



SKILLS TRAINING FOR PAEDIATRIC CARE

Preparedness for COVID-19

Directorate of Medical & Health Services, Uttar Pradesh





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JUNE, 2021
Directorate of Medical & Health Services, Uttar Pradesh

Amit Mohan Prasad
I.A.S.
Additional Chief Secretary
Medical Health and Family
Welfare, Uttar Pradesh



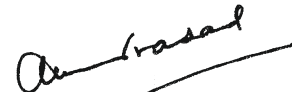
FOREWORD

The Government of Uttar Pradesh has made huge investments towards improving the survival of children including newborns through various policies and programs. The focused approach of the State continues to aim at reducing child and neonatal mortality and efforts are targeted towards achieving the Sustainable Development Goals and the goals committed in the National Health Policy (NHP 2017).

The public health system of the State met the huge challenges posed by the second wave of COVID-19 under the visionary State leadership. It is anticipated that the 3rd wave of COVID pandemic may affect children majorly. Mechanisms for preparedness for full paediatric care across public health facilities have been developed through numerous strategies and one of the strategies is to strengthen the capacity of the health providers across the State to treat children presenting with COVID infection.

In this regard the State initiated a Skills-based training program on May 31st, 2021 to strengthen the skills and processes for paediatric emergency care management. This cascade model of training program to train doctors as well as staff nurses of all 75 Districts across the State has been rolled out. This training program aims to impart a set of defined skills to the participants for not only prioritizing management but also to perform prereferral stabilization of sick children.

I sincerely hope that this module on Skills Training for Paediatric Care of COVID 19 will be used to improve paediatric services across the State immensely. I would like to express my appreciation to all the experts who contributed towards the preparation of this module. I am sure that this module will help in achieving better outcomes in sick children.


Amit Mohan Prasad



Smt. Aparna U.
I.A.S.
Mission Director
National Health Mission
Uttar Pradesh

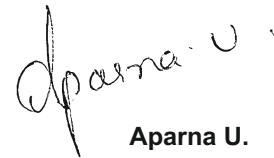


MESSAGE

Government of Uttar Pradesh has made substantial progress in key primary health care indicators for women and children. National Health Mission contributed to this progress through various interventions at the facility, community and household level including entitlements for women and children, augmenting the provider base, incentives for providers etc., along with a high focus on imparting trainings to the health providers on critical skills required for RMNCHA services delivery in public health facilities. UP NHM also contributed to an improvement in access to emergency transport, infrastructure, human resources, effective task shifting and skilling, active engagement with the private sector and use of Information Technology (IT) to monitor services ensuring quality of care for every mother, newborns and children.

The ongoing Covid-19 pandemic has impacted a substantial numbers of people including children. In order to better prepare the health system to manage COVID cases in the pediatric age group effectively in any potential future waves, this skill based Training, based on a cascade model preparing master trainers from 75 districts who will further train other medical officers and staff nurses within the districts is being rolled out. This Skills Training for Pediatric Care - Preparedness for Covid-19 module has been prepared by experts from the field of Pediatrics and Covid Care to standardize the treatment protocols across all facilities to ensure optimum and quality standard of care. It is expected that the quality of training will be maintained from state level right up to the block level facility.

I wish the facilitators and the master trainers the very best for a successful and comprehensive training exercise.


Aparna U.



Dr. (Major) D.S. Negi
Director General
Directorate of Medical & Health
Services, Uttar Pradesh



PREFACE

COVID-19 resulted in very high number of cases in the past few months and it also resulted in increasing number of children becoming COVID positive. The anticipated third wave is expected to further impact this pediatric population subset. Government of Uttar Pradesh (GoUP) is geared up to develop mechanisms for preparedness for pediatric care across public health facilities. GoUP has adopted strategies to strengthen the capacity of the health providers across the state to treat children with COVID infection. Reducing child mortality remains a key thrust area for the state team.

To address this, the Directorate of Medical & Health Services, Uttar Pradesh, and National Health Mission, Lucknow envisioned, prepared and implemented a cascade model of skills-based training for medical doctors and staff nurses across 75 Districts in the State. A technical resource package was prepared to support the trainers and participants at state-of-the-art Skills Lab situated at SIHFW Lucknow and COVID Hospital, GB Nagar. The team at the Directorate provided the overall operational support in rolling out the training at an exceptional pace.

I hope and urge all service providers (paediatricians, medical officers and nurses) to use this resource package for training their peers. This will also help them to continue to update their skills in both newborn & pediatric emergency management for COVID-19. I extend my appreciation to all the members of the team and UPTSU for developing this package.

Dr. D.S. Negi



Dr. A.K. Paliwal
Director
Communicable Diseases,
Directorate of Medical &
Health Services, Uttar Pradesh



From the Director's Desk

The State of Uttar Pradesh met the COVID-19 pandemic challenge with great success. Establishing Command Centres in each District and an online COVID-19 portal are some of the examples of good teamwork. Hospitalization and death data in the State of Uttar Pradesh revealed that 16% of the affected children required hospitalization and CFR was highest amongst the age group, 0-4 years.

The Directorate of Medical & Health Services with support from UP-TSU developed a resource package to conduct a skills based programme to train the district level providers in basic pediatric care with a focus on COVID management. The opportunity was also used as a refresher for the Infection Prevention Protocols to be followed. The training was rolled out across the State in accelerated mode with back to back batches held simultaneously at two newly established state-of-the-art Skill Labs at State Institute of Health & Family Welfare, Lucknow and at District Hospital, Sector 39, Gautam Buddha Nagar.

We are fortunate to work towards improving health & well-being of the citizens of the State under the able leadership of our Hon'ble Health Minister, Shri Jai Pratap Singh. The visionary leadership of Shri. Amit Mohan Prasad, Additional Chief Secretary, Medical Health & Family Welfare, and consistent support of Ms. Aparna U, Mission Director, NHM, UP, and our Director General, Dr. D.S. Negi, encourages us to go an extra mile.

My team at the Directorate of Medical & Health Services deserves appreciation for working zealously towards planning and successful implementation of this training programme. I also acknowledge UPTSU for providing extensive techno-managerial support to conduct trainings by developing and designing the training module, arranging logistics for skills station and onsite support.

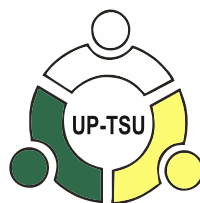
I am extremely thankful to all the eminent faculty of Kalawati Saran Children's Hospital & Safdarjung Hospital, New Delhi, Pediatric Super Specialty Hospital GB Nagar, SGPGI, Apollo Medics Super Specialty Hospital, Career Medical College, Hind Medical College and Kilkari Hospital, and the State Resource persons who contributed as Master Trainers for this training programme. The State trainers who in turn conducted quality trainings at the District level need to be applauded.

I urge that all providers at sub-District/District level to use this module as ready reckoner in effective case management of pediatric patients including for COVID-19.

Dr. A.K. Paliwal



Dr. Vasanthakumar N
I.A.S.
Executive Director
Uttar Pradesh Technical Support Unit
Uttar Pradesh



ACKNOWLEDGEMENT

The current set of COVID-19 data from Uttar Pradesh shows that its impact has been milder in younger aged population with lower case fatality rate. Only about 16% of COVID-19 affected children required hospital admission, out of which ~5% required higher levels of care in Level 2 and Level 3 hospitals. It is well documented that provision of timely and appropriate pediatric emergency care, adequate triage and assessment, appropriate inpatient treatment and sufficient monitoring favorably affect the outcome of hospitalized children.

At the behest of the State government of Uttar Pradesh, Directorate of Medical & Health Services and NHM, Lucknow, a Skills-based training package for pediatric care for COVID-19 was developed. This training program is unique as it is purely skills-based program conducted at skills labs. A training package consisting of a training module, OSCE checklists, a set of power points presentations and videos was developed by experts and clinicians to not only support the trainers in standardizing COVID Care for children but also guiding in protocols developed by the Government of India. It is envisaged that this module shall assist in supportive supervision and periodic refresher trainings.

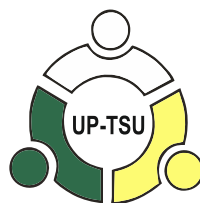
We are grateful to the Department of Pediatrics, Kalawati Saran Children's Hospital (KSCH) for sharing their technical resources. Dr Vikasendu and team at DGMH worked tirelessly to plan and roll out the training across the State. The facilitators from KSCH, SGPGIMS & IAP Lucknow, Safdarjung Hospital, New Delhi, SSPH PGI, GB Nagar need special mention for carrying out training with a lot of zeal. My team at TSU also supported wholeheartedly to make this training a success.

I hope that this training package will be utilized maximally at all levels and will be useful in rendering quality paediatric care.

Dr. Vasanthakumar N



Dr. Renu Srivastava
Strategy Director
Newborn & Child Health,
Uttar Pradesh Technical Support Unit
Uttar Pradesh



INTRODUCTION

The Uttar Pradesh Technical Support Unit (UP-TSU) supports the Government of Uttar Pradesh (GoUP) by providing techno-managerial assistance towards improving Reproductive, Maternal, Newborn & Child Health and Nutrition in the State.

The Directorate of Medical & Health Services (DG-MH) and the National Health Mission (NHM) were ably supported by team TSU under the able leadership of Executive Director UP-TSU, towards implementing the State-wide Skills based training programme for COVID management in pediatric population. The teams at DG-MH and UP-TSU co-developed the training package for this programme using the existing guidelines from the Government of India and the other job aides graciously shared by the Kalawati Saran Child Hospital and National Health Systems Resource Centre (NHSRC).

The training module has dedicated sections for the trainees to know the context and the modalities of this training, the critical and support procedures required for facility-based routine and emergency management of a sick child, including Infection Prevention Protocols.

A set of OSCE checklists to assist the readers for their own practice as well as a training and supportive supervision tool and pictorial charts to assist as a ready reckoner to the readers/participants are also added. As the module has been adapted from existing packages, a list of the same is provided for reference.

I am sure that this training module would help the health providers in their daily care practices and its use will be continued during mentoring to ensure overall improvement in quality of care.

Renu Srivastava
Dr. Renu Srivastava



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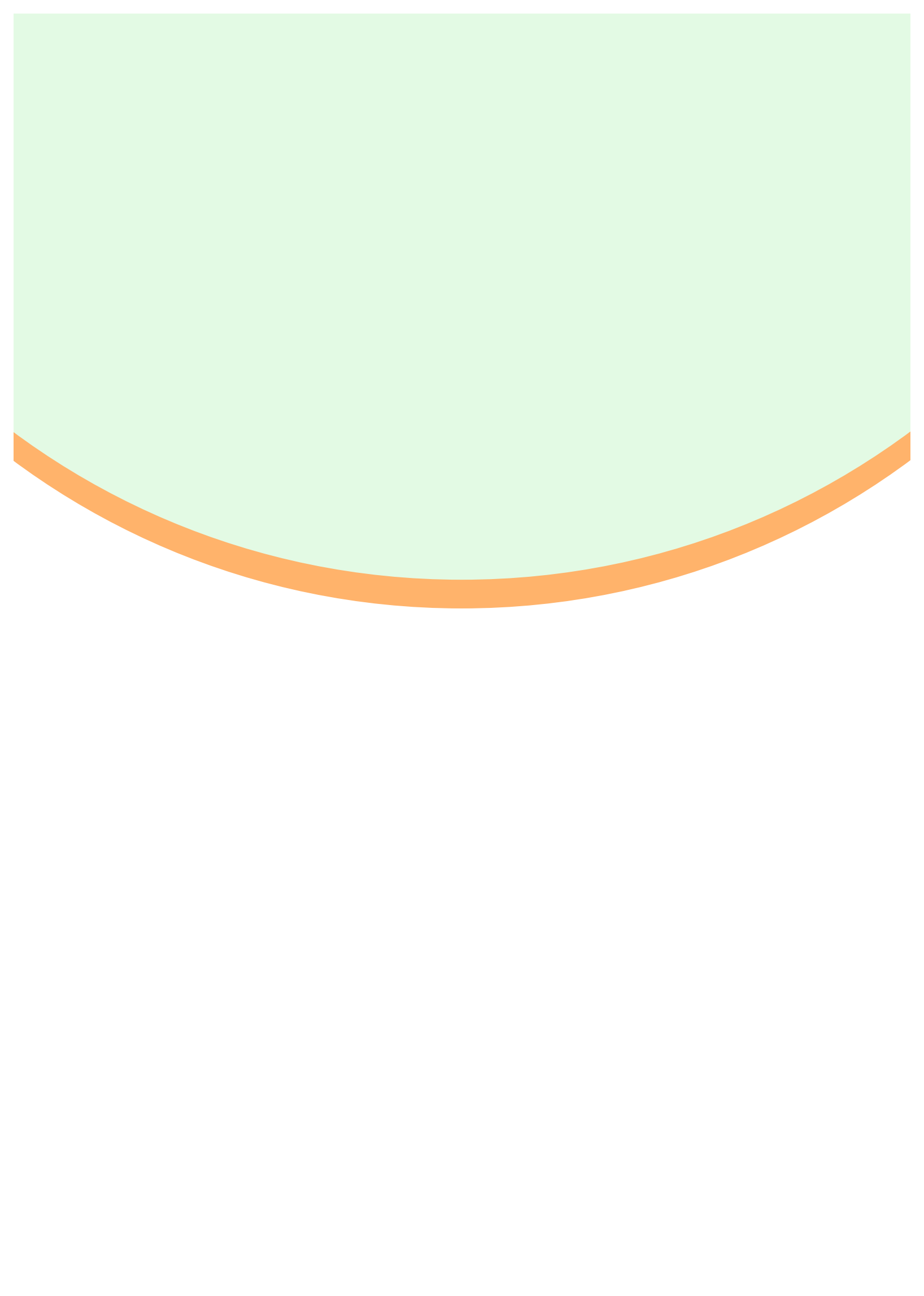
AGENDA OF 3 DAYS SKILL LAB BASED TRAINING ON BASIC PAEDIATRIC CARE IN COVID MANAGEMENT

Time	Topic	Modalities
DAY 1		
09:00-09:30	Registration RAT Testing of participants	Common Session in Classroom
09:30-09:45 09.45-10.00	Participants' introduction and Ice breaking. Rules of the road Objective of the workshop	
10:00-11:15	Assessment of danger signs, COVID in paediatric age group and its management Use of Pulse Oximeter & Glucometer	
11:15-11:30	Tea Break	
11:30-14:00	Assessment of danger signs	Group will be divided in 3 group and rotated on skill stations. Relevant videos will also be shown to the participants. OSCE Checklists to be used
	Use of Pulse Oximeter	
	Use of Glucometer	
14:00-14:45	Lunch Break	
14.45-15.30	Infection prevention protocols	Ppt in Classroom
15:30-17:00	COVID Sampling	Make 3 groups and rotate on three stations
	Hand washing, Face Mask & PPE	
	Bio medical waste management and Chlorine Solution	
DAY 2		
09:00-09:30	Recap of previous day	Classroom
09:30-11:15	Basic Life support and Intubation – Newborn & child Administer basic oxygen therapy Use a nebulizer/MDI for administration of inhalation therapy	Classroom with videos
11.15-11.30	Tea	
11:30-14:00	Basic Life support and Intubation – Newborn Basic Life support and Intubation – Child Administer basic oxygen therapy Use a nebulizer/MDI for administration of inhalation therapy	Skill station in 4 groups
14:00-14:30	Lunch Break	
14:30-16:00	Perform veni puncture and collect blood samples including ABG Insert a cannula into peripheral veins and use of Infusion pump Insert a Oro-gastric/naso-gastric tube	Classroom and skill station in 3 groups
16.15-16.30	Tea Break	
16.30-17.30	Basics of Ventilator	
DAY 3		
09:00-09:30	Recap of previous day	Classroom
09:30-11:30	Orientation on Basics of Ventilation Ventilator BiPaP HFNO	Classroom/ICU
11:30-11:45	Tea Break	
11:45-13:00	Practice drug dosage calculation and administration, Fluid and feed calculation	Classroom
13:00-13:45	Case scenarios	
13:45-14:00	Closing remarks and way forward	
14:00-14:45	Lunch Break and End of Training	

Section-1

Skill Lab Based Training for Paediatric Care





BACKGROUND

It is important to build capacity of the health work force for a possible future COVID wave particularly focusing on the paediatric age group. Analysis of UP data showed that COVID has been mild in younger age group with lesser case fatality rate and about 16% of the children required admission out of which about 5% required higher levels of care in level 2 and level 3 hospitals.

Emergency management is by team, so it is important that providers are well trained in important lifesaving procedures and their skills are strengthened at frequent intervals including other support staffs who may recognize some of the danger signs and are also updated on infection prevention protocols.

It is acknowledged that the seamless availability of necessary drugs and supplies, a system of supportive supervision to reinforce the use of the guidelines and to help overcome clinical and management problems has to be in place and training health workers alone might not be enough.

SKILL LAB BASED TRAINING FOR PAEDIATRIC CARE

The skills lab can be utilized to train and orient the master trainers and the participants in some critical paediatric skills useful towards preparedness for COVID management for the next predicted wave of COVID 19 particularly affecting the paediatric age group. The master trainers may also provide on-site mentoring to ensure practicing of the skills and adherence to the technical protocols acquired by the trainees.

TRAINING PLAN

Activity	Details	Remarks
Resource Package	Training agenda, methodology, mannequins -based skills, IEC and protocols	Draft GOUP Package to be aligned with existing training modules
Site of TOT	State Skills Lab at Noida & Lucknow for training of master trainers	Additional logistics to be added
Trainers at State Level	Nominated Facilitators for Child health trainings	4 trainers per district 2 doctors and 2 staff nurses preferably one pediatrician and one nurse mentor
Pre and Post Assessment Training	Assessment of knowledge using questionnaire and OSCE checklist for critical skills.	Need based Refresher trainings will be planned at state/district level based on assessment
Batch size	24-26 participants per batch	Expected Participants are 300 for state
Duration of training	3 days	Including travel

CASCADE OF TRAINING

- State Skills Lab** at Lucknow and Noida **TOTs:** 2 Medical Officers (Preferably 1 Paediatrician) and 2 Nurse Mentors (1 GoUP and 1 UPTSU) to train as master trainers for district level trainings.
- District Women Hospital Skills Lab:** All MOICs and GoUP Nurse Mentors from each Block CHCs who would further train the facility staff.
- Regular training at facility level at **Mini skill lab** for all Staff Nurses and Medical Officers.

Key Areas for Training for management of Paediatric Patients with COVID-19

S. No.	Activities (0-12 years) (including newborn age group)
1	Assessment of danger signs
2	Use of pulse oximeter
3	Use of glucometer
4	Basic Life Support* (Newborn & pediatric)

S. No.	Activities (0-12 years) (including newborn age group)
5	Endotracheal Intubation
6	Administer basic oxygen therapy
7	Use a nebulizer/MDI for administration of inhalation therapy
8	Perform veni puncture and collect blood samples
9	Insert a cannula into peripheral veins
10	Arterial Blood Sampling
11	Use of infusion pump
12	Insert a naso-gastric tube
13	Tests for COVID-19
14	Drugs, dosage and its Use in Emergencies and Anticonvulsant Drugs
15	Calculation of Fluid Requirements
16	Infection Prevention & PPE
17	Bio medical waste management

*Skills for Basic life support will be imparted at State level using mannikin and power point presentations and videos. Further at District and Block level power point presentations and videos will be used.

An orientation of the participants to ventilators will also be organized to familiarize them with the equipment. However, for operating the ventilators they would need a formal training and regular handholding.

Methodology

The facilitators will read all the resource material well and prepare in advance for the session. Each skill will be discussed in the class room using either power point/a video/both and then the class will be divided into smaller groups for skills station. At skills station they will be acquainted with each step using checklists and trainees will also learn to use checklist. The facilitator will start the day with the recap of the sessions held earlier, address the queries of the participants and would find out if a particular participant is facing any problem.

ORGANIZING SKILLS STATION PRACTICAL SESSIONS

The purpose of the skills stations is to give participants an opportunity to practice skills by showing and doing to have "hands on" participation in this simulated situation, to prepare them better to manage real patients.

- The practical sessions for this training should be organized in small groups at defined skills lab with sufficient space for 8-10 persons to stand and move around.
- Separate areas shall be required to have audio-visual privacy so that the group can focus on their own practical session.
- A list of supplies as under should be collected before-hand available with the facilitators. It may be updated or modified by facilitators considering the local situation. All the necessary supplies and equipment for all practical sessions should be in one place.
- Arrange for specific skills stations by providing the relevant supplies and equipment in the assigned room or space at/before the start of the day.
- Read & follow the manufacturer's instructions for preparing the mannequin before the start of the session.
- The facilitator needs to first demonstrate/teach the specific skills using checklist and then observe participants practicing the skills simulating of the situation to some extent.
- Each participant should be able to practice individually or in pairs. If a participant is not able to successfully perform the skill, the facilitator gives her/him guidance about what to do differently and s/he then tries again.

- The participant should repeat as needed, until s/he can successfully perform the skill. If a participant is having repeated difficulty, the facilitator will ask him/her to watch while another participant performs the skill. This should help the participant see what s/he is doing wrong.
- Time management is important as the group are required to rotate to different skills stations during the allotted session.

