

Transport of the critically ill patient

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Abstract

Transportation of a critically ill patient is a challenging task necessitating development of safety guidelines that can be universally followed to minimise problems during transit. This not only requires trained personnel with good communication skills but also necessitates a well-equipped transportation facility such as ambulance and modification of traffic rules to suit preferential allowance of such vehicles. It is also vital that the trained personnel are experts in handling emergencies, trained in cardiopulmonary resuscitation and airway management. The transport vehicle (ambulance) should be spacious enough to allow resuscitation that may require multiple personnel to be around the patient. Furthermore, the vehicle should have advanced communication equipment so as to be in constant communication with the hospital personnel to which the patient is getting shifted.

Keywords: Critically ill; Patient transport; Transportation of equipment; Check list; Risk factors.

Introduction

A critically ill person is one who has dysfunction of any organ system either alone or in combination with other organ systems that contributes to disruption of normal physiology in such a way that it becomes an immediate threat to the patient's life. Mechanical ventilation of a critically ill patient is well established in the intensive care units. However, when a need arises for transport of such patients to another location within the hospital or to another hospital, this becomes a highly challenging task requiring multiple factors to be addressed.¹ These include but are not limited to requirement of trained personnel, effective communication between the locations, additional equipment and gadgets such as portable monitors to be carried along with the patient during transfer. The hospital personnel attending such a patient during

transport require to be knowledgeable in use of equipment, cardiopulmonary resuscitation, have good communication skills etc.^{1,2} There is a need for development of rationale guidelines that can be applied in developing countries for monitoring and transporting such patients. The transfer of critically ill patients may be within the hospital or between two different hospitals. Both these require clear and decisive protocols to ensure patient safety.

A) Transfer of critically ill patients within the hospital

A critically ill patient may be required to be transported within the hospital to various other places for either diagnostic purposes such as MRI suite, CT scan or for therapeutic purposes to operating locations. In such situations, it is essential to adhere to certain clear protocols in order to safeguard the patient during transit period. The most important step is to identify a high risk patient and have a clear, purposeful communication between personnel involved in patient care at ICU, at the location to which the patient is to be shifted

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and those involved in patient transport. The next step is to ensure adequate supply of medications, monitoring and resuscitation equipment and have personnel trained in cardiopulmonary resuscitation accompany the patient. Some of the essential elements for intrahospital transport are discussed below.

Protocol development and written procedure:

Due to the varied differences in the availability of infrastructure between hospitals in countries such as India, an universal protocol will not be possible to be implemented at this stage. Hence, it is important that each hospital develops its own protocol based on the infrastructure. Furthermore, every department in the hospital must be clearly aware of these protocols. Proper documentation of the events at each stage will not only help provide best patient care but also will help in auditing and quality assessment.

Decision: Documentation has to be done in medical records that includes indications for transport and patient status. The intensivist and primary physician will take the decision to transport the patient. The aim of transport should be noted in case records. The patient's family should be informed of risks involved, possible benefits should be explained and consent should be taken in standard format.

Identification of high risk patient: Mechanically ventilated patients with high requirement of positive end-expiratory pressure (PEEP) and inspired oxygen concentration ($FIO_2 > 0.5$), patients with high therapeutic injury severity score, patients with head injury and haemodynamically unstable patient requiring continuous infusion of vasopressors or inotropes.¹⁻⁷

Preparing the patient for transport: This involves optimisation of haemodynamics and ventilator parameters with optimal fluid resuscitation and use of vasoactive agents as necessary; appropriate airway management and ensuring proper fixation of endotracheal tube or tracheostomy tube; sedation and analgesia as needed to reduce anxiety and fear of the patient along with use of muscle relaxants as required; having a sophisticated transport ventilator

that is portable and easy to handle and if ventilator is not available then a PEEP valve and self-inflating bag can be used with reservoir bag to deliver 100% oxygen.^{1,2} Splints and backboards should be used in order to avoid spinal fractures that may occur while shifting the patients. One must ensure that the drainage bags are emptied and intercostal drainage (ICD) tubes clamped at the time of shifting the patients. Also, it is essential to ensure working and adequate venous access. Patient's medical records and consent forms should also be shifted along with the patient.

