


EARLY WARNING SCORES IN ONCO-HEMATOLOGICAL PATIENTS: AN INTEGRATIVE REVIEW OF THEIR APPLICABILITY IN THE AMAZONIAN CONTEXT

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ABSTRACT

The increasing incidence of hematologic malignancies highlights the need to expand the use of Early Warning Scores (EWS) in this clinical context. However, the application of these tools in onco-hematological patients remains underexplored. This study aims to summarize the scientific evidence regarding the effectiveness of Early Warning Scores (EWS) in the early detection of clinical deterioration in onco-hematological patients and their applicability in the Amazonian context. This integrative literature review was conducted between August and November 2024, utilizing the following databases: Scientific Electronic Library Online (SciELO), Latin American and Caribbean Health Sciences Literature (LILACS), PUBMED, MEDLINE, Fundación Index Bibliographic Database (CUIDEN), Nursing Database (BDENF), accessed via the Virtual Health Library (VHL) portal, and Google Scholar. A total of 15 studies addressing the use of early warning scores in onco-hematological patients were identified, with emphasis on MEWS (Early Warning Score), NEWS (National Early Warning), PEWS (Pediatric Early Warning Score), and Qsofa (Xx), among others. All studies were conducted in an international context, revealing a research gap in Brazil and other vulnerable regions, such as the Amazon.

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INTRODUCTION

Among existing oncohematological diseases, leukemias, lymphomas, and myelomas hold greater significance due to their disproportionate impact on morbidity and mortality in low-income countries (1). These diseases affect populations that already face geographic isolation, socioeconomic inequalities, limited medical resources, and shortages of healthcare professionals (2) (3).

In the northern region of Brazil, geographical barriers, low human development indices, social inequality, and limited access to early detection and treatment contribute to a high incidence of cancer cases (4) (5). Patients with hematologic malignancies are particularly susceptible to severe adverse events, such as neutropenia, due to chemotherapy, radiotherapy, or immunobiological therapies, placing them at elevated risk for severe infections that can lead to clinical deterioration (6).

Currently, clinical deterioration is defined as a severe physiological alteration or an acute and unexpected worsening of the clinical condition, which compromises homeostasis and may lead to the onset of acute signs and symptoms, often associated with dysfunction of one or more organs. In many cases, this process is preceded by infections, especially in immunosuppressed patients whose immune response is insufficient to contain the progression of the condition (7).

Evidence shows that approximately 80% of clinical deterioration signs can be identified up to 24 hours before a patient's condition worsens, based on changes in vital signs. In this context, Early Warning Scores (EWS) emerged as structured tools for the early detection of clinical deterioration, enabling prompt medical interventions and improving patient outcomes. (8).

The EWS was developed in 1997 with the aim of systematizing the assessment of physiological vital sign parameters. The methodological design of the score was based on comparing the scores obtained at hospital admission with those recorded throughout hospitalization, allowing for correlation with clinical outcomes. This approach enabled the early and objective identification of the onset of clinical deterioration. Although Morgan and Wright were pioneers in the development of EWS for the adult population, several other versions have been developed over the Years. (9). (Figure 1).

