



# Efficacy of Graded Emergency Nursing on Acute Pancreatitis Patients: A Meta-Analysis

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## Abstract

**Background:** The efficacy of graded emergency nursing on acute pancreatitis (AP) patients was evaluated by the Meta-analysis system.

**Methods:** The databases of CNKI, WanFang, VIP, PubMed, the Cochrane Library and Web of Science were searched by computer in January 2021. The references were screened according to the inclusion and exclusion criteria. The data were extracted and the quality of those references was evaluated. Meta-analysis was made by RevMan 5.4 software, publication bias was detected by funnel chart, and sensitivity analysis was carried out.

**Results:** Thirteen papers were included, including 11 waiting time indexes, 7 disease judgment accuracy indexes, 13 rescue success rate indexes and 5 patient satisfaction rate indexes. Meta-analysis showed that compared with conventional emergency nursing methods, graded emergency nursing methods had shorter waiting time (MD=-11.97, 95%CI (-15.74, -8.21),  $P<0.00001$ ), higher accuracy in judging illness (OR=6.6, 95%CI (3.13, 13.93),  $P<0.00001$ ) and rescue success rate (OR=7.12, 95%CI (4.16, 12.20),  $P<0.00001$ ), and patients' satisfaction was higher (OR=8.79, 95%CI (3.59, 21.56),  $P<0.00001$ ).

**Conclusion:** Graded emergency nursing can optimize the allocation of emergency resources, effectively shorten the waiting time of AP patients. It also improves the accuracy of disease judgment, the success rate of rescue and the satisfaction of patients. It is an efficient emergency nursing method and is worthy of clinical application.

**Keywords:** Graded emergency nursing; Acute pancreatitis; Meta-analysis; Emergency nursing

## Introduction

Acute pancreatitis (AP) is one of the common acute abdominal diseases clinically, which is an inflammatory reaction caused by the activation of pancreatin in the pancreas. It leads to self-digestion, edema, bleeding and even necrosis of pancreatic tissue. The clinical manifestations include acute abdominal pain, nausea and vomiting,

fever and increased amylase in blood and urine (1). It can be divided into mild, moderate and severe AP according to the degree of pathological changes (2). About 80% patients are mild AP, which is often self-limiting and has a good prognosis, and only short-term hospitalization is needed (3). About 15%-20% of patients are



moderate or severe AP (4), which is a common acute and critical disease in the digestive department. Patients' pancreas will have various complications such as bleeding and necrosis, multiple organ failure, secondary infection, peritonitis and shock. The incidence is as high as 40%-70% (5), and the mortality is about 7%-47% (6, 7).

AP is a common disease in emergency department, which is dangerous and develops rapidly. If effective treatment measures are not implemented in time, it is easy to progress to multiple organ failure, threatening the life safety of patients (8). As the condition of the disease is complex, the key to emergency treatment is to grasp the best time for diagnosis and treatment. Emergency department is the rescue place, and triage is the first process after patients are admitted to hospital, which is vital for rescue success. Triage is a crucial part of emergency medical service. In view of the main symptoms and chief complaints of patients, triage can distinguish the priority of subordinate specialties and diseases, and then assign patients to specialist treatment and procedures after preliminary judgment. Graded emergency nursing can accurately judge and analyze the patients' illness degree and change, shorten time of triage and waiting, ensure fast treatment process and smooth treatment channel. The best treatment opportunity can be ensured, and the success rate of rescue can be improved (9, 10). It puts forward higher and stricter requirements for emergency nursing staff, which are generally composed of nursing staff with 2-3 years of clinical work experience. Constant business training is needed to improve their abilities of emergency response, thinking and business, to make a preliminary diagnosis and treatment in time, effectively and quickly (11, 12).

In this paper, the published related research results are comprehensively evaluated by Meta-analysis method, and then the results are combined for quantitative analysis, so as to obtain a reliable conclusion of the efficacy of graded emergency nursing on AP patients. Thus, it provides a certain basis for emergency nursing methods. The results are reported as follows.

## Methods

### *Inclusion and exclusion criteria of references*

Inclusion criteria: 1) The research type was randomized controlled trial (RCT), and the languages are Chinese or English. 2) The subjects were AP patients. 3) Intervention measures: The control group was given routine nursing, while the observation group was given graded emergency nursing. 4) Outcome indicators were waiting time, accuracy of disease judgment, rescue success rate and patient satisfaction.

