



EFFECTIVENESS OF THE PEDIATRIC EARLY WARNING SCORE (PEWS) IN IMPROVING TRIAGE ACCURACY AMONG PEDIATRIC PATIENTS IN THE EMERGENCY DEPARTMENT: A SYSTEMATIC REVIEW

Mariam Efendi*, Allenidekania, Mega Hasanul Huda, Ayu Widya Lestari

Department of Pediatric Nursing, Faculty of Nursing, Universitas Indonesia, Jl. Prof. DR. Sudjono D. Pusponegoro, Pondok Cina, Beji, Depok, West Java 16424, Indonesia

*mariyam.efendi51@ui.ac.id

ABSTRACT

Changes in children's health status in the Emergency Department (ED) often occur suddenly, progressively, and are difficult to recognize due to children's limited verbal communication and non-specific clinical manifestations. This condition triggers a high risk of triage errors (mistriage), especially in general EDs, leading to delayed treatment and increased mortality. The Pediatric Early Warning Score (PEWS) assessment system has the potential to be a structured solution to improve assessment accuracy through objective monitoring of physiological parameters. This study aims to evaluate the effectiveness of implementing PEWS in improving triage accuracy for pediatric patients in the emergency department through a systematic review. This study employed a systematic review following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. A comprehensive literature search was conducted across the PubMed, Scopus, ScienceDirect, Cochrane Library, and ProQuest databases for articles published between 2021 and 2025. The search strategy combined Medical Subject Headings (MeSH) terms and keywords, including "Pediatric Early Warning Score" OR "PEWS" AND "pediatric triage" OR "emergency department" OR "clinical deterioration" OR "early detection" OR "hospital admission" OR "critical care" OR "pediatric emergency". Articles were selected according to predefined inclusion criteria, and their methodological quality was assessed using the Joanna Briggs Institute (JBI) Critical Appraisal Tools. A total of 17 articles were included in the review. The findings demonstrated that the implementation of the Pediatric Early Warning Score (PEWS) enhances the early detection of clinical deterioration in pediatric patients and improves triage accuracy in emergency departments. Most studies reported that PEWS has good sensitivity and specificity for predicting the need for critical care admission, thereby facilitating faster and more accurate clinical decision-making. Furthermore, the use of PEWS improves communication among healthcare professionals and enhances pediatric patient safety.

Keywords: emergency department; pediatric early warning score (PEWS); pediatric triage

How to cite (in APA style)

Efendi, M., Allenidekania, A., Huda, M. H., & Lestari, A. W. (2026). Effectiveness of the Pediatric Early Warning Score (PEWS) in Improving Triage Accuracy among Pediatric Patients in the Emergency Department: A Systematic Review. *Indonesian Journal of Global Health Research*, 8(5), 139–148. <https://doi.org/10.37287/ijghr.v8i5.2435>.

INTRODUCTION

Changes in children's health status often occur rapidly and unexpectedly, requiring healthcare professionals to perform prompt and accurate clinical assessments. In the fast-paced emergency department (ED) environment, rapid and precise patient assessment is essential to ensure appropriate clinical decision-making. However, pediatric assessment presents unique challenges because children frequently have limited verbal communication abilities and often exhibit non-specific clinical manifestations. Consequently, triage errors (mistriage) remain common among pediatric patients, particularly in general emergency departments compared with specialized pediatric emergency departments. A recent study reported that children presenting to general EDs were at a significantly higher risk of inaccurate triage classification, emphasizing the need to improve triage accuracy to facilitate early recognition of critical illness and timely clinical intervention (Nicholas Geanacopoulos et al., 2025).

The Pediatric Early Warning Score (PEWS) has been widely introduced as a structured assessment tool designed to facilitate the early identification of clinical deterioration in hospitalized children.

Previous studies have demonstrated that PEWS improves patient monitoring, enhances early recognition of physiological deterioration, and promotes more systematic clinical assessment. Furthermore, implementation of PEWS strengthens communication among healthcare professionals and supports more timely clinical responses to changes in patients' conditions. Nevertheless, the application of PEWS in emergency settings remains inconsistent because of variations in scoring systems, insufficient staff education and training, and the absence of universally accepted implementation standards (Anne Solevåg et al., 2013).

Children admitted to emergency departments or inpatient units are particularly vulnerable to rapid clinical deterioration. Unlike adults, physiological changes in pediatric patients often develop gradually and may initially present with subtle or atypical signs, making early recognition challenging. Delayed identification of clinical deterioration may result in increased admission to pediatric intensive care units (PICUs), cardiac arrest, prolonged hospitalization, and increased mortality. Consequently, reliable early warning systems are required to support healthcare professionals in recognizing deterioration before irreversible complications occur (Christopher S. Parshuram et al., 2018). Several studies have shown that PEWS improves the early detection of pediatric deterioration and contributes to more accurate clinical assessment in emergency care settings (Branes et al., 2021).