Figure 1 – Main Early Warning Score systems for adults over the years

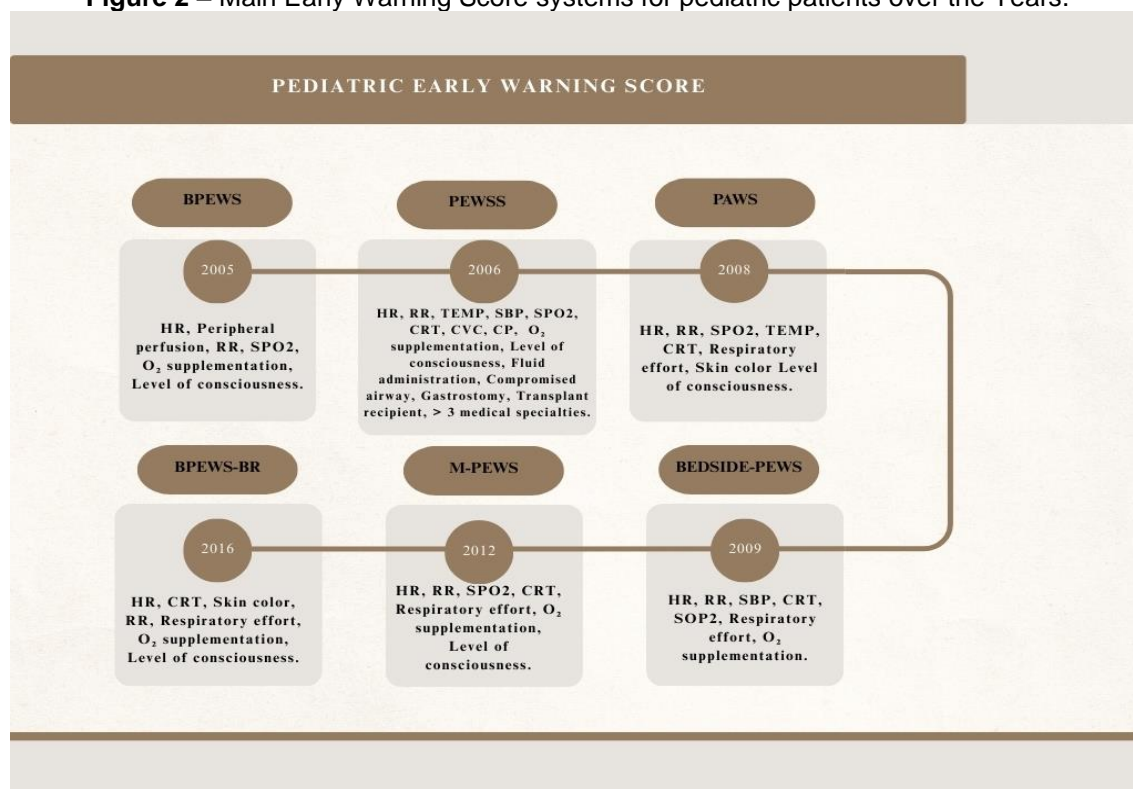


Legend: Early Warning Score (EWS); Heart Rate (HR); Hamilton Early Warning Score (HEWS); Modified Early Warning Score (MEWS); National Early Warning Score (NEWS); Oxygen (O₂); Peripheral Oxygen Saturation (SpO₂); Respiratory Rate (RR); Systolic Blood Pressure (SBP); Temperature (TEMP); Triage Early Warning Score (TREWS); Vital-Pac Early Warning Score (ViEWS); Yes or No (Y/N).

Source: Authors (2025)

Eight years after the development of the adult EWS, Alan Monaghan from the University of Brighton created the first pediatric early warning score (PEWS), known as the Brighton Paediatric Early Warning Score (BPEWS). This scale served as the foundation for the development of several other PEWS versions, adapted to different clinical settings and age groups. (10). (Figure 2)

Figure 2 – Main Early Warning Score systems for pediatric patients over the Years.



Legend: Bedside Pediatric Early Warning Score (BEDSIDE-PEWS); Brighton Pediatric Early Warning Score (B-PEWS); Brighton Pediatric Early Warning Score- Brasil (B-PEWS-Br); Capillary refill time (CRT); Central venous catheter (CVC); Cerebral palsy (CP); Heart Rate (HR); Modified Pediatric Early Warning Score (M-PEWS); Pediatric Advanced Warning Score (PAWS); Pediatric Early Warning System Score (PEWSS); Peripheral Oxygen Saturation (SPO₂); Respiratory Rate (RR); Systolic Blood Pressure (SBP); Temperature (TEMP).

Source: Authors (2025)

The immunological vulnerability of oncohematological patients makes them more susceptible to infectious processes. Once established, infections can rapidly progress to clinical complications and unfavorable outcomes. In this context, the use of early warning scores as tools for the timely detection of clinical deterioration becomes even more essential. However, unlike in high-income countries, the use of these scores remains limited in the Brazilian Amazon, whether due to the lack of training and continuing education opportunities or the absence of standardized, evidence-based institutional protocols.

OBJECTIVES

This study aims to identify and synthesize scientific evidence regarding the effectiveness of Early Warning Scores in the early detection of clinical deterioration in oncohematological patients, with the goal of supporting the implementation of these tools in a reference hospital in the Amazon region.

MATERIALS AND METHODS

This study is an integrative literature review conducted between August and November 2024, following the six stages proposed by Souza, Silva, and Carvalho (2010) (11): (1) formulation of the guiding question; (2) literature search or sampling; (3) data collection; (4) critical analysis of the included studies; (5) discussion of results; and (6) presentation of the integrative review.

To formulate the research question, the mnemonic proposed by Joanna Briggs Institute (JBI) was employed, using the Population, Concept, and Context (PCC) framework with the following parameters:

- **Population (P):** Onco-hematological patients
- **Concept (C):** Effectiveness of early warning scores
- **Context (C):** Amazon region

Based on these definitions, the review question was formulated as: *What scientific evidence is available regarding the effectiveness of early warning scores (EWS) used in patients with hematologic neoplasms, and how can these be applied in the Amazon region?*

The search strategy combined the DECS/MESH descriptors “hematologic neoplasms,” “early warning score,” and “hematologic malignancies,” using the Boolean operators AND/E and OR/OU, with terms in Portuguese, English, and Spanish.

Searches were conducted across the following databases: Scientific Electronic Library Online (SciELO), Latin American and Caribbean Health Sciences Literature (LILACS), PUBMED, MEDLINE, Fundación Index Bibliographic Database (CUIDEN), and the Nursing Database (BDENF), all accessed through the Virtual Health Library (VHL) portal, as well as Google Scholar.