SKILL STATION EQUIPMENT LIST

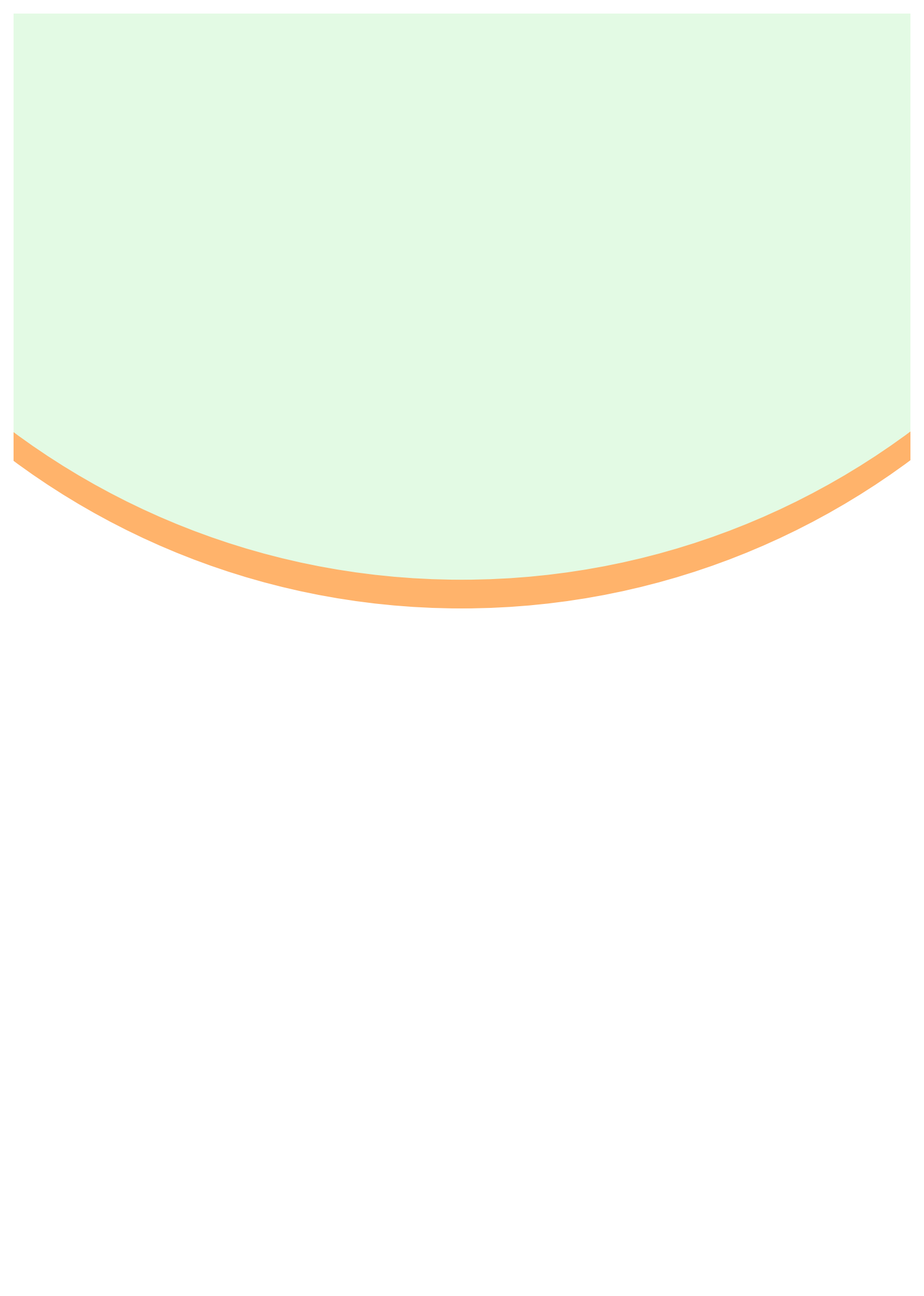
<ul style="list-style-type: none"> • Resuscitation mannequin- 2 sets (Neonatal, Pediatric) • Materials for stabilizing the neck: towel, tape • Oro-pharyngeal airways – several sizes (Guedel size 000 to 5) • Self-inflating bags of different sizes (500 & 750 ml) • Face mask of different sizes (Infant and Adult). • Suction apparatus (1 set) • Suction catheter (8,10,12 F) • Adhesive tapes • PPE kit • Gloves & N-95/surgical masks • COVID testing kit including VTM 	<ul style="list-style-type: none"> • Graduated jar (500ml) & measuring spoons 2.5ml-10ml (2 sets). • Glucometer (2), Blood sample for testing blood sugar. • Laryngoscope with blades (all sizes) • Endotracheal tubes (different sizes cuffed/uncuffed) • Blood Transfusion Set Blood/sample collection tubes/vials • I/V bottles, I/V set – paediatric infusion pump/drip set • Feeding tube/Nasogastric Tubes • I/V cannula (No. 26, 24,22)
<ul style="list-style-type: none"> • Pulse oximeter (1 set) • Face Mask (all sizes) • Nasal prongs (neonatal, Pediatrics, adult) • Head box (2) • Nebulizer (2 sets) with tubing • MDI & Spacer • Plastic bottle or cup for making spacer (2 sets) • Oxygen Flow regulator • BP apparatus with pediatric cuff • Disposable Syringes of different sizes including tuberculin syringe • Oxygen concentrator 	<p>Drugs: (2 sets)</p> <ul style="list-style-type: none"> • Dextrose (10% & 25%) • Injection Adrenaline, atropine • Salbutamol respiratory solution • Dopamine, Dobutamine • Hydrocortisone, Dexamethasone • Sodium Bicarbonate • Normal Saline/Ringer Lactate • Calcium gluconate • Injection Midazolam, Diazepam • Injection Phenytoin, Phenobarbitone

Note : Pediatric manikin and related airways etc may not be uniformly available at District level.

Section-2

Skills for Managing a Sick Child





INTERIM PROTOCOL FOR MANAGEMENT OF COVID - 19 IN CHILDREN

It is well documented that children are less commonly affected with COVID-19 infection and majority of them are asymptomatic or mildly symptomatic. A small proportion (10%- 20%) of symptomatic children may need hospitalization and 1% to 3% of symptomatic children may have severe illness requiring intensive care admission.

Median incubation period is 5.1 days (range 2 to 14 days). As per current evidence, the period of infectivity starts 2 days prior to onset of symptoms and lasts up-to 8 days. A person/ child with laboratory confirmation of COVID-19 infection irrespective of clinical signs and symptoms is defined as Confirmed Case.

Clinical Features

Common symptoms include- fever, cough, breathlessness/ shortness of breath, fatigue, myalgia, rhinorrhea, sore throat, diarrhea, loss of smell, loss of taste etc. Few children may present with gastrointestinal symptoms and a typical symptoms.

A new syndrome with name of multi system inflammatory syndrome has been described in children. Such cases are characterized by: unremitting fever > 38°C, epidemiological linkage with SARS CoV– 2 and clinical features suggestive of Multi System Inflammatory Syndrome.

Management of children with COVID –19 disease

Children with COVID-19 infection may be asymptomatic, mildly symptomatic, moderately sick or severe illness.

Asymptomatic children are usually identified while screening. If family members are identified as positive, such children do not require any treatment except monitoring for appearance of symptoms and subsequent treatment according to assessed severity. CHOs in the Districts may connect with them virtually and monitor them for any danger signs.

Mild disease: Children with mild disease may present with sore throat, rhinorrhea, cough with no breathing difficulty. Few children may have gastrointestinal symptoms also. Such children do not need any investigations. These children can be managed at home with home isolation and symptomatic treatment. It is important to assess whether home isolation is feasible by following steps:

- There is requisite facility for isolation at his/her residence and also for quarantining the family contacts
- Parents or other care taker who can monitor and take care of child. If available, ArogyaSetu App should be downloaded
- The parents/care giver has agreed to monitor health of the child and regularly inform his/her health status to the nodal person
- The parents/ care giver has filled an undertaking on self-isolation and shall follow home isolation/quarantine guidelines

Children with underlying comorbid condition such as: congenital heart disease, chronic lung diseases, chronic organ dysfunction, Obesity (BMI> 2SD) may also be managed at home, if they have features of mild disease and there is easy access to health facility in case of any deterioration. In case there is lack of proper arrangement to manage these children at home/ access to health facility is difficult, such children may be admitted.

Treatment of mild illness in home isolation is symptomatic.

- For Fever: Paracetamol 10-15 mg/kg/dose; may repeat every 4-6 hours
- For Cough: Throat soothing agents like warm saline gargles- in older children and adolescents
- Fluids & feeds: Ensure oral fluids to maintain hydration, and nutritious diet
- Antibiotics: Not indicated

There is No role of Hydroxychloroquine, Favipiravir, Ivermectin, lopinavir/ritonavir, Remdesivir, Umifenovir, Immunomodulators including Tocilizumab, Interferon B 1 a, Convalescent plasma infusion or dexamethasone

Monitoring at home: Explain parents/ care taker to maintain a monitoring chart including

- Counting of respiratory rates 2-3 times a day when child is not crying
- Looking for chest in drawing
- Bluish discolouration of body
- Cold extremities
- Urine output
- Oxygen saturation monitoring (hand held pulse oximeter) if feasible
- Fluid intake
- Activity level, esp for young children

There should be regular communication to doctor or health care worker. Parents/ caregiver should be explained whom to contact in case of emergency.

Management of children with Moderate COVID – 19 disease:

A child with COVID-19 will be categorized as having moderate disease if he/ she has the following:

1. Rapid respiration as follows:

Age	Respiratory Rate
less than 2 months	>60/ min
2 to 12 months	2 to 12 months
1 to 5 years	>40/min
more than 5 years	more than 5 years

2. Oxygen saturations above 90%.
3. Children with moderate COVID – 19 disease may be suffering from pneumonia which may not be clinically apparent.

Investigations: No lab tests are required as a routine unless indicated by associated co-morbid conditions.

Treatment: Children with moderate COVID-19 disease should be admitted in Dedicated Covid Health Centre / L2 Healthcare Facility and monitored for clinical progress. Maintain fluid and electrolyte balance. Encourage oral feeds (breast feeds in infants); if oral intake is poor, intravenous fluid therapy should be initiated.

Children with moderate COVID – 19 disease should be administered:

1. For fever: Paracetamol 10-15 mg/kg/dose. May be repeated every 4-6 hourly. (temperature > 38°C, i.e. 100.4°F).
2. Dispersible Tab/ Cap Amoxicillin to be administered, if there is evidence/ strong suspicion of bacterial infection.
3. For SpO2 below 94%, oxygen supplementation is required.
4. Corticosteroids may be administered in rapidly progressive disease. It is not required in all children with moderate illness, specifically during first few days of illness.
5. Supportive care for comorbid conditions, if any.

Management of children with Severe COVID-19 disease:

Children categorized as having severe degree of COVID-19 infection are.

- All cases with SpO2 level less than 90%
- Signs of severe pneumonia, or pneumonia with cyanosis
- Acute Respiratory Distress Syndrome, Clinically, such children may present with grunting, severe retraction of chest, lethargy, somnolence, seizure
- Septic Shock,

- Multi-organ dysfunction syndrome (MODS)

Such children should be admitted in Dedicated Covid Hospital/ Secondary/ Tertiary level healthcare facility. Few children may require care in HDU/ICU areas of these facilities. They should be assessed for: thrombosis, Haemophagocytic lympho histiocytosis (HLH), and organ failure.

Investigations:

Complete blood counts, liver and renal function tests, Chest X-ray

Treatment

- Intravenous fluid therapy – Start fluid as appropriate for the age and weight of the child. Fluids may have to be restrictive depending upon clinical conditions.
- Corticosteroids: Dexamethasone 0.15 mg/kg per dose (max 6 mg) twice a day is preferred. Equivalent dose of methylprednisolone may be used for 5 to 14 days depending on continuous clinical assessment.
- Anti-viral agents: Remdesivir is antiviral agent. There is lack of sufficient safety and efficacy data in children below 19 years of age. An emergency use authorization for children has been granted; it should be used in restricted manner in children with severe illness within three days of onset of symptoms after ascertaining that child's renal and liver functions are normal and monitored for side effects of medicine. Suggested doses if body weight > 40 kg: 200 mg on 1st day then 100 mg once daily for 4 days.
- There is No role of Hydroxychloroquine, Favipiravir, Ivermectin, lopinavir/ritonavir, Umifenovir.
- Children may need organ support in case of organ dysfunction; e.g. Renal Replacement Therapy.

Management of Acute Respiratory Distress Syndrome (ARDS): The principles of treatment are similar to that of ARDS due to any other underlying illness.

- Mild ARDS: High Flow Nasal Oxygenation, Non-invasive ventilation may be given.
- Severe ARDS: Mechanical ventilation may be given with low tidal volume (<6 mL/kg and High Positive End Expiratory Pressure).
- If the child does not improve clinically even then, may consider (if available) High Frequency Oscillatory Ventilation, Extracorporeal Membrane Oxygenation (ECMO).
- Awake prone position may be considered in older hypoxemic children if they tolerate.

Management of Shock: If the child develops septic shock or myocardial dysfunction then he/ she may require:

- Crystalloid bolus administration: 10 to 20 ml/kg over 30 to 60 minutes; be cautious if cardiac dysfunction is there.
- Early inotrope support with monitoring of fluid overload like any other cause of shock.

MANAGEMENT OF MULTISYSTEM INFLAMMATORY SYNDROME IN CHILDREN AND ADOLESCENTS TEMPORALLY RELATED TO COVID-19 (MIS-C):

This new syndrome is characterized by: unremitting fever > 38° C, epidemiological linkage with SARS CoV –2 and clinical features suggestive of Multi System Inflammatory Syndrome.

Diagnostic criteria of MIS-C in Children (WHO criteria): a constellation of clinical and laboratory parameters has been suggested for diagnosis. These include:

Children and adolescents 0–19 years of age with fever \geq 3 days AND two of these:

1. Rash or bilateral non-purulent conjunctivitis or muco-cutaneous inflammation signs (oral, hands or feet).
2. Hypotension or shock.
3. Features of myocardial dysfunction, pericarditis, valvulitis, or coronary abnormalities (including ECHO findings or elevated Troponin/NT- proBNP),
4. Evidence of coagulopathy (by PT, PTT, elevated d-Dimers).

5. Acute gastrointestinal problems (diarrhoea, vomiting, or abdominal pain).
AND
6. Elevated markers of inflammation such as ESR, C-reactive protein, or procalcitonin.
AND
7. No other obvious microbial cause of inflammation, including bacterial sepsis, staphylococcal or streptococcal shock syndromes.
AND
8. Evidence of COVID-19 (RT-PCR, antigen test or serology positive), or likely contact with patients with COVID-19.

Investigations: as listed above in criteria and investigations to rule out common differential diagnoses.

Treatment of MIS-C

- Steroids: Methylprednisolone 1 to 2 mg/kg per day.
- Intravenous Immunoglobulin 2 g/kg over 24 to 48 hours.
- Antimicrobials

The child needs appropriate supportive care, preferably in ICU. In absence of cardiac dysfunction, shock, coronary involvement, multi organs dysfunction, one may use steroids or IVIG

If the child does not improve with the above treatment or deteriorates, options include:

- Repeat IVIg
- High dose corticosteroid (Methylprednisolone 10 to 30 mg/kg/day for 3 to 5 days)
- Aspirin: 3 mg/kg/day to 5 mg/kg/day max 81 mg/day (if thrombosis or Coronary Aneurysm Score is >2.5)
- Low Molecular Weight Heparin: Enoxaparin: 1 mg/kg twice daily subcutaneously. Clotting Factor Xa should be between 0.5 to 1 (if patient has thrombosis/ Coronary aneurysm score > 10 or LVEF < 30%)

Steroids have to be tapered over 2 to 3 weeks while monitoring inflammatory markers.

For children with cardiac involvement, repeat ECG 48 hourly, repeat ECHO at 7 to 14 days and between 4 to 6 weeks and at 1 year if initial ECHO was abnormal.

Refer to Algorithms annexed for reference

ASSESSMENT OF DANGER SIGNS IN A SICK CHILD

Triage all sick children as soon as they arrive at hospital, well before any administrative procedure such as registration, into the following categories:

- Those with EMERGENCY SIGNS: Assess airway and breathing to start emergency treatments if required, status of circulation and level of consciousness and severe dehydration in a child with diarrhea for initiating management of shock, coma and convulsions
- Those with priority signs
- Those that are non-urgent cases (Queue)

Emergency signs can be identified on an average in twenty seconds as one can observe several points just by looking at the child. Triage can be carried out at different locations – e.g. in the outpatient queue, in the emergency room, or in a ward if the child has been brought directly to the ward. All medical and other health workers involved in the patient care can perform triage if trained properly and they should also be able to give the initial emergency treatment.

Emergency Signs

ABCD (Airway-Breathing-Circulation/Convulsions/Consciousness-Dehydration) concept

Assessment of Danger Signs	
Airway	If positive then treat , if negative then go to
Breathing	If positive then treat if negative then go to
Circulation/conscious or convulsing	If positive then treat if negative then go to
Dehydration	If positive, treat. If negative, proceed to priority signs

If the child has any emergency sign of the ABCD, it means the child has an emergency “E” sign and emergency treatment should start immediately.

1. Call for help from an experienced health professional if available, but don't delay starting treatment and may need to work with other health workers to begin several treatments at once
2. Senior/most experienced health professional should continue assessing the child to identify all underlying problems and prepare a treatment plan
3. Do not move neck if cervical spine injury
4. Make sure to keep the child warm always specially if young infant
5. Check for Obstructed breathing/Central cyanosis/ Severe respiratory distress

Signs of severe respiratory distress :

- Laboured or very fast breathing (RR >70/min)
 - Severe lower chest wall indrawing
 - Use of auxiliary muscles
 - Head nodding
 - Inability to feed because of respiratory problems
 - Abnormal respiratory noises (stridor, grunting)
 - SpO₂ (oxygen saturation) <90%
6. If not breathing or gasping — Manage airway and -Start life support
 7. If foreign body aspiration— Manage airway in choking child
 8. If no foreign body aspiration- - Manage airway & Give oxygen
 9. For circulation check for cold hands with Capillary refill (if longer than 3 seconds) and weak or fast pulse
 10. Prepare to perform veni puncture and insert a cannula
 11. Before starting the therapy send blood for investigations and for typing and cross-matching if the child appears to be severely anaemic or is bleeding significantly
 12. Insert IV line* and begin giving fluids rapidly if NO SEVERE ACUTE MALNUTRITION
 13. IF SEVERE ACUTE MALNUTRITION Give IV glucose, Insert IV line and give fluids
 14. If the child has any bleeding, apply pressure to stop the bleeding. Do not use a tourniquet, Give oxygen and Make sure child is warm
- *If not able to insert peripheral IV, insert an external jugular or intraosseous line.*
15. If Coma Or Convulsing: Manage airway, Position the unconscious child (if head or neck trauma is suspected, stabilize the neck first), give oxygen
 16. Check and correct hypoglycaemia, Give IV calcium if infant <3 months, If convulsions continue, give anti-convulsant
 17. In cases with history of diarrhoea plus any two of these: Lethargy, Sunken eyes, very slow skin pinch then after ensuring that child is warm, If No Severe Acute Malnutrition: Insert IV line and begin giving fluids (RL/NS) rapidly but in cases of Severe Acute Malnutrition (SAM): Do not give IV fluids, give ORS@ 5 ml/kg every 30 min for 2 hours
 18. Call for surgical help or follow surgical guidelines if a child has trauma or other surgical problems
 19. Carry out point of care emergency investigations (blood glucose, pulse oximeter & check temperature, blood smear, haemoglobin if possible urine for sugar/ketones etc

After giving emergency treatment, proceed immediately to assess, diagnose and treat the underlying condition. All these children should be hospitalized and observed till stabilization. During and after providing emergency treatment, the child should be re-assessed using the complete ABCD sequence.

Priority signs

If no emergency signs are found, check for priority signs (*below*). These children need prompt assessment (no waiting in the queue, move to the front of the queue) to determine what further treatment is needed.

1. **T**iny baby (any sick child aged <2 months)
2. **T**emperature (very high)
3. **T**rauma or other urgent surgical condition
4. **P**allor (severe)
5. **P**oisoning (history of swallowing drug/poisonous substance or stings/bites)
6. **P**ain (severe)
7. **R**espiratory distress [Laboured or very fast breathing (RR >70/min)/Severe lower chest wall in-drawing/Use of auxiliary muscles/Head nodding/Inability to feed because of respiratory problems/Abnormal respiratory noises (stridor, grunting)/SpO₂ (oxygen saturation) <90%
8. **R**estless, continuously irritable, or lethargic
9. **R**eferral (urgent)
10. **M**alnutrition: visible severe wasting
11. **O**edema of both feet
12. **B**urns (major)

NON-URGENT: Proceed with assessment and further treatment according to the child's priority.

PROVIDING BASIC LIFE SUPPORT

Equipment/resources required

- Resuscitation dolls/mannequins/resuscitation head
- Oro-pharyngeal airways in several sizes
- Face masks of varying sizes
- Self inflating bags of different sizes
- Oxygen and oxygen delivering equipment
- Electric or foot suction pump
- Suction catheter

Steps

Demonstrate following steps on a mannequin

- Remove any visible obstruction from the mouth. Clear secretions from the throat.
- Open the airway using head – tilt, chin-lift manoeuvre.
 - Extend the neck slightly and tilt the head by placing one hand on to the child's forehead.
 - Lift the mandible up and outward by placing the fingertips of other hand under the chin.
 - Maintain a neutral position (nose up) in an infant and a sniffing position (chin up) in a child

If child with suspected trauma, open airway with jaw thrust without head tilt.

- Kneel behind the patient's head.
- Rest your elbows on the surface on which the patient is lying.
- Place one hand on each side of the patient's head.
- Place the tips of your index and middle fingers under the angles of the patient's jaw. (This is done on both sides)

- Place your thumbs on the patient's jaw just below the level of the teeth. The thumbs will keep the patient's head from turning or tilting during the lift.
- Lift the jaw upward with your fingertips. The mouth should not be closed as this could prevent air from entering the patient's airway. Use your thumb to retract the patient's lower lip if needed.

Use of airway, indicated when the patient is unconscious.

- Select appropriate size oropharyngeal (Guedel) airway by measuring distance from the angle of mouth to the angle of the jaw when laid on the face with the raised curved side (convex) up ("the right side up"). The most commonly used size for children is 2.
- Position the child to open the airway, taking care not to move the neck if trauma is suspected.
- Using a tongue depressor, insert the oropharyngeal airway (the convex side up) In an infant & In a child, insert the airway "upside down" (concave side up) until the tip reaches the soft palate
- Re-check airway opening
- Use a different sized airway or reposition if necessary

Bag & Mask

- Check the bag and valve by closing the patient's connection with thumb and attempt to expel air from the bag.
- Choose a bag of appropriate volume for infants (500 ml) and children (750 ml) and an appropriately sized mask; which completely covers the mouth and nose without covering the eyes or overlapping the chin.
- Attach the bag-mask valve to an oxygen supply. Adjust flow to 10 litres per minute or to maximum possible if using a concentrator. If oxygen is not available, use room air for resuscitation.
- Hold the mask over the face with dominant hand. Maintain the head tilt, chin lift position.
- Perform the bag and mask ventilation with E-C clamp technique:
 - Position the thumb and index finger in a C shape over the mask and exert downward pressure on the mask to ensure proper air seal. Position the last 3 fingers under the angle of mandible to lift the jaw. If resuscitating alone, maintain the E-C clamp with one hand and compress the bag with the other hand.
 - Release bag completely between ventilations. Correct rate of ventilation /continue bag and mask ventilation at a rate of 20 breaths/ minute for a few minutes.
 - Look for noticeable rise in the chest. If chest does not rise and fall when using bag and mask:
- Reapply mask & reposition the head
- Suction the throat and keep mouth slightly open
- Increase pressure on the bag

Chest compressions coordinated with bag & mask ventilation to be provided if any of the following:

- Pulse cannot be detected
- Heart rate is less than 60 bpm
- Signs of poor perfusions after adequate ventilation

Thumb technique is preferred over 2 -finger technique

- Stand at the infant's feet or side.
- Place thumbs side by side over lower half of sternum, encircle the infant's chest and support the infants back with the fingers of both hands.
- Use both thumbs to depress the sternum.
- Push at a rate of at least 100 compressions per minute.
- Give two effective breaths after every 15 chest compressions (Ratio of chest compressions: ventilation of 15:2) if there are two rescuers.
- Maintain a ratio of 30:2 with a single rescuer.

2-finger technique:

- Lay the infant in supine position on a hard-flat surface
- Use tips of the middle finger and either the index finger or ring finger of one hand to compress the lower half of the sternum (but not over the xiphoid). After each compression, allow the chest to recoil fully.
- Push with sufficient force to depress the chest approximately one third to one half the antero-posterior diameter of the chest.
- Release completely to allow complete recoil of the chest by completely releasing the pressure but maintaining contact with the compression site.

