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PEDIATRICS



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Principles of Pediatric & Neonatal Emergencies

FOURTH EDITION

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CHAPTER

4

Transport of a Sick Child

P Ramesh Menon, Tsering Sandup

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INTRODUCTION

The standardized model of "transfer of a sick child" has a motto of "the right patient is taken at the right time, by the right people, to the right place by the right form of transport and receives the right care throughout". It is based on the "ACCEPT" approach [A-Assessment, C-Control, C-Communication, E-Evaluation, P-Preparation, Packaging, Pre-departure checks, T-Transport]. A brief framework including history and development is discussed here.

HISTORICAL BACKGROUND[1,2]

Centralization of critical care for the sickest patient including children in leading healthcare centers and intensive care units has become the norm in healthcare in the new millennium. This has led to the development of the science of time-critical transfer of a sick child by specialist-teams and related outcomes in the developed world with insurance–based healthcare services.

Military beginnings—Initially, the experience developed was in the transfer of sick and injured in the war for the military (during world wars); then terrorist attacks and civil unrest and strife became a major burden. The focus was on immediate stabilization and rapid evacuation of the critically injured enabling survival of immediate injury. These programs began to be applied to road/traffic accidents, cardiac and neurological emergencies and non-military accidents afterwards. Medical centers and disaster management units were established by the governments patterned after the military model and based on the war experiences. Such trauma centers started participating and establishing certification programs (e.g. ALSG-Advanced Life Support Group; www.alsg.org) and standards of care. Initial standards of care led to further research and refinement into the delivery of care during transfer within (intra-) and between (inter-) facilities. It is still an ongoing process with air-ambulances (fixed-wings or choppers) being pressed into service where time-critical transfers (like for organ (cardiac)-transplantation) have become standard practice and are being investigated for outcome improvement.

Outcome for adults, especially transport involving trauma and cardiac patients, is significantly improved by emergency transport systems. The same, when asked to respond to pediatric emergency transports have run into problems. Indications for transport of sick children (different from those of sick adults) and the support skills required therein have been the major determinants of the deficiency of transport of a sick child. Transport team members with infrequent exposure to critical sickness in babies and the difficulty in maintaining adequate pediatric skills without frequent application for team members have become reasons for a separate, dedicated pediatric transfer/transport teams with a similar flow of information, political and administrative support and guidelines as for sick adults (Neonatal Emergency Transport **(NET**) and Pediatric Emergency Transport (**PET**) .

STRUCTURE AND LEGISLATION

In established network of pediatric transport services (e.g. in the UK), the guiding principle of the structure of care

delivery is that centralization of services at larger dedicated pediatric intensive care improves patient outcome for critical illness. A loco regional efficient **coordinating node** was the focal point of developing and unifying the services for critically ill children. The initial organic, understaffed unit-based and bed-dependent ad-hoc transfer services were improved in terms of structure, training and staff. Progressively, a network of 29 PICUs (www.picsociety.uk) has been reported by 2014. Updates including quality benchmarks and standardized checklists have been developed and published by them.[2] More than 5000 interfacility transfers between these centers, 92% being done by a specialist transport team with a consultant at the helm of affairs—these reports highlight the different models of regional services that have been developed. The defining feature of a coordinated service has come to be single point of telephonic contact activating the conference call between clinicians, a "ready to roll" transport, no anchoring on bed availability and digital recording of the process for review and quality improvement. The various guidelines by societies of pediatric service providers recommend development of local protocols for inter- and intrahospital transport of sick children for diagnostic and therapeutic indications.

For example, Guidelines on transfer of seriously ill children within the hospital should be in use. They should give clear instructions regarding the escort and equipments required for taking babies to specific destinations, e.g. imaging room.

Inter-hospital transfer guidelines: These should cover (a) category of sickness and age of child to be transferred; (b) composition and competencies of the personnel in the escort team; (c) logistic support; (d) drugs, equipment - restraint of children during transfer; and (e) monitoring during transfer. Most hospitals will need to transfer children, for example, for opinions, investigations and treatment. Guidelines should reflect local circumstances and should cover transfer of both stable and unstable children. The advice of the **pediatric critical care operational delivery network** and the Specialist Pediatric Transport Service for the local population may be helpful in developing local guidelines.

The Government of National Capital Territory of Delhi[3] has come up with its legislative framework of requirements for transport ambulances, which has essential equipment for basic life support and advanced life support. It gives details of the equipment and the medications and other logistic supports required including the space and its dimension for registering ambulances in the National Capital Region.

In the private setup of healthcare delivery and transport of sick infants, the categorization of patient transport ambulances into routine transfer (Type B), basic life support (Type C) and advanced life support (Type D) is practiced. However, it remains non-uniform across urban and rural areas of the country.

