REVIEW ARTICLE

REVISTA ENFERMAGEM ATUAL IN DERME

APPLICABILITY OF THE NATIONAL EARLY WARNING SCORE IN THE EARLY DETECTION OF CLINICAL DETERIORATION: AN INTEGRATIVE REVIEW

APLICABILIDADE DO NATIONAL EARLY WARNING SCORE NA DETECÇÃO PRECOCE DA RECLAMAÇÃO CLÍNICA: UMA REVISÃO INTEGRATIVA

APLICABILIDADE DA NATIONAL EARLY WARNING SCORE NA DETECÇÃO PRECOCE DA DETERIORAÇÃO CLÍNICA: UMA REVISÃO INTEGRATIVA

Gessiana Silva dos Santos[1]
Gabrielle Bezerra dos Santos[2]
Leandro Melo de Carvalho[3]
Bárbara Ebilizarda Coutinho Borges[4]
Fabiane Rocha Botarelli[5]
Allyne Fortes Vitor[6]

[1]Residente no Hospital Universitário Onofre Lopes, Natal, Brasil. ORCID-ID: https://orcid.org/0000-0003-2284-5613
[2]Universidade Federal do Rio Grande do Norte, Natal, Brasil. ORCID-ID: https://orcid.org/0000-0002-6117-806X
[3]Aluno do curso de doutorado do Programa de Pós-graduação em enfermagem da Universidade Federal do Rio Grande do Norte, Natal, Brasil. ORCID-ID: https://orcid.org/0000-0002-0106-2882
[4] Aluna do curso de mestrado do Programa de Pós-graduação em enfermagem da Universidade Federal do Rio Grande do Norte, Natal, Brasil. ORCID-ID: http://orcid.org/0000-0001-6922-1475
[5] Professora Adjunta da Universidade Federal do Rio Grande do Norte, Natal, Brasil. ORCID-ID: http://orcid.org/0000-0002-6875-3143
[6] Professora Adjunta da Universidade Federal do Rio Grande do Norte, Natal, Brasil. ORCID-ID: http://orcid.org/0000-0002-4672-2303

Corresponding author
Bárbara Ebilizarda Coutinho Borges
Campus Universitário - Lagoa Nova, Natal – RN - Brazil, 59078-970. Fone: +55(84) 996652376 - E-mail: barbara_ebilizarda@hotmail.com

Submission: 01-03-2023
Approval: 15-05-2023

Authors' contribution

All authors contributed All authors contributed substantially to the conception, planning of the study, collection, analysis, interpretation of data, as well as to the writing, revision and final approval of the published version.

ABSTRACT
Aim: To identify, based on the literature, the applicability of the National Early Warning Score (NEWS) in the early detection of clinical deterioration in patients in different care sectors. **Methods:** This is an integrative literature review, carried out from seven data sources, namely: Virtual Health Library (VHL), Scientific Electronic Library Online (SciELO), National Library of Medicine and National Institutes of Health (PubMed), Cochrane Library, The Cumulative Index to Nursing and Allied Health Literature (CINAHL), Scopus and Web of Science. Publications that addressed the object of study in the last seven years (from 2015) were included in order to collect the most recent information about the score and taking into account its creation in 2012, which are available free of charge and in full. The final sample consisted of 41 studies. **Results:** There was a predominance of cohort studies, followed by observational studies. And the most applicable environments of NEWS, it presents a predominance of the hospital environment of medium and high complexity, with emphasis on the wards (51.35%), followed by the Intensive Care Units (10.81%) and pre-hospital environment (10 .81%). Regarding the professionals who most apply this score, nurses and physicians are the most prevalent. **Conclusion:** It was important to identify that NEWS can be applied in different environments, as it demonstrates effectiveness in identifying early clinical deterioration.
Keywords: Early Warning Score; Clinical deterioration; Nursing; Hospital Assistance.

RESUMEN
Objetivo: Identificar, con base en la literatura, la aplicabilidad del National Early Warning Score (NEWS) en la detección temprana de deterioro clínico en pacientes de diferentes sectores asistenciales. **Métodos:** Se trata de una revisión integrativa de la literatura, realizada a partir de siete fuentes de datos, a saber: Biblioteca Virtual en Salud (BVS), Biblioteca Científica Electrónica en Línea (SciELO), Biblioteca Nacional de Medicina e Institutos Nacionales de Salud (PubMed), Biblioteca Cochrane, The Índice acumulativo de literatura sobre enfermería y salud relacionada (CINAHL), Scopus y Web of Science. Se incluyeron publicaciones que abordaron el objeto de estudio en los últimos siete años (a partir de 2015) con el fin de recopilar la información más reciente sobre la partitura y teniendo en cuenta su creación en 2012, las cuales se encuentran disponibles de forma gratuita y completa. La muestra final estuvo compuesta por 41 estudios. **Resultados:** Predominaron los estudios de cohortes, seguidos de los estudios observacionales. Y los ambientes de mayor aplicación de NEWS, presenta un predominio del ambiente hospitalario de media y alta complejidad, con énfasis en las salas (51,35%), seguido de las Unidades de Cuidados Intensivos (10,81%) y ambiente prehospitalario (10. 81%). En cuanto a los profesionales que más aplican este puntaje, los enfermeros y médicos son los más prevalentes. Conclusión: Fue importante identificar que NEWS puede ser aplicado en diferentes ambientes, ya que demuestra efectividad en la identificación temprana de deterioro clínico.
Palabras llave: Puntaje de Alerta Temprana; Deterioro clínico; Enfermería; Asistencia Hospitalaria.

