National Guideline for Safe Transport of Sick Children and Neonates

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Male' Republic of Maldives

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1. Preface

In crafting this guide on the transport or sick children and neonates, our paramount concern has been to provide comprehensive and practical insights to those entrusted with the wellbeing of these vulnerable individuals during transfer. Rooted in a commitment to ensure the safety, comfort and specialised care required for paediatric patients and neonates, this Preface serves an earnest introduction to a resource designed to support and inform those navigating the critical journey of transporting sick children.

The goal of neonatal and Paediatric inter- facility transport is to bring speciality hospital quality of care to the bed side of patients who are not in proximity to a tertiary care facility and to ensure safe transfer to the hospital that will provide their definitive care.

Purpose

1. Streamlining the process of safely transporting critically ill children and neonates from one hospital to another.
2. Reduction in morbidity and mortality related to transporting critically ill children

1 Organisation of a transport process

1.1 Aim

To ensure safe and timely transport of neonates and children requiring emergency or controlled transfer from level of health care to another

Each health facility must have the following in place

1. A dedicated transport team

   This team should have a medical doctor and a registered nurse trained in paediatric advanced life support (PALS) / Basic life support (BLS) and neonatal resuscitation programme (NRP)

   - Ideally it is important to have completed the safe transport and retrieval course.

2. The Paediatric/ Medical officer in charge at each health facility should lead the core group in order to ensure the proper organisation of the transport process , supervision of training team members, availability of equipment, organising transport duty rotations and other related logistics. Communication with all concerned heads if and when required (namely Aasandha , coastguard, MNDF helicopter services, and referring hospital administration)
3. Any child who is critically ill or intubated, should be accompanied by at least 2 medical personnel (a doctor and a nurse competent in advanced life support skills)

1.2 Role of Transport Team Members

1.2.1 Role of Transport Physician/Medical Officer

1. "Team leader" – overall control of the transfer process.
2. Communications with the receiving centre and receiving approval for transfer from consultant in charge at the receiving hospital.
3. Informing parents about the transfer and explain to them the associated risks and benefits.
4. Taking charge of the clinical care of the child and ensuring continuity of critical care.
5. Filling all necessary documents, forms required by Aasandha and Airline.(See Annex)
6. The doctor should also be well trained in obtaining and securing a patent airway, and obtaining vascular access, including intraosseous access.
7. Prescribe / administer necessary medications during transfer.

1.2.2 Role of Transporting Nurse

1. Should be skilled in monitoring and providing nursing care for the critically ill child, administer various drugs and maintain temperature control.
2. Ensure all equipment is available and in a usable condition before and during transport.
3. Nurse should be familiar with all the documents, and ensure that they are filed appropriately before, during and after the transfer process.

1.3 Paediatrician at the Receiving Hospital

An in-house paediatrician should be available 24/7 in all the receiving hospitals who will provide any required advice for pretransfer stabilization and during transport.

1.3.1 Responsibilities of on call paediatrician

1. Obtain information from the referring health facility regarding patient's acuity, suitability and stability for transfer.
2. Suggest on required urgency of response, transport team composition, mode of transfer.
3. Provide referring doctor with recommendations for diagnostic and therapeutic intervention while awaiting transfer
4. Inform ER team leader , on duty medical officer (Paediatric medical officer), NICU/ PICU/ ICU staff for preparation to receive the case.
5. Inform other relevant specialists if needed depending on the diagnosis of the child.
6. Complete part B of referral form of the transfer-in cases and submit to head of department. (Annex 2)

Transport Equipment's and Medications

The interfacility transport of critically ill neonates and children requires basic and specialised equipment and medication geared towards the needs of the patient.

Transport team should be self-sufficient, with dedicated, organized supplies for quick, efficient access. If any equipment's need to be shared among transport programmes, local hospitals, or emergency medical services teams, plans and checklists should be developed to ensure that equipment is available and properly maintained. It is not advisable to rely on or plan to borrow equipment or medications from a referring hospital on a routine basis to serve a transport team's needs.

Transport equipment's needs to be light weighted, portable, rugged, and easy to clean, to meet or exceed all hospitals and to have tested in the transport environment.

All medical packs should be checked before and after each transport as well daily.

