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Application and Effectiveness of Modified Early Warning Score (MEWS) in Emergency Triage

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Abstract: *Objective:* To explore the application and effectiveness of the Modified Early Warning Score (MEWS) in emergency triage and evaluate its impact on triage efficiency and accuracy. *Methods:* A total of 6,000 patients who visited the emergency department between February 2023 and July 2024 were selected and randomly divided into the observation group and the control group, with 3,000 patients in each group. The observation group used MEWS for triage, while the control group adopted the traditional experience-based triage method. The triage time and accuracy were recorded and compared between the two groups. *Results:* The triage time of the observation group was significantly shorter than that of the control group (0.84 ± 0.21 min vs. 1.42 ± 0.35 min, $t = 6.54$, $P < 0.01$). The triage accuracy of the observation group was 98.67% (2,960/3,000), significantly higher than the control group's 93.33% (2,800/3,000, $\chi^2 = 5.95$, $P < 0.05$). *Conclusion:* MEWS significantly improves triage efficiency and accuracy in emergency triage, providing an effective tool for optimizing emergency resource allocation, reducing patient wait times, and ensuring patient safety. It has high clinical application value. Further research is needed to validate its effectiveness in multi-center and large-sample studies and to explore its integration with intelligent technologies.

Keywords: Modified Early Warning Score; Emergency triage; Triage efficiency; Triage accuracy

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1. Introduction

In the emergency department, timely and accurate assessment of a patient's condition is crucial for ensuring patient safety and optimizing the allocation of medical resources. The Modified Early Warning Score (MEWS), a scoring tool based on physiological parameters, quantifies abnormalities in vital signs, providing an effective method for the rapid identification of critically ill patients [1].

In recent years, the application of MEWS in emergency triage has garnered increasing attention due to its significant role in improving triage accuracy, reducing emergency waiting times, and optimizing medical

workflows. This study aims to evaluate the effectiveness of MEWS in emergency triage and provide scientific evidence for improving emergency management.

2. Materials and methods

2.1. General information

Between February 2023 and July 2024, 6,000 emergency department patients were selected as study participants using a random number table method. The patients were divided into an observation group and a control group, each with 3,000 participants.

Inclusion criteria: (1) Age ≥ 18 years; (2) Presentation to the emergency department due to acute illness or sudden events; (3) Ability to complete assessments and follow-up for this study; (4) Complete clinical data and vital signs monitoring; (5) Informed consent from the patient or their family members.

Exclusion criteria: (1) Patients unable to participate due to mental disorders or cognitive impairments; (2) Pregnant or breastfeeding women; (3) Patients previously involved in similar studies; (4) Patients with incomplete clinical data or those who withdrew during the study for any reason.

In the observation group, there were 81 males and 69 females, with ages ranging from 18 to 75 years (mean age: 46.32 ± 12.18 years). The duration of illness ranged from 0.5 to 48 hours (mean: 10.54 ± 4.32 hours). The main complaints included chest pain (34 cases), abdominal pain (46 cases), and dyspnea (28 cases).

In the control group, there were 83 males and 67 females, with ages ranging from 19 to 74 years (mean age: 45.87 ± 11.96 years). The duration of illness ranged from 0.5 to 47 hours (mean: 10.68 ± 4.19 hours). The main complaints included chest pain (31 cases), abdominal pain (48 cases), and dyspnea (30 cases). There was no significant statistical difference in baseline characteristics between the two groups ($P > 0.05$).

2.2. Methods

2.2.1. Observation group

Patients in the observation group underwent emergency triage using MEWS. MEWS evaluates vital signs (e.g., respiratory rate, heart rate, blood pressure, body temperature) and consciousness level to systematically assess patient conditions and provide early warnings for high-risk patients [2]. Specific measures included:

(1) Standardized assessment: Triage nurses used MEWS to quickly score patients and comprehensively assess the severity of their conditions [3].

(2) Triage optimization: Based on MEWS scores, high-risk patients were prioritized for further examinations or treatments to ensure timely interventions.

(3) Dynamic monitoring: Patients with high scores were tracked and reassessed dynamically to adjust triage and treatment strategies promptly [4].

The emergency triage MEWS scoring table was developed using the Delphi method [5-7], as shown in **Tables 1** and **2**. The reliability and validity of the scoring table were 0.864 and 0.892, respectively, meeting the required standards.

2.2.2. Control group

Patients in the control group underwent traditional emergency triage, primarily relying on the nurse's clinical judgment. Specific measures included:

(1) Chief complaint evaluation: Assessing the patient's condition based on their chief complaint and basic vital signs.
(2) Experience-based triage: Assigning priority levels and arranging appointments based on the initial assessment results [8].
(3) Dynamic monitoring: Continuously tracking patients' conditions and readjusting triage and treatment strategies as necessary.

