Transportation of Critically Ill Patient to Pediatric Intensive Care Unit, Siriraj Hospital

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This retrospective study was undertaken to evaluate and identify some difficulties encountered in the process of interhospital transport of pediatric critically ill patients from remote hospitals to the Pediatric Intensive care unit (PICU) of the Department of Pediatrics, Faculty of Medicine Siriraj Hospital. The study was conducted between 1st June, 2001 and 30thJune, 2003. Total number of patients transferred to PICU were 36. Most patients suffered from respiratory diseases (14 cases, 38.9%) and cardiovascular diseases (8 cases, 22.2%) prior to transfer. Five patients (13.9%) had cardiac arrest and required CPR prior to the transfers. Twelve cases (30%) were transferred at the parents' request or and due to socioeconomic problems. All patients were transported by ambulance. The longest transfer duration was from a hospital in Chiangmai province (11 hours by road transfer). The majority of accompanying medical personnel were nurses (55.5%) with no experience in intensive care pediatrics. In no cases were any doctors or trained paramedics presented with the transport team. Prior to transportation, the PICU physician was phone-contacted by the referring physician. The patients' status prior to being transferred to PICU were as follows; 23 cases (63.9%) were intubated, 4 (11.1%) cases had intravenous cut down and 10 (27.8%) were infused inotropic drug. None of the patients had any record on important patient's data (e.g. vital signs, oxygen saturation) or adverse events during transport such as equipment problems and clinical deteriorations. Twenty eight patients (77.8%) stayed in PICU average length of less than 7 days. Eleven patients died (mortality rate of 30.5%). In conclusion, the major obstacle in properly transporting patients to the PICU was the lack of experience/knowledge of transport team to perform safe transfer in pediatrics during transport. The second problem was lack of documentation or record of vital signs and adverse events observed during the transfer. Organization of effective team working in pediatric transfer to PICU is inevitably needed to improve the outcome of these critically ill patients.

Keywords: *Emergency transport, Intensive care unit, Obstacles*

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Pediatric patients transported to tertiary centers are usually in respiratory failure, shock or multiple organ dysfunctions. The Pediatric Intensive Care Unit (PICU) in Thailand, both in government and private hospitals, have limited number of beds and are usually fully occupied nearly all the time[1]. Pediatric diseases and injuries do not usually occur near a tertiary care. This has led to a long distance transfer of such patients to seek definitive or higher level of care[2]. Critical issues in transporting patients in critical care was how to maintain and stabilize patients on the way as a mobile ICU[3]. The quality of transports depends on the quality of transport vehicles, equipments and the skills of the transport team to monitor, assessing patients and to give appropriate measures of resuscitation whenever needed[4,5]. The American Academy of Pediatrics recommends that a pediatric transport system should be capable of rapidly delivering advanced and skilled pediatric critical care at the patients bedside, at the referring hospital, and be able to maintain

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that level of care during transport to the receiving hospital[6]. During the transfer, there are several risks of adverse events which could occur such as disconnection of monitor, empty batteries or oxygen tank, leak of venous access, accidental extubation, etc[7]. Furthermore, the condition of patients could be deteriorated such as developing hypotension, hypoxemia, cardiac arrhythmia, hypothermia, etc. Some studies demonstrated that incidence of these physiological changes could be as high as 68% even in intra-hospital transport[8-9]. The standard of pediatric inter-hospital transport should be set up and be evaluated for the better quality of care. Such establishment of standard requires a better organization, experiences, budgets, and special training programs for the transport team[10].

Material and Method

Medical records of the inter-hospital transported patients to the PICU of the Department of Pediatrics, Siriraj Hospital between June 1st, 2001 and June 30th, 2003 were retrospectively reviewed. Data collected included the patient's age, locations of the referring hospital, reasons for transport, duration of the transport, diagnosis of the patient, notifications made prior to transport, adequacy of pre-transport information, mode of transportation, and the condition of the patient at the time of arrival at the receiving hospital.

Results

I. Demographic data (Table 1)

There were a total number of 36 patients transported to Siriraj PICU, comprising 44.5% male and 55.5% female. Their age range was from 4 months to 13 years old. With majority being between 1-6 years of age.