All electrical equipment must have independent, rechargeable power sources that can easily connect to power outlets in ground and air transport vehicles. Compatibility of all mechanical equipment is critical (eg, the oxygen and air connectors must be compatible with all such connectors on all vehicles to be used) to avoid potentially disastrous interruption of therapy.

Routine, scheduled equipment maintenance should be performed by competent, well trained biomedical technicians.

The safety of all equipment's used in transport is mandatory. Techniques for securing patients, incubators, ventilators, stretchers and equipment's and drug packs need to be reviewed rigorously, and all personnel should be trained in these vitals aspects of transport safety.

Proper storage and dispensing of medication is essential for providing safe, effective care. Medications need to be checked and restocked routinely before and after every transport and their use needs to be logged appropriately. A routine and schedule inspection for expired, medications and a rotation plan for near- expired medications are recommended. Transport medications should be stored in a secure, safe, dedicated place between transports so they are not depleted inadvertently by use in another clinical area.

Most drugs used in paediatrics are given on a dose – per – kilogram basis and the weight of some

critically ill patients may not be available at the time of transport, it is recommended to use weight for age chart, length based tape be used to approximate child's weight.

Weight drug dose tables should be attached to drug packs and intake sheets to facilitate efficient mixing and administration of drugs. Drug cards, developed by each team, may be laminated and pocket sized and should include important telephone numbers.

Available modes of transport in Maldives

Aasandha and/or parents, in consultation with on call consultant and the referring doctor, will determine the mode of transport. Several factors are taken into consideration:

1.4 Patient specific factors

1. underlying clinical condition, degree of instability or potential for deterioration
2. Condition requires a time sensitive diagnostic and/or therapeutic intervention
3. Type of intervention and equipment required during transport

1.4.1 Other factors

1. Weather
2. Distance from referring hospital
3. Available modes of transfer in the region

1.4.2 A. Ground ambulance

- This mode of transport is used for transfer from health facility to health facility within interconnected islands and from health facility to jetty or to airfields for onward transfer to referred health facility.
- Existing ambulances will need modification to accommodate transport incubator, transport ventilator, oxygen cylinder, infusion pumps, monitors and transport team

1.4.3 B. Sea ambulance

- A high speed launch, custom designed to transfer patients, is stationed to cover each atoll and is operated in collaboration with MNDF coastguard.
- These vessels are designed to accommodate transport incubators oxygen cylinders and other equipment needed.
- These are already in operation for patient transfer within atolls, regional hospitals and to Male.
- Seems to be a promising mean for medium distance transfers with this country.

1.4.4 C. Helicopter

- This is an emerging mode of transportation (but not a routine service) operated by the Air Wing of MNDF. Ever since, the helicopter service became operational, it has done several emergency medical transfers from islands to male in extremely bad weathers, when sea ambulance and airplane transfer was not possible.
- Since it's a military grade equipment commissioned for search, rescue, surveillance and medical evacuation missions, transport incubators, portable ventilators, oxygen cylinders and other equipment can be fitted on.

- Can be a promising mode for neonatal transfer within the country for
    1. Speed and versatility
    2. Rapid departure and arrival of the team to the patient, decreased out-of-hospital time space

1.4.5 D. Airplane transport

- This is currently the most commonly used mode of patient transfer within the country and the only mode of transfer abroad.
- This service is obtained through commercially operated domestic and international airlines.
- Due to strict security procedures, air transfer through existing commercial air crafts are far from meeting the requirements for medical transfer of critically ill neonates;
    1. Limited oxygen supply
    2. Restriction on transport incubators and portable ventilators monitors and other devises fitted lithium batteries
    3. Limited access and space to monitor patient and carry out interventions

Table. 1 characteristics of modes of transport available.

	Ground Ambulance	Sea ambulance	Airplane	Helicopter
Departure times	Excellent	Excellent	Poor to fair	Excellent
Arrival time	Excellent	Excellent	Excellent	Excellent
Out of hospital time	fair	fair	Excellent	excellent
Patient accessibility	good	good	Poor	good
Weather issues	good	poor	Fair	fair
Cost	Very low	low	fair (high if chartering)	high

2 Using Structured Approach to transfer

These guidelines aim to streamline the transfer process using a systematic approach called the **ACCEPT** model.