Importantly, PEWS should not be viewed merely as a numerical scoring tool but as a comprehensive patient safety system. It incorporates several essential components, including early detection of clinical deterioration, rapid response mechanisms, continuous patient reassessment, organizational governance, and the promotion of a patient safety culture. Previous systematic reviews have demonstrated that PEWS implementation enhances multidisciplinary communication, teamwork, situational awareness, and healthcare professionals' confidence in making clinical decisions for deteriorating pediatric patients (Veronica Lambert et al., 2017).

Emergency care for pediatric patients requires efficient and accurate triage because children may deteriorate rapidly within a short period. PEWS provides a structured physiological assessment that assists healthcare professionals in recognizing early warning signs, prioritizing patient care, and improving clinical decision-making in emergency departments (Elizabeth Oldroyd & Angela Day, 2011). Likewise, the development and initial validation of the Bedside Pediatric Early Warning System (BedsidePEWS) demonstrated that standardized physiological scoring can accurately identify children at risk of clinical deterioration and facilitate earlier intervention, thereby supporting safer and more effective pediatric care (Lin et al, 2025).

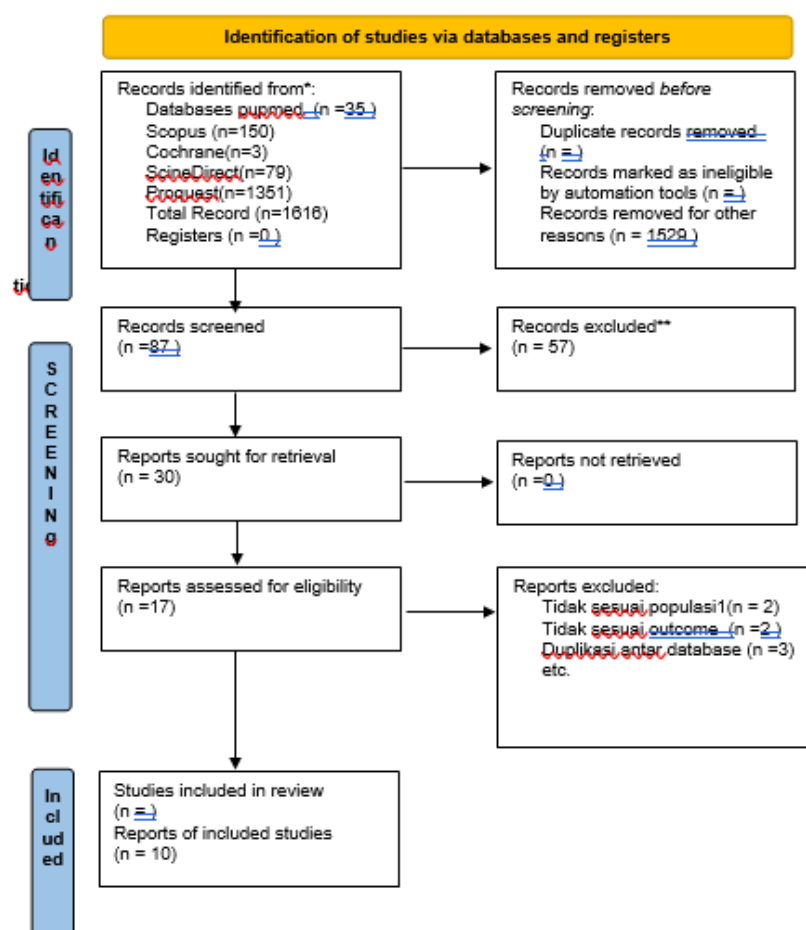
Although numerous studies have evaluated PEWS, the evidence regarding its effectiveness remains heterogeneous. A systematic review conducted by Veronica Lambert et al. (2017) concluded that PEWS has substantial potential for improving the recognition and management of pediatric clinical deterioration; however, variations in implementation strategies and outcome measures limit the generalizability of the findings. Similarly, Rebecca Trubey et al. (2019) reported that although PEWS demonstrates good predictive validity for identifying children requiring transfer to the PICU, evidence supporting its effectiveness in reducing overall hospital mortality remains inconclusive. The success of PEWS implementation depends not only on the predictive performance of the scoring system itself but also on contextual factors such as staff compliance, interprofessional communication, institutional support, and well-established escalation protocols.

Given the growing use of PEWS in pediatric emergency care and the increasing availability of new evidence, an updated systematic review is warranted to synthesize current findings regarding the effectiveness of PEWS in improving triage accuracy among pediatric patients in emergency departments. Such evidence is expected to support evidence-based clinical practice, strengthen

pediatric emergency care systems, and improve patient safety through earlier recognition of clinical deterioration and timely intervention.

