis or Severe Neonatal Sepsis with LP	• Blood culture should be done if not able to do LP • IV/IM antibiotics should be continued for a minimum of 14 days • IV/IM antibiotics for a minimum of 3 weeks, if gram negative meningitis is suspected
Clinical or radiological pneumonia	• IV/IM antibiotics should be continued for a minimum of 5 days or until completely well for 24 hrs • For positive LP see meningitis
Skin infection with signs of generalized illness such as poor feeding	• IV / IM antibiotics could be stopped after 72 hours if the child is feeding well without fever and has no other problem and LP, if done, is normal. Blood Culture negative • Oral antibiotics should be continued for a further 5 days.

Neonatal Jaundice

- Assess for jaundice in bright, natural light if possible. Check eyes, under tongue, palms and soles
- Always measure serum bilirubin if <24 hours and if clinically moderate or severe jaundice. Treat according to https://bilitool.org/ or infant age in days per WHO guidelines below
- **Any jaundice <24 hours needs further evaluation and urgent treatment with phototherapy or exchange transfusion**
- If unable to measure bilirubin start phototherapy:
  - In well baby with jaundice easily visible sole of foot during first week of life
  - In a preterm baby (<2000 gm) with ANY visible jaundice
  - In a sick baby with poor feeding, irritability and moderate to severe jaundice. Evaluate and treat for sepsis
- Babies over 2 weeks of age need evaluation for obstructive causes of jaundice such as biliary atresia. They do not usually require phototherapy.
- Phototherapy will not treat indirect hyperbilirubinemia

Phototherapy and Supportive Care: Checklist

- **Shield the eyes with eye patch or hat.** Remove periodically during feeds
- **Keep the baby naked**
- **Place the baby close to the light source –** 45 cm distance is often recommended but closer OK if baby not overheating. May use white cloth around light to reflect light back to bay. Learn recommended distance for your equipment
- **Do not place anything on phototherapy devices.** Lights and baby need to keep cool so do not block air vents. Also keep device clean – dust can carry bacteria and reduce light emitted
- **Promote frequent breastfeeding.** Unless baby dehydrated, supplements or IV fluids are unnecessary. Phototherapy can be interrupted for feeds and to allow maternal bonding
- **Periodically change position from supine to prone.** Expose the maximum surface area of baby. Reposition after each feed
- **Monitor temperature** every 2 hours and weight every 24 hours
- **Periodic (12-24 hours) plasma/serum bilirubin test required.** Visual testing for jaundice is unreliable
- **Make sure light source is working** and emitting light. Fluorescent tubes should be replaced if more than 6 months in use, tube ends have blackened or lights flicker.



Dermal Zone	Indirect Bilirubin (mg/100 mL)		
	Mean ± SD	Range	Observations
1	5.9 ± 0.3	4.3 – 7.9	13
2	8.9 ± 1.7	5.4 – 12.2	49
3	11.8 ± 1.8	8.1 – 16.5	52
4	15.0 ± 1.7	11.1 – 18.3	45
5		> 15	29

While can be used if no other method available, remember that visual inspection for jaundice is unreliable.

Treatment of jaundice based on serum bilirubin level[53]

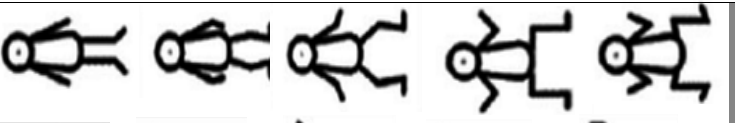
Age	Phototherapy		Exchange transfusion[a]	
	Healthy infant ≥ 35 weeks	Preterm infant < 35 weeks' gestation or any risk factors[b]	Healthy infant ≥ 35 weeks	Preterm infant < 35 weeks' gestation or any risk factors
Day 1	Any visible jaundice[c]		260 µmol/l (15 mg/dl)	220 µmol/l (10 mg/dl)
Day 2	260 µmol/l (15 mg/dl)	170 µmol/l (10 mg/dl)	425 µmol/l (25 mg/dl)	260 µmol/l (15 mg/dl)
Day ≥ 3	310 µmol/l (18 mg/dl)	250 µmol/l (15 mg/dl)	425 µmol/l (25 mg/dl)	340 µmol/l (20 mg/dl)

[a] Exchange transfusion is not described in this *Pocket book*. The serum bilirubin levels are included in case exchange transfusion is possible or if the infant can be transferred quickly and safely to another facility where exchange transfusion can be performed.

[b] Risk factors include small size (< 2.5 kg at birth or born before 37 weeks' gestation), haemolysis and sepsis.

[c] Visible jaundice anywhere on the body on day 1.

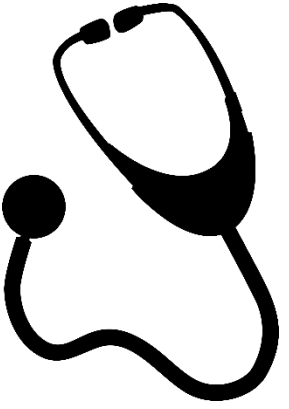
Ballard Score

SIGN	NEUROMUSCULAR MATURITY SCORE						
	-1	0	1	2	3	4	5
Posture							
Square Window	>90°	90°	60°	45°	30°	0°	
Arm Recoil		180°	140°–180°	110°–140°	90°–110°	<90°	
Popliteal Angle	180°	160°	140°	120°	100°	90°	<90°
Scarf Sign							
Heel to Ear							

SIGN	PHYSICAL MATURITY SCORE						
	-1	**0**	**1**	**2**	**3**	**4**	**5**
Skin	Sticky, friable, transparent	gelatinous, red, translucent	smooth pink, visible veins	superficial peeling &/or rash, few veins	cracking, pale areas, rare veins	parchment, deep cracking, no vessels	Leathery, cracked, and wrinkled
Lanugo	none	sparse	abundant	thinning	bald areas	mostly bald	
Plantar Surface	heel-toe 40-50mm: -1 <40mm: -2	>50 mm no crease	faint red marks	anterior transverse crease only	creases ant. 2/3	creases over entire sole	
Breast	imperceptible	barely perceptible	flat areola no bud	stippled areola 1-2mm bud	raised areola 3-4 mm bud	full areola 5-10mm bud	
Eye / Ear	lids fused loosely: -1 tightly: -2	lids open pinna flat stays folded	sl. curved pinna; soft; slow recoil	well-curved pinna; soft but ready recoil	formed & firm instant recoil	thick cartilage ear stiff	
Genitals Male	scrotum flat, smooth	scrotum empty, faint rugae	testes in upper canal, rare rugae	testes descending, few rugae	testes down, good rugae	testes pendulous, deep rugae	
Genitals Female	clitoris prominent & labia flat	prominent clitoris & small minora	prominent clitoris & enlarging minora	majora & minora equally prominent	majora large, minora small	majora cover clitoris & minora	

Total Score	MATURITY RATING												
(Neuromuscular + Physical)	**-10**	**-5**	**0**	**5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**	**45**	**50**
Weeks	**20**	**22**	**24**	**26**	**28**	**30**	**32**	**34**	**36**	**38**	**40**	**42**	**44**

Internal Medicine



Protocols

Adult Heart Failure Algorithm

Common Presenting Complaints

- Paroxysmal Nocturnal Dyspnea (PND)
- Orthopnea
- Dyspnea on Exertion (DOE)
- fatigue and weight gain
- cough
- exercise intolerance
- increasing abdominal girth
- lower extremity edema
- shortness of breath when bending forward ("bendopnea")

Risk Factors

- known history of heart failure, coronary artery disease, myocardial infarction or hypertension
- diabetes mellitus or dyslipidemia
- chronic obstructive pulmonary disease (COPD) or other lung disease
- cardiac valve disease
- pulmonary embolism or pulmonary hypertension
- sleep apnea
- infection
- recent surgery or trauma
- family history heart disease
- significant smoking/alcohol use

- Monitor, support ABCs
- Check vital signs (PR, RR, spO2, Temp, Weight)
- Start Oxygen if spO2 < 94%
- Place large bore IV
- Assess AVPU/GCS, hydration status
- Perform brief, targeted history, physical exam
- 12-lead ECG

Classify based on your physical exam

Congestion

Low Perfusion	Congestion: Yes	Congestion: No
Yes	**Cold & Wet** SBP<90/narrow pulse pressure Cool/pale extremities Decreased UOP Elevated JVP Crackles in lung bases +Peripheral edema Hepatomegaly/ascites	**Cold & Dry** SBP<90/narrow pulse pressure Cool/pale extremities Decreased UOP Normal/low JVP Clear Lungs Minimal peripheral edema
No	**Warm & Wet** SBP > 90 Good peripheral pulse Normal UOP Elevated JVP Crackles in lung bases +Peripheral edema Hepatomegaly/ascites	**Warm & Dry** SBP > 90 Good peripheral pulse Normal UOP Normal JVP Clear Lungs Minimal peripheral edema

Adult Heart Failure Treatment[73]

For all exacerbations:

- Monitor intake/output, consider foley, get daily weights
- Consider electrolytes, BUN, Cr
- ECHO if new Dx, repeat once stable if possible worsening baseline disease

Cold & Wet

I. Dopamine: 3-10 mcg/kg/minute to maintain SBP > 90
II. Furosemide
   a. Start once BP is sustained
   b. 40-80mg IV 2 hrly according to clinical evaluation
III. Digoxin
   a. **ONLY IF PROVEN** supraventricular tachycardia (atrial fibrillation, atrial flutter, etc.)
   b. Loading dose: 0.25-0.5mg IV
   c. Maintenance dose: 0.25mg 6-8 hrly / 24 hours prn

Cold & Dry

I. Dopamine: 3-10 mcg/kg/minute to maintain SBP > 90
II. Digoxin
   a. **ONLY IF PROVEN** supraventricular tachycardia (atrial fibrillation, atrial flutter, etc.)
   b. Loading dose: 0.25-0.5mg IV
   c. Maintenance dose: 0.25mg 6-8 hrly / 24 hours prn

Warm & Wet

I. Furosemide
   a. Initial IV dose should equal or exceed chronic daily PO dose OR 40-80mg IV bolus, double dose if no effect in 30 minutes
   b. Consider 2nd diuretic if no response
   c. Continue 2 hrly as needed
II. Morphine: 5-10 mg PO if distressed, restless or anxious
III. If hypertensive: ACE-inhibitor
IV. Continue home dose of Beta-blocker or ACEI if hemodynamically stable, but do not titrate until exacerbation is resolved

Warm & Dry (Stable, chronic heart failure, Rx should also be started in the hospital after an acute exacerbation is stabilized, prior to discharge)

I. Ace-inhibitor
   a. titrate to highest dose tolerated
   b. periodically monitor Cr and K+
II. Beta-blocker – start low dose, titrate up every two weeks to maximum dosage tolerable
III. Furosemide: for chronic volume overload
IV. Spironolactone
   a. For NYHA class II-IV
   b. Serum Cr < 2.5/2 (men/women)
   c. Potassium < 5

New York Heart Association (NYHA) Classes[96]

I. No limitation of physical activity. Ordinary physical activity does not cause undue fatigue, palpitation, dyspnea (shortness of breath)
II. Slight limitation of physical activity. Comfortable at rest. Ordinary physical activity results in fatigue, palpitation, dyspnea (shortness of breath).
III. Marked limitation of physical activity. Comfortable at rest. Less than ordinary activity causes fatigue, palpitation, or dyspnea.
IV. Unable to carry on any physical activity without discomfort. Symptoms of heart failure at rest. If any physical activity is undertaken, discomfort increases.

TIA/Stroke[27] (check or give glucose prior to initiating stroke evaluation)

Symptoms of TIA/Stroke

- Transient symptoms in TIA
- focal neurologic deficit
- unilateral motor dysfunction of extremities, face (weakness, clumsiness, paralysis)
- vision change: loss of vision in one eye, diplopia
- homonymous hemianopia
- speech disturbances (aphasia, dysarthria)
- unilateral sensory deficit (numbness, sensory loss)
- Vertigo, ataxia of gait, trunk, extremities
- Loss of consciousness, syncope convulsion

Management[27]

1. Monitor, support ABCs
2. Check vital signs (BP, PR, RR, spO2, Temp)
3. Start Oxygen if spO2 < 94%
4. Maintain glucose between 7.7 (140)-10 (180)
5. Obtain labs: CBC, RFT, electrolytes, coagulation studies, urinalysis for proteinuria
6. 12-lead ECG
7. Perform brief, targeted history, physical exam

→ ECG positive for arrhythmia or infarction → Prioritize Cardiac Stabilization (see protocol)

↓

Symptoms Ongoing?

No →

Evaluate and treat mimics:

- Hypo/hyperglycemia
- Convulsion
- (Complicated) Migraine
- Brain lesion (tumor/aneurysm)
- Infection (e.g. meningitis)
- Cardiac Disorders
- Syncope
- Delirium
- Psychiatric disorder
- Acute vestibular syndrome
- Peripheral Nerve Condition

Yes ↓

ROSIER Criteria[193]

Loss of consciousness or syncope	-1
Seizure activity	-1
Asymmetrical facial weakness*	+1
Asymmetrical arm weakness*	+1
Asymmetrical leg weakness*	+1
Speech disturbance	+1
Visual field defect	+1

Total < 1: Look for other causes → Evaluate and treat mimics

Total >= 1 → Stroke Protocol

No mimics found (TIA Rx is same as stroke at this point) → Stroke Protocol

Stroke Protocol

LAPSS Criteria[2]
1. Age > 45yo
2. No hx of seizures d/o
3. New neuro sxs last 24Hr
4. Ambulatory at baseline
5. Glucose >3.4 (60) & < 22.2 (400)
6. Asymmetry is unilateral

Meets **ALL** LAPSS Criteria: Treat for Stroke

Meets **SOME** LAPSS Criteria: Treat for Stroke, but evaluate for other causes

Management[1]
1. Continue to monitor, support ABCs
2. Check vital signs (BP, PR, RR, spO2, Temp)
3. Start Oxygen if spO2 < 94%
4. Maintain glucose between 7.7 (140)-10 (180)
5. Treat hypovolemia with normal saline
6. **Blood Pressure: maintain < 170/105**
   (if no bradycardia) Labetalol 10-20mg IV over 1-2 minutes, may repeat 1 time
   Hydralazine

Continue Supportive Care

Stroke

Perform the NIH Stroke Scale (NIHSS)
And repeat periodically to measure patient's progression

Score	Stroke Severity
0	No Stroke Symptoms
1-4	Minor Stroke
5-15	Moderate Stroke
16-20	Moderate to Severe Stroke
21-42	Severe Stroke

TIA

ABCD3 Score[194–198]

Age	> 60	+1
BP	> 140/90	+1
Clinical Features	Unilateral Weakness	+2
	Speech Impairment, No Weakness	+1
Duration of Sxs	> 60 minutes	+2
	10-59 minutes	+1
Diabetes	Yes	+1
TIA in last 7 days		+2

Score < 4: very low risk of stroke

National Institute of Health Stroke Scale[97]

1a. Level of consciousness (LOC)	0 = Alert; keenly responsive 1 = Not alert, but arousable by minor stimulation 2 = Not alert; requires repeated stimulation 3 = Unresponsive or responds only with reflex
1b. LOC Questions: What is the month? What is your age?	0 = Both answers correct 1 = Answers one question correctly 2 = Answers both questions incorrectly
1c. LOC Commands	0 = Performs both tasks correctly 1 = Performs one task correctly 2 = Performs neither task correctly
2. Best Gaze	0 = Normal 1 = Partial gaze palsy 2 = Forced deviation
3. Visual	0 = No visual loss 1 = Partial hemianopia 2 = Complete hemianopia 3 = Bilateral hemianopia
4.Facial palsy	0 = Normal symmetric movements 1 = Minor paralysis 2 = Partial paralysis 3 = Complete paralysis of one or both sides
5. Motor arm 5a. Left arm 5b. Right arm	0 = No drift 1 = Drift 2 = Some effort against gravity 3 = No effort against gravity; limb falls 4 = No movement
6. Motor leg 6a. Left leg 6b. Right leg	0 = No drift 1 = Drift 2 = Some effort against gravity 3 = No effort against gravity; limb falls 4 = No movement
7.Limb ataxia	0 = Absent 1 = Present in one limb 2 = Present in two limbs
8.Sensory	0 = Normal, no sensory loss 1 = Mild-to-moderate sensory loss 2 = Severe to total sensor loss
9.Best language	0 = No aphasia; normal 1 = Mild 10 moderate aphasia 2 = Severe aphasia 3 = Mute, global aphasia
10. Dysarthria	0 = Normal 1 = Mild 10 moderate dysarthria 2 = Severe dysarthria
11.Extinction and inattention	0 = No abnormality 1 = Visual/tactile/auditory/spatial/personal inattention 2 = Profound hemi-inattention or extinction

Adult Sepsis

Definitions

1. Sepsis (no more Severe Sepsis): Life-threatening Organ Dysfunction Caused by Dysregulated Host Response to Infection
2. Organ Dysfunction: acute change in Sequential Organ Failure Assessment (SOFA) score >= 2 points secondary to infection
3. Septic Shock
   a. sepsis with severe circulatory/cellular/metabolic abnormalities substantially increasing mortality (hospital mortality >=40%)
   b. Clinical definition: persistent hypotension requiring vasopressors to maintain MAP >=65 & serum lactate <= 2mmol/L (18mg/dL) after adequate volume resuscitation

Monitor, support ABCs
Check vital signs
-(BP, PR, RR, spO2, Temp, Wt)
Start Oxygen if spO2 < 94%
12-lead ECG
Brief, targeted history, physical exam

→

qSOFA (Quick SOFA)[199–201]
2 or more of:
1. GCS < 15
2. Respiratory Rate > 22
3. SBP < 100

Yes →

Bolus IVF
Start Antibiotics
Draw labs, including Bood Cx
Treat as sepsis until labs result

No →

Don't treat for Sepsis!