Table 1. Emergency triage Modified Early Warning Score (MEWS)

Score	5	3	2	1	0	1	2	3	5
Temperature (℃)			< 35.0		35.0–38.4		> 38.4		> 41
Respiration (breaths/min)			< 9		9–14	15–20	21–29	≥ 30	
Heart rate (beats/min)	< 40			41—50	51–100	101–111	112–129	≥ 130	> 180
Systolic blood pressure (mmHg)	< 70		70–80	81–100	101–199				≥ 200
AVPU score					A	V	P	U	
SPO_2 (oxygen saturation, %)	< 80	≤ 84	85–89	90–95	96–100				
Blood glucose (mmol/L)	< 3.3			3.4–3.8	3.9–6.1				> 6.2

Abbreviation: AVPU, alert voice pain unresponsive.

Table 2. MEWS scores

MEWS score	Classification	Zone	Vital sign monitoring frequency	Intervention
0–1 points	Non-urgent (Level IV)	Green	Once per 8 h	No special treatment, wait in the general area
2 points	Sub-acute (Level IV)	Green	Once per 4 h	No special treatment, wait in the general area
3–4 points	Urgent (Level III)	Yellow	Once per 1 h	Observation in the observation area, establish intravenous access
5–9 points	Severe (Level II)	Orange	Once per 15–30min or anytime	Transfer to the resuscitation room for treatment
> 9 points	Critical (Level I)	Red	Once per 5 min or anytime	Immediate transfer to the resuscitation room for treatment

2.3. Observation indicators

(1) Triage time: The time taken for patients to complete triage from their arrival at the emergency department was recorded, and the differences between the observation and control groups were compared [9].
(2) Triage accuracy: The consistency between the actual condition severity and the triage classification was calculated to evaluate the accuracy of the triage methods [10].

2.4. Statistical analysis

Data analysis was performed using SPSS 25.0 software. Measurement data were expressed as mean ± standard deviation (SD) and compared between groups using an independent sample *t*-test. Count data were expressed as frequency and percentage, and comparisons between groups were conducted using the chi-squared (χ^2) test. A significance level of $P < 0.05$ was considered statistically significant.

3. Results

3.1. Triage time

The triage time for the observation and control groups was recorded and compared, as shown in **Table 1**.

Table 1. Comparison of triage time (mean ± SD)

Group	Triage time (min)
Observation group	0.84 ± 0.21
Control group	1.42 ± 0.35
t	6.54
P	< 0.01

3.2. Triage accuracy

The triage accuracy for the observation and control groups was recorded and compared, as shown in **Table 2**.

Table 2. Comparison of triage accuracy [n (%)]

Group	Triage accuracy
Observation group	2,960 (98.67)
Control group	2,800 (93.33)
χ^2	5.95
P	< 0.05

4. Discussion

The results of this study demonstrate that the application of the MEWS significantly improved both the efficiency and accuracy of emergency triage, playing a key role in enhancing the quality of emergency patient management.

The findings indicate that the triage time for patients in the observation group was significantly shorter than that of the control group (0.84 ± 0.21 min vs. 1.42 ± 0.35 min, $t = 6.54$, $P < 0.01$), suggesting that the introduction of MEWS effectively reduced the triage process time. This improvement may be attributed to the quantitative scoring method of MEWS, which enables triage nurses to assess patient conditions quickly without relying on subjective judgment [11]. Additionally, MEWS incorporates graded warnings and color coding, simplifying complex decision-making processes and reducing the impact of human factors on triage efficiency. Compared to traditional methods, MEWS provides greater efficiency in information integration and decision support, consistent with findings from related studies [12]. Previous literature [13] indicates that the application of early warning scoring tools can significantly improve triage efficiency in emergency departments, thereby saving valuable time for patient treatment, which is especially critical for high-risk patients.

However, while triage time was reduced, it is important to avoid over-reliance on the tool at the expense of comprehensive patient assessment. Triage nurses should combine clinical experience with the use of the scoring tool to ensure its accuracy and flexibility.

The triage accuracy of the observation group was 98.67% (2,960/3,000), significantly higher than the 93.33% (2,800/3,000) in the control group ($\chi^2 = 5.95$, $P < 0.05$). This result demonstrates that MEWS not only improves efficiency but also significantly enhances triage accuracy. This advantage may stem from MEWS's multidimensional quantitative metrics, such as body temperature, heart rate, blood pressure, and consciousness level, which comprehensively reflect the severity of a patient's condition and reduce triage errors [14].

Despite these improvements, a small number of triage errors still occurred in the observation group. This may be attributed to the following factors:

(1) Limitations of the tool itself: Certain hidden conditions may not be detected through abnormalities in vital signs.