Inclusion criteria were:

- Full-text articles available online and free of charge
- Publications in Portuguese, English, or Spanish
- Articles containing the descriptors “Hematologic Neoplasms,” “Hematologic Malignancies,” “Hematologic,” “Early Warning Score,” and “Track and Trigger Systems.”

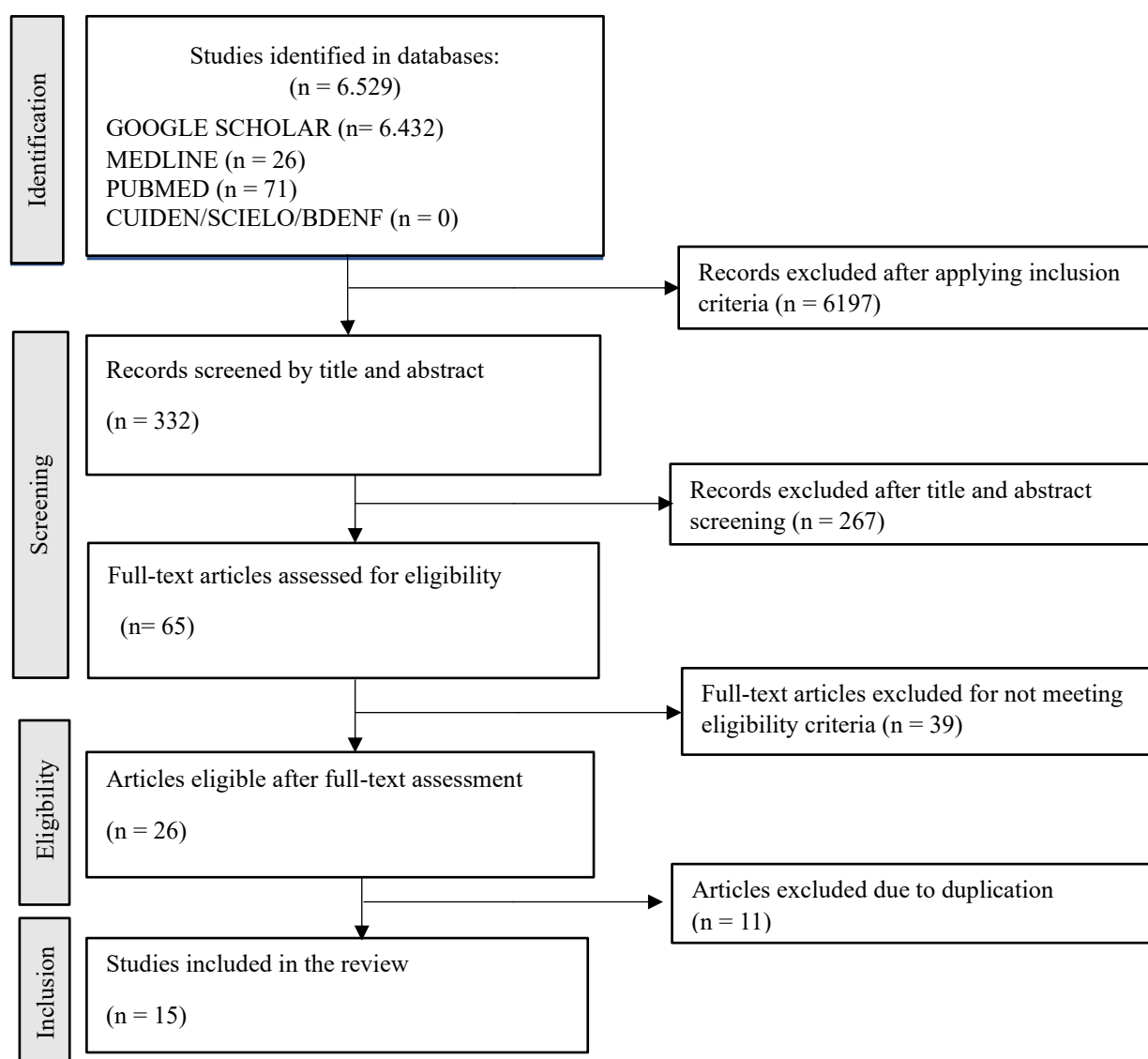
Exclusion criteria were:

- Studies that did not address the guiding question
- Articles not available in full text or not accessible free of charge

After conducting the searches, study selection was carried out by applying the inclusion and exclusion criteria. Duplicate studies were removed. The initial screening was based on titles, followed by abstract screening to evaluate eligibility. Studies not meeting the research objective were excluded. The remaining articles were subjected to full-text reading, with data extraction and synthesis of key results.

To facilitate the visualization and understanding of the search and selection process, a flowchart was constructed based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) guidelines (12), presented in figure 3.

Figure 3 - PRISMA-ScR: Flowchart of Study Selection Included in the Literature Review.