This model emphasises the importance of preparing the child prior to transport and ensures that appropriate assessments and procedures are carried out before, during and after the process is completed.

Components

A – Assessment

C – Control

C – Communication

E – Evaluation

P – Preparation and Packaging

T – Transportation

2.1 Assessment

This first step is carried out prior to transporting a patient. Proper assessment requires taking into consideration both the child's clinical condition as well as the competencies of the transferring team. (Answering the following questions may aid the process):

After obtaining the history carefully, an ABCDE approach should be adopted to identify the immediate and predicted needs of the child

Assessment Questions:

1. What is the problem?
2. What is being done?
3. What effect is it having?
4. What is needed now?

2.1.1 Airway:

- Will it be possible to assess the airway during transfer?
- Is there a member of the team present who can secure the airway, if required?
- If the child is intubated:
  a) Is the ET tube visible?
  b) Is the length of the tube at the lips/nose recorded?
  c) If cuffed, is the pilot balloon visible?
  d) Are the connections to the ventilation tubing visible?
  e) Is the ventilator tubing secured to ensure that it will not become snared or drag the ET tube out?

f) Does a member of the team have easy access to a prepared pack of the drugs and equipment that might be needed to (re)intubate?

2.1.2 Breathing:

- Is sufficient oxygen available for the transfer?
- Is a self-inflating bag–valve–mask system readily available if required?
- If the child is ventilated:
  a) Do you have visual and hands-on access to the ventilator and the breathing circuit?
  b) Is there symmetrical chest movement?
  c) Can you see the pulse oximeter and capnograph displays?

2.1.3 Circulation:

- Can you assess the child's circulatory situation?
- Do you have an adequate intravenous access?
- Can you respond to changes in the child's circulatory status (inotropes/ volume)?

2.1.4 Disability:

- Does the child require analgesia?
- Assess the child's neurological status in the ambulance
- Plan how the team will respond to changes in the child's neurological status.

2.1.5 Exposure and environment:

- Has the child been kept warm during assessment and stabilization?
- Is the child adequately covered and secured (on stretcher or incubator)?
- Is the monitoring and therapeutic equipment adequately secured?
- Are all personnel going to be adequately secured?

2.2 Control

This is the process of ensuring that each member of the transport team is familiar with his/ her responsibilities and duties. All tasks are organized, all equipment are in a good working condition and drugs used during transport are available. Control comprises of two main processes; task identification and task allocation.

2.2.1 Task identification:

Once control has been established, clinical care of the child must continue, communication with those who need to know then becomes a priority. Resources including staffing, equipment and drugs will need to be identified and allocated.

2.2.2 Task allocation:

The team leader should allocate tasks among team members taking into consideration relative priority of each task and competencies of staff.

2.3 Communication:

The successful transfer of an ill patient from one clinical area to another requires the coordinated efforts of individuals from different teams. Communication begins at an individual level, as soon as the initial referral has been received.

The following section will highlight key elements of successful communication.

2.3.1 Involved personnel:

From the referring hospital:

- Consultant in charge.
- Nurse in Charge.
- The child's parents/relative.
- Ambulance driver.

To the receiving team:

- Consultant in Charge.
- Receiving Doctors.
- Receiving nursing staff.
- Emergency department.
- Others (PICU, NICU)

2.3.2 What needs to be communicated?

Successful communication occurs when all necessary information has been passed on and understood by all relevant people.

1 Plan what to say before calling.
2 Be systematic in passing the information and ensure clarity of the connection.
3 Summarise the situation and repeat what you need from the listener at the end

Communication of each case should consist of the following:

- Name of the caller and referring provider and facility
- Patients name, age, date of birth, allergies and weight
- Call back phone number, including the unit where patient is located and the referring providers number
- Name of the receiving facility and destination within the receiving facility (eg NICU / ER/ ICU)
- Name of accepting physician
- Patients presenting condition and preliminary diagnosis
- Time sensitivity (emergency, urgent, non-emergency, elective)
- Concise description of the current problem and pertinent medical history
- Patients physiological status including full set of current vital signs
- Patients laboratory and radiological data
- Current treatment (including vascular access, mechanical ventilation, medications)
- Intervention and response to intervention
- Special equipment, medications, or personnel requested
- Infection control issues

- Family or social considerations (including custody issues)
- Ability of family to accompany the team (with proper identification)
- Summarised agreed plans

2.4 Evaluation:

Evaluation is a dynamic process that starts from the first contact with the child.

