Effective Evaluation of Nursing Intervention Based on Pediatric Early Warning Score for Pediatric Patients in the Respiratory Department

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Objective. This study evaluated the impact of nursing intervention based on the Pediatric Early Warning Score (PEWS) on pediatric patients. Methods. A retrospective analysis was performed on 120 children admitted to the pediatric respiratory unit of Anhui Children’s Hospital, and they were randomly and equally assigned to the observation group (PEWS-based nursing intervention) and the control group (usual care). The following parameters were compared: incidence of unplanned admissions to the pediatric intensive care unit (PICU), disease progression, average hospitalization days, hospital costs, time required for nursing assessment and management, nursing record error rate, and medical satisfaction. Results. The incidence of unplanned admissions to PICU and disease exacerbations, mean hospital days and hospital costs were significantly lower in the observation group than in the control group ($P < 0.05$). Compared with the control group, the observation group had lower nursing care time, time to assess the disease, and an error rate in writing the entire nursing record. In addition, the accuracy rate of nurse assessment and the satisfaction rate of doctors and nurses in the observation group were significantly higher than those in the control group ($P < 0.05$). Conclusion. The PEWS-based nursing intervention not only reduced the unplanned admission rate, the incidence of disease worsening, and the average number of hospital days and hospital costs in the PICU but also accelerated the recovery process of pediatric patients in the respiratory unit. Meanwhile, PEWS-based nursing interventions can effectively improve nursing efficiency and medical care satisfaction.

1. Introduction

In children, the respiratory system is not fully developed, the airways are narrow, the number of alveoli is less, the ability to regulate breathing is poor, and infections are more likely to cause airway obstruction and lead to respiratory failure [1]. Although children have better compensatory mechanisms than adults, when their compensatory capacity is overwhelmed, their disease deteriorates almost immediately, severely affecting their survival and prognosis [1, 2]. Disease progression and death in hospitalized children is predictable and preventable, and clinical deterioration usually occurs before 24 hours of physical change. The care and treatment of critically ill children in respiratory medicine is a particular challenge, and the difficulty in identifying the severity of disease and the inability to correctly measure and interpret signs is a current challenge in this field [3]. Therefore, it is important to systematically assess the child, highlight the characteristics of nursing care for the respiratory child, and identify the critically ill child in a timely manner [4]. Whether in the emergency room or in the inpatient/general ward, many patients, especially pediatric patients, have more unpredictable disease transitions that can change or progress at any time. Therefore, early identification of patients with critical or potentially deteriorating conditions, early triage, and timely intervention are necessary. However, at present, the judgment of the degree of criticality of patients attending medical institutions depends largely on personal subjective experience and intuition, resulting in the inability to correctly identify and timely handle critically ill/potentially...
critically ill patients, resulting in medical pitfalls and even disputes. Therefore, there is a need to use some objective
criteria for early warning of health care workers and timely
detection of critical illnesses or potentially critical illnesses in
clinical work. Various assessment methods have been ap-
p lied in clinical practice, and those commonly used at home
and abroad include the Acute Physiology and Chronic
Health Score (APACHE), simplified acute physiological
parameters score (SASP), and the probability of death model
(MPM). However, these scoring systems test numerous
items, take a long time to perform, are difficult to assess
and intervene quickly in patients, and are hardly applicable
to pediatric patients. The Pediatric Early Warning Score
(PEWS) is a scoring system that identifies clinical deterio-
ration in children. It uses bedside parameters for scoring,
does not require complex and expensive equipment, is
simple to perform, easy to implement, and is objective and
efficient [5]. It is widely used abroad for early warning and
monitoring of critically ill or potentially critically ill patients
in the emergency room or in the inpatient/general ward,
while it is still in an almost blank state in China. This study
intends to analyze whether PEWS-based interventions can
improve the care of children in respiratory units.

2. Research Methodology

2.1. Clinical Data. A total of 120 children, including 62
males and 58 females, who were diagnosed and treated in the
Department of Respiratory Medicine of Anhui Children’s
Hospital from January to December 2021 were equally and
randomly assigned into the observation group and control
group based on the method of random number table. In-
clusion criteria: ① age <14 years old; ② first hospitalization
in the respiratory department of our hospital; ③ complete
clinical data. Exclusion criteria: ① this score does not in-
clude the assessment of delivery, so neonates aged 0–28 days
are excluded; ② children who are transferred to the pediatric
intensive care unit (PICU) within 24 hours admission; ③ children or family members cannot cooperate to complete
the experiment. This study has been approved by the ethics
committee of our hospital, and informed consent was
obtained.

