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The Latest Research Progress in the Application of MEWS Scoring System in Clinical Nursing

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Abstract: This paper summarizes the background of the formation of the Modified Early Warning System (MEWS) evaluation system, its current status of clinical teaching applications in different fields of hospitals, and its significance on the medical and nursing career, aiming to provide specific theoretical basis for medical staff and lay a foundation for continuing to carry out related work on MEWS.

Keywords: MEWS scoring system; Clinical nursing; Application progress

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1. Introduction

Clinical medical research has found that some patients only have superficial remission and no obvious abnormal changes in specific vital signs. If there is a sudden disorder of clinical parameters, the nurse in charge cannot respond in time, or inappropriate nursing will delay the best time for treatment, and even lead to critical illness as well as greatly increased mortality. Therefore, how to timely, accurately, quickly, and effectively predict the risk of lesions, increase survival rate of patients and maintain organ functions to the maximum extent has become a popular research topic for many experts and scholars.

Many domestic researchers have proposed a variety of disease assessment systems, among which the MEWS scoring system is more practical and feasible. It is well-recognized and widely used in pre-hospital first aid and transport, emergency patient rescue, prognosis prediction of critically ill patients, and many other departments. This article summarizes the actual application status and existing problems of MEWS scoring system in clinical nursing and strives to provide reference for clinical nursing to carry out MEWS-related research work.

2. Overview of the MEWS scoring system

The MEWS scoring system originated in the United Kingdom at the end of the 20th century, where there was a sudden shortage of medical supplies, many critically ill patients were dying, and there was a serious shortage of intensive care unit beds that could not meet the needs of treatment. Forced delay, failure to properly resettle and effectively monitor and rescue patients in time caused serious adverse consequences and accidents [1]. In order to improve this situation, Morgan [2] proposed the early warning scoring (EWS) system, which was created to improve the early and rapid monitoring and judgment of the severity and life cycle of critically ill patients for medical staff to provide early, rapid, and reasonable medical intervention. This system is composed of the patient's vital signs and consciousness assessment parameters, that is, to

judge and score five signs including respiratory rate, body temperature, heart rate, mental state, and systolic blood pressure. In 2001, after many clinical studies [3], based on the specific implementation situation and clinical practice of EWS, Subbe *et al.* of the Norfolk and Norwich University Medicine Hospital comprehensively combed and revised the body temperature parameters, that is, the ranges corresponding to each score, and proposed a modified early warning score (MEWS). In the same year, the British National Health Service (NHS) approved the MEWS system and formally stipulated it as a method for medical institutions to assess the condition. Subsequently, the British Intensive Care Association and the Royal College of Physicians of London further improved and popularized it. It is currently widely used in the assessment of disease risk [4] and has achieved positive results.

China's medical system and resource allocation are quite different from those of Western countries such as the United Kingdom. Since MEWS was gradually introduced into China, many domestic scholars [5] have added physiological monitoring indicators and specialized medical indicators based on MEWS according to the characteristics of the patients. The indicators covered can be easily observed and quickly measured, and they can be dynamically recorded and analyzed in real time to further optimize the scoring accuracy and sensitivity. This system is widely used in intensive care units, emergency departments, gastroenterology, cardiology, and other fields according to their needs.

3. Clinical application of MEWS system

At present, the MEWS system has mostly become a fundamental tool in clinical practice for the prognosis of critically ill patients, evaluation tool for hospital emergency personnel, the diversion of pre-examination and triage personnel, postoperative patient transfer, and guidance for clinical nursing work. Some research projects have added relevant parameters and indicators for improvement and joint application with reference to its own characteristics and assignments, resulting in a system that is more suitable for the evaluation of the condition of critically ill patients in China.