METHOD

This study employed a systematic review design following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. A comprehensive literature search was conducted across five electronic databases: PubMed, Scopus, ScienceDirect, Cochrane Library, and ProQuest. The search strategy utilized combinations of the keywords "Pediatric Early Warning Score," "PEWS," "triage," "emergency department," and related terms. Eligible studies were original research articles published in English between 2015 and 2025, employing randomized controlled trial (RCT) or cohort study designs. Studies were included if they evaluated the effectiveness of the Pediatric Early Warning Score (PEWS) in improving triage accuracy, early recognition of clinical deterioration, or clinical outcomes among pediatric patients in emergency departments. Studies that did not meet the inclusion criteria, conference abstracts, review articles, editorials, and non-English publications were excluded. A total of 17 studies met the eligibility criteria and were included in the final analysis, representing an overall study population of more than 65,000 pediatric patients from various countries. The methodological quality of the included studies was assessed using the Joanna Briggs Institute (JBI) Critical Appraisal Tools, and data were synthesized narratively by comparing study characteristics, PEWS implementation, outcome measures, and key findings related to triage accuracy and early detection of clinical deterioration.



*Consider, if feasible to do so, reporting the number of records identified from each database or register searched (rather than the total number across all databases/registers).

**If automation tools were used, indicate how many records were excluded by a human and how many were excluded by automation tools.

Table 1.
Article Quality Assessment Table using the JBI Critical Appraisal Tool for RCT

N O	Author. Year	Q1 - Q2	Q3	Q4- Q6	Q7- Q8	Q9	Q10 - Q12	Q13	Total Yes	De cisi on
1	Author: Lin et al. (2025) Published ; 01- 2025 Country: China	✓ ?	✓ X	X ?	✓ X ?		✓ ✓ ✓	✓	7 of 13	Inc lud e
2	Parshuram et al., 2015 Canada	✓ ?	✓ X	X ?	✓ ? X		✓ ✓ ✓	✓	7 of 13	Inc lud e
3	Parshuram CS et al., (2018), Dutch	✓ ?	✓ X	X ?	✓ ? X		✓ ✓ ✓	✓	7 of 13	Inc lud e

Information:

Q1-Q13 : JBi RCT

` ✓ = Yes . X= Risk, ? = Unclear

Include is determined based on critical risk not just total score

Table 2.
Article Quality Assessment Table using the JBI Critical Appraisal Tool for Cohort Study

No	Author, Year	Q1-Q2	Q3	Q4-Q5	Q6-Q7	Q8 - Q11	Total yes	Decision
4	Truel et al., 2025	✓ ✓	✓	✓ ?	? ✓	✓ ✓ ? ✓	8 of 13	Include
5	Romaine et al., 2020`	✓ ✓	✓	✓ ✓	✓ ✓	✓ ✓ ? ? ✓	9 of 11	Include
6	Agulnik A., et al.2023 Latin America in	✓ ✓	✓	✓ ✓	✓ ✓	✓ ✓ ✓ ✓ ✓	13 of 13	Include
7	Leviathan et al., 2022, Eng s	✓ ✓	✓	✓ ✓	✓ ✓	✓ ✓ ✓ ✓ ✓	13 of 13	Include
8	Soeteman.et al, 2021 Netherland	✓ ✓	✓	✓ ✓	✓ ✓	✓ ✓ ✓ ✓ ✓	13 of 13	Include
9	R acken et al. (2022)	✓ ✓	✓	? ✓	✓ ✓	✓ ✓ ? ? ✓	7 of 11	Include
10	Soeteman.et al, 2023	✓ ✓	✓	✓ ✓	✓ ✓	✓ ✓ ✓ ? ✓	10 of 11	Include

Information:

Q1-Q11: JBi Cohort Study

` ✓ = Yes . X= Risk, ? = Unclear

Include is determined based on critical risk not just total score

RESULT

The literature screening process from five electronic databases (PubMed, ScienceDirect, Scopus, Sage Journal, and Cochrane Library) resulted in 8 high-quality scientific articles that met the inclusion and exclusion criteria. Based on the results of the methodological quality assessment using the Joanna Briggs Institute (JBI) Critical Appraisal Tool , the eight articles consisted of 3 articles with Randomized Controlled Trial (RCT) designs and 5 articles with Cohort Study designs ,

all of which were declared eligible (Include) with a low to moderate risk of bias. The characteristics of the RCT studies reviewed included large-scale studies such as the EPOCH Trial by Parshuram et al. (2018) in 7 countries, the MPEWS clinical trial by Lin et al. (2025) in China, and a multicenter intervention protocol by Jensen et al. (2017) in Denmark. Meanwhile, the cohort study cluster was represented by a multicenter prospective investigation at 32 oncology centers in 11 Latin American countries by Agulnik et al. (2023), a prospective validation protocol in the Netherlands by Soeteman et al. (2021), a risk stratification study using biomarkers by Leviathan et al. (2022), and a predictive performance analysis of triage accuracy by Romaine et al. (2021) and Truel et al. (2025) in the UK. Comprehensive data extraction was synthesized into three main outcome domains: triage accuracy and early deterioration detection, the effectiveness of the clinical transfer disposition pathway, and the impact of efficiency on length of stay and mortality in pediatric patients.