Exclusion criteria: summary and conference papers; case reports and repeated publications; those with incomplete data and are unable to obtain full-text literature; those do not meet the inclusion criteria and do not contain any outcome indicators; the outcome index is not clear; the research objects were animals, cells and so on.

### *Retrieval methods*

In January, 2021, the references were searched in CNKI, WanFang Data, VIP, PubMed, the Cochrane Library and Web of Science databases (Table 1).

### *Screening and data extraction of references*

Two researchers searched the references independently according to the search strategies, and then excluded the duplicate, repeatedly published, summarized and conference papers. According to the preliminarily screened data set, both of them read the titles, abstracts and keywords respectively, and judged whether to include the papers according to the inclusion criteria. Thus the twice screened data set were obtained. The full text of the references in the secondary screening data set was downloaded and read to further exclude those that did not meet the inclusion criteria. If there is any dispute, it will be judged and discussed with a third party, and finally an agreement will be reached. For documents with uncertain data, the required data were collected as much as possible after contacting the first or correspondent authors.

The data extracted from the references include: basic research information, first author, published year, article title, subject characteristics (age, gender), sample size, intervention measures,

emergency nursing methods, key elements of biased risk assessment, outcome indicators and result measurement data, etc.

**Table 1:** Retrieval strategies

<i>Database</i>	<i>Retrieval formula</i>	<i>Preliminary search results</i>
China Knowledge Network (CNKI) full-text database	SU = ('emergency nursing'+ 'acute pancreatitis')	22 articles
WanFang Database (WanFang)	Theme: ("emergency nursing") and ("acute pancreatitis")	28 articles
VIP (VIP)	((M= "emergency nursing") AND (M= "acute pancreatitis"))	16 articles
PubMed	((emergency nursing[Title/Abstract] or emergency care [Title/Abstract]) AND (acute pancreatitis [Title/Abstract]))	5 articles
the Cochrane Library	((emergency nursing): ti, ab, kw OR (emergency care): ti, ab, kw) AND (acute pancreatitis): ti, ab, kw	22 articles
Web of Science	(TS=emergency nursing OR TS=emergency care ) AND (TS=acute pancreatitis)	178 articles

### **Biased risk assessment included**

Two researchers independently completed the risk assessment of bias included in the references. If there was any dispute, they would negotiate with a third party to solve it. The quality of the included references was assessed by the assessment tool of risk of bias recommended by Cochrane System Evaluator Manual 5.1.0, including selection (including random sequence generation and distribution concealment), implementation (blind evaluation of researchers and subjects), measurement (blind evaluation of research outcome), follow-up (completeness of outcome data), report (selective reporting of research results) and others (other bias sources), totally 7 items. The judgment results of "low risk bias", "high risk bias" and "unclear" were made for each item according to the assessment criteria.

### **Statistical analysis**

Meta-analysis was performed by RevMan 5.4 software. The included reference data were continuous variables, and the mean difference (SMD) was used as the effect index for the measurement data. Each effect quantity gave its point estimation value and 95% confidence interval (CI). The heterogeneity between studies was analyzed by  $\chi^2$  test, and the heterogeneity was quantitatively judged by  $I^2$ . If the heterogeneity among the research results was not obvious ( $I^2 \leq 50\%$ ), the fixed effect model was used for Meta-analysis. If there was obvious heterogeneity among the studies ( $I^2 > 50\%$ ), the random effect model was used for Meta-analysis. Meta-analysis results were mainly presented in the form of forest map, and whether there was publication bias and sensitivity analysis was analyzed by funnel chart.

## Results

### *Inclusive references*

#### *Screening of references*

Overall, 76 Chinese and 205 English documents were initially retrieved, 45 duplicate documents were excluded by using NoteExpress software,

and 25 papers were summarized. Twenty-one related documents were obtained after titles, abstracts and keywords were read. After the full text was downloaded and read, irrelevant documents would be further excluded, and finally 13 documents would be included. The specific process is shown in Fig. 1.

