

# Study on the Effectiveness of Pre-hospital First Aid in Patients with Upper Gastrointestinal Bleeding

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**Abstract:** *Objective:* To explore the application effect of the emergency center's standardized pre-hospital first aid program with dispatch guidance (clinical path) as the core in patients with upper gastrointestinal bleeding, and to clarify the impact of dispatch guidance on the quality of first aid. *Methods:* 46 patients with upper gastrointestinal bleeding who were jointly treated by our center and hospital from January 2020 to December 2021 were selected and divided into a clinical pathway group where our center's online dispatching telephone dispatch guidance system was implemented in 2021 and a non-implementation clinical pathway group where the center's dispatch guidance system was not online in 2020 using the random number table method, with 23 cases in each group. The non-scheduling-guided clinical pathway group uses conventional pre-hospital first aid: initial on-site assessment, establishing a single intravenous line for infusion of normal saline, assisting in lateral decubitus positioning to prevent suffocation when vomiting blood, and monitoring consciousness and vital signs during transport, without scheduling guidance throughout the process; the dispatch-guided clinical pathway group uses scheduling guidance Guided standardized first aid: After the dispatcher receives the call, the dispatcher collects the patient's condition over the phone and instructs the family members on basic first aid. After arriving at the scene, the emergency personnel quickly review the condition according to the dispatch information, implement oxygen inhalation, stop bleeding, establish double venous access and collect blood, and regularly monitor vital signs during transfer and link the hospital for treatment. Compare the emergency-related time indicators, vital sign stability rate and complication rate between the two groups. *Results:* The emergency-related time indicators in the group with dispatch guidance were shorter than those in the group without dispatch guidance, the vital signs were more stable, and the incidence of complications was lower ( $P < 0.05$ ). *Conclusion:* The emergency center adopts a standardized pre-hospital emergency plan with scheduling guidance (clinical path), which can effectively shorten the emergency time for patients with upper gastrointestinal bleeding, improve the stability of vital signs, and reduce the risk of complications. Its core advantage is to optimize the emergency process through pre-scheduling intervention, which has important clinical application value.

**Keywords:** Upper gastrointestinal bleeding; Pre-hospital emergency; Emergency center; Vital signs; Complications

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## 1. Introduction

Upper gastrointestinal bleeding is a common clinical emergency. It has a sudden onset and rapid progression. Massive bleeding in a short period of time can quickly lead to circulatory dysfunction in patients. According to clinical data, the mortality rate of this disease can reach 8%-15%, and delay in effective emergency intervention is one of the important causes of death<sup>[1]</sup>. Pre-hospital first aid in the emergency center is the first medical intervention that patients receive after the onset of illness. The standardization and timeliness of first aid measures have a great impact on subsequent treatment effects and patient prognosis. Whether the treatment is appropriate during this “golden first aid time” directly determines whether the patient can be successfully transferred to the hospital for further treatment. At present, the pre-hospital first aid process of some emergency centers has problems such as irregular operation and poor connection between links, such as slow dispatch response, single on-site first aid measures, and inadequate monitoring during transfer. These problems often lead to low first aid efficiency and missing the best opportunity for treatment. At the same time, the conditions of patients with upper gastrointestinal bleeding are complicated, and the bleeding characteristics caused by different causes (such as gastric ulcer bleeding, esophageal and gastric variceal bleeding, etc.) are different. The conventional and unified first aid model cannot meet the treatment needs of different patients, and it is easy for the first aid to be insufficiently targeted<sup>[2]</sup>. Based on this, this study compares the effects of pre-hospital first aid on patients with upper gastrointestinal bleeding in the same emergency center before and after the introduction of a dispatch guidance system. It aims to provide a reference for optimizing the pre-hospital first aid process, improving the quality of first aid, and helping emergency centers develop first aid strategies that are more in line with clinical reality and reduce the risk of poor patient prognosis<sup>[3]</sup>.

## 2. Materials and methods

### 2.1. General information

46 patients with upper gastrointestinal bleeding jointly treated by our center and hospital from January 2020 to December 2021 were selected as cases and divided into two groups using the random number table method. There were 23 patients selected in the group with scheduling guidance, including 13 males and 10 females, aged 37–68 ( $45.38 \pm 4.06$ ) years old. In the group without scheduling guidance, 23 patients were selected, including 12 males and 11 females, aged 38–69 ( $45.80 \pm 3.96$ ) years old. The two groups are comparable,  $P > 0.05$ .

Inclusion criteria: (1) Meet the diagnostic criteria for upper gastrointestinal bleeding; (2) The time from onset to call for help is  $\leq 2$  hours; (3) Conscious and able to cooperate with first aid.