Table 1.
Analisy of Article

No	Author, Year, & Place	Research objectives & methods	Interventions and Research Results
1	Kang Lin, Xiaojun Weng, Bing Du, Ting Tian, and Xiaoxiang Quan. 2025 Tertiary hospital (Child Care Building) in Guangdong Province, China	Objective To explore the effectiveness of the Modified Pediatric Early Warning Score (PEWS) application in early identification of critically ill children in general pediatric wards. Design: Single-blind, two-arm randomized controlled trial (RCT) using a convenience sampling method Method: The study was conducted on 300 hospitalized pediatric patients (June 2021–December 2023) who were randomly divided using a random number table into an Observation Group (150 cases) and a Control Group (150 cases). Validity analysis used a Receiver Operating Characteristic (ROC) curve to determine the Area Under the Curve (AUC), sensitivity, specificity, and Youden index.	Intervention The control group received standard routine care based on medical orders. The observation group received a graded nursing <i>management model</i> combined with the <i>Modified</i> PEWS assessment (including additional dimensions of normal heart and respiratory rates according to age group) evaluated on a scale based on a cluster score (score 0–1, 2–3, 4, >5). Results : The observation group showed a statistically significant decrease in complication rates, <i>length of stay, and hospitalization costs compared to the control group (\$P < 0.05\$)</i> . <i>The level of parental satisfaction in the intervention group was also shown to be significantly higher (\$P < 0.05\$)</i> . <i>The Modified</i> PEWS score of ≥ 1 point was determined as the optimal cutoff value to distinguish critical conditions in pediatric patients with high accuracy (AUC = 0.91; sensitivity = 92.1%; specificity = 75.4%; Youden index = 0.675).
2	Claus Sixtus Jensen, Hanne Aagaard, Hanne Veber Olesen, and Hans Kirkegaard. Year: 2007 Country: In the Central Denmark Region	<i>Paediatric Early Warning Score</i> (PEWS) models , namely the Canadian <i>Bedside</i> PEWS model and the Central Denmark Region PEWS model, in reducing the number of unplanned emergency transfers or deaths due to clinical deterioration. Design: <i>Multicentre, randomized, controlled clinical trial</i> (RCT) with a 1:1 patient allocation trial without blinding . Methods : The study was designed to involve a total sample of 14,000 hospitalized children aged 18-24 years. Effectiveness evaluation was conducted by stopping data analysis exactly one hour before the occurrence of critical events to avoid modeling bias. Data analysis followed the <i>modified intention-to-treat principle</i> using logistic regression tests to determine the <i>Odds Ratios</i> (OR) value and 95% confidence intervals with a significance level of $p < 0.05$.	Patients in the first arm were monitored using the <i>Bedside</i> PEWS model (Canadian standard), which includes systolic blood pressure but does not assess consciousness. Patients in the second arm were monitored using the Central Denmark Region PEWS model, which eliminates routine blood pressure measurements (making them optional) and replaces them with assessment of the level of consciousness. Both groups were integrated into a clinical decision algorithm based on the ABCDE principle with dynamic observation intervals based on score clusters. Research Results (This study was designed to have a statistical power of 80% to detect a 30% difference in clinical decline in the unplanned transfer indicator. Based on scientific justification, restructuring to the Central Denmark model was hypothesized to be superior in improving ward nurse

