Outcome of children transported for paediatric intensive care to a tertiary care setting in Sri Lanka

***Deshan Adhihetty[1], Nalin C Kitulwatte[2], K L W Hathagoda[3], C T Weeraratne[3], Srilal de Silva[4], E P D S Ediriweera[5]**

Sri Lanka Journal of Child Health, 2016; **45**(2): 103-106

Abstract

Introduction: Patient transport remains a necessary facet of today's health care environment and transport conditions bear a major impact on the outcome. There is a recent move in Sri Lanka to establish retrieval teams. Thus, identifying problems faced by the present system will be of utmost importance in development of transport teams.

Objective: To evaluate the present system of transportation of sick children to the Medical Intensive Care Unit (MICU), Lady Ridgeway Hospital for Children (LRH), Colombo.

Method: A prospective, descriptive, observational study of transferred patients was conducted at the MICU LRH, Colombo. All children admitted to MICU from 1st March 2014 to 1st June 2014 were included in the study. Data was collected using a self-administered questionnaire. The Wilcoxon significant rank test and the Chi squared test were utilized in statistical analysis.

Results: There were 200 patients comprising 105 (52.5%) out-of-hospital transfers and 95 (47.5%) in-hospital transfers. Of the admissions, 72% were live discharges while 28% expired; 42.5% of transfers were from the Colombo district. Pneumonia was the commonest diagnosis, occurring in 38.5%. The pre-transfer Paediatric Risk Mortality (PRISM) scores had a median of 12, mean of 13.7±7.8 and Q1-8 to Q3-18. The 12 hour PRISM scores, after excluding patients with PRISM scores of less than 5, showed a median of 14, mean of 18.5±11.7 and a 'p' value 0.0002. There was no outcome difference between in-hospital vs out-of-hospital transfers based on the Chi squared test. A written summary was available only in 61 (30.5%) patients.

Conclusion: A rise in the PRISM score after transfer indicates that the patients had deteriorated during the transfer and transfer conditions need to be improved.

DOI: http://dx.doi.org/10.4038/sljch.v45i2.7998

(Key words: Paediatric transport, PRISM score)

Introduction

Patient transport remains a necessary facet of today's healthcare environment. However, adverse events are common during transport and increased transport time is associated with adverse outcome[1]. There are standard practices before, during and after transport to minimize these adverse effects. In this study we assessed the adherence to standard practices during transportation of sick children[2]. Scoring systems in paediatric intensive care units are used to measure illness severity, assess therapeutic requirements and determine prognosis. The PRISM score 111 is an improved version of the PRISM score developed at the Children's National Medical Centre in Washington DC. It has been validated in several studies done worldwide. Using 17 variables the PRISM score 111 is used to assess the disease severity prior to transfer and after transfer[3,4]. If transfer conditions are ideal the scores should be equal or should have improved at the receiving end. Thus it would reflect the transfer conditions. The outcomes of these children were also evaluated.

Objectives

General Objective

Evaluate the present system of transport of sick children to MICU LRH, Colombo.

[1]*Senior Registrar in Paediatric Intensive Care, Lady Ridgeway Hospital for Children, Colombo,* [2]*Consultant Paediatric Intensivist,* [3]*Medical Officer,* [4]*Consultant Paediatrician, Medical Intensive Care Unit, Lady Ridgeway Hospital for Children, Colombo,* [5]*Lecturer, Faculty of Medicine, University of Kelaniya*

**Correspondence:* deshan80520@gmail.com

(Received on 28 July 2015: Accepted after revision on 18 September 2015)

The authors declare that there are no conflicts of interest

Personal funding was used for this project.