Exclusion criteria: (1) Combined with severe heart, liver and kidney diseases; (2) Gastrointestinal bleeding caused by trauma; (3) Coagulation dysfunction.

### 2.2. Method

The non-dispatch guidance group implements the routine pre-hospital first aid method of the emergency center: after receiving the emergency call, emergency personnel are dispatched to the scene as usual. Upon arrival, the emergency personnel briefly assess the patient's condition, measure vital signs, establish a single intravenous access for the patient, and infuse normal saline. If the patient vomits blood, assist him in maintaining a lateral decubitus position to prevent suffocation, and then transport the patient. At the hospital, changes in the patient's consciousness and vital signs were only closely observed during the transfer. There was no early connection with the hospital's emergency department, and no dispatching and guidance-related operations were involved in the entire process. During the process of first responders arriving at the scene (average 14 minutes in Changzhou City) and patients getting on the bus and being transferred to the hospital (average within 12 minutes), there was no scheduling intervention to optimize the emergency process.

A dispatch guidance group implements a standardized pre-hospital first aid method with dispatch guidance as the core: after receiving the call for help, the dispatch staff immediately starts the clinical path guidance process, quickly inquires and records the patient's bleeding symptoms, bleeding volume, state of consciousness and other information over

the phone, and at the same time remotely guides the family members to let the patient keep in a supine position, tilt your head to one side, and avoid eating and drinking. After the first responders arrive at the scene, based on the preliminary condition assessment report passed by the dispatcher, they will complete an accurate review of consciousness, breathing, blood pressure, heart rate and other indicators within 5 minutes, and give oxygen at a flow rate of 3–5 L/min to those with large bleeding volumes. , use tranexamic acid injection according to the patient's weight, establish double venous channels (one for infusion of normal saline, and one for backup), and collect venous blood samples at the same time; before transfer, the patient's position and various pipelines are fixed according to the condition information fed back by the dispatch, and vital signs are monitored and recorded every 15 minutes during the transfer. Symptoms, the data is synchronized and fed back to the dispatch center. If signs of shock occur, the dispatch center immediately coordinates the emergency department of the hospital to prepare for treatment. During the time it takes for emergency personnel to arrive at the scene (14 minutes) and transfer (within 12 minutes), the emergency efficiency is improved through pre-dispatch guidance and full linkage.

### 2.3. Observation indicators

Compare the emergency-related time (time of emergency personnel arriving at the scene, on-site first aid time, and transfer time to the hospital), vital signs (systolic blood pressure, heart rate), and the incidence of complications (hemorrhagic shock, asphyxia, multiple organ dysfunction) before and after intervention between the two groups.

### 2.4. Statistical methods

Use SPSS 24.0 to analyze the data, t-test for measurement data, and  $\chi^2$  test for count data.  $P < 0.05$  represents a significant difference.

## 3. Results

### 3.1. Comparison of emergency-related time between the two groups

All first aid-related times in the group with dispatch guidance were shorter than those in the group without dispatch guidance ( $P < 0.05$ ) (Table 1).

**Table 1.** Comparison of first aid-related time between two groups (mean  $\pm$  SD, min)

Group	First responder arrival time	Transfer time to hospital
No Scheduling Guidance Group (23)	12.65 $\pm$ 1.24	10.78 $\pm$ 1.01
There is a scheduling guidance group (23)	10.42 $\pm$ 0.87	8.13 $\pm$ 1.68
<i>t</i>	7.060	6.483
<i>P</i>	0.000	0.000

### 3.2. Comparison of vital signs between the two groups before and after intervention

There was no significant difference in systolic blood pressure and heart rate between the two groups before the intervention ( $P > 0.05$ ). After the intervention, the systolic blood pressure and heart rate of the group with scheduling guidance were higher than those of the group without scheduling guidance ( $P < 0.05$ ) (Table 2).

**Table 2.** Comparison of vital signs between the two groups before and after intervention (mean  $\pm$  SD)

Group	Systolic blood pressure (mmHg) - before intervention	Systolic blood pressure (mmHg) - post-intervention	Heart rate (beats/min) - before intervention	Heart rate (beats/min) - after intervention
No Scheduling Guidance Group (23)	85.36 $\pm$ 6.24	92.58 $\pm$ 5.87	118.42 $\pm$ 10.35	105.63 $\pm$ 8.72
There is a scheduling guidance group (23)	84.92 $\pm$ 6.51	101.24 $\pm$ 6.13	117.85 $\pm$ 9.86	92.35 $\pm$ 7.41
<i>t</i>	0.234	4.893	0.191	5.566
<i>P</i>	0.816	0.000	0.849	0.000

### 3.3. Comparison of complication rates between the two groups

The incidence rate of complications in the group with scheduling guidance was lower than that in the group without scheduling guidance ( $P < 0.05$ ) (Table 3).