No	Author, Year, & Place	Research objectives & methods	Interventions and Research Results
			compliance, considering that previous data showed that complete recording of all conventional <i>Bedside</i> PEWS parameters was very low (achieved in only 5.1% of patients) due to technical difficulties and children's resistance to blood pressure measurements. An interim safety analysis <i>was</i> strictly scheduled after reaching the 7,000 patient quota using the <i>Haybittle-Peto statistical approach</i> .
3	Parshuram et al., 2018. The study was conducted in 21 hospitals spread across 7 countries, namely Canada, England, Ireland, Italy, New Zealand, Australia, and the Netherlands.	Objective: To evaluate the effectiveness of the implementation of the Bedside Paediatric Early Warning System (BedsidePEWS) on reducing all-cause mortality in hospitalized pediatric patients. Methods: The study used a multicenter cluster randomized controlled trial (RCT) design. A total of 144,539 hospitalized pediatric patients were included. Hospitals were randomized to the intervention group (implementation of BedsidePEWS) and the control group (standard care). The primary outcome measured was all-cause mortality during hospitalization.	Parshuram et al. (2018) conducted a study in 21 hospitals across seven countries: Canada, the United Kingdom, Ireland, Italy, New Zealand, Australia, and the Netherlands. This study aimed to evaluate the effect of implementing the Bedside Pediatric Early Warning System (BedsidePEWS) on all-cause mortality in hospitalized pediatric patients. The study used a multicenter cluster randomized controlled trial (RCT) design involving 144,539 pediatric patients. Hospitals were randomized into the intervention group implementing Bedside PEWS and a control group receiving standard care. The primary outcome evaluated was all-cause mortality during the hospital stay.
4	Authors: Marijn Soeteman, Teus H Kappen, Martine van Engelen, et al. 2021 Setting: Princess Máxima Centre, Netherlands (an 80-bed pediatric oncology hospital directly connected to a 22-bed shared PICU).	Objective: To evaluate and validate the predictive performance of a modified <i>Bedside Paediatric Early Warning System</i> (PEWS) score for predicting the need for non-elective PICU transfer or cardiopulmonary resuscitation (CPR) in hospitalized pediatric oncology patients. Method: Methods: This study used a prospective <i>observational cohort study design</i> . A Cox proportional hazards regression model <i>was</i> used to estimate the association between the modified Bedside PEWS score and time to PICU transfer or CPR. The unit of analysis was a single "clinical episode" (uninterrupted ward admission).	Interventions: This study was observational, so no new clinical interventions were provided. However, this protocol tested the implementation of a modified Bedside PEWS score consisting of 8 physiological parameters (including the addition of temperature parameters and more specific oxygen therapy allocation) assessed routinely by nurses every 8-hour shift, or more frequently (up to hourly) if the patient's condition deteriorated. Results: Because this document is a study protocol, the final results in the form of predictive performance (discrimination and calibration) of the score have not been reported in the text. However, the estimated number of primary outcomes <i>is</i> projected to be approximately 150 events over the 2-year study period based on the growth of national centralized data.
5	Romaine, ST, Sefton, G., Lim, E., et al. (2022), Liverpool, England (United Kingdom)	Objective: To compare the performance of the National Pediatric Early Warning Score (National PEWS) with six other PEWS systems (Alder Hey PEWS, Bedside PEWS, Bristol PEWS, Newcastle PEWS, Scotland PEWS, and POPS) in predicting the need for critical care (CC) in febrile children presenting to the Emergency Department (ED). Methods: This was a retrospective single-center cohort study at a tertiary children's hospital. A total of 11,449 febrile children's visits to the ED over two years were analyzed. The primary outcome was	Intervention: Calculation and comparison of seven Pediatric Early Warning Score (PEWS) systems using the worst-case clinical data during the patient's stay in the ED. Results: All PEWS systems demonstrated excellent ability to predict the need for critical care (AUC 0.91–0.95) and mortality due to sepsis (AUC 0.95–0.99). The National PEWS and Bedside PEWS performed best at a cut-off of ≥ 6 (AUC 0.90) with a sensitivity of approximately 89.6% and a specificity of 90.6%.

