

# Assessment of Intrahospital Transportation of Pediatric Emergency Patient for MRI at Vietnam National Children's Hospital

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**Abstract:** ***Background:** Intrahospital transportation of emergency pediatric patients for MRI scans takes place frequently during treatment and complications may occur during transportation. **Objective:** To assess about the transportation of emergency patients undergoing MRI at the National Children's Hospital. **Methods:** A cross-sectional descriptive study at the Transportation Department of the Emergency Center. **Results:** Collected on 101 pediatric patients, mainly under 12 months of age (69.3%), boys (54.5%) and brain scans (49.5%); contacting before transport (100%) and making a plan (100%). Prepare equipment: do not check the amount of oxygen (16.8%), the batteries of the machines are not fully charged (19.8%), have not checked other equipment and supplies (12.9%), have not inspecting and handing over drugs (5.9%). More than 60% of patients have to wait for their turn compared to the original appointment, the number of patients having to use sedation during the MRI scan (84.2%), sedation  $\geq 2$  times (16.9%). After the patient is transported to the department: hand over the patient (99%), the drug (95%), and medical records (88.1%) directly to the medical staff of the department. Transport time is mainly from 60 - 90 minutes (49.5%). Incident occurred: the patient's condition worsened (22.8%), oxygen ran out (11.9%), vomiting (11.9%), monitor battery ran out (10.9%), hypoglycemia blood (5%). **Conclusion:** Emergency transportation for MRI scans is mostly for children under 12 months of age, mainly for cranial scan. Focus on strengthening the preparation of equipments and patients before transporting and building a checklist for safe transportation. Transport-related complications were mainly due to the patient's equipment and clinical problem*

**Keywords:** Intrahospital transportation, incident, MRI

## 1. Background

Emergency transportation of intrahospital MRI patients is the transportation of critically ill patients in a hospital from departments to the MRI room to perform MRI techniques and then return the patient to the original ward. There are many factors affecting during emergency transportation: patient's condition, patient care procedures; medical equipment. . . Studies show an error rate of 6 - 70% during emergency transport, of which 1/3 is related to equipment [1]. Most of the predisposing factors are preventable with adequate adherence to safe intrahospital emergency transport [2]

The Vietnam National Children's Hospital is a leading pediatric hospital with 2,200 beds; the Emergency Center has to receive 80 - 100 emergency cases every day. The emergency process requires prompt diagnosis and intervention, so patients are often transported for testing, imaging, surgery, resuscitation, and appropriate specialties. Such transportation processes must ensure safety and throughout the treatment process for the patient. Pediatric patients often progress rapidly, especially neonates and under 1 year of age, with a high risk of death [3]

In Vietnam, there are not many studies on transportation, especially emergency transportation of intrahospital MRI childrens. Therefore, we conducted a study to find out to assess of intrahospital emergency transportation for MRI at Vietnam National children hospital

## 2. Methods

### 2.1 Research object

#### Criteria for selecting patients

- Severe pediatric patients who were indicated MRI were transferred by intrahospital emergency transport team (IETT) for MRI from September to October 2020 at the National Children's Hospital.
- Medical staff participated in the emergency transport of patients for MRI scans
- Families, patients and health workers agreed to participate in the study

#### Exclusion criteria

- Patients are assigned to have tests and films but no MRI
- The patient/families/health workers did not consent to participate in the study

### 2.2 Method

This is a cross-sectional descriptive research method of 101 emergency patients who were transfer to radiology department for MRI

### 2.3 Sample

This was convenience sampe of severe patients who indicated for MRI are transported by IETT of Emergency Center in VNCH from Sep, 2020 to Oct 2020 with transportation for MRI

Volume 10 Issue 9, September 2021

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2.4 Procedures

Observe and evaluate health workers and patients for MRI scans as indicated: Contact before transport, prepare instruments, explain family, receive patients, transport patients, monitor during the scan and transport, handover to the designated faculty. Evaluation of research indicators from the time of transportation, during the imaging process and transporting the patient back to the department

Data were entered into an SPSS file (SPSS v 20, IBM, Armonk NY)

3. Result

Study on 101 patients transported for MRI at the Emergency Transport Department - Emergency Center, in September - October 2020. The results are as follows:

General characteristics of patients

Table 1: Characteristics of transported pediatric patients

Characteristics		Quantity	Percentage (%)
Age	Neonate	30	29,7
	1 - 12 months	40	39,6
	>12 - 60 months	20	19,8
	>60 months	11	10,9
Sex	Boy	55	54,5
	Girl	46	45,5
The department ordered MRI scan	ED	60	59,4
	NICU	21	20,8
	SICU	5	5,0
	ICU	12	11,8
	Other wards	3	3,0
MRI Scan	Brain	50	49,5
	Chest	19	18,8
	Abdomen	17	16,8
	Others	15	14,9

Comments: Patients were mainly under 1 year old (69.3%), boys accounted for 54.5%, indicated for imaging at the emergency center (59.4%) and brain MRI scan (49.5%).