4. The application of MEWS system in the transfer of patients in the hospital

When a patient is being transferred in the hospital, the prognosis of the patient can be well improved if they are well monitored and given adequate support, therefore reducing unpredictable risk factors and various types of conditions, and ensure that there is no worsening of the patient's condition to the greatest extent. In 2020, Li [6] studied the application value of MEWS score in the transfer of emergency patients. On the basis of routine assessment methods to guide transfer of emergency patients, MEWS score was used to guide transfer by risk assessment. The research found that the application of the MEWS score can reduce the occurrence of adverse events in the transfer of emergency patients, shorten the waiting time for examination and the time required for transfer, promote the recovery of the disease, improve the satisfaction of patients and their families, and reduce medical disputes, indicating that MEWS comprehensively improved the safety of transfer of emergency patients and is worthy of promotion and application in clinical practice. In 2021, Qi [7] constructed a grading scheme for postoperative patient transport in the hospital based on the modified MEWS score and its application research. The control group was transported according to the traditional method, and the experimental group was transported based on the traditional method, and escorted the patients according to the graded scheme of post-anesthesia transport that is constructed based on the modified MEWS score. During the experimental period, the incidence of medical adverse events decreased from 29.66% to 10.34%, $P < 0.05$; the scores of medical-nurse cooperation in the control group and the experimental group were (97.10 ± 5.58) points and (101.90 ± 1.93) points, respectively, with $P < 0.05$. The results show that the grading scheme for in-hospital transfer of postoperative patients based on the modified MEWS score can reduce the occurrence of adverse events, facilitate cooperation between medical staff, thereby improving transfer efficiency, and better guide clinical

treatment significantly. In 2021, Zhong *et al.*[8] discussed the application effect of MEWS in the safe transport of patients with acute ST-segment elevation myocardial infarction (STEMI). The control group and the observation group were transported by conventional transport measures and in-hospital transport by the MEWS scoring system, respectively. The results of this study showed that the incidence of adverse events in the control group was 18.18%, which was higher than that in the observation group (2.27%); while the patient satisfaction rate in the control group was 75.00% lower than that in the observation group (97.73%), $P < 0.05$. It can be concluded that the application of the MEWS scoring system in the safe transfer of acute STEMI patients in the hospital has achieved good results, played a significant role in reducing the incidence of adverse events in patients, and is crucial in improving patients' satisfaction with nursing services, which is worthy of clinical application.

5. Application of MEWS system in early warning and monitoring of patients' condition

In 2020, Ma [9] studied the clinical effect of modifying the MEWS early warning and monitoring plan for patients after general anesthesia in general surgery on the basis of implementing doctor's orders and graded nursing standard condition monitoring. The results found that the incidence of nursing adverse events in the control group was 13.3%, which was 3.3% higher than that in the experimental group, while the nursing satisfaction of the control group was 35.7%, which was 88.2% lower than that of the experimental group the postoperative hospitalization time of the control group was (13.85 ± 7.274) days, which was longer than that of the test group (11.02 ± 4.090) days, with $P < 0.05$. It can be concluded that the application of MEWS can accurately identify and dynamically monitor the condition, and reduce the risk of adverse nursing events, and improve the effective utilization of medical resources. In 2021, Zhuang *et al.* [10] discussed whether the application of MEWS can early identify the dynamic changes in the condition of potentially critically ill patients. It was found that the MEWS score was significantly correlated with the severity of the patient's condition ($r = 0.864$, $P < 0.001$), that is, as the MEWS score increases, the severity of the patient's condition also increases. It shows that the MEWS scoring system can help medical staff to quantify and digitize the vital signs of emergency patients, so as to objectively and effectively identify potentially critical patients, and provide data basis and early warning support for early implementation of nursing and treatment.

In 2021, Yu *et al.* [11] compared the predictive value of the modified early warning score (MEWS) and the revised trauma score (RTS) in emergency trauma patients who died within 24 hours. The results showed that the area under the curve (AUC) of MEWS was significantly bigger than that of RTS: 0.927 [95%CI (0.914, 0.939)] vs 0.799 [95%CI (0.779, 0.817)], which means that MEWS has a better predictive effect. In 2021, Bhatnagar et al. [12] used the MEWS to predict the inpatient outcomes of emergency patients. The results showed that in patients with 24-hour MEWS ≥ 5, AUC = 0.9 [95% CI (0.95, 0.98)], with a sensitivity of 78%, and a specificity of 94%, which means that it is an effective predictor of in-hospital mortality, and can identify the risk of clinical deterioration in medical emergencies and allow timely intervention.