Key points to remember

- **When to ventilate:** Use a bag & mask when child's breathing is very shallow, or slow, or obstructed, or child is not breathing.
- **When to initiate chest compressions:** If pulse cannot be detected or if heart rate is less than 60 bpm in an infant or child with signs of poor perfusion even after adequate oxygenation and ventilation, then provide chest compressions coordinated with ventilations.
- **When and how to stop ventilation:** Stop after a few minutes; look to see if the child starts to breathe spontaneously. If not breathing adequately, continue for 45 minutes or according to decision of clinician.

NEWBORN RESUSCITATION

Essential logistics and drugs for NBR

Equipment	Accessories	Function	Accessories
Radiant warmer	Temperature sensor and sensor cover Warm towels or blanket	Warmth, maintaining the warm chain	Preheated warmer
	10F or 12F suction catheter suction, set at 80 to 100 mm Hg	Clearing of airways	Bulb syringe Meconium aspirator
Bag & mask	Term- and preterm-sized masks	Positive pressure ventilation	8F feeding tube and large syringe
	Pulse oximeter with sensor and cover Equipment to give free-flow oxygen		Target oxygen saturation table
If trained in NRP protocols and can intubate then must have the following equipment checked. A paediatric stethoscope should be available for auscultation			
Laryngoscope with straight blades	size-0&1, Endotracheal tubes (sizes 2.5, 3.0, 3.5), endotracheal tube insertion depth table Waterproof tape or tube-securing device Scissors, 5-mL syringe	Intubate	Laryngeal mask (size1), Carbon dioxide (CO2) detector, Measuring tape and/or
	Normal saline Supplies for placing emergency umbilical venous catheter and administering medications	Medicate	

Newborn resuscitation to be practiced as per the checklist on manikin

After 5 breaths through Bag and mask, if bilateral chest rise does not occur, check for the following (MRSOPA):

	Problem	Remedial Step
M	Inadequate seal	Mask Adjusted to ensure airtight seal
R	Inappropriate Position	Reposition the head in sniffing position
S	Blocked Airway	Suction the Airway
O		Open baby's mouth and ventilate
P	Inadequate pressure	Increase Pressure by squeezing the bag with more pressure till a chest rise is visible
A	No improvement with above steps	Consider Alternate means of breathing such as endotracheal intubation

1. Chest Compressions

- a. Call for additional help if necessary
- b. Ask assistant to increase oxygen concentration to 100%
- c. Ask assistant to place ECG leads and attach to monitor (recommended)
- d. Compressor moves to head-of-bed position, ventilator to side of bed
- e. Place thumbs on sternum (lower one-third, below imaginary line connecting nipples), fingers under back supporting spine (fingers do not need to touch)
- f. Compress sternum one-third of the AP diameter of chest, straight up and down
 - i. Compressor counts cadence "One-and-two-and-three-and-breathe-and"
 - ii. Positive-pressure ventilation administered during compression pause ("breathe-and")
 - iii. 3 compressions and 1 breath every 2 seconds
- g. After 60 seconds of chest compressions and ventilation:
 - i. If the heart rate is 60 bpm or greater, discontinue compressions and resume PPV at 40 to 60 breaths per minute.
 - ii. If the heart rate is less than 60 bpm, check the quality of ventilation and compressions. If ventilation and compressions are being correctly administered, epinephrine administration is indicated.

2. Medication: Epinephrine Summary

- a. Preparation : Intravenous or Intraosseous 5 1-mL syringe labelled "Epinephrine-IV" Endotracheal 5 3- to 5-mL syringe labelled "Epinephrine-ET only"
- b. Dose : Intravenous or Intraosseous 0.1 to 0.3 mL/kg Endotracheal 0.5 to 1 mL/kg
- c. Administration : Intravenous or Intraosseous: Flush with 0.5 to 1 mL normal saline. Endotracheal: PPV breaths to distribute into lungs Repeat every 3 to 5 minutes if heart rate remains less than 60 bpm.
- d. Route : Intravenous (preferred) or Intraosseous Option, Endotracheal only while intravenous or intraosseous access is being obtained

Concentration 1:10,000 epinephrine (explained in drug summary)

ENDOTRACHEAL INTUBATION

By the end of the session the participants should be able to

- 1) Identify indications for endotracheal intubation
- 2) Equipment needed for intubation
- 3) Know different size tubes and length of the ET tube to be inserted
- 4) Intubate
- 5) Correct positioning of Endo tracheal tube in Trachea

Endotracheal intubation is done either as part of New born resuscitation or as part of resuscitating a sick new born or electively to connect the baby to a ventilator preparatory to surgical procedures or otherwise.

Indications for intubation:

1. Ineffective B & MV
2. With Chest Compression
3. For medication
4. Prolonged PPV
5. Diaphragmatic hernia

List of equipment needed for intubation

Disposable ET tubes of various sizes (2.5,3,3.5,4)	Straight blade Laryngoscope with detachable blades size 00,0 and 01 with batteries
New Batteries AA / AAA size -2	Bulb for laryngoscope
Scissors	Cut tapes for holding the tube in position
Disposable gloves	Bag & Mask with reservoir and Oxygen tubing

Identifying correct tube size

Tube Size	Weight
2.5 (ID mm)	<1000 gm
3.0 (ID mm)	1000-2000 gm
3.5 (ID mm)	2000-3000 gm
4.0 (ID mm)	>3000 gm

Steps before Intubation:

- Call for help
- Wash hands & Wear gloves
- Identify the correct tube to be inserted and the correct blade (0) of laryngoscope
- Fix 0 size blade in the laryngoscope and check whether the bulb glows
- Check the expiry date and that the cover of the ET tube is intact, before cutting the cover open
- Cut the ET tube to 13 cm length after marking it by holding at the point to cut through
- Reconnect the ET tube connector at the cut end

Steps of checking the correct placing of ET tube

Correctly positioned tube	Bilateral equal breath sounds, Rise of the chest with each ventilation No air heard entering stomach No gastric distention
Tube in Rt. Main bronchus	Breath sounds only on right chest Action: withdraw the tube a little and recheck as above
Tube in Lt. Main bronchus	Air heard entering stomach Gastric distention may be seen No mist in tube Action: Remove the tube, oxygenate the infant with a bag and mask, reintroduce ET tube

Key points Providing free-flow oxygen (Assistant's responsibility),
Limiting each intubation attempt to 20 seconds

OXYGEN THERAPY

Objective : To learn the use of various oxygen delivery devices in an infant/child with problem with the airway or breathing.

Equipment/resources required

- Nasal prongs
- Nasal catheters
- Headbox
- Oxygen supply/source (oxygen cylinder with humidifier, concentrator)

- Humidifier
- Appropriate mannequin

Procedure

- Demonstrate use of each of the oxygen delivery equipment.
- Discuss the method of disinfection in case the device is reusable.

Steps

Always give oxygen first when indicated, while continuing to assess for other problems and continue to monitor by pulse oximetry. A source for oxygen supply and the proper equipment to control oxygen flow rates are pre-requisites.

Oxygen delivery

Make the child comfortable and try alternative modes to deliver the oxygen and position of comfort with an aim to reduce both oxygen consumption and possibly respiratory distress.

Nasal prongs

Nasal prongs are short tubes inserted into the nostrils. They are the preferred method of delivery in most circumstances, as they are safe, non-invasive, reliable and do not obstruct the nasal airway; there is minimal wastage of oxygen by this method.

Place age appropriate size of prongs just inside the nostrils and secure with a piece of tape on the cheeks near the nose. Care should be taken to keep the nostrils clear of mucus, which could block the flow of oxygen. Nasal prongs are best for delivering oxygen to young infants and children with severe croup or pertussis; do not use a nasal catheter as they provoke paroxysms of coughing.

Oxygen Mask

Severely ill children with signs of obstructed breathing, central cyanosis, severe respiratory distress or signs of shock or who are unconscious should receive oxygen initially by nasal prongs at a standard flow rate (0.5 – 1 L/min for infants and 2-4 L/min for older children) or through an appropriately sized face mask (flow rate > 4 L/min) to reach a peripheral capillary oxygen saturation $\geq 94\%$.

The soft vinyl paediatric mask is often poorly tolerated by infants & toddlers but may be accepted by older children. A flow rate of 6-10 litres/minute should be kept and titrated with SpO₂ monitoring.

Oxygen hood (Head box): is a clear plastic shell that encompasses the patients head. It is very well tolerated by infants; allow easy access to the chest, trunk and limbs and permits control of inspired oxygen. A high flow rate is required (10-15 litres/minute). As a rule, a hood is too small to use with children older than approximately 1 year. The use of head boxes is not recommended because of oxygen wastage.

Nasopharyngeal catheter: This is a 6 or 8 FG catheter which is passed to the pharynx just below the level of uvula a distance equivalent to that from the side of nostril to the front of the ear. Nasal catheter is made from tubing of 6 or 8 FG size such as a nasogastric tube or suction catheter. The tubing is inserted into either nostril a distance equivalent to that from the child's nostril to the inner eyebrow. It must then be firmly secured using tape, and connected to the oxygen. The tip of the catheter should NOT be visible below the uvula. Set a flow rate of 0.5-1 litres for infants and 1-2 litres/min for older children

Humidification is required. The bubble humidifier should be filled with clean warm water. The water should be changed daily. Nasal or nasopharyngeal catheters may be used as an alternative only when nasal prongs are not available. For standard flow oxygen therapy, humidification is not needed. In an emergency setting when a flow >4 L/min through nasal cannulae is required for more than 1-2 h, effective heated humidification should be added.

Indications

- Pulse oximetry is recommended to determine the presence of hypoxaemia in all children with ETAT emergency signs
- When the child has only respiratory distress, oxygen supplementation is recommended at SpO₂ < 90%.

- Children presenting with other ETAT emergency signs with or without respiratory distress should receive oxygen therapy if their SpO₂ is < 94%.
- When pulse oxymeter is not available or pulse oxymeter does not pick saturation in conditions like shock, hypothermia, the necessity for oxygen therapy should be guided by clinical signs although they are less reliable. Oxygen should be given to children with severe pneumonia, bronchiolitis or asthma who have:
 - Central cyanosis
 - Inability to drink (when this is due to respiratory distress)
 - Severe lower chest wall in-drawing
 - Very labored or very fast breathing (Respiratory rate \geq 70/min)
 - Grunting with every breath (in young infants)
 - Depressed mental status.

Monitoring during oxygen therapy

Monitor the child at least every 3 hours to identify and correct any problems, including:

- Oxygen saturation, by pulse oximeter
- Position of nasal prongs
- Leaks in the oxygen delivery system
- Oxygen flow rate
- Airway obstructed by mucus (clear the nose with a moist wick or by gentle suction)

Duration of oxygen therapy

Oxygen therapy can be stopped when a child no longer has ETAT emergency signs and maintains a peripheral capillary oxygen saturation \geq 90% in room air. When the child is stable and improving, take the child off oxygen for 15 min. If the SpO₂ readings with room air remain \geq 90%, discontinue oxygen but check again 30 min later and every 3 h thereafter on the first day off oxygen to ensure that the child remains stable.

Sources of oxygen:

Central supply of oxygen

Large hospitals usually have central oxygen supply and oxygen ports as source of oxygen. For all sick children, assess oxygen saturation using a pulse oximeter. Heated and humidified oxygen should be given if the oxygen saturation is \leq 90%, and the oxygen flow should be regulated to maintain saturation between 91-95%. Use a pulse oximeter to guide oxygen therapy. Oxygen can be discontinued once the infant can maintain saturation > 90% in room air.

Oxygen Concentrators

An oxygen concentrator is a device providing oxygen therapy to a patient at minimally to substantially higher concentrations than available in ambient air. Oxygen concentrators are less expensive than liquid oxygen and are the most cost-effective source of oxygen therapy and more convenient alternative to tanks of compressed oxygen.

Room air contains 21% oxygen combined with nitrogen and a mixture of other gases. A miniaturized compressor inside the machine pressurizes this air through a system of chemical filters. This chemical filter is made up of silicate granules called, Zeolite. The Zeolite will sieve the nitrogen out of the air, concentrating the oxygen. Through this process, the system is capable of producing medical grade oxygen up to 96%, consistently. Most of the portable oxygen concentrator systems available today provide high concentration of oxygen and also maximize the purity of the oxygen.

Safety

The concentrator's instruction manual indicates as to what maintenance is necessary; here are some general guidelines to follow:

- The concentrator needs good, clean air to operate properly. Hence, operate the concentrator in a well-ventilated area.

- Wash the filters periodically (at least once in a week).
- Replace the filters periodically (at least once in a year).
- Ensure examination of the concentrator, at least once in a year by the company engineer.

There are also some very important safety issues to be kept in mind. Oxygen is most dangerous in the presence of fire. Keep flammable materials away, and do not allow any heat sources to be near a working oxygen concentrator. In both clinical and emergency-care situations, oxygen concentrators have the advantage of not being as dangerous as oxygen cylinders, which can, if ruptured or leaking, greatly increase the combustion rate of a fire.

Oxygen concentrators are considered sufficiently full proof to be used in children. They can be used for more than one patient by using flow splitters. However, they need a power source.

Parts

1. Machine with compressor
2. Flow meter with/without splitter
3. Humidification bottle

Working

1. Plug onto the power supply.
2. Switch on the concentrator using the ON/OFF button.
3. Once the concentrator is on, a yellow light will come up.
4. Next, adjust the flow to 3-4 liters. This light will be on till the desired concentration of oxygen is achieved, which in most concentrators is nearly 90-93%, after which it goes off.

Every manufacturer has its own way of showing the achieved desired concentration. In some concentrators this yellow light will become green after achieving the desired concentration.

Maintenance

1. Coarse filter –Ensure it is dust free, wash daily
2. Zeolite granules –Change every 20,000 hrs
3. Bacterial filter –Change every one year

Oxygen Cylinder

It must have a regulator to limit the pressure of oxygen being released, a gauge to indicate the amount of oxygen in the cylinder and a flow meter to control oxygen flow to the patient.

Steps

- Ensure the oxygen cylinder is secured on a flat surface on a trolley
- Attach regulator, flow meter and humidifier to the cylinder
- Attach the humidification bottle to the flow meter and fill with clean water up to the mark level on the bottle (between 1/3 and 2/3)
- Use a spanner/key to open the cylinder
- Check whether the flow indicator moves along with the bubbles in the humidifier when the flow meter is opened
- Attach the oxygen tube to the humidifier
- Connect the oxygen tube to the nasal prongs/oxygen hood to deliver oxygen to the patient

When to discontinue oxygen therapy:

- Reduce by 0.5 L every few minutes and observe oxygen saturation. If the saturation maintained at 90-94%, gradually remove oxygen.

Precautions

- Tighten all the connections (between the cylinder and the regulator and between the regulator and the flow meter), so that oxygen does not leak out.
- Open the regulator and check the amount of oxygen in the cylinder on the pressure gauge. If the needle of the gauge is in the red zone, the cylinder is nearly empty and should not be used, unless it is the only one you have. Never allow such a cylinder to be used for a child overnight, as it will run out and the child will become hypoxemic.
- Seamless Oxygen supply must be maintained like an emergency drug to avoid any stock out

DO NOT ALLOW an open flame anywhere within 3 meters of an oxygen source as it is highly inflammable. Firebreak connectors are recommended to stop the oxygen flow in the event of fire.

Oxygen Therapy during Referral Transportation

Airway & oxygenation: Ensure clear airway and breathing, maintain saturation between 91-95%.

The neck should be kept slightly extended by placing a shoulder roll, avoid hyperextension. Avoid placing pillow/sheet below the head.

To ensure the airway patency always keep a mucous extractor handy for suction during transport.

Children who need oxygen should be transported with nasal prongs/mask attached to an oxygen source with flow of 0.5 to 1 L/min.

The adequacy of oxygen in gas cylinder should be ensured, before starting.

If child becomes apnoeic during transport and if a trained health attendant/provider is present in the ambulance, provide positive pressure ventilation using a bag and mask.

When to stop Oxygen therapy

Child no longer has ETAT emergency signs and maintains a peripheral capillary oxygen saturation $\geq 90\%$ in room air.

Child is stable and improving, take the child off oxygen for 15 min. If the SpO₂ readings in room air remain $\geq 90\%$, discontinue oxygen but check again 30 min later. Check every 3 hours thereafter on the first day off oxygen to ensure that the child remains stable.

The term mechanical ventilation refers to all forms of positive pressure ventilation as well as ventilators to support ventilation and oxygenation.

Invasive Ventilation is indicated in cases of respiratory failure, apnea/respiratory arrest/inadequate ventilation OR oxygenation, cardiac insufficiency/shock, neurologic dysfunctions.

Invasive ventilation may be considered as a last resort unless indicated. Non-invasive ventilation can be considered before resorting to intubation but should not delay endotracheal intubation, but no specific limits can be provided in any disease condition.

USING A NEBULISER AND METERED DOSE INHALER WITH SPACER/ VOLUME HOLDING CHAMBER

Nebulizer delivers medications as aerosol & MDI with spacer as an alternative method for delivery of medications by inhalation. Detailed steps are in the checklist

Practical points on nebulizer usage:

Nebulization is a method of converting a medicine or solution into an aerosol, which is inhaled directly into the lungs. The Nebulizer sets come with three components:

- The chamber, where the solution to be nebulized is placed/poured.
- A mouthpiece or mask (either can be used depending on the age of the patient)
- Tubing to attach the gas inlet on the chamber to either an air or oxygen supply.

- The driving source for the nebulizer must deliver at least 6–9 litres/minutes of air.
- Recommended methods are an air compressor, ultrasonic nebulizer or oxygen cylinder, but in severe or life-threatening asthma oxygen must be used.
- Use saline as the diluent and not distilled water to avoid reflex bronchospasm.
- Delivery may be through a mouthpiece or mask, if a mask is used, it should be held close to the face (but not so tight that it causes inconvenience). Any gap reduces drug delivery significantly.

Post-procedure cleaning of equipment

- Disconnect the Nebulizer set from the tubing and the flow meter.
- Take the Nebulizer chamber apart, so that the three components are separated from each other.
- Ensure any residual solution is discarded since any residual solution left in the chamber will rapidly become colonised with bacteria from environmental sources.
- Wash the three parts of the chamber in warm soapy (neutral detergent/washing up liquid) water.
- Chlorhexidine-based or other soap products are not suitable.
- Washing the chamber ensures no residual drug is left in the Nebulizer set avoiding subsequent re-administration with the next Nebulizer.
- Rinse all three parts well. Remove excess water. Leave the Nebulizer parts in a clean area to air dry away from any area where water may splash on it to reduce the risk of contamination.
- Regularly review the integrity of the Nebulizer set. Discard the chamber and tubing if either shows any signs of the following:
 1. Discolouration
 2. Stickiness
 3. Cracking of the chamber

Giving salbutamol by Spacer/Volume holding chamber + MDI Steps detailed in Checklists

1. Assemble the spacer.
2. Remove the cap of the inhaler, shake the inhaler and insert it into rear end of the spacer device.
3. Place the mouthpiece of the spacer in the child's mouth. A good seal should be made with spacer.
4. If required, seal the child's lips around the mouthpiece by gently placing the finger of one hand around the lips.
5. Encourage the child to breathe in and out slowly and gently. This may make a 'clicking' sound as the valve opens and closes (only in spacer with valve).
6. Once the breathing pattern is well established, press the canister with the free hand and leave the device in the same position as the child continues to breathe (tidal breathing) 4 to 5 times.
7. An older child may be taught to breathe in deeply coordinating with the puff release and pause after inspiration to a count of '5-10'. Most children can empty out the spacer in 1-2 breaths.
8. As the tidal volume of the patient and the capacity of the spacer can be variable, as a thumb rule, one can ask the child to take 3-5 breaths after the release of each puff without removing it from the mouth between breaths.
9. Remove the device from the child's mouth.
10. If a second puff is required, wait for about one minute before repeating steps 1-5.
11. For children below about three years, a face mask should be attached to the mouthpiece end of the spacer and opposed closely to the face to achieve a tight seal before repeating steps 4-6.

Key points to remember

- Spacer is a way of effectively delivering bronchodilator drugs and works similar to Nebulizer if correctly used. A child below age of 5 years should not be given inhaler without spacer.
- If commercial devices are not available, a spacer device can be made from a plastic cup or a 1-litre plastic bottle by cutting a hole at the base of the cup/bottle in the same size and shape as the mouthpiece of the inhaler. These deliver three to four puffs of salbutamol, and the child should breathe from the device for up to 30 seconds.

Cleaning the spacer

Wash with a mild soap/detergent solution every month. Allow to drip dry. Do not use a cloth to wipe. This minimizes the static charge and thus, reduces drug deposition on the spacer wall.

USE OF PULSE OXIMETER

Equipment & Supplies

- Pulse oximeter
- Alcohol swab
- Power supply (socket)

The pulse oximeter consists of a computerized unit and a sensor probe, which when attached to the patient's finger, toe or earlobe measures oxygen saturation of haemoglobin in the blood by comparing the absorbance of light of different wavelengths across a translucent part of the body.

The oximeter displays the SpO₂ the most critical vital sign and, in most models display pulse rate or pulse wave. Pulse oximetry correctly identified hypoxaemia in 20–30% more children than with signs alone.

Perform Pulse oximetry:

- During triage, on all patients with clinical signs of hypoxaemia and children and neonates with any “emergency or priority” sign
- On all patients admitted to an inpatient ward with respiratory illness, emergency signs or any sign of hypoxaemia.

Features of a pulse oximeter

Alarm : A pulse oximeter must be connected to mains power whenever it is not being used in the ward. A low-battery alarm alerts the health workers to plug into a power supply.

Sensors : Have to be appropriate to the size of the patient, can be disposable or reused for several patients. Soft rubber sensor probe are ideal for neonates and young children and can be attached to the hand, foot, toe or finger. Probes and connecting cables are delicate and are easily damaged if stepped on. It is important always to have a spare probe available in case one fails.

Display : The accuracy of the heart rate reading should be checked by comparing the number on the pulse oximeter display with auscultation of the heart. It gives no indication of ventilation for children on supplemental oxygen.

Following are the major sources of error in pulse oximetry

- Poor skin perfusion
- Movement artefact
- Greater margin of machine error at lower SpO₂

Key points to remember:

- Pulse oximeter is used both for screening and monitoring purpose
- Also used as a screening tool for SpO₂ in a newborn presenting with any congenital cardiac abnormalities
- Desired range for preterm 91% to 95% and desired heart rate 100 to 160 /min.
- Read and record the findings 1-2 hourly in the case sheet only after the number/wave forms are stable.
- Observe and change site, at least once in 6-8 hours.
- Fingertip pulse oximeter is not reliable in newborns and hence should preferably avoid using.

Precautions:

- Avoid oedematous, bruised sites and excessive pressure.
- Avoid excess ambient light to shine on the probe, if so cover with an opaque material

- Do not tie the BP cuff proximal to the limb where the probe is fixed to avoid poor perfusion
- Keep fully charged but do not run on battery alone if back up power is available
- Baby movement – pulse waveform can be not well detected leading to abnormal reading

Daily cleaning of Pulse oximeter

- Clean probe with spirit swab before every application
- Use moist cloth (with soap and water) to clean monitor
- Do not autoclave, pressure sterilize
- Do not use petroleum based, acetone or other harsh solutions
- Carefully connect and disconnect probes and plugs the probe to avoid damage by gripping the hub and not the cable.