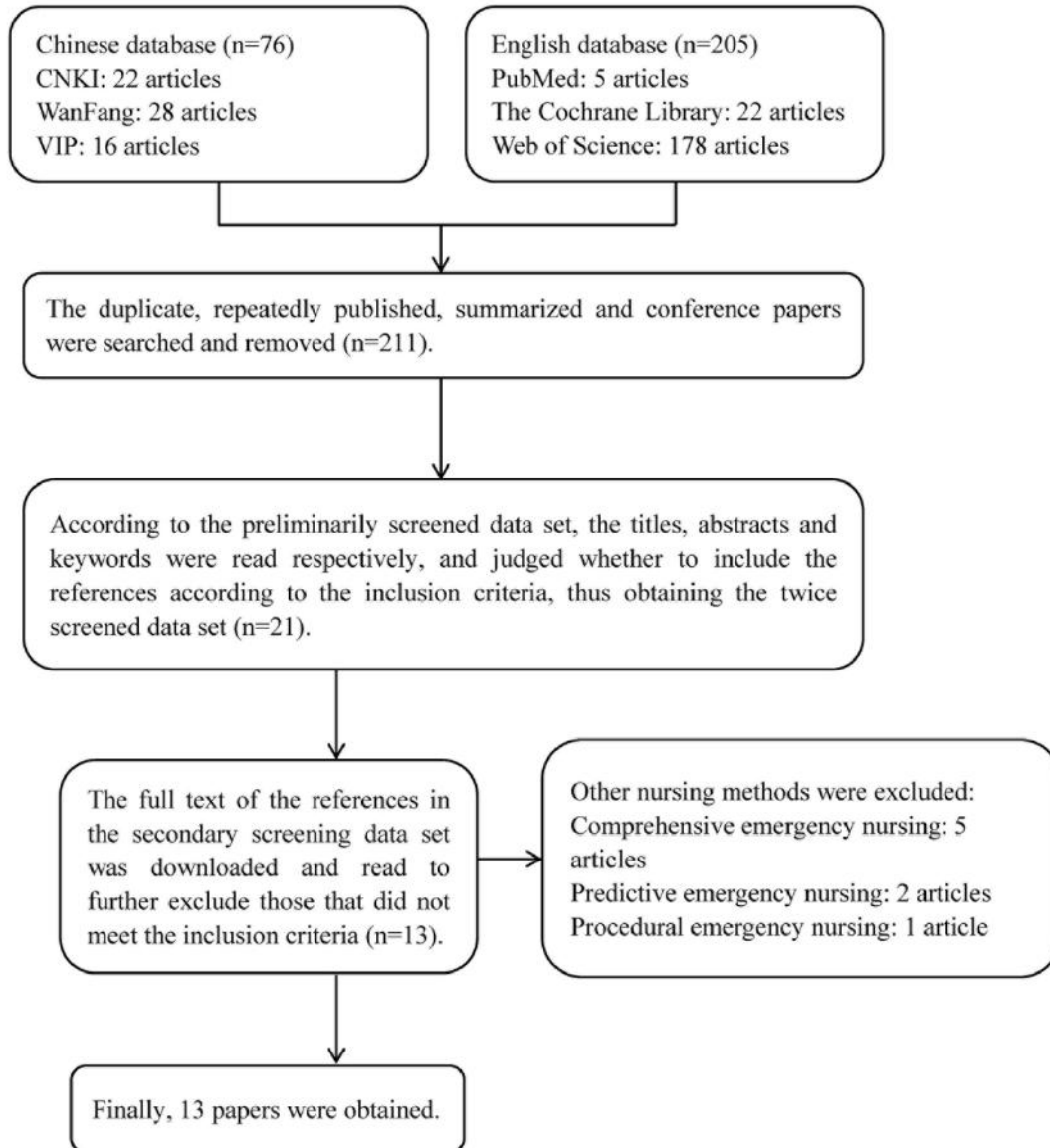


Fig. 1: Reference screening process and results

#### *Basic characteristics of references*

Thirteen Chinese documents were included in this Meta-analysis, and none of them were in-

cluded in the standard English documents. The basic characteristics were shown in Table 2 (13-21).