The main aim of evaluation is to decide on the appropriateness and urgency of the transfer. The urgency of transfer is categorized as follows: Emergency (critical time):

Stable: A child in this group would have a secured airway, be clinically stable and have a good venous access. No obvious danger of cardiorespiratory collapse should be evident

Unstable: Children in this category pose the greatest threats. However, at times, these children may become stable with appropriate interventions. Once all efforts of stabilization are exhausted the team leader should communicate with both receiving and referring consultants to decide if it is appropriate to transfer the child or not.

2.5 Preparation:

Although it is not possible to provide all critical care management modalities during a transfer, the standards of monitoring and care must not be compromised. In order to achieve this both the current needs of the child and the potential needs must be thought of and accounted for. This process normally includes two components; preparation and packaging:

Preparation: there are three distinct components to this step;

1 The child must be stabilized to reduce any physiological complications
2 All necessary equipment must found and checked
3 All personnel who are to undertake the transfer must be prepared.

2.5.1 Child preparation:

The team leader must ensure that the child is in the best possible condition before transporting the child and that all team members are fully briefed about the child's needs. It is useful to use the ABCDE approach.

- Make sure the child has a definitive airway.
- If there is any doubt about the child's ability to breathe then elective intubation should be considered.
- A decision to omit intubation in this case must involve the consultant in charge of receiving the case.
- Ensure the ETT is well secured, the formula to calculate ETT size is: age /4+4 and the formula to calculate the ETT length is: age/2 +12 cm (oral), age/2 +15cm (nasal).
- If the child is breathing spontaneously, a non-rebreathing mask with high flow oxygen can be used.
- Conscious children are best transferred sitting up accompanied by a parent.
- Ensure the child has good IV access prior to transport.
- It is advisable that a child has either two peripheral access points or one sutured central access.
- An infusion pump is recommended.
- Infusions should be rationalised to reduce their number to a minimum.

- If necessary, sedatives or muscle relaxants can be given as boluses, some may be mixed in one syringe.
- Any suspicion of spinal injury warrants taking appropriate measures to ensure spinal immobilization during transfer. Such measures would include using a size appropriate hard collar and spinal boards which should be secured to the ambulance stretcher.
- Children may also become hypothermic during transfer. Ensure appropriate measures are taken to prevent hypothermia.

2.5.2 Equipment preparation:

- Transport equipment should not be used for other purposes; it should be stored in a specific location and must be checked regularly.
- Monitors and pumps must be kept charged at all times
- Supplies of drugs and fluids should be more than adequate for the whole intended journey.
- Make sure you carry all documents, films, investigations and transfer forms with you.
- It may be useful to keep a loading check list and use multi-compartment bags.

2.5.3 Personnel Preparation:

- All personnel should be familiar with the relevant transfer procedures and the equipment to be used, as well as the details of the child's condition.
- Staff should have appropriate life support skills for both the current and possible needs of the child.
- Staff should be equipped with methods of proper communication.

2.6 Packaging:

Packaging is defined as the process of making sure that the child and all the equipment is protected and secured. Appropriate measures to minimize the deleterious effects of the hostile environment should be undertaken.

2.6.1 Packaging the child:

The key elements in packaging the child are security and accessibility.

- Any endotracheal tube (ETT) must be securely fastened. In children this means fixation with an adhesive tape (box below). Excessively long tubes may kink especially when attached to a ventilator. The ETT should never be cut until a chest x-ray is taken to confirm that it is long enough.
- The ETT should always be protected to prevent extubation. There is always an increased risk when moving a child from a bed to a stretcher, or incubator to transport incubator.
- If the atmospheric pressure is likely to change significantly, for example during air transport, the cuff on the cuffed tubes should be filled with water rather than air. This avoids the associated volume changes that may damage the trachea.
- The eyes of the sedated child must be protected by closing the lids with tape, this will prevent accidental corneal abrasion. Make sure to assess the pupils regularly to evaluate levels of sedation and signs of raised intra-cranial pressure (ICP).
- A reserved oxygen supply must be readily on hand and should have an appropriate connector attached.