Source: Authors (2025)

During the database search, a total of 6,529 studies were identified, with 97 studies retrieved from the selected databases and 6,432 from the Google Scholar platform. Among the studies identified in the databases, 71 (74%) were published in PUBMED and 26 (26%) in MEDLINE.

After applying the inclusion and exclusion criteria, 6,197 studies were excluded, resulting in 332 studies remaining for initial analysis. A subsequent screening of titles and abstracts was performed, leading to the exclusion of 267 studies that did not align with the research theme and 11 studies due to duplication.

This process left 65 studies for full-text evaluation. In the second stage, a detailed full-text review of these 65 studies was conducted. During this stage, 39 studies were excluded for not addressing the guiding question or not meeting the eligibility criteria. Consequently, 15 studies were included in the final sample of this integrative review.

RESULTS

A total of 15 studies were selected from the literature search, which were read in full and analyzed to synthesize the main findings. To facilitate visualization and understanding, **Table 1** below presents the characterization of the included studies, containing key extracted data, including author, year and place of publication, objectives, main results, and level of evidence.

Table 1 – Characterization of Studies Included in the Integrative Review, Manaus, 2025.

Study	Author	Publication	Type of study	Objective	Main Results	Level of Evidence (LE)
E1	VON LILIENFELD-TOAL et al, 2007 (13).	United Kingdom (2007)	Retrospective cohort study.	Validate 3 established EWSS (MEWS, PARS and LEWS) in adult recipients of Allogeneic SCT (Allo-SCT) and to determine their usefulness at predicting survival.	All 3 EWSS revealed high accuracy in predicting in-hospital survival. LEWS \geq predicted in-hospital mortality with 100% sensitivity and 95% specificity; In-hospital survivors with a LEWS >3 during their admission had a shorter median survival than patients with LEWS ≤ 3 . Respiratory alterations were the most significant physiological predictors of poor prognosis.	LE IV

E2	AGULNIK, et al, 2018 (14).	United States (2018)	Quasi-experimental quality improvement study.	Describe the impact of PEWS implementation in a dedicated pediatric hematology-oncology/HSCT hospital.	PEWS can be successfully implemented in a pediatric hematology-oncology/HSCT hospital with improvement in accuracy over time. Implementation of PEWS resulted in increased use of the RRT system and more patients with clinical deterioration arriving to the PICU via an organized escalation pathway, representing standardization of care and improvement in the culture of safety in the hospital.	LE III
E3	STEEN, 2017 (15)	United States (2018)	Quasi-experimental pre and post-implementation study.	The NEWS system was applied to improve communication by using standard, consistent language, identify deteriorating patients, and escalate level of care earlier.	SIRS criteria are neither specific nor sensitive enough for this population; therefore, the NEWS system was implemented. NEWS assists the clinical team in identifying and intervening earlier in patients experiencing clinical deterioration.	LE III
E4	GERSHKO VICH, et al, 2019. (16).	Canada (2019)	Multicenter retrospective cohort study.	To examine the prognostic accuracy of SIRS and qSOFA criteria for predicting in-hospital mortality among oncologic/hematologic patients with suspected infection.	Among the subset of patients with suspected infection, SIRS criteria are more sensitive, whereas qSOFA criteria are more specific regarding the prognostic accuracy for in-hospital mortality.	LE III
E5	LEE et al, 2020. (17).	South Korea (2020)	Retrospective derivation and prospective validation cohort study.	To evaluate the modified early warning score (MEWS) for predicting ICU admissions and in-hospital mortality among at-risk patients with hematologic malignancies and to develop a modified MEWS.	The MEWS_SF score proved superior to the traditional MEWS in identifying patients with hematologic malignancies who may require intensive care and in predicting in-hospital mortality. These findings suggest that oxygen monitoring is important in at-risk patients with hematologic malignancies, and that the MEWS_SF score may serve as a useful screening tool for	LE III

					predicting in-hospital mortality in clinically deteriorating patients with hematologic cancers.	
E6	AGULNIK et al, 2020. (18).	United States (2020)	Retrospective observational study.	To evaluate if clinical deterioration is an appropriate metric to assess the quality and effectiveness of hospital emergency response systems in pediatric hematology-oncology and post-HCT patients using the PEWS-LS and system and whether CD is preceded by abnormal vital sign allowing for intervention.	Using vital sign data 48h prior to deterioration events, those with CD had higher PEWS-LS on PICU admission, spent more time with elevated PEWS-LS prior to PICU transfer and had a longer time from first abnormal PEWS-LS. CD is preceded by a long duration of abnormal vital signs, making it potentially preventable through earlier recognition.	LE III
E7	SUHR et al, 2020. (19)	United States (2020)	Retrospective study.	To evaluate the implementation and use of the National Early Warning Score (NEWS) system in patients with hematologic malignancies and those undergoing cellular therapies.	The NEWS scoring system improved the identification of patients experiencing clinical deterioration and the activation of the Rapid Response Team (RRT). The score was calculated and assessed every four hours.	LE III
E8	Constantine scu et al, 2021. (20)	Romania (2021)	Retrospective, longitudinal, and observational study.	To evaluate the ability of the Modified Early Warning Score (MEWS) to predict mortality in hematologic patients at the time of transfer from the ward to the intensive care unit (ICU).	MEWS ≥ 6 demonstrated predictive capability for mortality. Higher scores were associated with an increased risk of death.	LE III
E9	MILLS, et al, 2021 (21).	Palestine (2021)	Quasi-experimental quality improvement study.	Evaluate baseline vital sign documentation with a goal to increase compliance above 80% and implement a PEWS tool with greater than 80% compliance in frequency and accuracy of PEWS scoring over a three month post-intervention surveillance period.	The implementation of the PEWS-Resource Limited (PEWS – RL) early warning score in the pediatric hematology/oncology setting is feasible and can lead to effective practice change by improving the frequency of vital sign monitoring and generating accurate scores, which are key measures for the successful	LE III