Table 2: Previous contact before transportation

Content		Quantity	Percentage (%)
Contacted with transport dept	Yes	101	100
Noticed time for transport	Yes	101	100
Discussed medical condition	Yes	101	100
Contacted with radiology dept	Yes	101	100
Planning	Yes	101	100

Comments: 100% of the indicated wards contact with IETT notify about the time and patient's condition, and IETT contacts the imaging department and develops a transportation plan

Table 3: Preparation for transportation

Content		Quantity	Percentage %
Check medical record	Yes	101	100
The batteries of the devices are fully charged	No	20	19,8
	Yes	81	80,2
Check the amount of Oxygen	No	17	16,8
	Yes	84	83,2
Drug check and handover	No	6	5,9

	Yes	95	94,1
Check other equipment and supplies	No	13	12,9
	Yes	88	87,1

Comments: No oxygen level test (16.8%); the batteries of the machines are not fully charged (19.8%); other equipment and supplies have not been checked (12.9%); drugs have not been tested and handed over (5.9%).

Table 4: Time of receiving patients

Characteristics		Quantity	Percentage
Patient's condition	Worse	20	19,8
	Like the announcement	65	64,4
	Milder	16	15,8
Transport time	Like the announcement	60	59,4
	Must wait	41	40,6
Other problems	not complete administrative procedures yet	6	5,9
	Not fully prepared	10	9,9

Comment: When the staff transported to the departments to carry out the transportation of patients for MRI scans, the number of patients with more severe condition (19.8%), had to wait (40.6%), administrative procedures have not been completed (5.9%)

Table 5: Patient status at MRI room

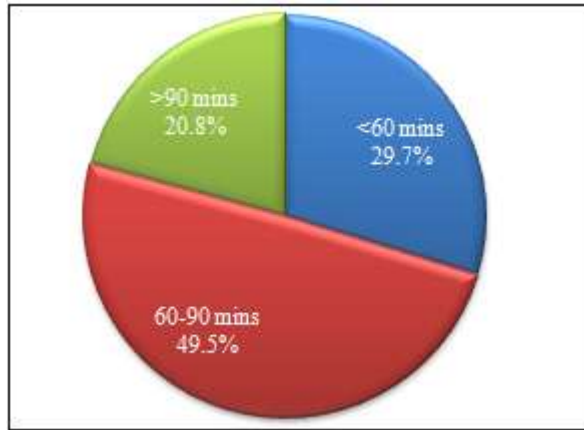
Characteristics		Quantity	Percentage
Waiting time	On schedule	40	39,6
	Waiting ≤ 15 minutes	37	36,6
	Waiting > 15 minutes	24	23,8
Using sedatives	Yes	85	84,2
	No	16	15,8
Number of times of using sedatives	1 time	68	67,3
	≥ 2 times	17	16,9

Comment: Over 60% of patients had to wait compared to the original appointment. The number of patients using sedation during the MRI scan (84.2%), required sedation ≥ 2 times (16.9%)

Table 6: Handover after transportation to the faculty

Hand over		Quantity	Percentage
the patient	Yes	100	99,0
	No	1	1,0
Drugs/medicine	Yes	96	95,0
	No	5	5,0
Medical records	Yes	89	88,1
	No	12	11,9

Comment: hand over the patient to the staff (99%); did not hand over the medicine (5%), the medical records (11.9%)



**Figure 3:** Total transport time for MRI

Comment: transport time is mainly 60 - 90 minutes (49.5%)

**Table 7:** An incident during the transportation of patients for MRI

Incidents		Quantity	Percentage
Patient gets worse	Yes	23	<b>22, 8</b>
	No	78	77, 2
Running out of oxygen	Yes	12	<b>11, 9</b>
	No	89	88, 1
The machine battery is out	Yes	11	<b>10, 9</b>
	No	90	89, 1
Patient vomits	Yes	12	<b>11, 9</b>
	No	89	88, 1
Hypoglycemia	Yes	5	<b>5, 0</b>
	No	96	95, 0

Comments: the patient's condition worsened (22.8%), ran out of oxygen (11.9%), vomited (11.9%), ran out of monitor battery (10.9%), hypoglycemia (5%).

#### 4. Discussion

Among 101 pediatric patients transported for MRI by staff of the emergency transport department, the number of patients less than 12 months of age accounted for nearly 70%, of which neonatal age accounted for nearly 30%, who requires special equipment. Male children account for 54.5%, this is consistent with the fact that boys are often more sick than girls according to annual statistics at the hospital [4]. The survey also showed that the majority of pediatric patients were hospitalized in the EmergencyCenter with 59.4% and half (49.5%) of the transported patients indicated for brain MRI.

##### *Contact and prepare before shipping:*

It is very necessary to notify the patient's conditions who are assigned to be transported for MRI scans from the clinical department to the transportation department. This helps the transport staff to know the patient's condition, develop a plan, preparing the appropriate equipment and human resources to ensure the highest safety during the transportation process. According to L. K. Ott et al (2011) [5], in intrahospital emergency transportation, advance planning relies on "coordination and communication between the sending and receiving departments". Thereby helping the transport staff understand the patient's condition, the types of interventions on the patient. . . and develop a

plan, prepare equipment suitable for the patient's condition, especially the severe patient.

