Guideline for management protocol of Children with Fever and respiratory symptoms

Clinical presentation and relevant history

Fever ≥ 3 days

Cough, running nose, sore throat

Diarrhoea, vomiting and body ache in few patients

Fast breathing

Increased work of breathing

Family history of similar illness at present or recent past

Presence of Co-morbidity – prematurity, low birth weight, congenital heart disease, chronic respiratory disease, neurological disability, renal disease , malignancy, malnutrition and immunocompromised state.

Danger signs and criteria for hospitalization –

1. Persistent fever ≥ 3-5 days
2. Fast Breathing
3. Increased Work of breathing – Subcostal and/or intercostal retraction, flaring of alae nasi
4. SpO_2 ≤ 92% in room air
5. Decreased oral intake < 50% of normal intake
6. Urine output < 5 times in a day
7. Extrapulmonary manifestations like – Altered sensorium, convulsion, shock, myocardial dysfunction, acute kidney injury

Fast Beathing (Tachypnoea) –

Age	RR - breath/min
0-2 months	➢ 60
2 months- 12 months	➢ 50
1-5 yr	➢ 40
>5 yrs	➢ 30

Investigations –

1. Complete hemogram, CRP
2. Exclude – Covid-19, malaria (both slide and RDT), dengue,
3. Scrub typhus, enteric fever, leptospira as appropriate
4. Other relevant investigations as per clinical presentations of patients

5. Chest X-ray
6. Respiratory viral panel – if facility available

Whom to test for respiratory viral panel?

a. Hospitalized patients with oxygen requirement > 48 hours
b. Patients with severe co-morbidities (mentioned earlier)
c. Associated Extrapulmonary manifestations like – Altered sensorium, convulsion, shock, myocardial dysfunction, acute kidney injury.

If there is clustering of cases in a particular area/community – One time test can be sent to referral center. At least 5 good quality nasopharyngeal and oropharyngeal swab samples should be sent.

Treatment –

Home Management –

1.Supportive care

a. Adequate hydration and feeding.
b. ORS for diarrhoea
c. Monitoring of temperature, fast breathing, general activity, oral intake and urine output

2.Symptomatic care:

a. Paracetamol (10-15mg/kg/dose, not more than 5 times/day, minimum 4 hours gap between 2 doses)
b. Tepid sponging if required
c. Anti-histaminic if required
d. Saline nasal drops/Decongestant drops/ clearing of nose may be considered to alleviate URTI symptoms.
e. Domperidone/Ondansetron for vomiting.

3.Danger signs to be explained in details

4.Report to health care facilities if danger signs develop .

Hospital Management –

If possible, arrange respiratory isolation unit

1.**Monitoring** – Monitor temperature, RR, SpO_2, work of breathing, BP, oral intake, hydration status and urine output every 6 hrly.

2.Supportive Care

a. Adequate hydration and feeding. May need iv fluids and /or Nasogastric feeding.
b. Start oral feeding as soon as patient able to accept orally

3.Symptomatic Care:

Oral Paracetamol (10-15mg/kg/dos, (not more than 5 times/day, minimum 4 hours gap between 2 doses)

Domperidone/Ondansetron for vomiting.

4.Oxygen therapy:

A. Give supplemental oxygen through nasal prongs/ face mask if oxygen saturation is ≤ 92% in room air. Flow range in nasal prong – 1-5L/min and in mask – 5-10L/min

B. Heated humidified High flow nasal cannula (HHHFNC) with a flow of 1-2L/kg/min and fio2 of 40% if Spo2 ≤ 92% with nasal prong or mask oxygen .
C. **Target SPO2 92to 96%.** Titrate flow and FiO_2 according to response. (Increase flow by 0.5L/kg above 12kg)

D. If no response to HHFNC within 2 hours , step-up to NIV/Invasive mechanical ventilation.
E. Early mechanical ventilation if patient present with respiratory failure or GCS < 8 or hemodynamically unstable.

F. Transfer the patient to appropriate referral centre if patient require HHHFNC, or Mechanical ventilation or associated severe extrapulmonary manifestations.

5.MDI with Salbutamol and/Ipratropium may be considered in patients with pre-existing reactive airway disease who presented with wheezing.

6. Empirical antibiotics if bacterial co-infection is suspected.

7. **Oseltamivir –**

Empiric oseltamivir treatment should be started in the priority groups -

1. Hospitalized patients with progressive/severe respiratory distress
2. Patients with high risk of complication , like patients with co-morbidity

Stop if respiratory Viral Panel does not detect Influenza

Age/Body Weight	Dose	Duration	Formulation
If younger than 1 yr old	3 mg/kg/dose twice daily	5 days	Oral suspension of Oseltamivir available as 6 mg/ml strength. Capsule – 75 mg
15 kg or less	30mg twice daily	5 days	
>15 to 23 kg,	45 mg twice daily	5 days	
>23 to 40 kg,	60 mg twice daily	5 days	
>40 kg,	75 mg twice daily	5 days	

DISCHARGE CRITERIA

Patient is out of all organ support or in pre-morbid condition

Maintaining Saturation >94% in room air for 48 hours

Afebrile for 48 hours.

Accepting oral feed well.

Mother is Confident to take care at home

Follow up after 1-2 wks.

Prevention –

1. Isolation of Adult members with fever and respiratory symptoms
2. Isolate children < 2 yrs from adult members or older children with fever or any respiratory symptom.
3. Wear mask at home if having fever or any respiratory symptom.
4. Regular hand sanitization and hand washing
5. Proper surface disinfection and disposal of infected materials
6. Avoid crowded place. Maintain social distancing.

Monitoring Chart

TIME	HR	RR	WOB	CRT	BP	Temp	SpO2	FiO2	Oxygen Flow Rate	UO/ AG

Management of Critically ill patient

Critically ill patients predominantly present with respiratory distress or failure. However they may present with other organ involvement like shock, myocardia dysfunction, convulsion or acute kidney injury.

Respiratory

Severe pneumonia - Child with clinical signs of pneumonia at least one of the following:

- Central cyanosis or SpO2 < 90%
- Severe respiratory distress (e.g. grunting, very severe chest indrawing)
- Any of the general danger signs: inability to breastfeed or drink, lethargy or unconsciousness, or convulsions.
- Chest imaging may provide corroborative evidence and identify or exclude complications.

Pediatric ARDS –

- Acute onset (within 7 days of known clinical insult)
- Respiratory failure (not fully explained by cardiac failure or fluid overload) with
- Chest imaging findings of new infiltrate consistent with acute parenchymal disease with
- Exclusion of perinatal related lung disease with

- Mild – 4 ≤OI<8 , 5≤OSI <7.5
- Moderate - 8 ≤OI< 16, 7.5≤OSI <12.3
- Severe - OI ≥ 16 , OSI ≥ 12.3

Mild to Moderate –

1. Start with High Flow Nasal Oxygen (HFNO) or Non-invasive ventilation(NIV) as per the work of breathing.
2. Consider awake proning in older children > 8 years

3. **HFNO –**

- Flow rates @1.5-2L/kg/min up to 12kg, plus 0.5 L/kg/min for each kg above 12kg (to a maximum of 50 LPM) ,
- FiO_2 - 21-50% .
- FiO_2 requirement > 60% , Flow 2 ml/kg and no clinical improvement within 1-2 hrs - consider escalation to NIV
- endotracheal intubation in case the patient acutely deteriorates

4. **Non-invasive ventilation/BiPAP –**

- Nasal or oronasal mask.
- Mask should be properly fitted to minimize leak. Choose appropriate size full face mask.
- Start with PIP(IPAP) – 10, PEEP(EPAP) – 5, FiO2- 40%.
- Escalate according to work of breathing (WOB), RR, SpO2 .
- Target SpO2 – 92-96%.