PERFORMING VENIPUNCTURE & COLLECTION OF BLOOD SAMPLE

Objective: By the end of this exercise, the participants should be able to perform venepuncture & collect blood sample in paediatric age group.

Venipuncture is a procedure in which needle is used to take blood from vein usually for lab testing. When more than 1ml of blood sample is required it should be taken from a vein.

Supplies for venepuncture & blood sample collection

1. 2 pairs of sterile gloves.
2. Sterile 5 ml syringe.
3. Swabs or cotton-wool balls soaked in antiseptic solution
4. Blood collection tubes
5. Tourniquet, single-use
6. Lab forms & blood specimen labels

Steps

1. Gather the supplies & make patient comfortable. Wash hands, and put on sterile gloves
2. Identify a suitable vein. Place the tourniquet around patients arm above intended site. (Usually cubital fossa or dorsum of hands)
3. Sterilize area- wipe in single direction and wait for 30 seconds to dry
4. Stretch the skin & hold it firmly with non-dominant hand, Insert needle (shallow approach) & observe the flashback of blood (sign of being in vein)
5. Pull back very slightly on syringe & hold, so that it fills slowly to the amount of blood required
6. Release the tourniquet & remove the needle. Cover the site with cotton ball
7. Fill the labelled tube.
8. Discard waste in the bio medical waste bins as per protocols.
9. Wash hands and document the procedure

Use alcohol to disinfect the site instead of providine iodine to reduce chances of false lab test results. Precaution – do not pull back the syringe too fast for drawing blood as it will collapse the vein & blood will not be withdrawn.

Complications of venipuncture are – excessive bleeding, nerve damage, haematoma, infection.

PERIPHERAL VEIN CATHETERISATION

Objective: The participants should practise the insertion of IV line and collecting samples. A peripheral vein catheterisation is indicated to provide access to administer IV fluids, medications, repetitive venous blood sampling, & blood transfusion.

Supplies for PVC

- 1) 2 pairs of sterile gloves.
- 2) Sterile IV catheter 22-24 gauge in infants and small children
- 3) Sterile infusion set with IV fluid
- 4) Sterile 1,2,5 & 10-ml syringe
- 5) Swabs or cotton-wool balls soaked in antiseptic solution
- 6) Tourniquet, single-use
- 7) Splint
- 8) Adhesive tape
- 9) Syringe with normal saline
- 10) Mannequin arm

Steps:

- Insertion of an indwelling intravenous cannula in a peripheral vein
- Identify an accessible peripheral vein. In young children aged > 2 months, this is usually the cephalic vein in the antecubital fossa or the fourth inter digital vein on the dorsum of the hand.
- An assistant should keep the position of the limb steady and should act as a tourniquet by obstructing the venous return with his or her fingers lightly closed around the limb or use a tourniquet.
- Clean the surrounding skin with an antiseptic solution (such as spirit, iodine, isopropyl alcohol or 70% alcohol solution), then introduce the cannula into the vein and insert most of its length.
- Fix the catheter securely with tape.
- Apply a splint with the limb in an appropriate position (e.g. elbow extended, wrist slightly flexed)

Care of the cannula:

Secure the cannula when introduced. This may require splinting neighbouring joints to limit the movement of the catheter.

Keep the overlying skin clean and dry. Flush and fill the cannula with normal saline immediately after the initial insertion and after each injection.

Common complications:

Superficial infection of the skin at the cannula site is the commonest complication and may lead to thrombophlebitis, which will occlude the vein and may also result in fever. The surrounding skin is red and tender. Remove the cannula to reduce the risk of further spread of the infection. Apply a warm, moist compress to the site for 30 min every 6 hour.

Intravenous drug administration through an indwelling cannula:

Attach the syringe containing the IV drug to the injection port of the cannula and inject the drug. Once all the drug has been given, flush with normal saline until all the blood has been expelled and the catheter is filled with the solution.

For beginners, it is safe to cannulate veins on dorsum of hand.

- In antecubital fossa, veins are in close proximity of arteries, hence accidental puncture is common. To diagnose –fresh bright red colour blood flows in cannula with force.

Sites for cannulation are

- Lower limb-greater saphenous vein, lesser saphenous vein, dorsum of foot, popliteal fossa.
- Upper limb- dorsum of hand, snuff box, forearm, cubital fossa, cephalic.

Signs of being in vein is sense of giving away of skin resistance & blood in chamber of cannula, then pause advancement, pull back the sharp end of trocher slightly & advance the blunt end of cannula. Else it will counter the vein.

ARTERIAL BLOOD SAMPLING

(WHO Guidelines on Drawing Blood: Best Practices in Phlebotomy)

An arterial blood sample is collected from an artery, primarily to determine arterial blood gases. The sample can be obtained either through a catheter placed in an artery, or by using pre-heparinized syringe.

The most preferred site is radial artery, which is located on the thumb side of the wrist. Alternative sites for access are brachial or femoral arteries, but these have several disadvantages as are less superficial than the radial artery, have poor collateral circulation are surrounded by structures that could be damaged by faulty technique. Children may fight more if placed in a supine position; preferable to have the child sitting on the parent's lap.

Equipment and supplies:

- Gloves
- Apron
- Alcohol wipe (70% isopropyl)
- Sharps container
- Pre-heparinized syringe;
- Needles (20, 23 and 25 gauge, of different lengths) – choose a size that is appropriate for the site (smaller gauges are more likely to lyse the specimen);
- A safety syringe with a needle cover that allows the syringe to be capped before transport, without manually recapping (this is best practice for radial blood sampling);
- A bandage Gauze or cotton wool, tape to cover the puncture site after collection;
- A container with crushed ice for transportation of the sample to the laboratory (if the analysis is not done at the point of care);
- Where applicable, Lidocaine 1% (1 mL) local anaesthetic and an additional single-use sterile syringe (1-2 ml) and needle. (25-27 G)

Procedure for arterial blood sampling using radial artery

1. Locate the radial artery by performing an Allen test (see below) for collateral circulation. If the initial test fails to locate the radial artery, repeat the test on the other hand.
2. Once a site is identified, note anatomic landmarks to be able to find the site again. If it will be necessary to palpate the site again, put on sterile gloves.
3. Perform hand hygiene, clear off a bedside work area and prepare supplies.
4. Put on an impervious gown or apron, and face protection, if exposure to blood is anticipated
5. Disinfect the sampling site on the patient with 70% alcohol and allow it to dry.
6. The needle and heparinized syringe and pull the syringe plunger to the required fill level should be preassembled
7. Holding the syringe and needle like a dart, use the index finger to locate the pulse again, inform the patient that the skin is about to be pierced then insert the needle at a 45degree angle, approximately 1 cm distal to (i.e. away from) the index finger, to avoid contaminating the area where the needle enters the skin.
8. Advance the needle into the radial artery until a blood flashback appears, then allow the syringe to fill to the appropriate level. DO NOT pull back the syringe plunger.
9. Withdraw the needle and syringe; place a clean, dry piece of gauze or cotton wool over the site and have the patient or an assistant apply firm pressure for sufficient time to stop the bleeding. Check whether bleeding has stopped after 2–3 minutes. Five minutes or more may be needed for patients who have high blood pressure or a bleeding disorder, or are taking anticoagulants.
10. Activate the mechanisms of a safety needle to cover the needle before placing it in the ice cup. In the absence of a safety-engineered device, use a one-hand scoop technique to recap the needle after removal.
11. Expel air bubbles, cap the syringe and roll the specimen between the hands to gently mix it. Cap the syringe to prevent contact between the arterial blood sample and the air, and to prevent leaking during transport to the laboratory

12. Label the sample syringe.
13. Dispose appropriately of all used material and personal protective equipment.
14. Remove gloves and wash hands thoroughly with soap and water, then dry using single-use towels; alternatively, use alcohol rub solution.
15. Check the patient site for bleeding (if necessary, apply additional pressure) and thank the patient.
16. Transport the sample immediately to the laboratory, following laboratory handling procedures.

Complications related to arterial blood sampling

1. Arteriospasm or involuntary contraction of the artery
2. Haematoma or excessive bleeding
3. Nerve damage
4. Other problems can include a drop in blood pressure, complaints of feeling faint, sweating or pallor that may precede a loss of consciousness

Above may be prevented simply by explaining the procedure and positioning the person comfortably, prevented by inserting the needle without puncturing the far side of the vessel, avoiding redirection of the needle and by applying pressure immediately after blood is drawn and applied for a longer time.

Sampling errors

- presence of air in the sample;
- collection of venous rather than arterial blood;
- an improper quantity of heparin in the syringe,
- or improper mixing after blood is drawn;
- a delay in specimen transportation.

Modified Allen's test

Before taking a sample from the radial artery, a modified Allen's test should be performed to assess the collateral arterial supply of the hand from the ulnar artery.

1. Ask the patient to clench their fist.
2. Apply pressure over the radial and ulnar artery to occlude both vessels.
3. Ask the patient to open their hand, which should now appear blanched. If the hand does not appear it suggests you are not completely occluding the arteries with your fingers.
4. Remove the pressure from the ulnar artery whilst maintaining pressure over the radial artery.
5. If there is adequate blood supply from the ulnar artery, the normal colour should return to the entire hand within 5-15 seconds. If the return of colour takes longer, this suggests poor collateral circulation. Do not perform arterial blood gas sampling on a hand that does not appear to have an adequate collateral blood supply.

It should be noted that there is no evidence performing this test reduces the rate of ischaemic complications of arterial sampling.

USING GLUCOMETER TO TEST BLOOD SUGAR

Equipment & Supplies

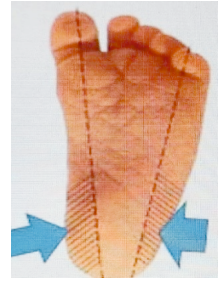
- Glucometer
- Glucometer test strips
- Sterile needle (26G) or lancet
- Alcohol for skin preparation
- Cotton swabs

Procedure

Steps are detailed in OSCE checklist

Glucose levels in plasma are generally 10%–15% higher than glucose measurements in whole blood. Blood glucose meters measure the glucose in whole blood while most lab tests measure the glucose in plasma. Hence, laboratory values are higher than measured by glucometer. Blood glucose meters must meet accuracy standards set by ISO and should be calibrated regularly, as recommended by the manufacturers. The instrument should not be exposed to excessive humidity, extreme heat or cold for prolonged periods. A daily check of the strip guide, reflectance disc and optical window should be made.

For taking the blood sample, heel is the most commonly used site in New born and in children finger is used. Sample should be free flowing; do not squeeze the part, avoiding contamination of test pad with alcohol and cover test pad should be completely covered with blood. Carefully time various steps such as wiping or washing and the reading.



Use this site for blood collection in new-born

The strips should never be cut into 2 or 3 strips to economize. The reflectance disc and optical window can be cleaned with a soft, lint free cloth or lens tissue soaked with water, surgical spirit or alcohol. The instrument should be handled gently. Discard the used strips and lancet/needles as per the biomedical waste management (BMW) guidelines.

Key Points to remember

Avoid capillary sampling if the peripheral perfusion is poor

- Keep the box containing the strips tightly closed. For premature neonates, a 0.85 mm lancet is used.
- Do not use povidone/betadine for cleaning puncture site.
- In heel- pricks, the depth should not go beyond 2.4 mm.
- Normal blood sugar levels within age group of 6-12mg/dL range from 80 -180mg/dl
- Blood glucose <45 mg/dl is to be treated as hypoglycaemia in all children and needs immediate correction. For SAM children less than 54 mg/dl is taken as hypoglycaemia.

USE OF INFUSION PUMPS

Controlled intravenous delivery of common medications, such as inotropic agents, vasodilators, aminophylline, insulin, heparin etc. via infusion pump is the preferred mode of therapy in acute care for assuring precise and accurate delivery of prescribed fluid volumes over a specified time and to help in better nursing management.

Indications infuse fluids in small babies with compromised renal, cardiac or pulmonary function in order to prevent fluid overload.

Desirable specifications

A good infusion device should be easy to set up and use, portable and powered with both battery and main, capable of alerting line occlusion and need to re-change syringe including clear display of rate of infusion and volume.

SYRINGE INFUSION PUMP



How to use it

1. Connect the power cable to the power slot and fix the infusion pump on to the installation pole.
2. Press the On button for 1 second to switch on the syringe pump. All signals on the display unit will glow for a second.
3. Choose the appropriate size and type of syringe as per the need of the patient.
4. Set the syringe in the slot in the driving unit. To do this, lift up the syringe holder and place the drug filled syringe with the inner and the outer cylinders in their corresponding grooves and ensure good fixation.
5. The syringe should be connected to the appropriate tubing. Avoid cutting of the IV set tubing to fit the syringe nozzle.
6. Set the rate of infusion using the up and down arrow keys in the control panel. Before starting infusion press the prime button to flush the tubings to remove all air bubbles.
7. Now connect to the patient after ensuring patency of the IV line.

Troubleshooting

Alarm Message	Possible Problem	Corrective Action
"OUT OF INFU"	Slider has moved Inadvertently	Fix syringe again and restart infusion
"OCCLUSION"	Tube occluded with >60 kPa pressure	Check and remove cause of occlusion; P.N. Unnecessary pushing fluid into the IV line may cause extravasations
"AC FAILURE"	Low internal battery	Connect to AC power
"SYRINGE IN USE"	Syringe removed from holder	Set syringe properly and resume infusion
"NEAR EMPTY"	Low internal battery	Keep loaded syringe ready

Maintenance

- Cleaning: In case of spillage wipe with soft cloth soaked in lukewarm water
- Disinfection: Disinfect with Benzalkonium chloride
- **Don'ts**
 - i) Do not use alcohol based disinfectant
 - ii) Do not autoclave
 - iii) Do not clean with wet cloth while connected to mains

Types of Pumps	
Gravity controlled	<ul style="list-style-type: none">• Drip rate regulators• Drip rate controllers
Positive displacement pumps	<ul style="list-style-type: none">• Drip rate pumps• Volumetric pumps• Syringe pumps – most preferred• Multi-channel pumps• Ambulatory pumps

INSERTION OF ORO/NASO GASTRIC TUBE AND FEEDING

Objective:

By the end of this exercise, the participant will be able to insert an Oro-gastric tube and feed a new born through it. Gavage feeds are initiated for any baby weighing below 1500 grams or for any baby between 1500-1800 grams who is not able to accept cup-feeds or is losing weight on cup-feeds.

Equipment & supplies:

- Sterile Oro gastric (OG) feeding tube (6F or 8F)
- 2-5 mL syringe (for aspiration)
- Sterile 10mL /20 ML syringe (for feeding)
- Kidney dish or bowl
- Stethoscope
- Scissors
- Normal saline
- Adhesive tape

Steps of Oro/Naso gastric insertion are detailed in Section of Checklists

NASOGASTRIC (NG) FEEDING

It may be necessary to use a nasogastric (NG) tube if the child is very weak, has mouth ulcers that prevent drinking, or if the child cannot take enough starter diet by mouth. The minimum acceptable amount for the child to take is 80% of the amount offered. Use an NG tube if the child does not take 80% of the feed (i.e., leaves more than 20%) for 2 or 3 consecutive feeds. NG feeding should be done by experienced staff.

The NG tube should be checked every time before administrative feed. Change the tube if blocked. Do not plunge starter diet through the NG tube; let it drip in, or use gentle pressure. Abdominal distension can occur with oral or NG feeding, but it is more likely with NG feeding. Remove the NG tube when the child takes: 1) 80% of the day's amount orally; or 2) Two consecutive feeds fully by mouth. Exception: If a child takes two consecutive feeds fully by mouth during the night, wait until morning to remove the NG tube, just in case it is needed again in the night.

Key Points to remember:

1. Precautions while inserting the tube: Observe closely for breathing difficulty and colour changes: -
 - If the baby has difficulty in breathing or turns blue or vomits, remove the tube immediately as it may be in the trachea. Always pinch the tube before removing.
 - If resistance is felt during insertion, do not push further. Remove the tube and retry or call for assistance.
2. Confirm correct positioning of the tube:
 - Place a stethoscope just below xiphisternum slightly to the left side of the upper abdomen. Attach a syringe having 2-3 ml air, auscultate with a stethoscope for sound of gush of air in the stomach as the air is pushed.
 - If no sound heard, withdraw the tube immediately by pinching it and reinsert it and reconfirm correct position by reinjecting air.
 - Once confirmed remove the syringe and close the OG tube.

3. Feeding technique

Take the required amount of feed (breast milk) in a clean bowl. Ensure the tube is in the stomach by noting its point of measurement at the angle of mouth and cross-checks it with the records. At the time of feeding, the outer end of the tube is attached to a 10/20ml syringe (without plunger) and keeping the syringe vertical, the required amount of milk is poured in the syringe and is allowed to trickle by gravity. Do not push. Remove the syringe and close the tube.

- The baby should be placed in the right lateral position for 15 to 20 minutes to avoid regurgitation.
- There is no need to burp a gavage-fed baby
- The Naso/orogastric tube may be inserted before every feed or left in situ for upto 7days.

Monitoring during feeding

Routine pre-feed aspiration of gastric contents is not recommended. Before every feed, the abdominal girth (just above the umbilical stump) should be measured. If the abdominal girth increases by more than 2 cm from the baseline, then

perform pre-feed aspirate. It may be also done if baby vomited previous feed.

If the aspirate is more than 25 percent of the last feed or if it contains blood, feeding should be suspended and baby should be shifted to intravenous fluids while evaluating for sickness. While pulling out a feeding tube, it must be kept pinched and pulled out gently.

Calorie-rich, semi-solid, soft diets may be prepared from a variety of cereals and pulses. Fat and sugar help in reducing the bulk of the diets and make them energy dense. If milk is not tolerated, it may be replaced by an equal volume of curd/yogurt/soymilk. About 6-8 feeds should be given during the day.

Feeding during illness

- Never starve the child.
- Feed energy-rich cereals-pulse diet with milk and mashed vegetables.
- Feed small quantities at frequent intervals.
- Continue breast-feeding as long as possible.
- Give plenty of fluids during illness.
- Use oral rehydration solution to prevent and correct dehydration during diarrhea episodes.

PRECAUTIONS DURING DRUG ADMINISTRATION

Objective:

At this skill station, the participants should learn how to reconstitute medicines for use during emergencies and the precautions to be taken.

Familiarise themselves with the available forms, doses and routes of administration. (Annexure 1)

Resources required

- Dextrose (10% & 25%)
- Adrenaline injection
- Salbutamol respiratory solution
- Dopamine
- Hydrocortisone
- Dexamethasone
- Sodium Bicarbonate
- Frusemide

Steps:

- Show the vial of each drug and discuss its reconstitution.
- Discuss route of administration as well as its dose in various conditions and age groups.
- Discuss conditions in which its use has been discussed during the training.
- Inform participants about the precautions to be taken and potential adverse effect of each medication.

ANTICONSULSANT DRUGS

Per rectal Diazepam to stop convulsions (when no IV line is in place)

Turn the child to his/her side and clear the airway (A recovery position).

Wash hands and put on clean examination gloves.

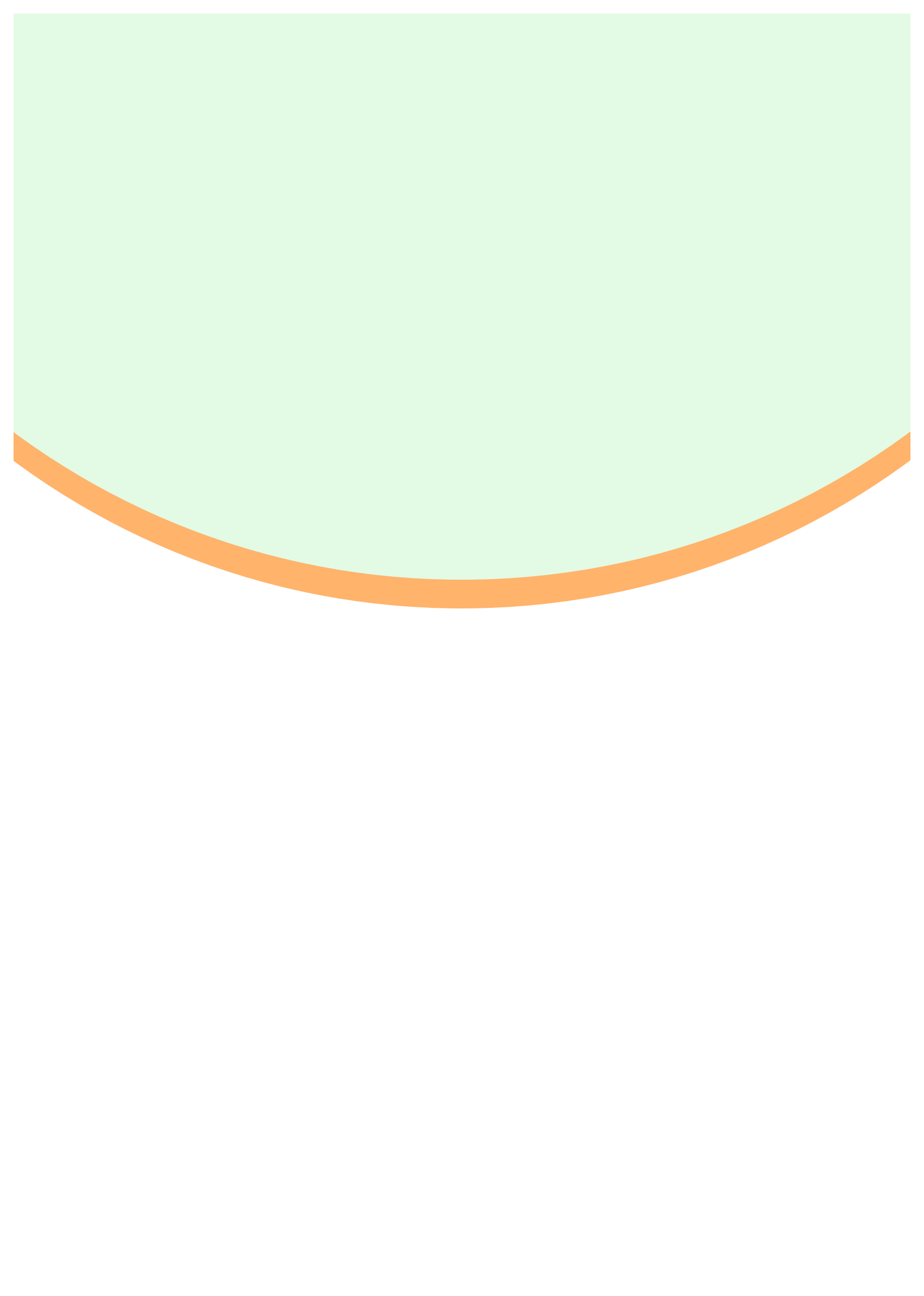
- Have an assistant remove the baby's napkin and hold the baby on one side, similar to the lying position for lumbar puncture.
- Draw up exact dose of Diazepam into the tuberculin syringe. Remove the needle from the syringe.
- Lubricate the syringe with a water-based lubricant.
- Gently insert the syringe into the baby's rectum and advance it approximately 4-5 cm.
- Administer the drug slowly over 3 min and then slowly withdraw the syringe. Allow the baby to relax from the curled-up position.
- If the dose is passed from the rectum within the first five minutes, repeat the dose.
- The majority of absorption will occur between 5 and 15 min after administration, so if stool is passed after this, the dose does not need to be repeated.
- Interval before giving another dose (if convulsions do not stop) is 10 min.
- Give 0.5 mg/kg Diazepam injection solution per rectum using a small syringe without a needle (like atuberculin syringe) preferably using a catheter. Flush the catheter, after giving drug.
- Check for low blood sugar.
- Give oxygen.
- If convulsions have not stopped after 10 minutes, repeat diazepam dose.