Table 2: Basic characteristics of included references

First author (Reference number)	Publication time	Grouping	Sample size	Age	Gender (male/female)	Nursing methods	Outcome indicators
Lin hua (13)	2016	Control group	40	56.16±5.43	19/21	Routine emergency nursing	1,2,3
		Experimental group	48	55.78±5.21	25/23	Graded emergency nursing	1,2,3
Zhu Liyan (14)	2016	Control group	39	54.6±4.2	27/12	Routine emergency nursing	1,3,4
		Experimental group	39	54.9±6.4	25/14	Graded emergency nursing	1,3,4
Liu Sai (15)	2017	Control group	40	54.7±4.3	23/17	Routine emergency nursing	2,3
		Experimental group	40	54.8±4.2	24/16	Graded emergency nursing	2,3
Jia Hongyan (16)	2017	Control group	36	56.20±5.18	19/17	Routine emergency nursing	1,3
		Experimental group	36	56.38±5.17	20/16	Graded emergency nursing	1,3
Jin Lin (17)	2017	Control group	44	45.1±10.5	28/16	Routine emergency nursing	1,2,3,4
		Experimental group	44	45.6±11.8	26/18	Graded emergency nursing	1,2,3,4
Tian Jingjing (12)	2017	Control group	44	54.8±5.1	25/19	Routine emergency nursing	1,3
		Experimental group	44	55.1±5.2	24/20	Graded emergency nursing	1,3
He Hua (18)	2018	Control group	32	48.33±8.24	18/14	Routine emergency nursing	1,2,3,4
		Experimental group	32	48.21±8.33	19/13	Graded emergency nursing	1,2,3,4
Zhong Min (11)	2018	Control group	20	46.98±4.84	11/9	Routine emergency nursing	1,2,3,4
		Experimental group	20	46.67±4.61	12/8	Graded emergency nursing	1,2,3,4
Yan Huiling (19)	2018	Control group	40	56.52±5.13	29/11	Routine emergency nursing	3
		Experimental group	40	56.66±5.03	30/10	Graded emergency nursing	3
Huang Yanhui (9)	2019	Control group	20	-	20/0	Routine emergency nursing	1,2,3,4
		Experimental group	20	-	20/0	Graded emergency nursing	1,2,3,4
Xiong Ruyun (20)	2019	Control group	33	59.27±0.55	13/20	Routine emergency nursing	1,3
		Experimental group	33	60.01±0.42	17/16	Graded emergency nursing	1,3
Tu Renna (21)	2020	Control group	60	52.30±10.29	37/23	Routine emergency nursing	1,3
		Experimental group	60	52.82±10.03	38/22	Graded emergency nursing	1,3
Song Wen (10)	2020	Control group	30	27~68	18/12	Routine emergency nursing	1,2,3
		Experimental group	30	25-69	16/14	Graded emergency nursing	1,2,3

Note: The outcome indicators are: 1. waiting time; 2. accuracy of disease judgment; 3. rescue success rate; 4. patient satisfaction



*Risk assessment results of reference bias*

The quality of included references was assessed via Cochrane bias risk assessment tool, and the results were shown in Fig. 2 and 3.

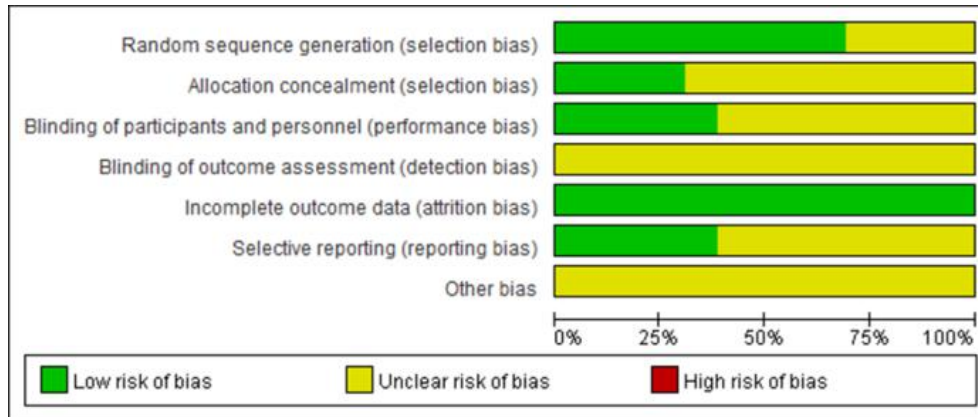


Fig. 2: Risk map of total bias of included articles

	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of participants and personnel (performance bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)	Other bias
He Hua 2018	+	?	?	?	+	+	?
Huang Yanhui 2019	?	?	?	?	+	?	?
Jia Hongyan 2017	+	+	+	?	+	?	?
Jin Lin 2017	+	?	?	?	+	+	?
Lin Hua 2016	+	?	?	?	+	+	?
Liu Sai 2017	+	?	+	?	+	?	?
Song Wen 2020	+	+	+	?	+	+	?
Tian Qingqing 2017	+	+	+	?	+	?	?
Tu Renna 2020	?	?	?	?	+	?	?
Xiong Ruyun 2019	?	?	?	?	+	?	?
Yan Huiling 2018	?	?	?	?	+	?	?
Zhong Min 2018	+	?	?	?	+	+	?
Zhu Liyan 2016	+	+	+	?	+	?	?