SOFA Score[200]

	0	1	2	3	4
PaO2/ FIO2[a]	≥400	<400	<300	<200 with respiratory support	<100 with respiratory support
Plts[b]	≥150	<150	<100	<50	<20
TBili[c]	<1.2	1.2–1.9	2.0–5.9	6.0–11.9	>12.0
MAP[d]	≥70	<70	Dopamine <5 or dobutamine (any dose)	Dopamine 5.1–15 or epinephrine ≤ 0.1 or norepinephrine ≤ 0.1	Dopamine > 15 or epinephrine >0.1 or norepinephrine >0.1
GCS[e]	15	13–14	10–12	6–9	<6
Cr[f]	<1.2	1.2–1.9	2.0–3.4	3.5–4.9	>5.0
UOP[g]				<500	<200

[a]mmHg, [b]x10^3/µL, [c]mg/dL, [d]mean arterial pressure or pressor requirement to maintain >65, [e]Glasgow Coma Scale, [f]creatinine mg/dL, [g]urine output mL/day

REMINDER: This protocol can be used during hospitalization, not just at admission!

≥2 increase in SOFA score from baseline? (assume a score of 0 if no known preexisting organ dysfunction)

No → **Don't treat for Sepsis!**

Yes → **Treat Sepsis**

Estimate of PaO2 using O2Sat[98]

PaO2	O2sat	PaO2	O2sat	PaO2	O2sat
21	35%	36	69%	51	86%
22	37%	37	71%	52	86%
23	40%	38	72%	53	87%
24	43%	39	74%	54-55	88%
25	45%	40	75%	56-57	89%
26	48%	41	76%	58-59	90%
27	50%	42	77%	60-62	91%
28	53%	43	79%	63-65	92%
29	55%	44	80%	66-68	93%
30	57%	45	81%	69-73	94%
31	60%	46	82%	74-78	95%
32	62%	47	83%	79-85	96%
33	64%	48	83%	86-96	97%
34	65%	49	84%	97-114	98%
35	67%	50	85%	>=115	99%

Estimate of Oxygen Flow Rates

Nasal Cannula	
Oxygen Flow Rate	FiO2 (%)
Room Air	21
1L	24
2L	28
3L	32
4L	36
5L	40
6L	44

Therapeutic management

I. Cardiovascular: monitor HR, BP, UOP, and capillary refill for signs of hypoperfusion
   a. **Initial Bolus: 30mL/kg LR/NS in first 3 hours**[99]
   b. Further Bolus: additional 500mL-1L LR/NS as needed
   c. Vasopressor: begin if MAP < 65 after fluid resuscitation
      i. Dopamine 5mcg/kg/minute, titrate to effect
II. Respiratory: Oxygen as necessary to keep O2sat > 90%
III. Labs to draw
   a. **CBC, malaria, Blood Culture**
   b. Renal Functions, electrolytes
   c. Liver functions, amylase, lipase
   d. PT/INR, PTT
   e. Urine Cultue
IV. Choice of Antibiotics[99,100,109,101–108]
   a. dual therapy ONLY for those in shock
   b. 2nd line or additional antibiotic based on clinical suspicion of source
      i. **1st line: Ceftriaxone 2g IV daily**
      ii. Gram Negatives
         1. Gentamycin IV 5mg/kg/day (also for MRSA)
         2. Meropenem 1g IV 8 hourly (also gram+ but NOT MRSA)
      iii. Gram Positives (including MRSA)
         1. Clindamycin 600mg IV 8 hourly (also anaerobes)
         2. Vancomycin 15mg/kg IV 8 hourly (consult pharmacy)
V. Transfuse: Hgb < 5
VI. Glucose Control: insulin to keep glucose under 12
VII. DVT Prophylaxis: generally recommended
VIII. GI Prophylaxis[110]: only recommended if mechanically ventilated or coagulopathy present, may consider in severely ill with multiple comorbidities, may use H2-blocker or PPI
IX. Nutrition: begin enteral feeding early in the disease course

Adult Convulsions[27]

Active convulsion or Status Epilepticus (> 5 minutes or 2 discrete convulsions with incomplete recovery between)

Hx of convulsions

- Ensure safety.
- Start oxygen.
- Treat both fit and hypoglycaemia:
  - Rectal Diazepam 4 suppositories 2.5mg each
  - IV diazepam 0.15mg/kg slowly over 1 minute (max 10mg)
- Give 50mL 50% Dextrose
- Check ABCs when fit stops.

- Monitor, support ABCs
- Check vital signs (PR, RR, spO2, Temp, Weight)
- Assess AVPU/GCS, hydration status
- Start Oxygen if spO2 < 94%, insert IV if needed
- Perform brief, targeted history, physical exam
- Labs: CBC, malaria, HIV, electrolytes

Still Convulsing or Recurrent Convulsion
- Rectal Diazepam 4 suppositories 2.5mg each
- IV diazepam 0.15mg/kg slowly over 1 minute (max 10mg)

Max 2 doses of Diazepam

Still Convulsing or Recurrent Convulsion
- Phenobarbital/Phenobarbitone
  - Loading dose: 15mg/kg IM/IV (if given IV, give over 20 minutes)
  - Maintenance Therapy: 5mg/kg IV OD

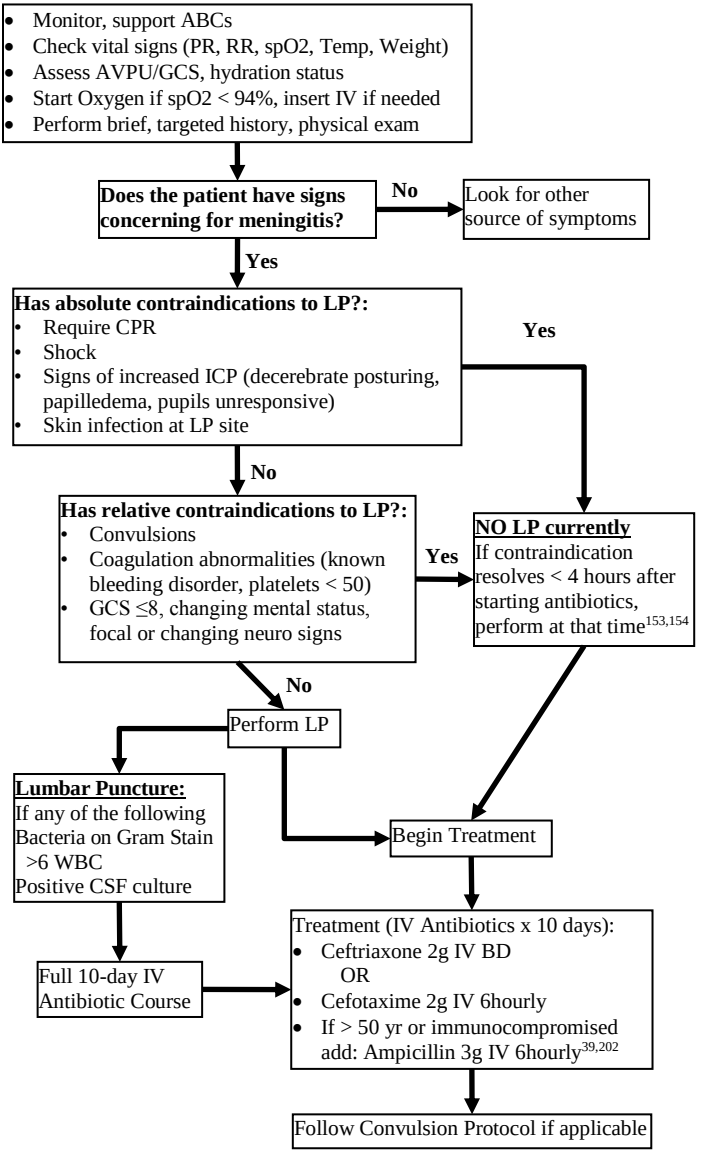
Adult Meningitis[1,111]

1. Symptoms are often nonspecific, if unclear treat for Meningitis **AND** other diagnosis (malaria, TB meningitis, etc.) until definitive tests.
2. There is **NO WAY** to rule in or rule out meningitis without a lumbar puncture

Symptoms that **MAY** be present	Warning Signs/Red Flags (indicate more critical illness)
Fever*+	Rapidly Progressive Rash
Headache*	Poor Peripheral Perfusion: CR > 4 sec, oliguria, SBP < 90
Neck Stiffness or Kernig's/Brudzinski's*+	Respiratory Rate: < 8, > 30
Altered Mental Status – Confusion, Obtundation*+	Pulse: > 140, < 40
*If < 2 of these symptoms, **strongly** consider alternate diagnosis[112,113]	WBC < 4
+ If none of these, should not consider meningitis[114]	GCS < 12
Convulsions	Poor response to initial resuscitation
Photophobia	Focal Neurological Signs
	Cushing's Triad: Late and Ominous Sign (HTN, bradycardia, irregular breathing)

3. If culture reveals meningococcus, must treat close-contacts
   a. Close-contacts:
      i. Household members, roommates, dorm members,
      ii. On same flight/bus > 8 hours
      iii. Exposed to oral secretions (intimate kissing, mouth-to-mouth resuscitation, intubation or ET-tube management)
   b. Rx:
      i. > 15 years old: Ciprofloxacin 500mg PO stat
      ii. < 15 years old: Ceftriaxone 125mg IM stat[115,116]
4. TB see tuberculosis section
5. Steroids no longer recommended[38–41]

Management of Meningitis



Upper GI Bleed

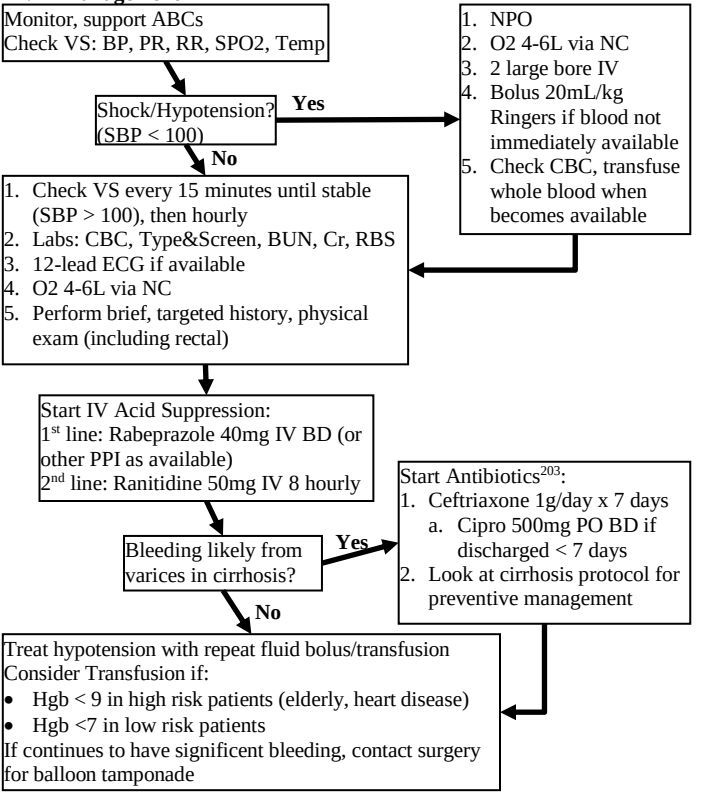
I. Common Presentations[27]

a. Melena: dark, tarry stools, stained with blood. Requires 50mL of blood from UGI.
b. Haemetemesis: bright red blood in vomitus, usually source is above ligament of Treitz.
c. Coffee-ground emesis: vomitus containing dark, altered blood with stomach contents.
d. Haematochezia: bloody faeces.

II. Factors effecting likelihood of UGI bleed[117]

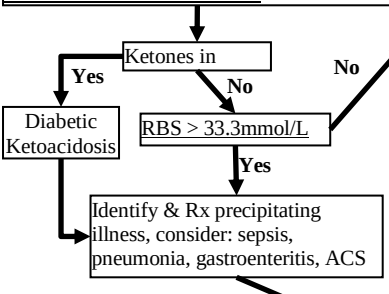
a. More likely: history of melena, melenic stool on exam, coffee grounds on lavage, Urea/Cr > 30
b. Severe bleeding more likely: red blood detected during lavage, tachycardia, Hgb < 8
c. Less likely: blood clots in stool

III. Management



Adult Hyperglycemia, DKA and HHS (RBS > 14mmol/L)[26,27]

Management
Monitor, support ABCs
Check vital signs (BP, PR, RR, spO2, Temp)
Start Oxygen if spO2 < 94%
IV access, draw renal functions, potassium urinalysis
12-lead ECG (adults)
Perform brief, targeted history, physical exam
DO NOT GIVE INSULIN



Uncomplicated Hyperglycemia

Known Diabetic
- Medication compliance?
  - No: restart regimen
  - Yes: change dose
- Keep log of RBS
- Clinic f/u in 5 days

Newly Diagnosed Diabetic
- Start Metformin
- 500mg BD with meals
- Titrate qweek if no GI sxs
- If GI sxs, decrease to previous dose until resolution
- Max dose is 1000mg BD or sometimes 850mg TID

All Patients
- Lifestyle modification advice

Insulin Protocol (start after 1 hr of hydration):
1. Soluble insulin Injection
   a. IM 0.1 IU/kg/hr
   b. SC 0.15 IU/kg every 2 hours
2. Soluble insulin infusion
   a. 0.14 IU/kg/hr

Potassium Protocol:
Add 5mEq KCl/500mL bag

DO NOT give potassium if urine output < 1mL/kg/hr (or K > 5.5)

Monitor Neuro Status for: headache, slowing HR, irritability, incontinence, decreased conscious, focal signs
1. Check/correct hypoglycemia
2. Call senior, transfer ICU
3. Mannitol 0.5-1g/kg

Fluid Protocol:
1. Initial bolus
   a. Hypovolemic Shock: 15-20mL/kg NS or RL bolus, repeat until BP improves
   b. Hypovolemic but no Shock: 15-20mL/kg of NS or RL over 1st hr
   c. **DO NOT** give > 50mL/kg in first 4hrs, can cause cerebral edema
2. IF CORRECTED Na is < 135, continue NS or LR @ 250-500mL/hr
3. IF CORRECTED Na is > 135, continue with ½ NS @ 250-500mL/hr
4. Satisfactory urine output is 1-2 mL/kg/hr

NEVER alternate D10 & NS/RL this can cause brain oedema

When RBS < 14, recheck Urinalysis
1. Ketones still present
   a. Change IVF to 5% Dextrose ½ NS at 150-200mL/hr
   b. Insulin 0.02-0.05 IU/kg/hr infusion (IM/SC maintain regimen)
2. No ketones, switch to SC insulin with meals, sliding scale, or Mixtard BD
   a. Usual dose: 0.5-1 IU/kg/day

Hypertensive Urgency and Emergency[3]

BP > 180/120 → **No** → **BP > 140/90** → **No** → Not hypertensive

BP > 180/120 → **Yes** → **Management**[3]

BP > 140/90 → **Yes** → Hypertensive, go to Hypertension Protocol

Management[3]

19. Monitor, support ABCs
20. Check vital signs (PR, RR, spO2, Temp)
21. Repeat and ***VERIFY*** BP
22. Start Oxygen if spO2 < 94%
23. IV access, 12-lead ECG
24. Labs: RBS, CBC, renal functions, urinalysis for proteinuria
25. Perform brief, targeted history, physical exam

REMEMBER
Headache alone is ***NEVER*** an emergency.

Evidence of end-organ dysfunction[204]

1. Chest Pain/Angina/ACS/Heart Failure
2. Shortness of breath or Pulmonary Edema
3. Stroke/Numbness/weakness/changes in vision/difficulty speaking
4. Encephalopathy
5. Acute Kidney Injury
6. Aortic dissection
7. Eclampsia

Yes → Hypertensive Emergency

No → Hypertensive Urgency

Rx with any of the following[205]:

1. Nicardipine: initial 5mg/H, increase 2.5mg/hr q5min to max of 15mg/H
2. Sodium nitroprusside: 0.3-0.5 mcg/kg/min, increase 0.5 mcg/kg/minute every few minutes to max 10mcg/kg/min
3. Labetalol: 10-20 mg IV, then bolus of 20-80 mg q10min until BP at target or 300mg total dose

→ Must be admitted for management
Goal[206]: 20-25% decrease in BP in 1st hour, then <160/110 in next 2-6 hours

Rx with any of the following;

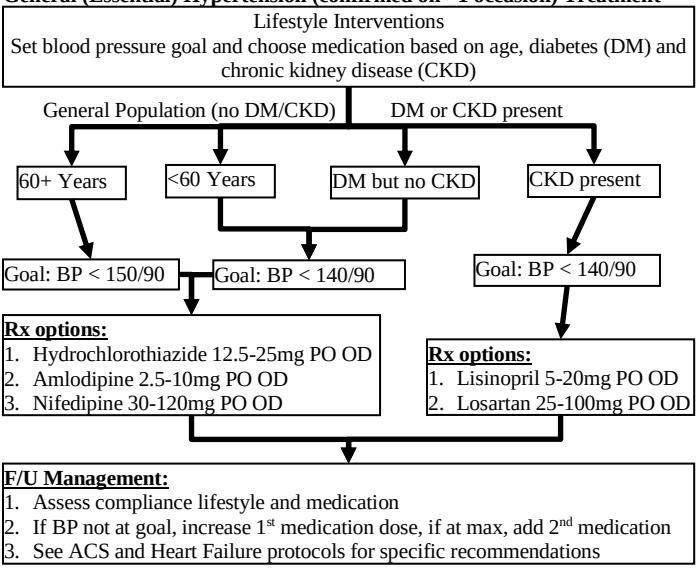
1. Nicardipine 20-40mg PO q8-12H
2. Captopril 25mg PO q8-12H
3. Labetalol 200mg PO, then 200-400mg q6-12H prn

→ No specific goal BP acutely
If still no evidence of end-organ dysfunction at 6 hours, may discharge home with follow-up in a **few days**

Hypertension in Specific Conditions

1. Acute aortic dissection
   a. Goal: SBP < 120 in 5-10 minutes
   b. Recommended Rx is beta-blocker and vasodilator
      i. Esmolol/metoprolol & nicardipine, nitroprusside, fenoldapam
2. Acute stroke – see stroke pathway
3. Hypertensive Encephalopathy
   a. Goal: lower SBP by no more than 20-25% or DBP 100-110 in first hour
   b. Rx options: labetalol, nicardipine (DO NOT USE: nitroprusside)
4. Acute myocardial ischemia (also see Acute Coronary Syndrome protocol)
   a. Goal: SBP < 160, DBP < 100
   b. Rx recommended: Nitroglycerin (unless phosphodiesterase inhibitor use in last 48 hours – sildenafil, tadalafil)
   c. Alternatives: labetalol, esmolol, nicardipine
5. Acute Heart Failure (also see Heart Failure protocol)
   a. Rx recommended: IV or SL nitroglycerine
6. Acute postoperative hypertension
   a. Usually starts <2H after operation, Usually requires Rx < 6 hours
   b. Goal in cardiac surgery patients: BP < 140/90 or MAP < 105
   c. Rx options: esmolol, nicardipine, labetalol, nitroprusside
7. Acute pulmonary edema
8. Acute renal failure – see renal failure algorithm
9. Preeclampsia/eclampsia – consult OBGYN