Name of drugs	Dose	Available As	Route of Administration	Indication	Limitation/ Side effects
Phenobarbitone	20-40 mg/kg as loading dose	200mg per ml. ampule	I/V Slowly after dilution in normal saline	Convulsion in infants, can be used in all age groups	Good drug controlling seizure & long term use
Phenytoin	15-20 mg/kg	100mg/ 2ml Amp	I/V Slowly after dilution in normal saline	Convulsion in all age all groups	Good drug for control of seizure & maintenance
Diazepam	0.1-0.3 mg/kg Short Acting	I/V or P/R	I/V slowly Syrup Suppository P\R	Uncontrolled Convulsions	May cause respiratory arrest in newborns & infants
Midazolam	0.2 mg/kg	1 mg/ml	S/C, intra nasal safe in injections	Uncontrolled in infants	Short acting

Section-3

Support Procedures





TESTS FOR COVID-19

Most preferred test for the diagnosis of COVID 19 is Reverse transcriptase – Polymerase chain reaction (RT-PCR/CBNAAT/TrueNat). However, rapid serology kits may be negative during first 7–10 days of infection and may result as positive for several weeks following infection.

Proper infection control precautions should be maintained when collecting specimens.

Preferred sites for sample collection: upper respiratory tract sample (nasopharyngeal and oropharyngeal swab)

Broncho-alveolar lavage (BAL) or endotracheal aspirate would be the preferred specimen in mechanically ventilated children.

Transported in viral transport media (VTM) on ice

Methods of collecting nasopharyngeal and oropharyngeal (Throat) Swab

1. Sample should be collected by trained health care professionals wearing appropriate personal protective equipment (PPE) with preferably latex free purple nitrile gloves, otherwise use whatever is available while collecting the sample from the patient.
2. Use only synthetic fiber swabs (e.g. Dacron or rayon) with plastic shafts. Do not use cotton or calcium alginate swabs or swabs with wooden shafts.
3. For nasopharyngeal swab, tilt patient's head back at an angle of 70 degrees. Insert the swab in one nostril and push deep along floor and septum of nose until resistance is felt. Rotate the swab several times against nasopharyngeal wall. Place tip of the swab into sterile viral transport media tube and cut off the applicator stick.
4. For throat swab, take a second dry swab, insert into mouth, and swab the posterior pharynx. Avoid touching the tongue, teeth, gums and tonsils. Place tip of swab into the same tube and cut off the applicator tip.
5. Requisition form for each specimen should be completed and submitted.
6. Proper disposal of all waste generated for COVID has to be ensured (**red container**).

All suspected cases should be isolated in the designated area where COVID prevention infection control measures are in place, reported to district and state surveillance officers & should be managed as per recommended guidelines in COVID treatment health facility.

INFECTION PREVENTION PROTOCOLS

1. HAND HYGIENE

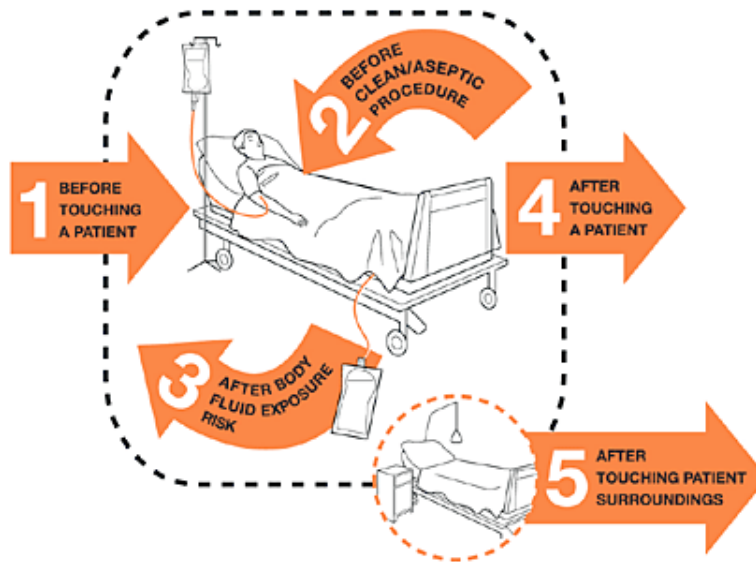
Hand Washing:

- With Soap, running water and single use towel,
- Wash hands for 40–60 seconds

Hand Rub:

- An alcohol-based hand rub product, if hands are not visibly soiled
- Rub hands for 20–30 seconds

WHO 5 HAND HYGIENE MOMENTS



How to Handwash?

WASH HANDS WHEN VISIBLY SOILED! OTHERWISE, USE HANDRUB

Duration of the entire procedure: 40-60 seconds



Wet hands with water;



Apply enough soap to cover all hand surfaces;



Rub hands palm to palm;



Right palm over left dorsum with interlaced fingers and vice versa;



Palm to palm with fingers interlaced;



Backs of fingers to opposing palms with fingers interlocked;



Rotational rubbing of left thumb clasped in right palm and vice versa;



Rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa;



Rinse hands with water;



Dry hands thoroughly with a single use towel;



Use towel to turn off faucet;



Your hands are now safe.

2. PERSONAL PROTECTIVE EQUIPMENT



HAZMAT suits



Apron



Plastic Coverall



Nitrile Gloves



Masks



Goggles



Face- Shield



Gum Boots

How to Select PPE

- It should be based on Risk assessment:
 - Risk of exposure
 - Extent of contact anticipated with blood, body fluids, respiratory droplets, and/or open skin
- Select which PPE items to wear based on this assessment
- Perform hand hygiene according to the WHO “5 Moments” and Steps of hand washing
- Should be done for each patient, each time.

Risk Assessment for Use of PPE

Eye-Wear	Medical Mask	Gown	Gloves	Hand Hygiene	Scenario
	✓				Always before and after patient contact, and after contaminated environment
	✓		✓	✓	If direct contact with blood and body fluids, secretions, excretions, mucous membranes, non-intact skin
	✓	✓	✓	✓	If there is risk of splashes onto the health care worker's body
✓	✓	✓	✓	✓	If there is a risk of splashes on to the body and face

DONNING OF PPE

Step 1
Remove the ornaments

Step 2
Wash the hands

Step 3
Wear the cap

Step 4
Wear the shoe cover

Donning the PPE

Step 5
Sanitise the Hands

Step 6
Wear the inner Pair of gloves

Step 7
Wear the Apron

Donning the PPE

Step 8
Wear Mask & Goggles

Step 9
Wear Hood


Step 10
Wear Second pair of gloves

Step 11
Sanitize the hands


Donning the PPE

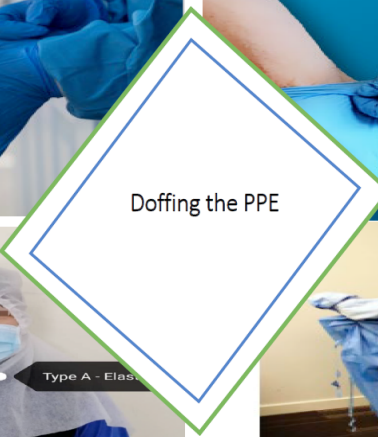
DOFFING OF PPE

Step 1
Sanitise the hands




Step 2
Remove the outer pair of gloves







Step 3
Remove Hood



Step 4
Remove the gown



Step 4: Removal of Gown



- Unfasten the ties
- Peel gown away from neck and shoulder
- Turn contaminated outside toward the inside
- Fold or roll into a bundle
- Discard

Step 5
Sanitize



Step 7
Sanitize



Step 6
Remove the shoe cover



Step 8
Remove Goggles, Mask & Cap





Step 9
Sanitize



Step 10
Remove inner pair of gloves



Step 11
Sanitize



Step 12
Wash the hands

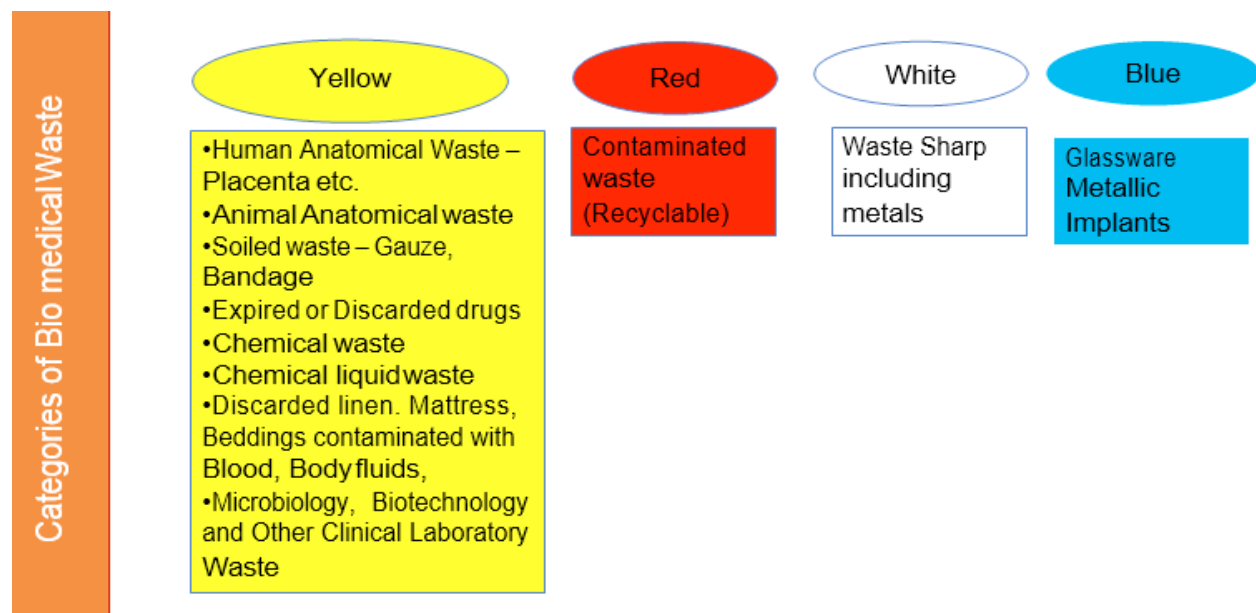


Key Points

- Always clean your hands before and after wearing PPE
- PPE should be available where and when it is indicated
 - in the correct size
 - selected according to risk or per transmission-based precautions
- Always put on PPE before contact with the patient
- Always remove immediately after completing the task and/or leaving the patient care area
- NEVER reuse disposable PPE
- Clean and disinfect reusable PPE between each use
- Change PPE immediately, if it becomes contaminated or damaged
- PPE should not be adjusted or touched during patient care; specifically: -
 - Never touch your face while wearing PPE
 - If there is concern and/or breach of these practices, leave the patient care area when safe to do so and properly remove and change the PPE
 - Always remove carefully to avoid self-contamination (from dirtiest to cleanest areas)

3 BIOMEDICAL WASTE MANAGEMENT

Any waste, which is generated during the diagnosis, treatment or immunization of human beings or animals or in research activities pertaining thereto or in the production or testing of biologicals or in health camps, including the categories mentioned in Schedule I of Biomedical Waste Rules 2016.



BMW Rules -2016 are applicable for:

- COVID -19 Isolation wards: (Where COVID-19 Positive patients are kept for treatment/diagnosis).
- It includes temporary healthcare facilities like rail coach wards, COVID Care centers, etc.
- Sample Collection Centres & Laboratories for COVID -19 suspected patients
- Quarantine Centers/Camps/ Home Quarantine or Home Care Facilities.

Pre requisite for segregation of biomedical waste

- Bins should be closed at all times.

- Bins with foot operated lids.
- Both liners & bins must have sign of Biohazard Symbol
- Both liner & bins used in COVID wards must have labels of "COVID -19 waste"- as it helps CBWTF to identify the waste for priority treatment.
- Double layer of liner should be used to ensure adequate strengthening and to prevent any leaks.
- Liner should be Non Chlorinated & not be less than 15 microns
- Segregation at source should be ensured (No segregation of waste in temporary waste collection /storage area)

**SEGREGATION OF WASTE
YELLOW BIN**



- Non-plastic or Semi Plastic coverall
- Tissue
- Toiletries of COVID patient



All used masks including triple layer & N-95 masks



Disposable linen gown |



Head Cover/ cap



Any Non-plastic or Semi Plastic coverall



Shoe Cover



RED BIN



Goggles



HAZMAT suits



Splash Proof gown
Plastic Cover on



Face- Shield



Nitril Gloves



Catheter



Syringe without Needle

Any recyclable material



Heavy utility glove



Tubbing IV bottles



Viral Transport Media



Pipette Tip



Vacutainer



Testing Kits



Plastic Vial



BLUE



Glassware & Metallic Waste



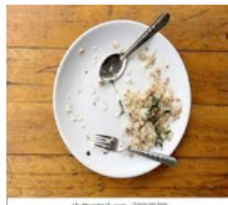
WHITE



Sharp blade, different type of needles & Metallic Sharp waste



BLACK



Key Points to remember:

- Inner and outer surfaces of bins and containers of BMW should be disinfected with 1% Sodium Hypochlorite solution daily.
- Dedicated bins and BMW trolleys for COVID -19 area.
- Waste should be handed over directly to CBWTF or should be kept separately in hospital temporary storage areas.

Collection and Transportation

- Use dedicated collection bins labeled as “COVID-19” to store COVID -19 waste and keep separately in temporary storage room prior to handing over to CBWTF.
- BMW waste collected in COVID isolation wards can also be lifted directly from ward into CBWTF collection van.
- Depute dedicated sanitation workers separately for collection of biomedical waste so that it can be transferred timely to temporary waste storage area.

GENERAL SOLID WASTE MANAGEMENT (SWM) RULES 2016

- Non-disposable items must be used for serving food.
- Appropriate precautions need to be taken to clean and disinfect as per hospital guidelines.
- If use of disposable items is inevitable, use bio-degradable disposables.
- The wet and dry solid waste bags to be tied securely in leak-proof bags.
- Spray with Sodium Hypochlorite solution and hand over to authorized waste collector of ULBs on daily basis.
- Compostable bags should be used for collecting wet-waste.

Disposal of Used PPE

PPEs doffed by healthcare workers accompanying diseased body of COVID- 19 patient to crematorium / graveyards should be treated as biomedical waste:

- Should be collected in separate bin with yellow-bag and handed over to authorized waste picker engaged by ULBs for disposal through CBWTFs
- Or
- May ask healthcare staff to take-back the PPEs after collecting it in red and yellow bags/bins provided in the hospital ambulance itself.
- Or
- May ask the healthcare workers to doff the PPEs at the hospital or healthcare unit from which they collected the corpse.

KEY POINTS

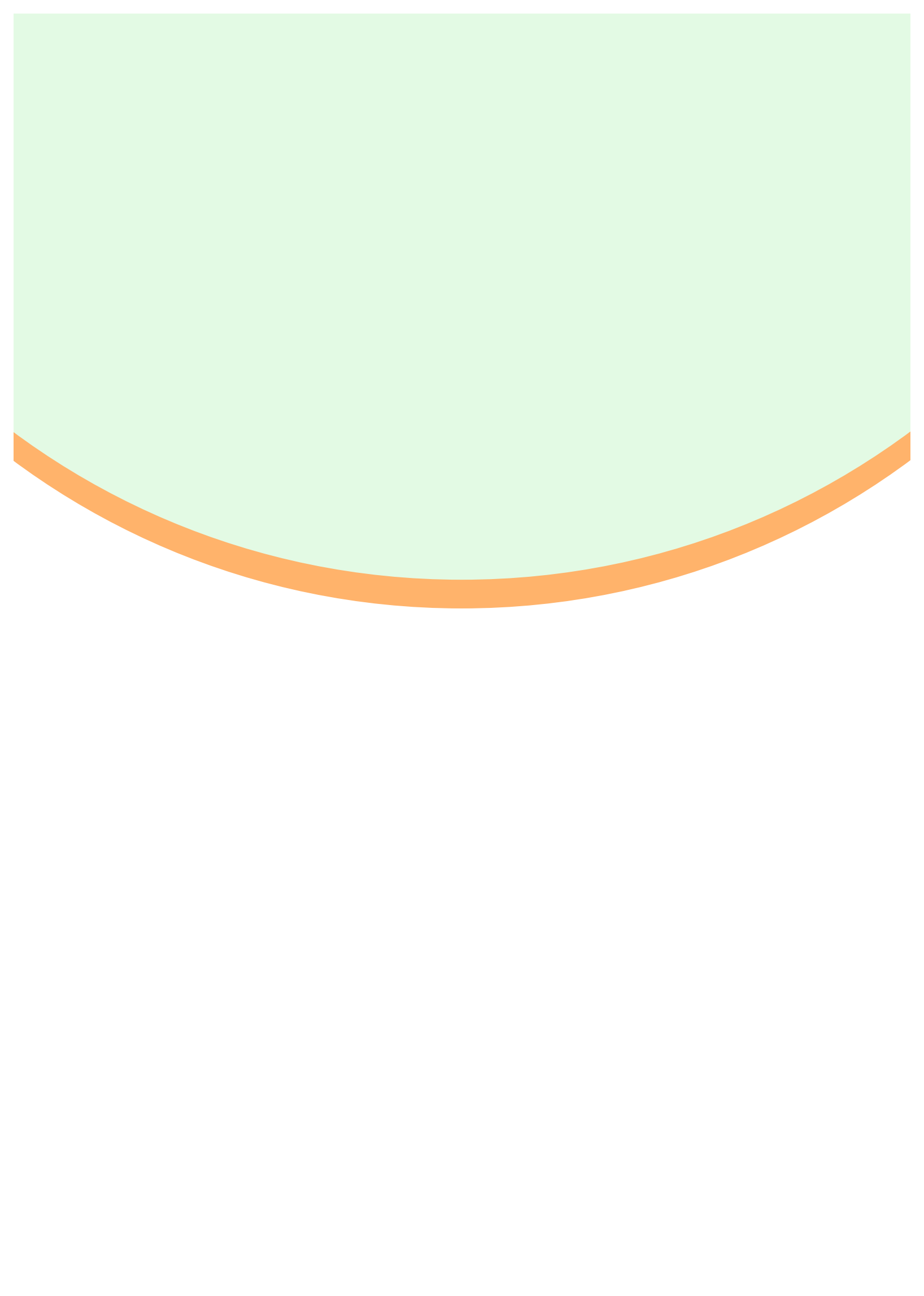
- No mixing of general solid waste and biomedical waste.
- All PPE used by health care service provider for COVID positive patients to be kept in yellow bags.
- General solid waste should not be collected in yellow bags.
- ULB should provide contact details of CBWTF operator to quarantine camps.
- Provide yellow coloured bags to person responsible for operating quarantine camp or home care (May be given by CBWTF)
- Create team of workers for door waste collection – Designate staff to collect the waste.
- Training should be provided to waste collectors.
- PPE – 3 layer masks, splash proof gown, HD gloves, gum boots & safety goggles.
- Agency operating quarantine centre /camp – Designate a Nodal person responsible for record generation and register the centre/camp with COVID-19 BMW app and update the data.
- Use dedicated carts/trolleys/ vehicle to transport BMW & solid waste separately.

- Ensure sanitization of the vehicle with 1% Sodium Hypochlorite after each trip.
- Bags containing general waste may be disinfected (1% sodium hypo) prior to disposal.
- Ensure daily collection of segregated general solid waste from quarantine centres, home-care and hospitals.
- Waste should be in securely tied bags.
- General solid waste may be disposed as per SWM Rules, 2016, which may include disposal in landfills, waste to energy plants etc.

Section-4

OSCE Checklists for Skills Stations





OSCE CHECKLIST 01: ASSESSMENT OF EMERGENCY SIGNS IN A SICK CHILD

- All medical and other health workers involved in the care of all sick children should Triage them as soon as they arrive at hospital, well before any administrative procedure such as registration.
- Emergency signs can be identified on an average in twenty seconds as one can observe several signs just by looking at the child.
- After successful Triage all sick children can be categorized as those with:
 - EMERGENCY SIGNS: Assess airway, breathing, circulation and level of consciousness and severe dehydration in a child with diarrhea for initiation of emergency treatments.
 - Priority signs
 - Those that are non-urgent cases (Queue)

Objective: By the end of this exercise the participants should be able to perform triage and be able to give the initial appropriate emergency treatment.

#	Steps	Score	Participants				
			1	2	3	4	5
1	Look if the child is breathing and if having emergency signs	1					
2	Call for help and start treatment	1					
3	Look for any signs of cervical spine injury (a possibility)	1					
4	Make the child warm always, specially if young infant	1					
5	If not breathing/gasping --Manage airway and start life support	1					
6	If foreign body aspiration-- Manage airway in choking child Manage airway & Give oxygen	1					
7	Look for signs of Respiratory distress: <ul style="list-style-type: none"> • Labored or very fast breathing (RR >70/min) • Severe lower chest wall in-drawing • Use of auxiliary muscles • Head nodding/Inability to feed because of respiratory problems • Abnormal respiratory noises (stridor, grunting) • SpO2 (oxygen saturation) <90% 	4					
8	Check for cold hands with Capillary refill (longer than 3 seconds) and weak and fast pulse	1					
9	If the child appears to be severely anemic / bleeding significantly, apply pressure to stop the bleeding. Do not use a tourniquet, give oxygen and make sure child is warm	1					
10	Prepare to perform venipuncture. Send the blood for investigations and for typing and cross-matching and insert IV line* and begin giving fluids rapidly if NO SEVERE ACUTE MALNUTRITION	1					
11	IF SEVERE ACUTE MALNUTRITION Give IV glucose. Insert IV line and give fluids	1					
12	Look for Coma/ Convulsions: Manage airway, Position the unconscious child (if head or neck trauma is suspected, stabilize the neck first), give oxygen Give IV calcium if infant <3 months, If convulsion continue, give anti-convulsant	2					
13	Check and correct hypoglycaemia	1					
14	If history of diarrhea plus any two of these: Lethargy, Sunken eyes, very slow skin pinch then after ensuring that child is warm, If No Severe Acute Malnutrition: Insert IV line and begin giving fluids (RL/NS) rapidly but in cases of Severe Acute Malnutrition (SAM): Do not give IV fluids, give ORS@ 5 ml/kg every 30 min for 2 hours	1					

15	Call for surgical help or follow surgical guidelines if a child has trauma or other surgical problems	1					
16	Carry out point of care emergency investigations (blood glucose, pulse oximeter & check temperature, blood smear, hemoglobin if possible urine for sugar/ketones etc	1					
Total		20					

Points to remember

1. After giving emergency treatment, proceed immediately to assess, diagnose and treat the underlying condition.
2. All these children should be hospitalized and observed till stabilization.
3. During and after providing emergency treatment, the child should be re-assessed using the complete ABCD sequence

*If not able to insert peripheral IV, insert an external jugular or intraosseous line.