**Table 3.** Comparison of complication rates between the two groups [n (%)]

Group	Hemorrhagic shock	Suffocate	Multiple organ dysfunction	Overall incidence rate [n (%)]
No Scheduling Guidance Group (23)	4 (17.39)	2 (8.70)	2 (8.70)	8 (34.78)
There is a scheduling guidance group (23)	1 (4.35)	0 (0.00)	0 (0.00)	1 (4.35)
$\chi^2$				4.973
<i>P</i>				0.026

## 4. Discussions

The results of this study show that the scheduling-guided clinical pathway group is significantly better than the non-scheduling-guided clinical pathway group in terms of first aid-related time indicators, vital sign stability rate, and complication rate ( $P < 0.05$ ). This difference is due to the essential differences in the core links of the two groups of emergency models in process design, resource integration, and intervention timing. Combined with the clinical characteristics of upper gastrointestinal bleeding diseases, the reasons can be analyzed from three dimensions: “time window optimization”, “intervention accuracy improvement” and “medical connection closed-loop construction”<sup>[4]</sup>.

Judging from the differences in emergency-related time indicators, the scheduling guidance clinical pathway group can significantly shorten the time-consuming first aid. The core is to move the starting point of emergency intervention from “emergency personnel arriving at the scene” to “receiving a call for help”, forming a “time difference advantage.” The prognosis of patients with upper gastrointestinal bleeding is closely related to the time required to control bleeding. Without effective intervention within 1-2 hours after bleeding, the incidence of shock will increase by more than 30%. In the non-dispatch guidance mode, within 14 minutes (average in Changzhou City) of first responders arriving at the scene, family members are unable to take effective measures due to a lack of professional guidance, and may even cause vomiting and aspiration due to improper posture, wasting the “golden first aid time window”<sup>[5]</sup>. In the dispatch guidance group, the dispatchers can collect the patient’s bleeding symptoms, state of consciousness and other information within 3–5 minutes after receiving the call, and simultaneously instruct the family members to keep the patient in a supine position with his head tilted to one side, eat and drink, and build a “basic protective barrier” before the arrival of emergency personnel. At the same time, the condition information is transmitted to the emergency team in real time, so that they can complete preliminary research and judgment on the way to the scene, prepare targeted equipment and drugs in advance, and avoid

the waste of time in “temporary assessment and preparation.” For example, for patients with heavy bleeding, emergency personnel can start oxygen inhalation and establish dual venous access directly based on the dispatch information after arriving at the scene. This alone can save 5-8 minutes. In addition, the “scheduled monitoring + early linkage with the hospital” model in the transfer process enables the hospital’s emergency department to reserve rescue resources in advance, and the patient directly enters the rescue process after arriving at the hospital, avoiding the waiting time of “re-evaluation and coordination after arrival at the hospital”, forming a closed loop of “pre-hospital-in-hospital” time connection, and further compressing the transfer connection time<sup>[6]</sup>.

The difference in the vital signs stability rate is essentially the difference in the “accuracy” of the two groups of emergency intervention, and the improvement in accuracy comes from the “information symmetry” and “enhanced targeted measures” brought by dispatch guidance. Fluctuations in vital signs of patients with upper gastrointestinal bleeding (falling blood pressure, accelerated heart rate) are directly related to the amount and speed of bleeding, and the effectiveness of first aid depends on the accuracy of disease diagnosis. In the non-scheduling guidance group, emergency personnel only obtain information through “simple assessment + vital sign measurement”, which can easily lead to inappropriate measures due to one-sided information. For example, for patients who are confused but do not meet the shock standard, only a single intravenous channel is established to infuse normal saline, and hemostatic drugs are not used in a timely manner, resulting in difficult to control bleeding; for patients who vomit hemorrhage, the color and amount of vomitus are not assessed, and key information for determining the location of bleeding is missed. The dispatch guidance group builds a more comprehensive understanding of the condition through the dual assessment of “scheduling pre-collection + on-site accurate review”: when the dispatcher receives the call, they not only ask about bleeding symptoms, but also pay attention to accompanying symptoms such as melena and dizziness, to help determine the location and speed of bleeding (for example, hematemesis accompanied by melena is usually upper gastrointestinal bleeding) and speed (dizziness indicates that the bleeding volume reaches 10%–15% of the circulating blood volume); emergency personnel can complete the condition review within 5 minutes after arriving at the scene, quickly clarify the severity and take targeted measures. For example, for patients with “large bleeding volume and still clear consciousness” as indicated by the dispatch, tranexamic acid can be used accurately and dual venous channels (one for rehydration and one for backup) can be established to avoid the problem of insufficient rehydration in a single channel. At the same time, blood samples are collected on site and sent for examination during transportation. After the patient arrives at the hospital, the results of blood routine and coagulation function are issued. Doctors can directly adjust the treatment plan to avoid delays in treatment due to waiting for examinations and stabilize vital signs more quickly<sup>[7]</sup>.

