Pediatrics Protocols

Pediatric Handbook

3rd Edition

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Preface

This protocol was prepared by Dr Neetu Vashisht, building on the work of previous editions and the work of Dr R S Beri, Dr Nirmal Kumar, Dr Vineet Tyagi and Dr Jyotsna James.

The First Edition was published in 2003 and the Second Edition in 2004. This third edition has been a long time coming.

The 3rd edition is in the format of a web-based-protocol that allows up-dating and ever-greening. We will appreciate comments and suggestion for corrections at all times. You can send these to Puliyel@gmail.com

This book of protocols adapts some standard protocols laid out by others, but elsewhere it merely accepts them without change. Acknowledgement in each instance would by unwieldy. References are quoted mostly for controversial recommendations only.

We changed the title for this edition. It is hardly a book of protocols. It is more a handbook – a ready reckoner. We used the 'dummy yardstick' to decide what goes into the book and what goes out. Instructions were simplified that we could understand them ourselves. The new book of protocols is called – Pediatric Handbook

Jacob Puliyel
Feburary 2011

Contents

Drugs and Infusions

DRUG	DOSE	CONCENTRATION IN VIAL	DILUTION	INFUSION RATE
DOPAMINE	5-20 microgms/kg/min	40mg/ml	(Wt × 6× 3) mg dilute in 30 ml NS	1ml/hr =10mcg/kg/min
DOBUTAMINE	5-20 microgms/kg/min	25mg/ml	(Wt × 6× 3) mg dilute to 30 ml NS	1ml/hr =10mcg/kg/min
ADRENALINE	0.1-1 microgms/kg/min	1mg/ml	(Wt × 0.6) mg dilute in 10 ml NS	1ml/hr =1mcg/kg/min
FENTANYL	1-4 microgms/kg/hr	50 micrograms/ml	(Wt × 40) mcg dilute in 40 ml NS	1ml/hr =1mcg/kg/hr
MORPHINE	10-20 microgm/kg/hr	15 mg/ml	(Wt × 0.5) mg dilute in 50 ml 5% Dextrose	1ml/hr =10mcg/kg/hr
MIDAZOLAM	1-24 microgms/kg/min	5 mg/ml	(Wt × 0.6×5) mg dilute in 50 ml NS	1ml/hr =1mcg/kg/min
VECURONIUM	1.5-2.5mic/kg/min or o.09-0.12mg/kg/hr	As powder, 10 and 20 mg, dilute 10 mg vial in 2 ml NS (i.e 5mg/ml)	(Wt X0.6 X 5) mg dilute in 50 ml NS	1ml/hr = 1 mcg/kg/min
NOREPINEPHRINE	0.1-1 microgms/kg/min	1mg/ml	(Wt × 0.6) mg dilute in 10 ml NS	1ml/hr =1mcg/kg/min
VASOPRESSIN	0.02 to 0.06 unit/kg/hour	20 units / ml	1 unit/kg in 50 ml 5% dextrose	1-3 ml/hour
MILRINONE	Load 0.5 mcg/kg in 10 minutes follow by 0.375 to 0.75mcg/kg/min	1mg/ml	Wt X 0.6 mg dilute in 10 ml NS	1ml/hr = 1 mcg/kg/min
PROSTAGLANDIN	0.05-0.1 microgms/kg/min May need to go up to 0.4 microgram/kg/min	0.25mg/ml or 250mcg/ml or 500mcg/ampoule (1 ampoule = 2ml = 0.5mg)	(Wt × 0.6 × 0.3) mg dilute in 30 ml NS Works well for babies less than 2.5 kg. ---------- For 5 kg child add to 15 ml NS (Wt × 0.6 × 0.15) ---------- For 4 kg child add to 20 ml (Wt × 0.6 × 0.2) ---------- For 3 kg child add to 25 ml (Wt × 0.6 × 0.25)	1ml/hr =0.1mcg/kg/min
NITROGLYCERINE	0.5mcg/kg/minute - 5mcg/kg/minute Increase every 5 minutes	5mg/ml (10 ml vial = 50 mg)	(Wt × 0.6) mg dilute in 10 ml dextrose	1ml/hr =1mcg/kg/min Start at 0.5ml/hour. Increase every 5 minutes by 0.5ml/hour
NITROPRUSSIDE	0.3mcg/kg/minute to 4mcg/kg/minute	25mg/ml	(Wt X 0.6 X 3) mg dilute in 30 ml 5%D	1ml/hour =1mic /kg/min
KETAMINE **Ketamine IM**	5-20 mic/kg/min	50mg/ml	Wt X 3 X 3 mg dil in 30 ml NS 1.5 to 2 mg/kg IM X 1 dose	1 ml/hr= 5 mic/kg/min

SILDENAFIL **Bosentan** **Niedipine** **Amlodipine**	5-8mg/kg/day given 8 hourly 1mg/kg/dose tid (IJP 2015: page 1131) 2mg/kg BD 2-5 mg/kg/day in 3 divided doses 2.5 – 5 mg/kg/day in BD doses	Available as tablets , suspension to be made from pharmacy , as desired		
Adenosine (SVT)	0.1mg/kg (max 6 mg as first dose). Repeat with 0.2mg/kg if needed - in absence of response (max 12 mg as repeat dose)	3mg/ml(2ml ampoule)	To be administered as **rapid IV push** followed by NS flush. Dilute 1ml adenosine in 2 ml normal saline as stock solution. (1mg/ml) USE 0.1 to 0.2 ml per Kg	
Amiodarone (SVT)	5mg/kg IV in 10-30 minutes. Repeat if needed. Followed by continuous infusion of 5 mic/kg/min upto a max of 10mic/kg/min	50mg/ml	For infusion: Wt X 3 X 3 mg dilute in 30 ml NS	1 ml/hr= 5 mic/kg/min
Lignocaine	Loading dose:1mg/kg followed by continuous infusion of 20-50mic/kg/min	100mg/5 ml or 20mg/ml	For infusion Wt X 3 X 12 mg dilute in 30 ml NS	1 ml/hr= 20 mic/kg/min
Procainamide (SVT)	Loading dose :10-15mg/kg max of 1g over 30 to 60 minutes. Followed by continuous infusion of 30-80mic/kg/min	100mg/ml or 500mg/ml	For infusion Wt X 4.5 X 12 mg dilute in 30 ml NS	1 ml/hr= 30 mic/kg/min
Aropine	0.02mg/kg (min 0.1mg, max 0.5 mg in smaller children and 1mg in adolescents)	0.1mg/ml		
Digoxin	LOADING DOSES **Preterm neonate** IV: 15-30 mic/kg, Oral:20-30mic/kg **Term neonate** IV: 20-30mic/kg, Oral: 25-35mic/kg **1-2 Years** IV: 30-50 mic/kg, Oral:40-50mic/kg **2-5 Years** IV: 25-35mic/kg, oral:30-40mic/kg **5-10 Years** IV: 5-30 mic/kg, Oral: 20-35mic/kg	MAINTAINENCE DOSES Preterm neonate IV: 4-9- mic/kg/day Oral: 4-12mic/kg/day Term neonate IV: 6-8mic/kg/day Oral: 6-10mic/kg/day 1-2 Years IV: 8-10 mic/kg/day Oral: 10-15mic/kg/day 2-5 Years IV: 6-8mic/kg/day, Oral: 8-10mic/kg/day 5-10 Years IV: 4-8 mic/kg/day, Oral:5-10mic/kg/day	Available as Inj:100,250mic/ml Elixir: 50mic/ml	