General (Essential) Hypertension (confirmed on >1 occasion) Treatment[118]



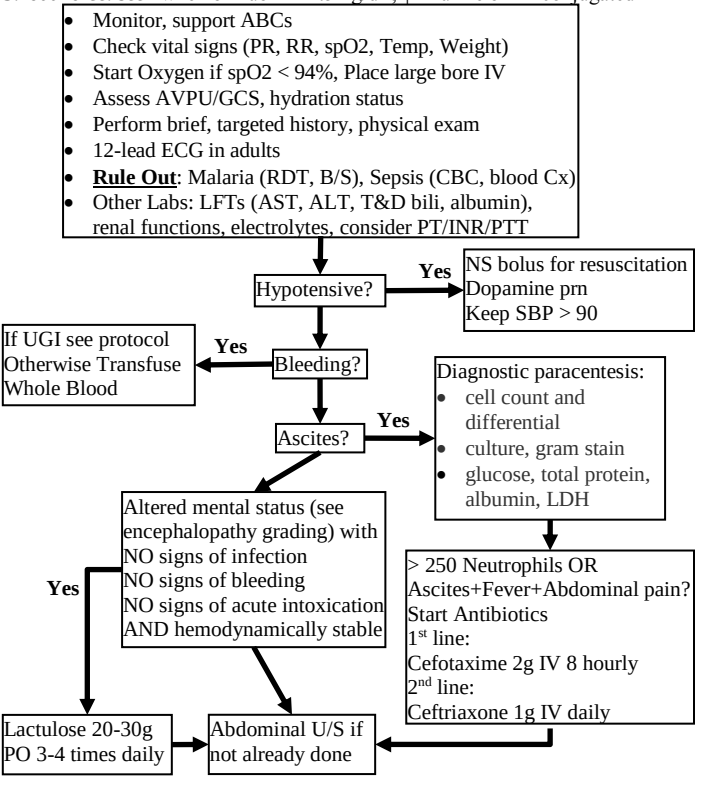
Liver Failure Algorithm[72]

<u>If no known history, suspect liver disease with:</u>

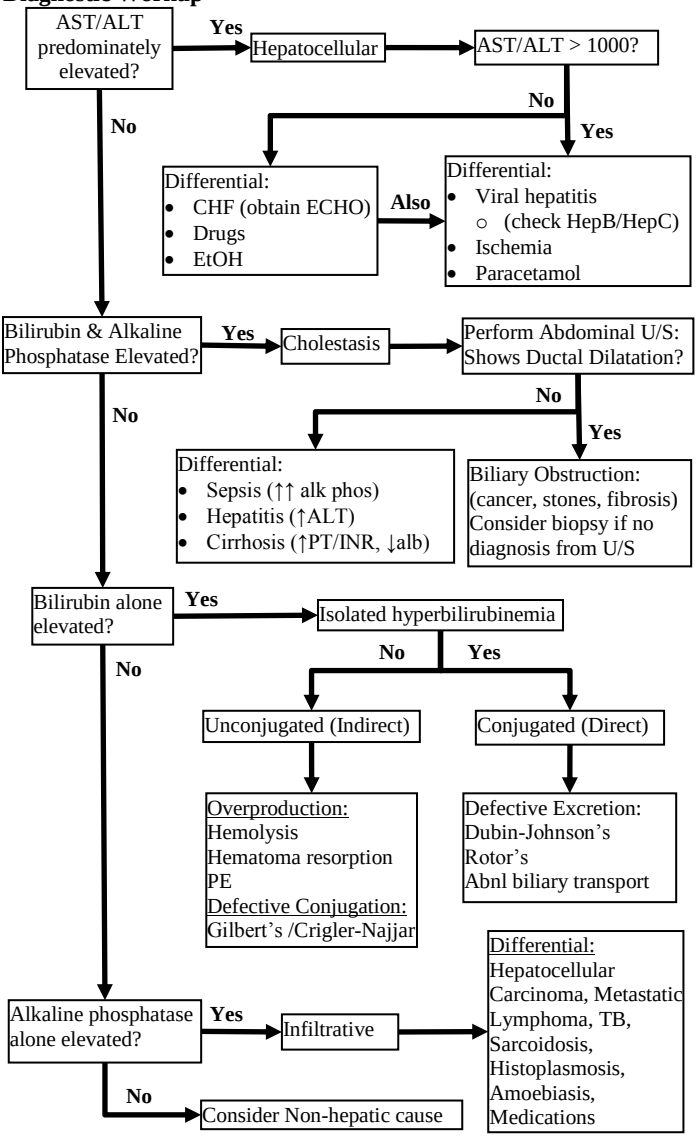
Elevated liver function tests	Jaundice
Peripheral edema/ascites	Cutaneous telangiectasias
Abdominal distension	Spider angiomas
Gastrointestinal bleeding (hematemesis/melena)	Palmar erythema
Abdominal wall collaterals (caput medusa)	Digital clubbing
Encephalopathy (confusion, change in sleep pattern)	Peripheral Neuropathy
Gynecomastia/testicular atrophy	Asterixis

<u>Notes on Lab Results</u>

1. ↓albumin, ↑PT/INR/PTT in liver failure
2. ALT more liver specific than AST
3. ALT > AST: viral hepatitis, fatty liver/nonalcoholic steatohepatitis (pre-cirrhotic)
4. AST > 2 x ALT: alcoholic hepatitis, cirrhosis (non-hepatic source)
5. Jaundice: seen when bilirubin > 2.5mg/dL, ↑ in urine bili if conjugated



Diagnostic Workup[72]



Grading Encephalopathy
Stage I = Altered/depressed mental status, not acting like their usual self
Stage II = Lethargy, Confusion, sleep reversal
Stage III = Stupor, somnolence, combativeness
Stage IV = Coma

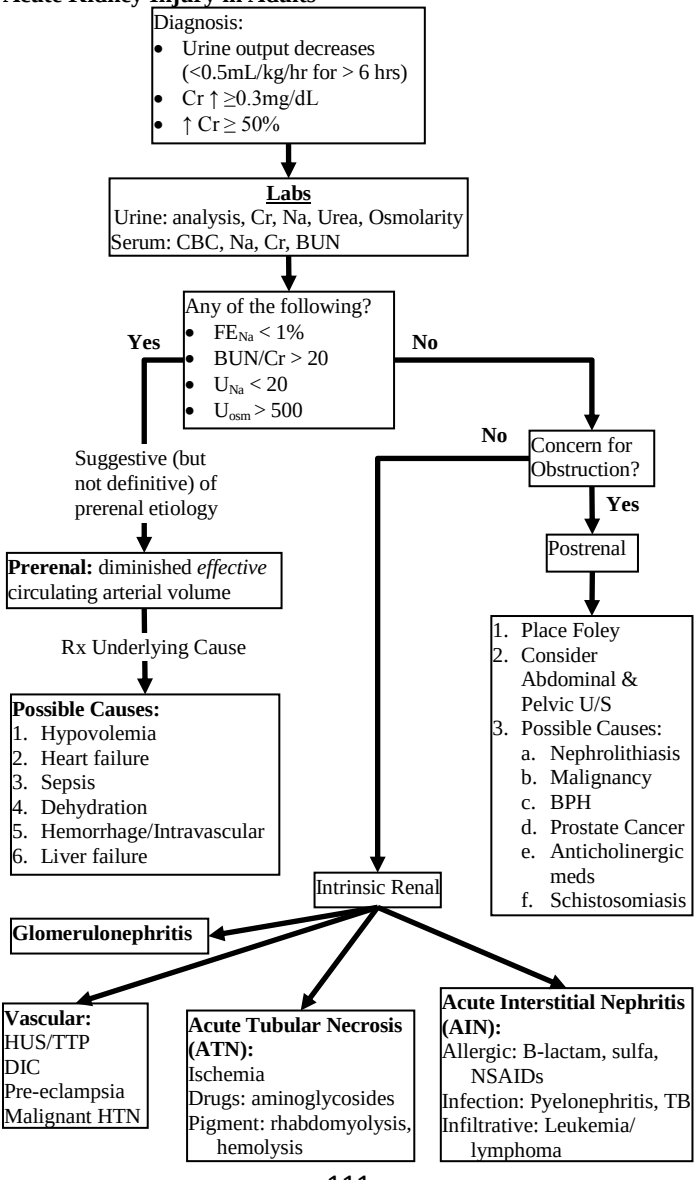
Modified Child-Turcotte-Pugh Score

	Points Scored		
	1	**2**	**3**
Ascites	None	Easily Controlled	Poorly Controlled
Encephalopathy	None	Grade 1 or 2	Grade 3 or 4
Bilirubin (mg/dL)	< 2	2-3	> 3
Albumin (g/dL)	> 3.5	2.8-3.5	< 2.8
PT (sec > control)	< 4	4-6	>6
Or INR	< 1.7	1.8-2.3	>2.3
	Classification		
	A	**B**	**C**
Total points	5-6	7-9	10-15
1-year survival	100%	80%	45%

Chronic Management
1. Vaccinate for Hepatitis A & B if not done already
2. Educate about avoiding EtOH, paracetamol, and other hepatotoxic drugs
3. Variceal Bleeding
   a. Start prophylaxis 1 week after bleeding if hemodynamically stable
   b. Propranolol 20mg PO BD or Carvedilol 3.125mg PO BD
   c. Titrate to 1 of the following criteria[119]
      i. Resting HR 55 beats/minute
      ii. HR reduction 25% from baseline rate
      iii. Development of side effects
4. If all of the following, start Co-trimoxazole 160/800mg PO 5 days/week or Norfloxacin 400mg PO daily[120–122]
   a. Spontaneous bacterial peritonitis
   b. Ascitic fluid protein < 1.5g/dL
   c. Impaired renal function (Cr > 1.2, BUN > 25 or Na < 130)
   d. Child-Turcotte-Pugh Score > 9 & bilirubin > 3
5. Ascites Rx
   a. Education: reduce salt, reduce fluid intake if low Na and hypervolemic
   b. Diuretics (both if blood pressure can tolerate)
      i. Spironolactone 100mg/day (max 400mg/day)
      ii. Furosemide 40mg/day (max 160mg/day)
   c. If refractory, consider therapeutic paracentesis

Children
1. Almost always secondary (almost never intrinsic hepatic disease)
2. If intrinsic disease, hepatitis A most common, but screen for Hepatitis B/C
3. If cholelithiasis/choledocholithiasis, must rule-out sickle cell disease

Acute Kidney Injury in Adults



Severely Agitated or Violent Patient[123]

I. Prevention is always better than treatment when possible

II. Factors making violence more likely
   a. Male gender
   b. A history of violence
   c. Drug or alcohol abuse

III. Signs of impending violence
   a. Provocative behavior
   b. Angry demeanor
   c. Loud, aggressive speech
   d. Tense posturing (eg, clenched fists)
   e. Frequently moving or changing body position, pacing
   f. Aggressive acts (eg, pounding walls, throwing objects, hitting oneself)

IV. 10 elements for verbal de-escalation
   a. Respect personal space (2 arms lengths)
   b. Do not be provocative (remain calm)
   c. Establish verbal contact (first person to contact leads discussion)
   d. Use concise, simple language
   e. Identify feelings & desired ("What are you hoping for")
   f. Listen closely (repeat back to patient to ensure accuracy)
   g. Agree, be clear, agree to disagree if necessary
   h. Set clear limits and boundaries (explain violence/abuse is not tolerated)
   i. Offer choices, stay positive
   j. Debrief the patient and staff

V. DO NOT
   a. Argue
   b. Threaten
   c. Condescend
   d. Command

Management of Severely Agitated or Violent Patient[27]

Ensure Staff Safety

Attempt to Calm Patient Using Verbal Techniques

Call security/police when possible for any concern about violence or patient threatening violence

Indications for restraints

- Imminent harm to others
- Imminent harm to self
- Disruption of important treatment
- Damage to surround equipment/environment
- Unsuccessful verbal approach

- Monitor, support ABCs
- Establich IV/O2 monitor if possible
- Check vital signs (BP, PR, RR, spO2, Temp, Weight)
- Check blood glucose

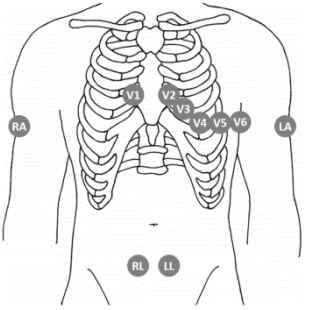
Attempt to Calm Patient Using Verbal Techniques

Rapid sedation required
And/or
Not responding to Verbal Techniques

Severely violent patient	**Drug intoxication/withdrawal or undifferentiated**	**Known psychiatric disorder**
Haloperidol 2.5-5mg IV/IM	Midazolam 2.5mg-5mg IV/IM	Haloperidol 2.5-5mg IV/IM
AND/OR	AND (if necessary)	AND/OR
Midazolam 2.5mg-5mg IV/IM	Haloperidol 2.5-5mg IV/IM	Midazolam 2.5mg-5mg IV/IM

Electrocardiography (ECG)[124]

Placement



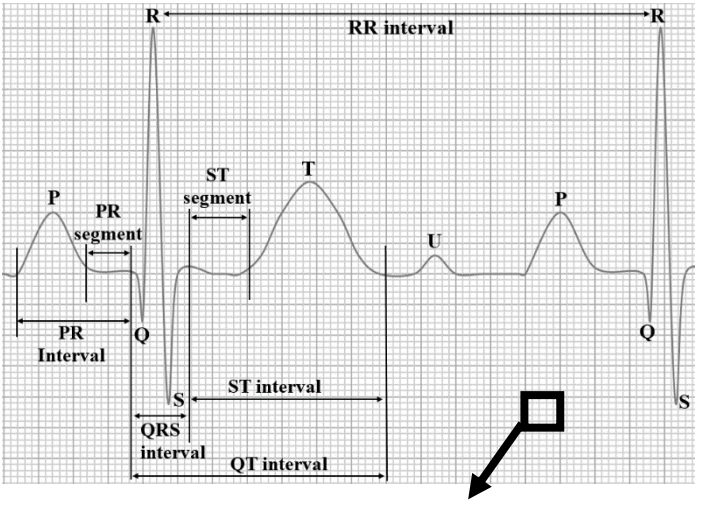
- LA/RA: Placed mid-arm, lateral bicep, immediately below V4 horizontal line
- LL/RL: Limb (abdominal) leads, placed 7.5cm below umbilicus, 5cm on either side of the umbilical vertical line.
- V1: 4th ICS, just right of sternum
- V2: 4th ICS, just left of sternum
- V3: midway between V2 & V4
- V4: midclavicular line, 5th ICS
- V5: anterior axillary line, lateral V4
- V6: midaxillary line, lateral V4 & V5

Properly mounted?

- R waves in lead II should be sum of R waves in lead I and lead III
- Sum of waves in aVR, aVL & aVF should equal zero

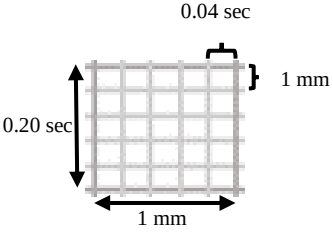
Basic Parts of ECG

- P wave - atrial depolarization (activation)
- QRS complex - ventricular depolarization (activation)
- ST segment, T wave, and U wave -ventricular repolarization (recovery)

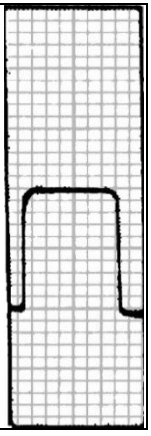


1 large box

1 Large Box = 5mm = 0.20 seconds
1 small box = 1mm = 0.04 seconds
5 small boxes = 1 large box

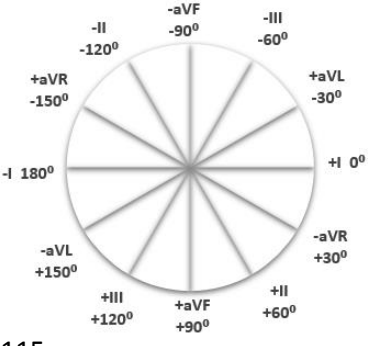


Proper calibration, 10mm tall, represents 1-mV (10 small boxes, 2 large boxes). This is ensured with a standardization mark at the beginning of the ECG, as on the right.