- Maximum increase of support PIP (IPAP)– 15, PEEP(EPAP) – 8, FiO2-> 60% (persistently) – Escalate to Invasive Mechanical Ventilation (IMV)

Severe ARDS

5. Mechanical Ventilation Strategy - Lung protective

- Low tidal volume (5-8 ml/kg – Lower TV in severe ARDS)
- Peak pressure < 28-32 cmH2O
- Mean Airway Pressure -18-20 cmH2O, Driving pressure < 16 cmH2O
- PEEP – 6-10 cmH2O (higher in refractory hypoxia – titrate according to individual patient)
- FiO2 – May start with 100% in severe hypoxia. Target < 60% after stabilization.
- Target Spo2 88–92% for severe ARDS, Permissive Hypercapnia – Pco2 up-to 55-60 if Ph > 7.2
- Adequate Sedation- Analgesia ± Neuromuscular Blocker
- Neuromuscular blockade -Consider early for 24–48hr if Pao2/Fio2 < 150; OI ≥ 16; OSI ≥ 10
- Prone ventilation – 16 hrs/day in severe ARDS - if Pao2/Fio2 < 150; OI ≥ 16; OSI ≥ 10, especially if there is concomitant reduced lung compliance.
- If refractory, HFOV, ECMO
- Daily assessment for weaning and early extubation

6. General Supportive Care

- Restricted fluids (70-80% of maintenance), calculate fluid overload %age (FO%) and keep FO% <10%, Judiciously use diuretics.
- Enteral nutrition within 24 hours, achieve full feeds by 72 hours
- Transfusion trigger Hb < 7 gm/dl if stable oxygenation and hemodynamic and < 10 g/dL if refractory hypoxemia or unstable shock.

Management of Shock –

Shock may be due to hypovolemia(diarrhoea), myocardial dysfunction (cardiogenic) or vasodilatory shock (Septic).

Assessment of Shock –

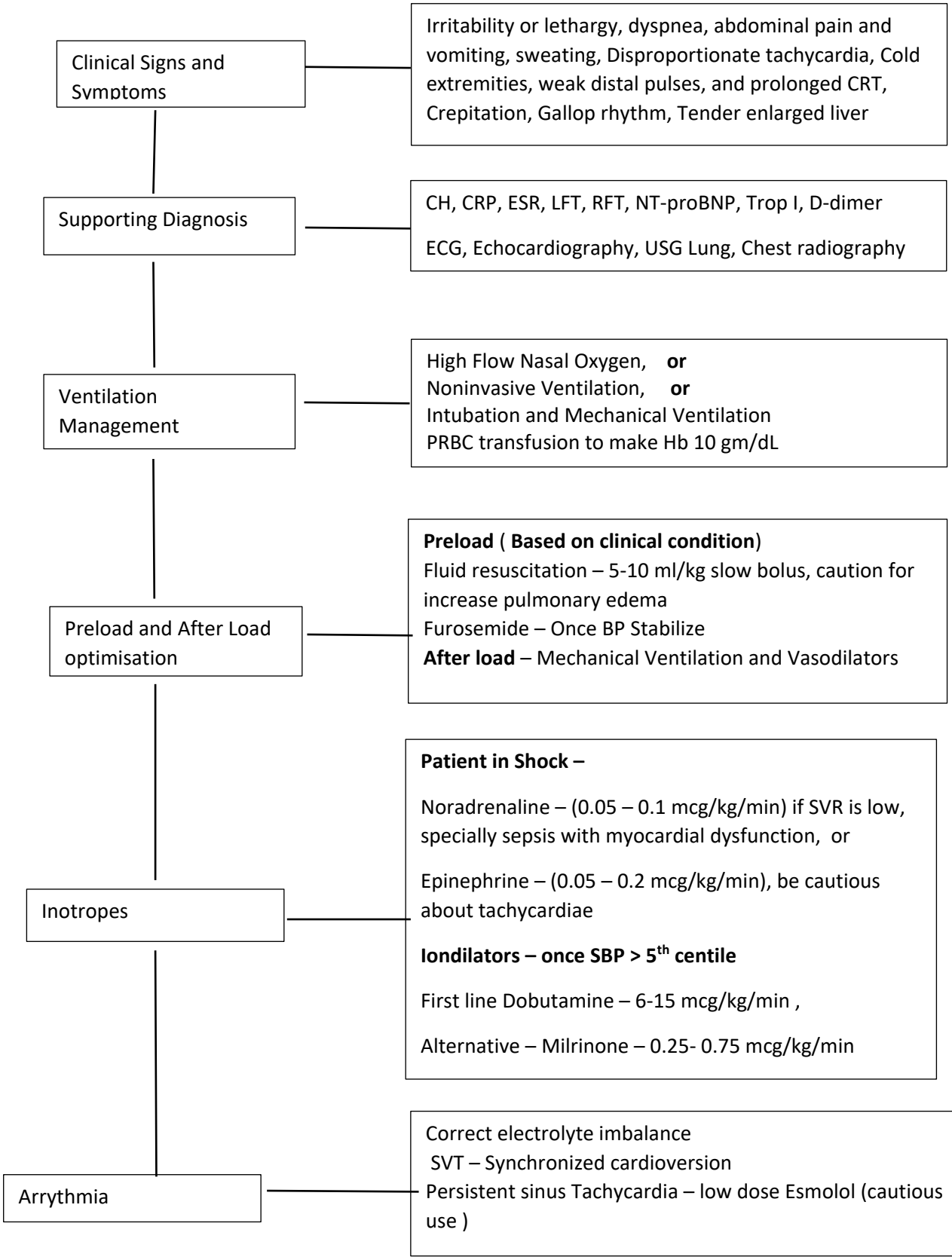
- Altered mental status
- Bradycardia or tachycardia (HR < 90 bpm or > 160 bpm in infants and heart rate < 70 bpm or > 150 bpm in children)
- Hypotension (SBP < 5th centile or > 2 SD below normal for age)
- Prolonged capillary refill (> 3 sec) or weak pulse
- Mottled or cool peripheries
- Reduced urine output
- Remember hypotension is a late sign

Diarrhoea with severe dehydration - Start IV fluids immediately. If the patient can drink, give ORS by mouth until the drip is set up. Give 100 ml/kg Ringer's Lactate Solution divided as follows:

Age	First give 30 ml/kg in	Then give 70 ml/kg in
< 12 months	1 hr	5 hr
>12 months	30 min	2½ hours

- Reassess the patient every 1-2 hours.
- If hydration is not improving, give the IV drip more rapidly.
- After six hours (infants) or three hours (older patients), evaluate the patient using the assessment chart. Then choose the appropriate Treatment Plan (A, B or C) to continue treatment.