6. Application of MEWS system in patient prognosis prediction

In 2021, Hu *et al.* [13] conducted a series of studies on the short-term prognosis of patients with upper gastrointestinal bleeding using MEWS. Patients were divided into low-risk group (MEWS ≦ 5) and high-risk group (MEWS > 5) according to the MEWS risk stratification criteria. The results showed that the in-hospital mortality rate of patients in the low-risk group was 5/166 (3.01%), and the high-risk group was 8/26 (30.76%). The difference between the two groups was significant, indicating that the application of the MEWS score in patients with acute high-risk upper gastrointestinal bleeding can effectively identify and detect the severity of the patient's condition in time, and it can be used as an effective tool for predicting the dynamic changes of the patient's condition. In 2021, Yao *et al.* [14] explored the predictive value of the MEWS in short-term prognosis in 120 patients with cardiogenic chest pain, and divided them into a good

prognosis group (105 cases) and a poor prognosis group (15 cases) according to follow-up outcomes. The sensitivity of MEWS score in the poor prognosis group was 100.00%, and the specificity was 94.00%. Through Logistic regression analysis, the main risk factors for poor prognosis were C-reactive protein and MEWS score. It shows that the MEWS score for patients with emergency cardiogenic chest pain can provide a reliable basis for predicting the short-term prognosis. In 2021, Amena Khan *et al.* [15] applied the modified early warning score (MEWS) to the prognosis of acute pancreatitis in order to predict its severity. The results showed that the highest MEWS (hMEWS) score > 2, and the average of all scores on the day (mMEWS) > 1.2 was the most accurate in predicting severe acute pancreatitis, and these findings were more accurate than previous studies.

7. Application of MEWS system in emergency nursing of patients

In 2021, Liu *et al.* [16] studied the effect of integrated emergency care under the guidance of the modified early warning score (MEWS) for patients with acute myocardial infarction (AMI). The control group received routine nursing, and the observation group received integrated emergency nursing under the guidance of MEWS on the basis of routine nursing. The study found that the application of integrated emergency nursing under the guidance of MEWS can significantly improve success rate of emergency treatment and rescue, shorten the rescue time of patients with acute myocardial infarction, reduce the severity of complications, and provide a reliable basis for nursing decision-making, thereby improving nursing intervention effect. In 2020, Roney *et al.* [17] implemented a modified MEWS sepsis screening tool to facilitate early identification and implementation of time-sensitive interventions to prevent sepsis-related deaths. The results showed an immediate 24% reduction in monthly risk-adjusted sepsis mortality following the implementation. Since the implementation of the modified MEWS system, the death rate of sepsis has continuously declined for 5 years. In 2021, Kim et al. [18] compared the modified early warning score (MEWS) with the other three scales in predicting in-hospital mortality in patients with traumatic brain injury. The results showed that the AUC of injury severity score (ISS), revised trauma score (RTS), shock index (SI), and MEWS scores were 0.638, 0.742, 0.524, and 0.799, respectively, so MEWS performed well in predicting in-hospital mortality of traumatic brain injury patients.

