

# Combined Application of 5-level Pre-examination & Triage System and Green Channel for Safe Transfer of Patients in Pediatric Emergency

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## Abstract

In this research actual combined application effects of 5-level pre-examination & triage and green channels for safe transfer of critical children patients of emergency nature were explored. The analysis was conducted on the application of 5-level pre-examination and triage system for transfer of 600 emergency cases of children patients brought into the hospital from January to November 2014 and from January to November 2015. The current research divided the patients into observation groups and control groups according to whether or not the system is applied; transfer methods; worked out statistical analysis on admission rate, success rate of rescue and satisfaction of the two groups of children patients. Success rate of rescue and satisfaction of observation group were obviously superior to those of control group. Comparative difference of the two groups has statistical meaning ( $p < 0.05$ ). This research reported the application of 5-level pre-examination and triage for rapid judgment of critical patients' situation, timely and effective use of green channel for their safe transfer inside hospital. By following this the rescue time can effectively be shortened and will increase chances of rescue success and satisfaction.

**Keywords** 5-level pre-examination and triage; Green channel; Transfer inside hospital; Critical children patients



## 1. Introduction

Owing to physiological and pathological specialty, big span of age, complicated situation of diseases, fast changes and complications in diseases and poor expression of patients of pediatrics, their parents are usually noticed as much apprehensive in nature<sup>[1]</sup>. The influence of strange hospital environment and widespread terror and anxiety about emergency diseases, it is seen that the satisfaction of family members of patients is low. Considering this situation, higher requirements are proposed for medical nursing, concerning high service quality and fast and effective supply of service. However, traditional step-wise treatment process counts on registration, then measuring body temperature, triage, and then visit the doctor, and admission as per guidance of the doctor, which in turn delays the treatment of diseases. According to analysis on domestic emergency materials, only 20% emergency patients are true emergency cases, but the remaining 80% of the patients are not emergency cases at all. Though transfer inside hospital does not take a long time, more potential safety

risks are existent in the transfer process. For transfer of critical patients inside hospital, dangerous events are existent from 6% to 71.1%<sup>[2]</sup>. Scientific and effective pre-examination and triage can ensure timely entry into the green channel of critical children patients. This realizes safe and effective transfer inside hospital and guarantee reasonable utilization of medical resources. Such practice is an inevitable trend. At present, 5-level pre-examination and triage system has been widely used all over the world. This system has been proved to be reliable through clinical study<sup>[3]</sup>. As there are numerous death cases seen in critical children patients of pediatrics, hence following their safe transfer inside hospital carries a very important meaning to lower the death rates. The hospital started to combine 5-level pre-examination and triage system and use of green channel to realize safe transfer of patients in January 2015. An obvious improved success rate of rescue and service satisfaction was noticed and it lowered misdiagnosis and ultimately decreased death rate of children patients was seen.



## 2. Materials and methods

### 2.1 General materials

Materials of children patients treated by outpatient emergency of the hospital from January 2014 to December 2015 were screened at the hospital, but following circumstances were excluded: 1) When a child patient is older than 14 years of age; 2) When patient was transferred to any other special department; 3) When patient leaves the hospital due to various reasons, 4) When their triage materials are not perfect;

5) When medicine is prescribed or inspection sheet is issued for treatment. Over a span of around two years, 300 cases of critical children patients at outpatient emergency department from January to November 2014 were selected as control group and 300 cases from January to November 2015 as observation group (Table 1). All of the mentioned patients were admitted to receive further treatment of the hospital.