No	Author, Year, & Place	Research objectives & methods	Interventions and Research Results
		admission to critical care within 48 hours, while secondary outcomes were length of stay >48 hours and mortality due to sepsis.	
6	Agulnik, A., et al. (2023), Latin America (11 countries, 32 hospitals)	Objective: To evaluate the effect of Pediatric Early Warning Systems (PEWS) implementation on mortality due to <i>clinical deterioration events</i> in children with cancer treated in low-resource hospitals in Latin America. Methods: This was a prospective multicenter cohort study conducted in 32 hospitals in 11 Latin American countries within the Proyecto EVAT project. Data were collected prospectively before and after PEWS implementation.	Intervention: Implementation of Pediatric Early Warning Systems (PEWS) consisting of patient condition assessment using PEWS scores by nurses, clinical escalation algorithms, health worker training, implementation assistance, and monitoring the quality of use. Results: After PEWS implementation, mortality due to <i>clinical deterioration events</i> decreased significantly from 1.33 to 1.09 per 1,000 patient-days (IRR 0.82; 95% CI 0.69–0.97; p=0.021).
7	Soeteman, M., Kappen, TH, van Engelen, M., et al. (2023), Utrecht, Netherlands (Princess Máxima Center for Pediatric Oncology)	Objective: To validate the predictive ability of the <i>modified Bedside Pediatric Early Warning System (PEWS)</i> in detecting clinical deterioration requiring unplanned PICU transfer or CPR in hospitalized pediatric oncology patients. Methods: Prospective Cohort Study. A total of 1,137 pediatric oncology patients aged 0–18 years were followed during the period February 2019–February 2021. Analysis using Cox Proportional Hazard Model and bootstrap validation.	Intervention; Implementation and assessment of the Modified Bedside PEWS, which has been modified to include body temperature parameters and oxygen therapy categories. PEWS scores are routinely recorded by nurses to detect early deterioration in patient condition and determine the need for care escalation or transfer to the PICU.
8	Lenihan et al., 2022. The study was conducted at Alder Hey Children's Hospital, United Kingdom.	Objective: To assess the ability of the Mid-Regional Pro-Adrenomedullin (MR-proADM) biomarker combined with the Pediatric Early Warning Score (PEWS) in risk stratification of febrile children presenting to the emergency department. Methods: Secondary analysis of a prospective cohort study of 1,183 children aged <16 years with fever who underwent blood tests in the Pediatric Emergency Department.	Intervention: Measurement of MR-proADM, procalcitonin (PCT), and PEWS upon patient arrival. Results: PEWS had good accuracy in predicting the need for PICU/HDU admission (AUC 0.83), while MR-proADM was better at predicting the need for fluid resuscitation (AUC 0.73). The combination of MR-proADM and high PCT was associated with an increased risk of PICU/HDU admission, the need for fluid resuscitation, and bacterial infection. The authors concluded that MR-proADM can improve risk stratification when used in conjunction with PEWS.
9	Abbey Bracken, Gerri Sefton, Steven Lane, et al. Year: 2022 England (England) goals and methods	Objective : To compare the performance of seven Paediatric Early Warning Score (PEWS) systems, including the proposed National PEWS for England, in predicting Critical Deterioration Events (CDE) in hospitalized children. The study used a randomized controlled trial design. Methods : A retrospective cohort study conducted at a tertiary children's hospital in the UK. Researchers analyzed 423,321 observations from 11,601 inpatients aged <18 years during the period March 2018 to February 2019. The performance of each PEWS was evaluated using the Area Under the Receiver Operating Characteristic Curve (AUC) to predict the occurrence of critical deterioration within 4, 6, 12, and 24 hours.	Intervention: The study did not provide direct clinical interventions, but rather evaluated and compared seven PEWS systems (Alder Hey, Bedside, Bristol, Irish, National, Newcastle, and Scotland PEWS) to assess the ability of each score to detect the risk of Critical Deterioration Events (CDE) requiring emergency transfer to the PICU or HDU.
10	Leviathan et al.,	Objective: To assess whether the	Intervention: Measurement of the Mid-

No	Author, Year, & Place	Research objectives & methods	Interventions and Research Results
	2022, Eng s	combination of Mid-Regional Pro-Adrenomedullin (MR-proADM), procalcitonin, and Pediatric Early Warning Score (PEWS) biomarkers can improve risk stratification in febrile children presenting to the emergency department. Methods: Secondary analysis of a prospective cohort study , with a population of 1183 children under 16 years of age	Regional Pro-Adrenomedullin (MR-proADM) biomarker and combination with Pediatric Early Warning Scores (PEWS) to assess the ability to predict the risk of clinical deterioration in children with fever who come to the emergency department (ED).

DISCUSSION

Accuracy of Clinical Triage and Early Detection of Clinical Deterioration

One of the greatest challenges in pediatric emergency care is conducting rapid and accurate clinical assessments despite children's limited verbal communication and the often nonspecific presentation of their clinical symptoms. In general emergency departments, triage errors (mistriage) among pediatric patients pose greater risks than in dedicated pediatric emergency settings (Gold et al., 2021; World Health Organization [WHO], 2022). The evidence synthesized in this review indicates that the implementation of the Pediatric Early Warning Score (PEWS) significantly improves triage accuracy through a structured assessment of physiological parameters, including cardiovascular, respiratory, and neurological status.

A retrospective cohort study by Truel et al. (2025) evaluating the Children's Observation and Severity Tool (COAST), an adaptation of PEWS, demonstrated superior performance in identifying illness severity among pediatric patients presenting to the emergency department compared with conventional triage systems such as the Manchester Triage System (MTS). By applying an objective scoring framework, PEWS minimizes subjective variation in nurses' clinical judgment and facilitates the immediate identification of early signs of clinical deterioration upon patients' arrival at the hospital. This systematic approach supports timely clinical decision-making and enables earlier initiation of appropriate interventions. Similar findings have been reported in recent systematic reviews showing that PEWS improves recognition of deteriorating children and supports earlier escalation of care (Lam et al., 2023; Roland et al., 2022).

Effectiveness in Predicting Hospital Admission and Intensive Care Transfer

The predictive capability of PEWS extends beyond initial triage assessment and has demonstrated excellent validity in predicting patients' subsequent clinical disposition, including hospital admission and escalation to intensive care. Romaine et al. (2021) reported that seven different PEWS models achieved outstanding discriminatory performance, with area under the receiver operating characteristic curve (AUC) values ranging from 0.91 to 0.95 for predicting critical care admission among febrile children presenting to the emergency department. Similar diagnostic performance has been reported in recent validation studies evaluating PEWS in pediatric emergency settings (Roland et al., 2022; Gold et al., 2021).