	Give half dose stat followed by ¼ dose twice in 8-12 hrs	Divide oral maintenance doses in 2 doses to 4 doses		
Carnitine	50 mg/kg as loading dose followed by 50mg/kg/day as maintenance in 4 or 6 divided doses	100mg/ml solution for oral use or 200mg/ml for IV use		
Baclofen	2-7 years age oral route: 10-15 mg/day, titrate to effect and increase every 3 days by 5-15mg/day 8 years age: Titrate to effect, max dose of 60mg/day	Available as tablets in strengths of 10,20 mg		
Enoxaparin (Low molecular weight Heparin)	Prophylaxis in > 2 months age for DVT or pulmonary embolism: 0.5mg/kg SC in 2 divided doses Treatment of the same: 1mg/kg SC in 2 doses. Titrate to desired anti factor Xa level (0.1-1u/ml) **Do not administer IV or IM**	100mg/ml only for Sub Cutaneous administration only		
Levothyroxine	0-6 months:8-10mic/kg/day 6-12months:6-8mic/kg/day 1-5yrs:5-6mic/kg/day 6-12yrs:4-5mic/kg/day >12yrs:2-3mic/kg/day	Tablets strengths: 25, 50, 75, 100, 125, 150, 175, 200, 300 mcg		
Enalapril	Start with oral dose of 0.1mg/kg/day in 2 divided doses (max 5mg) Titrate upto 0.5mg/kg/day in 2 divided doses (max 40mg/day)	Available as tablets in strengths of 2.5, 5, 10, 20 mg.		
Nifedipine	0.6-0.9mg/kg/day PO in 2 or 4 div doses Hypertensive emergency: 0.25-0.5 mg/kg/dose PO/Sublingual (max 10 mg) can repeat in 4-6 hrs	Available as capsules 10, 20 mg		

Read "add in 30 ml NS" to mean:
Add drug to normal saline (NS) to reach desired volume of 30 ml.
Similarly for Dextrose (D).

Status Epilepticus

- Oxygen
- Dextrose infusion

0-5 Minutes	IV **Lorazepam** in doses of 0.1 mg/kg/dose Or **Medazolam** 0.2mg/kg/dose
5-10 Minutes	Repeat above dose of IV **Lorazepam or Medazolam**
10-30 Minutes	IV **Phenytoin** in dose of 20mg/kg (1g max) (over 20 minutes) @ 1mg/kg/min **OR** Inj **Fosphenytoin** dose 20 mg/kg of Phenytoin equivalents. (Can be infused three times faster @ 3 mg/kg/min)
35 Minutes	Loading dose of Inj **Valproate** 30 mg/kg (1:1 dilution in NS over 10 minutes) **OR** Inj **Phenobarbitone** @ 20 mg/kg (@1mg/kg/min) **OR** Inj **Leveteriacetam** @20-30 mg/kg (@ 5 mg/kg/min)
If Responds 45 Minutes	If response is seen to Valproate: Follow the loading dose by continuous infusion @ 5 mg/kg / hour (till 6 hours seizure free period) and taper by 1 mg/kg/hr every 2 hrs. Start maintenance dose of Valproate @ 10 mg/kg/dose 8 hourly when tapering Valproate.
No response 45 Minutes	Consider elective **intubation** at this juncture. **Propofol** infusion 2-5 mg/kg IV bolus followed by 1-4 mg/kg/hr **OR** **Midazolam** Infusion 2-24 mcg/kg/min (after 24 hr seizure free period taper by 1 mic/kg/min every 3 hours) **OR** **Thiopentone** infusion Of 2-4 mg/kg bolus followed by 2-4 mg/kg/hr infusion (Titrate with EEG, increments of 1 mg/kg/hr every 30 minutes upto max of 6 mg/kg/hr or till burst suppression pattern attained)

- Reduce Intra cranial tension
  - Mannitol
  - Hypertonic saline
  - Diuretics
  - Hyperventilate

ACTH 0.04-0.06 mg (1.6-2.4 IU)/kg/day and a total ACTH dose of 1.1-1.5 mg (44-60 IU)/kg resulted in better mental development than smaller doses of ACTH (Ito M Pediatr Neurol. 1990;6:240-4.

Status Asthamaticus

<table>
<tr><td colspan="2">Oxygen + Nebulised beta agonists + IV Steroids + inhaled Ipratropium bromide

IV Hydrocort @10mg/kg loading dose followed by maintenance dose of 5mg/kg/dose Q 6 hourly
OR
IV Methylprednisolone @ 2mg/kg as loading dose followed by
maintenance dose of 0.5 – 1 mg/kg Q 6 hourly</td></tr>
<tr><td colspan="2">Reassess in 1 hour</td></tr>
<tr><td rowspan="6">Good response</td><td>No response</td></tr>
<tr><td>PICU Transfer</td></tr>
<tr><td>IV Terbutaline in bolus dose of 10 mcg/kg in 30 minutes
followed by IV infusion of 0.1-4 mcg/kg/min
OR
SC Terbutaline 0.005mg/kg 6 hourly (max 0.3 mg)
(It is to be noted that the sc and iv preparations of terbutaline are separate and cannot be interchanged for administration)</td></tr>
<tr><td>OR
IV Salbutamol 15mcg/kg IV bolus over 10 minutes
(Reference: Ped Critical Care Med 2002)</td></tr>
<tr><td>OR
IV Magnesium Sulphate 25-75 mg/kg as infusion over 20 Minutes
Dilute to 30 ml (D5 OR N/5)
(max dose is 2 – 2.5 g/dose)</td></tr>
<tr><td>OR
IV Aminophylline (with O_2 on flow) at loading dose of 5-6 mg/kg
followed by infusion @ following rates:
2 – 6 months: 0.4 mg/kg/hr
6 – 11 months: 0.7 mg/kg/hr
1 – 9 year: 1 mg/kg/hr
9 – 12 year: 0.9 mg/kg/hr
12 year & above: 0.5 mg/kg/hr
Not to exceed continuous infusion rate > 25 mg/minutes</td></tr>
<tr><td>OR
SC Adrenaline 0.01 mg/kg -0.3 mg (max dose)
(every 20 minutes for 3 doses)
Neutralize Metabolic Acidosis (Base Excess if more than 10) with $NaHCO_3$</td></tr>
</table>

$MgSO_4$ 50 mg/kg (0.1ml/kg) over 30 minutes

Methylprednisolone 2 -3 mg/kg/day

Turbutaline 5-10 ug/kg loading over 10 minutes
Follow by 0.4 ug/kg/minutes
Increase by 0.2 ug/kg/minute every 10-15 minutes
Maximum 10ug/kg/min