Table 1 Materials of children patients treated by outpatient emergency of the hospital from 2014 to 2015 were screened at the hospital

Control group		Observation group	
Hyperpyretic convulsion	116	Hyperpyretic convulsion	106
Pneomonia and heart failure	230	Pneomonia and heart failure	86
Influenza B	35	Alimentary tract hemorrhage	5
Tracheo-bronchial foreign body	5	Severe hand-foot-mouth disease	45
Carbon monoxide poisoning	2	Neonatal jaundice	10
Drug misusage	4	Septicemia of newborn	16
Alimentary tract hemorrhage	8	Influenza B	20
Severe hand-foot-mouth disease	40	Transfusion therapy for patients of severe thalassemia	12

## 2.2 Methods

### 2.2.1 Triage criteria and reception methods

Control group:

The traditional process of treatment is as follows

Registration – > measure body temperature – > triage – > visit the doctor – > admission as per doctor's advice.

Observation group:

The children pre-examination and triage guidelines (P ed. CTAS) were formulated by scholars of Canada. Critical degree of children patients was divided into five levels<sup>[5]</sup> varying from very critical (need to be rescued immediately) at very critical stage to non-emergency cases (to be treated in a normal hospital procedure) at an ordinary stage. Patients of level 1 are emergency and need to be rescued immediately, patients of level 2 are critical and need to be rescued within 15 minutes, patients of level 3 are emergency and need to be treated within 60 minutes, patients of level 4 are sub-emergency and need to be treated within 120 minutes and patients of level 5 are ordinary ones, who shall wait for treatment at ordinary outpatient department. In combination with actual situation of children patients of outpatient emergency department of our hospital, criteria of emergency pre-examination and triage system (Table 2) and process chart (Figure 1) were formulated via discussion and practice. These systems

and processes are aiming to ensure timely arrangement of treatment for children patients of level 1 and level 2.

Arrival of children patients at outpatient emergency department and their pre-examination

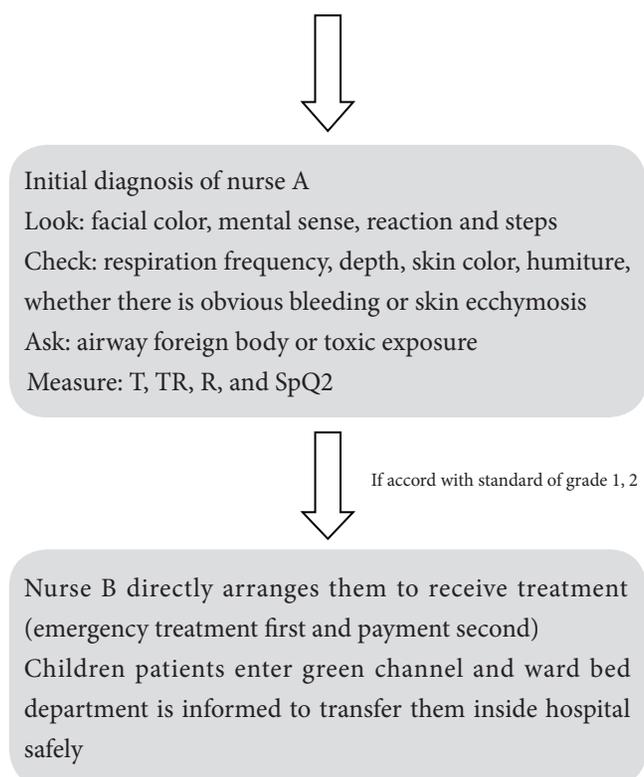


Figure 1 Criteria of emergency pre-examination and triage system and process chart were formulated via discussion and practice.