The predictive performance of PEWS may be further enhanced through integration with laboratory biomarkers. A secondary analysis conducted by Leviathan et al. (2022) demonstrated that combining PEWS with Mid-Regional Pro-Adrenomedullin (MR-proADM) significantly improved the identification of children at high risk of severe clinical deterioration. This integrated approach facilitates earlier clinical decisions regarding aggressive fluid resuscitation, intravenous antibiotic administration, and proactive transfer to the Pediatric Intensive Care Unit (PICU) or High Dependency Unit (HDU) before irreversible clinical deterioration or cardiac arrest occurs. Recent studies also suggest that combining physiological scoring systems with biomarkers and electronic clinical decision-support tools further improves prediction accuracy for pediatric deterioration (Nielsen et al., 2024; Lam et al., 2023).

Length of Hospital Stay and Clinical Outcomes

Length of stay (LOS) is an important indicator of healthcare efficiency and hospital resource utilization. Early recognition of clinical deterioration through systematic PEWS monitoring enables nurses and physicians to initiate timely, individualized interventions that prevent progression to more severe complications. In a randomized controlled trial, Lin et al. (2025) demonstrated that pediatric patients monitored using a Modified Pediatric Early Warning Score (MPEWS) experienced significantly fewer complications, shorter hospital stays, and lower hospitalization costs than patients receiving standard care ($p < 0.05$). Similar improvements in patient safety, early intervention, and resource utilization have also been reported in recent pediatric emergency studies (Roland et al., 2022; Lam et al., 2023).

Although the large multicenter cluster randomized EPOCH Trial conducted by Parshuram et al. (2018) did not demonstrate a statistically significant reduction in all-cause mortality associated with BedsidePEWS implementation, the intervention consistently reduced the incidence of major clinical deterioration events in hospitalized children. Furthermore, among vulnerable pediatric populations in resource-limited settings, Agulnik et al. (2023) reported that PEWS implementation in pediatric oncology centers across Latin America was associated with a reduction in mortality related to clinical deterioration from 1.33 to 1.09 deaths per 1,000 patient-days. These findings suggest that systematic early warning systems facilitate earlier recognition of clinical deterioration, reduce prolonged intensive care utilization, improve patient safety, and contribute to better clinical outcomes among hospitalized children (WHO, 2022; Roland et al., 2022).

CONCLUSION

Based on the critical appraisal and synthesis of the available evidence, the Pediatric Early Warning Score (PEWS) is a valid and reliable clinical assessment tool with high predictive accuracy for pediatric emergency and inpatient care. The evidence consistently demonstrates that PEWS improves the early recognition of clinical deterioration, accurately predicts the need for hospital admission and transfer to the Pediatric Intensive Care Unit (PICU), and contributes to shorter hospital stays by facilitating timely nursing and medical interventions. Although the evidence regarding reductions in overall mortality remains heterogeneous and appears to be influenced by contextual factors such as staff adherence, institutional resources, and escalation protocols, PEWS consistently enhances patient safety by supporting timely recognition of clinical deterioration and reducing the occurrence of life-threatening events among hospitalized children. Therefore, integrating PEWS into routine pediatric nursing practice represents an evidence-based strategy for strengthening clinical decision-making, improving patient safety, and optimizing the quality of pediatric healthcare delivery.

REFERENCES

- Agulnik, A., Ferrara, G., Puerto-Torres, M., Gillipelli, S. R., Elish, P., Muniz-Talavera, H., Gonzalez-Ruiz, A., Armenta, M., Barra, C., Diaz, R., Hernandez, C., Tobias, S. J., Loeza, J. D. J., Mendez, A., Montalvo, E., Penafiel, E., Pineda, E., & Graetz, D. E. (2022). Assessment of barriers and enablers to implementation of a pediatric early warning system in resource-limited settings. *JAMA Network Open*, 5(3), e221547. <https://doi.org/10.1001/jamanetworkopen.2022.1547>
- Agulnik, A., Muniz-Talavera, H., Pham, L. T. D., Chen, Y., Carrillo, A. K., Cárdenas-Aguirre, A., et al. (2023). Effect of paediatric early warning systems (PEWS) implementation on clinical deterioration event mortality among children with cancer in resource-limited hospitals in Latin America: A prospective, multicentre cohort study. *The Lancet Oncology*, 24(9), 978–988. [https://doi.org/10.1016/S1470-2045\(23\)00285-1](https://doi.org/10.1016/S1470-2045(23)00285-1)