Fig. 3: Summary chart of risk of bias in included articles

**Meta-analysis**

**Waiting time**

Waiting time was analyzed in 11 studies, and there were obvious heterogeneity ( $I^2 > 50\%$ ). Meta-analysis with random effect model manifested

that the waiting time of the experimental group was shorter than that of the control group [MD=-11.97, 95%CI (-15.74, -8.21),  $P < 0.00001$ ], and the difference was statistically marked (Fig. 4).

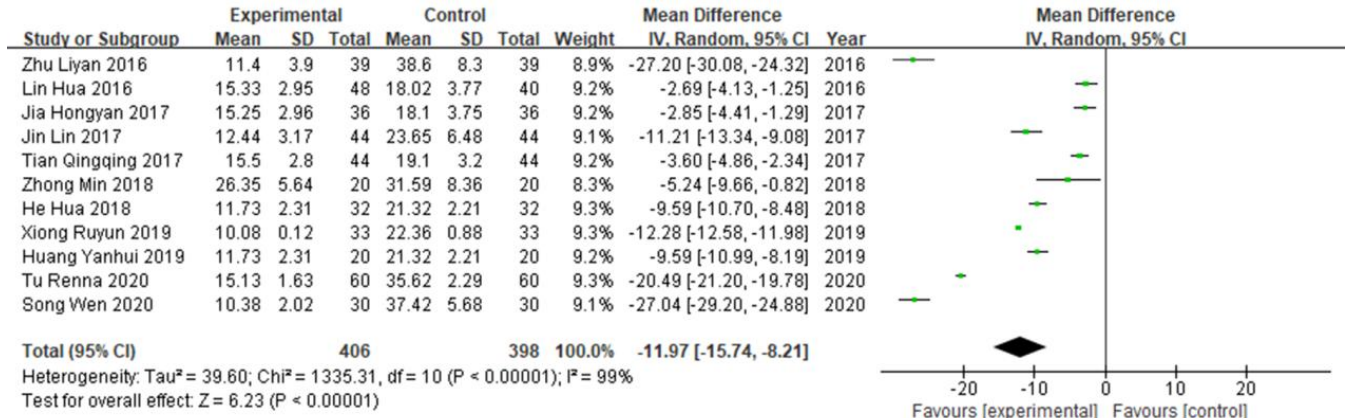


Fig. 4: Meta-analysis of waiting time

**Accuracy of disease judgment**

The accuracy of disease judgment was analyzed in 7 studies, and there was no obvious heterogeneity ( $I^2 = 0\%$ ). Meta-analysis with fixed effect model revealed that the accuracy of disease judgment in

the experimental group was higher than that in the control group [OR = 6.6, 95% CI (3.13, 13.93),  $P < 0.00001$ ], with statistical significance, as shown in Fig. 5.