Approach (*a systematic approach is vital*)

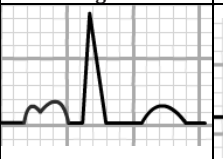
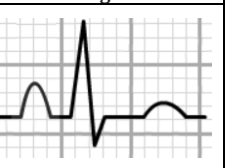
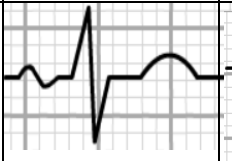
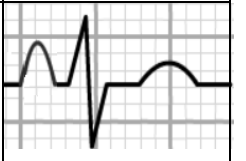
1. Rate (? tachy, brady): 300 ÷ R-R interval (# large boxes) = beats per minute
2. Rhythm (? relationship between P and QRS): sinus is P before every QRS, QRS after every P, and P up in II and down in aVR
3. Intervals
   - PR 0.12-0.2 sec (3-5 small boxes)
   - QRS < 0.1-0.11 sec (3 small boxes)
   - QT/QTc (QTc = 0.33-0.44/0.45 sec)
   - Easily Confused Points
     - RR interval is really the QRS-QRS interval
     - PR interval is really start of P to start of QRS
     - QT interval is really onset of QRS to end of T
     - Not every QRS has all 3
4. Mean QRS Axis (? LAD or RAD)
   - Midway between two extremity leads with tall R waves of equal height
   - Points at 90° (right angle) to any extremity lead with biphasic QRS complex (Q=R or R=S)
   - Normal between -30° and 100°
   - If QRS positive in I & II, axis is normal
   - If QRS positive in I & negative in II, LAD is present
   - If QRS positive in II & negative in I, RAD is present



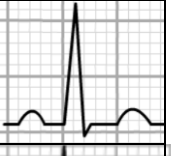
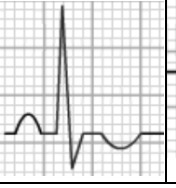
5. Atrial/Ventricular enlargement (all findings suggestive but not diagnostic)

- Right atrial enlargement (RAA)
  - P wave > 2.5mm in II, III, or aVF but < 0.12 sec
  - Usually with R. ventricular enlargement
  - Often with pulmonary disease or congenital heart disease

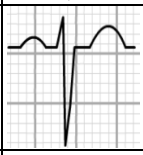
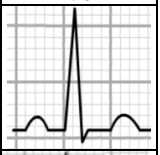
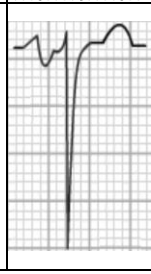
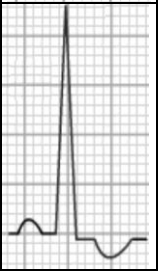
- Left atrial enlargement (LAA)
  - P wave > 0.12 sec
  - P wave with double humped or notched appearance in extremity leads
  - P wave biphasic in V1 – negative deflection > 0.04 sec or >1 mm
  - If particularly notable, indicates increased risk for afib

	Normal[a]	**Left Atrial Enlargement[b]**	**Right Atrial Enlargement[c]**
II			
V1			

- Right ventricular hypertrophy (RVH)
  - Tall R wave in V1
  - R wave > S wave in V1
  - Right axis deviation
  - T-wave inversions in V1-V3
  - Often in congenital heart disease
  - RAA is often present

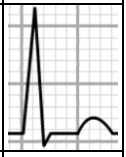
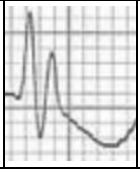
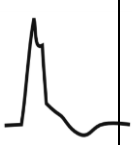
	V1	V6
normal[a]		
RVH[d]		

- Left ventricular hypertrophy (LVH)
  - Deep S waves in right chest leads
  - Tall, positive R waves in left chest leads
  - S wave height in V1 plus R wave height in either V5 or V6 > 35mm
  - Cornell Voltage Criteria: S wave height in V3 + R wave Height in aVL, men > 28mm, women > 20mm
  - R wave in aVL > 12mm
  - LAA is often present
  - 2 most common causes: Hypertension and aortic stenosis

	V1	V6
normal[a]		
LVH[e]		

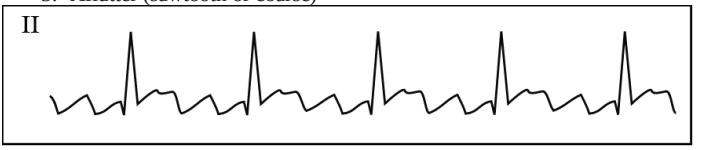
6. Conduction Abnormalities
   - Right Bundle Branch Block (RBBB)
     - rSR' pattern in V1 (small initial r wave, followed by a normal size S wave, and then another large positive deflection)
     - Complete RBB: QRS > 0.12 seconds with above pattern
     - Incomplete RBB: QRS 0.10-0.12 seconds with above pattern

   - Left Bundle Branch Block (LBBB)
     - Loss of initial r wave in V1 & q wave in V6
     - QS pattern in V1 (just downward deflecting, may be notched)
     - R pattern in V6 (just upward deflecting, may be notched)
     - Complete LBBB: QRS 0.10-0.12 seconds with above pattern
     - Incomplete LBBB: QRS 0.10-0.12 seconds with above pattern

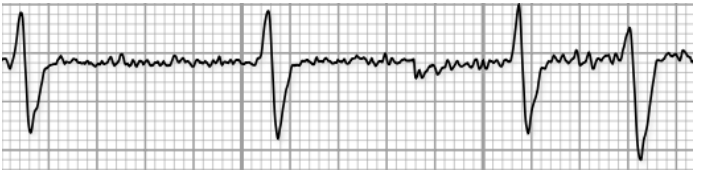
	V1	V6
normal[a]		
RBBB[f]		
LBBB[g]		

7. EKG findings in Supraventricular Arrhythmias

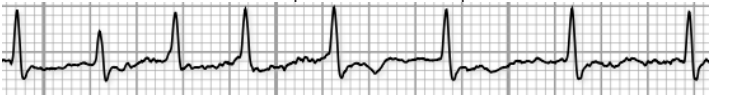
- <u>Atrial flutter</u>
  1. Typically ~300 cycles/minute, ventricular rate 150/min
  2. Classic F waves negative in II, III, aVF, positive in V1
  3. Aflutter (sawtooth or coarse)[h]



- <u>Atrial Fibrillation</u>
  1. Atrial wave irregular
  2. Pattern irregularly irregular
  3. Atrial Fibrillation



4. Atrial Fibrillation with Rapid Ventricular Response



[i]

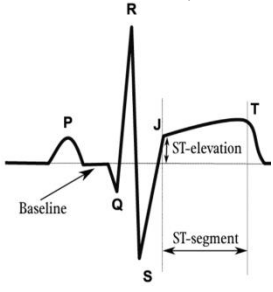
8. EKG findings of Ischemia

I. Usually the result of blockage of one of the 3 main arteries
- Right coronary artery (RCA) supplies inferior wall
- Left anterior descending (LAD) supplies anterior
- Left Circumflex (LCx) supplies lateral
- Note: Left main supplies both anterior and lateral

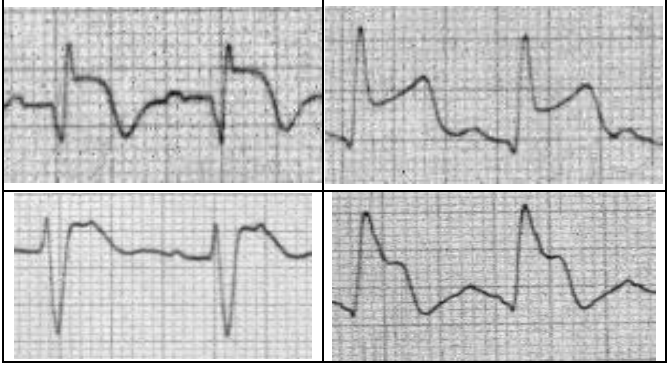
ii. Localization is sometimes possible via the EKG

Anatomic Area	ECG leads	Coronary Artery
Septal	V1-V2	Proximal LAD
Anterior	V3-V4	LAD
Apical	V5-V6	Distal LAD, LCx or RCA
Lateral	I, aVL	LCx
Inferior	II, III, aVF	RCA (85%), LCx (15%)
RV	V1-V2 & V4R	Proximal RCA
Posterior	ST *depression* V1-V2	RCA or LCx

iii. ST-Elevation Myocardial Infarction (ST-Elevation MI or STEMI)[j]
- Transmural ischemia – entire thickness
- ST segment elevation at J point in 2 contiguous leads
  a. Leads V2-V3
     - 2mm elevation in men ≥ 40 years old
     - 2.5mm elevation in men < 40 years old
     - 1.5mm elevation in women
  b. 1mm elevation in all other leads
  c.



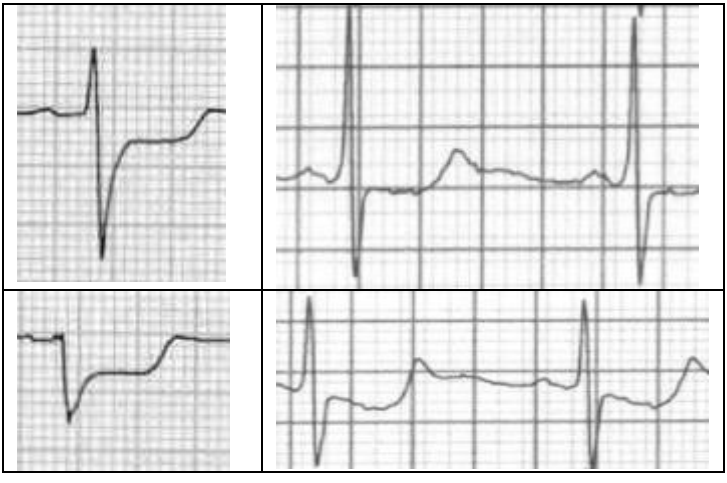
- Examples of ST segment elevation[k,l,m,n]



- Examples of ST segment elevation with Left Bundle Branch Block[o,p]

iv. Non-STEMI (NSTEMI)
- Subendocardial ischemia
- Abnormal ST segment
  a. Present in 2 contiguous leads
  b. Horizontal or downward ST depression
  c. 1 mm or more
  d. Lasting at least 0.08 seconds
- NOTE: ST depressions < 1mm (or only J point) with a rapid rise of ST segment are considered normal

- Examples of ST segment depression[q,r,s,t]



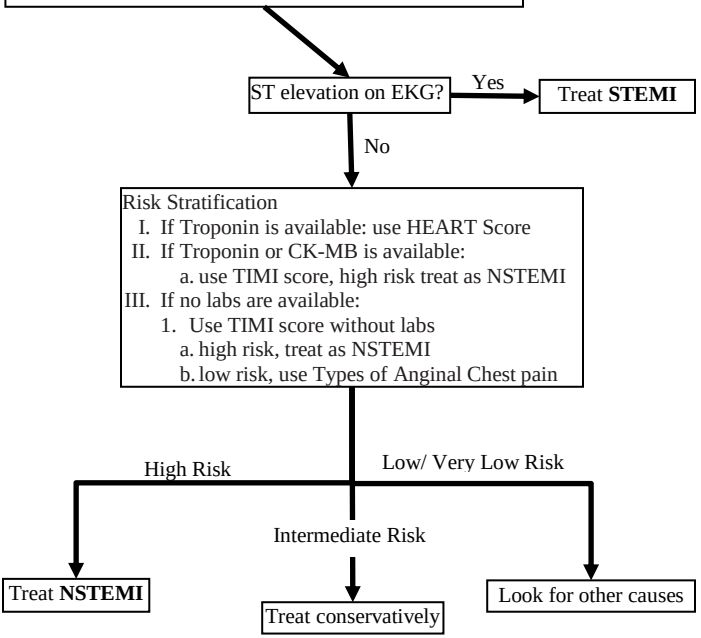
Chest Pain

I. Wide differential should be considered

I. Most dangerous usually: acute coronary syndrome, aortic dissection, pulmonary embolism, tension pneumothorax, pericardial tamponade, mediastinitis (from things like esophageal rupture)

II. Management – chest discomfort suggestive of ischemia

- Monitor, support ABCs
- Obtain/Review EKG
- Check vital signs (PR, RR, spO2, Temp, Weight)
- Assess AVPU/GCS, hydration status
- Start Oxygen if spO2 < 94%, insert IV if needed
- Perform brief, targeted history, physical exam
- Aspirin 300/325mg PO x 1 dose
- Nitroglycerin sublingual spray or tablet 0.4mg every 5 minutes x 3 doses maximum, until symptoms resolved
- IV morphine/fentanyl if available for pain control



A. HEART Score[125–131] (≤ 3 – Low Risk, 4-6 Intermediate Risk, ≥ 7 High Risk)

Characteristic		Points
History	Highly suspicious	2
	Moderately suspicious	1
ECG	Significant ST depression	2
	Nonspecific repolarization abnormality	1
Age	65 or older	2
	45-65	1
Risk Factors	diabetes, > 90 days smoker, hyperlipidemia, hypertension, FHx of CAD, BMI > 30, history of atherosclerotic disease	
	3 or more	2
	1-2	1
Troponin	> 3 times normal limit	2
	1-3 times normal limit	1

B. TIMI Risk Score (TRS) for NSTEMI (≥ 3 High Risk)

Characteristic	**Point**
Historical	
Age ≥ 65	1
≥ 3 Risk factors for CAD (Hypertension, hypercholesterolemia, diabetes, family history of CAD, current smoker)	1
Known CAD (stenosis ≥ 50%)	1
Aspirin use in the last 7 days	1
Presentation	
Severe angina (≥ 2 episodes in last 24 hours)	1
ST deviation ≥ 0.5mm	1
+ cardiac biomarkers (troponin, CK-MB)	1

C. Types of Anginal Chest Pain

Substernal chest pain or discomfort Provoked by exertion/exercise/emotional stress Relieved by rest and/or nitroglycerin	• Typical Angina has all 3 components • Atypical Angina has 2 of 3 • Non-anginal chest pain has < 2 components

Likelihood of Coronary Artery Disease

Age	**Gender**	**Typical Angina**	**Atypical Angina**	**Non-Anginal Chest Pain**
30-39	Men	*Intermediate*	*Intermediate*	Low
	Women	*Intermediate*	Very Low	Very Low
40-49	Men	**High**	*Intermediate*	*Intermediate*
	Women	*Intermediate*	Low	Very Low
50-59	Men	**High**	*Intermediate*	*Intermediate*
	Women	*Intermediate*	*Intermediate*	*Low*
60-69	Men	**High**	*Intermediate*	*Intermediate*
	Women	**High**	*Intermediate*	*Intermediate*

Treatment of Acute Coronary Syndromes/Myocardial Infarctions

I. STEMI[132]:
   1. Anti-platelet:
      a. Aspirin 325mg PO x 1 dose if not already given
      b. Clopidogrel 300mg PO x 1 dose
   2. Nitroglycerin sublingual spray or tablet (if not already given)
      a. 0.4mg every 5 minutes x 3 doses maximum, until symptoms resolved
   3. Anticoagulant:
      a. Unfractionated Heparin
         i. 60 units/kg IV bolus, maximum 4,000 units
         ii. 12 units/kg/hr IV infusion, maximum 1,000 units/hr
      b. Enoxaparin
         i. 30mg IV bolus followed 15 minutes later by
         ii. 1mg/kg subcutaneously q12hrs (maximum 100mg/dose for first 2 doses)
         iii. Should not be given if creatinine clearance < 30
   4. Thrombolytics
      a. Ideally within first 24 hours of chest pain
      b. Patient should be connected to defibrillator if possible
      c. Contraindications

Absolute Contraindications	Relative Contraindications
• History of intracranial hemorrhage • Known structural cerebrovascular lesion (such as arteriovenous malformation) • Known intracranial malignant neoplasm • Ischaemic stroke within 3 months (EXCEPT ischaemic stroke within 3 hours) • Suspected aortic dissection • Active bleeding • Significant head/facial trauma within 3 months • Intracranial/intraspinal surgery within 2 months	• History of chronic, severe, poorly controlled hypertension • Uncontrolled hypertension (>180/110) • Ischemic stroke > 3 months • Dementia • Known intracranial pathology that is not an absolute contraindication • CPR > 10min or traumatic • Major surgery within 3 weeks • Pregnancy • Active peptic ulcer • Oral anticoagulant therapy

      d. Dosages[27]
         i. Tenecteplase, mix 50mg vial in 10mL sterile water (5mg/mL), administered as an IV bolus over 5 seconds
            - < 60kg: 30mg (6mL)
            - 60-69kg: 35mg (7mL)
            - 70-79kg: 40mg (8mL)
            - 80-89kg: 45mg (9mL)
            - ≥90kg: 50mg (10mL)
         ii. Streptokinase
            - 1.5 million units in 50mL of D5W IV given over 60 minutes
      e. Monitor vital signs every 15 minutes during infusions
      f. Monitor patient for 30 minutes after infusion
   5. Transfer patient to ICU whether or not they have received infusion

II. NSTEMI
   1. Recheck EKG in 6 hours
   2. Anti-platelet:
      a. Aspirin 325mg PO x 1 dose if not already given
      b. Clopidogrel 300mg PO x 1 dose
   3. Nitroglycerin sublingual spray or tablet (if not already given)
      a. 0.4mg every 5 minutes x 3 doses maximum, until symptoms resolved
   4. Anticoagulant:
      a. Unfractionated Heparin
         i. 60 units/kg IV bolus, maximum 4,000 units
         ii. 12 units/kg/hr IV infusion, maximum 1,000 units/hr
      b. Enoxaparin
         i. 30mg IV bolus followed 15 minutes later by
         ii. 1mg/kg subcutaneously q12hrs (maximum 100mg/dose for first 2 doses)
         iii. Should not be given if creatinine clearance < 30
   5. Oral Beta Blocker within first 24 hours
      a. Preferred Metoprolol Succinate or Carvedilol
      b. Metoprolol Succinate (Metoprolol ER) 25mg PO daily
      c. Carvedilol 6.25mg PO BD
      d. Metoprolol Tartrate 25mg PO BD
      e. Labetalol 100mg PO BD
      f. Atenolol 50mg PO daily
   6. Oral ACE inhibitor with first 24 hours
      a. Captopril 12.5mg PO BD
      b. Lisinopril 5mg PO daily
      c. May use ARB if no ACE inhibitors available
         i. Losartan 50mg PO daily

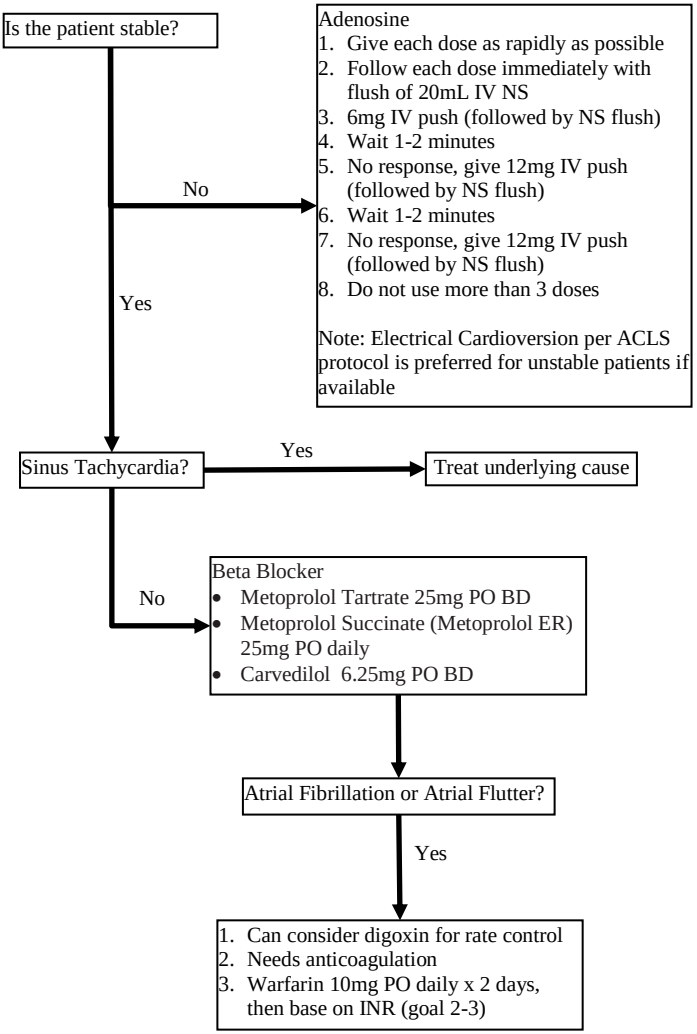
III. Intermediate risk category
   1. Anti-platelet:
      a. Aspirin 325mg PO x 1 dose if not already given
   2. Nitroglycerin sublingual spray or tablet (if not already given)
      a. 0.4mg every 5 minutes x 3 doses maximum, until symptoms resolved
   3. Prophylactic anticoagulant
      a. Heparin 5,000 units subcutaneously q12hrs[133]
      b. Enoxaparin 40mg subcutaneously daily