- Branes, H., Solevåg, A. L., & Solberg, M. T. (2021). Pediatric early warning score versus a paediatric triage tool in the emergency department: A reliability study. *Nursing Open*, 8(2), 702–708. <https://doi.org/10.1002/nop2.675>
- Cheng, Y., Zhang, X., Zhang, J., & Lu, G. (2022). The application of Pediatric Early Warning Score (PEWS) in the emergency observation room. *Journal of Pediatric Nursing*, 66, 1–5. <https://doi.org/10.1016/j.pedn.2022.05.011>
- Geanacopoulos, A. T., Peltz, A., Melton, K., Neuman, M. I., Gutman, C. K., Walsh, K. E., Samuels-Kalow, M. E., & Michelson, K. A. (2025). Pediatric triage accuracy in pediatric and general emergency departments. *Hospital Pediatrics*, 15(1), 37–45. <https://doi.org/10.1542/hpeds.2024-008063>
- Lambert, V., Matthews, A., MacDonell, R., & Fitzsimons, J. (2017). Paediatric early warning systems for detecting and responding to clinical deterioration in children: A systematic review. *BMJ Open*, 7(3), e014497. <https://doi.org/10.1136/bmjopen-2016-014497>
- Lin, K., Weng, X., Du, B., Tian, T., & Quan, X. (2025). Analysis of the accuracy of disease prediction in pediatric ward patients based on the modified early warning score for children: A randomized controlled trial. *Heliyon*, 11(1), e40937. <https://doi.org/10.1016/j.heliyon.2024.e40937>
- Oldroyd, C., & Day, A. (2011). The use of Pediatric Early Warning Scores in the emergency department. *Journal of Emergency Nursing*, 37(4), 374–376. <https://doi.org/10.1016/j.jen.2011.03.007>
- Parshuram, C. S., Dryden-Palmer, K., Farrell, C., Gottesman, R., Gray, M., Hutchison, J. S., Helfaer, M., Hunt, E. A., Joffe, A. R., Lacroix, J., Moga, M. A., Nadkarni, V., Ninis, N., Parkin, P. C., Wensley, D., Willan, A. R., Tomlinson, G. A., & for the Canadian Critical Care Trials Group and the EPOCH Investigators. (2018). Effect of a Pediatric Early Warning System on all-cause mortality in hospitalized pediatric patients: The EPOCH randomized clinical trial. *JAMA*, 319(10), 1002–1012. <https://doi.org/10.1001/jama.2018.0948>
- Roland, D., Powell, C., Lloyd, A., Trubey, R., Tume, L., Sefton, G., Huang, C., Taiyari, K., Strange, H., Jacob, N., Thomas-Jones, E., Hood, K., & Allen, D. (2023). Paediatric early warning systems: Not a simple answer to a complex question. *Archives of Disease in Childhood*, 108(5), 338–343. <https://doi.org/10.1136/archdischild-2022-323951>
- Romaine, S. T., Sefton, G., Lim, E., Nijman, R. G., Bernatoniene, J., Clark, S., Schlapbach, L. J., Pallmann, P., & Carroll, E. D. (2021). Performance of seven different paediatric early warning scores to predict critical care admission in febrile children presenting to the emergency department: A retrospective cohort study. *BMJ Open*, 11(5), e044091. <https://doi.org/10.1136/bmjopen-2020-044091>
- Soeteman, M., Kappen, T. H., Van Engelen, M., Kilsdonk, E., Koomen, E., Nieuwenhuis, E. E. S., Tissing, W. J. E., Fiocco, M., Van den Heuvel-Eibrink, M., & Wösten-van Asperen, R. M. (2021). Identifying the critically ill paediatric oncology patient: A study protocol for a prospective observational cohort study for validation of a modified Bedside Paediatric Early Warning System score in hospitalised paediatric oncology patients. *BMJ Open*, 11(5), e046360. <https://doi.org/10.1136/bmjopen-2020-046360>
- Solevåg, A. L., Eggen, E. H., Schröder, J., & Nakstad, B. (2013). Use of a modified Pediatric Early Warning Score in a department of pediatric and adolescent medicine. *PLoS ONE*, 8(8), e72534. <https://doi.org/10.1371/journal.pone.0072534>
- Trubey, R., Huang, C., Lugg-Widger, F. V., Hood, K., Allen, D., Edwards, D., Lacy, D., Mann, M., Mason, B., Oliver, A., Roland, D., Sefton, G., Skone, R., Thomas-Jones, E., Tume, L. N., & Powell, C. (2019). Validity and effectiveness of paediatric early warning systems and track and trigger tools for identifying and reducing clinical deterioration in hospitalised children: A systematic review. *BMJ Open*, 9(5), e022105. <https://doi.org/10.1136/bmjopen-2018-022105>
- World Health Organization. (2022). *Pocket book of hospital care for children: Guidelines for the management of common childhood illnesses* (3rd ed.). World Health Organization.