(2) Variations in nurses' understanding and application of the scoring standards: Individual differences among nurses may affect triage outcomes [15].

To further improve triage accuracy, future efforts could focus on more comprehensive training for nurses and the incorporation of additional assessment tools (e.g., NICE guidelines) to optimize the triage process.

The findings of this study validate the practicality of MEWS in emergency triage, providing new technical support for optimizing emergency management. By simplifying triage workflows, MEWS improves triage efficiency, particularly under conditions of limited emergency resources. It also ensures patient safety and enhances rescue success rates. Furthermore, the improved accuracy of MEWS provides a scientific basis for the early intervention of critically ill patients, ultimately improving clinical outcomes.

However, the widespread application of MEWS faces several challenges, including enhancing nurse training, refining scoring parameters, and further validating its applicability in various emergency scenarios. Additionally, integrating MEWS with artificial intelligence technologies to achieve automated and intelligent scoring could further enhance triage efficiency and accuracy—an avenue worth exploring in future research.

This study was conducted at a single center with a limited sample size, which restricts the generalizability of the results. Moreover, the study did not follow up on patients' long-term outcomes. Future research should involve multi-center, large-sample studies to further verify the effectiveness of MEWS and explore its impact on atypical and complex conditions to ensure more comprehensive and precise triage outcomes.

5. Conclusion

In conclusion, the application of MEWS in emergency triage significantly improves triage efficiency and accuracy, providing a scientific foundation for optimizing emergency resource allocation and ensuring patient safety. Future studies should focus on multi-center research and technological advancements to further promote its clinical application.

Disclosure statement

The author declares no conflict of interest.

References

[1] Lai C, Fang Y, Zhang Y, 2021, Application of Modified Early Warning Score in Emergency Triage. J Gannan Med Univ, 41(7): 712–714.

[2] Zhang G, Gesang Y, Yan S, et al., 2023, A Bibliometric and Visualized Analysis of Research Status on Critical Illness Scores in Emergency Triage in China. Chin J Emerg Resusc Disast Med, 18(11): 1474–1477.

[3] Luo X, Liu C, Cao M, 2023, Comparative Study on the Application of Two Early Warning Scoring Systems Combined with a Green Pathway in Emergency Triage. Nurs Integr Tradit Chin West Med (Chin Engl), 9(10): 148–150.

[4] Zhuang T, Pan Y, 2023, Application of a Modified Early Risk Warning Scoring System for Triage of High-Risk Pregnant Women. J Clin Nurs, 22(5): 20–22.

[5] Jin J, Chen S, Zhang M, et al., 2016, A Study on the Development of Standards for Emergency Triage Classification. Chin J Emerg Med, 25(4): 527–531.

[6] Emergency Medicine Committee of the Chinese Nursing Association, Zhejiang Emergency Medicine Quality Control Center, 2016, Standards for Emergency Triage Classification. Chin J Emerg Med, 25(4): 415–417.

[7] Shi D, Liu X, Zhou Y, 2018, Expert Consensus on Emergency Triage. Chin J Emerg Med, 27(6): 599–604.

[8] Han Z, 2019, Effect of Improved Early Warning Scoring System on Pre-detection Triage of Emergency Patients with Chest Pain. J Cardiovasc Dis Integr Chin West Med, 7(11): 182.

[9] He G, Zhong Y, Tian X, et al., 2018, Application of Improved Early Warning Score in Pre-detection Triage of Emergency Trauma Patients. Clin Med Res Pract, 3(33): 147–148 + 155.

[10] Du L, 2018, Application of Improved Early Warning Scoring System in Domestic and Foreign Hospitals. Gen Pract Nurs, 16(32): 3997–4000.

[11] Shao Y, 2018, Application of Improved Early Warning Scoring System in Pre-detection and Triage of Pregnant Women. Electron J Pract Clin Nurs, 3(35): 146–147.

[12] Li X, Liu C, Wang Y, et al., 2018, Application of Improved Early Warning Score in Emergency Pre-detection Triage. Chin J Contin Med Educ, 10(22): 75–77.

[13] Jian Y, Zhu X, Wang H, et al., 2018, Application of Improved Early Warning Score in Pediatric Emergency Triage. Chin J Emerg Resusc Disast Med, 13(1): 97–98.

[14] Song X, Liu X, Long X, 2017, Effect of Improved Early Warning Scoring System on Pre-detection Triage of Emergency Patients with Chest Pain. J Pract Clin Med, 21(22): 19–21.

[15] Zhu X, Wang H, Jian Y, 2017, Application of Improved Early Warning Score in Emergency Pre-detection Triage. Shanghai Nurs, 17(4): 82–84.