Cardiogenic Shock –



Septic Shock

Initial phase –

Start Oxygen with NRMB or HFNO as per clinical decision
Mechanical ventilation if poor GCS or high work of breathing
Obtain quick IV Access and Check blood glucose , ionized Calcium, Send blood culture and hemogram
Crystalloid fluid bolus 10-20 ml/kg over 20-30 min, fast if hypotension and no signs of fluid overload
Start empiric Antibiotic

Reassessment – Examine the child for clinical signs of shock and Fluid Overload

Fluid overload

No

Persistent Shock –

Repeat Crystalloid fluid bolus 10-20 ml/kg over 20-30 min,
Reassess after each bolus
Early vasoactive support
Cold Shock – Epinephrine (Start with 0.1mcg/kg/min).
Warm Shock-
Nor-epinephrine – 0.1 mcg/kg/min
Can be started in peripheral line
Titrate as per response

Add Nor- epinephrine in persistent cold shock (Epi >@0.3 mcg/kg/min)

Add Vasopressin in Warm shock (when Nor-Epi > 0.3 mcg/kg/min)

Yes

Persistent Shock

Yes

Start Epinephrine – 0.05 mcg/kg/min

Add Dobutamine – 10 mcg/kg/min

Cardiac Evaluation – Echocardiography

Transfer to PICU

Refer to Cardiogenic Shock Algorithm

Monitor and reassess

No

Stop further bolus

Evaluate cardiac function – Echo

Monitor and reassess for recurrent shock

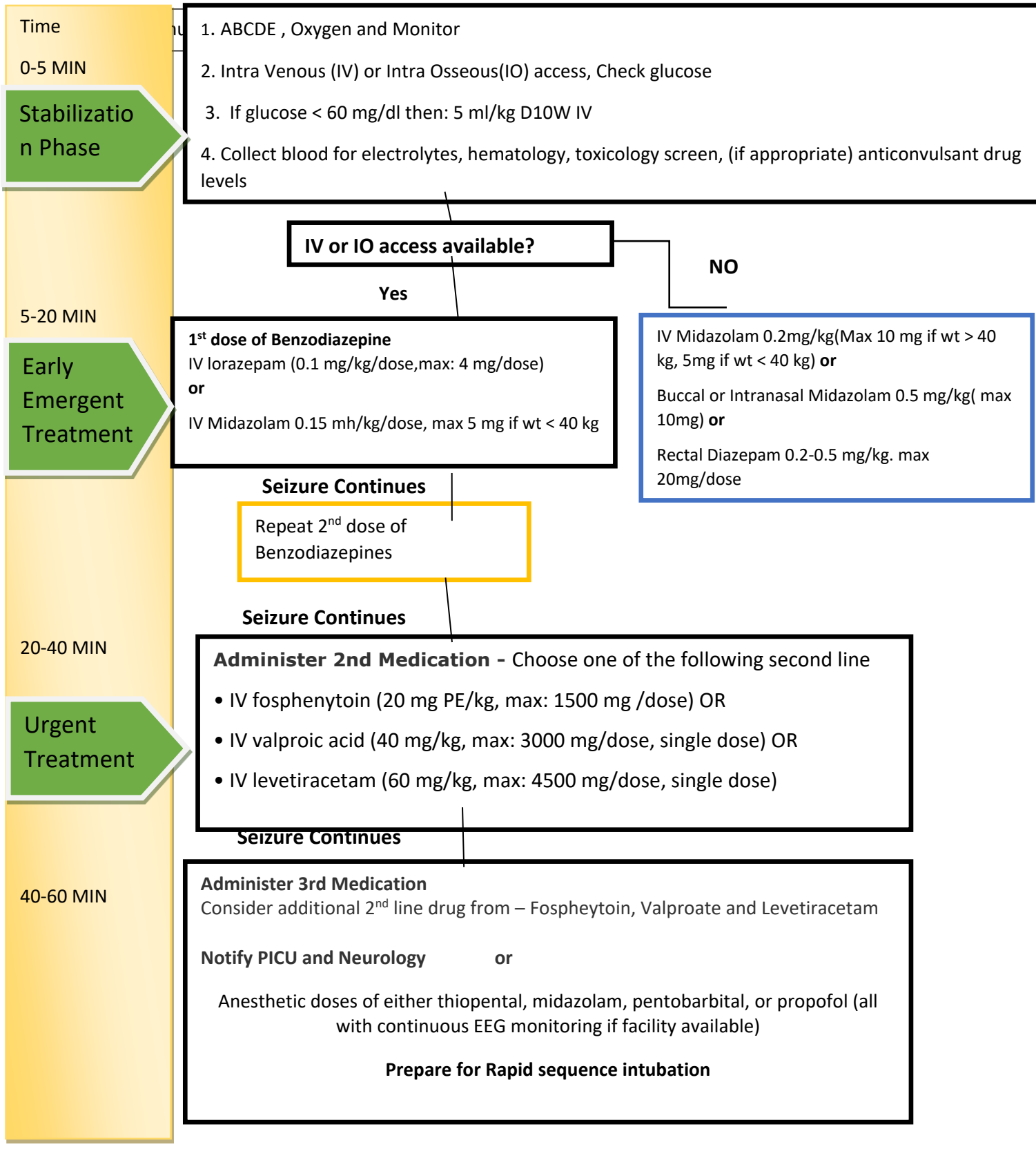
Monitor – Invasive Arterial BP (preferable) or NIBP, Urine output, Peripheral temp, CRT, ABG and Lactate, Echocardiography and lung USG if facility available

Steroid –

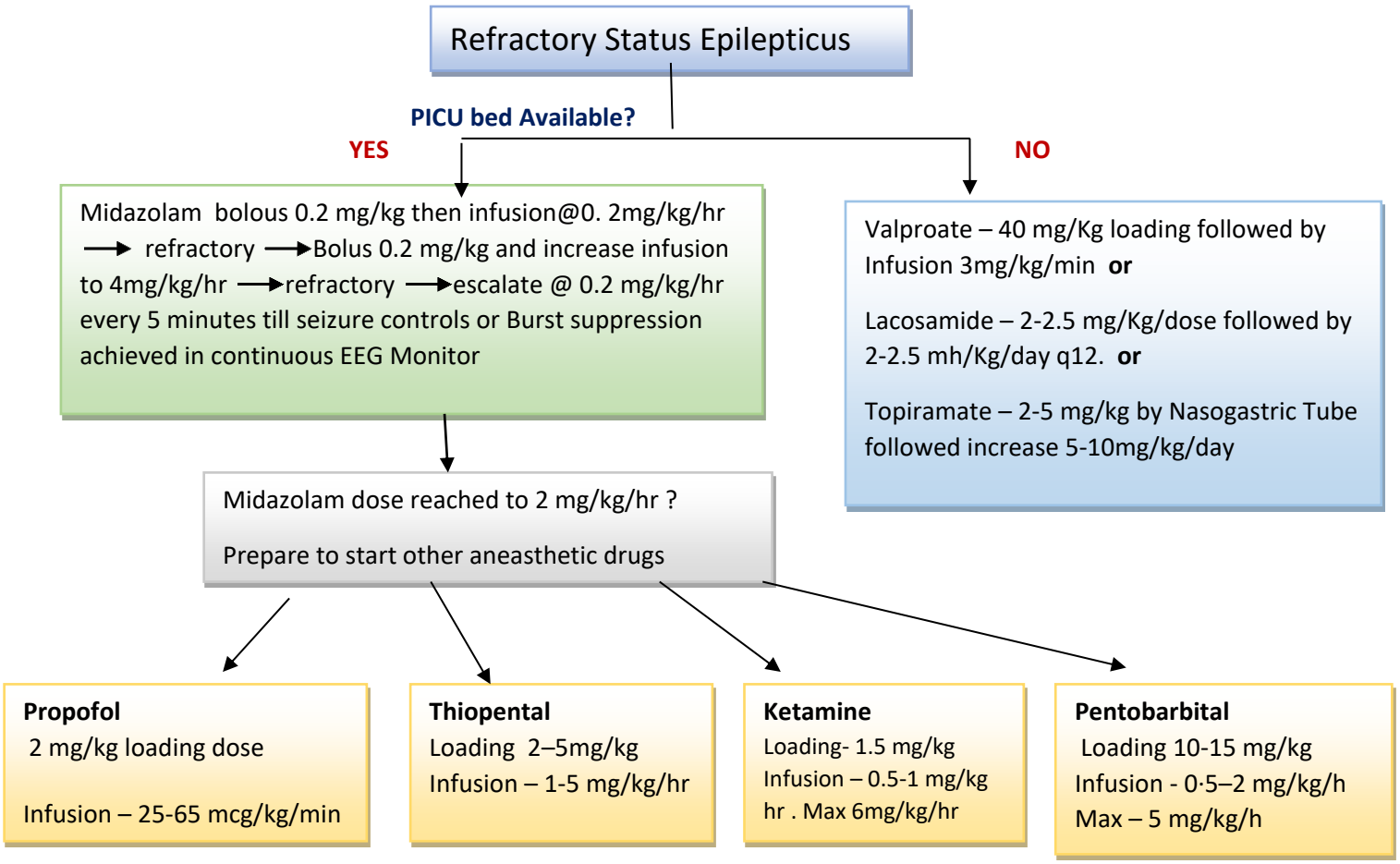
1. Patient at risk of adrenal insufficiency – purpura fulminans, recent acute or chronic treatment with corticosteroid, congenital adrenal insufficiency
2. Fluid and Catecholamine (Epinephrine > 0.3 mcg/kg/min) shock