IV. Low/Very low risk categories: Look for other causes

Supraventricular Tachycardias (SVT)

1. Tachycardias arising above the AV node
2. Narrow QRS indicates SVT

3. Evaluation of SVT



Adult Common Clinical Complaints

1) Syncope
   a) Good and complete history and physical
      i) Include circumstances: changes in medication, dehydration, defecation, urination, coughing, pain, heat exposure, standing outside for long periods of time, head rotation, pressure on carotid sinus (such as shaving), exercise, shortness of breath
   b) Check RBS, CBC, Pregnancy Test
   c) Consider convulsions (but remember shaking alone does not mean convulsion, non-convulsive shaking common after syncope)
   d) 12-lead ECG, ECHO if concerning murmur or if syncope occurred during exercise or associated with chest pain
   e) Electrolytes **ONLY** in patients with high likelihood of abnormalities
   f) If above are all WNL, including VS, may be safely discharged home

2) Epigastric Pain
   a) Good and complete history and physical
      i) VS and SPO_2
      ii) Consider: ACS, pancreatitis, DKA, cholecystitis, Ulcer, Pre-eclampsia/Eclampsia, HELLP, ectopic pregnancy
      iii) Tests to consider: 12-lead ECG, CXR
      iv) Labs to consider: CBC, RFTs, amylase/lipase, LFTs, glucose, pregnancy test
      v) Signs requiring immediate surgical consult: unstable VS or signs of peritonitis (severe abdominal pain on palpation or rebound tenderness)
      vi) Indications for Oesophagogastroduodenoscopy: >55yo, bleeding/bloody stools/bloody vomitus/anemia, early satiety, unexplained/unintended weight loss (>10% body weight), progressive dysphagia, odynophagia, persistent n/v, PMHx or FHx of gastrointestinal cancer, previous ulcer, abdominal mass
      vii) Helicobacter Pylori:
         (1) ≤ 55yo, test for H. Pylori if possible, treat if positive
         (2) >55yo, consider OGD, if negative, test for H. pylori, Rx if positive

3) Headache
   a) Good and complete history and physical
   b) Danger signs ("red flags") for spacy-occupying or vascular lesion, infection, metabolic disturbance, systemic condition[134,135]
      i) Systemic symptoms or condition (e.g. fever, ↓wt, pregnancy, HIV)
      ii) Neuro sxs (e.g. confusion, decreased consciousness, focal signs, vision changes, meningismus, convulsions, papilledema)
      iii) New onset (especially if > 40yo) or sudden ("thunderclap")
      iv) H/O head trauma, illicit drug use, toxic exposure
      v) HA awakens from sleep, worse with Valsalva, cough, exertion or sexual activity, or worse in a specific position
      vi) H/O HA with change in features: frequency, severity, associated features

Adult COPD and Asthma

VI. History

a. CC: almost always shortness of breath
b. COPD: often chronic and progressive symptoms
    a. Cough, wheezing
    b. Sputum production (3 or more months in the last 2 yrs)
    c. Dyspnea on exertion, usually worse w/ upper body activity, lower body activity better tolerated
    d. Smoking History
c. Asthma: may also have cough, chest tightness, wheezing

VII. Physical Exam/Study Findings

a. Prolonged expiratory phase
b. Expiratory Wheezing
c. Use of accessory respiratory muscles
d. Hypoxia
e. NOT finger clubbing (if present, other dx needs to be considered)
f. CXR: hyperinflation, flat diaphragm

Management

- Monitor, support ABCs
- Check VS (PR, RR, spO2, Temp, Weight)
- Assess AVPU/GCS
- Assess hydration status, IV if needed
- Perform brief, targeted history, physical exam

IMPORTANT NOTE ON OXYGEN!

If patient has known or suspected COPD, aim for spO2 of 90-92% not higher

Evaluate for other causes of SOB

1. Heart Failure
2. Pneumonia
3. Pulmonary TB

Albuterol/Ipratropium q20min x 3 doses
Nebulizer (5mg/0.5mg) / MDI 8 puffs

-Caution using albuterol with cardiac disease
-Evaluate after first Rx and after first 3 Rx, if symptoms dramatically improve, more likely to be asthma

Prednisolone 40mg/d x 5 days

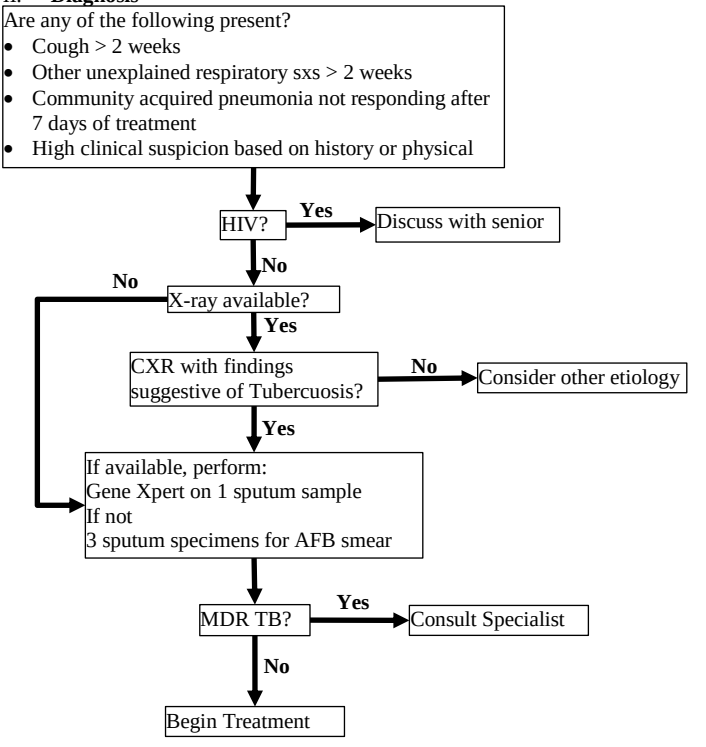
More sputum, change in color to yellow/green, or increased breathlessness, fever, tachypnea? Suspect COPD and Rx:
-Amoxicillin/Clavulanate: 875mg BD x 5 days
-Doxycycline 100mg BD x 10 days
-Azithromycin 500mg once daily x 3 days

Adult Tuberculosis

I. **Consider Tuberculosis with the following**

a. Chronic cough (> 2-3 weeks)
b. Chronic fever (>2-3 weeks)
c. Pneumonia not improving on treatment
d. Wasting
e. Lymphadenopathy (large, painless)
f. Ascites
g. Heart failure/pericardial effusion
h. Refusal to bend a painful joint
i. Irritability, meningeal signs
j. Haematuria, sterile pyuria
k. Close contact with someone with TB in last 2 years

II. **Diagnosis**[136,137]



Treatment for Adult Tuberculosis[207,208]

Check LFTs*

ALT > 3 x upper limit of normal? **Yes** → Consult senior about possible alternate regimen

No

Abnl LFTs but ALT< 3 x upper limit of normal? **Yes** → Recheck LFTs qmonth*

No

First 2 months treatment

Drug	Recommended Daily dose	Pre-treatment body Wt	Fixed Dose Combination RHZE (150,75,400,275)
Rifampicin (R)	10mg/kg	38-54kg	2 tabs
Isoniazid (H)	5mg/kg	30-37kg	3 tabs
Pyrazinamide (Z)	25mg/kg	55-70kg	4 tabs
Ethambutol (E)	15mg/kg	>70kg	5 tabs
Note: Pyridoxine 25mg PO QD should be given for duration of treatment			

Are any of the following present?
- TB meningitis
- Pulmonary TB with respiratory distress
- Pulmonary TB w/ airway obstruction from hilar lymph nodes
- Severe military TB
- Pericardial effusion

Yes → Add Prednisone[209]
- 60mg/day x 2 weeks
- Reduce by 10mg/day weekly

No

Further (continuation) treatment after 2 months:
- Cerebral TB requires 10 more months
- Pulmonary TB requires 6 more months
- Sputum smear
  - If positive retest at 3 months
    - If positive at 3 months, retest susceptibilities

Continuation Treatment

Drug	Recommended Daily dose	Pre-treatment body Wt	Fixed Dose Combination RHZE (150,75)	(300,150)
Rifampicin (R)	10mg/kg	38-54kg	2 tabs	
Isoniazid (H)	5mg/kg	30-37kg	3 tabs	
		55-70kg		2 tabs
		>70kg		2 tabs

*If liver tenderness, hepatomegaly or jaundice recheck LFTs. Do not change regimen unless LFTs > 5 x upper limit of normal

Deep Vein Thrombosis (DVT)

I. **Common Presenting Complaints**
   a. Leg swelling, pain, unilateral leg tenderness
   b. Iliofemoral thrombosis may present with
      i. Pain in buttocks/groin, swelling in thigh, collateral superficial veins

II. **Risk Factors**[138,139]
   a. Prolonged bed rest, immobilization, air or bus travel
   b. Age > 40 years
   c. Obesity
   d. HIV or Tuberculosis

Well Prediction Score[210]

Finding	Points
Previous DVT/PE	1
Paralysis/immobilization of lower extremity	1
Bedridden >3 days or major surgery within 4 weeks	1
Local tenderness	1
Swelling of entire leg	1
Calf difference ≥ 3cm	1
Pitting edema ONLY in symptomatic leg	1
Collateral superficial veins	1
Alternative diagnosis more likely than DVT	-2

I. Score ≤ 0: Low Risk
II. Score 1-2: Intermediate Risk
III. Score ≥ 3: High Risk

III. **Management Recommendations**
   a. Low Risk: can rule out with doppler ultrasound of lower extremities or D-dimer if concerned, otherwise no treatment
   b. Moderate Risk
      i. Doppler ultrasound of lower extremities or D-dimer to rule out
      ii. Wait until results to begin treatment
   c. High Risk
      i. Begin treatment
      ii. Order Doppler ultrasound of lower extremities for confirmation

IV. **Treatment Options for DVT or PE**
   a. Acute
      i. Enoxaparin 1mg/kg subcutaneously q12hrs
      ii. Unfractionated Heparin IV 80 units/kg (5000 units max), then 18 units/kg/hr (1000 units max)

V. Chronic: Warfarin 10mg PO daily x 2 days, then base on INR (goal 2-3)

Pulmonary Embolism (PE)[140]

I. Common Presenting Complaints (usually with rapid onset)

a. Dyspnea
b. Tachypnea
c. Pleuritic chest pain
d. Cough
e. Fever
f. Tachycardia

II. Risk Factors

a. Same as DVT

ALSO

b. Medications: hormonal contraceptives, hormonal replacement therapy, antipsychotics, fibrates

Pulmonary Embolism Rule-Out (PERC)[212]

Does the patient meet all of these?

1. Age < 50 years
2. Pulse < 100
3. SpO2 > 94%
4. No unilateral leg swelling
5. No hemoptysis
6. No surgery or trauma within 4 weeks
7. No previous DVT/PE
8. No oral hormone use

Yes → Do not treat for Pulmonary Embolism

No → Evaluate for DVT

Positive for DVT → Treat for DVT/PE

Well Clinical Decision Rule[211]

Finding	Points
Previous DVT/PE	1.5
Immobilization > 3 days or surgery in previous 4 weeks	1.5
Malignancy in last 6 months	1
Leg swelling/pain with palpation of deep veins (clinical signs of DVT)	3
Hemoptysis	1
Pulmonary Embolism most likely diagnosis	3
Heart rate > 100	1.5

→

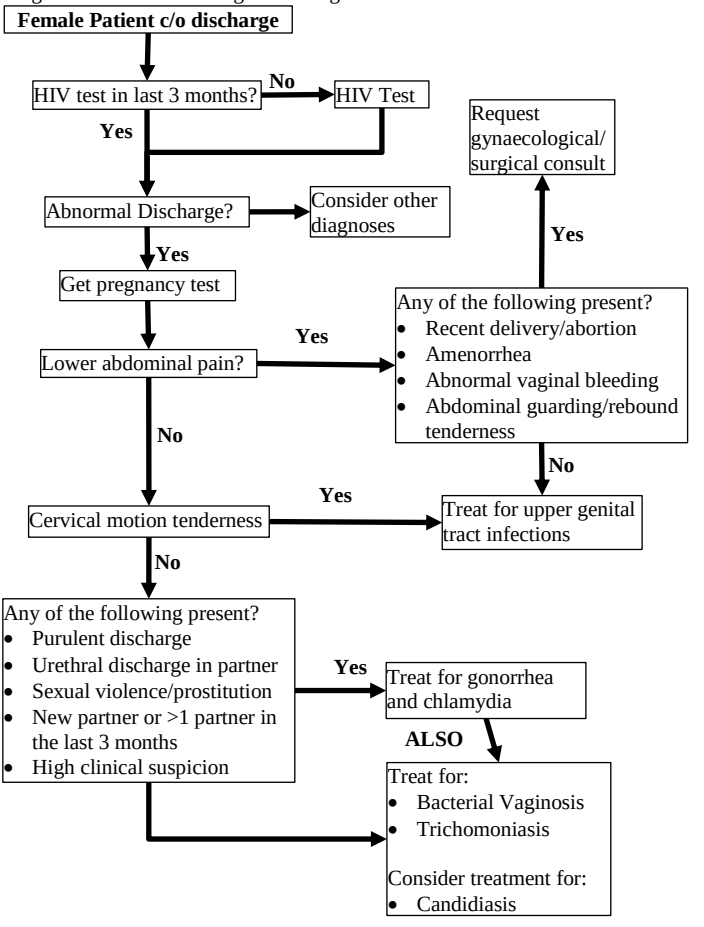
I. Score 2: Low Risk
II. Score 2-6: Intermediate Risk
III. Score>6: High Risk

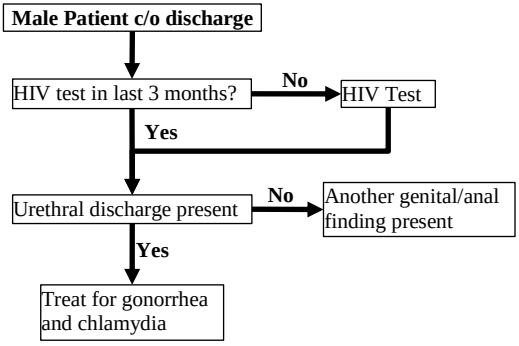
III. Treatment Based on Risk

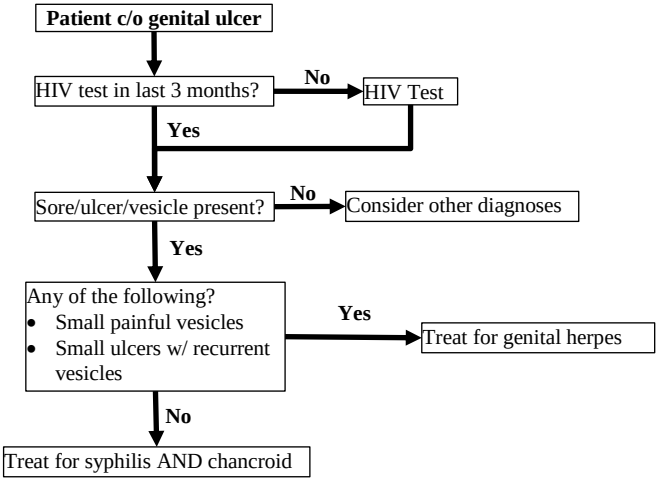
a. Low Risk: no treatment
b. Intermediate risk: discuss with senior if treatment is appropriate
c. High Risk: may start empiric treatment, discuss with senior if treatment should be continued

Sexually Transmitted Infections/Diseases (STI/STDs)[73]

I. Common Presenting Complaints
   a. Dysuria
   b. Dyspareunia
   c. Lower Abdominal Pain
   d. Urethral/Vaginal Discharge
   e. Vulvar/Vaginal itching/burning
   f. Penile/scrotal itching/burning
   g. Blisters/sores/warts/growths in genital/anal area







II. **While beyond the scope of this text, these symptoms in any children are sexual abuse until proven otherwise**

III. **Always consider sexual assault**

IV. **Partner Treatment -** All sexual partner of patient should be treated even if no symptoms (except herpes and candidiasis)