Asthma Ventilation

Ventilation indications

- Exhaustion
- Lethargic
- Silent chest
- Worsening SpO2

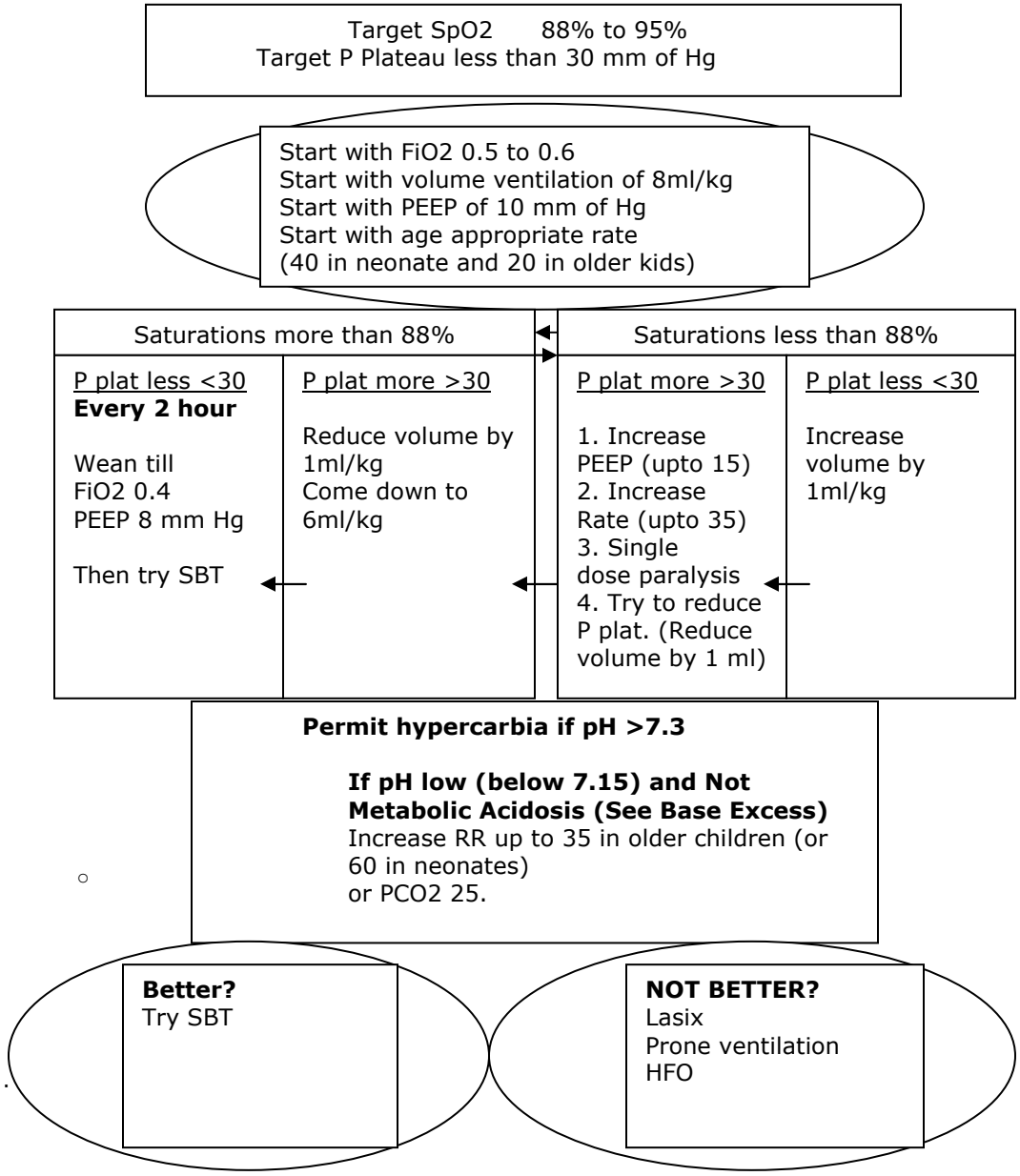
Strategy

- Use ketamine
- Low PIP (low volume)
- Slow rate
- Low PEEP
- Allow permissive hypercarbia.

Ventilation and ARDS Management

Definition ARDS = PaO_2 / FiO_2 < 200.
(ALI = PaO_2 / FiO_2 < 300)
ARDS = Saturation less than 100% (PaO_2 less than 100) in 50% O_2

- Acute onset respiratory distress
- Radiographic infiltrates (bilateral patchy, diffuse or homogenous consistent with pulmonary edema like in CCF)
- Normal heart size suggesting absence of CCF



Spontaneous Breathing Trial (SBT)

$FiO_2 \leq 0.40$ and PEEP ≤ 8.

Systolic BP ≥ 75 + Age mm Hg.

If all above criteria are met for at least 12 hours:
Try SBT up to 2 hours
Put on FiO2 < 0.5 and PEEP < 5:

Place on T-piece with CPAP ≤ 5 cm H_2O

OR

PEEP ≤ 5 cm H_2O; PSV < 10 (ET size 3) and <5 for adult ET

Assess for tolerance as below for up to two hours.

a. $SpO_2 \geq 90$: and/or $PaO_2 \geq 60$ mmHg
b. Spontaneous $V_T \geq 4$ ml/kg PBW
c. RR ≤ 35/min
d. pH ≥ 7.3
e. No respiratory distress (distress= 2 or more)
   - HR > 120% of baseline
   - Marked accessory muscle use
   - Abdominal paradox
   - Diaphoresis
   - Marked dyspnea

Reference NIH NHLBI ARDS Clinical Network

Volume ventilation
Broad target guidelines

Start with 8 ml / kg
Safe volume is 6 ml / kg

Minute Ventilation is 200 ml/kg/minute in newborns

Going down to 100 ml/kg in adults

Peritoneal dialysis

Monitor Vitals
Sedate with Benzodiazepines
Empty bladder, prepare abdomen
Pre-warm PD fluid to body temperature
Add Heparin (1000 u/l) to PD fluid Inject PD fluid through 14 g needle into peritoneal cavity initial infusion is 20 ml/kg
Pass stylet through needle and remove needle, to thread 14 gauge canula over stylet
Initial infusion volume of 15-30 ml/kg, Increase upto 50-70 ml/kg as tolerated. (usual amount is 40-50 ml/kg)
Stop Heparin after 2 cycles if returns are clear
No Potassium to be added to PD fluid unless Serum k < 5 meq/l
Dwell time of 30-45 mins
Outflow time of 15-20 mins
1 Cycle/hr
Remove PD Catheter after 3-5 days
Monitoring: · Monitor Vitals · Monitor Urine output · Renal function and electrolytes at the end of 3 rd , 10 th and 20 th cycles · Blood Gas at the end of 3rd, 10th and 20th cycles · 4 Hourly Blood Glucose · Blood Counts, Gram staining, Cultures of drained PD fluid once or twice a day · Blood cultures at the end of PD · PD catheter tip for fungal smear and culture

Septic Shock

The following should be achieved in the first hour of management:

1. Airway
2. Breathing (Oxygen)
3. Circulation
   Fluid Bolus 20 ml/kg with Isotonic Crystalloids, going up to 60 ml/kg
   (may use Colloids instead of Crystalloids)
4. Correct Hypoglycemia and Hypocalcemia
5. Start Antibiotics
6. Stress dose hydrocortisone @ 2mg/kg iv stat, followed by 2 mg/kg/day for 48 hours, as continuous infusion

Fluid Responsive: (responding to 2-3 fluid boluses)

- Capillary filling time improves to< 2 seconds
- Peripheral core temperature difference becomes < 3 degrees C Heart rate normalizes
- Urine output improves to > 1 ml/kg/hr
- Consciousness improves
- Serum lactates decrease
- Base deficit decreases
- B P normalises