- Adequacy of respiratory support is assessed by a pulse oximetry, the probe can be placed on a finger inside under the blanket, because it is more likely for the probe to work well in this low light.
- One point of venous access should be kept easily available for drug and fluids administration.
- All the intravenous lines must be secured before transfer.
- Peripheral lines should be fixed in place with adhesive dressings.
- The part covering the entry point of the cannula must be transparent and should be regularly inspected for any signs of extravasation.
- Bandages that completely cover the cannula must not be used.
- Central venous lines should be stitched in place after insertion. The insertion site should be covered with transparent, adhesive dressing. The access port can be secured to the shoulder of the child to avoid displacement during transfer.
- Heat loss resulting in hypothermia presents a major problem during transfer. It can be substantially reduced by wrapping the child in a pre-warmed blanket.
- Checking of ventilator and associated equipment needs to be done thoroughly before transfer.

2.7 Transportation:

All critically ill patients should receive the same level of physiological monitoring available in the Intensive Care Unit (ICU) this includes at a minimum continuous ECG, continuous pulse oximetry and periodic measures of blood pressure, heart rate and respiratory rate. Before leaving the referring unit ensure you have done the following:

- If the child is breathing spontaneously, change to transport oxygen supply and ensure that the mask is appropriate and fits.
- Ensure that the transport oxygen cylinder is full and has the appropriate valve connected.
- If requiring ventilation, attach the child to the transport ventilator to check adequate ventilation and oxygenation are achieved; if possible check the blood gas after 10 minutes.
- Ensure adequate ventilation on both sides of the chest.
- Ensure that any chest drain present is secure and functioning.
- Hang any fluid bags so that they do not interfere with the transfer of the child.
- Check the position of the urinary catheter ensuring that the tube is not kinked.
- Check the position of the naso-/orogastric tube.
- Plan the move with the team.
- Brief the child's parents - give them the opportunity to see and touch their child.
- Where appropriate brief the child.
- Check that no line or tube is likely to be snared in the move.
- Move the child to the trolley using appropriate aid.

2.8 The measures below should be considered in the transportation process:

2.8.1 Sedation and pain management:

It is easier to maintain the patient's ventilation during transport if the patient is kept sedated and paralysed. This precaution minimizes the chance that the endotracheal tube will become displaced.

2.8.2 Ventilation:

- If a patient is connected to a ventilator the patient should initially receive Positive End Expiratory
- Pressure (PEEP) of 4 to 6 cm H2O.
- The Peak Inspiratory Pressure is the amount of pressure needed to inflate the lungs and that is sufficient for alveolar ventilation. The following list provides initial ventilator settings:
  - Fractional concentration of inspired oxygen, 1.0.
  - Respiratory rate, 20 to 40 bpm (depends on age and arterial carbon dioxide concentration).
  - PEEP, 4 to 6 cm H2O.
  - Peak Inspiratory Pressure 15-30 cm H20 to achieve a Tidal Volume of 6-10 cc/kg.
  - Inspiratory time, 0.5 to 1.0 second.
- You can assess adequate ventilation throughout transport by paying attention to the following clinical signs:
  - Adequate chest movements
  - Color: especially of the mucosa or conjunctiva.
  - Breath sounds: should be equal bilaterally.
  - Bradycardia: this may indicate hypoxia.
  - Abdominal distention: It is advisable to insert a nasogastric tube in all intubated babies to remove any swallowed air.

2.9 Suctioning:

- The ETT requires regular suctioning; the appropriate size of the suctioning catheter depends on the size of the endotracheal tube: the smaller the tube the smaller the suction catheter should be.

Arrival to the referred hospital

The team should give complete transfer summary of the clinical details and condition en route and copies of the referring health facility medical records and radiographic studies. The team should inform the referring-doctoror health facility to inform them the patients status at arrival.

3 Threats and Actions during transfer

The key to managing problems during transfers is having pre-emptive thinking; what can go wrong and how can we identify the problem if prevention failed? In the following section we will explore common threats that can happen during transfer and what actions need to be taken.