V. **Treatment Regimens**

a. Upper Genital Tract Infections
   i. Admit to hospital if the following are present
      1. Concern for severe infection (sepsis), toxic appearance, clinical concern that outpatient regimen is unsuitable
      2. Concern for complicated infection (peritonitis, abscess)
      3. Unclear etiology
      4. Unable to tolerate PO
      5. No improvement/worsening in first 48hrs of outpatient treatment
   ii. Inpatient Treatment
      1. Ceftriaxone 250mg IM daily
      2. Doxycycline 100mg/dose PO BID x 14 days
      3. Metronidazole 500mg PO/IV BID x 14 days
   iii. Ambulatory Treatment
      1. Ceftriaxone 250mg IM x 1 dose
         a. Alternative: Cefixime 400mg PO 1 dose
      2. Doxycycline 100mg/dose PO BID x 14 days
      3. Metronidzole 500mg PO BID x 14 days

b. Gonorrhea
   i. Ceftriaxone 250mg IM x 1 dose
      1. Alternative: Cefixime 400mg PO x 1 dose

c. Chlamydia
   i. Azithromycin 1g PO x 1 dose
      1. Alternative for non-pregnant Women/Men: Doxycycline 100mg/dose q12hrs x 7 days
      2. Alternative for pregnant women: Erythromycin 1g/dose q12hrs x 7 days

d. Bacterial Vaginosis
   i. Tinidazole 2g PO x 1 dose
   ii. Alternative: Metronidazole 2g PO x 1 dose

e. Trichomoniasis (using vaginal tablets)
   i. Clotrimazole 500mg inserted vaginally at bedtime x 1 dose
   ii. Alternative: Clotrimazole 100mg inserted vaginally at bedtime x 6 days
   iii. Alternative: Nystatin 100,000 IU

f. Herpes
   i. Initial outbreak
      1. Ineffective if given started after 5 days from onset
      2. Acyclovir 400mg/dose PO q8hrs x 7 days
   ii. Recurrence
      1. Ineffective if given after 24 hours from onset
      2. Acyclovir 400mg/dose PO q8hrs x 5 days

g. Syphilis
   i. Benzathine Penicillin 1.2 million IU IM in each buttock
      1. If < 2 years of infection, 1 dose
      2. If > 2 years or unknown, 1 dose weekly x 3 weeks

h. Chancroid
   i. Azithromycin 1g PO x 1 dose
   ii. Alternative: Ceftriaxone 250mg IM x 1 dose

Opportunistic Infections in HIV[26,141,142]

IV. Prophylaxis

When to give to Prevent Infection	Regimen
CD4 < 200 OR % CD4 < 14% Pneumocystis jiroveci pneumonia (PCP) CD4 < 100 and toxoplasma IgG positive Toxoplasma gondii encephalitis	Preferred: TMP-SMX Child < 5kg: 120mg PO QD Child 5-14.9 kg: 240mg PO QD Child 15-29.9 kg: 480mg PO QD Child > 30kg and adult: 1 DS tab PO QD Alternative: Dapsone Child < 12yo: 2mg/kg PO QD Child > 12yo and adults: 100mg PO QD
CD4 < 50 and ruling out disseminated active MAC Disseminated Mycobacterium avium complex (MAC)	Preferred: Child Azithromycin 20mg/kg PO once weekly OR Clarithromycin 7.5mg/kg PO BD OR Azithromycin 5mg/kg/day PO Alternative: Rifabutin 5mg/kg PO daily Adult Azithromycin 1200mg PO once weekly OR Clarithromycin 500mg PO BD OR Azithromycin 600mg PO twice weekly Alternative: Rifabutin 300mg PO daily

V. Candida (oropharyngeal and oesophageal)
   a. CD4: usually < 200
   b. Symptoms: cotton feeling in the mouth, loss of taste, varying degrees of pain with swallowing
   c. Diagnosis: Physical exam reveals pseudomembranous white plaques
   d. Treatment
      - Oropharyngeal (treat 7-14 days)
        i. Fluconazole
           1. Child: 3-6mg/kg/dose PO daily
           2. Adult: 100mg PO QD
        ii. Nystatin
           1. if suspension, swish in mouth as long as possible prior to swallowing
           2. Child < 5yo: 100,000 IU (1mL) q6hrs PO
           3. Child 5-12 years: 200,000 IU (2mL) q6hrs PO
           4. >12yo and adult: 400,000-600,000 IU (4-6mL) q6hrs PO
      - Oesophageal (treat 14-21 days)
        i. Fluconazole
           1. Child: 6mg/kg/dose PO x 1, then 3-6mg/kg/dose PO daily
           2. Adult 400mg PO x 1, then 150-200mg PO QD

VI. Toxoplasmosis
   a. CD4: usually < 200
   b. Symptoms: often neurological/encephalitis (headache, confusion), may also have fever, can have pneumonitis (present similarly to PCP)
   c. Diagnosis: usually presumptive based on clinical picture, can also diagnose with positive Ig test
   d. Treatment (Pyrimethamine, Sulfadiazine and Leucovorin):
      - Children
         a. Pyrimethamine 0.5mg/kg/dose BD x 2-4 days followed by 0.25mg/kg/dose x 4 weeks PLUS
         b. Sulfadiazine 40mg/kg/dose 4 times daily
         c. Leucovorin 5mg PO QD once every 3 days
      - Adults
         a. Pyrimethamine 200mg PO once follow by
            i. Wt ≤ 60kg: 50mg PO QD; Wt > 60kg: 75mg PO QD
         b. Sulfadiazine 1.5g PO q6hrs
         c. Leucovorin 10-25mg PO QD
         d. Alternative: TMP-SMX 5mg/kg/dose & 25mg/kg/dose PO BD

VII. Cryptococcal meningitis
   a. CD4: usually < 100
   b. Symptoms: typical meningoencephalitis symptoms, fever, headache, meningismus, photophobia and vomiting
   c. Diagnosis: LP - CSF analysis (india ink stain, Ag testing, fungal culture)
   d. Treatment:
      - Induction phase (2 weeks) – one of the following, first option preferred:
         a. (Preferred) Liposomal amphotericin B 4 mg/kg/day IV plus flucytosine 25 gm/kg/dose PO 4 times daily x 2 weeks
         b. Amphotericin B deoxycholate 1 mg/kg/day IV plus flucytosine 25 mg/kg/dose PO 4 times daily
         c. Fluconazole 800mg/day (12mg/kg/day in children < 19kg) plus flucytosine 25 mg/kg/dose PO 4 times daily
      - Consolidation phase (8 weeks):
         a. Fluconazole 400mg/day (10mg/kg/day in children <19kg)

VIII. Pneumocystis jiroveci pneumonia (PCP)
   a. CD4: usually < 200
   b. Symptoms: progressive dyspnea on exertion, nonproductive cough, fever, chest discomfort, may be severely hypoxic
   c. Diagnosis: CXR with bilateral infiltrates, elevated LDH
   d. Treatment options (21 days) – first option preferred:
      - TMP-SMX: 5mg/kg/dose & SMX 25 mg/kg/dose IV or PO q6hrs
      - Pentamadine 4mg/kg IV QD
      - If initial O2 sat on room air is < 90: add Prednisone/Prednisolone
         a. Days 1-5: 1mg/kg/dose BID (max 40mg/dose)
         b. Days 6-10: 1mg/kg/dose QD (max 40mg/dose)
         c. Days 11-21: 0.5mg/kg/dose QD (max 20mg/dose)

IX. Mycobacterium Avium Complex (MAC)

a. CD4: usually < 50
b. Symptoms: typically nonspecific, including fevers, night sweats, abdominal pain and diarrhea, but can also cause lymphadenitis
c. Diagnosis: AFB smear from blood, bone marrow, stool, sputum, bronchial washings, gastric aspirate, or biopsy/FNA
d. Treatment (at least 2 drugs)
   - Children
     a. Clarithromycin 10mg/kg/dose BD
     b. Ethambutol 20mg/kg PO QD
     c. Azithromycin (in place of Clarithromycin) 10mg/kg QD
     d. If CD4 < 50 consider adding Rifabutin 15mg/kg PO QD
   - Adults
     a. Clarithromycin 500mg PO BD
     b. Ethambutol 15mg/kg PO QD
     c. Azithromycin (in place of Clarithromycin) 500mg PO QD

X. Cryptosporidiosis

a. CD4: usually < 100
b. Symptoms: varying degrees of diarrheal illness, from mild to severe enteritis, can be profuse and life threatening
c. Diagnosis: clinical presentation, stool microscopy, PCR
d. Treatment
   - Primary treatment is to start ART, difficult to clear infection while severely immunocompromised
   - May attempt direct treatment
     a. Nitazoxanide: 1-3yo 100mg PO BD, 4-11yo 200mg PO BD, ≥12yo 500-1000mg PO BD w/ food x 14 days
     b. Alternative: Paramomycin 500mg PO QID x 14-21 days

XI. Histoplasmosis

a. CD4: usually < 150
b. Symptoms: nonspecific, may include fever, chills, sweats, malaise, fatigue, muscle ache, weight loss, often may have pulmonary involvement and can be mistaken for TB. May have hepatosplenomegaly.
c. Diagnosis: Often only by history (exposure to soil contaminated with bat and bird feces). Difficult to make , cultures may take 6 wks, Ag (in blood or urine) more rapid, Ig may take 4-6 weeks after initial exposure to appear
d. Treatment:
   - Induction, one of the two below (first option preferred):
     i. Liposomal amphotericin B 3mg/kg IV QD (children 3-5mg/kg)
     ii. Amphotericin B deoxycholate 1 mg/kg/day IV
   - Maintenance
     i. Children: Itraconazole 2-5mg/kg/dose TID x 3 days then BID
     ii. Adults: Itraconazole 200mg PO TID
   - If CD4 < 50, consider adding Rifabutin 300mg PO QD

XII. Herpes Simplex Virus (HSV) types 1 & 2

a. CD4: no specific level, generally more severe as CD4 drops
b. Symptoms: often prodrome of pruritis, followed by eruption of painful vesicles and ulcerations, may be multiple or single, unable to determine 1 vs 2 from clinical presentation alone
c. Diagnosis: Often clinical, ideally viral culture, Ag detection or PCR for HSV DNA if available (especially because if immunocompromised multiple disease may present with ulcers)
d. Treatment:
   - Valacyclovir 1g PO BD (Children and Adults)
   - Acyclovir
     a. Children < 12yo: 20mg/kg/dose PO TID
     b. Children > 12yo & adults: 400mg PO TID

XIII. Varicella Zoster Virus (VZV) – "Shingles"

a. CD4: no specific level, generally more severe as CD4 drops
b. Symptoms: erythematous papules, progress to vesicals or bullae, generally distributed along a single dermatome (although more likely to affect greater area with more severe immunosuppression)
c. Diagnosis: usually clinical, based on history, vesicular/dermatomal rash
d. Treatment:

Valacyclovir	Acyclovir
1. Children: 20mg/kg/dose PO TID 2. Adults: 1g PO TID	1. Children: 20mg/kg/dose PO QID 2. Adults: 1g PO TID
Severe cutaneous, visceral or disseminated disease in children and adults: Acyclovir 10-15 mg/kg/dose IV q8hrs until improvement	

e. Prevention – Vaccination
   - Give in Pts w/ CD4> 200, no prior vaccination, no prior outbreaks, and seronegative for VZV
   - Primary varicella vaccination: 0.5mL SQ x 2 doses ≥ 3 months apart

XIV. Cytomegalovirus (CMV)

a. CD4: usually < 50
b. Symptoms: Retinitis most common (80-90%), causes blurring, blind spots, floaters, or flashing lights, usually unilaterally. Can also effect GI track, presenting with nonspecific GI complaints that usually include pain. Rarely can effect nervous system, symptoms of encephalitis or peripheral nerve involvement.
c. Diagnosis: Generally made by ophalmologist, Serum PCR and Serologies are not normally helpful, but if found in CSF on LP high likelihood of brain involvement
d. Treatment
   - Induction (one of the following)
     a. Adults: Valgancyclovir 900mg PO BD
     b. Alternatives for Adults and Children
        i. Ganciclovir 5mg/kg/dose IV q12hrs
        ii. Foscarnet 90mg/kg/dose IV q12hrs

Electrolytes:

Na^+ & K^+

Abnormalities

Electrolyte Abnormalities

Sodium Abnormalities

I. Calculations with Sodium

a. *TBW (Total Body Water) = Weight (kg) x fraction of water*

b. *Fraction of water =*

Children: 0.65 < 6 yo, 0.6 until adulthood
Adult: 0.5 for females, 0.6 for males
Elderly: 0.45 for females, 0.5 for males

c. $Change\ [Na]_{serum}\ per\ L\ infusate = \frac{[Na]_{infusate} - [Na]_{serum}}{TBW+1}$

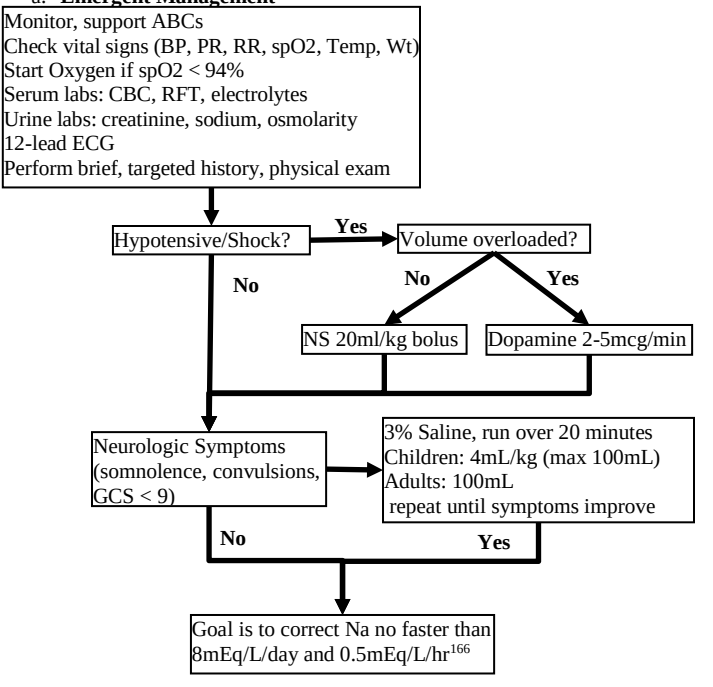
d. $Rate\ of\ IVF\ infusion\ to\ increase\ Na\ by\ 0.5\ mEq/L/h\ = \frac{1000}{2 \times [Na]_{serum}}$

e. $Free\ H_2 0\ Deficit\ (L) = \frac{[Na]_{serum} - 140}{140} \times TBW$

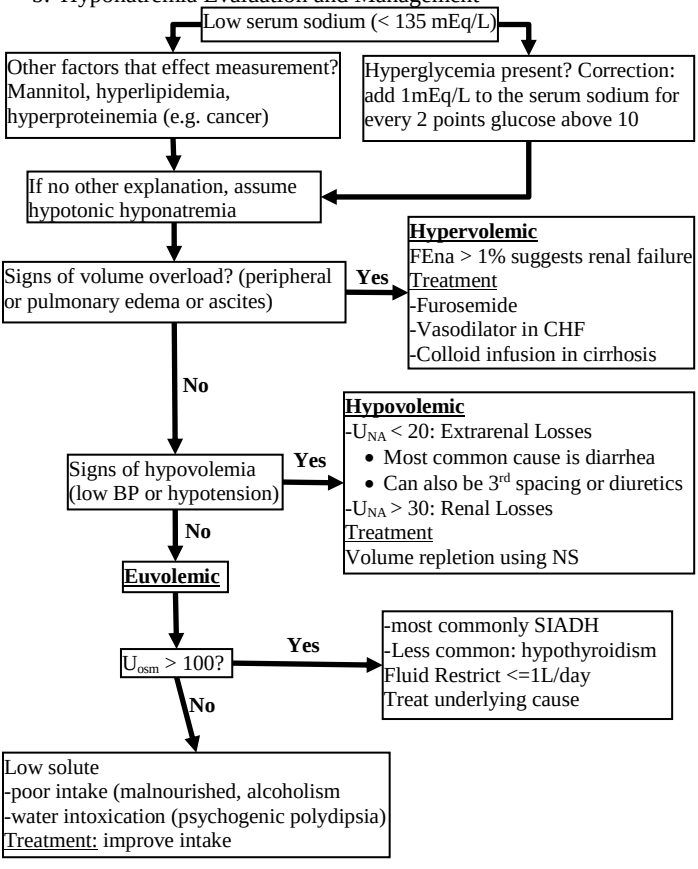
f. $FENa\ (fractional\ excretion\ of\ sodium) = 100\ \times \frac{Na_{urine} \times Cr_{serum}}{Na_{serum} \times Cr_{urine}}$

II. Hyponatremia (Na < 135)

a. **Emergent Management**



b. Hyponatremia Evaluation and Management



III. Hypernatremia (Na > 145)

c. Most common renal causes: osmotic diuresis, loop diuretics, diabetes insipidus
d. Most common extrarenal causes: vomiting, diarrhea
e. Treatment
   i. Restore access to PO water (>1 L/day)
   ii. Correct Na no faster than 10mEq/L/day and 0.5 mEq/L/hr
f. Assess if clinically logical, if not, consider confirming before managing
g. Unless reason to suspect otherwise (extremely elevated glucose, mannitol, high serum protein levels – e.g. cancer), assume hypotonic hyponatremia

Potassium Abnormalities

Hypokalemia (main Rx is treating cause)

I. Risk Factors: diarrhea, vomiting, diuretics, refeeding syndrome, inadequate dietary intake (malnutrition, chronic alcoholic)
II. Potassium Replacement
   a. < 3: even if asymptomatic
   b. < 4: in heart failure, HTN or arrhythmias
III. IV Potassium
   a. Indications: K < 2.5, symptomatic, or a nonfunctioning GI tract
   b. 40mEq in 1L NS, (children: 0.5-1mEq/kg/hr, adult: 10mEq/hr infusion)
   c. NEVER BOLUS
IV. PO Potassium
   a. 40-100 mEq/day (max adult 200mEq/day, max children 3mEq/kg/day)
   b. Divide into doses every 6 hours
V. Magnesium (often accompanies hypokalemia)
   a. Rx unstable or symptomatic & Magnesium < 1: magnesium sulfate 2g in 50mL 5% dextrose, given over 30 minutes 6 hourly, (children 25-50mg/kg)
   b. Stable, asymptomatic, Magnesium <2 but > 1: oral supplementation

Hyperkalemia

Presentation[169]

- MAJORITY ARE ASYMPTOMATIC[170]
- Muscle Weakness/paralysis
- Cardiac Arrhythmias/Palpitations
- Decreased bowel motility
- Neuro: Parasthesia, confusion, convulsion

Common Risk Factors[167]

- Acute and chronic kidney disease
- Medications: (ACEI and ARBS, Beta Blockers, Digoxin, NSAIDs, Spironolactone, Co-trimoxazole[168])
- Highly aggressive tumours with tumour lysis syndrome
- Tissue damage (rhabdomyolysis, burns or trauma)

Monitor, support ABCs
Check vital signs (BP, PR, RR, spO2, Temp, Wt)
Start Oxygen if spO2 < 94%
Serum labs: CBC, RFT, electrolytes
12-lead ECG
Perform brief, targeted history, physical exam