					implementation of an early warning system.	
E10	SRICHARO EN et al, 2022 (22).	Thailand (2022)	Retrospective cohort study.	To compare the REWS, qSOFA, and SOFA scores in predicting severe complications and 28-day mortality in patients with hematologic malignancies in the emergency department.	The study indicated that the SOFA and qSOFA scores were more accurate than the REWS criteria in predicting severe complications in patients with hematologic malignancies. The SOFA score is highest in predicting severe complications among hematologic malignancy patients.	NE III
E11	VAN MOURIK et al, 2023. (23).	Netherlands (2023)	Multicenter retrospective observational cohort study.	To investigate the predictive value of the Modified Early Warning Score (MEWS) and the Sequential Organ Failure Assessment (qSOFA) for ICU admission of patients with hematologic malignancies hospitalized in the general ward.	The Modified Early Warning Score (MEWS) was a sensitive predictor of ICU admission in hemato-oncologic patients and outperformed qSOFA, indicating its potential value in detecting clinical deterioration.	LE III
E12	LI et al, 2023. (24) .	China (2023)	Retrospective study.	Derive and validate a prognostic scoring system to identify patients with hematological malignancies (HMs) and sepsis who have a high mortality rate.	A new scoring system was derived and validated using three independent variables (age ≥ 60 years, PT ≥ 27 seconds, and SOFA score ≥ 4.5) to identify septic patients with hematologic malignancies (HMs) at risk of death. The new scoring system outperformed the SOFA score.	LE III
E13	FRAIRIA et al, 2023. (25)	Italy (2023)	Retrospective cohort study.	To validate two scores (NEWS and qSOFA) in patients with acute myeloid leukemia (AML) during the period of post-chemotherapy febrile neutropenia.	Both scores appear to be valid tools in patients with febrile neutropenia and acute myeloid leukemia (AML). They have shown utility in supporting the daily management of AML patients by providing a standardized and user-friendly instrument for predicting the severity of septic illness.	LE III

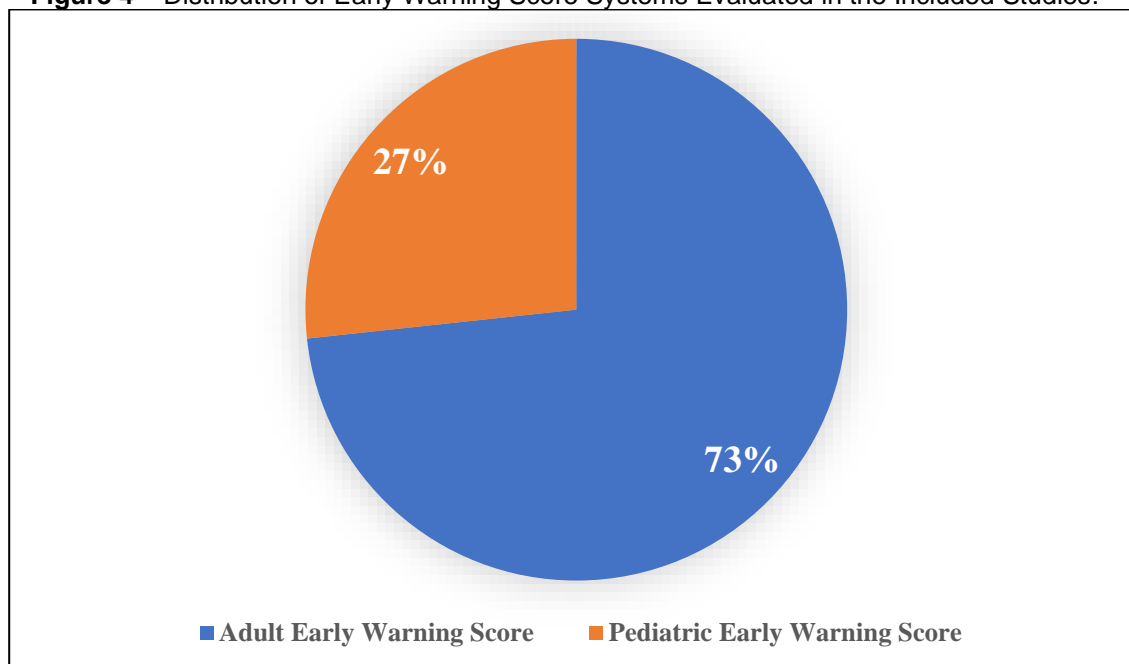
E14	WU et al, 2023 (26)	China (2023)	Retrospective study.	To analyze the prognostic factors of sepsis in children with acute leukemia admitted to the pediatric intensive care unit (PICU), and to compare the effectiveness of different scoring systems in predicting outcomes in this pediatric population.	The pediatric sequential organ failure assessment (PSOFA) score had the greatest predictive validity for hospital mortality, followed by the pediatric early warning score (PEWS) and pediatric critical illness score (PCIS). PEWS and pSOFA scores had similar predictive abilities for mortality in the PICU among children with sepsis.	LE III
E15	BOLDINGH et al, 2024, (27).	Netherlands (2024)	Multicenter retrospective cohort study.	To develop and validate a model for predicting 12-month mortality in patients with hematologic malignancies acutely admitted to the intensive care unit.	The final model with thirteen variables demonstrated good predictive performance to support decision-making in intensive care.	LE III