OSCE CHECKLIST 02: PROVIDING BASIC LIFE SUPPORT

Objective

At this skill station, the participants should be able to practice on mannequin:

- Basic airway manoeuvre techniques including use of an oropharyngeal (OP) airway on a mannequin.
- Bag-mask ventilation.
- Chest compression.

Equipment/resources required

- Resuscitation dolls/mannequins/resuscitation head.
- Oro-pharyngeal airways in several sizes.
- Face masks of varying sizes.
- Self-inflating bags of different sizes.
- Oxygen and oxygen delivering equipment.
- Electric or foot suction pump.
- Suction catheter.

#	Steps	Score	Participants				
			1	2	3	4	5
1	Remove any visible obstruction from the mouth. Clear secretions from the throat	1					
2	Open the airway using head – tilt, chin-lift method.	1					
	Head tilt-chin-lift manoeuvre						
3	Extend the neck slightly and tilt the head by placing one hand on to the child's forehead.	1					
4	Lift the mandible up and outward by placing the fingertips of other hand under the chin	1					
5	Maintain a neutral position (nose up) in an infant and a sniffing position (chin up) in a child	1					
	If child with suspected trauma, open airway with jaw thrust without head tilt						
6	Kneel behind the patient's head.	1					
7	Rest your elbows on the surface on which the patient is lying.	1					
8	Place one hand on each side of the patient's head.	1					
9	Place the tips of your index and middle fingers under the angles of the patient's jaw. (This is done on both sides)	1					
10	Place your thumbs on the patient's jaw just below the level of the teeth. The thumbs will keep the patient's head from turning or tilting during the lift.	1					
11	Lift the jaw upward with your fingertips. The mouth should not be closed as this could prevent air from entering the patient's airway. Use your thumb to retract the patient's lower lip if needed.	1					
12	Use of airway , indicated when the patient is unconscious.	1					
13	Select appropriate size oropharyngeal (Guedel) airway by measuring distance from the angle of mouth to the angle of the jaw when laid on the face with the raised 1 curved side (convex) up ("the right side up"). The most commonly used size for children is 2.	1					

14	Position the child to open the airway, taking care not to move the neck if trauma is suspected.	1					
15	Using a tongue depressor, insert the oropharyngeal airway (the convex side up) In an infant & In a child, insert the airway “upside down” (concave side up) until the tip reaches the soft palate.	1					
16	Re-check airway opening.	1					
17	Use a different sized airway or reposition if necessary.	1					
	Bag & Mask						
18	Check the bag and valve by closing the patient's connection with thumb and attempt to expel air from the bag.	1					
19	Choose a bag of appropriate volume for infants (500 ml) and children (750 ml) and an appropriately sized mask; which completely covers the mouth and nose without covering the eyes or overlapping the chin.	1					
20	Attach the bag-mask valve to an oxygen supply. Adjust flow to 10 litres per minute or as high as possible in a concentrator. If oxygen is not available, use room air for resuscitation.	1					
21	Hold the mask over the face with dominant hand. Maintain the head tilt, chin lift position.	1					
22	Perform the bag and mask ventilation with E-C clamp technique: <ul style="list-style-type: none"> • Position the thumb and index finger in a C shape over the mask and exert downward pressure on the mask to ensure proper air seal. Position the last 3 fingers under the angle of mandible to lift the jaw. If resuscitating alone, maintain the E-C clamp with one hand and compress the bag with the other hand. • Release bag completely between ventilations. Correct rate of ventilation /continue bag and mask ventilation at a rate of 20 breaths/ minute for a few minutes. • Look for noticeable rise in the chest. If chest does not rise and fall when using bag and mask: <ul style="list-style-type: none"> ✓ Reapply mask & reposition the head ✓ Suction the throat and keep mouth slightly open ✓ Increase pressure on the bag 	1					
23	Chest compressions coordinated with bag & mask ventilation to be provided if any of the following: <ul style="list-style-type: none"> • Pulse cannot be detected • Heart rate is less than 60 bpm • Signs of poor perfusions after adequate ventilation. 	1					
24	Thumb technique is preferred over 2 -finger technique.	1					
25	Stand at the infant's feet or side.	1					
26	Place thumbs side by side over lower half of sternum, encircle the infant's chest and support the infants back with the fingers of both hands.	1					
27	Use both thumbs to depress the sternum.	1					
28	Push at a rate of at least 100 compressions per minute.	1					
29	Give two effective breaths after every 15 chest compressions (Ratio of chest compressions: ventilation of 15:2) if there are two rescuers.	1					
30	Maintain a ratio of 30:2 with a single rescuer.	1					
	2-finger technique:						
31	Lay the infant in supine position on a hard-flat surface.	1					
32	Use tips of the middle finger and either the index finger or ring finger of one hand to compress the lower half of the sternum (but not over the xiphoid). After each compression, allow the chest to recoil fully.	1					

33	Push with sufficient force to depress the chest approximately one third to one half the antero-posterior diameter of the chest.	1					
34	Release completely to allow complete recoil of the chest by completely releasing the pressure but maintaining contact with the compression site.	1					
TOTAL		34					

OSCE CHECKLIST 03: NEWBORN RESUSCITATION (NBR)

#	Steps	Score	Participants				
			1	2	3	4	5
1	Resuscitation should preferably be done on Radiant warmer and should be equipped with resuscitation kit, suction catheter, Oxygen, laryngoscope, ETT, Adrenaline	1					
2	Place the baby on radiant warmer (already switched on), inform Doctor and helper.	1					
3	Quickly assess for breathing/ Crying, If answer is NO, Start initial steps.	1					
4	Perform the initial steps of resuscitation (PSDSR) as required <ul style="list-style-type: none"> Position the baby in slight neck extension using a shoulder roll If required, clear the airway. First suction the mouth and then suction the nose using a mucus extractor. Dry the baby Stimulate by gently rubbing the newborn's back or extremities twice Reposition and reassess breathing 	2					
5	Assess for breathing, heart rate and colour If breathing normally provide Observational care with mother: <ul style="list-style-type: none"> Provide Warmth and support breastfeeding Monitor temperature, HR, breathing and colour every 30 mts for first 2 hours. 	2					
6	If not breathing well (apnea, gasping)/HR <100 bpm Initiate bag and mask ventilation using room air*(> 35 weeks & 21-30% < 35 weeks) for 30 seconds.	1					
7	If labored breathing and persistent cyanosis, Position and clear airway. Monitor SpO2. Supplemental O2 as needed.	1					
8	For PPV, Give 5 inflatory breaths and look for chest rise. If chest is not rising, follow MR SOPA: <ul style="list-style-type: none"> Mask adjustment, position of head, suction if required, Open mouth, increase pressure and alternate airway. Consider ETT or Laryngeal mask if needed 	2					
9	Continue bag and mask ventilation for 30 seconds Reassess the baby for breathing after 30 seconds of bag and mask ventilation by checking for umbilical pulsations: Total pulsations felt in 6 seconds x 10= heart rate.	1					
10	a) If HR > 100/ minute continue bag and mask ventilation till the baby starts breathing spontaneously and bilateral chest rise is seen, Wean off bag and mask ventilation b) If HR <100/ minute, continue bag and mask ventilation and connect oxygen	2					
11	If HR < 60/ minute, Intubate if not already done Chest compression (only by paediatrician or trained doctor) Coordinate with PPV with 100% Oxygen	2					
12	If HR continue to be <60/ minute Consider Epinephrine (1:10000) 0.1 to 0.3ml/kg IV, If endotracheal route, give 0.5- 1.0 ml/kg	1					

13	At any point if baby starts breathing spontaneously and bilateral chest rise is seen, wean off bag and mask ventilation and give post-resuscitation care. (needs admission in SNCU) <ul style="list-style-type: none"> • Monitor every 15 minutes and check for breathing, temperature, colour and CFT • Monitor blood sugar • Watch for complication "convulsion, coma, poor feeding, lethargy, respiratory distress" 	2					
14	If baby is not breathing, continue bag and mask ventilation for maximum 20 minutes.	1					
Total Score		20					

OSCE CHECKLIST 04: ENDOTRACHEAL INTUBATION

#	Steps	Score	Participants				
			1	2	3	4	5
1	Place the child supine on a flat surface, head in midline and neck slightly extended by the shoulder roll.	1					
2	Ask the assistant to connect the pulse oximeter to the baby.	1					
3	Bag the baby for 30 seconds and check that SPO2 reading in pulse oximeter is >95%.	1					
4	Hold the laryngoscope in your left hand Stabilize the infant's head with right hand.	1					
5	Slide it over the tongue with the tip of the blade resting on the vallecular.	1					
6	Lift the blade slightly, lifting the tongue out of the way to expose the pharyngeal area.	1					
7	Visualize Epiglottis , insert the ET tube sliding it along the side of the tongue till the tube enters between the vocal cord and upto the black band. (vocal cord guide)	1					
8	Check the distance from the tip to the lip to be correct.	1					
9	Secure the tube by fixing the tape by fixing the two cut ends of the tape to skin above the upper lip and below the mouth.	1					
10	Connect the ET tube connector to the Bag assembly. Auscultate over the lungs at Axilla to hear air entry / See for rise of the chest.	1					
Total		10					

**OSCE CHECKLIST 05: MEASURING OXYGEN SATURATION USING PULSE OXIMETER
(FOR NEWBORNS AND CHILDREN)**

#	Steps	Score	Participants				
			1	2	3	4	5
1	Ensure availability of following items <ul style="list-style-type: none"> • Pulse oximeter • Y-type probe and/or fingertip probe • Medical tape • Alcohol swab 	1					
2	Tell the mother about the procedure .	1					
3	Choose the appropriate pulse oximeter probe for the age of the child and ensures that it is properly attached to machine.	1					
4	Position the child* appropriately – preferable seated in the lap of their mother/caregiver.	1					
5	Identify a well perfused site preferably in the hand (finger) or foot, toe to apply the probe.	1					
6	Reposition the probe till the display panel shows wave forms/ number and secures the probe using the Velcro extension.	1					
7	Set high and low alarm limits for SPO2 (2% above and below desired limits and for heart rate.*	1					
8	Read and record the findings in the case sheet after the number / waveforms are stable.	1					
9	Monitor and record heart rate, SPO2 at least 2 hourly.	1					
10	Observe and change site at least once in 8 hours.	1					
	Total	10					

- Any child recording SPO2 less than 90 needs oxygen support
- For COVID pneumonia management in children cutoff line of SPO2 is >94
- In neonates to avoid O2 toxicity target saturation should not exceed above 94

OSCE CHECKLIST 06: USE OF GLUCOMETER

#	Steps	Score	Participants				
			1	2	3	4	5
1	Check the expiry date before using the strips.	1					
2	Perform hand hygiene and put on sterile gloves.	1					
3	Insert a new strip into the glucometer. The meter will turn on automatically.	1					
4	In New born warm the heel by holding the heel in your palm, while gently squeezing it for a few minutes.	1					
	In Children Hold the fingertip while gently squeezing it for a few minutes.						
5	Identify the puncture site on the postero-lateral aspect on the heel.	1					
6	Prepare the site with spirit and allow it to air dry.	1					
7	Make a needle stick puncture on the posterolateral aspect of heel, allow blood to collect and form a droplet.	1					
8	Apply the blood droplet to the test strip when the droplet symbol appears in the glucometer window.	1					
9	Read the result from the glucometer display panel and record it.	1					
10	Discard the used strips in the red bin and the lancet in the puncture proof container.	1					
Total		10					

OSCE CHECKLIST 07: TO PERFORM VENIPUNCTURE & COLLECT BLOOD SAMPLE

Supplies for venepuncture & blood sample collection

- 1) 2 pairs of sterile gloves.
- 2) Sterile 5 ml syringe.
- 3) Swabs or cotton-wool balls soaked in antiseptic solution
- 4) Blood collection tubes
- 5) Tourniquet, single-use
- 6) Lab forms & blood specimen labels

#	Steps	Score	Participants				
			1	2	3	4	5
Preparation							
1	Gather the supplies & make patient comfortable.	1					
2	Wash hands, and put on sterile gloves.	1					
Patient Part							
3	Identify a suitable vein. Place the tourniquet around patients arm above intended site. (Usually cubital fossa or dorsum of hands.	1					
4	Sterilize area- wipe in single direction and wait for 30 seconds to dry.	1					
5	Stretch the skin & hold it firmly with non-dominant hand, Insert needle (shallow approach) & observe the flashback of blood. (sign of being in vein)	1					
6	Pull back very slightly on syringe & hold, so that it fills slowly to the amount of blood required.	1					
7	Release the tourniquet & remove the needle. Cover the site with cotton ball.	1					
8	Fill the labelled tube.	1					
9	Discard waste in the bio medical waste bins as per protocols.	1					
10	Wash hands and document the procedure.	1					
Total		10					

OSCE CHECKLIST 08: PERIPHERAL VEIN CATHETERISATION

Supplies for PVC

- 1) 2 pairs of sterile gloves.
- 2) Sterile IV catheter 22-24 gauge in infants and small children
- 3) Sterile infusion set with IV fluid
- 4) Sterile 1,2,5 & 10-ml syringe
- 5) Swabs or cotton-wool balls soaked in antiseptic solution
- 6) Tourniquet, single-use
- 7) Adhesive strapping, or thin paper tape (to secure catheter)

#	Steps	Score	Participants				
			1	2	3	4	5
Preparation							
1	Gather the supplies and prepare the solution to be infused.	1					
2	Wash hands, and put on sterile gloves.	1					
Patient Part							
3	Vein Identification: Expose the intended insertion site Comfortable position of baby Upper limb- back of hand/antecubital fossa/ Forearm Lower limb--greater saphenous vein, lesser saphenous vein, dorsum of foot, popliteal fossa.	1					
4	Identify a suitable vein. (are the ones you can feel)	1					
5	Sterilize area- wipe in spiral motion working outwards and wait for 30 seconds to dry.	1					
6	Place the tourniquet around patients limb above intended insertion site.	1					
7	To fix vein ,stretch skin , immobilize the limb insert the cannula at 15-20 degree angle to the skin with the dominant hand.	1					
8	When the flashback is observed, Pause, withdraw inner sharp trochar slightly, & push the outer cannula slowly gliding into the vein.	1					
9	Remove the tourniquet and place a cotton gauge underneath the cannula.	1					
10	Remove the trochar & press thumb over the tip to stop blood flow. Collect sample if required Flush with 1-2 ml NS.	1					
11	Remove the gauze and clean any blood spillage.	1					
12	Secure the Cannula, with adhesive tape to prevent it from being dislodged. Write date of insertion on adhesive.	1					
13	Immobilise the joint by applying splint, keeping in comfortable position.	1					
14	Discard wastes in the bio medical waste bins as per protocols.	1					
15	Wash hands and document the procedure.	1					
Total		15					

OSCE CHECKLIST 09: FOR OXYGEN THERAPY

#	Steps	Score	Participants				
			1	2	3	4	5
1	Explain to the caregiver that the baby needs the support of oxygen to relieve the difficulty in breathing.	1					
2	Ensure oxygen cylinder is secured on flat surface.	1					
3	Attach the regulator and flow meter and ensure all the connections are tight.	1					
4	Attach the humidification bottle to the flow meter and fill with clean water up to the mark level on the bottle. (between 1/3 and 2/3)	1					
5	Select the appropriate size nasal prongs and connect oxygen tubing to the regulator and flow meter.	1					
6	Set the flow rate at 0.5-2 L/minute.	1					
7	Open the cylinder using spanner/key.	1					
8	Ensure the nostrils are clear of secretions, place the nasal prongs and secure by taping along the cheeks.	1					
9	Monitor SPO ₂ at regular interval using pulse oximeter to monitor to check the condition of the baby and need for further oxygen treatment.	2					
Total		10					

OSCE CHECKLIST 10 : USING A NEBULISER

Nebulizer delivers medications as aerosol & MDI with spacer as an alternative method for delivery of medications by inhalation

Equipment/resources required

- Nebulizer
- Selection of oxygen masks
- Mouthpiece
- Oxygen supply with tubing
- Commonly used vials of medication for nebulization
- Mannequin or volunteer/patient
- MDI with SPACER and mask

#	Steps	Score	Participants				
			1	2	3	4	5
1	Ensure that the Nebulizer is clean/sterilised appropriately.	1					
2	Wash hands thoroughly before using.	1					
3	Position patient correctly and maintain comfort.	1					
4	Measure the correct dose of medication (eg; salbutamol Nebulizer solution) to be administered and pour into the Nebulizer compartment/chamber.	1					
5	The dose of salbutamol is 2.5 mg (i.e. 0.5 ml of the 5 mg/ml nebulizer solution).	1					
6	Add saline to make volume upto 2-4 ml.	1					
7	Connect the Nebulizer tubing to the port on the compressor.	1					
8	Turn the compressor on and check the Nebulizer for misting.	1					
9	Select age appropriate sized oxygen mask and connect to nebulizer, a mouthpiece can be used	1					
10	Place facemask over patient's nose and mouth and secure. Hold the Nebulizer in an upright position to avoid spillage while using the mask; ensure that it fits well.	1					
11	Older children may keep the mouthpiece inside the mouth and close the lips around it.	1					
12	Start oxygen at 4–6 l/min. Nebulize the child when no further aerosol can be seen and the nebulizer set sounds 'empty', turn off the Nebulizer. Assist the child to remove the mask/mouthpiece.	1					
13	Document that the medication given and its dose; note if the nebulisation has had any effect on the condition of the child (eg; oxygen saturation, air entry etc.)	1					
Total		13					

OSCE CHECKLIST 11 : METERED DOSE INHALER WITH SPACER/ VOLUME HOLDING CHAMBER

#	Steps	Score	Participants				
			1	2	3	4	5
Ask the Child/ Parent to							
1	Remove the mouthpiece cover and shake the inhaler.	1					
2	Breathe out gently.	1					
3	Place the mouthpiece of the inhaler in the mouth between the teeth and seal lips around it taking care not to bite.	1					
4	Press the canister and simultaneously start breathing in, slow and deep. Continue to inhale deeply.	1					
5	Remove the inhaler from the mouth and hold breath for about 10 seconds.	1					
6	Wait for at least 15-30 seconds before taking another inhalation.	1					
7	Parents must assist and supervise those children who need help in using their MDI correctly.	1					
Total		7					

OSCE CHECKLIST 12: FEEDING WITH ORO GASTRIC TUBE

#	Steps	Score	Participants				
			1	2	3	4	5
1	Arrange necessary supplies.	1					
2	Use 8F OG tube for babies >2000 gms and 6F for babies.	1					
3	Wash both hands, air dry and put on sterile gloves.	1					
4	Ask helper to open the pack carefully and remove the tube carefully.	1					
5	Note the point of graduated marking from the angle of mouth to the lower tip of tragus and then to the mid-point between the xiphisternum and umbilicus.	1					
6	Note the marking as this length of the tube should be inserted through the mouth.	1					
7	During insertion, elevate the baby's head to flex the neck slightly and hold the tube at least 5-6 cms from the tip for insertion.	1					
8	Gently insert it through the mouth pointing towards the back of throat to the required distance.	1					
9	Place a stethoscope just below xiphisternum slightly to the left side of the upper abdomen. Attach a syringe having 2- 3 ml air, auscultate with a stethoscope for sound of gush of air in the stomach as the air is pushed.	1					
10	Secure the tube in place gently with tape on the cheek and Record point of its insertion in cms at the angle of mouth in the case sheet.	1					
Total		10					

OSCE CHECKLIST 13: FEEDING WITH NASO GASTRIC TUBE

#	Steps	Score	Participants				
			1	2	3	4	5
1	Arrange necessary supplies.	1					
2	Use 8F NG tube for babies >2000 gms.	1					
3	Wash both hands, air dry and put on sterile gloves.	1					
4	Ask helper to open the pack carefully and remove the tube carefully.	1					
5	Note the point of graduated marking from the angle of the tip of nostril mid-point between the xiphisternum and umbilicus.	1					
6	Note the marking as this length of the tube should be inserted through one nostril.	1					
7	During insertion, elevate the baby's head to flex the neck slightly and hold the tube at least 5-6 cms from the tip for insertion.	1					
8	Gently insert it through one nostril through Nasopharynx to the required distance.	1					
9	Place a stethoscope just below xiphisternum slightly to the left side of the upper abdomen. Attach a syringe having 2- 3 ml air, auscultate with a stethoscope for sound of gush of air in the stomach as the air is pushed.	1					
10	Secure the tube in place gently with tape on the nose & cheek and Record point of its insertion in cms at the angle of nostril in the case sheet.	1					
Total		10					

OSCE CHECKLIST 14: FOR HANDWASHING

#	Steps	Score	Participants				
			1	2	3	4	5
1	Remove rings, bracelets, threads and watch.	1					
2	Wet hands in clean running water. Apply soap.	1					
3	Vigorously rub hands on both sides in following manner <ul style="list-style-type: none"> • Palms, fingers and web spaces • Back of hands • Knuckles • Thumbs • Fingertips and creases • Wrist and forearm up to the elbow 	6					
4	Thoroughly rinse hands in clean running water.	1					
5	Allow air dry keeping the hands above waist level.	1					
Total		10					

OSCE CHECKLIST 15: FOR PREPARATION OF 1% CHLORINE SOLUTION

#	Steps	Score	Participants				
			1	2	3	4	5
1	Keep the necessary items ready (plastic bucket and mug, wooden stirrer, tea spoon, bleaching powder in an airtight container, 1 litre water, plastic apron, utility gloves).	1					
2	Wear plastic apron and utility glove.	1					
3	Take 1 litre water in a plastic bucket.	1					
4	Put 6 level tea spoonful of bleaching powder (30 gm) in the plastic mug and add little water to make thick paste.	1					
5	Add this paste to 1 litre water in the bucket to make 1 % chlorine solution.	1					
6	Stir the solution with a wooden stirrer – a milky white solution will appear. Keep it covered.	1					
	Total	6					

OSCE CHECKLIST 16: FOR DONNING PPE

#	Steps	Score	Participants				
			1	2	3	4	5
1	The participant removes all the ornaments and washes his hand as per protocol.	1					
	The participant puts the PPE components in the following order.						
2	Wear the Cap.	1					
3	Wear the Shoe cover/ footwear.	1					
4	Sanitize the hands.	1					
5	Wear the inner pair of gloves.	1					
6	Wear the Apron.	1					
7	Wear Mask and Goggles.	1					
8	Wear Hood.	1					
9	Wear second pair of gloves.	1					
10	Sanitize the hands.	1					
	Total	10					

OSCE CHECKLIST 17: FOR DOFFING PPE

#	Steps	Score	Participants				
			1	2	3	4	5
1	The participant removes the PPE components in the following order Sanitize the hands.	1					
2	Remove the outer pair of gloves.	1					
3	Remove Hood.	1					
4	Remove the gown.	1					
5	Sanitize the hands.	1					
6	Remove the shoe cover.	1					
7	Sanitize the hands.	1					
8	Remove goggles, mask and cap.	1					
9	Sanitize the hands.	1					
10	Remove the inner pair of gloves.	1					
11	Sanitize the hands.	1					
12	Wash the hands.	1					
	Total	12					