K + ≥ 5.5 = Hyperkalemia
Recheck to confirm result
Stop all K + supplementation

Any of the following?
1. K+ > 6.5[173]
2. Weakness, frank muscle paralysis, palpitations, paraesthesia
3. ECG changes? - tall tented T-waves, PR prolongation, AV-block, widening QRS (may eventually begin to merge with T-wave)

Yes →

- Cardiac monitoring
- 10% Calcium Gluconate IV[169–172]
  - Children: 0.5mL/kg
  - Adults 10mL
  - give over 2-3 minutes
  - repeat every 5min until ECG improves
  - lasts 30-60 min
- Furosemide IV
  - Children: 1mg/kg
  - Adults: 20-40mg
- Dialysis: Urgently if unstable, consider for asymptomatic patients with ESRD

No ↓

K+ = 6.5-6? — **Yes** →

Insulin/glucose[170,174,175]
Adults: IV bolus Insulin 10IU+Glucose 40-60g
Children: Insulin IV 0.05 IU/kg/hr + Glucose IV 0.5g/kg/hr for RBS < 180

↓

No ↓

Consider no Rx →

Salbutamol q1-2hr[172,174–176]

Nebulizer	MDI+spacer+mask
< 25kg: 2.5mg in 3mL NS	5-10 kg: 4 puffs
> 25kg: 5mg in 5mL NS	10-20 kg: 6 puffs
(Adults 10-20mg max)	> 20 kg: 8 puffs

Resonium q6hr	PO	PR
Children	1g/kg	1g/kg
Adults	15g	30-50g

Essential Medications

Formulary[148]

Note on age designations

Neonates: ≤ 28 days old
Infants: ≤ 1-year old, and includes neonates unless specified
Children: ≤ 12 years old, includes infants & neonates unless specified
Adult: >12 years old

Note on dosing regimens

When written "dose BD", this indicates that dose is given twice daily, not divided

When written "dose ÷ BD", this indicates the dose is the total for the day and it is to be divided into two separate and equal doses

Note on dosages

We have tried to include the most common dosing regimens for the most commonly encountered conditions, but the specific patient or condition you are treating may require different dosing

Medications	**Dose and Route**	**Notes/ Contraindications**
Acyclovir	**Children:** • HSV: 20mg/kg/dose PO TID • VZV: 20mg/kg/dose PO QID **Adults:** • HSV: 400mg PO TID • VZV: 1g PO TID	
Albendazole	**Age < 2yrs**: 200mg PO x 1 dose **Age ≥ 2yr:** 400mg PO x 1 dose	

Aminophylline	**Infants (only <32weeks or 1.5kg with apnea of prematurity):**
	• Loading: 6mg/kg IV/PO over 1hr
	• Maintenance dose: (IV or oral)
	  ○ Age ≤ 6 days: 2.5mg/kg 12hrly
	  ○ Age 7-28 days: 4mg/kg 12hrly
		Not compatible with phenobarbital
		IV infusion: give over 20- 30 minutes
		Oral Preparation: Mix 10 ml aminophylline (250 mg vial) with 40 ml sterile water = 5mg/1ml

Amoxicillin/ Amoxiclav (Amoxicillin-Clavulanic acid)	**Children:** • 25mg/kg/dose BD for simple infections • 40-45mg/kg/dose BD for pneumonia/otitis media **Adults:** 875mg PO BD	
Amlodipine	**Children:** 0.05mg/kg/dose OD **Adults:** 5-10mg/dose PO daily	Max dose 5mg/dose, 10mg/24hr

Amphotericin	**Children/Adults:** Liposomal Amphotericin B: 4mg/kg/day IV Amphotericin B deoxycholate: 1mg/kg/day IV	Used with flucytosine
Ampicillin	**Neonate:** 50mg/kg/dose IV or IM • ≤ 7 days: 12 hourly • 8-28 days: 8 hourly **Infants/Children:** 50mg/kg/dose (Max 500mg) 6 hourly IV/ IM **Adults:** 2g 6 hourly IV/IM	**DO NOT MIX WITH GENTAMICIN.** ***Flush line or burette if given at same time as Gentamicin.*** IV Push: over 3-5 min IV infusion: over 15-30 min.
Artesunate	**<5 kg:** treat as though 5 kg **< 20 kg:** 3mg/kg IV/IM at 0, 12 & 24 hrs **> 20 kg:** 2.4mg/kg IV/IM at 0, 12 & 24 hrs	
Azithromycin	**Infants/Children:** 10mg/kg PO x 1 day, then 5mg/kg PO x 4 days **Adults:** 500mg PO x 1 day, then 250mg PO x 4 days	**MAC:** first day dose is continued as maintenance dose
Benzyl Penicillin (Crystalline Penicillin, PenG)	**< 7 days:** 50,000 IU/kg/dose q12hrs IV/IM **≥ 7 days:** 50,000 IU/kg/dose q6hrs IV/IM **Group A Streptococcal Pharyngitis** **≤ 27kg:** 600,000 IU IM single dose **>27kg:** 1.2 million IU IM single dose	
Calcium	**Children:** • Replacement: 10mg/kg/day • Tetany/convulsions: 0.6-1 mL/kg of 10% solution via slow push **Adults:** • Tetany/convulsions: 2g IV calcium gluconate • Replacement: 10mg/kg/day	20mg = 1 mEq 100mg Ca Carbonate = 40mg elemental Ca = 2 mEq Ca **Ca Gluconate 10%** Max dose: 20 mL/kg Max dose: 2g
Captopril	**Neonate:** • 0.01-0.05mg/kg/dose PO Q8-12hr **Infants < 6mo:** • 0.01-0.5mg/kg/dose PO BID-TID **Children:** • 0.3-0.5mg/kg/dose PO BID-TID **Adults:** • 12.5-25mg PO BID-TID • Titrate qweek by 25mg/dose	• Max dose 450mg/24hr

Carbamazepine	**< 12 years:** • Initial: 10-20 mg/kg/24hr PO ÷ q12hr • Titrate qweek **> 12 yr:** • Initial: 200mg PO BD • Titrate qweek by 200mg/24hr	*Avoid abrupt withdrawal and watch carefully for side effects* <u>Max Dose</u> • <12 yrs: 1g/day, 35mg/kg/day, 100mg/dose BD, • 12-15yrs: 1g/24hr • > 15yrs: 1.2g/24hr • Adult: 1.6-2.4g/24hr
Carvedilol	**Infants/Children:** 0.025 mg/kg/dose PO q12hr **Adults:** 3.125mg PO q12hr, max 25mg PO q12hr	Titrate every 2 weeks
Cefotaxime	**Neonates:** • ≤ 7 days: 50mg/kg/dose IV/IM 12 hourly • 8-28 days: 50mg/kg/dose IV/IM 8 hourly **Infants/Children:** • 50mg/kg/dose q8hr • Meningitis: 50mg/kg/dose q6hr • Max: 2000mg/dose **Adults:** • Meningitis/Sepsis: 2g IV 6hrly • Other: 1g IV 12hrly	***Flush line or burette well if given at same time as Gentamicin*** IV push: over 5 minutes IV infusion: over 30 min
Ceftriaxone	**Infants:** • Meningitis 100mg/kg IV OD • Sepsis/Pneumonia 80mg/kg IV OD **Children:** • 50mg/kg/dose IV/IM q24hr • Meningitis: 100mg/kg/dose q24hr • Max: 2g/dose **Adults:** • Meningitis: 2g IV q12hr • Other: 2g IV q23hr	***Contraindicated in neonates if severe jaundice. Do not mix with RL.*** IV push: 10 minutes IV infusion: Give over 30-60 minutes
Ciprofloxacin	**Children:** • 10-15mg/kg/dose PO BD • Max: 1000mg/dose **Adults:** • Mild/Moderate infection: 500mg PO BD • Severe Infection: 750mg PO BD • UTI (uncomplicated): 250mg PO BD x 3 days	

Clarithromycin	**Children:** 10mg/kg/dose BD **Adults:** 500mg PO BD	
Clotrimazole	**Children:** paint for oral thrush, apply BD-TID until cleared **Children/Adults:** apply to infected area BD-TID until cleared	
Cloxacillin	**Neonates:** 25-50mg/kg/dose • ≤ 7 days: every 12hours • 8-28 days: every 8 hours **Infants/Children:** • 25-50mg/kg/dose IV/IM q6hr **Adults:** • 2g IV/IM • Mild/Moderate Infection: q6hr • Severe Infection: q4hr5	***Flush line or burette will if given at same time as Gentamicin***
Co-trimoxazole (Trimethoprim – Sulfamethoxazole) TMP-SMX	**Children:** • Dosage: 4mg/kg/dose TMP + 20mg/kg/dose SMZ/dose BD • For interstitial pneumonia in children with HIV give 8mg/kg/dose + SMZ/40mg/kg/dose TMP TID x 21 days **Adults:** • TMP 160 mg/ SMX 800 mg PO every 12 hrs • PCP Pneumonia: TMP 15-20 mg/kg/day SMX 75-100mg/kg/day Divided in 4 equal doses	Syrup: 40mg TMP/ 200mg SMZ per 5mL Paediatric Tab: 20mg TMP/100mg SMZ **Max dose:** TMP 160 mg/ SMX 800mg PO q12hrs <u>Tablets</u> Single Strength (SS): TMP 80mg/ SMX 400mg Double Strength (DS): TMP 160mg/SMX 800mg
Dapsone	Prophylaxis CD4 < 200 **Children:** 2mg/kg PO QD **Adults:** 100mg PO QD	
Dexamethasone	**Children:** • Extubation/upper airway swelling: 0.25-0.5mg/kg/dose IV q6hr (Max: 8mg/dose) • Asthma/Croup: 0.6mg/kg/dose IV/IM/PO x 1 dose **Adults:** • Cerebral Edema: 2mg PO TID	

Dextrose/ Glucose	**Neonates/Infants/Children:** • D10% 5ml/kg IV push (if no D10 immediately available use D5) **Adults:** 25-50mL D50 IV push	**How to make D10:** 1mL of D50% + 9mL D5% OR 2mL of D50% + 8mL NS
Diazepam	Rectal Diazepam 2.5mg suppository • <10kg 1 suppository • 10-15 kg: 2 suppositories • 15-20 kg: 3 suppositories • 20-25 kg: 4 suppositories IV Diazepam: 0.3mg/kg slowly over 1 minute	**Do not give to neonate** **Do not give IM**

Digoxin	**Age 2-5 yrs**:
	• Loading: 35mcg/kg ÷ TID x 24hr
	• Maintenance: 5mcg/kg/dose BD
	Age 5-10 yrs:
	• Loading: 25mcg/kg ÷ TID x 24hr
	• Maintenance: 3mcg/kg/dose BD
	Age 10-12 yrs:
	• Loading: 0.75-1.5mg÷TID x 24hr
	• Maintenance 30-125mcg BD
	Adults:
	• Rapid digitalization:
	  o IV/IM: 5 mcg/kg x 1 dose, followed by 2.5 mcg/kg q8hr x 2 doses
	  o PO: 7mcg/kg x 1 dose, followed by 3mcg/kg q8hr x 2 doses
	• Maintenance:
	  o IV/IM: 2.4-3.6 mcg/kg/day
	  o PO: 3.4-5.1 mcg/kg/day
		Titrate maintenance dose every 2 weeks

Enoxaparin	**Children/Adults:** • DVT/PE Treatment: 1mg/kg SC q12hrs **Adults:** • DVT prophylaxis: 40mg SC OD • Acute Coronary Syndrome treatment: 1mg/kg SC q12hrs	Should not be given if CrCl < 30 For ACS: 30mg **<u>IV</u>** bolus is given 15 minutes before starting **<u>SC</u>**
Epinephrine (Adrenaline)	<u>Resuscitation</u> **Children:** 0.1ml/kg IV of 1:10,000 **Adults:** 1mg or 10mL 1:10,000 <u>Viral Croup</u> **Children:** 2mL of 1:1000 nebulized, may repeat if effective	**To make 1:10,000:** mix 1mL of 1:1000 epinephrine in 9mls NS

Ethambutol	**Children:** 20mg/kg/dose PO QD **Adults:** 15mg/kg/dose PO QD	
Erythromycin (Estolate)	**Infants/Children:** • 50mg/kg/day PO ÷ q6-8hrs • 20mg/kg/day IV ÷ q6hrs **Adults:** 500mg PO q6hr	
Fluconazole	Oropharyngeal Candidiasis **Children:** 3-6mg/kg/dose daily x 7-14 days **Adult:** 100mg PO QD x 7-14 days Oesophageal Candidiasis **Children:** 6mg/kg/dose PO x 1, then 3-6mg/kg/dose PO daily x 14-21 days **Adult:** 400mg PO x 1, then 150-200mg PO QD x 14-21 days	
Folic Acid/ Folate	**Infants/Children Maintenance** • Infant: 0.1mg PO/day • < 4 years: 0.3mg PO/day • ≥ 4 years: 0.4mg PO/day **Adults** • Deficiency: 1mg PO/day • Maintenance: 0.4mg PO/day **Pregnant Women** • 0.8mg PO/day	Megaloblastic/ Macrocytic anemia all receive 1mg PO/IM/IV daily regardless of age NEVER LESS THAN 0.1 MG PO/DAY IN PREGNANCY
Foscarnet	**Everyone:** 90mg/kg/dose IV q12hrs	
Furosemide/ Lasix	**Children:** 1-2mg/kg IV/PO q12hrs **Adults:** • Heart failure exacerbation: 40mg IV/IM (or double maintenance dose) q2hrs • Heart failure maintenance: 20-40mg PO OD-BD • Other: 20-40mg IV/IM/PO	**Not compatible with Gentamicin** IV Push: max rate 0.5mg/kg/min IV Infusion: 10-15 min See heart failure protocol for specific details
Gancyclovir	**Everyone:** 5mg/kg/dose IV q12hrs	
Gentamicin	**Neonates** (if LBW <2.5kg and Term with Birth Asphyxia): ○ ≤ 7 days: 3mg/kg/day OD ○ 8-28 days: 5mg/kg/day OD **Term Neonates/Children/Adults:** 5-7.5mg/kg/day OD	**Do not mix with Ampicillin.** ***Flush line or burette well if given at same time as Ampicillin*** IV push: no IV infusion: Give over 30 minutes. Flush line well.

Heparin (unfractionated)	**Children:**
	• DVT/PE Treatment:
	  ○ 75 units/kg IV bolus
	  ○ 20 units/kg/hr IV infusion
	Adults:
	• DVT prophylaxis: 5000 units SC q12hrs
	• DVT/PE Treatment:
	  ○ 80 units/kg IV bolus
	  ○ 18 units/kg/hr IV infusion
	• Acute Coronary Syndrome
	  ○ 60 units/kg IV bolus
	  ○ 12 units/kg/hr IV infusion
		Treatment is given as an IV bolus followed by a continuous IV infusion
		
		Maximum bolus for DVT/PE: 5,000 units
		
		Maximum bolus for ACS: 4,000 units
		
		Maximum infusion rate: 1,000 units/hr

HCTZ (hydrochloro-thiazide)	**Children:** 0.5-1mg/kg/dose OD or BD **Adults:** 12.5-50mg OD	**Max Dose:** <2 years: 37.5mg OD 2-12 years: 100mg OD >12 years: 200mg OD
Hydroxyurea	Child 2-12 years initially 20mg/kg once daily, increased every 12 weeks in steps of 2.5 - 5 mg/kg daily according to response; usual dose 20 - 30 mg/kg daily (max. 35 mg/kg daily)	For use in SCD with stroke, admission for acute chest syndrome, >3 admissions/yr for pain, require ≥*2* transfusions yearly
Ibuprofen	**Neonates (PDA Closure):** • Dose 1 at 0 hours: 10mg/kg PO • Dose 2 & 3: 5mg/kg PO at 24 & 48 hours **Children:** 10mg/kg PO q6hrs **Adults:** 400-800mg PO q6-8hrs	**Max:** • 800mg/dose • 2400mg/day Do not give in cases of renal disease Give with food when possible
Iron	**Pre-term Infant:** 2-4mg elemental Fe/kg/day **<u>Iron Deficiency</u>** **Children:** 3-6mg elemental Fe/kg/day **Adults:** 60-120mg elemental iron daily	**Max dose:** 15mg elemental Fe/kg/day Hemaforte syrup: 5 mg elemental iron/ml 325mg Ferrous Sulfate tablet contains 65mg elemental Iron
Isoniazid	**Children:** 10mg/kg PO QD **Adults: 5**mg/kg PO QD	
Lactulose	**Infants (hepatic encephalopathy):** 2.5-10mL ÷ TID-QID **Children:** 1-3mL/kg/day ÷ q8-12hrs **Adults:** 30mL PO q6hr	**Children Max dose:** 60mL/day **Formulation:** 10g/15mL **Goal:** at least 3-4 soft stools daily

Leucovorin	**Children:** 5mg PO QD **Adults:** 10-25mg PO QD	
Lisinopril	**Infants/Children:** 0.1mg/kg PO OD **Adults:** 5mg PO OD	**Max Dose:** Children: 0.6mg/kg/day or adult dose Adults: 40mg/day
Lorazepam	**Adults/Children (>12yr):** • Anxiety (acute): 2mg PO q8hr • Agitation: 0.5-2mg IV 12-4hrs	**Use with caution in elderly**
Losartan	**Infants/Children:** • Initial: 0.5mg/kg/day • Maintenance: up to 1.4mg/kg/day **Adults:** 25mg PO daily	**Infants/Children Max:** Initial: 12.5mg/day Maintenance: 150mg/day **Adult Max:** 150mg/day
Metronidazole	**Neonates:** 7.5mg/kg/dose IV First week of life • <1.2 kg: every 48 hours • 1.2-2kg: every 24 hours • >2 kg: every 12 hours Weeks 2-4 • <1.2kg: every 24 hours • >1.2kg: every 12 hours Mild Infections **Infants/Children:** 7.5mg/kg/dose PO q8hrs **Adults:** 500mg PO q6hrs Moderate-Severe Infections **Infants/Children:** 10mg/kg/dose IV q8hrs **Adults:** 500mg IV q6hrs	**Not compatible with phenobarbital or Ringers Lactate** ***Administer separately. Discontinue primary IV.*** IV push: no IV infusion: Give over 60 minutes in D10 or NS.
Morphine	**Neonate:** 0.05-0.2 mg/kg/dose IM/ SC/slow IV q4hr prn **Children:** • 0.1-0.2 mg/kg/dose IV q2-4hrs prn • 0.2-0.5 mg/kg/dose PO q4-6hrs prn **Adults:** • 1-2 mg/dose IV q2-4hrs prn • 2-10mg/kg/dose PO q2-4hrs prn	Ensure high enough dose for pain control, just remember to monitor frequently (at least q1hr to start), to avoid respiratory depression