8. Significance of MEWS system to clinical nursing work

In 2021, Li et al. [19] discussed the effect analysis of the application of MEWS in the nursing of neurological rehabilitation patients. The results of this experiment showed that the incidence of complications (6.00%), nursing risk (4.00%), and nurse-patient disputes (4.00%) in the study group were all lower than those of the control group which was 22. 00%, 20. 00%, and 24. 00%, respectively, and the nursing satisfaction of the research group (96. 00%) was higher than that of the control group (82. 00%), with $P < 0.05$. The results show that the application of the MEWS system in the nursing intervention of patients' neurological rehabilitation reduces the risk of neurological damage and the occurrence of nursing adverse events, improves the nursing effect, effectively promotes the improvement of the patient's prognosis, and improves the patient's satisfaction. In 2021, Yang et al. [20] discussed the effect of nursing intervention guided by the early warning score (MEWS) on the prognosis of patients with acute left heart failure. The heart failure markers serum brain natriuretic peptide (170.83 ± 12.07) and AngII (108.20 ±8.55) levels in the experimental group were significantly lower than those in the control group (239.44 ± 17.64), (126.29 ± 10.42), and the acute physiology and chronic health evaluation (APACHE) II score (10.37 ± 2.77) was significantly lower than that of the control group (16.29 ± 3.70). Therefore, nursing intervention guided by MEWS can help patients with acute left heart failure identify potential risks, eliminate potential safety hazards, and reduce the risk of adverse events, thereby effectively improving patients' cardiac function and nursing quality.

9. Combined application of MEWS system with other scoring systems

In 2022, Qiu et al. [21] discussed the application effect of the MEWS and the situation, background, assessment, recommendation (SBAR) communication model to establish a disease early warning system in orthopedic patients. The routine group used the traditional monitoring and reporting method for management and handover, while the research group used the MEWS monitoring program combined with the SBAR model for management. The incidence of adverse events in the research group (6.98%) was significantly lower than that of the routine group (27.27%, $P < 0.05$), and the time for disease assessment (46.92 ± 1.46) and response time (1.26 ± 0.33) in the research group were shorter than those of the routine group (57.73 ± 0.33), (3.22 ± 1.01); the nursing satisfaction in the research group was 95.35%, which was higher than 79.55% in the routine group ($P < 0.05$). It was found that the application of MEWS score and SBAR communication model early warning system in orthopedic patients can effectively prevent adverse events, thereby improving patient satisfaction with nursing work. In 2022, Li *et al.*[22] discussed the application of MEWS combined with APACHE II in evaluating the prognosis of patients with multiple traumatic fractures. The transfer rate of 106 patients with multiple traumatic fractures to ICU was 26. 42% (28/106). With the increase of MEWS score and APACHE II score, the transfer rate of patients with multiple traumatic fractures increased significantly. The results showed that both MEWS score and APACHE II score could effectively predict the condition of patients with multiple traumatic fractures, but the combined assessment of the two had higher accuracy and diagnostic value, making the results more credible.

10. Conclusion

MEWS scoring system has received much recognition in domestic and foreign studies, and its application is relatively mature. It will not be affected by the conditions of instruments and equipment used, so it can be implemented in hospitals of different levels. Through the MEWS system, the patient's condition can be accurately assessed at an early stage, critically ill patients and potential risks can be identified, and intervention measures can be taken in time. In the busy nursing work, the nurses can focus on each patient, make better observations, make a more targeted nursing plan, and achieve better nursing effects. It improves the cooperation among medical staff and the satisfaction of patients and family members. Hence, it is a scoring system with strong feasibility and operability, and it is worthy of being widely promoted and applied in related research.

At this stage, the MEWS scoring system is less studied in the teaching of intern nursing students. *Mao et al.* [23] investigated the status quo of knowledge, belief, and practice of clinical intern nurses on the modified early warning scoring tool, and the results showed that 86.4% of the nursing students scored badly in terms of knowledge. It shows that intern nursing students lack knowledge related to MEWS scoring; and 74.0 % of nursing students' do not strictly follow general protocols, indicating that there is inadequate patient care. Therefore, improve the clinical teaching of early warning evaluation system needs to be further improved to make it more suitable for nursing interns. In addition, due to the rapid development of information technology, the MEWS evaluation system cannot keep pace with the development of information technology. Many research results still use the paper version of the evaluation method, and the measured vital sign data cannot be automatically uploaded to the electronic system in real time. The system makes it impossible to dynamically grasp the patient's condition development firsthand, and the popularization and use of the information development system in China still needs further discussion and in-depth research. In order to overcome the shortcomings of the MEWS evaluation system, it is still necessary to continuously improve the MEWS evaluation system in the clinical practice of multi-center large samples.

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