Source: Authors (2025)

It was identified that among the 15 reviewed studies, 80% had a cohort and/or retrospective study and 20% were quasi-experimental, design and conducted in various countries, including Romania (1), the United Kingdom (1), South Korea (1), Palestine (1), the Netherlands (2), the United States (4), China (2), Canada (1), Italy (1), and Thailand (1). These studies were published between 2007 and 2024.

Regarding the target population of the studies, 73,3% were directed to adult patients and 26,7% to the pediatric public, as illustrated in figure 4. Among the instruments derived and validated for the adult public, the MEWS, NEWS, PARS, LEWS, REWS, SIRS, qSOFA and SOFA scores were tested and compared, in addition to original scores developed in some of the studies. For the pediatric population, scores related to PEWS, such as PSOFA, PCIS, PEWS-LS and PEWS-RL, were derived and validated.

Figure 4 – Distribution of Early Warning Score Systems Evaluated in the Included Studies.



Source: Authors (2025)

DISCUSSION

The gathered evidence addressed the effectiveness of developing and validating Early Warning Scores (EWS) for the prevention and early detection of risk signs for clinical deterioration in patients with hematologic malignancies. Among the scales analyzed in the studies, the Modified Early Warning Score (MEWS), National Early Warning Score (NEWS), and Pediatric Early Warning Score (PEWS) were highlighted. In addition to being applied in the context of onco-hematologic patients, these scales were compared with other scoring systems to assess their accuracy and effectiveness.

Studies E1, E5, E8, and E11 examined the effectiveness of the MEWS system. In Study E1, the use of this scale indicated accuracy in predicting hospital mortality; however, it was found to be less sensitive to the specificities of Allo-SCT recipients when compared to the Leed's Early Warning Score, which prioritizes respiratory parameters (13).

Other studies show that more than 30% of patients with hematologic malignancies develop pulmonary complications, and about 50% of them are admitted to intensive care units (ICU). Acute respiratory failure is often identified as a primary reason for ICU admission among these clinically deteriorating patients (28) (29). This suggests that MEWS, when adapted to specific settings, may require adjustments to maximize its sensitivity. To make the score more relevant in hematologic scenarios, specific adjustments could include the incorporation of respiratory variables, such as oxygen saturation. The authors further

suggest that future studies should integrate new parameters into MEWS, such as serum lactate and the SpO₂/FiO₂ ratio, to enhance its specificity (13).

Supporting these findings, Study E5 investigated the effectiveness of the MEWS compared to "MEWS_SF", which involves adding the SpO₂/FiO₂ ratio to the score to predict in-hospital mortality in patients with hematologic malignancies (17). The inclusion of the SpO₂/FiO₂ ratio is a key predictor of patient oxygenation and allows for a more accurate assessment of respiratory status (30).

Other studies also demonstrated that adding additional variables to MEWS, such as blood lactate levels or the SpO₂/FiO₂ ratio, can improve its accuracy in predicting the need for ICU admission (31); (32).

The MEWS_SF score, compared to the traditional MEWS, showed a better ability to predict both ICU admission and in-hospital mortality in onco-hematologic patients at risk of clinical deterioration. The combination of MEWS with the SpO₂/FiO₂ index improved the score's sensitivity in the early detection of complications in patients with hematologic malignancies, enabling early interventions and reducing mortality (17).

Delayed identification of acute respiratory failure and delayed initiation of respiratory support in immunocompromised patients are associated with higher mortality and intubation rates (33). Once admitted to the ICU, this group showed high mortality rates over time, highlighting the severity of their clinical condition and the need for early risk identification. (34).