Hydrocortisone- 2-4 mg/kg, Max – 200 mg

Algorithm of Management of Status Epilepticus in Emergency Department (in accordance to American Epilepsy Society Guideline)



Treatment Algorithm Refractory Status Epilepticus



Additional therapeutic option

Steroid/Immunoglobulin /Plasma Exchange – Autoimmune Encephalitis, FIRES

Pyridoxine – In children < 2yrs . 50-100 mg IV bolous followed by 50 mg daily

Magnesium Sulphate – initial 25-50 mg/kg IV (Max 2 grams, aiming for plasma levels of 3.5 mmol/L

KETOGENIC DIET - High fat, low carbohydrate, adequate protein diet devised to mimic a fasting state and produce ketosis. It can be effective for patients with drug resistant Epilepsy. Roll in FIRES. Mostly underutilized and delay in start.

Surgery - Surgical intervention can help for patients with particularly refractory focal SE

Inhalation Aneasthetic - Isoflurane and dexflurane. Limited experience

Acute Kidney Injury

Table 1: Criteria for KDIGO AKI definition and staging

Stage	Serum creatinine	Urine output
1	Increase to 1.5 -1.9 times of baseline over 7 days Or ≥ 0.3 mg/dl over 48 hours	< 0.5 ml/kg/hr for 6-12 hrs
2	Increase to 2.0 -2.9 times of baseline	< 0.5 ml/kg/hr for 12-24 hrs
3	Increase to ≥ 3 times of baseline OR Value >4mg/dl with rise of 0.5 mg/dl OR eGFR <35 ml/min/1.73m^2 OR Initiation of dialysis	< 0.3 ml/kg/hr for >24 hrs OR anuria for >12 hrs

- eGFR (modified Schwartz formula) = {0.42 X height (in cm)} ÷ creatinine (in mg/dl)

In previously healthy children where the baseline serum creatinine is unknown the normative serum creatinine values for age and gender can be considered as baseline.

Table 2: Therapy for Complications and supportive care

Pulmonary edema	Oxygen, IV frusemide 1–2 mg/kg, Fluid restriction, Dialysis if refractory to medical therapy
Fluid overload	• Restrict total intake (including drug infusions) to insensible losses (400 ml/m^2/day) plus urine output and other losses • Give 5–10% dextrose for insensible losses • N/2 saline for urine output replacement • Oral replacement is safer
Hypertensive emergency	IV sodium nitroprusside 0.5–3 mcg/kg/min or labetalol infusion 0.25–3 mg/kg/h (BP lowering should be 25% of desired in first 8 h, and to target MAP of 95th centile over 24 hours)
Metabolic acidosis (high anion gap)	IV NaHCO3 if pH<7.15 or HCO3 <15 mEq/L Hypernatremia to be monitored
Anemia	Packed cell transfusion only after creating negative balance with dialysis in case of anuric or overloaded child
Hyperkalemia	• Inj Calcium gluconate (10%): 1ml/kg over 5 min under ECG monitoring (if no preexisting hypercalcemia), maximum 10 ml • Inj NaHCO3: 1-2 ml/kg over 30 min (if Na<145 and no alkalosis) • Salbutamol nebulisation 5-10 mg, may be repeated • Insulin –dextrose: 0.1 unit/kg insulin with 2ml/kg of 25% dextrose over 30 min, may be repeated after 2-4 hrs • Calcium based exchange resin (K-Bind sachet 15gm): 1 gm/kg 8 hourly orally or per rectal along with lactulose (unless diarrhea)

Hyponatremia	Restrict fluids; if symptomatic seizures pt should receive 3% saline 5 ml/kg over 30–90 min

Renal replacement therapy (RRT):
Indication of RRT-

- Fluid overload that is unresponsive to diuretics and is a hindrance to administration of medications volume
- Hyperkalemia (K > 6.5 mEq/L) unresponsive to medical therapy
- Metabolic acidosis unresponsive to/ unable to undergo medical therapy
- Uremia BUN > 80- 100 mg/dl or uremic complication (encephalopathy, pericarditis, repeated vomiting/hiccups)

RRT modalities include hemodialysis (HD), peritoneal dialysis (PD), and continuous RRT (CRRT). The RRT choice depends on the clinical status of the patient, the expertise of the clinician, and the availability of appropriate resources.

Heated Humidified High Flow Nasal Cannula(HHHFNC)

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Objectives

At the end of this session the learner should be able to

- Describe mechanism and components of HFNC Machine.
- Demonstrate Circuit, Cannula, Temperature settings
- Enumerate indications and contraindications
- Describe titration of flow and oxygen
- Describe monitoring during therapy
- Define success and failure
- Explain special issues during COVID while using HHHFNC

Definition of HHHFNC

- HHHFNC is defined as heated, humidified and blended air/oxygen delivered via nasal cannula at different flow rates ≥ 2 L/min, delivering both high concentrations of oxygen and potentially continuous distending pressure.
  (Cochrane review from 2014)