NON FLUID RESPONSIVE

NORMOTENSIVE $ScVO_2$ <70%	**HYPOTENSIVE VASODILATED** $ScVO_2$>70% Warm Shock Sepsis (High pulse volume)	**HYPOTENSIVE VASOCONSTRICTED** $ScVO_2$ <70% Cold Shock (Low pulse volume)
DOPAMINE 5- 20mcg/kg/min **DOBUTAMINE** 5- 20mcg/kg/min	**DOPAMINE** 5- 20mcg/kg/min **DOBUTAMINE** 5- 20mcg/kg/min	**DOPAMINE** 5- 20mcg/kg/min **DOBUTAMINE** 5- 20mcg/kg/min
HYDROCORTISONE **Dilute 1mg in 1ml dextrose** Give 1mg/kg over 5 minutes follow by 1mg/kg Q8H over 30 minutes (Day 1) 0.5mg/kg Q12H (Day 2) 0.25mg/kg Q12H (Day 3) 0.125mg/kg Q12H (Day 4) **Nelson suggests giving** Stress dose 50 mg/kg Max dose 300mg	**HYDROCORTISONE** **Dilute 1mg in 1ml dextrose** Give 1mg/kg over 5 minutes follow by 1mg/kg Q8H over 30 minutes (Day 1) 0.5mg/kg Q12H (Day 2) 0.25mg/kg Q12H (Day 3) 0.125mg/kg Q12H (Day 4) **Nelson suggests giving** Stress dose 50 mg/kg Max dose 300mg	**HYDROCORTISONE** **Dilute 1mg in 1ml dextrose** Give 1mg/kg over 5 minutes follow by 1mg/kg Q8H over 30 minutes (Day 1) 0.5mg/kg Q12H (Day 2) 0.25mg/kg Q12H (Day 3) 0.125mg/kg Q12H (Day 4) **Nelson suggests giving** Stress dose 50 mg/kg Max dose 300mg
	NOREPINEPHRINE 0.05 to 1.5 mcg/kg/min	**EPINEPHRINE** 0.1 to 3 mcg/kg/min

MILRINONE 50 mcg/kg (0.05mg/kg)] Preparation: 1mg/ml (Sufficient for 20 kg) Follow by 0.5 to 1mcg/kg/minute (Wt X 0.6)mg dilute in 20ml NS Run at 1ml/hr= 0.5mcg/kg/min **NITROPRUSSIDE** 0.5 to 4 mcg/kg/min (can be used only in normotensive cold shock and not in hypotensive	**VASOPRESSIN** 0.02 to 0.06 u/kg/hour Prepare 20 units / ml Add 1 unit per kg in 50 ml of 5% dextrose Dose 1-3 ml/hour	

Hypokalemia (<3.5 mEq/l)

ECG changes in severe Hypokalemia: Prominent u waves, diphasic T waves, ST segment depression, apparent QTC prolongation, PR interval prolongation, sino-atrial block.

Serum Potassium	***Infusion Rates***
2.5-3.5	Add IV Potassium 40 mEq/l to 60 mEq/l 1 ml KCl provides 2O mEq/L if added to 100 ml of Potassium free fluid.
< 2.5 OR Severe Symptomatic Hypokalemia	**Speak to Consultant** Rapid correction 0.3-0.5 mEq/kg **Run in 1 hour and STOP.** Remember this is nearly 200mEq/L (Central vein) **Wt × 0.5/2 ml KCl dilute in 5%Dextrose** Add this to 50 ml in child less than 10 kg Add to 100 ml in 10 to 20 kg child Add to 150 ml in 20-30 kg child Add to 200 ml if more than 30 kg Run in 1 hour

Hyperkalemia (>6 mEq/l)

Normal ECG (Potassium = 6 - 7 mEq/l)	**Abnormal ECG** (Potassium >7 mEq/l) (peaked T waves, loss of p waves, widened QRS complex, sine waves, AV blocks, bradycardia, ventricular arrhythmias)
1. Stop all Enteral AND Parenteral Potassium 2. Sodium polysterene resin 0.25 to 1gm/kg orally or rectally one to 4 times daily	1. IV **Calcium Gluconate** in dose of 1 ml/kg/dose over 3-5 minutes. Repeat the second dose after 10 minutes if required. 2. IV **Sodium Bicarbonate** 1-2 mEq/kg over 5- 10 minutes 3. Subcut **Crystalline Insulin** in doses of 0.1 u/kg WITH 2 ml/kg of 25% **Dextrose** (0.5 g/kg) in 30 minutes. Repeat dose in 30-60 minutes OR begin a continuous infusion of Insulin at 0.1u/kg/hr + 1-2 ml/kg/hr of 25 % dextrose 4. **Salbutamol inhaled** OR IV Salbutamol of 4 Microgram/kg in 20 minutes 5. Sodium polysterene resin 1gm/kg orally or rectally 6. Dialysis

Hyponatremia (Serum Sodium <130 mEq/l)

GI loss And Dehydration	Water Intoxication	SIADH	Renal Salt Wasting
High BUN High Urine Osmolarity Oliguria	• Fe Na >1 % • Low Urine Osmolarity • Polyuria	• Fe Na >1% • High Urine Osmolarity > 100 mOsm/l • Oliguria	• Fe Na >1% • High Urine Osmolarity • Polyuria
Replace deficit with 0.9% NaCl over 48 Hours	Restrict Water + Replace Urine Sodium Losses	Restrict Water to 2/3 Maintenance using 0.9% NaCl	Replace Urine Sodium Losses + Replace Water Deficit as 0.9% NaCl

Treatment of Hyponatraemia

SYMPTOMATIC (seizures, deeply comatose, depressed respiration)

Consider intubation and ventilation

3% NS through central vein (don't delay while administering anticonvulsants simultaneously): to be given as 2 ml/kg over 15-30 minutes (1ml/kg of 3% NS raises serum sodium by 1 mEq/l).

Repeat infusion if symptoms persists up to 3 times.

Aim is to raise the plasma sodium till CNS symptoms resolve and/or change in plasma sodium <12 mmol/l/24hrs or plasma sodium becomes 125 mmol/l.

- Risk of Central Pontine Myelinolysis if rapidly corrected especially in long standing hyponatraemia.
- Acute hyponatraemia is more symptomatic and is also safer to treat with hypertonic saline.

ASYMPTOMATIC

Treatment with half normal saline is often all that is needed.

- Restrict fluids to 60% of maintenance (IVF or enteral feeds)
- 3% NS to achieve change in plasma sodium by 1-2 meq/l/over 30 minutes
- Lasix if edematous

Hypernatremia

Free water deficit estimation (FWD) = 0.6 × Wt × (1 – 145/current sodium)

(As total body water is 60% of the body weight)

STRATEGY

Use Maintenance fluid +additional 30% of maintenance

(for correction of hypernatraemic dehydration slowly)

Choice of fluids In Hypernatremia:

- Replacement fluid in absence of complicating factors: Half Normal Saline
- If with shock: NS OR 5% Albumin
- If due to Sodium overload: add Sodium free fluid like 5% dextrose in addition to loop diuretic
- If associated with Hyperglycemia: use 2.5 % dextrose.
- **Do not use Insulin for hyperglycemia as that can cause precipitous fall in Plasma Glucose/Osmolarity with subsequent cerebral edema.**

  - Monitor Serum Sodium 4 hourly
  - Correct concomitant Hypocalcemia
  - Add 40mEq/l of KCl if patient passes urine well.

- ✓ If Sodium > 200mEq/l: Peritoneal Dialysis
- ✓ If associated with Diabetes Insipidus: use DDAVP, Diuretics, VASOPRESSIN.