Be prepared, be pessimistic – 'what can go wrong…will go wrong'

3.1 Use an ABCDE Approach:

3.1.1 Airway

Stop the vehicle if possible and assess the child.

Confirm displacement of the tube by checking that the level of the tube at the lips or nose has changed.

Manually ventilate the child. Re-position the ET tube or Re-intubate and secure the tube.

Arrange for the vehicle to stop.

Outward migration of the ET tube dislodgement: The child may exhibit signs of a leak; gurgling sound on inspiration, crying or vocalisation.

Disconnect from mechanical ventilation. Exclude evidence of tube blockage. Confirm displacement by clinical signs; such as equal chest movements bilaterally, equal breath sounds over both sides of the chest and direct visualisation of the length of the ETT at the nose or mouth. Suction the tube, if you find difficulty passing the suction catheter it may be blocked.

Think Pneumothorax if the tube is patent and correctly placed. Reposition the ET tube and secure it. Visually check the tube for any visible kinks. Use the suction device and an appropriate suction catheter to clear suctions from the ET Tube lumen. Consider replacing the ET Tube completely.

Inward migration of ET Tube: although the child may show similar signs as above but the first indication may be a drop in pulse oximetry as a result of ventilation reaching one lung on

Occlusion or obstruction of ET Tube: obstruction can occur as a result of secretions within the ETT. Dry secretions can be a particular problem, especially when dried gasses are used to ventilate the child.

3.1.2 Breathing

Always keep a high index of suspicion in children with risk factors. If suspected look for changes in oxygenation, blood pressure or asymmetrical chest movement. Check if any existing chest drain is not kinking.

To relieve the pneumothorax, insert a large cannula in the second intercostal space in the mid-clavicular line on the suspected side. Do not remove the cannula till a proper chest drain is inserted. Recheck ventilator and monitors. Consider diversion to nearby hospital. Pass a definitive chest drain. Increase oxygen supply during transfer.

Lung ventilation and perfusion mismatch: during the transfer process the blood flow is influenced by the acceleration/deceleration forces which may result in the child becoming hypoxic.

3.1.3 Circulation

Ensure that the child is appropriately fluid resuscitated before transfer. Monitor the child's ECG carefully for changes in heart rate or rhythms as tachycardia and dysrhythmias may indicate hypovolemia.

3.1.4 Disability

Check the integrity and potency of associated intravenous lines and the syringe drivers.

Failure of the delivery of sedation, analgesia or muscle relaxants.

3.1.5 Exposure and Equipments

Check for hypothermia, and if equipment's are secured.

Prevention of Complications During Air Transport of Neonatal and Pediatric Patients

Gas Expansion

1. Insert orogastric or nasogastric tubes open to air in every infant and child who may experience gastrointestinal symptoms or may be at risk for vomiting.
2. If a cufed endotracheal or tracheostomy tube is in place, carefully monitor cuff pressure or consider replacement of air with water to prevent expansion of the cuff with altitude changes.
3. Ensure that chest tubes, endotracheal tubes, and other artificial vents are patent.
4. Suction airway well before and during transport, as needed.
5. Reevaluate frequently for presence of extrapulmonary air.
    a. Carry a portable transillumination device (for neonates).
    b. Have a needle thoracentesis set available
6. Request that, if possible, the pilot fly at a lower altitude or increase the cabin pressurization (to simulate a lower altitude) when transporting a patient with trapped gas (eg, pneumothorax, pneumoperitoneum, or bowel obstruction).

Decreased PO2

Before leaving the referring hospital:

a. Ensure that the child is optimally oxygenated
b. Correlate arterial POz and COz measurements with cutaneous pulse oximetry and end-tidal CO2 (ETCO2) (in-line or nasal) and/or blood gas values by using point-of-care testing
c. Check placement and stabilization of the endotracheal tube.

En route:

a. Use a cutaneous oxygen saturation monitor for all patients requiring oxygen or assisted ventilation(along with frequent careful assessment of the color of skin and mucous membranes).
b. Increase F1o2 as needed to maintain adequate oxygenation saturation.
c. The oxygen adjustment equation can be used to calculate the F102 required at any cabin altitude or be destination altitude as follows:

(F102 . BP1)/BP2= F1o2 Required

where Fioz is the fraction of inspired oxygen the patient is receiving; BP1, the current barometric pres- sure; and BP2, the destination or altitude barometric pressure.