Table 2 Level-1 and Level-2 Criteria of 5-level Pre-examination and Triage

Level	Level 1 (emergency)	Level 2 (critical)
Body temperature	High fever and seizure	Fever of newborn $\geq 38^{\circ}\text{C}$ and fever of infants $\geq 40^{\circ}\text{C}$
Nerve	Deep coma, convulsion seizure, cramp	Somnolence, severe headache, dysphoria and acute myasthenia
Respiration	Acute respiratory distress, respiratory arrest, Attack of severe asthma, airway foreign body, Acute wheezing rale and laryngeal obstruction at 3rd degree	Difficult breathing, obvious shortness of breath, attack of asthma and obvious wheezing rale
Circulation	Cardiac arrest, severe arrhythmia and shock, Severe dehydration and poor peripheral circulation	Heart failure, severe chest pain and distress, high blood pressure and emesis
Digestive tract	Massive alimentary tract bleeding and severe abdominal distension	Alimentary tract bleeding and obvious abdominal distension
Anaphylactic reaction	Respiratory distress and allergic shock	Swelling of head and face and obvious rash
Blood system	Coagulation disorder and bleeding of whole body	Severe anemia and blood platelet $< 20 \times 10^9/\text{L}$ Active bleeding
Other	Drowning and poisoning with disturbance of consciousness	Drowning and poisoning with clear consciousness

### 2.2.2 Conduct skilled training of medical staff and establish nursing and transfer team for critical patients

Pre-examination and triage of outpatient emergency and safe transfer inside hospital may bring huge pressure for nursing staff, even for experienced nurses. So, related skilled training cannot only improve confidence of nursing staff in transfer, but also enhance their ability of responding to emergency medial events, lowering risks of transfer and avoiding occurrence of unexpected events that may cause trouble<sup>[4]</sup>. Rapid and effective pre-examination and triage will ensure the rescue time of critical children patients. So, it was suggested to ensure selection of nurses of pediatrics diligently. It was advised to

select the nurses with at least 5-year experience of pediatric and strong ability of communication and expression. As far as pre-examination and triage office of outpatient emergency is concerned, it was suggested to ensure nurses of pediatrics to achieve high level of special theoretical and technological knowledge, form fast responding ability and at least 5-year working experience as nursing members of safe transfer team. Training contents included clinical manifestation of critical diseases of pediatrics and treatment of their complication, principles and precautions of using first aid medicine of pediatrics, critical value of inspection

result of pediatric lab, and rescue techniques of pediatrics, including cardio pulmonary resuscitation, and venous puncture etc. Moreover, in combination with processes and standards, simulation of cases was recommended to need to ensure the ones who make consistent evaluation on diseases with doctors to take the positions in these teams was made.

By classifying level-1 or level-2 critical children patients with fast pre-examination and triage, outpatient emergency department should conduct initial first aid treatment and inform critical nursing and transfer team of ward beds to take related instruments and equipped with first aid kit to reach at disposal location within 10 minutes of time. In transfer process, it must be taken into consideration to pay special attention to temperature management of patients and to ensure body temperature of children patients must be stabilized in the transfer process. Also the team must focus on respiration management, maintain their position, fix their head, keep airway open, constantly check and monitor oxyhemoglobin saturation and focus on preventing detachment of trachea cannula. Other important considerations are to conduct circulating management and electro-cardiograph monitoring, get to know heart rate and blood pressure, observe skin color and temperature and adjust infusion speed. Keeping an eye on all the above important operations, it must be ensured to transfer patients to their designated wards and implement rescue measures of next step without any delay.

### 2.2.3 Preparations of medicine and equipment

Some medicine and equipment are important measures to ensure safety of patients, including portable ECG monitor, oxyhemoglobin saturation detector, oxygen bag filled with oxygen, manual respirator, syringe pump and some basic first aid medicine (such as cardiotoxic drug, anti-arrhythmic drug, sedative, anti-allergic agent and normal saline etc.). A small rescue cart needs to be prepared well. Staff shall check them every day to ensure their emergency state at the rate of a maximum possible percentage. This will ensure the effective use of

that cart in emergency situations.

## 2.3 Evaluation method

According to data analysis, admission rate and success rate of rescue of patients in the two groups was compared; questionnaire method to compare satisfaction of patients of the two groups with waiting time was applied, general services of hospital and diagnosis and treatment services of doctors, et al was followed.

## 3. Statistical methods

To see the statistical significance  $\chi^2$  test was performed to conduct inter-group comparison. All statistical analyses were performed using the SPSS (SPSS Inc., Chicago, IL, USA). P value <0.05 was considered statistically significant.