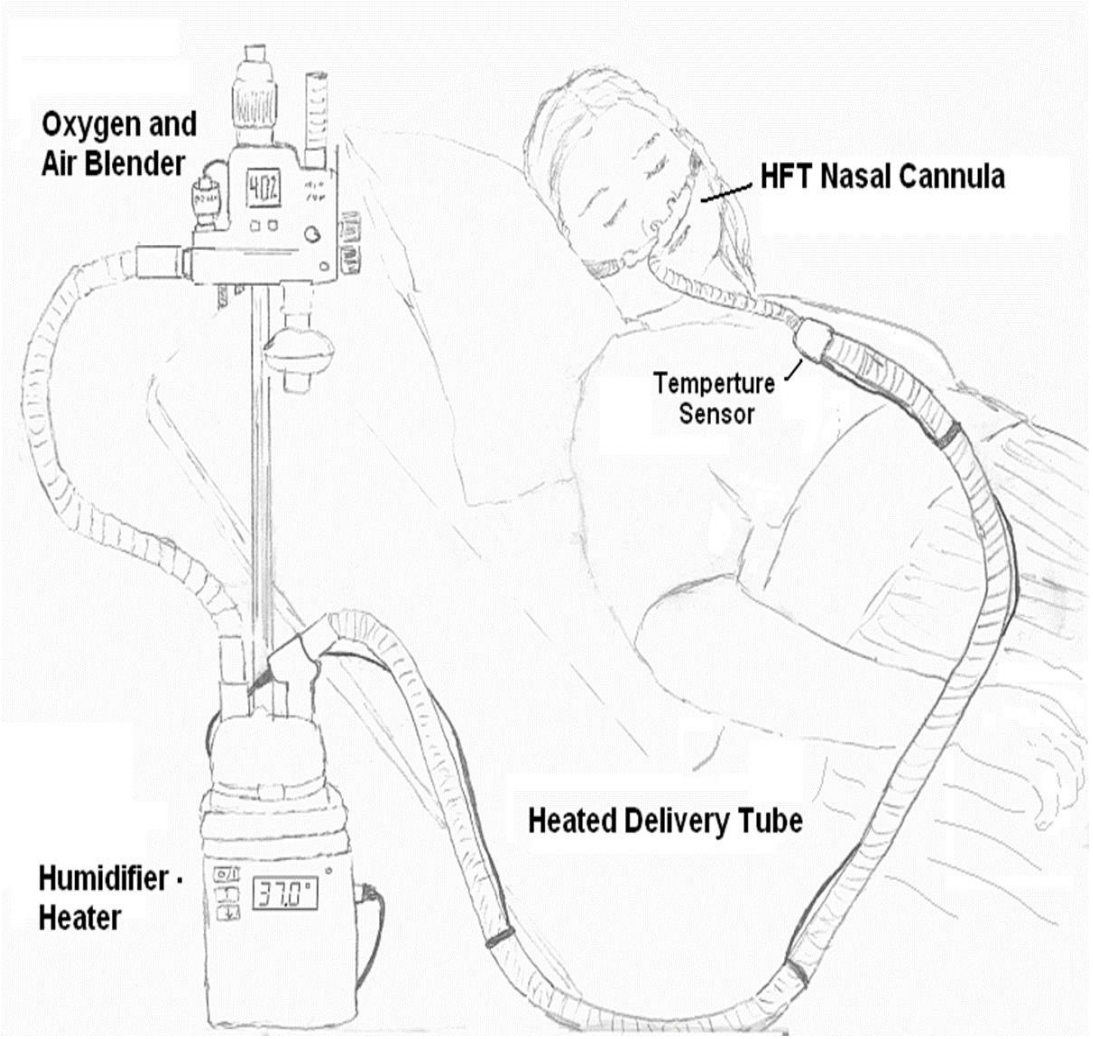
- The basic principle ⟹ set a higher oxygen flow than patients peak inspiratory demand flow according to the clinical situation.

Mayfield S, Jauncey-Cooke J, Hough JL, Schibler A, Gibbons K, Bogossian F. High-flow nasal cannula therapy for respiratory support in children. Cochrane Database Syst Rev. 2014;3:CD009850

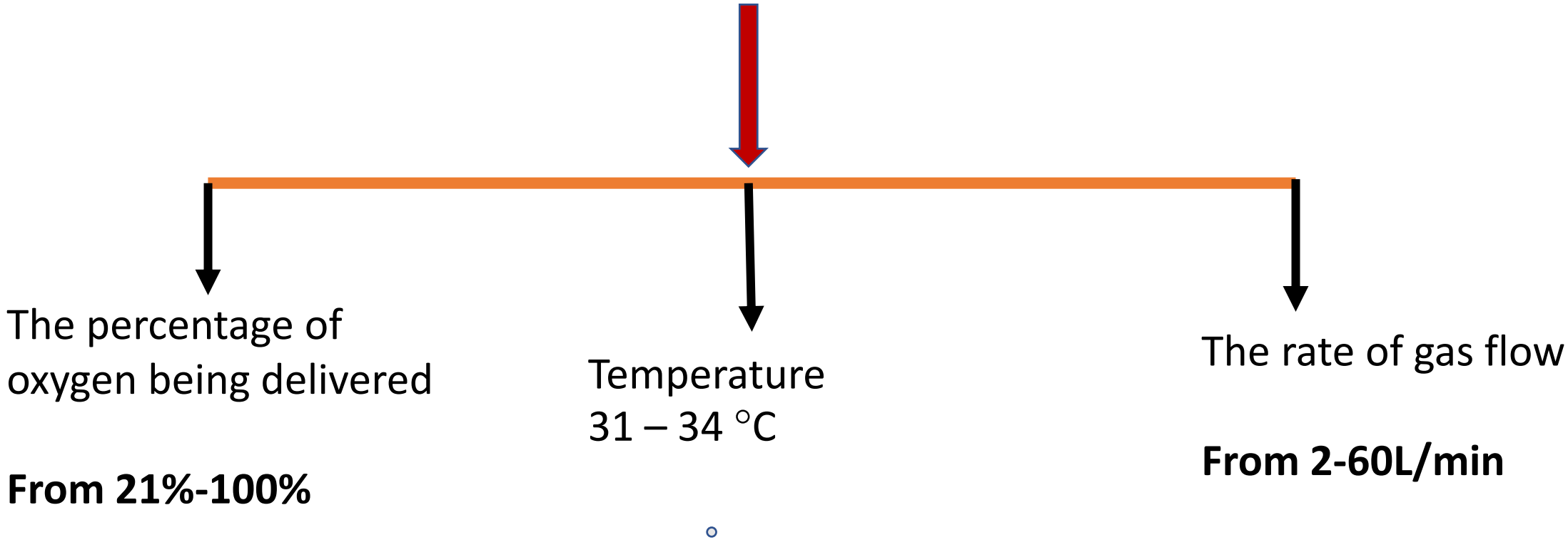
Möller W, Feng S, Domanski U, Franke KJ, Celik G, Bartenstein P, et al. Nasal high flow reduces dead space. J Appl Physiol (1985) 2017;122:191-7

Components of HHHFNC Machine

- Flow generator - air/oxygen blender
- Active heated humidifier
- A single heated Circuit
- Nasal cannula of different size



Variables in a HFNC device



How does it help the patient ?

Effect of High Gas Flow	Effect of Humidification and Heating	Effects of Controlled FiO2
Washout of Physiological dead space and carbon dioxide (CO_2)	Improved ciliary clearance	Better monitoring of oxygen requirement
Reduction of inspiratory resistance and work of breathing by providing adequate flow	Reduction of bronchoconstriction	FiO2 up to 1.00 provided to the patient
Positive end-expiratory pressure	Better hydration of the mucosa	Accurate FiO_2
Decreased respiratory rate		

Mauri, T.; Turrini, C.; Eronia, N.; Grasselli, G.; Volta, C.A.; Bellani, G.; Pesenti, A. Physiologic effects of high-flow nasal cannula in acute hypoxemic respiratory failure. Am. J. Respir. Crit. Care Med. 2017, 195, 1207–1215.

Rubin, S.; Ghuman, A.; Deakers, T.; Khemani, R.; Ross, P.; . Effort of breathing in children receiving high-flow nasal cannula. Pediatr. Crit. Care Med. 2014, 15, 1–6.
Kwon, J.-W. High-flow nasal cannula oxygen therapy in children: A clinical review. Clin. Exp. Pediatr. 2020, 63, 3–7.