2.2. Intervention Methods. The control group received
routine care and disease observation: monitoring the child’s
body temperature, blood pressure, heart rate, and respira-
tion; recording the child’s consciousness, changes in the
skin, oral cavity, and eyelid mucosa; and keeping the oral
cavity clean. When the child’s physiologic indicators were
abnormal, the nurse reported it to the doctor, who issued a
medical prescription that the nurse carried out. All medical
staff in the observation group attended a 2-hour training
session before implementation. Based on the control group,
the observation group identified and resuscitated children
with deteriorating conditions according to PEWS, as shown
in Table 1. The PEWS consisted of three dimensions: be-
behavioral awareness, cardiovascular system, and respiratory
system. It provides reliable information for clinical nurses to
quickly, objectively, and accurately assess the condition of
children [6]. Each dimension is assigned a score of 0 to 3, and
PEWS is the sum of the scores of the three dimensions. The
higher the points, the more serious the disease [7]. PEWS
total score 0–1 points: no treatment, continue to observe; 2
points: notify the responsible nurse to use PEWS for con-
tinuous monitoring, consider whether there are symptoms
such as pain and fever, and calculate the fluid balance and
urine output; 3 points: evaluate at least every 24 hours, based
on 2 points, dynamically evaluate, observe the child and
notify the specialist nurse; 4 points: evaluate at least every 8
hours, notify the doctor or resident doctor on duty, and
prepare for transfer; >4 points, score increase >2 points,
single score 3 points: The evaluation is performed every 4
hours, and the general inpatient and PICU doctors are
 notified to arrive at the scene within 15 minutes, cooperate
with the rescue, and prepare for the transfer.

2.3. Evaluation Indicators. Children’s clinical variables and
demographic data were obtained from records. The inci-
dence rates of unplanned admission to PICU and disease
deterioration, average hospitalization days and hospitali-
zation expenses, medical and nursing satisfaction, and error
rate of nursing records were assessed.

Unplanned admission to the PICU was defined as complica-
tions during hospitalization in the general ward of the
child, who was transferred to the PICU for further treat-
ment after consultation with an intensive physician.

Condition deterioration: ① Need mechanical ventila-
tion, including noninvasive ventilation, endotracheal intu-
bation, or tracheostomy; ② Use vasoactive drugs, including
dopamine, dobutamine, epinephrine, norepinephrine, and
isoproterenol or milrinone, etc.; ③ perform cardiopulmo-

nary resuscitation or start extracorporeal membrane oxy-
genation [8].

Nursing job satisfaction. A homemade questionnaire
was used to investigate the satisfaction of nurses and phy-
sicians with nursing care. The questionnaire included three
dimensions: whether the nurses’ observation, judgment, and
reporting of the child’s condition were timely and accurate;
whether the treatment was appropriate; and whether the
medical and nursing cooperation was satisfactory. Each
dimension was divided into 0: very dissatisfied, 1: disas-
satisfied, 2: average, 3: satisfied, and 4: very satisfied. Higher
scores (ranging from 0–12) indicate higher satisfaction.

The time to assess the child’s condition is the time from
the time the nurse detects a change in the child’s condition
to the time of accurate assessment of the child’s condition.
Nursing time was defined as the time it took for the nurse to
perform nursing actions on the child after assessing his or
her condition. The accuracy of the assessment was defined as
the nurse’s decision at the bedside. Whether the assessment
was consistent with the final medical and nursing records.
The evaluation of nursing record writing included, among
other things, that the frequency of recording met the re-
quirements, that the treatment could be accurately recorded
according to medical orders, and that the actual condition of
the child could be reflected in detail. The condition of the

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child and the nursing measures are consistent with the current situation. The nursing records reflect the characteristics of the children in the respiratory department. The sentences are fluent and correctly expressed without typos.

2.4. Statistical Method. SPSS 25.0 software processed data which were displayed as mean ± standard deviation (SD) or the percentage and assessed by t-test or chi-square test. P < 0.05 indicated a significance.

3. Results

3.1. Patients Characteristic. As shown in Table 2, 6 cases out of 120 children dropped out, including 4 cases in the control group and 2 cases in the observation group. Finally, 114 cases were enrolled, including 60 males and 54 females, aged 1–14 years (mean age: 7.17 ± 3.09). There were 58 cases in the observation group and 56 cases in the control group. No significant differences were found between the two groups in terms of age, weight, and gender (P > 0.05).