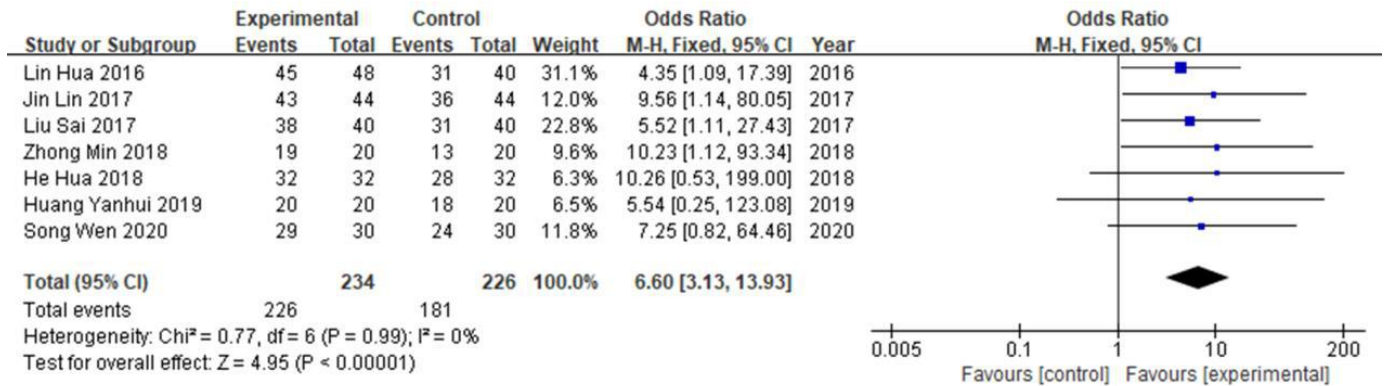


Fig. 5: Meta-analysis of accuracy of disease judgment

**Rescue success rate**

Rescue success rate was analyzed in 13 studies, and there was no obvious heterogeneity ( $I^2 = 0\%$ ). Meta-analysis with fixed effect model manifested that the rescue success rate of the experi-

mental group was higher than that of the control group [OR = 7.12, 95% CI (4.16, 12.20),  $P < 0.00001$ ], and the difference was statistically remarkable, as shown in Fig. 6.

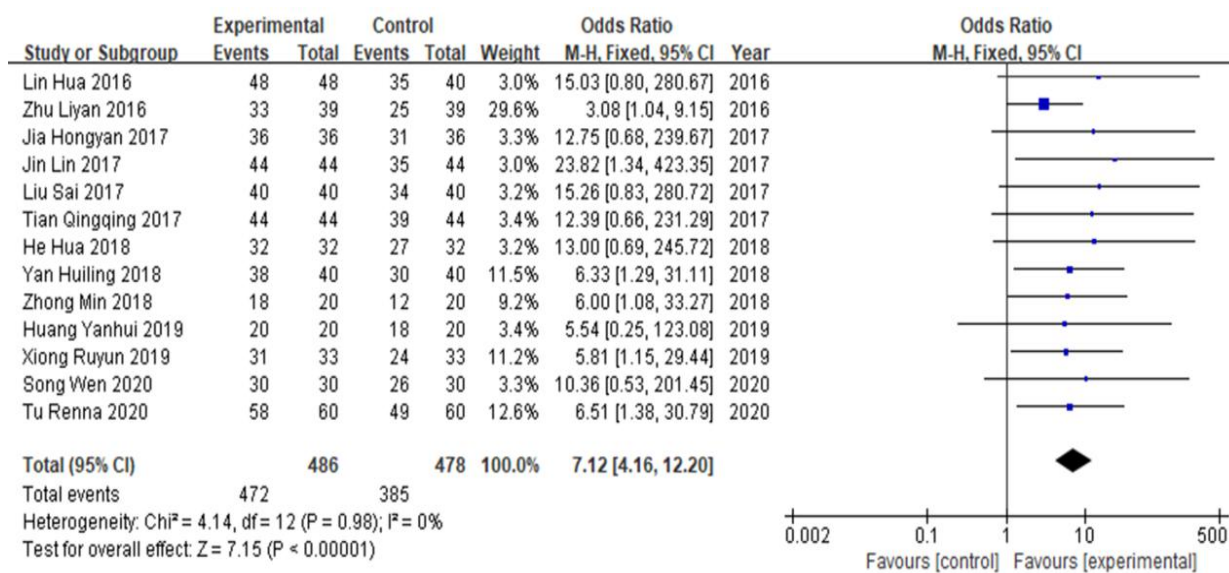


Fig. 6: Meta-analysis of rescue success rate

**Patient satisfaction rate**

Patient satisfaction rate was analyzed in 5 studies, and there was no obvious heterogeneity (I<sup>2</sup> = 0%). Meta-analysis with fixed effect model revealed that the patient satisfaction rate of the ex-

perimental group was higher than that of the control group [OR = 8.79, 95% CI (3.59, 21.56), P < 0.00001], and the difference was statistically obvious, as shown in Fig. 7.