Hypocalcemia

ECG changes in Hypocalcemia: prolonged QTc interval

Asymptomatic		Symptomatic
No Bolus. 10% Ca Gluconate 8ml/Kg/Day **OR** 80 mg/Kg/Day Elemental Calcium PO for 2 Days		10% Cal Gluconate as Bolus of 2ml/kg diluted in 1:1 dilution using 5%DEXTROSE. CAN RUN IN 10 TO 20 MINUTES
Repeat Serum Calcium		Repeat Bolus if no response occurs
If normal,taper to 4ml/kg/day of IV Calcium **OR** 40 mg/kg/day elemental Calcium PO for 1 Day		Follow it with IV infusion of 8ml/kg/day for 48 hrs of Ca Gluconate
		Taper to 4ml/Kg/day of Cal Gluconate OR 40 mg/kg/day of elemental Calcium for 1 Day

Hypocalcaemia in an Older Child

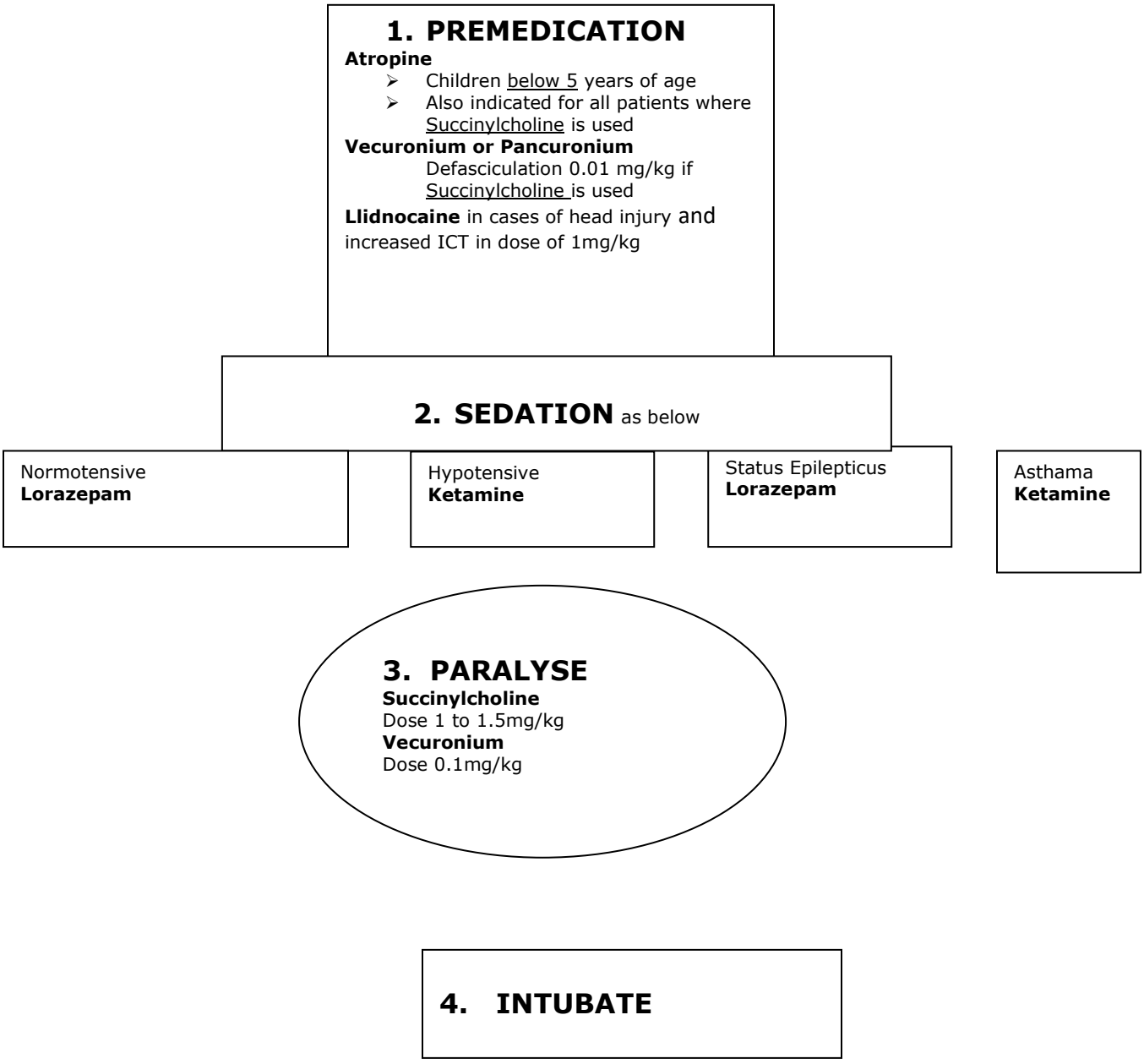
- 1-2 ml/kg of 10% calcium gluconate (100-200 mg/kg) IV stat in 15-20 minutes under cardiac monitoring
- Followed by 20-50mg/kg/hr (0.2-0.5 ml/kg/hr)

Run this for 4 hours only.

Check serum levels before starting infusion for next 4 hours.
Stop infusion when calcium levels reach 8mg%

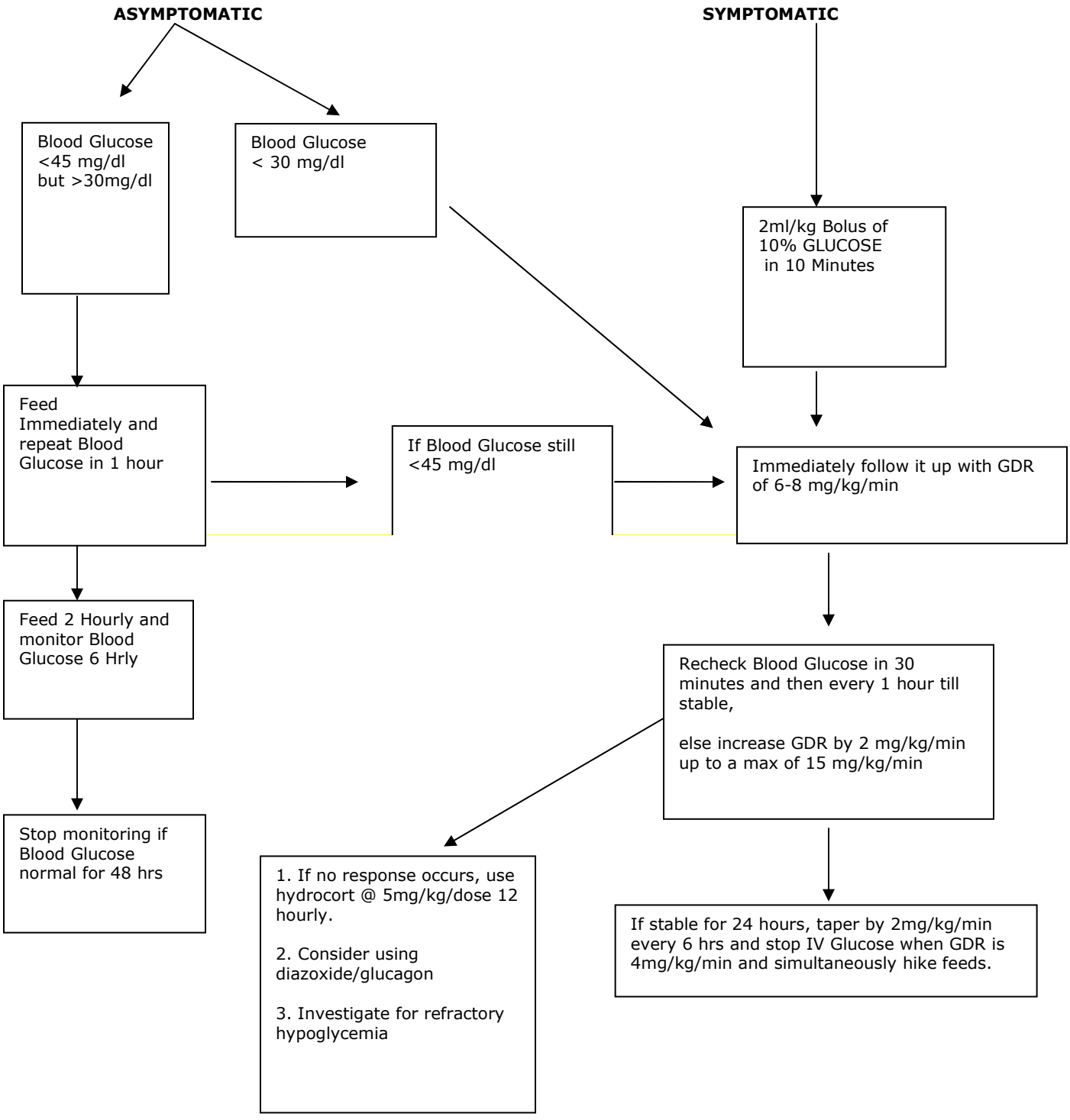
May need to supplement with magnesium also