II. The location of referring hospitals (Table 2)

Patients were referred from 29 hospitals to our PICU. Most of these hospitals located in Bangkok and

Table 1. Patients' demographic data

Age (years)	sex		Total cases (%)
	Male cases (%)	Female cases (%)	
< 1	2 (5.5)	2 (5.5)	4 (11.1)
1-6	10(27.7)	10(27.7)	20 (55.5)
7-12	3 (8.3)	8 (22.2)	11 (30.5)
> 12	1 (2.8)	0	1 (2.8)

Table 2. The location of referring hospitals

Location of the referring hospital	Private cases (%)	Government cases (%)	Total cases (%)
Bangkok and territory	17 (58.6)	6 (20.7)	23 (79.3)
Other province	1 (3.5)	5 (17.2)	6 (20.7)
Total	18 (62.1)	11 (37.9)	29 (100)

Table 3. Reasons for referring

Reasons for referring	cases (%)
1. No specialist	8 (22.2)
2. For further investigation or proper management	8 (22.2)
3. Request from parents or caregivers	7 (19.5)
4. Socioeconomic problems	5 (13.9)
5. For surgery	3 (8.3)
6. No intensive care facilities or no bed available in the ICU	3 (8.3)
7. Need of special equipments	2 (5.6)
Total	36 (100)

nearby provinces with only one transport from Chiangmai province, 700 km from Bangkok.

III. Reasons of referrals (Table 3)

Common reasons for referring were the requirement of specialists especially pediatric cardiologist and for further investigations or proper management (Table 3). However, several were transported to our PICU at the request of the parents due to socioeconomic problems.

Table 4. Documents with the transportation

Documents with transportation	cases (%)
1. Referring letter	36 (100)
2. Copy of previous treatment before transport	10 (27.8)
3. Copy of important investigation	9 (25)
4. The radiographic results (x-ray, CT scan, MRI .etc)	No data

Table 5. Detail of patients' diagnosis (n=36)

Disease / Diagnosis	cases
a. Respiratory diseases	14
- Pneumonia with respiratory failure	4
- Pneumonia with effusion	1
- Foreign body aspiration	4
- Near drowning	3
- Acute Respiratory Distress Syndrome	1
- Tracheal stenosis	1
b. Cardiovascular diseases	8
- Myocarditis	2
- Congenital heart disease	2
- Rheumatic heart disease / severe carditis	1
- Pericardial effusion	1
- Kawasaki disease	1
- Supraventricular tachycardia	1
c. Neurological diseases	5
- Encephalitis	4
- Ruptured cerebral arteriovenous malformation (AVM)	1
d. Infectious disease	3
- Dengue shock syndrome	1
- Dengue hemorrhagic fever (grade 3) with gastrointestinal bleeding	1
- Tetanus	1
e. Endocrinological diseases	3
- DM type I with diabetic ketoacidosis (DKA)	3
f. Hematological diseases	2
- Acute leukemia (T cell)	1
- Hemophilia A with subdural hematoma	1
g. Other	1
- Anaphylaxis	1
Total	36

IV. Mode of transportation and the transport team

All patients were transported by road in ambulances. There was no MDs present in any of the transport. Most patients were transported by nurses and paramedics. There was no data about the experience of transport team and the ability to perform pediatric resuscitation or endotracheal intubation in case of patients' deterioration during transport.

V. Preparation before transport. (Table 4)

All transportations were preceeded by phone-contacts from the referring physicians to PICU. One patient had been sent from the referring hospital 30 minutes prior to the call being made. Twenty three patients (63.9%) had an endotracheal intubation inserted prior to transportation. One patient came with a tracheostomy. All patients had intravenous access including peripheral lines (89%) and central lines (11%). Ten patients (27.8%) received infusion of inotropic drug during transfer.

VI. Patient care during transport

In no cases, there was any data containing patients status and medical procedures performed during the transport. One patient had endotracheal tube obstruction from secretion and 5 patients had hypotension at the time of arrival. Most of patients (25 cases, 69.4%) arrived PICU after the working hours (after 8 PM).

VII. Patients' diagnosis and outcome

Diagnoses of patients were tabulated in Table 5. Five patients (13.9%) had cardiac arrest and needed cardiopulmonary resuscitation before transport and four died after admitted to the PICU. Most patients (28 cases, 77.7%) had the average length of stays less than 7 days.

Eleven patients died (30.5%). Twenty-five patients (69.4%) were successfully treated and were discharged from PICU with one patient sent back to the referral hospital after surgery.