Nifedipine	**Children (>1yr):** • Initial: 0.125mg/kg BD • Maintenance: up to 3mg/kg/day or 120mg/day **Adults:** • Initial (XR): 30mg PO OD • Maintenance (XR): up to 120mg/day • Immediate release (IR): 10-30mg PO q8hr	**Only use extended release (XR) with children** **Ideally adults would only use XR for HTN** **Immediate release (IR): should really only be used for angina**
Nitazoxanide	**1-3yo:** 100mg PO BD x 14 days **4-11yo:** 200mg PO BD x 14 days **≥12yo and adults:** 500-1000mg PO BD x 14 days	Give with food
Nitrofurantoin	**Children (>1yr):** 1.5 mg/kg PO q6hr (total 6mg/kg/day) **Adults:** 100mg PO q6hr	**Full course for UTI in children and adults is 7 days**
Nitroglycerine	**Adults:** 0.4mg SL q5min x 3 doses	prn anginal pain
Nystatin	**Preterm Infants:** 0.5mL to each side of mouth q6hrs **Term Infant:** 1mL to each side of mouth q6hrs **Children/Adults:** • Oropharyngeal Candidiasis: 4-6ML PO q6hr	PO: Suspension=100,000 units/mL Two weeks if HIV+ve (swish in mouth as long as possible before swallowing)
Omeprazole	**Children:** 0.5-1 mg/kg/dose PO OD or BD **Adults:** 20-40mg PO OD	May reduce serum concentration of clopidogrel
Paracetamol/ Panadol	**Children:** 10-15mg/kg PO q4-6hr **Adults:** 650mg PO q4-6hr	**Max dose:** 4g/day Not given in liver failure
Paramomycin	**≥ 12yo and Adults:** 500mg PO QID x 14-21 days	
Pentamidine	**Adults/Children:** 4mg/kg IV QD	
Pethidine (Demerol)	**Children:** 0.5-1mg/kg q4hrs **Adults:** IM/PO/SQ: 50mg q3hrs	Morphine is almost always preferred if available (including for biliary issues)
Phenobarbitone/ Phenobarbital	**Neonates:** • Loading: 20mg/kg IV/IM • Maintenance: 5mg/kg IV/IM/PO OD **Infants/Children/Adults:** • Loading: 15mg/kg IV/IM (max initial loading dose 320mg) • Maintenance: 5mg/kg IV/IM/PO OD	**<u>Not compatible with Aminophylline, Metronidazole</u>** Give over 20 minutes if IV (not faster than 1 mg/kg/min)

Phenytoin	**Children:** • Loading: 15-20mg/kg IV • Maintenance: 2.5-4 mg/kg IV/PO q12hrs **Adults:** • Loading: 20mg/kg IV • Maintenance: 100mg IV/PO q6-8hrs	**Not compatible with Aminophylline** ***Give in NS only. Flush with NS after giving*** IV Push: max rate 50mg/min
Potassium	**Children:** 1mEq/kg/dose **Adults:** • Dose based on level of hypokalemia • 10mEq raises potassium approximately 0.1 • PO preferred to IV	1 mEq = 75mg (KCl) Frequency based on level of deficiency
Prednisone/ Prednisolone	**Children:** 1-2 mg/kg PO OD **Adults:** 40mg PO OD Suggested tapering schedule: **Children:** Decrease dose by ~10% every 2 weeks **Adults:** Dose ≥ 20mg/day: decrease by 5mg/day every week Dose 10-20mg/day: decrease by 2.5mg/day every 2 weeks Dose ≤10mg/day: decrease by 1mg/day every 2 weeks	**Max for asthma:** 60mg/day Tapering is only required if used for **>3 weeks** If any symptoms of adrenal insufficiency, return to previous dose Symptoms of adrenal insufficiency: abd pain, vomiting, unusual sweating, dehydration, confusion, fatigue, weakness, low BP, high HR, shock
Propranolol	**Children:** 0.5-1 mg/kg/day PO ÷ q6-12hrs **Adults:** • Initial: 40mg PO BID	**Max:** 8mg/kg/day **Max:** 320mg PO ÷ q6-12hrs
Pyrazinamide	**Children:** 35mg/kg PO QD **Adults:** 25mg/kg PO QD	
Pyridoxine	**Adults:** 25mg PO QD	Given with TB treatment
Pyrimethamine	**Children:** Initial: 0.5mg/kg/dose BD x 2-4 days Maintenance: 0.25mg/kg/dose **Adults:** Initial: 200mg PO once Maintenance: Wt ≤ 60kg: 50mg PO QD Wt > 60kg: 75mg PO QD	Given with Sulfadiazine and Leucovorin

Quinine	**Infants/Children/Adults:** • See malaria algorithm • Loading dose: 20mg/kg IV given over 4 hours (after dilution) • Maintenance dose: 10mg/kg IV q8hrs (dilute, give over 2 hrs)	**DANGER:** rapid administration is dangerous, mix with 10mL/kg of 5% dextrose & run over 2-4 hours, DO NOT exceed 5mg/kg/hr
Ranitidine	Neonates: • <37 weeks: 0.5mg/kg IV q12hrs • > 37 weeks: 1mg/kg IV q12hrs • PO: 1-2mg/kg q12hrs Children: 2-5 mg/kg/dose q12hrs Adults: 150mg PO BD	**Not compatible with Phenytoin** IV Push: minimum >5 min to prevent hypotension IV infusion: 15-20min **Caution:** increase risk of NEC in VLBW infants
Rifabutin	**Children** Treatment: 15mg/kg PO QD Prophylaxis: 5mg/kg PO QD **Adults:** 300mg PO QD	In severe MAC
Rifampicin	**Children**: 15mg/kg PO QD **Adults:** 10mg/kg PO QD	
Salbutamol	**Nebulization** **≤ 20 kg:** 2.5mg/dose in 3mL NS **> 20 kg:** 5mg/dose in 5mL NS **MDI (metered dose inhaler)** **5-10 kg:** 4 puffs **10-20 kg:** 6 puffs **> 20 kg:** 8 puffs	**DO NOT EVER GIVE ORALLY – not effective**
Sulphadoxinepirimetamine (SP)	• Children • 2-5yo: ½ tab monthly • 5-10yo: 1 tab monthly • 10-15yo: 2 tabs monthly • >15yo: 3 tabs monthly	Malaria prophylaxis in patients with Sickle Cell Disease
Spironolactone	**Children:** 0.5-1.5 mg/kg/dose BD **Adults:** 25mg PO OD	**Max dose:** 100mg/day
Valacyclovir	**Children:** • HSV: 1g PO BD • VZV: 20mg/kg/dose PO TID **Adults:** • HSV: 400mg PO TID • VZV: 1g PO TID	
Valgancyclovir	**Adults: 900mg PO BD**	
Sulfadiazine	**Children:** 40mg/kg/dose QID **Adults:** 1.5g PO q6hrs	Given with Leucovorin and Pyrimethamine for PCP

Valproic Acid/ Sodium Valproate	**Children:** • Initial: 10-15mg/kg/day PO ÷ q8-12hrs • Maintenance: 30-60mg/kg/day ÷ q8-12 hrs **Adults:** • Initial: 15mg/kg/day PO ÷ q8-12hrs • Maintenance: 60mg/kg/day ÷ q8-12 hrs	
Vitamin A	**< 6 months:** not recommended **6-12 months:** 100,000 units PO stat **>12 months:** 200,000 units PO stat	Once on admission, should not be given twice within 1 month
Vitamin D	**Infants:** • Rickets: 2000 IU/day x 6-12 wks • Maintenance: 400 IU/day **Children** • Rickets: 2000 IU/day x 6-12 wks • Maintenance: 600-1000 IU/day Adults: • Deficiency: 6000 IU/day x 8 wks • Maintenance: 2000 IU/day	Children may also take 50,000 IU/week x 6 weeks

Vitamin K	**Neonate:**
	• Preterm <1kg: 0.3mg/kg IM stat
	• Preterm > 1kg: 0.5mg IM stat
	• Term: 1mg IM stat
	Supratherapeutic INR:
	• **Children:** 0.03 mg/kg/dose IV
	  ○ Maximum dose: 1mg
	• **Adult:**
	  ○ INR 4.5-10 no bleeding: may consider 1-2.5mg PO
	  ○ INR >10: 2.5-5mg PO
	  ○ Minor bleeding & elevated INR: 2.5-5mg PO
	  ○ Major bleeding & elevated INR: 10mg PO
		Adequate Standard Intake Daily:
		• 0-1 yrs: 2.5mcg
		• 1-3 yrs: 30mcg
		• 4-13 yrs: 60mcg
		• 9-13 yrs: 60 mcg
		• >14yrs female: 90mcg/day
		• >14yrs male: 120mcg/day

Vitamin B12	**Infants Dietary Deficiency:** • 1mg IM/day x 5 days, then weekly x 3 more doses **Infants/Children Malabsorption:** • 1mg IM every other day x 6 days, then weekly for 6 weeks **Adults:** • Deficiency: 1mg PO QD • Severe Deficiency or Pernicious Anemia: 1mg IM every other day x 6 days, then weekly for 6 weeks	Also known as Cyanocobalamin
Warfarin	**Children:** 0.2mg/kg (max 10mg) PO OD x 2 days **Adults: 10mg PO OD x 2 days**	Max 10mg/dose in
Zinc Sulfate	**Age ≤ 6 m**: 10mg daily for 10-14 days **Age > 6 m**: 20mg daily for 10-14 days	

Medicine Compatibility Chart (✓=compatible, XXX=incompatible)

	Rate (minutes)	AMPICILLIN	GENTAMICIN	AMINOPHYLLINE	D10%
AMPICILLIN	**3-5**		**XXX**	✓	✓
GENTAMICIN	**30**	**XXX**		✓	✓
AMINOPHYLLINE	**30**	✓	✓		✓
CEFTRIAXONE	**30**	✓	✓	✓	✓
METRONIDAZOLE	**60**	✓	✓	✓	✓
PHENOBARBITAL	**10-15**	✓	✓	**XXX**	✓
D10%		✓	✓	✓	
RINGERS LACTATE		✓	✓	✓	✓

	Rate (minutes)	CEFTRIAXONE	PHENOBARBITAL	METRONIDAZOLE	RINGERS LACTATE
AMPICILLIN	**3-5**	✓	✓	✓	✓
GENTAMICIN	**30**	✓	✓	✓	✓
AMINOPHYLLINE	**30**	✓	**XXX**	✓	✓
CEFTRIAXONE	**30**		✓	✓	**XXX**
METRONIDAZOLE	**60**	✓	**XXX**		**XXX**
PHENOBARBITAL	**10-15**	✓		**XXX**	✓
D10%		✓	✓	✓	✓
RINGERS LACTATE		**XXX**	✓	**XXX**	

Abbreviations

abnl – abnormal
ACEI – angiotensin converting enzyme inhibitor
ACLS – advanced cardiac life support
ACS – acute coronary syndrome
AKI – acute kidney injury
Ag - antigen
ARDS – acute respiratory distress syndrome
AS -aortic stenosis
ASD – atrial septal defect
a/w – associated with
BD, BID – twice daily
b/c – because
BCS – Blantyre Coma Scale
BCx -blood culture
bili. – bilirubin
BMI – body mass index
BP – blood pressure
BUN – blood urea nitrogen
bx – biopsy
Ca – calcium
CAD – coronary artery disease
CBC – complete blood count
CCB – calcium channel blocker
CFU – colony forming unit
CHD – congenital heart disease
CKD – chronic kidney disease
CMP – cardiomyopathy
CMV - cytomegalovirus
CPAP – constant positive airway pressure
COPD – chronic obstructive pulmonary disease
Cr – creatinine
CrCl – creatinine clearance
CSF – cerebrospinal fluid
CVA- cerebrovascular accident
Cx – culture
CXR – chest radiograph
ΔMS – mental status change
d/c – discontinue
DDx – differential diagnosis
DIC – disseminated intravascular coagulation
DKA – diabetic ketoacidosis
DOE – dyspnea on exertion
DVT – deep vein thrombosis
Dx – diagnosis
ECG, EKG – electrocardiogram
EF – ejection fraction
EGD – esophagogastroduodenoscopy
ENT – ear, nose, and throat
ESR – erythrocyte sedimentation rate
ESRD – end-stage renal disease
EtOH – ethanol
Fe – iron (level)
FHx – family history
FNA – fine needle aspiration
f/u – follow-up
GCS – Glasgow coma score
GERD -gastroesophageal reflux disease
GFR – glomerular filtration rate
Gluc. – glucose
HA – headache
Hb, Hgb – hemoglobin
HAV – Hepatitis A virus
HBV – Hepatitis B Virus
Hct - hematocrit
HCV – Hepatitis C Virus
H/o – history of
HR – heart rate
hr/hrs – hour/hours
HSV – herpes simplex virus
HTN – hypertension
Hx – history
ICP – intracranial pressure
ICU – intensive care unit
Ig - Immunoglobulin
INH – isoniazid
INR – international normalized ratio
ITP – idiopathic thrombocytopenic purpura
IVF – intravenous fluids
JVD – jugular venous distension
LDH – lactate dehydrogenase
LFTs – liver function tests
LOC – loss of consciousness
LP – lumbar puncture
MIVF – maintenance IV fluids
RL – ringer’s lactate
LUQ – left upper quadrant
LUSB – left upper sternal border
LV – left ventricle

LVH – left ventricular hypertrophy
MAC – mycobacterium avium complex
MAM – moderate acute malnutrition
MAP – mean arterial pressure
MAT – multifocal atrial tachycardia
MCV – mean corpuscular volume
MDI – metered dose inhaler
MI – myocardial infarction
mo – month
mod. – moderate
MTb – *mycobacterial tuberculosis*
MV – mitral valve
n/v – nausea vomiting
nL – normal
NPO – nothing by mouth
NS – normal saline
NSAID – nonsteroidal anti-inflammatory drug
O2 sat – oxygen saturation
OD, QD – daily
OGD – Oesophagogastroduodenoscopy
OTC – over-the-counter
o/w – otherwise
PCN – penicillin
PCP/PJP – *Pneumocystis jiroveci* pneumonia
PEA – pulseless electrical activity
PEEP – positive end-expiratory pressure
PFO – patent foramen ovale
PI – protease inhibitor
PID – pelvic inflammatory disease
PMHx – past medical history
PNA – pneumonia
PND – paroxysmal nocturnal dyspnea
PO – oral intake
PPD – purified protein derivative
PPI – protein pump inhibitor
PRBCs – packed red blood cells
PSHx – past surgical history
PT – prothrombin time
PTT – partial thromboplastin time
p/w – presents with
qac – before every meal
qhs – every bedtime
QID – four times daily
RF – rheumatic fever
RHD – rheumatic heart disease
RI – reticulocyte index
r/o – rule-out
ROS – review of systems
RR – respiratory rate
RUQ – right upper quadrant
Rx – treatment, therapy
SAM – severe acute malnutrition
SBP – spontaneous bacterial peritonitis
sev. – severe
SIADH – syndrome of inappropriate antidiuretic hormone
SIRS – systemic inflammatory response syndrome
SJS – Steven-Johnson Syndrome
SOB – shortness of breath
s/p – status post
SPO_2 – oxygen saturation
STD – sexually transmitted disease
STI – sexually transmitted infection
SVDK – Snake Venom Detection Kit
sxs – symptoms
TB – tuberculosis
TIA – transient ischemic attack
TIBC – total iron-binding capacity
TID – three times daily
TMP-SMX – trimethoprim-sulfamethoxazole
TSH -thyroid stimulation hormone
U/A – urinalysis
U/S – ultrasound
UCx – urine culture
UOP – urine output
URI – upper respiratory tract infection
UTI – urinary tract infection
VS -vital signs
VZV – varicella zoster virus
w/ - with
wk – week
WNL – within normal limits
w/o – without
w/u – work-up

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a-https://en.ecgpedia.org/index.php?title=File:LAE.png;
b-https://en.ecgpedia.org/index.php?title=File:LAE.png;
c-https://en.ecgpedia.org/index.php?title=File:RAE.png;
d-https://en.ecgpedia.org/index.php?title=File:RVH.png;
e-https://en.ecgpedia.org/index.php?title=File:LVH.png;
f-https://en.ecgpedia.org/index.php?title=File:RBBB_inf_MI.jpg;
g-https://en.ecgpedia.org/index.php?title=File:MI_LBBB.png;
h-https://en.ecgpedia.org/index.php?title=File:Aflutt_small.svg;
i-https://en.ecgpedia.org/index.php?title=File:Afib_detail.jpg;
j-https://en.ecgpedia.org/index.php?title=Myocardial_Infarction;
k-https://en.ecgpedia.org/index.php?title=File:DVA2255.jpg;
l-https://en.ecgpedia.org/index.php?title=File:DVA2244.jpg;
m-https://en.ecgpedia.org/index.php?title=File:DVA2248.jpg;
n-https://en.ecgpedia.org/index.php?title=File:DVA2256.jpg;
o-https://en.ecgpedia.org/index.php?title=File:E000002.jpg;
p-https://en.ecgpedia.org/index.php?title=File:MI_in_LBBB_01.jpg;
q-https://en.ecgpedia.org/index.php?title=File:AMI_inferior.jpg;
r-https://en.ecgpedia.org/index.php?title=File:AMI_inferior.jpg;
s-https://en.ecgpedia.org/index.php?title=File:Ami0005.jpg;
t-https://en.ecgpedia.org/index.php?title=File:Ami0005.jpg. Main Authors: J.S.S.G. de Jong, MD PhD, P.G. Postema, MD PhD, Rob Kreuger. ECGs: A.A.M. Wilde, MD PhD, W.A. de Voogt, MD PhD, Dr. Alberto Giniger, M. Rosengarten, BEng, MD. Credit: [CC BY-SA 3.0 (https://creativecommons.org/licenses/by-sa/3.0], from Wikimedia Commons.

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Index