The significant difference in the incidence of complications is a reflection of the dispatch guidance to build a “whole-process risk prevention and control system”, which reduces the risk of common complications such as suffocation, shock precursors, and infection through a closed loop of “pre-emptive prevention-on-site control-transport monitoring-hospital connection”. From the perspective of suffocation prevention, the non-scheduling guidance group only assists the patient in maintaining the side-lying position when he vomits blood, lacking pre-emptive intervention; while the dispatch guidance group immediately instructs the family to adjust the patient’s position after receiving the call, cutting off the “hematemesis-aspiration-suffocation” chain from the early stage of calling for help. Clinical data show that this measure can reduce the incidence of asphyxiation by more than 40%. Regarding the signs of shock, the non-scheduling guidance group lacks precondition information. It takes time for emergency personnel to judge the amount of bleeding after arriving. During this period, continued bleeding can easily lead to signs of shock. The dispatching guidance group uses pre-information to determine the amount of bleeding in advance. Emergency personnel immediately start hemostasis and dual-channel fluid replenishment after arriving. Monitor vital signs every 15 minutes during transport. If abnormalities are found, the dispatch center can link the hospital to adjust the treatment plan to control the risk in the bud. For infectious complications, the non-scheduling guidance group only relied on the concept of sterility during operation; the scheduling guidance group used “pre-guidance on fasting and water prohibition” (to avoid gastrointestinal infections caused by feeding by family members), “standardized operation of double venous access” (to reduce the number of punctures), “fixing of transfer

lines” (to avoid contamination), and linked the hospital in advance to ensure that patients quickly enter a clean rescue environment, reducing the risk of infection through multiple links <sup>[8]</sup>.

In addition, the improvement of the first aid effect of dispatch guidance also comes from the reconstruction of “information flow” and “resource integration” of pre-hospital first aid. In the non-dispatch guidance mode, dispatch, first responders, and hospital emergency departments “operate independently,” and information transmission is broken, which can easily lead to information deviation and resource waste. The dispatch guidance group uses the dispatch center as the “information hub” to realize real-time sharing of information from the “call for help end - first aid end - hospital end”: the dispatcher transmits the condition information provided by the family members, the first responders feedback on the scene and transfer situation, and the dispatch center synchronizes with the hospital to form an “information closed loop”. This not only allows all measures to be formulated based on accurate information, but also enables precise allocation of resources. If a patient is found to have signs of shock, the hospital will be notified immediately to prepare ventilators, dopamine, etc., so that patients can be rescued with “zero delay” after arriving at the hospital, further improving the stability of vital signs and reducing the risk of complications.

From a medical theory perspective, first aid for upper gastrointestinal bleeding is a “race against time”, with the core goals being rapid blood control, stable circulation, and prevention of complications. The dispatch guidance group grasps this core and solves the three major pain points of traditional first aid: “waste of time windows”, “information asymmetry” and “poor resource connection”; although the non-dispatch guidance group complies with the basic specifications, it lacks exploration of the value of time and full-process risk prevention and control, making it difficult to achieve optimal results. At the same time, dispatch guidance can alleviate their anxiety through effective communication with family members, making them calmer to cooperate with first aid. The good collaboration between “family members and emergency personnel” also provides assistance for improving first aid efficiency and preventing and controlling complications <sup>[9]</sup>.

## 5. Conclusion

In summary, the indicators of the scheduling guidance clinical pathway group are better, which is the result of innovating the pre-hospital emergency process from the three dimensions of “time window optimization”, “intervention accuracy improvement” and “medical connection closed-loop construction”. By moving the starting point of first aid intervention forward, realizing full-process information sharing, and building a full-link risk prevention and control system, dispatch guidance effectively solves the core pain points of traditional first aid, confirming the scientific and clinical value of integrating it into the pre-hospital first aid clinical path.

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## Disclosure statement

The author declares no conflict of interest.

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