Discussion

From this study, problems and obstacles to proper transporting process have been identified and categorized into 4 groups, i.e., (1) lack of proper mode of transport, (2) unnecessary referrals and problems related to the transport team, (3) lack of pre-transported stabilization, and (4) lack of communication and lack of record and documentation during the transport.

Lack of proper mode of transport

One intubated patient from Chiangmai province, 700 km from Bangkok, was sent by road ambulance, which took longer than 11 hours. During the transport, they stoped to refill the oxygen source once, on the way. The patient arrived with obstructed endotracheal tube and required emergency re-intubation on arrival. In several countries, air ambulance such as helicopters or fixed-wing air crafts to transport critically ill patients from remote area are available for safer and shorter transport.[11] Although, we have private air ambulance for transportation in Thailand, the cost of this mode of transport is too expensive for most patients.

Unnecessary referrals

Most of referrals were appropriate by the medical reasons, i.e., no specialists available or for further investigation and proper management. However, one-third of the transport were due only to family's request or from socioeconomic problems. Once the health care system in Thailand is improved, these patients could have stayed in improved ICU at secondary level hospitals, in outlying area and thus avoiding transportations to Bangkok. By all means, families should be given enough information about the necessity of transfer and on the risks vs. benefits of transporting to the higher level of care.

Lack of communication from the referring hospital and lack of patient assessment during transportation

Despite the fact that phone contacts were made in the majority of cases, one patient had been sent to our PICU 30 minutes prior to making such call. There was no available communication system between the transport team on ambulance to the PICU. Such communication could have provided help in the stabilization of patients' condition during the transport, on the way to PICU.

Lack of training of transport team

The transport team should be trained for the knowledge of how to properly transport and stabilize patients during the transport. They should be able to perform emergency procedures such as endotracheal intubation, defibrillation, and CPR. It is poignant that in no case that were received by of our PICU, was accompanied by appropriate documentation indicating patients status during transport nor any action taken to stabilize patients condition on the way to the

PICU. In 1990, a survey by American Academy of Pediatrics found that only 28% of pediatric transportations were performed by the specialized pediatric transport team[7]. The pediatric emergency transport program was essential and could reduce the cost of treatment in the hospital[12].

Generally, after the call, the PICU should be able to suggest treatment to stabilize patients before patients left the referring hospitals. However, we found that, all decisions, such as endotracheal intubation or inotrope infusion were made only by the referral team. Sometimes results of necessary investigations and the X-ray films were not brought along with the patients. As stated earlier, in all transports, no records or documents of what they had done or what they found during transport was available. Such lack of information sometimes affected the further treatment of patients and made a study for quality improvement difficult. In several studies, Pediatric Risk of Mortality Score was used to evaluate the severity of patients prior to ICU admission.[13] Kanter, et al. demonstrated that adverse events during inter-hospital transport were markedly reduced from 20% to 2 % by the specially trained team[14-15]. Furthermore, the transport teams could reduce the mortality and could improve the ICU outcome[16-19]. This problem indicates that standard of care in pediatric transportation in Thailand should be set up as a national policy in future.

Conclusion

This study was performed to evaluate the transportation of critically ill children to PICU at Siriraj Hospital. The quality of transportation could be able to systematically improved by better communication, better documentation and more experience of the transport teams. The establishment of special training course for transport, the set up of a guideline and standard of pediatric transportation should be done to improve patients outcome[20].

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การส่งต่อตัวผู้ป่วยเด็กที่มีอาการป่วยในขั้นวิกฤติจากโรงพยาบาลอื่น ๆ มาที่หออภิบาลเด็กของภาควิชากุมารเวชศาสตร์ คณะแพทยศาสตร์ศิริราชพยาบาล