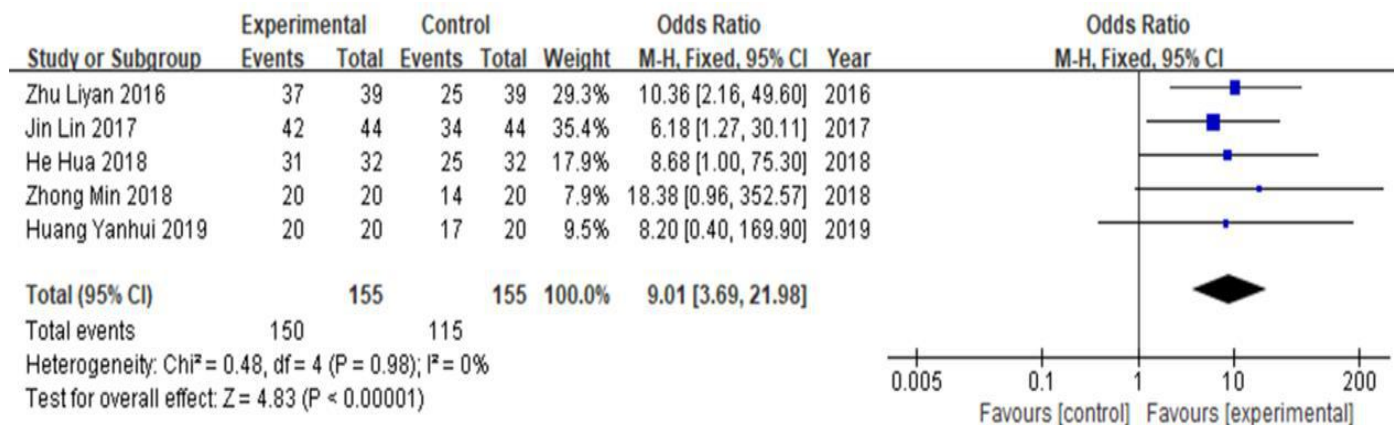


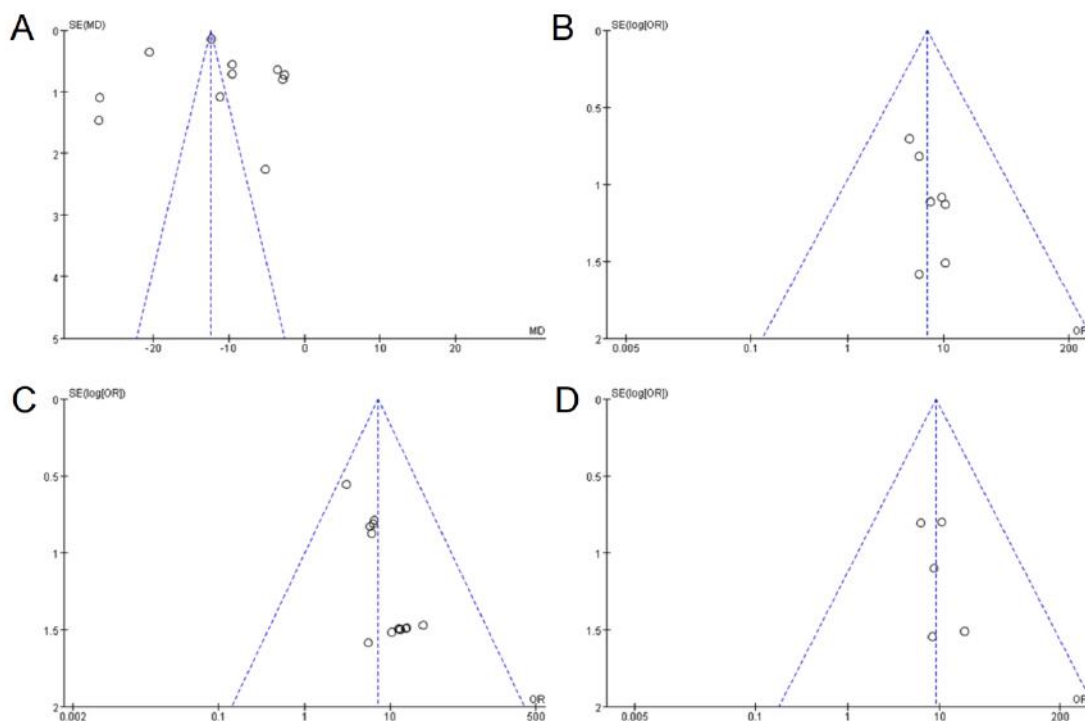
Fig. 7: Meta-analysis of patient satisfaction rate

**Published bias analysis**

In view of the waiting time, the accuracy of disease judgment, the success rate of rescue, and the outcome index of patient satisfaction, the funnel chart was drawn and the publication bias test was carried out. The results manifested that the accuracy of disease judgment, the success rate of rescue and the satisfaction of patients were relatively

evenly distributed on both sides of the funnel graph, and they were all located below the funnel, indicating that there was no obvious publication bias. However, the distribution of waiting time was asymmetric, and multiple data points were located outside the funnel, suggesting that there may be publication bias, as shown in Fig. 8.