## 4. Result

Compared with control group, safe transfer of patients inside hospital in observation group via combination of 5-level pre-examination and triage was observed through the dataset used for this research. This led to make fast judgment on diseases of critical children patients with timely and effectively utilization of green channel. This results in effectively shorten the rescue time and improve success rate of rescue and satisfaction (Table 3).

## 5. Discussion

It was suggested to conduct standardized training of pre-examination and triage for triage nurses of critical patients of outpatient emergency department, and combine it with uniform training for nurses responsible for safe transfer of patients. Other



Table 3 Comparison of satisfaction with admission rate and success rate of rescue between the two groups n (%)

Group	n	Admission rate	Success rate of rescue	Satisfaction
Control group	300	276(92.00%)	276(92.00%)	263(87.67%)
Observation group	300	296(98.67%)	296(98.67%)	277(92.33%)
$\chi^2$		30.10	30.10	7.22
P		<0.01	<0.01	<0.01

important considerations in such critical patients include stress evaluation on diseases of critical children patients, cultivation of emergency treatment ability, interpersonal communication ability, make full preparations for transfer, strengthen monitoring in transfer process, pay attention to safety and ensure transferred children patients to be nursed just like their nursing in ICU<sup>[5]</sup>. This will ensure the rescue of critical children patients in a timely and effective manner. Also it will improve success rate of rescue and enhance satisfaction of their family members.

The current research result showed 24 cases of 300 children patients of control group who needs to be admitted but were not successfully admitted to the hospital (with reasons unknown) so that their life safety cannot be affirmed. 3 cases of 300 children patients of observation group who need to be admitted were transferred to special hospital due to restrictions of conditions. Another case of level 2 criteria was refused due to special reasons of family, but to be retained in observation zone of emergency department; and leave the hospital when the patient's disease was noticed as stable. Success rate of rescue and satisfaction of observation group were greatly improved when compared with those of control group.

When critical children patients seek medical treatment in hospital, medical staff are recommended to apply standards of pre-examination and triage system to judge treatment sequence of children patients

according to their specific diseases, and make rapid and orderly selection so as to ensure children patients to receive effective treatment within the shortest term, all of which fully present the rescue concept: 'time is life'. Though transfer of patients inside hospital for continuing medial treatment needs several minutes, there are still plenty of potential risks that will endanger life of patients in the transfer process<sup>[6]</sup>. Any carelessness may lead to delay of treatment and missing best rescue opportunity, which will bring immeasurable harm to children patients. In this perspective it was reported in the literature that transfer inside hospital may increase occurrence of critical patients' complication and patients transferred need to face a danger of death rate, 9.6% higher than usual patients<sup>[7]</sup>. From arrival of critical children patients at hospital to their safe rescue, hospitals must shape a strongly responsible nursing team with ability of independent work and emergency disposal. The team members must be trained with rescue techniques and special operation theory and practice so as to make accurate judgment. There are a few domestic reports on combination of pre-examination and triage for safe transfer of patients inside hospital, but the advantages of their respective application have been reported. However, the author thought nursing work needs team cooperation, as team cooperation of nurses is related with safe nursing quality of children patients<sup>[8]</sup>. This will ensure strong communication, connection and cooperation between

outpatient emergency and wards with the ability of disposing problems and communication, identify critical patients rapidly and accurately, and make it to get the diagnosis and treatment in the shortest possible time<sup>[9]</sup>. Nurses are to actively receive patients and timely remove strange and helpless sense and terror of children patients and their family members so as to shorten waiting time. In combination with safe transfer of patients inside hospitals, mental pressure of children patients and family members will be greatly relieved, and treatment effects of children patients can be improved greatly. As a result it will enhance trust of children patients and family members to the hospital

and will result in higher level of satisfaction.

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#### Competing Financial Interests

The authors declare no competing financial interests.

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