3.2. Comparison of Hospitalization between the Two Groups. As shown in Table 3, the incidence of unplanned PICU admissions and disease exacerbations, mean hospital costs, and mean hospital days were significantly lower in the observation group than in the control group (P < 0.05).

3.3. Comparison of Processing Time and Satisfaction between Two Groups. As shown in Table 4, the observation group had significantly lower nursing care time and disease assessment time, and higher assessment accuracy and physician-nurse satisfaction than the control group (P < 0.05).

3.4. Comparison of Writing Error Rate of Nursing Records. As shown in Table 5, the observation group had a significantly lower frequency mismatch, time not recorded, inconsistent clinical practice, difficulty in reflecting specialty characteristics, type and misrepresentation than the control group (P < 0.05).

4. Discussion

In clinical work, early and timely assessment of children’s conditions is very important. The Pediatric Critical Care Score (PCIS) is a commonly used method to assess the condition of critically ill children in China, but the score includes up to 10 physiological indicators such as electrolytes and liver and kidney function, which are difficult to apply easily and quickly in clinical work [9]. PEWS typically takes routine physiological measures such as vital signs and laboratory data as input and assesses the risk of clinical deterioration events in children as output [10]. In China, the PEWS score is mainly used in emergency triage as well as in clinical assessment applications in pediatric neurosurgery, respiratory medicine, neurology, and hematology [11–14]. When a child's score exceeds a certain threshold, the nurse alerts the appropriate clinician for further evaluation and intervention. Thus, as a relatively well-established predictive and assessment tool, the PEWS provides an accurate picture of disease prognosis, outcomes, and other indicators. It is suggested that PEWS be widely used as an important part of the assessment of children's condition in pediatric wards [15]

Currently, in clinical work in general pediatric wards, communication between physicians and nurses about diseases is mostly subjective and inaccurate expressions such as “mild, moderate, or severe” [12]. The junior nurses have little clinical experience and insufficient ability to observe the disease, assess dynamically, analyze and solve problems actively [13]. In addition, children's conditions are hidden and change rapidly, and they often can only mechanically carry out medical orders [16, 17]. Using PEWS can improve the communication efficiency of clinical doctors and nurses, especially the independence and self-confidence of junior nurses. PEWS standardizes and quantifies children’s abnormal physiological indicators, which helps medical staff to easily and quickly identify and treat critically ill or potentially critically ill children, facilitates rational allocation of medical resources, and improves the safety of children. Based on the above analysis, this study used children hospitalized in pediatric general wards as the study subjects for early identification and early intervention of critically or potentially critically ill patients. The study showed that the PICU transfer rate, the incidence of disease deterioration, average length of stay, and hospitalization cost of children hospitalized in pediatric general wards were significantly reduced after intervention with the PEWS graded response strategy, as well as higher satisfaction of children’s families and physicians, and the literature was consistent with our results [18].
the PEWS-based nursing documentation method can identify children’s problems in a timely manner and provide effective care in the first instance. It reduced the time to assess and care for the child’s condition, especially for junior nurses, and improved efficiency and avoided delays in treatment due to excessive time.

Nursing documents are medical documents with legal benefits, and they must be written in strict accordance with document writing standards. In this study, after the implementation of the nursing intervention, all nurses were able to write nursing records in a timely manner and in accordance with the frequency of medical orders and also in line with clinical reality, and the overall nursing record writing error rate decreased significantly. (Z) This method improved the timeliness, objectivity, and accuracy of nursing documentation and reduced the work pressure of nurses. (Z) There was still one case of specificity and misspellings and expression errors in the observation group. (Z) This may be due to the fact that the intervention time is still short and individual nurses have not yet mastered the issues. More centers and a large-scale nursing intervention model based on PEWS are needed in the future. These samples were further validated by the experiment.

5. Conclusion

PEWS-based pediatric interventions can not only reduce the number of unplanned PICU admissions, the incidence of exacerbations, the average length of stay, and hospital costs, and accelerate the recovery process of children, but also effectively improve the efficiency of care and medical satisfaction. The main problems faced by pediatric acute and critical care workers now are how to find the most suitable PEWS system and standardize it so that it can be widely accepted; how to implement the PEWS system more effectively and train the corresponding medical and nursing staffs effectively; how to measure those important vital indicators of patients more accurately and record and calculate the scores more systematically. Through unremitting exploration and research, we believe that a unified and more effective PEWS system can be applied in clinical work in the near future.

Data Availability

The data can be accessed upon request from corresponding author.
Disclosure
Lihua Huang and Lemei Cheng are the co-first author.

Conflicts of Interest
The authors declare that there are no conflicts of interest.

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