PEDIATRIC TRANSPORT TEAM

Evidence supports the enhanced safety and quality with specialist transport team(s) with a reduction in the rate of critical incidents, risk-adjusted PICU mortality rate, and overall cost of care – actualizing the concept of an outreach for PICU services. The Pediatric Intensive Care Society (PICS) has set up national standards in UK requiring consultant cover for 24 hrs, pediatric specific training and certification, quality assurance of standard pediatric equipment, care of parents and referring facility education. Alternative accreditation standards (Commission on Accreditation of Medical Transport Systems; www.camts.org) are also available for ensuring safety and quality of transport environment. A brief outline about the two types of transport (intra- and interhospital) is discussed here.

Intrahospital Transport

This is usually undertaken for diagnostic evaluation and sometimes for surgical or intervention based therapy. The team, its constitution and knowledge, skill and competence matching is entirely on a case to case basis in resource-limited settings. There is insufficient evidence that a dedicated team improves outcomes significantly compared to even a nurse/nurse practitioner including the bedside care provider in settings where transfers are thought-through and are routine. There are primarily four concerns, which require written intensive care unit policies and procedures: communication, personnel, equipment, and monitoring.

Interhospital Transport

Patient outcomes are dependent on the competence of and equipment available to personnel within each referring and referral unit. When required services overwhelm available resources, a patient must be transferred to an

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another facility that has the required resources. Obviously, the benefits to the patient should exceed the risks of the transfer. A decision to transfer a patient is the responsibility of the attending physician at the referring institution.[4] In cases of neonatal interfacility transfers, the use of a specialized retrieval team has improved outcomes, in terms of enhanced survival. Significantly, more adverse events occurred when a nonspecialized team transported pediatric patients. These included airway issues, sudden cardiac and/or respiratory events requiring cardiopulmonary resuscitation, hypotension and loss of vascular access. Another study demonstrated a reduction in pediatric mortality rate from 23% to 9% when using specialized transport teams. Having dedicated transport teams especially for high-volume centers with interfacility transfers, improves availability and mobilization as well as response times. Impact of the presence of a physician in the physical transport is not defined yet. There is no scoring tool for the accurate prediction of transport morbidity. One method is to group all transfers based on occurrence of complications during transport. A successful transport team requires good leadership, with team members who demonstrate flexibility, independence, critical thinking, timely judgment and problem solving skills, together with interpersonal and communication skills and appropriate crisis resource management. Team health and safety are also of primary importance, and should be considered when determining the best performance model.[5]

The importance of Inter Professional Education (IPE) and practice is also being increasingly recognized as the most relevant model in terms of safety and quality. It breaks healthcare silos and improves team building. Appreciating discrete roles, responsibilities and intersections of care of a sick child is critical for effective team work and gaining time for critical transfers.

Legal Framework

The dynamic nature of care giving and transfer including physical transport is tested within the framework of the "Bolam test", legally. It says that "If a doctor reaches the standard given by a responsible body of medical opinion, he/she is not negligent". Therefore, it is clear that as long as the reasonable competence in resuscitation skills and inpatient safety matters is maintained, team members would be legally supported. The understanding is that there is no sudden shifts in responsibility for patient care, in the best interest of the child throughout the process. From referral to handover, the child remains the sole responsibility of the referring hospital team. Once the transport team has physically taken over the care of the child, it assumes responsibility of care. Similarly at the point of care at the receiving hospital. The legal responsibility of care of a sick child remains by the patient's bedside and travels with the patient.

APPROACH INCLUDING ACCEPT, REVIEW BASIS[6,7]

A 4-yr old child presents to a primary health center at 8:00 pm with alleged history of drinking the mosquito repellant and vomiting. Her mother informs the ED staff that she had a similar history just a month ago. Her consciousness progressively deteriorates in ED from A to P in AVPU scale The emergency trainee registrar calls the anesthetic trainee registrar who takes control of the airway and ventilation for the child. A CXR shows bilateral lung haziness and drop in SpO_2 levels on room air as well as supplemental oxygen ventilation. Being a time-critical case, the team in ED decides to activate the ACCEPT approach:

Assessment

The structured ABCD protocol has now been the safest checklist to be incorporated for assessment even for transport.

Airway: She is intubated by the Emergency Department Physician in view of the progressive neurological deterioration, with a 5.0 mm orotracheal tube taped securely at 13 cm at the lips. A CXR has been done to confirm the tip position.

Breathing: She is on a transport ventilator with $EtCO_2$ at 33 mm Hg.

Circulation: NIBP measures 92/50 mm Hg in the right upper limb in supine position with no signs of compromised perfusion. Two peripheral IV lines have been established.

Drugs/Disability/Diagnostics: Drug infusions are started. Pupils are equal in size and reacting to light when tested.