Types of Circuit and Cannula

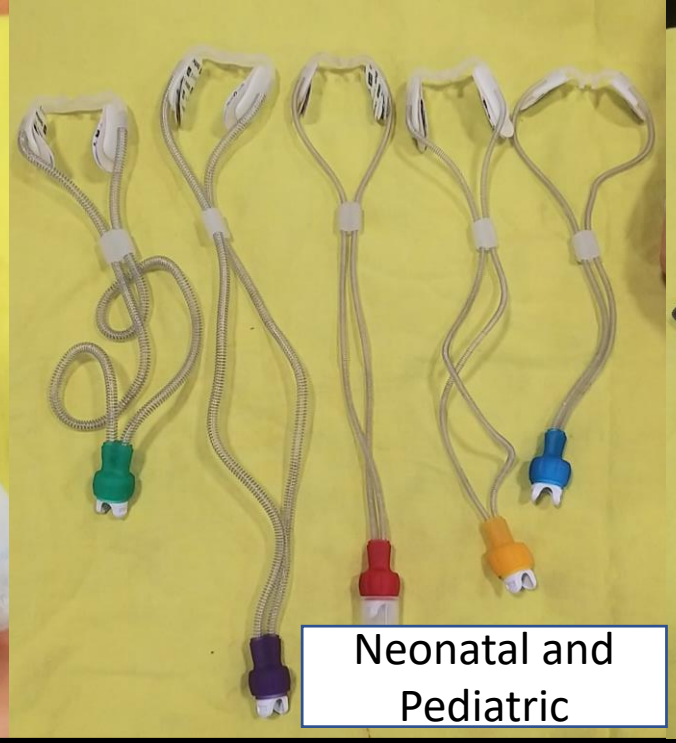
Diameter	Flow Delivered
15 mm	2-25 L/min
22 mm	10- 60 L/min

Circuits are heated uniformly by integrated heating wire

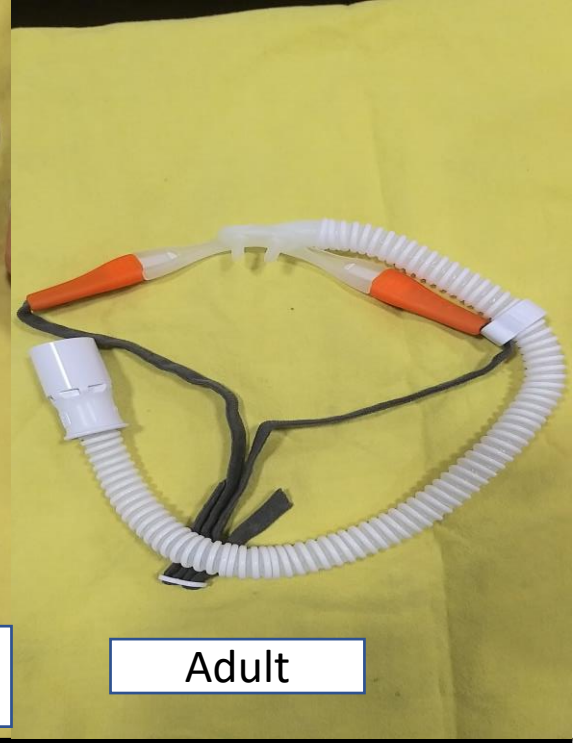
Cannula size

- Cannula size varies by age , body weight and flow delivery
- The cross-sectional area of the cannula should not be more than 50% that of the nares.
- Allow expiratory gas to exhale – reduce risk of unexpected elevations in airway pressure

  Appropriate outer diameter of the cannula is no more than two-thirds that of the nares
- Maximum flow delivery though a cannula also depends on diameter of cannula

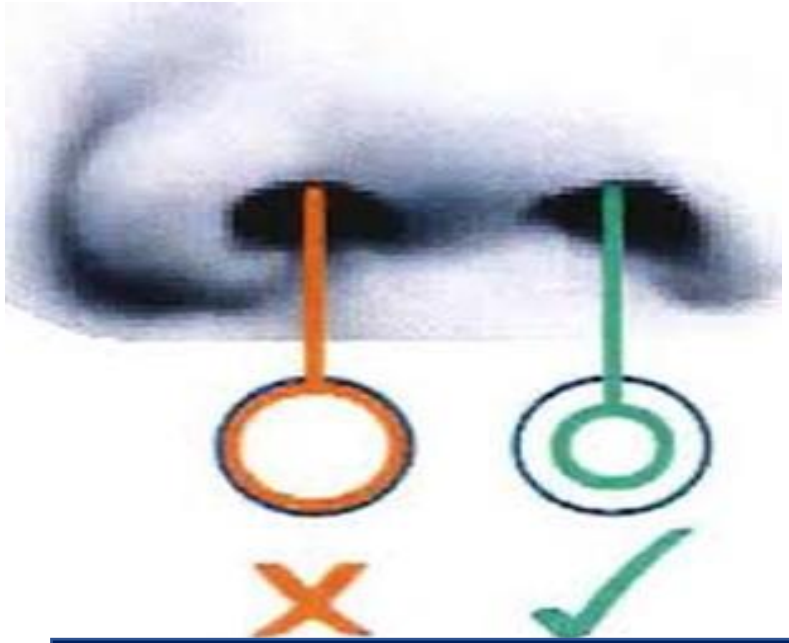


Neonatal and Pediatric



Adult

Cannula Size	Color	Flow Delivery range (L/min)
Extra Small (XS)	Blue	0.5 -8
Small (S)	RED	0.5 - 9
Medium (M)	YELLOW	0.5 - 10
Large (L)	PURPLE	2 - 20
Extra Large (XL)	GREEN	2 – 25
Adult Small		10 - 50
Adult Medium		10-60
Adult Large		10-60



Sufficient Gap should be present

Flow setting

- There is a lack of guidance about optimal flow in pediatric patients
- Reasonable flow rate is thought to be 1–2 L/kg/min up to 12 kg in patients, followed by an increase of 0.5 L/kg/min.
- Higher flow - 3 L/kg/min flow creates discomfort despite the same efficacy in children < 2 years. Risk of air leak with 3L/kg/min flow.

- Milesi C, Pierre AF, Deho A, Pouyau R, Liet JM, Guillot C, et al. A multicenter randomized controlled trial of a 3-L/kg/min versus 2-L/kg/min high-flow nasal cannula flow rate in young infants with severe viral bronchiolitis (TRAMONTANE 2). Intensive Care Med 2018;44:1870-8.

Pressure generated by HHHFNC

Factors

- Weight/ size of the patient,
- Flow rate
- Diameter of the nasal cannula compared to the nares

- Pressure delivery as measured in pharynx and esophagus, ranges from 2– 4 cm H_2O both in children and adults.

Arora B, Mahajan P, Zidan MA, Sethuraman U. Nasopharyngeal airway pressures in bronchiolitis patients treated with high-flow nasal cannula oxygen therapy. Pediatr Emerg Care. 2012;28:1179–84.

Initiating HHHFNC

- OXYGEN

Start with FiO2 of 50% and titrated up (or down) as needed to achieve a target oxygen saturation of 92% to 96%.

May start with 100 % Fio2 if patient is in severe hypoxia

Exception Cyanotic congenital heart disease and balanced circulation.

Titrate FiO_2 to the minimum amount required in order to maintain target SpO_2.

- HUMIDIFICATION
- Because flows used are high, heated water humidification is necessary.
- Avoid drying of respiratory secretions and for maintaining nasal cilia function.
- Set humidifier at 34° C.