Studies E8 and E11 found that elevated MEWS scores at ICU admission in hematologic patients were linked to increased ICU needs and higher mortality, highlighting the score's usefulness for prognosis and early intervention (31).

According to VAN MOURIK et al. (2023), while a MEWS threshold of ≥ 3 predicts ICU admission, it shows low specificity for onco-hematologic patients. Raising the threshold to ≥ 6 improves specificity without reducing sensitivity, aligning with findings from other studies (23). The authors emphasize that further studies are needed to validate the efficacy of the score in different scenarios, as well as to explore the application of MEWS in hematological patients outside the ICU. (17). (20).

Study E11 compared the applicability of MEWS with the quick-SOFA (qSOFA) score, where elevated MEWS and qSOFA values were predictors of ICU admission in patients with hematological malignancies, but not of in-hospital mortality (23). The qSOFA is a screening score that can be applied when infection is suspected, helping to identify patients

at risk of ICU admission or death. In qSOFA, three criteria are considered: altered mental status, systolic blood pressure ≤ 100 mmHg, and respiratory rate ≥ 22 breaths per minute. The presence of at least two of these criteria indicates a higher risk of unfavorable outcomes (35).

The authors also demonstrated that qSOFA showed low sensitivity for identifying hemato-oncological patients at risk of ICU admission, making it unsuitable for bedside detection. These findings are similar to those of a previous study, which revealed that qSOFA was less effective than MEWS for early detection (36).

Corroborating these findings, study E4 reveals that the criteria evaluated in the Systemic Inflammatory Response Syndrome (SIRS) were more sensitive when compared to qSOFA criteria in predicting mortality in onco-hematological patients. The authors highlight that both systems can be used in a complementary manner, as SIRS is useful for screening, while qSOFA should be used for risk stratification prior to ICU admission (16).

Studies suggest that MEWS can be valuable in preventing deaths by aiding in the early detection of clinical deterioration through the monitoring of vital signs (CONSTANTINESCU et al., 2019). However, evidence remains limited, and its predictive value in hemato-oncological patients is still uncertain, highlighting the need for further research in this specific context (20) (17).

Another scoring system evaluated in studies E3, E7, and E13 was the National Early Warning Score (NEWS), which was compared with other scores such as SIRS and qSOFA. When comparing the effectiveness of NEWS with the SIRS score, the authors of studies E3 and E7 argue that SIRS criteria did not prove to be sufficiently specific for the onco-hematological population, leading to the implementation of the NEWS system as an alternative to improve early detection of clinical decline and communication between healthcare teams (15) (19).

In study E13, both NEWS and qSOFA scores demonstrated a high ability to identify clinical deterioration in hematological patients over time, starting from the onset of fever (Frairia et al., 2022). However, other studies have shown that the NEWS system presented greater sensitivity and specificity compared to SIRS, SOFA, and qSOFA for the diagnosis of sepsis and identification of clinical deterioration (37) (38).

Focusing further on comparative studies, study E10 compared the effectiveness of the SOFA and qSOFA scores with the Ramathibodi Early Warning Score (REWS) in

predicting complications in patients with hematologic malignancies, where SOFA and qSOFA were more accurate than REWS (39).

The study conducted by Costa and collaborators (2018) emphasizing that the SOFA score helps prioritize treatment among patients with sepsis, and when combined with an elevated qSOFA, indicates the need for immediate intervention (40).

The authors highlighted that although systems such as NEWS and MEWS show greater accuracy in predicting in-hospital mortality compared to qSOFA, there is no current evidence supporting the replacement of these early warning tools (22). However, although qSOFA still demonstrates a good ability to predict sepsis, a recent study by Figueiredo et al. shows that NEWS, due to its higher sensitivity, becomes the best tool for ruling out the diagnosis of sepsis (41). This is attributed to its positive impact on negative predictive value, reinforcing international guidelines for the management of sepsis and septic shock, which recommend not using qSOFA or SOFA systems in isolation.

In summary, the NEWS system is a practical and effective tool for assessing sepsis severity in hematology units. However, further research is needed to confirm its applicability in other settings and to identify key components relevant to hematologic malignancies (25).

Another scale evaluated in studies E2, E6, E9, and E14 was the Pediatric Early Warning Score (PEWS). Pediatric onco-hematological patients undergoing hematopoietic stem cell transplantation often progress to clinical deterioration, where PEWS can assist in the early identification of this decline, improving clinical outcomes (14).

Study E9 highlights that the implementation of PEWS in hospital settings reduces the occurrence of complications, the incidence of in-hospital cardiac arrests, and overall mortality. However, many hospitals in low- and lower-middle-income countries still lack effective systems for the early identification of patients at risk (21).