กวีวรรณ ลิ้มประยูร, สุประพัฒน์ สนใจพาณิชย์, จักรพันธ์ สุศิวะ

การศึกษานี้เป็นการศึกษาย้อนหลัง มีวัตถุประสงค์เพื่อแสดงให้เห็นถึงปัญหาและอุปสรรคบางประการของการส่งต่อผู้ป่วยเด็กระยะวิกฤติที่มารับการรักษาในหออภิบาลเด็ก ภาควิชากุมารเวชศาสตร์ คณะแพทยศาสตร์ศิริราชพยาบาล ในช่วงระหว่างวันที่ 1 มิถุนายน พ.ศ. 2544 - 30 มิถุนายน พ.ศ. 2546 ผลการศึกษาพบว่า มีจำนวนผู้ป่วยทั้งหมด 36 คน หนึ่งในสามของผู้ป่วยทั้งหมดได้รับการส่งต่อเนื่องจากความต้องการของญาติ และปัญหาทางเศรษฐฐานะมากกว่าที่จะเป็นเหตุผลทางการแพทย์ สาเหตุหลักหรือกลุ่มโรคของผู้ป่วยที่ส่งต่อมารับการรักษาคือโรคทางระบบหายใจจำนวน 14 รายคิดเป็นร้อยละ 38.9 ระบบหัวใจและหลอดเลือดจำนวน 8 รายคิดเป็น ร้อยละ 22.2 ตามลำดับ โดยมีผู้ป่วยจำนวน 5 ราย (ร้อยละ 13.9) มีภาวะหัวใจหยุดเต้นและได้รับการช่วยฟื้นคืนชีพมาก่อนทำการย้ายผู้ป่วยทุกรายถูกส่งตัวโดยใช้รถฉุกเฉินของแต่ละโรงพยาบาล ผู้ป่วย 1 รายส่งต่อมาจากโรงพยาบาลในจังหวัดเชียงใหม่ซึ่งมีระยะทางไกลที่สุด ใช้เวลาประมาณ 11 ชั่วโมงในการเคลื่อนย้าย บุคลากรทางการแพทย์ที่ร่วมเดินทางมาส่งต่อผู้ป่วยร้อยละ 55.5 เป็นพยาบาล ไม่มีบันทึกว่ามีแพทย์ร่วมเดินทางมาด้วย การส่งตัวผู้ป่วยทุกรายจะมีการติดต่อประสานงานระหว่างโรงพยาบาลผู้ส่งต่อกับทางหออภิบาลเด็กล่วงหน้าก่อนเดินทาง การเตรียมการโดยทีมผู้รักษาก่อนการเดินทางพบว่าผู้ป่วย ร้อยละ 63.9 (23 ราย) ได้รับการใส่ท่อช่วยหายใจมาก่อน ผู้ป่วยร้อยละ 11.1 (4 ราย) ได้รับการแทงเส้นเลือดดำขนาดใหญ่เพื่อให้สารน้ำ และผู้ป่วยร้อยละ 27.8 (10ราย) ได้รับการใช้ยากระตุ้นความดันโลหิตและการบีบตัวของหัวใจก่อนและระหว่างทำการย้าย จากการศึกษาครั้งนี้ไม่พบหลักฐานการจดบันทึกข้อมูลที่สำคัญ เช่น สัญญาณชีพ รวมทั้งปัญหาหรือการเปลี่ยนแปลงทางสรีรวิทยา ที่อาจเกิดขึ้นระหว่างการเดินทางเลย ผู้ป่วยส่วนใหญ่หรือร้อยละ 77.8 (28 ราย) ใช้เวลาในการรักษาตัวอยู่ในหออภิบาลไม่เกิน 1 สัปดาห์ โดยผลการรักษาในระยะสั้นพบว่ามีผู้ป่วยเสียชีวิต ร้อยละ 30.5 (11 ราย) และมีภาวะแทรกซ้อนเกิดขึ้นระหว่างการรักษา ร้อยละ 58.3 (21 ราย) โดยสรุปปัญหาที่ควรได้รับการแก้ไขปรับปรุงเพื่อให้ระบบการส่งต่อผู้ป่วยเด็กระยะวิกฤติเกิดประโยชน์สูงสุดแก่ตัวผู้ป่วย คือการบันทึกข้อมูลที่สำคัญของผู้ป่วยขณะเดินทาง ไม่ว่าจะเป็นการเปลี่ยนแปลงทางสรีรวิทยา หรือแม้แต่อันตรายหรือภาวะแทรกซ้อนจากอุปกรณ์หรือเครื่องมือทางการแพทย์ ปัญหาบุคลากรที่ร่วมเดินทางมาส่งตัวผู้ป่วยนั้นคงจะต้องมีการวางระบบเครือข่ายที่ดีในการส่งต่อผู้ป่วย หรือมีการฝึกอบรมให้ความรู้แก่แพทย์และเจ้าหน้าที่ผู้มีส่วนเกี่ยวข้องกับการส่งต่อผู้ป่วยกลุ่มนี้เพื่อจะได้มีความมั่นใจ และประสบการณ์ที่ดีในการส่งต่อผู้ป่วยเด็กระยะวิกฤติในอนาคตต่อไป