OSCE CHECKLIST 18: FOR USE OF FACE MASK

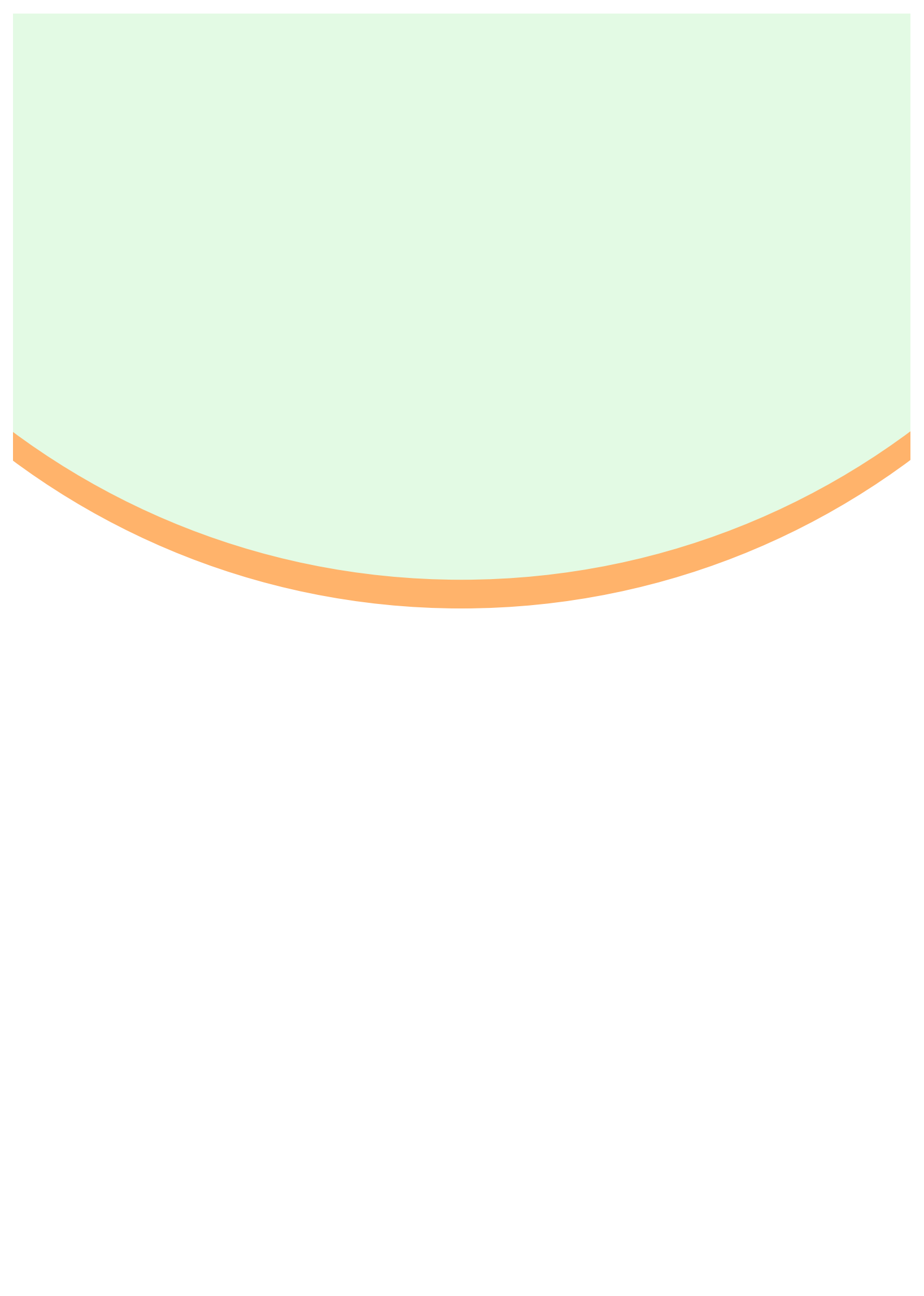
#	Steps	Score	Participants				
			1	2	3	4	5
1	The participant washes his hand as per protocol.	1					
2	Places the mask carefully to cover mouth and nose and tie securely to minimize any gaps between the face and the mask.	2					
3	While in use, avoids touching the mask.	1					
4	Removes the mask by removing the lace from behind while not touching the front.	2					
5	Cleans the hands by using an alcohol-based hand rub or soap and water if visibly soiled after removal of the mask or whenever inadvertently touched a used mask.	2					
6	Replaces the mask with a new clean, dry mask as soon as they become damp/humid.	1					
7	Discards the single-use masks after each use and dispose-off them immediately upon removal.	1					
Total		10					

OSCE CHECKLIST 19: FOR BMW SEGREGATION

#	Steps	Score	Participants				
			1	2	3	4	5
1	Segregation						
	Yellow Category <ul style="list-style-type: none"> Human Anatomical Waste Animal Anatomical Waste Soiled Waste Discarded or Expired Medicine Chemical Liquid Waste Chemical Laboratory Waste Chemotherapy Drug Vials Non Plastic / Semi plastic overall Discarded linen, mattress, beddings contaminated with blood, body fluids All PPE used by healthcare providers for covid patients 	1					
	Red Category <ul style="list-style-type: none"> Contaminated Waste (Recyclable) 	1					
	Blue Category <ul style="list-style-type: none"> Glassware Metallic Body Implants 	1					
	White Category <ul style="list-style-type: none"> Waste Sharps including metals 	1					
2	Bins should be closed all the time and with Foot operated lids.	1					
3	Both liners & bins must have sign of Biohazard Symbol.	1					
4	Both liner & bins used in COVID wards must have labels of "COVID -19 waste"-as it helps CWTF to identify the waste for priority treatment.	1					
5	Double layer of liner should be used to ensure adequate strengthening and to avoid any leaks.	1					
6	Liner should be Non Chlorinated & not be less than 15 microns.	1					
7	Segregation at source should be ensured (No segregation of waste in temporary waste collection /storage area).	1					
8	Inner & outer surfaced of bins & container containing BMW should be disinfected-with 1% sodium hypochlorite solution daily.	1					
9	Waste should be handed over directly to CWTF.	1					
	Total	12					

Annexure





Annexure 1
Detailed drug chart to be discussed with the participants along with vials of each

Drug	Indication	Available Forms/ Route	Dosages	Monitoring	Precaution	Side effects
Injection Dextrose (Glucose)	Hypoglycemia	Injection: D10W (0.1 g/mL) D25W (0.25 g/mL) D50W (0.5 g/mL) IV/IO	0.5 to 1 g/kg D50W..1 to 2 mL/kg D25W..2 to 4 mL/kg D10W..5 to 10 mL/kg	Do not administer unless hypoglycemia is documented (Use glucometer to test)	if continued therapy indicated...Follow bolus of glucose with continuous infusion Max recommended conc for bolus administration is D25W (prepare by mixing D50W 1:1 with sterile water/ NS)	Sclerosis of veins (hypertonic glucose concentrations) Hyperglycemia
Injection Dopamine	Ventricular dysfunction, including cardiogenic & Distributive shock	Injection: 40, 80, 160 mg/mL Prediluted in D5 W: 0.8, 1.6, 3.2 mg/mL IV/IO	2 to 20 mcg/kg per minute infusion (titrate to desired response)	Monitor ECG continuously and blood pressure frequently.	>20 mcg/kg per minute produce peripheral, renal and splanchnic vasoconstriction and ischemic; if infusion dose >20 mcg/kg per minutes is required, consider addition of alternative adrenergic agent (e.g. epinephrine/norepinephrine). Do not mix with sodium bicarbonate Infiltration with phentolamine may reduce local toxic effect of dopamine.	Headache, Dyspnea, Palpitations, premature ventricular contractions, SVT, VT, hypertension, peripheral vasoconstriction, Nausea, vomiting, diarrhea, Acute renal failure, local necrosis (with filtration)

Drug	Indication	Available Forms/ Route	Dosages	Monitoring	Precaution	Side effects
Dexamethasone	Croup Asthma	Injection: 4, 10 mg/ml Elixir: 0.5 mg/ 5 ml Oral solution: 0.1, 1 mg/ml	Croup: PO/IM/IV 0.6 mg/kg x 1 dose (maximum dose 16 mg) Asthma: PO/IM/IV 0.6 mg/kg every 24 hours (maximum dose 16 mg)			Depression, headache, irritability, euphoria, seizures, Hypertension, thrombophlebitis, nausea, Diarrhea, abdominal distention Hypokalemia
Furosemide	Pulmonary oedema Fluid overload	Injection: 10 mg/mL	IV/IM , 1 mg/kg (typical max dose 20 mg for patient not chronically on loop diuretics)	blood pressure frequently. Monitor serum creatinine, BUN, and electrolytes, especially potassium	Hypokalemia can be severe and may need replacement therapy Look specially for hypomagnesemia, hyperuricemia, hypocalcemia, hyponatremia, metabolic alkalosis	Headache, weakness, vertigo, paresthesia, Hearing loss, tinnitus, blurred vision, dry mouth, Orthostatic hypotension, angina, ECG change ,, diarrhea, abdominal cramps, Polyuria, Stevens Johnson syndrome
Hydrocortisone	Adrenal insufficiency (may be associated with septic shock)	Sodium succinate injectable in 100, 250, 500, 1000 mg/vial	IV/IO 2 mg/kg bolus (maximum dose 100 mg)		Watch for infections, hypertension, hyperglycemia mood changes	headache, blurred vision peptic ulcer, osteoporosis, thrombophlebitis, oedma, acne, poor wound healing, ecchymosis

Drug	Indication	Available Forms/ Route	Dosages	Monitoring	Precaution	Side effects
Norepinephrine	Hypotensive shock (i.e. associated with low SVR unresponsive to bolus fluid administration)	Injection: 1 mg/mL	IV/IO 0.1 to 2 mcg/kg per minutes infusion (titrate to desired change in blood pressure and systemic perfusion)	ECG continuously and blood pressure frequently	<ul style="list-style-type: none"> May produce hypertension, organ ischemia, or arrhythmias. Do not mix with sodium bicarbonate/alkaline solutions Special considerations: ideally should be administered via a central venous catheter	Tissue infiltration may produce severe ischemia and necrosis. Infiltration with phentolamine may reduce local toxic effect of norepinephrine.
Sodium Bicarbonate	Metabolic acidosis (severe) Hyperkalemia Routine administration is not recommended in cardiac arrest.	Injection: 4% (0.48 mEq/mL), *4.2% (0.5 mEq/mL), 7.5% (0.89 mEq/mL), 8.4% (1 mEq/mL) Injection (premixed): 5% (0.6 mEq/mL) *recommended for infants younger than 1 month	IV/IO 1 mEq/kg slow bolus; maximum dose 50 mEq Drug should not be administered via the endotracheal route. Irrigate IV/IO tubing with NS before and after infusion	SPO2 and ECG continuously. ABG.	Ensure adequate ventilation to avoid transient paradoxical acidosis. May inactivate catecholamines, decrease in serum potassium and ionized calcium concentrations. Do not combine with calcium salts	tremors, hyperreflexia, tetany, seizures, Respiratory depression, Arrhythmia, paralytic ileus, Cyanosis, Hypertatremia, hypocalcemia, hypokalemia, Metabolic alkalosis, water retention
Salbutamol respiratory solution	Asthma Anaphylaxis (bronchospasm) Hyperkalemia	Nebulized solution: 0.5% (5 mg/mL) Pre diluted nebulized solution: 0.63 mg/3 mL NS, 1.25 mg/3 mL NS, 2.5 mg/3 mL NS (0.083%) Metered dose inhaler (MDI): 90 mcg/ puff	Refer to chart below		Do not use in Tachyarrhythmias, severe cardiac disease.	Tremors, headache, Dry nose and throat, Palpitations, tachycardia, systolic hypertension, sweating

Asthma, Anaphylaxis (Mild to Moderate), Hyperkalaemia		
MDI	4 to 8 puffs (inhalation) every 20 minutes PRN with spacer	
Nebulizer	Weight <20kg	2.5 mg/dose (inhalation) every 20 minutes PRN
	Weight >20 kg	5 mg/dose (inhalation) every 20 minutes PRN
Asthma, Anaphylaxis (severe)		
Continuous nebulizer	0.5 mg/kg per hour continuous inhalation (maximum dose 20 mg/h)	
MDI (recommended if intubated)	4 to 8 puffs (inhalation) via ET tube every 20 minutes PRN or with spacer if not intubated	

Epinephrine

Indications:

- Anaphylaxis
- Asthma (when more selective b₂ – agonists are not available)
- Bradycardia (symptomatic)
- Croup (nebulized)
- Cardiac arrest
- Shock
- Toxins/overdose (e.g. b-adrenergic blocker, calcium channel blocker)

Available forms:

- Injection: **1:1000* aqueous (1 mg/mL)**, 1:10 000 aqueous (0.1 mg/mL)
- IM autoinjector: 0.15 mg, 0.3 mg
- Recemic solution: 2.25

Dose & Administration

Adverse Effects:

Anaphylaxis	
IM	<ul style="list-style-type: none"> • mg/kg (0.01 mL/kg of 1 :1000) every 15 minutes PRN (maximum dose 0.3 mg or • IM autoinjector 0.3 mg ((for patient weighing > 30 kg) or IM junior autoinjector 0.15 mg (for patients weighing 10 to 30 kg)
IV/IO	<ul style="list-style-type: none"> • mg/kg (0.1 mL/kg of 1:10 000) every 3 to 5 minutes (maximum dose 1 mg) if hypertension is present). • If hypotension persists despite fluids administration and bolus injection, consider continuous infusion of 0.1 to 1 mcg/kg per minutes
Asthma	
Subcutaneous	<ul style="list-style-type: none"> • 0.01 mg/kg (0.01 mL/kg of 1: 1000) every 15 minutes (maximum dose 0.3 mg)
Bradycardia	
IV/IO	<ul style="list-style-type: none"> • 0.01 mg/kg (0.1mL/kg of 1:1000) every 3 to 5 (maximum dose 1 mg)
Croup	
Nebulizer	<ul style="list-style-type: none"> • 0.25 mL recemic solution (2.25%) mixed in 3 mL NS by inhaled nebulizer for moderate to severe illness (i.e., stridor at rest) in infants or young children; up to 0.5 mL mixed in 3 mL NS for older children or • 0.5 mL/kg of 1:1000 epinephrine, maximum of 5 mL, dilute in 3 mL NS; this dose approximately equal to 0.25 mL of recemic solution
Cardiac Arrest	
IO/IV	<ul style="list-style-type: none"> • 0.01 mg/kg (0.1 mL/kg of 1:10 000) every 3 to 5 minutes dose 1 mg)
ET tube	<ul style="list-style-type: none"> • 0.1 mg/kg (0.1mL/kg of 1:1000) endotracheally every 3 to 5 minutes

Shock	
IV/IO infusion	• 0.1 to 1 mcg/kg per minutes infusion (consider higher doses if needed)
Toxin overdose	
IV/IO	• 0.01 mg/kg (0.1 mL/kg of 1:10 000) (maximum dose 1 mg); if no response, consider higher doses up to 0.1 mg/kg (0.1 mL/kg of 1:1000)
IV/IO infusion	• 0.1to 1 mcg/kg per minute infusion (consider higher doses if hypotension refractory to this dose)

- Tremors, anxiety, insomnia, dizziness, weakness
- Dyspnoea, Arrhythmias (especially tachy-arrhythmias, e.g. SVT and VT)
- Renal vascular ischemia, Hyperglycemia
- Hyperkalemia (b2- post-resuscitation stimulation causes intracellular potassium shift)

Precautions:

- High doses release vasoconstrictions and may compromise organ perfusion.
- Low doses may increase cardiac output with redirection of blood flow to skeleton muscles, producing decreased renal and splanchnic blood flow.
- Myocardial O₂ requirements are increased (as the result of increased heart rate, myocardial contractility and with higher doses, increased SVR).
- Tissues ischemia and necrosis may result if IV infiltration occurs. Infiltration with phentolamine may reduce local toxic effect of epinephrine.

Consideration:

When give IM in anaphylaxis best absorption occurs from injection in thigh rather than deltoid muscle.

Subcutaneous administration is not recommended for treatment of anaphylaxis because absorption is delayed.

Annexure 2: Maintenance of Fluid Requirements

Weight (kg)	Volume in 24 hrs	Rate (ml/hr)	Drip rate drops/min) Adult IV set (20 drops = 1 mL)	Drip rate (drops/min) Pedia set (60 drops= 1 mL)
3	300	13	4	13
4	400	17	6	17
5	500	21	7	21
6	600	25	8	25
7	700	29	10	29
8	800	33	11	33
9	900	38	13	38
10	1000	42	14	42
11	1050	44	15	44
12	1100	46	15	46
13	1150	48	16	48
14	1200	50	17	50
15	1250	52	17	52
16	1300	54	18	54
17	1350	56	19	56
18	1400	58	19	58
19	1450	60	20	60
20	1500	63	21	63
21	1525	64	21	64
22	1550	65	22	65
23	1575	66	22	66
24	1600	67	22	67
25	1625	68	23	68

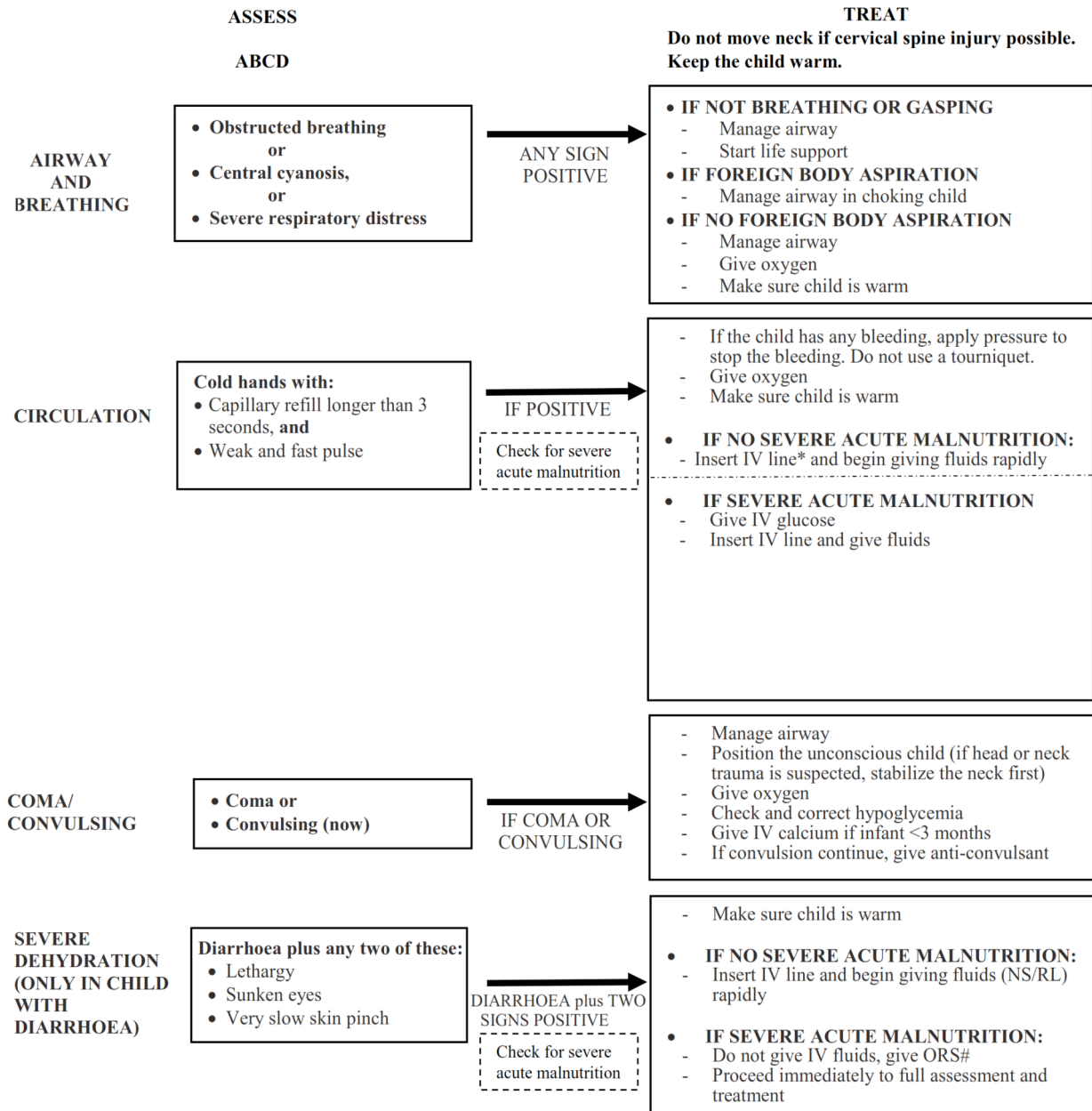
Note: Give the sick child more than the above amounts if he or she has fever (increase by 10% for every 1°C of fever).

The total daily fluid requirement of a child is calculated from the following formula:

- First 10 Kg - 100 ml/kg
- Next 10 kg - 50 ml/kg
- Next each additional kg 20 - 25 ml/kg

In case the child is accepting Oro/nasogastric feeds then calculate the total requirement and divide accordingly

Annexure 3 - Triage of a Sick Child (Updated chart by core group of F-IMNCI)



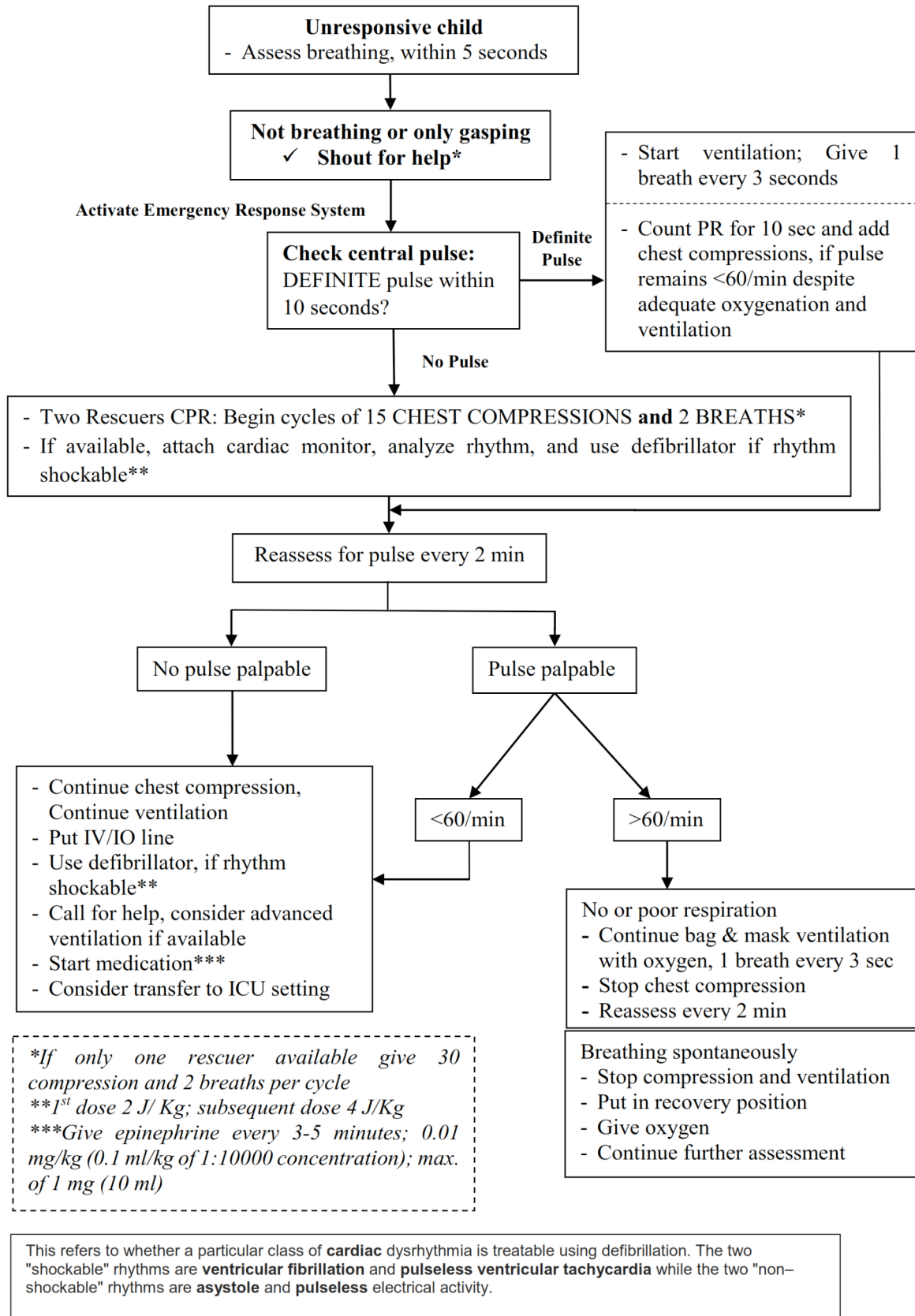
IF THERE ARE NO EMERGENCY SIGNS LOOK FOR PRIORITY SIGNS:
These children need prompt assessment and treatment

PRIORITY SIGNS	
- Tiny baby (<2 months)	- Restless, continuously irritable, or lethargic
- Temperature very high	- Referral (urgent)
- Trauma or other urgent surgical condition	- Malnutrition: Visible severe wasting
- Pallor (severe)	- Oedema of both feet
- Poisoning	- Burns (major)
- Pain (severe)	
- Respiratory distress	

**If not able to insert peripheral IV, insert an external jugular or intraosseous line.
5 ml/kg every 30 min for 2 hours*

Note: If a child has trauma or other surgical problems, get surgical help or follow surgical guidelines.