Accompanying personnel: In our hospital, a patient is usually accompanied by a critical care physician looking after the patient along with a respiratory therapist and the admitting unit doctor. This ensures that an appropriately trained person in cardiopulmonary resuscitation and airway management is always available during transfer. It has been clearly established that the life threatening complications during transport are minimised by the presence of trained personnel during transfer.^{1,8}

Equipment, drugs and monitoring: Equipment should be portable and checked to be ready for use. The transport trolley ideally should have custom made shelves near the bed to keep the emergency drugs. All equipment should be operable by battery and should be fully charged. One must have equipment compatible with the working environment such as MRI compatible equipment.

Care during transport: The vitals signs should be monitored continuously during transport, airway patency should be ensured and any adverse events should be noted and immediately acted upon.

B) Transport between the hospitals

Interhospital transport of the patients in Indian scenario presents an even more challenging scenario because of lack of specialised transport teams such as medical retrieval units or regional transport teams. Currently, there is an ever increasing need for interhospital transport due to the development of speciality centres in the management of different problems such as respiratory failure, trauma,

transplant, cardiac setups.² In the developed world, interhospital transport may happen by road or by air transfers. However, in India, most of the transports are by road through ambulance services. Interhospital transport may be necessary in India for either therapeutic purpose to higher specialised centres or for diagnostic purposes such as CT scan or MRI as many of these facilities are not available in large number of hospitals while it may also happen due to monetary constraints when the patient's may need to be shifted to centres that offer care at lower prices.

Initiating transport and preparing patient for transport: The treating critical care expert should decide the timing of transport ensuring that the patient is reasonably stable enough to tolerate the stress associated with transport. The patient's family should be taken into confidence and informed about necessity and possible adverse effects of transport while the indication for transport, risks and expected benefits must be clearly written in medical records. If the patient is transferred for further care, the receiving intensivist should be contacted directly and patient's clinical status should be communicated clearly to him/her as he/she might have some suggestions to improve the patient's stability which may be undertaken before shifting the patient and this will also ensure that the intensivist receiving the patient is in a prepared position to tackle the patient on arrival. If non urgent, the transport should be planned for morning to avoid peak traffic.

Communication and coordination: The destination hospital must be informed of the time when the patient sets off from the ICU, the expected time of arrival of the patient at destination. Transport team must be able to keep constant contact with referring as well as the receiving intensivist. The receiving hospital must ensure that the patient is directly taken up to ICU without any delay on arrival. The transport team must be aware of whom to contact in an emergency.

Mode and choice of transport: This may be influenced by the nature of the illness, clinical impact of the transport environment, urgency of

intervention, the distance to be covered, facilities available for transport and the patient's economic status.

Care during transport: Equal care as given at the referring ICU should be provided during transport also. The instances when mishaps are most likely to happen during transport are while shifting the patient from hospital to ambulance trolley, shifting the patient trolley in ambulance and while shifting the trolley from ambulance at receiving hospital. Therefore, during these intervals extra vigilance is needed to prevent disconnections, equipment malfunctions and dislodgement of indwelling catheter. All relevant information and imaging films including copies of medical records and investigation reports should accompany the patient during transport. Patient trolley must be secured appropriately in ambulance. If the patient is intubated and ventilated, head must be secured appropriately in the ambulance to prevent undue movements.^{1,8}

Complications

Complications that may occur during transport of a critically ill patient can be subdivided into individual systems:²

Cardiovascular complications: Tachy or brady arrhythmias, hypotension, hypertension, myocardial ischaemia, worsening of the cardiac condition and possibly cardiac arrest.

Respiratory complications: Problems in ventilation, hypoxaemia, aspiration, barotrauma, airway obstruction, accidental extubation, endobronchial migration of the tracheal tube etc.

Neurologic complications: Anxiety, increase in intracranial pressure in susceptible patients.

Other complications: Such as increased risk for the development of ventilator associated pneumonia, haemorrhage, hypothermia etc. may also happen during transport. Often equipment failure such as loss of battery power, loss of oxygen supply, loss of venous access or damage to equipment may also contribute the significant problems during transport.

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Ambulance specifications

Vehicles should be appropriate to the task in terms of design including cabin environment and equipment. Regular inspection and servicing of vehicles are required.¹ Ideally the ambulance should have features such as driven by suitably trained personnel, able to carry up to four members of hospital staff in addition to ambulance crew, safety of both patient and staff is taken care off, seats for staff should be ideally rear facing or forward facing, patient trolley should be centrally mounted allowing all round patient access, stable comfortable ride with minimal noise and vibration levels, regular services and maintenance contracts, adequate and functioning equipment such as monitors, suction machines and ventilators with appropriate battery backup. The ambulance should also have standard 12 volt DC supply and 240 volts, 50 Hz AC power supply from an inverter or a generator.

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