With respect to time-efficiency, the referring CHC (Community Health Center) supporting the PHC (Primary Health Center)decides to undertake the transfer to the tertiary center. Time-critical transfers, e.g. those requiring surgical procedures and other life-saving complex interventions are usually undertaken by the referring hospital. The team is decided from amongst the referring hospital staff, if one is not already designated and/or present.

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Control

Overall control may change hands like baton in a relay race. Leadership is vital to stabilization and safe transfer. Initial stabilization by the ED physician may be followed by pediatric consultant who may subsequently hand over to the anesthetics or transport consultant. Shared or overlapping of care is usual; however, a written/printed checklist at each handover significantly reduces information loss and medical errors.

Communication

Safe transfer of a critically sick child involves multiple individuals working in teams across many sites. Poor quality of communication especially with multiple native languages for the team(s) is usually the reason for the system to fail and the child to suffer. Structured checklists (for communication) may decrease adverse events related to transport. It requires uniform computer interfaces across hospitals (e.g. GPACS for X-ray) so that the team can carry minimum amount of hard data related to the child's condition.

In the above example, the senior anesthetic consultant agrees to transfer the child by road ambulance. The shared care given by the ED physician and the pediatric consultant is formally handed over. The CXR and other images are sent across digitally to the center of care. The patient notes are updated and category (graded as per time-criticality) is escalated to "emergency transfer". Senior consultant second-on call agrees to provide anesthetic cover at the referring hospital.

Evaluation and Preparation

Appropriateness of transfer correlates to the condition of the child and the support at the referring hospital. Senior team members take a call on the time and nature of the transport for the child. Road ambulances are usually preferred for all time-critical transfers. When distances are more than 150 km or time to travel lesser distances may be inordinately long due to absence of a "green-channel" for fast transport, alternatives to road ambulances (air, water, etc.) may be options.

Packaging and Pre-departure Checks

Appropriate preparation and labeling of infusions, size and comfort of pediatric harnesses, transport trolleys and emergency medications, monitoring devices and transport ventilators are some of the specific time-consuming preparations, which determine the smoothness, and safety of transport of a sick child. The usual time consumed for resuscitating and stabilizing the child before transfer must be balanced against the delay in transfer to a better equipped PICU. However, it is clear that hasty transfers often escalate the cost to the patient and the system in terms of the adverse effects of a "quick retrieval".

Transport

A smooth transfer is critical besides time to maintain the physiology of the sick child and reducing the deterioration of resuscitation benefits. Bumpy maneuvering for as quick as possible transfers is to be avoided. Dramatizing the whole process (sirens, lights, screeching turns and repeated accelerations, etc.) only adds "stress (oofff)" to the entire team including the sick(er) infants and premature babies who respond adversely. Ideally, the circumstances of transport must provide a step-up in the level of care than provided by the referring hospital. The parent(s) may or may not accompany the child in the ambulance or by their own means. However, they must be briefed about the entire transfer process before the actual transfer. The receiving center also must be briefed about the clinical status just prior to transfer and an expected time of arrival. The communication may be brief and continued while "en-route" also depending on the condition just prior to transfer. It may be difficult in air ambulances especially a rotor-craft. Contrary to expectations, air retrieval is not superior to road ambulances. Based on at least two decades of experience, the American Academy of Pediatrics and other authorities on the subject have given specific recommendations about the transport (team constitution and functioning, optimizing safe and smooth transport) in transfer of a sick child. Some of them are discussed in the next section.

KEY RECOMMENDATION AND FUTURE[7-10]

An extensive review of 5 years of literature on pediatric critical transport had the following recommendations:

- There is an increased risk for complications with handover and transfers of a sick child.
- Standardized checklists, handover tools, mnemonics for communication(s) must be used.
- The tools (e.g. the ISBAR - Identify Situation Background Assessment Recommendation checklist) for handover do not increase the time for handover.[8,9]
- The tools for handover improve patient outcomes, provider satisfaction, team work and trust.

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- The tools for handover reduce technical errors, complications, handoff failures.
- The tools of handover improve workflow.
- Best outcomes are achieved by specialized models who share mental models and trust.
- Specialized teams are associated with decreased mortality.
- Good quality transports DO NOT escalate costs.
- There should be minimum interruptions and distractions during handover.
- An interdisciplinary approach for nursing handover reduces stress for the workforce.
- Quality improvement measurement must be user-friendly.
- Administrators should have the responsibility of time, funding, research into quality improvement metrics.

KEY MESSAGES

- Risk for patient complications (airway compromise, cardiac arrest, loss of IV line, hypothermia, hypoxemia, intracranial hemorrhage) is more with pediatric transport and handovers.
- Standardization of communication using tools and checklists including specialized teams and teamwork is the CRUX for improved outcomes. This is measured in terms of patient outcomes, provider satisfaction and cost.
- Frequent monitoring while transfer and specialized training for specific situations including debriefing for providers improves patient outcomes.

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2020

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