Assessment and Feedback

Upon submission of event report by transport team or on call paediatrician, the head of department shall assess the event, look for cons and pros and give timely feedback to

1. Transport team members
2. Manager of the health facility from where transport team was mobilised and /or
3. QID of the referring / Referred hospital and MOH

4 Training in transport medicine

Transport of critically ill children and neonates involves high stress situations where it is crucial for the transport team to work well together to ensure patient and team members safety, ensure efficiency and improve patients outcomes. Simulation based training allows team members to practice working together to enhance their interactions and efficiency in a safe environment.

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Annex 1 Equipments

Item	No. per team
Alcohol swabs	
Arm boards	
Batteries	
Blood pressure cuff	
Butterfly needles: 23 and 25 gauge	
Clipboard with transport data forms, progress notes	
Endotracheal tubes: 2.5, 3, 3.5, 4, 4.5 , 5 , 5.5 ,6 cuffed and uncuffed mm	
Face masks, term and premature	
Feeding tubes: 5 and 8 F	
Gauze pads	
Gloves, sterile and examination	
Intravenous catheters: 22 and 24 gauge and tubing	
Suction catheters: 6, 8, and 10 F	
Needles: 18, 20, 26 gauge	
Oxygen tubing	
Pigtail catheters	
nasogastric tube	
Scalpel blades, no. 11	
Suture material (silk 3--0, 4---0, on curved needle)	
Syringes: 1, 3, 5, 20, 10, 50 ml	
Tape	
Thermometer	
IO needle	

Equipment	No. per team
Transport incubator	1
Transport ventilator	1
Portable cardiac monitor with leads	1
Portable Suction device	1
Infusion pumps	2
Gel-filled mattress	2
Airway equipment	2
Flow-inflating bag with manometer	2
Neopuff device	1
Laryngoscopes with no. 00, 0, and 1 blades	1 set
C02 detectors	1
Instrument tray for vascular catheters, percutaneous needle thoracostomy	1
Stethoscope	1
oxygen cylinder	2
Light source	1
Extra batteries	1 set each devise

Respiratory equipment:	
50 psi oxygen source	
Oxygen flow meter with 15 lpm capacity	
Oxygen devices (nasal cannula, ordinary and non re-breathing masks for spontaneous	
ventilation)	
Neonatal/ pediatric transport ventilator (for secondary and tertiary hospital)	
Self inflating bags (Ambu bags). 250ml for small babies, 500ml and 1500mls.	
Face masks for artificial ventilation of different sizes (small, medium and large).	
Laryngoscopes straight bladed sizes 0, 1, 2, and curved sizes 1,2,3,4.	
Endotracheal uncuffed tubes sizes 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0 and 6.5	
Endotracheal tubes stylets	

Magill forceps, neonates/ pediatric	
Oral airways sizes 00,0,1,2,3	
Suction apparatus with battery backup	
Suction catheters (size 6,8,10 and 12 FG)	
Yankauer suction	
Bulb syringe for suction	
Nasogastric tubes (size 6,8,10 and 12 FG)	
Aerosol medication delivery system	

Monitoring equipment:	
Stethoscope	
Cardio- respiratory monitor (ECG, Oxygen saturation, RR, BP)	
ECG electrodes (infants and child)	
Pulse oximeter	
Blood pressure (BP) measurement apparatus (manual and automatic)	
BP cuffs (neonatal, infant and child)	
Thermometer	
Flashlights	
Defibrillator with pediatric paddles (preferred)	
Communication backup, mobile phone (optional)	
Transport isolette/incubator for neonates (preferred).	
Spare batteries	
ET CO2 detector.	