Rapid Sequence Intubation



Neonatal Hypoglycemia (below 45mg/dl)

$$\text{Glucose Delivery Rate (GDR) (mg/kg/min)} = \frac{\%\ \text{dextrose} \times \text{Volume (ml/kg/day)}}{144}$$



TPN Made Simple

Glucose 10% or 12.5%
Isolyte P for maintainance electrolytes
Heparin 1 unit/ml of above
MVI add 1 ml to days fluid

Aminoacid
From day 1 if enteral feeding not anticipated for 5 days
Add 15 ml to 85 ml AA to Isolyte P
Day 3 add 20 ml AA to 80 ml Isolyte P
Day 5 add 25 ml AA to 75 ml Isolyte P
Day 7 add 30 ml AA to 70 ml Isolyte P
Run through long line
Don't break the line for another infusion

After 1 days lipids may be added
Infuse 2.5ml/kg of 20% Intralipid

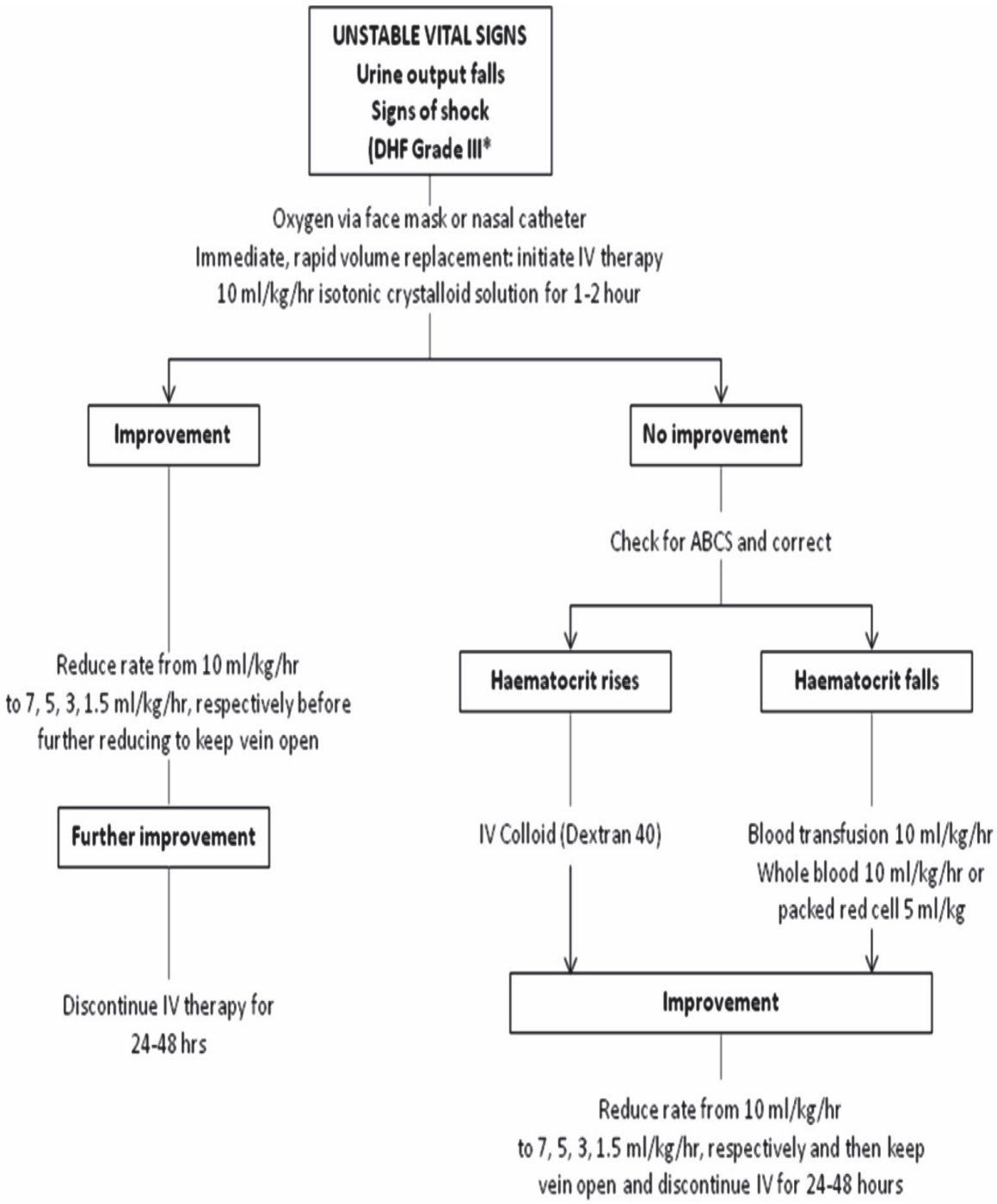
Day 3 run 5 ml/kg (0.2ml/kg/hour)
Day 5 run 7.5 ml/kg (0.3ml/kg/hour)
Day 7 run 10 ml/kg (0.4 ml/kg/hour)
Day 9 run 12.5 ml /kg (0.5ml/kg/hour)
Day 11 onwards run 15 ml/kg (0.6 ml/kg/hour)
This is the maximum of 3 gm/kg/day
Run lipid through a peripheral line

Dengue

Danger signs

- Persistent vomiting, not drinking.
- Severe abdominal pain.
- Lethargy and/or restlessness, sudden behavioral changes.
- Bleeding: Epistaxis, black stool, haematemesis, excessive menstrual bleeding, dark colored urine (haemoglobinuria) or haematuria.
- Pale, cold and clammy hands and feet.

WHO Protocol for fluid management on next page



*In case with prolonged/profound shock (DHF grade IV) rate IV is 20 ml/kg/hr for 10-15 minutes. Or until BP is restored, then reduce the rate to 10 ml/kg/hr

PICU Antibiotic guide

A child being shifted to PICU for worsening sepsis may need up gradation of antibiotics after discussion with the consultant. Following system may be used.