Specific Objectives

1. Assess whether basic principles of patient transportation were adhered to.
2. Assess whether the patient was stabilized prior to transfer.
3. Assess the competence of health professionals accompanying the transfer and whether it plays a role in the outcome.
4. Assess the problems encountered by the transfer team.
5. Assess the commonest reason for transfer to MICU.
6. Assess the immediate outcome on morbidity of transferred sick children using the 12 hour PRISM score.
7. Assess whether there is an outcome difference in in-hospital vs out-of-hospital transfers

Method

A prospective, descriptive, observational study of transferred patients was conducted at the MICU LRH, Colombo. All children admitted to MICU from 1st March 2014 to 1st June 2014 were included in the study. Children above 12 years and those who were transferred for routine procedures (plasmapheresis, central venous line insertion) were excluded from the study. A data collection sheet was used to obtain information regarding the condition on arrival and at 12 hours after admission. Details prior to transfer were obtained from the accompanying medical officer using the self-administered questionnaire. The receiving medical officer completed the data collection sheet regarding the condition on arrival. Outcome of the child, using the PRISM score and other relevant information was recorded by the principal investigator. The primary outcome measurement was clinical deterioration during transport assessed by the PRISM score measured before transport and within 12 hours after transfer. Secondary outcome (live discharge or death) at the end of ICU care was assessed. The Wilcoxon significant rank test and the Chi squared test were utilized in data analysis.

Results

A total of 200 children were included in the study. One hundred and five (52.5%) transfers which the MICU received were from outside of the hospital while 95 (47.5%) transfers were from within the hospital. There were 111 boys and 99 girls. The average age was 210 days (Q1-190 and Q 3 -1095 days). The median duration of MICU stay was 4 days. Live discharges were 134 (72%) while 56 (28%) patients expired. Eighty five (42.5%) were from the Colombo district. Transfers from the districts of Gampaha, Kalutara, Kandy and Puttalam were 26 (13%), 16 (8%), 14 (7%) and 13 (6.5%) respectively. Pneumonia was the commonest principal diagnosis occurring in 77 (38.5%).The reasons for MICU admission are shown in Table 1.

Table 1: ***Reasons for MICU admissions (n=200)***

Cause	No. of cases (%)
Pneumonia	77 (38.5)
Septic shock/septicaemia/sepsis	23 (11.5)
Dengue haemorrhagic fever	21 (10.5)
Meningoencephalitis	16 (08.0)
Others	15 (07.5)
Heart failure	09 (04.5)
Status asthmaticus	09 (04.5)
Neonatal surgical conditions	05 (02.5)
Anaphylaxis	02 (01.0)
Snake bite	02 (01.0)

Out of the 200 transfers 162 (81%) patients were accompanied by middle grade medical officers and 38 (19%) by house officers. In 163 (81.5%) transfers, the accompanying medical officer was able to intubate, while 37 (18.5 %) did not have the ability. One hundred and sixty five (82.5%) accompanying medical officers knew the correct dose of adrenaline in cardiac arrest while 35 (17.5%) did not know it. The route of administration of adrenaline in a cardiac arrest was correctly known by 166 (83%); however 23 (11.5%) gave an incorrect response and 11 (5.5%) did not know. There was no outcome difference whether a middle grade medical officer accompanied the transfer or a house officer accompanied the transfer (p=0.6547).

One hundred and seventy two (86%) transfers were complicated with severe technical failure, clinical complications or a problem related to the staff of the transfer team. Haemodynamic instability of the patient was the commonest clinical problem whereas monitor (pulse oximeter or multipara monitor) battery failure was the commonest equipment related issue. Hypothermia was a common finding in neonates and infants. Accidental extubation, tube dislocation from the connector or tube dislodging to the right main bronchus were observed in 4 (3.8%) cases. Problems encountered during transfer are shown in Table 2.