INDICATIONS

- Hypoxaemia with respiratory distress due to bronchiolitis or pneumonia.
- Mild ARDS
- Respiratory support in chronic lung disease.
- COVID Pneumonia - hypoxemia (SpO_2<90% with NRBM Oxygen > 10L/min) and signs of *severe* respiratory distress.
- Weaning therapy from mask CPAP or BiPAP
- Preoxygenation before intubation.
- Post extubation respiratory support

CONTRAINDICATIONS

- Impending respiratory failure
- Decreased level of consciousness (GCS ≤ 7)
- Upper airway obstruction
- Central apnoea
- Haemodynamic instability
- Blocked nasal passages/choanal atresia
- Trauma/surgery to nasopharynx
- Pneumothorax

NURSING CARE

- **Feeding:**
  - Avoid feed during the initial 2 hours following commencement of HHHFNC therapy.
  - Some infants can continue to feed orally, but many require feeding via NGT
  - 2 hourly NG bolus feeds with EBM or formula as appropriate
  - IV Fluids - not clinically stabilize within 2 hours or do not tolerate NGT feeds
  - Aspirate the NGT for air 2-4 hourly.
- Oral and nasal care must be performed 4 hourly.
- Note nasal prongs are in correct position and no pressure areas to nares.
- Gentle suction as required to keep nares clear.

MONITORING

- RR, HR, Blood pressure SpO_2 & WOB .
- Work of Breathing –

  subcostal, intercostal or sternal recession

  nasal flaring , grunting, tracheal tug or lethargy
-

- Flow rate, FiO_2 & humidifier temp.

- Clinical stabilization: After 1-2 hrs

  FiO_2 required should decrease to <60%.

  HR should reduce by 20% or to within normal range.
  RR should reduce by 20% or to within normal range.
  Signs of respiratory distress should improve.

  SpO_2 92-96%

Monitoring chart

TIME	HR	RR	WOB	CRT	Temp	SpO2	FiO2	Flow Rate	UO/ AG

Review and Escalate therapy

- Patient does not exhibit signs of clinical stabilization within **2 hours** of commencement of HFNP therapy
- Hypoxaemia persists despite oxygen therapy.
- **Requirement for flow > 2L/Kg/min or FiO2 >60% ⟶ may escalate to NIV**
- Rapid deterioration of SpO2 or marked increased WOB – do chest x-ray to exclude a pneumothorax ⟶ Invasive mechanical ventilation and ICD placement .
- Do not allow for the patient to deteriorate significantly in Pre arrest state.
- Emergency intubation can risk the HCW to more aerosol generating procedure.
- **Delayed intubation may result in worse outcomes**.

When can HHHFNC be weaned and stopped?

Patient Stable for 24hrs – Start weaning Oxygen First

Once the patient maintains SpO2 ≥92% for 4 hours with FiO2=21%

Then decrease flow rate to 1L/kg/min.

Remains stable for 2-4 hours then reduce again to 0.5L/kg/min and then cease.

Weaning of flow can also be started when FiO_2 requirement < 40%

- Wean off in low flow oxygen and observe
- If condition starts to deteriorate restart HHHFNC
- No evidence for a set time on and off.

Humidified High Flow Nasal Cannula Oxygen Guideline for Metropolitan Paediatric Wards and ED's - 1 st edition, January-2016

Side effects and safety

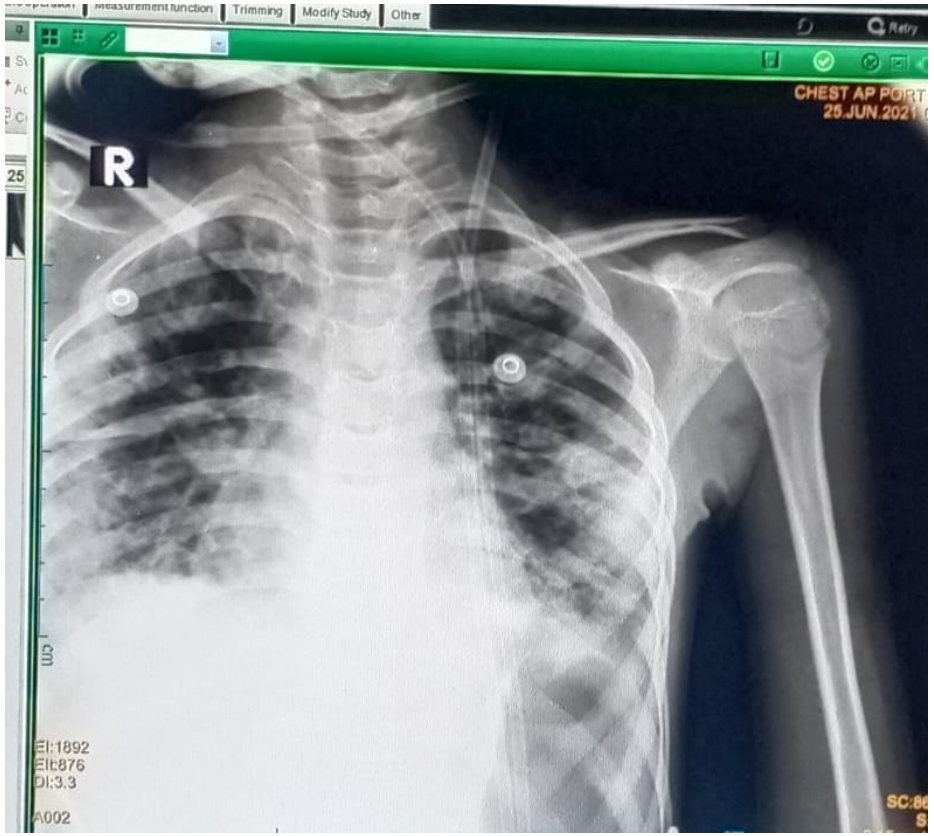
- Most studies have reported no adverse events for children on HHHFNC.
- Use of HFNC is safe both in a general pediatric ward , emergency and PICU .
- Reports described four serious cases of pneumothorax in children on HHHFNC.
- The pressure applied to the airways in HFNC – can not be monitored
- Abdominal distension - careful in children with intra-abdominal pathology .
- Mucosal injury with nasal bleeding and ulceration – less frequent

Hegde S, Prodhan P. Serious air leak syndrome complicating high-flow nasal cannula therapy: a report of 3 cases. Pediatrics 2013;131:e939-44

Case - 1

- 9 year old female, 25 kg
- Fever for 7days and cough and cold
- Respiratory distress for 2 days
- RR – 40/min, Moderate retraction
- Covid -19 RT-PCR Negative
- Spo2- 85% in RA and with NRBM (15 L/min) – 90% .

- Hb9.2. TLC- 9000 N-78% L- 19%. Plt 1.62lac. CRP- 44.6mg /l . ESR - 40



Where will you admit the patient ?

Any further investigation you want to do ?

How will you treat the child ?

COVID HDU/ICU

BEST treatment option

1. Continue NRBM Oxygen
2. Start HFNO
3. Start HFNO, Oseltamivir send respiratory viral panel if facility available.

Case continue….