GRADE 1:

Cefotaxime / Ceftriaxone with or without Amikacin / Gentamycin
Amoxycillin with or without Clavulinic acid
Ampicillin with or without Gentamycin

GRADE II

Piperacillin tazobactam (poor CSF penetration) + Amikacin
Cefoperazone /sulbactam (Magnex) + Amikacin
Ceftazidim (Fortum) with or without vancomycin / Linizolid (compromised CSF Penetration)

GRADE III

Meropenem / Imipenam cilastatin + Vancomycin / Linizolid
Empirical addition of disease/ system specific antibiotic (ATT/ septran / clindamycin / acyclovir / fluconazole / amphotericin)

GRADE IV (Must be avoided in the absence of sensitivity evidence / avoid as single agent)

Colistin
Polymyxin B
Phosphomycin

Other supportive care / agent: only after multidisciplinary or departmental meeting

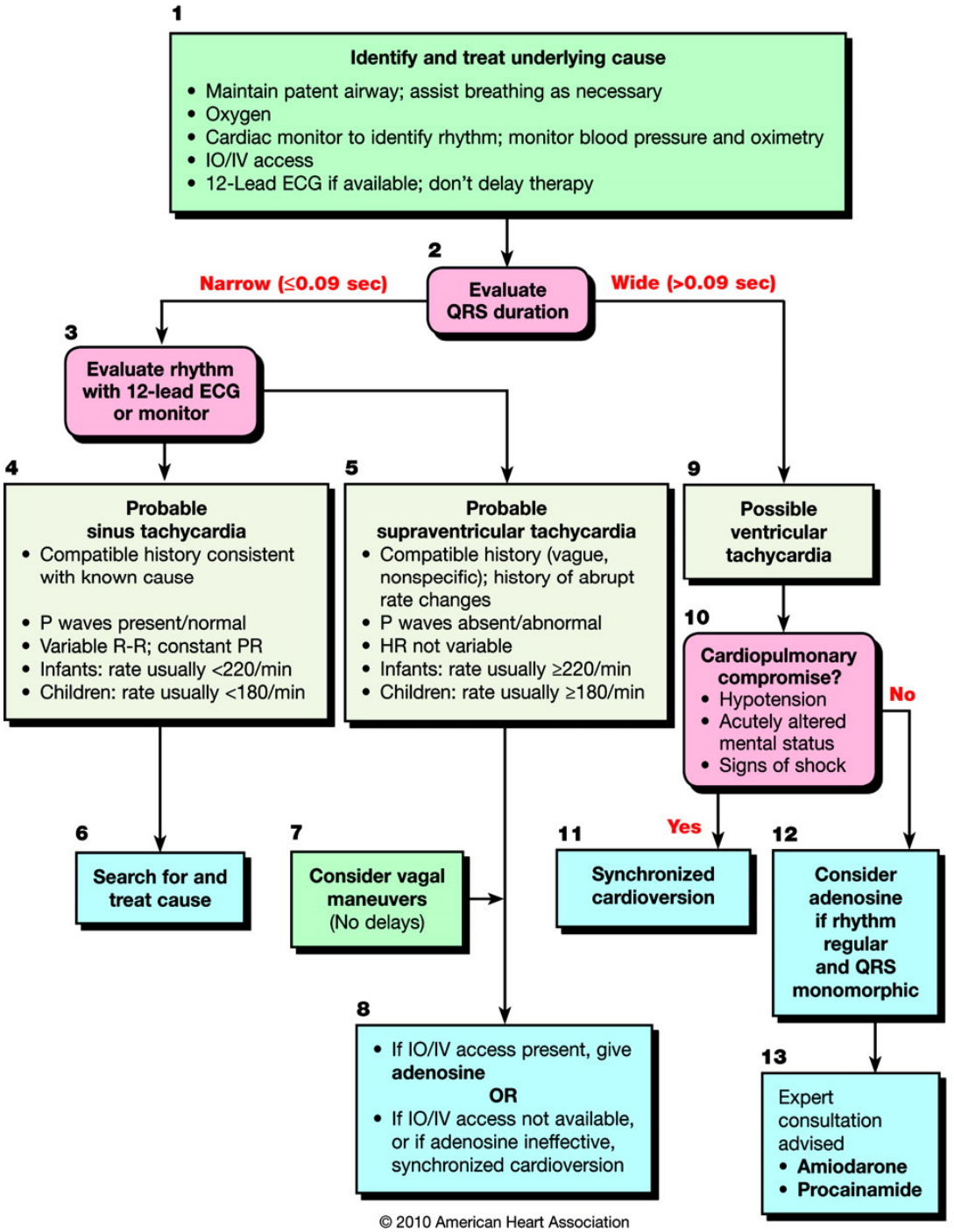
Exchange transfusion for sepsis
IVIG for sepsis

Miscellaneous

PEF	**(5 Height in cm) - 400(+/-50)**
Systolic BP	**70 + (Age X 2)**
Diastolic BP	**55 + Age**
Endotracheal tube size	**For Child over 1 year = (Age [Y] divided by 4) + 4 Preterm 2.5 Term 3 1 year 4**
Endotracheal tube length	**(Age[Y] divided by 2) + 12 ET size X 3**
Cricothyroid needle	**14 gauge needle with 3 mm ET adapter**
Drug infusion calculation	**(Weight 0.6 mg) Add to 10 ml Run 1 ml/hour = 1 microgram/kg/minute**
Empyema	**Streptokinase 2.5 to 3 lakh units in 100 ml saline. Retain 4 hours (Cost Rs 1500)**
SaO_2 between 90 and 60%	**$SaO_2 - 30 = PaO_2$**
Weight in <12 months of age	**Age(in months) +9/2**
Weight (1-6 yr age)	**(Age X2)+ 8**
Weight(> 6 yrs age)	**(Age X 7)-5/2**
Height(>2 yrs)	**(Age X 6) +77**
pAo_2	**(760-47) X FiO_2 - $paCO_2$/0.8**

Subcutaneous effusion of IV fluid especially Calcium
Apply Nitroglycerine ointment locally every 4 hours

Pediatric Tachycardia
With a Pulse and Poor Perfusion



Doses/Details

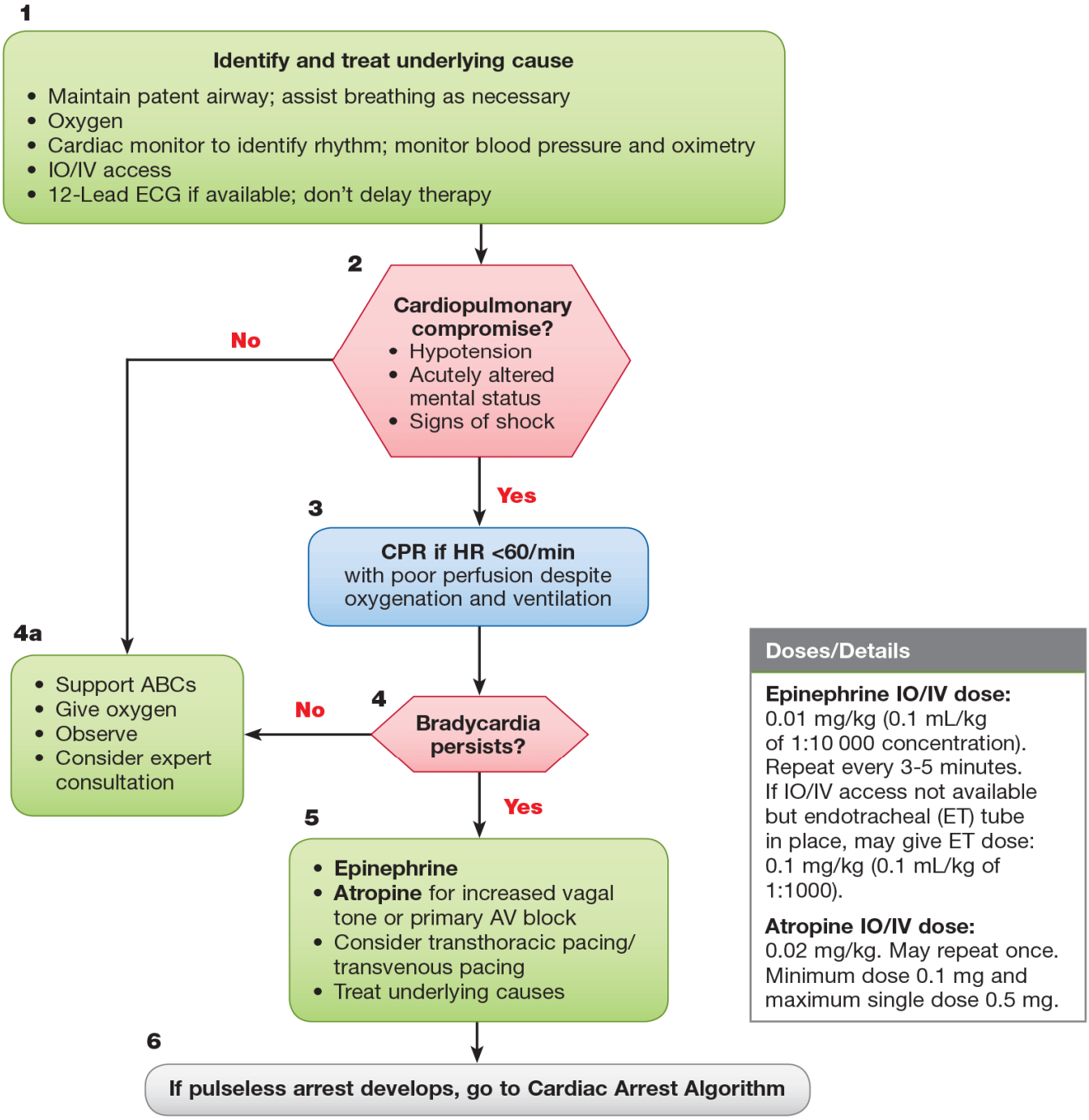
Synchronized Cardioversion:
Begin with 0.5-1 J/kg; if not effective, increase to 2 J/kg.
Sedate if needed, but don't delay cardioversion.