Table 2: *Problems during Transfer*

Problem	No. of cases (% of total ambulance transfers)
Haemodynamic instability	61 (58.1)
Monitor battery failure	36 (34.3)
Obstructed airway	31 (29.5)
Hypothermia	22 (21.0)
Motion sickness of medical officer or nursing officer	16 (15.3)
Accidental extubation	04 (03.8)
Cardiac arrest	02 (01.9)
Oxygen over	02 (01.9)
Others	02 (01.9)

Only 19 (18.1%) ambulances were equipped with a suctioning device. Eighty six (81.9%) did not have the facility; 97.1% were equipped with a pulse oximeter or a multi-para monitor. None were equipped with temperature monitoring devices. A functioning light source within the ambulance cabin was available only in 77 (71.3%); 75.2% were equipped with an additional oxygen cylinder. All transfers to the MICU had been discussed with the MICU team except for one. The consent for transfer had been obtained from the respective parents of all the admissions. Functioning vascular access was available only in 131 (65.3%). Out of the transfers 53 (26.5%) needed intubation on admission in contrast to 147 (73.5 %) which were either intubated or did not need intubation on admission. The size of the ET tube was correct in 77 (95.1%) patients. In 56 (69.1%) cases the specified lip level was correct. A post intubation chest X-ray was available in only 16 (19.8%) admissions while 24 (80%) did not have a post intubation chest X-ray. The ET tube was dislodged on admission in 16 (19.8%) patients. None of the transfer teams had calculated the oxygen requirement during the transfer. A transport ventilator was available only in 2 situations while in the vast majority hand ventilation through the bag valve mask had been done. A maternal blood sample was sent accompanying the patient in 52 (98.1%) neonates.

Blood pressure was not documented in 65 (34.5%) transfers and a capillary blood sugar was not done in 53 (26.5%) cases prior to transfer; 19.5% patients did not have the Glasgow Coma Scale (GCS) documented while only 17% had been catheterized prior to transfer. A clear written summary with essential information was available only in 61 (30.5%) patients. The association between the pre transfer PRISM scores and the post transfer PRISM scores were analyzed based on the Wilcoxon significant rank test. The pre-transfer PRISM scores had a median of 12, mean of 13.7±7.8 and Q1-8 to Q3-18, while in the 12 hour PRISM score the median was 10, the mean 15.12±12.1 and Q1-7 to Q3-22. This meant that the PRISM score had improved after the transfer. Therefore a re-analysis was done after excluding those patients with pre transfer PRISM scores of less than 5. This analysis showed a median of 14, mean of 18.5±11.7 and a p=0.0002. This means that the patient's clinical conditions had deteriorated during transfer. Thus the transfer conditions of patients should be improved. There was also no outcome difference between in-hospital vs out-of-hospital transfers based on the Chi squared test. There were no significant differences between the pre-transfer PRISM scores of in-hospital vs. out-of-hospital transfers (p=0.5153) nor were there significant differences between the outcome of in-hospital vs out-of-hospital transfers.

An analysis was carried out to assess the standard practices of gaining intravenous access, blood pressure documentation, patient catheterization, capillary blood sugar check, endotracheal tube size and depth specification, post intubation chest X-ray and documentation of a clear patient summary in in-hospital vs out-of-hospital transfers. There were no significant differences except in the case of documentation (p= 0.0003). A large proportion (79%) of in-hospital transfers did not have a written summary and 60% of out-of-hospitals transfers did not have a written summary.

Discussion

The MICU, LRH caters to patients from the entire island but mostly covers the Western Province. The commonest cause of MICU admission was childhood pneumonia which emphasizes the need for thorough medical management of pneumonia as well as immunization of children in order to reduce the incidence and prevalence of childhood pneumonia. Our study showed that 16% of medical officers who accompany critically ill patients lack the knowledge and skills of endotracheal intubation and management of cardiac arrest. This is a significant problem. Thus it is important to arrange in-service training programmes in order to improve these skills and test them regularly to prevent them being lost. Haemodynamic instability was the commonest (58.9%) problem during transfer. In 2011, Stroud et al showed that enhanced haemodynamic monitoring and early intervention during transfer reduced duration of hospital stay and lessened multiple organ dysfunction syndrome[2]. Therefore, it is important to stabilize the patients prior to transfer, get adequate

intravenous access and monitor haemodynamic parameters during transfer.