Miscellaneous:	
Adhesive tapes	
Urinary bladder catheters	
Intravenous cannulas 24,22,18 and 16 guages	
Tourniquets for venopuncture and IV access	
Arm boards	
Intraosseous cannulas	
Chest drain tubes.	
Syringes 1ml, 3ml, 5ml,10ml,20ml and 50 ml	
Assorted size needles	
Infusion pumps, simple, easy to use with long lasting battery	
Normal saline 10ml ampoules/ water for injections.	
Intravenous fluid administration tubing	
Three- way stopcocks	

Annex 2 Neonatal Transport Checklist

Patient name:			Referral date: time
Referring hospital:			
Referral diagnosis:			
DOB:	Birth time:	Birth weight:	GA:
Present weight:	Apgar score:		Allergies:
Does baby required resuscitation beyond initial steps No Yes (specify below)			
Positive pressure ventilation (PPV) only	Yes		Duration
PPV + chest compression No	Yes		Duration
Medication Yes (specify)	dose (mg/kg)	total doses gives	
Adrenalin			
Dextrose bolus			
NS bolus			
Referral approved by:			
Immediate patient management instructions: 1. 2. 3.			
Pre-transport stabilization instructions: 1. 2 3.			
Parent name:		Parent phone:	
Transport team: Dr.		Nurse:	

Patient name:		Birth date:
Referring hospital:		
Referral diagnosis:		
Estimated date/time of departure:		
Referral approved by:		
Immediate patient management instructions: 1. 2. 3.		
Pre-transport stabilization instructions: 1. 2 3.		
Patient received by:	Date\time arrived to NICU:	
Condition of patient:		
Immediate patient management instructions followed:	Yes	No
Pre-transport stabilization instructions followed:	Yes	No
Event report submitted: Yes no	Date:	

Annex 3 : Patient Transfer Form

Referring hospital: Receiving hospital:
Patient Name: Age: Gender: M/F ID: Weight: kg
Consultant & contact number:
Date of admission/ transfer:
Diagnosis at admission:
Brief clinical details:
Transfer from: ☐ Ward ☐ A& E ☐ High dependency ☐ ICU
Transfer mode: ☐ Land ☐ Air ☐Sea
Equipments checked prior to transfer: ☐ Yes ☐ No
Drugs checked prior to transfer : ☐ Yes ☐ No
Urgency of transfer1: ☐ Emergency ☐ Urgent ☐ Elective
Reason for transfer: ☐ Lack of bed ☐ Surgical ☐More specialized care ☐ Evaluation & procedures
Time of departure: _____hrs. _____min.(am./ pm.)
Time of arrival: ____hrs. _____min.(am./ pm.)
Ventilation details:
Mode of ventilation: ☐ Spontaneous ☐ Ambu bag ☐ Mechanical
Et tube size ETT depth

Fluids. 1. 2. 3.				
No and sites of the lines 1. 2.				
Central line:				
Drugs given during transport:				
Drug infusions during transport				
Known allergies:				
Monitoring:				
Circulation : HR: / Min BP: / mmhg CRT: / sec Respiratory: RR: /Min SPO2: Ventilation: PIP: Rate: FiO2: PEEP: Disability: GCS: Pupil size & reaction: Exposure : Temp: Rash: Yes/ No Description: Investigation: Images :☐ Bloods ☐				
Transfer comments: (including description of adverse events)				
Transfer outcomes: ☐ uneventful ☐ with complications ☐ death				
Receiving doctor (comments)				
Nurse:	Nurse:	Doctor:	Doctor:	
Name & Signature of escorting team:				

Annex 4: Transport Drugs:

Intravenous fluids	Dextrose 10% in water Dextrose 5% in water Dextrose 5% in 0.2 NS Dextrose 5% in 0.45 NS NS DNS Ringers Lactate	
Inotropic agents	Dopamine Dobutamine Epinephrine Norepinephrine Milirinone	
Code medications	Epinephrine Sodium bicarbonate Nalaxone Lidocaine Amiadarone Atropine Adenosine Calcium gluconate Magnesium sulphate	
Rapid sequence intubation medication	Fentanyl Midazolam Ketamine Etomidate Thiopental Rocuronium Vecuronium Succinylcholine atropine	

diuretics	Furesomide	
Antibiotics	Ampicillin Amikacin Cefotaxime Ceftriaxone Cefazolin Acyclovir	
prostaglandin		
Surfactant preparation		
Asthma and croup medication	Methylprednisolone Dexamethasone Racemic epinephrine Salbutamol Terbutaline Ipratopium	
Anticonvulsants	Lorazepam Phenorbarbital Phenytoin	
Intracranial pressure medication	Mannitol Dexamethasone Hypertonic Saline	