Adenosine IO/IV Dose:
First dose: 0.1 mg/kg rapid bolus (maximum: 6 mg).
Second dose: 0.2 mg/kg rapid bolus (maximum second dose 12 mg).

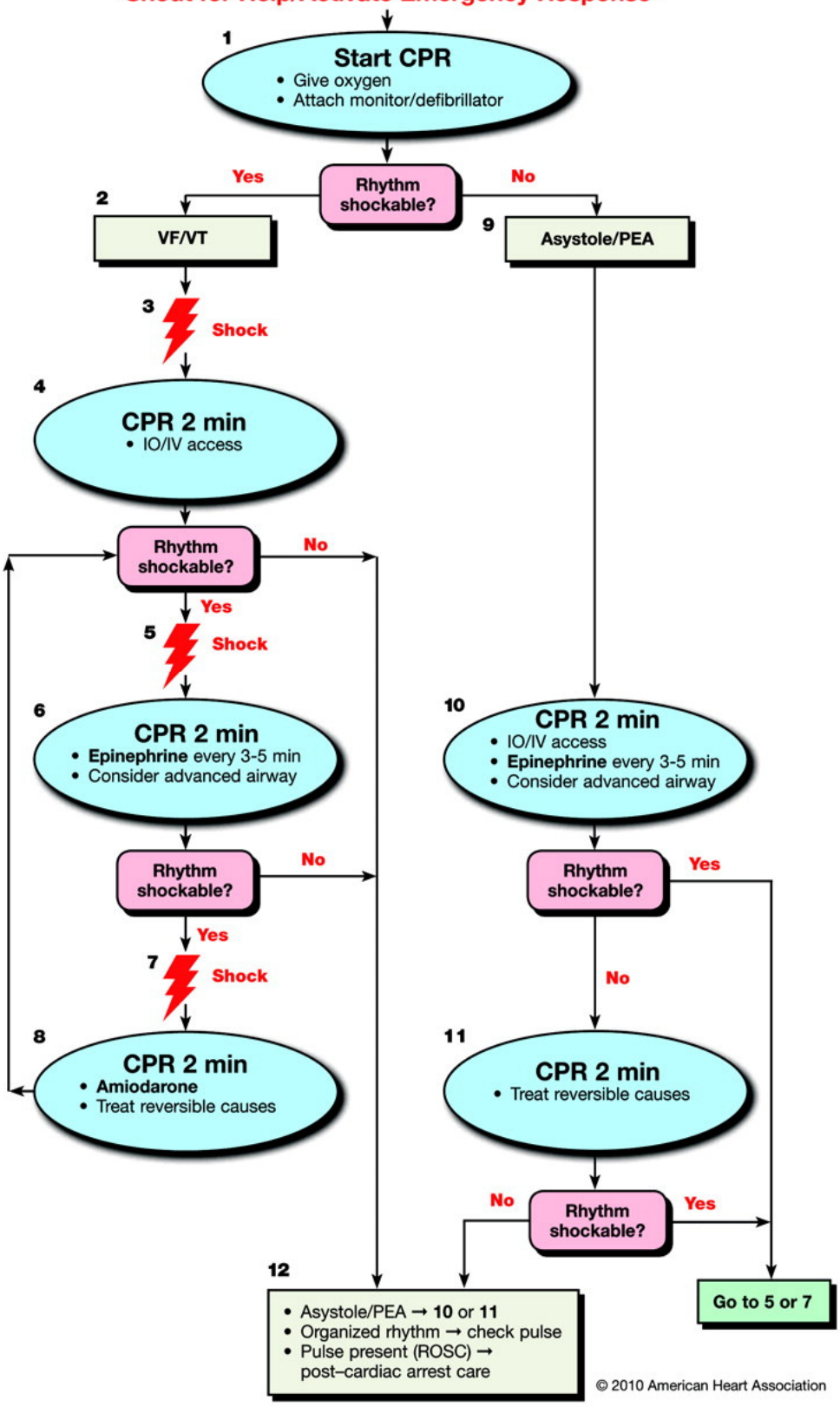
Amiodarone IO/IV Dose:
5 mg/kg over 20-60 minutes
or
Procainamide IO/IV Dose:
15 mg/kg over 30-60 minutes

Do not routinely administer amiodarone and procainamide together.

Pediatric Bradycardia With a Pulse and Poor Perfusion Algorithm



Pediatric Cardiac Arrest



Doses/Details

CPR Quality
- Push hard (≥1/3 of anterior-posterior diameter of chest) and fast (at least 100/min) and allow complete chest recoil
- Minimize interruptions in compressions
- Avoid excessive ventilation
- Rotate compressor every 2 minutes
- If no advanced airway, 15:2 compression-ventilation ratio. If advanced airway, 8-10 breaths per minute with continuous chest compressions

Shock Energy for Defibrillation
First shock 2 J/kg, second shock 4 J/kg, subsequent shocks ≥4 J/kg, maximum 10 J/kg or adult dose.

Drug Therapy
- **Epinephrine IO/IV Dose:** 0.01 mg/kg (0.1 mL/kg of 1:10 000 concentration). Repeat every 3-5 minutes. If no IO/IV access, may give endotracheal dose: 0.1 mg/kg (0.1 mL/kg of 1:1000 concentration).
- **Amiodarone IO/IV Dose:** 5 mg/kg bolus during cardiac arrest. May repeat up to 2 times for refractory VF/pulseless VT.

Advanced Airway
- Endotracheal intubation or supraglottic advanced airway
- Waveform capnography or capnometry to confirm and monitor ET tube placement
- Once advanced airway in place give 1 breath every 6-8 seconds (8-10 breaths per minute)

Return of Spontaneous Circulation (ROSC)
- Pulse and blood pressure
- Spontaneous arterial pressure waves with intra-arterial monitoring

Reversible Causes
- **H**ypovolemia
- **H**ypoxia
- **H**ydrogen ion (acidosis)
- **H**ypoglycemia
- **H**ypo-/hyperkalemia
- **H**ypothermia
- **T**ension pneumothorax
- **T**amponade, cardiac
- **T**oxins
- **T**hrombosis, pulmonary
- **T**hrombosis, coronary