Corroborating this finding, study E2 emphasizes the importance of implementing systems like PEWS in resource-limited environments (14). Other previous studies have also demonstrated that the application of the score in low-income countries leads to a reduction in clinical deterioration, but difficulties arise due to inadequate infrastructure and limited budgets for health tools (42).

In the study conducted by Mills et al (2021), the implementation of the PEWS system resulted in significant improvements in vital sign collection and the documentation of important patient information. (21),

The authors of study E6 used the PEWS-LS system, a version derived from PEWS, calculated based on cardiovascular, respiratory, and neurological vital signs, as well as physical exam findings. The PEWS-LS proved effective in identifying clinical deterioration events, with higher scores at admission to the intensive care unit (ICU) being associated with increased mortality. Altered vital signs preceding clinical deterioration suggest that these events may be preventable with early intervention (18). Despite these results, studies suggest that it is still not fully proven whether clinical deterioration in pediatric onco-hematological patients is preceded by changes in vital signs that can be rapidly identified and reversed (14) (43).

In study E14, the Pediatric Sequential Organ Failure Assessment (pSOFA) score demonstrated the highest predictive validity for hospital mortality, followed by PEWS and the Pediatric Critical Illness Score (PCIS). The study concluded that using various scoring systems can aid in early sepsis identification, monitoring clinical status, recognizing critical illness, and determining the optimal timing for PICU transfer, ultimately improving patient outcomes (26).

However, PEWS stood out for being simpler and more practical in clinical practice. This fact is supported by results from another study that also demonstrated the efficacy of PEWS as an indicator for monitoring changes in the clinical condition of children in the hematology oncology unit, serving as a basis for adjusting the level of care and ICU transfers (44).

Finally, in studies E12 and E15, the authors sought to develop their own prognostic scoring system to identify patients in clinical deterioration with a high mortality rate, improving the accuracy of predictions. The authors justified their studies by noting that, currently, there is no reliable and validated scoring system that determines the admission of onco-hematological patients to the ICU or predicts their long-term survival, which complicates early detection and interventions (27) (24).

The new scoring system developed by Li et al (2023), included three independent variables to identify septic onco-hematological patients at high risk of death, which were: age over 60 years, prothrombin time (PT) of 27 seconds or more, and a SOFA score of 4.5 or more. Age, particularly over 60 years, was defined as a critical factor, in line with previous studies highlighting the relevance of ages over 65 years as a risk factor for sepsis (24) (45) (46).

The study also indicated that the SOFA score and the prothrombin time were good predictors of prognosis in sepsis cases, consistent with previous research. However, this was the first study to associate a PT ≥ 16 seconds with high mortality in patients with hematological malignancies and sepsis (24).

In contrast, the study by Boldingh et al. (2024) proposed a simplified clinical prediction model to predict 1-year mortality in patients with hematological malignancies hospitalized in the ICU, based on the analysis of the following variables: mechanical ventilation, lowest platelet count, active disease, previous allogeneic hematopoietic stem cell transplantation (HSCT), acute kidney injury (AKI), age, type of malignancy, and maximum heart rate during the first 24 hours after ICU admission. (27)

This model focuses on a long-term prediction, offering a different perspective on the severity of the disease and risk factors. The evaluation of variables such as the inflammatory response, hematological malignancy status, and response to intensive treatment are key components of this model.

Both studies emphasize the importance of personalizing predictive models, as traditional scores may not be sufficiently sensitive to the characteristics of patients with hematological malignancies. By creating models specific to this population, the researchers were able to improve prediction accuracy and, consequently, clinical decision-making.

The review analyzed 15 studies focused on the development and application of early warning scores (EWS) in patients with hematological malignancies—a highly vulnerable group at increased risk for sepsis, organ dysfunction, clinical deterioration, and death. The findings underscore the importance of identifying available tools tailored to this population. Despite the proven effectiveness of EWS, the review revealed a significant gap in studies involving validated and implemented scales in Brazil, particularly in the Amazon region, where no research on the application of these tools was found.

Although these tools have shown benefits internationally, the absence of local research limits their adaptation to Brazil's unique healthcare challenges, including regional diversity and resource constraints. This gap hinders early detection and intervention for patients at risk of clinical deterioration, especially in remote areas with limited infrastructure. Without proper validation and implementation, it becomes difficult to optimize care, prevent complications, and reduce avoidable deaths, directly affecting healthcare outcomes in vulnerable regions.

CONCLUSION

Studies on early warning scores for patients with hematological malignancies are scarce, highlighting a significant gap in the scientific literature. Despite the use of these scores in other contexts, their effectiveness in patients with hematological malignancies has not been sufficiently explored. Furthermore, the studies identified were exclusively conducted in international contexts, revealing a lack of research tailored to the Brazilian reality, especially in the Amazon region. This emphasizes the urgency of developing investigations in this area, aiming to provide theoretical and scientific support to professional practices in Brazil.

DECLARATION OF COMPETING INTEREST

The authors declare that they have no competing interests.

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