**Fig. 8:** Funnel diagram of bias detection. Note: the outcome index is as follows: A. waiting time; B. accuracy of disease judgment; C. rescue success rate; D. patient satisfaction.

### Sensitivity analysis

Based on the analysis of the above data, it can be seen that there may be no heterogeneity in the result data of illness judgment accuracy, rescue success rate and patient satisfaction, and  $I^2$  was all 0. But, the heterogeneity of the results of waiting time was very large ( $I^2 = 99\%$ ), and any group of data was manually removed for sensitivity analysis. Other studies were excluded one by one, the overall effect value of waiting time did not turn over and the value did not change. It indicated that the research results had good stability, so the references were not excluded for Meta-analysis.

### Discussion

With the continuous improvement of people's need for medical treatment, the rate of medical treatment in large hospitals has been continuously improved. The increase of patients has increased the density of people in various departments of the hospital, and the queuing of medical treatment has become increasingly serious (22).

AP patients are complicated, with different degrees of illness and dynamic changes. Without efficient emergency management, it is easy to miss the best time for diagnosis and treatment, or lead to emergency crowding. In order to get efficient emergency management, emergency nurses need to evaluate patients' condition reasonably and classify them (23). The triage system is used to screen patients' condition preliminarily, so as to adopt the corresponding emergency management scheme according to their actual situation, and ensure that they can complete effective emergency treatment in the shortest time (24, 25). Improving the emergency nursing level of AP has a key impact on saving patients' lives and improving their prognosis (26).

Patients usually hang up and wait for a doctor in light of the normal procedure in conventional emergency nursing methods (12, 15, 16). Nurses generally observe patients' vital signs, and evaluate their condition according to their own nursing experience. At the same time, they know the basic information of patients' allergy history,

medical history, etc. If necessary, they can take other auxiliary tests, such as blood glucose measurement, etc., and divide patients into three cases: general emergency and critically ill patients who will be rescued immediately, and general emergency patients who will wait for a doctor. According to the results of emergency triage, patients were given different diagnosis and nursing, such as general and critical emergency.

The graded emergency nursing method requires emergency nursing staff to grade based on patients' illness degree, which is generally divided into 4-5 grades according to CTAS standard or Standardized Process of Hospital Emergency Department promulgated by the Ministry of Health of China. Patients with different grades are treated or waiting in different areas (9, 21). In addition, we should pay close attention to the changes of their condition, and adjust the grading and zoning at any time. Meanwhile, it is necessary to keep the rescue channel unblocked, open a green channel for sudden and critical patients, and strive for the maximum rescue time for them. Then, the graded emergency nursing team needs regular professional training, and is familiar with the process of each link and the area of each department. So, triage, waiting and rescue in each department are in an orderly manner, which is beneficial for nursing staff to carry out targeted monitoring and nursing for patients with different degrees of illness and ensure nursing effect (13, 15-17, 21). Besides, the emergency nursing staff should also explain the related disease knowledge to patients, so as to let them know the causes and precautions of the induced diseases, eliminate their bad emotions, and improve the cooperation degree of treatment, thus improving the treatment effect (11).

Graded emergency nursing method requires higher nursing ability, and timely, effective and rapid emergency nursing for patients according to reasonable and efficient grading and zoning methods. AP develops rapidly, and every minute counts. Shortening the waiting time can win precious rescue time for patients and improve the success rate of rescue to a certain extent. Meta-analysis further shows that graded emergency

nursing mode can shorten waiting time, provide precious time for emergency treatment and improve treatment effect. Emergency nurses can judge the illness quickly and correctly, which can improve the success rate of first aid and increase the satisfaction of patients.

## Conclusion

Graded emergency nursing for AP patients is more effective than conventional emergency nursing, with clinical application value.

## Ethical considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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## Conflict of interest

The authors declare that there is no conflict of interest.

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