We found that 83.2% of the medical staff checked the oxygen cylinder; the batteries of the machines are fully charged (80.2%) and 87.1% have the equipment and supplies checked before shipping. This shows that there are still a certain percentage of medical staffs that do not fully check all kinds of equipment before transport and can lead to problems during patient transport; also there is no checklist to check those categories. According to research by Anja H Brunsveld - Reinders [2] a checklist of categories should be included to avoid these omissions.

##### *Receiving patients for transport to the MRI department*

It is essential to accurately communicate the patient's condition to the transport staff. However, in this survey, we found that 19.8% of patients had more severe conditions than reported. Inaccurate reporting of the patient's condition may affect the safety and quality of the transportation process, such as not preparing enough drugs and equipment during transportation.

In fact, each emergency transport case has different manifestations of life dysfunction and the causes of the disease are also different, so it requires separate equipment and accompanying items, not redundant, not lacking. . According to C. Waydhas et al. [6] Carrying too many unnecessary devices can compromise patient safety and distract healthcare workers.

According to a study by Vieira, A. L et al. [3] on 641 neonatal patients with 1197 transfers, the disadvantages during transport such as loss of intravascular access (3.1%), accidental extubation (0.6%), selective intubation (0.2%), trachea tube obstruction (0.1%), loss of bladder catheter (0.3%). Equipment failures accounted for 4.8%, insufficient oxygen (0.8%), malfunction of the equipment as follows: oximeter (1.6%), incubator (1.2%), and infusion pump (1.1%)

##### *Status of patients in the MRI room:*

When transporting patients out of the wards, there are many possible risks for patients, so shortening the time will reduce the risks for patients. Before transporting the patient to the MRI room, IETT all contact the MRI room to arrange a suitable schedule. However, 60.4% of patients when transported to the MRI room had to wait, in which the waiting time over 15 minutes was 23.8%

According to a study by Well J. et al. [7], for critically ill patients in intensive care units, the construction of a procedure for arranging patients for MRI scans will reduce time and ensure safety during the procedure, in which the prior contact, making a plan, prepare patients and equipment to increase safety, reduce imaging time, and improve patient satisfaction

For patients requiring MRI to lay still without stimulation, older children can cooperate, but young children cannot cooperate. Therefore, to ensure that the patient lies still during the MRI scan, the solution is to give a sedative. The rate of patients using sedation was 84.2%, of which the

number of patients using sedation only once was 67.3%, and using more than two times was 16.9%. The reason for this difference is because depending on the time of the scan and the condition of each patient, patients with a long scan time or agitated patients will use more times and will increase the risk for the patient.

#### *Patient transport time:*

In the process of transporting the patient's safety, which is responsible for the staff of the emergency transport department, this is a great pressure on medical staff. The longer the transit time, the greater the risk factors, the proportion of patients with total time to undergo MRI in this survey less than 60 minutes is 29.7%; 49.5% is between 60 - 90 minutes; 20.8% of patients had a transit time of more than 90 minutes for MRI.

#### *Some problems occurred during transportation*

Most of the patients transported by IETT for MRI scans are serious patients, when the patient is located in the wards where there are adequate emergency treatment equipment, there may also be complications. Therefore, when transporting patients out of the department, the risk of an incident is very likely, possibly from an objective factor due to the patient's progress, it can also be subjective from the preparation, planning and coordination among medical staff in departments. In this survey, we found that a number of incidents occurred due to the patient's condition such as vomiting (11.9%), hypoglycemia (5%) and the patient's condition worsening (22.8%) during the transport process. Some other incidents related to equipment such as running out of oxygen (11.9%) and running out of batteries of the equipments (10.9%). This may be due to the objective factor that the patient's scan time is longer than expected due to waiting at the MRI room; it may also be due to the subjectivity of the medical staffs that did not check the equipment first before transporting patients. With these incidents, it may affect the safety of patients as well as additional manpower to assist in supplementing oxygen or batteries for monitors.

According to the study of Kue R. et al. [1] showed that the events occurred during transport related to the use of oxygen therapy, vasopressors. Delacrétaz's study [8] on the complications that occurred in the transport of newborns on 138 neonate patients with 429 transports, of which transportation for MRI accounted for 30%, the accident occurred accounted for 18.4% and mainly decreased SpO<sub>2</sub> (6%), irritability (5%) and hypothermia (5%)

According to Bishr Haydar et al. [9], in a systematic study of in - hospital transport for children with severe/critical condition, it was found that the events occurring during transport were found to be mainly related to the child's medical condition and respiratory support. To minimize these problems, it is necessary to stabilize the patient's condition before transport, train a professional transport team, carefully check the equipment before transportation and should have a doctor accompany the patient.

## 5. Conclusion

Emergency transportation for MRI scans is mostly for children under 12 months of age, mainly for cranial scan.

Focus on strengthening the preparation of equipments and patients before transporting and building a checklist for safe transportation. Transport - related complications were mainly due to the patient's equipment and clinical problem

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