Most of the failures of the pulse oximeters and multi para monitors were due to inadequate power supply. They should be adequately charged or be able to be connected to the ambulance power supply. Lack of suctioning devices which can result in inability to manage airway obstruction effectively was the third commonest problem during transfer; thus measures should be taken to include such devices in the ambulance cabin. In our study there were 04 (3.8%) accidental extubations, 16 (19.8%) had tracheal tube dislodgements and 24 (80%) did not have post intubation x-rays. This emphasizes the need for high quality work with focus on technical detail, especially in the pre-transport stabilization period. Proper fixation of tracheal tube, x-ray confirmation of tube position, sedation of restless patients are important to avoid tube dislocation. Doctors and nurses who have a history of motion sickness should take antiemetic prophylaxis as motion sickness in them could impair correct decision making and proper functioning.

Our study showed that 26% of all transfers needed intubation on admission. This means that either the initial assessment was wrong or the patient had deteriorated during transfer. This emphasizes the need for simulation based in-service training programmes on patient stabilization and transport. None of the transfer crews had estimated oxygen demand during transfer. Estimation of oxygen demand will prevent problems like oxygen run out during transfer as well as unnecessarily carrying an additional oxygen cylinder. The immediate outcome based on the pre-transfer vs 12 hour PRISM score showed an interesting finding. Initial analysis showed an improvement of PRISM score after transfer. However once the data with a PRISM score of <5 was removed and re-analyzed worsening of PRISM score was noted. This showed that some transfers to the MICU were unnecessary. This emphasizes the need of proper selection criteria based on disease severity before transfer. In our study 79% of in-hospital transfers and 60% out-of-hospital transfers did not have a written summary. In 2003 a study by L.L Sudewa et al showed that there were significant deficiencies in information provided in the transfer forms of the patients transferred to LRH[5]. It is imperative to provide accurate data about the transferred patients to optimize the care at the receiving hospital. Limitations of our study include the sample size, single centre design, lack of inclusion of paediatric trauma victims and paediatric cardiac (post-surgical) patients. National guidelines on stabilization and transport of the critically ill child should be developed and all medical professionals should have an in-service training on emergency management at regular intervals in their career

Conclusions

1. Medical officer's competence of managing cardiac arrest and intubation is substantially low.
2. A rise of the median PRISM score indicates that the patients had deteriorated during the transfer and that the transfer conditions need to be improved.
3. 172 (86%) had problems during transfer indicating that pre-transfer stabilization was inadequate.
4. Stabilizing of the critically ill child with attention to the airway, breathing and circulation prior to transfer was significantly low.

References

1. Odetola FO, Clark SJ, Gurney JG. Effects of inter hospital transfer on resource utilization and outcome at a tertiary paediatric intensive care unit. *Journal of Critical Care* 2009; **24**(3):379-86.
http://dx.doi.org/10.1016/j.jcrc.2008.11.007
PMid: 19327327

2. Stroud MH, Pradhan P, Fiser R, Anana K. Enhanced monitoring improves pediatric transport outcome: a randomized controlled *Pediatrics* 2011; **1**: 42-8.

3. Sriram,Svirbely.1999 PRISM 111 Online calculator-
http://www.medal.org/visitor/www/Files/Sheets/ch30/PRISM%20III%20score/PRISM%20III%20score.aspx

4. Ganapathy B, Tom A, David H. Prospective evaluation of the paediatric risk of mortality score. *Archives of Disease in Childhood* 1992; **67**:196-200.
http://dx.doi.org/10.1136/adc.67.2.196

5. Sudewa LL, Nelundeniya NPUBP, Perera BJC, Weerasinghe I. A survey of transfer forms at the Lady Ridgeway Hospital for Children. *Sri Lanka Journal of Child Health*, 2003; **32**: 44-7.
http://dx.doi.org/10.1542/peds.2010-1336
PMid: 21173006