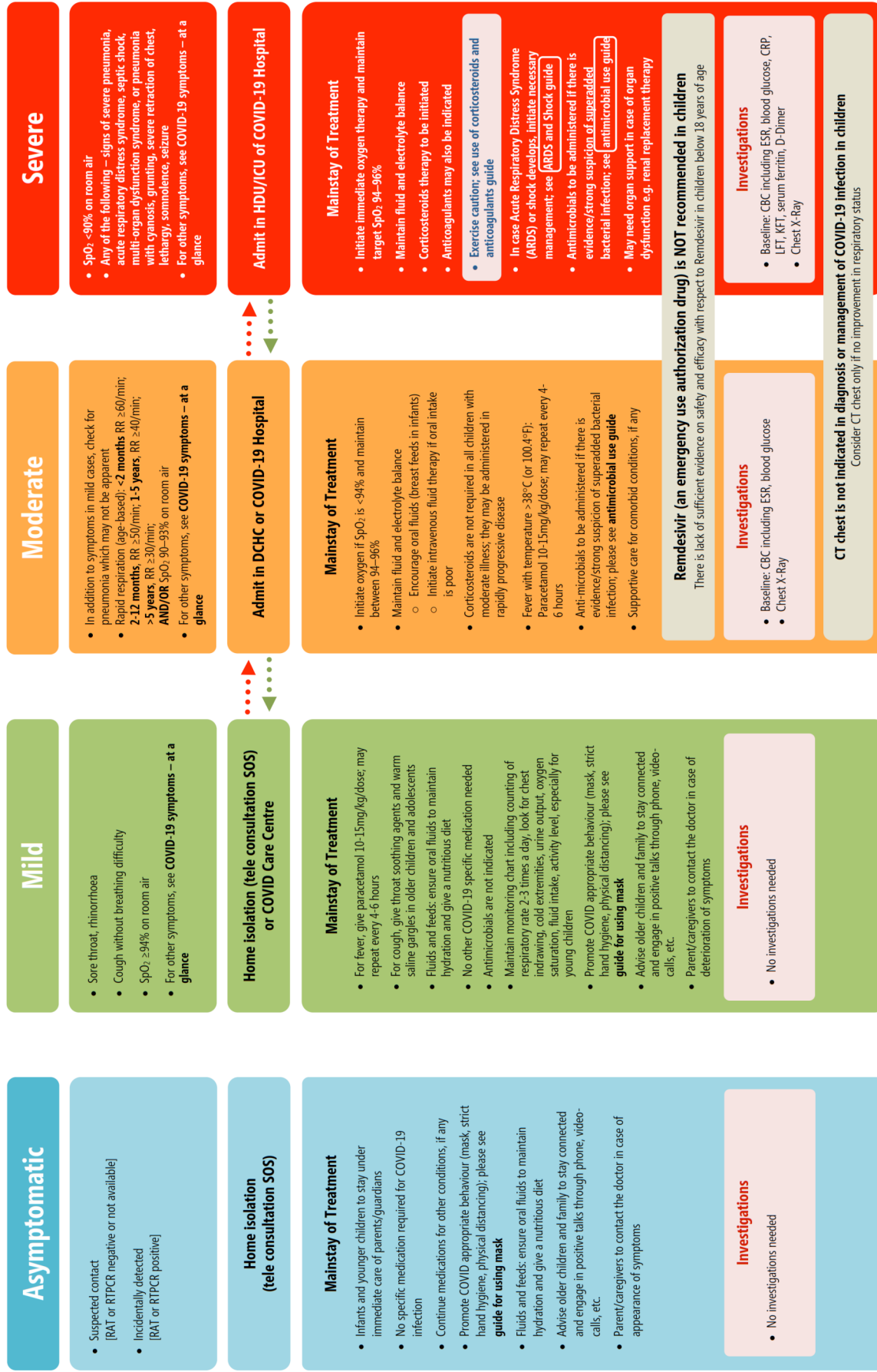
Annexure 4 - Providing Basic Life Support (Updated chart by core group of F-IMNCI)



Annexure 5 - COVID-19 Symptoms in Children - At a Glance

Common symptoms		Sore throat/throat irritation	Diarrhoea		
Fever					
Cough		Body ache/headache	Anorexia/nausea/vomiting		
Rhinorrhoea		Malaise/weakness	Loss of sense of smell and/or taste		
Differentiating symptoms/signs		Asymptomatic	Mild	Moderate	Severe
Respiratory rate/min		Normal with age dependent variation	Normal with age dependent variation	Rapid respiration (age based) <2 months ≥60/min 2-12 months ≥50/min 1-5 years ≥40/min >5 years ≥30/min	Rapid respiration (age based) <2 months ≥60/min 2-12 months ≥50/min 1-5 years ≥40/min >5 years ≥30/min
SpO ₂ on room air		≥94%	≥94%	≥90%	<90%
Grunting, severe retraction of chest		×	×	×	+/-
Lethargy, somnolence		×	×	×	+/-
Seizure		×	×	×	+/-

Annexure 6 - Guidelines for Management of COVID-19 in Children



Annexure 7 - Diagnosis of Multisystem Inflammatory Syndrome (MIS)

Multi System Inflammatory Syndrome in Children (MIS-C) is a new syndrome in children characterized by unremitting fever >38°C and epidemiological linkage with SARS-CoV-2

Diagnostic criteria (WHO)

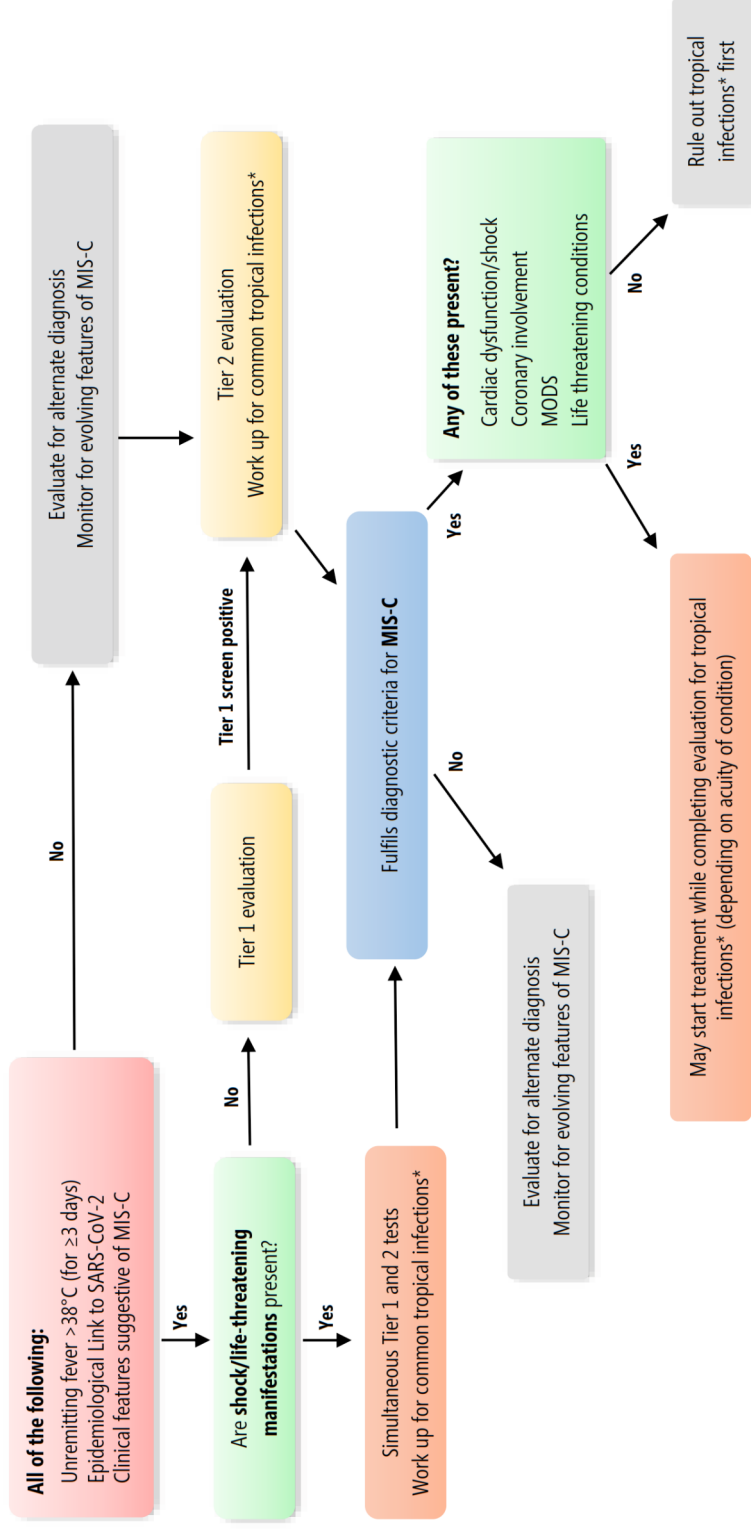
- Children and adolescents 0–18 years of age with fever ≥ 3 days
- **And any two** of the following:
 - Rash or bilateral non-purulent conjunctivitis or muco-cutaneous inflammation signs (oral, hands or feet)
 - Hypotension or shock
 - Features of myocardial dysfunction, pericarditis, valvulitis, or coronary abnormalities (including ECHO findings or elevated Troponin/NT-proBNP)
 - Evidence of coagulopathy (PT, PTT, elevated D-Dimers)
 - Acute gastrointestinal problems (diarrhoea, vomiting, or abdominal pain)
- **And** elevated markers of inflammation such as ESR (>40 mm), C-reactive protein (>5 mg/L), or procalcitonin
- **And** no other obvious microbial cause of inflammation, including bacterial sepsis, staphylococcal or streptococcal shock syndromes
- **And** evidence of recent COVID-19 infection (RT-PCR, antigen test or serology positive), or likely contact with patients with COVID-19

Alternative diagnoses that must be excluded before making a diagnosis of MIS-C

- Tropical fevers (malaria, dengue, scrub typhus, enteric fever)
- Toxic shock syndrome (staphylococcal or streptococcal)
- Bacterial sepsis

MIS-C with Kawasaki Disease (KD) phenotype is characterised by fever, conjunctival redness, oropharyngeal findings (red and/or cracked lips, strawberry tongue), rash, swollen and/or erythematous hands and feet and cervical lymphadenopathy

Annexure 8 - Stepwise Investigation in a Patient with MIS-C



Tier 1 tests (may be done at Covid Care Centre, Dedicated Covid Health Centre): CBC, complete metabolic profile (LFT/KFT/blood gas/glucose), CRP and/or ESR, SARS-CoV-2 serology and/or RT-PCR, blood culture

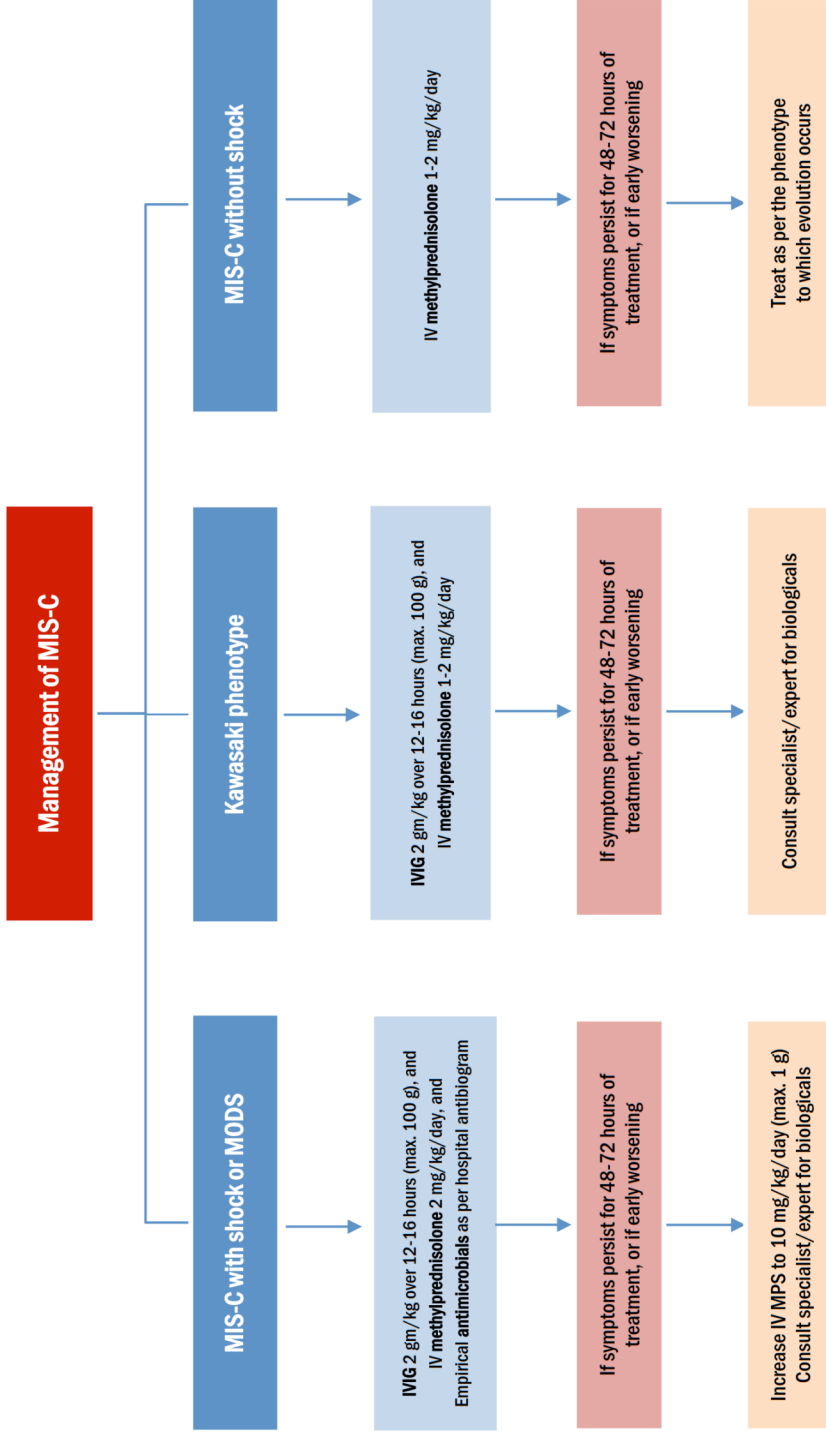
Positive Tier 1 screen (*both* of these should be present):

1. CRP > 5 mg/L *and/or* ESR > 40 mm/hour;
2. At least *one* of these: ALC < 1000/ μ L, platelet count < 150,000/ μ L, Na < 135 mEq/L, neutrophilia, hypoalbuminemia

Tier 2 tests (may be done at Dedicated Covid Hospital): Cardiac (ECG, echocardiogram, BNP, troponin T); inflammatory markers (procalcitonin, ferritin, PT, PTT, D-Dimer, fibrinogen, LDH, triglyceride, cytokine panel); blood smear; SARS-CoV-2 serology

* Common tropical infections include malaria, dengue, enteric fever, rickettsial illness (scrub typhus), etc.

Annexure 9 - Management of MIS-C



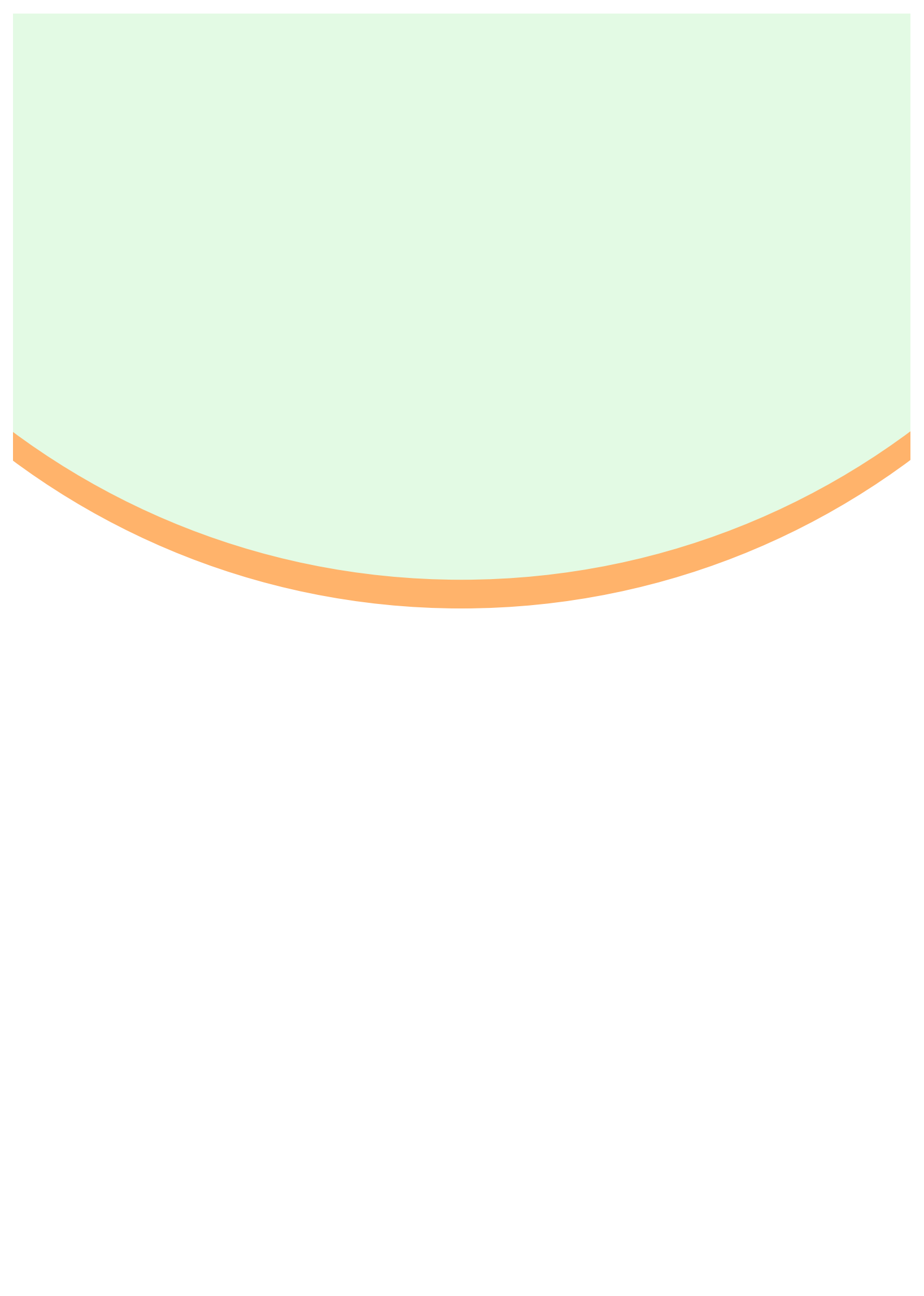
Use biologicals only after expert consultation and at tertiary care only

- Appropriate supportive care is needed preferably in ICU for treatment of cardiac dysfunction, coronary involvement, shock or multi-organ dysfunction syndrome (MODS)
- IVIG to be given slower (over up to 48 hours) in children with cardiac failure/ fluid overload
- Taper steroids over 2-3 weeks with clinical and CRP monitoring
- Aspirin 3-5 mg/kg/day, maximum 75 mg/day in all children for 4-6 weeks (with platelet count >80,000/ μ L for at least 4-6 weeks or longer for those with coronary aneurysms)
- Low molecular weight heparin (Enoxaparin) 1 mg/kg/dose twice daily \geq c in >2 months (0.75mg/kg/dose in <2 months) if patient has thrombosis or giant aneurysm with absolute coronary diameter \geq 8 mm or Z score \geq 10 or LVEF <30%
- For children with cardiac involvement, repeat ECG 48 hourly & repeat ECHO at 7-14 days and between 4 to 6 weeks, and after 1 year if initial ECHO was abnormal

Section-5

References and List of Contributors





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5. Ministry of Health & Family Welfare, Government of India. Emergency Triage and Treatment module for Staff nurses –Facilitator module -2018
6. Emergency Triage and Treatment module for Staff nurses – Chart booklet* -2018 for Job Aides (updated by Department of Pediatrics -Kalawati Saran Children Hospital,LHMC, New Delhi
7. Covid 19 Training Resource - NHSRC - <http://qi.nhsrindia.org/cms-detail/training-material/MTMx>
8. Guidelines for Management of COVID-19 in Children (below 18 years) by MOHFW, GOI.
<https://www.mohfw.gov.in/pdf/GuidelinesforManagementofCOVID19inCHILDREN18June2021final.pdf>

TRAINING RESOURCE MATERIAL AVAILABLE AT

<https://drive.google.com/file/d/1FUktR7FEOgTSMzgclxakOke1s1Zpo52L/view?usp=sharing>

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