- After 1 hour
- Flow – 25 L/min
- FiO2 – 70 %
- SpO2 – 90-92 %
- Moderate work of breathing
- RR – 36/min
- BP – 108/74
- HR – 120/Min

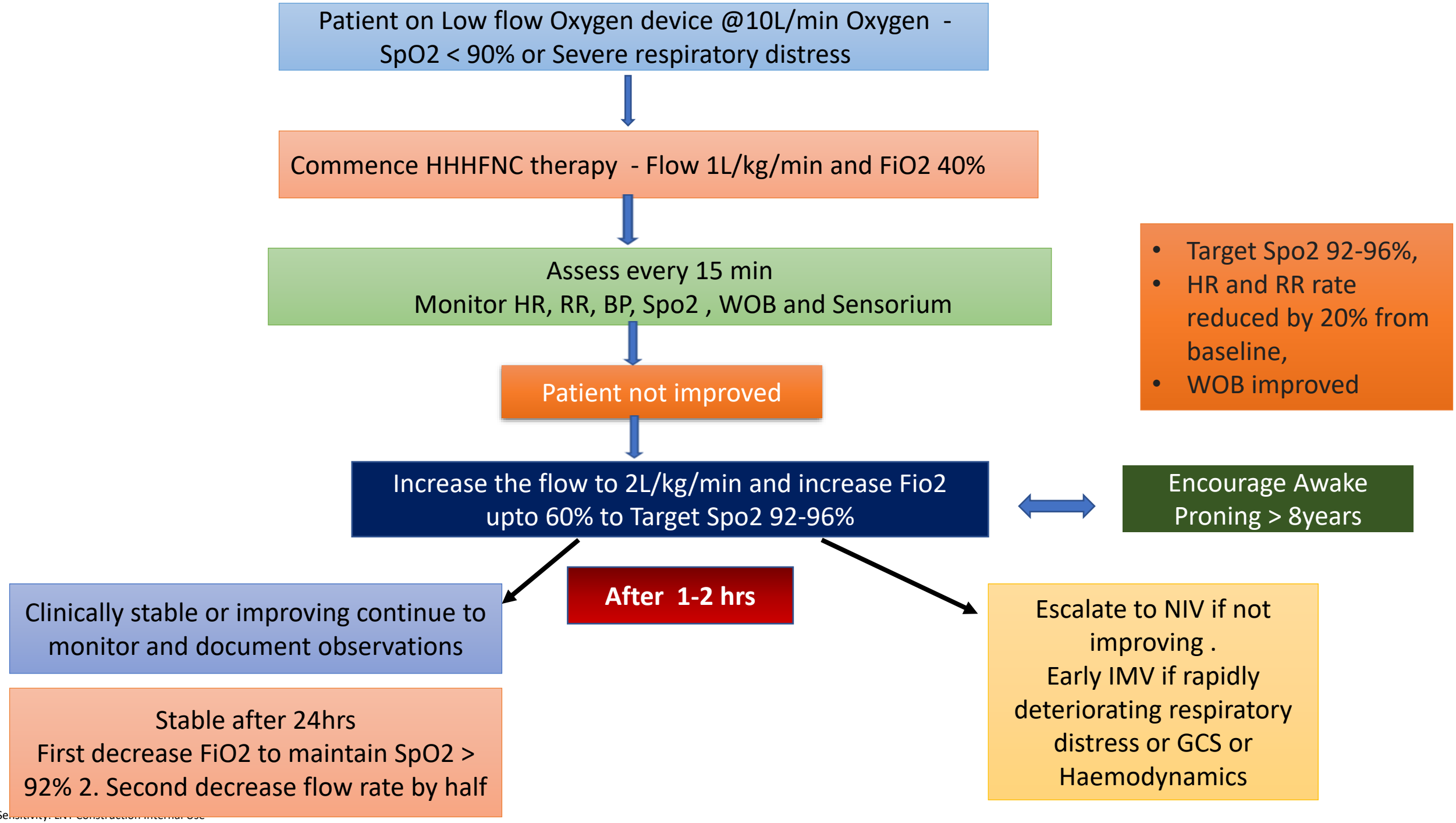
- What will you do now ?

- Flow gradually increased to 35 L/min
- Fio2 – 70%
- After 2 hours
- Spo2 – 97%
- Work of breathing Mild
- RR – 28/min
- Patient comfortable
- HR- 92/min
- BP – 110/74

What will do now ?

Weaning – After 24 hours in stable condition

- Titrate Oxygen First - Up to < 40% while maintain SpO2 – 92-96%
- Then step down flow to 1 L/Kg/Min → 0.5 L/kg/min
- Monitor – RR, WOB, HR, SpO2, Mental status and comfort level.
- Encourage Proning
- Start feeding


Patient on Low flow Oxygen device @10L/min Oxygen -
SpO2 < 90% or Severe respiratory distress
Commence HHHFNC therapy - Flow 1L/kg/min and FiO2 40%
Assess every 15 min
Monitor HR, RR, BP, Spo2 , WOB and Sensorium
Patient not improved
Increase the flow to 2L/kg/min and increase Fio2
upto 60% to Target Spo2 92-96%
Target Spo2 92-96%,
HR and RR rate reduced by 20% from baseline,
WOB improved
Encourage Awake Proning > 8years
After 1-2 hrs
Clinically stable or improving continue to monitor and document observations
Stable after 24hrs
First decrease FiO2 to maintain SpO2 > 92% 2. Second decrease flow rate by half
Escalate to NIV if not improving .
Early IMV if rapidly deteriorating respiratory distress or GCS or Haemodynamics

Summary

- HHHFNC is a safe and effective respiratory support in patients with mild to moderated hypoxia.
- It delivers heated and humidified flow higher than patients peak inspiratory flow.
- Choose Circuit, Cannula, Flow, Temperature according to patient body weight and clinical condition.
- Meticulous monitoring and nursing care is the key to success
- Do not unnecessarily delay to escalate therapy if patient not improving within 1-2 hrs.

Daily report format for ARI/ILI in children

Sl.No	District	Name of Hospital	Cases				Death	
			New Admitted cases	Total Cases (Cumulative)**	No. of Cases currently admitted	Currently Admitted in ICU/PICU/SNCU/ Others	Last 24 Hrs.	Total (Cumulative)

** Cumulative since the surge of ARI in the State.

N.B. 1.If any unusual increase or clustering of cases is noticed. It must be brought into the notice of PH & CD Branch, Swasthya Bhaban with appropriate case list.

2. If death occurs, detailed line list should be submitted along with cause of death and comorbidity(if any).

3. All these reports should be sent to the mail id - ncovrep.wb@gmail.com

Increased incidence of ARI/ILI in paediatric age group

Surveillance guideline

A. Facility based surveillance

- Identify suspected cases in OPD, ER and IPD.
- Record the provisional diagnosis so that the case can be included in the report.
- Daily figures (24 hours) to be entered into DKPI Portal from all hospitals everyday (inclusive of Sundays & holidays).
- No. of ARI/ILI cases and Pneumonia cases to be carefully captured daily and shown in P Report of IDSP on weekly basis.
- If any significant increase in no. of cases or cluster of cases from same/adjacent areas – Superintendent will immediately inform the CMOH and Dy. CMOH-II.
- In such situations, line list of cases to be prepared and shared with SSU, IDSP.
- Also, if there is a death, Superintendent will immediately inform the CMOH and Dy. CMOH-II along with case details.

B. Community based surveillance

- Enhanced house visit by ANM/ MPHW (M)/ASHA/ AWW/HHW in affected areas to list the newly occurring cases and give messages on home based care & prevention.
- Daily reporting of 'Fever with Cough & Cold' (< 5 years/ ≥5 years/ total) to the district level through the BMOH/HO.
- In otherwise normal areas (unaffected), stimulated passive surveillance by ANM/ MPHW (M)/ASHA/HHW. No. of cases captured in SC Clinic, Outreach Camps & routine field visits – to be reported daily in the same manner as above.
- Community level workers must keep vigil for any death of or unusual occurrence of ARI/ILI in children.
- No. of cases of 'Fever with Cough & Cold' (< 5 years/ ≥5 years/ total) to be carefully captured daily and shown in S Report of IDSP as per usual norm.
- Daily figures received from the Blocks to be monitored at the District level and alert to be raised whenever indicated. Alert to be shared also with SSU, IDSP.

NB: Daily report of admitted cases to be sent, irrespective of incidence, by the DSU to the State level in the format attached.
Reference period: 12 noon to 12 noon. Report to be sent to ncovrep.wb@gmail.com within 1.30 p.m.
Data of only major hospitals to be e ntered in this report. However, if there is a surge in any lower level hospital, include that facility also.