RESUMO
Objetivo: Identificar, a partir da literatura, a aplicabilidade da National Early Warning Score (NEWS) na detecção precoce de deterioração clínica de pacientes nos diferentes setores assistenciais. **Métodos:** Trata-se de uma revisão integrativa de literatura, realizada a partir de sete fonte de dados, a saber: Biblioteca Virtual em Saúde (BVS), Scientific Electronic Library Online (SciELO), National Library of Medicine and National Institutes of Health (PubMed), Cochrane Library, The Cumulative Index to Nursing and Allied Health Literature (CINAHL), Scopus e Web of Science. Foram incluídas as publicações que abordassem o objeto de estudos nos últimos sete anos (a partir de 2015) a fim de coletar o que há de mais recente sobre o escore e levando em consideração sua criação em 2012, sendo elas disponíveis de forma gratuita e integral. A amostra final foi composta por 41 estudos. **Resultados:** Observou-se predomínio dos estudos de coorte, seguidos de estudos observacionais. E os ambientes mais aplicáveis da NEWS, apresenta predominância do ambiente hospitalar de média e alta complexidade, com destaque para as enfermarias (51,35%), seguidas das Unidades de terapia intensiva (10,81%) e ambiente pré-hospitalar (10,81%). Com relação aos profissionais que mais aplicam este escore, profissionais enfermeiros e médicos são os mais prevalentes. **Conclusão:** Fez-se importante identificar que o NEWS pode ser aplicável em diversos ambientes, pois demonstra efetividade ao identificar deterioração clínica precoce.
Palavras-chave: Escore de Alerta Precoce; Deterioração Clínica; Enfermagem; Assistência Hospitalar.

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INTRODUCTION

Early Warning Scores (EWS) are tools used to assess patients who are often at risk of clinical deterioration. In the United Kingdom, different EWS systems are used in different health services and, to solve the limitations caused by the use of a variety of scores in these scales, the Royal College of Physicians (RCP) developed the National Early Warning Score (NEWS), which was introduced in the country in 2012 [1].

NEWS was evaluated in relation to a series of results that demonstrate great relevance for patients and health professionals, since it expresses a good ability to classify patients at risk of physiological instabilities that can culminate in undesirable outcomes, such as cardiorespiratory arrest, unexpected admission to the Intensive Care Unit (ICU) or death within 24 hours. Such a scale therefore offers ample opportunity for appropriate clinical intervention in order to modify the patient's clinical condition [2].

The tool serves to evaluate a set of clinical parameters, such as heart rate, respiratory rate, oxygen saturation, need for additional oxygen support, temperature, systolic blood pressure and level of consciousness, which provides monitoring of the severity of the patient in clinical deterioration, which, when aggregated, determine a score. Its magnitude reflects how extreme this parameter varies from normality. A total score is generated by the sum of the scores assigned to each parameter, which establishes a predetermined conduct, and seeks the best relevant assessment regarding the patient's current situation [3].

Clinical deterioration is defined as the physiological factor of decompensation that occurs when a patient presents worsening conditions or the acute onset of a serious physiological disturbance. Furthermore, the deteriorating patient converges to a worsened clinical state, increasing morbidity and organ dysfunction, with prolonged hospital stay or even death. The criterion for distinguishing clinical deterioration is commonly determined from objective and subjective observations. Signal monitoring is a practice standard in healthcare interactions between professionals and patients and a real-time descriptor for deterioration [4].

Promptly recognizing clinical deterioration can save lives. It is in the presence of the nursing team that these changes can be primarily observed, creating several strategic opportunities to prevent the transfer of patients to higher and more complex levels of care and to reduce mortality [4].

Thus, given the importance of early detection of clinical deterioration in the health of patients, and bearing in mind that the nursing team is inserted in this context, this research becomes relevant for the improvement of nursing practice in the sense of directing care and determine interventions that provide positive results. It is based, therefore, on the following research question: What is the applicability of the National Early Warning Score in identifying

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the clinical deterioration of patients in different care environments?

That said, the present study aims to: synthesize, from the literature, the applicability of the National Early Warning Score in the early detection of clinical deterioration of patients in different care sectors.

METHODS

This is an integrative literature review, which addresses the applicability of an early warning scale used to detect clinical deterioration. This method synthesizes primary research results and shows results from the literature corpus on a specific phenomenon. It comprises, therefore, all studies related to the guiding question that guides the literature search [5].

The NEWS early warning scale aims to estimate the prediction of worsening severity of a clinical condition. The score refers to scores according to the assessment of vital signs, level of consciousness, heart rate, systolic blood pressure, respiratory rate, temperature, oxygen saturation, with the implementation of the use of supplemental oxygen therapy. Thus, it infers that the higher the changes in physiological signs, the greater the state of deterioration, which is classified into four stages, namely: 0-3 (low risk), 4-5 (medium risk), 6- 7 (high risk) [6].

For each physiological parameter, scores from zero to three are performed and, at the end, it is added to the other signals. In addition, two points are added in situations where the patient uses oxygen therapy, providing a final score from 0 to 20, with a direct correlation between a higher score and a greater risk of deterioration, therefore, the higher the score, the higher the level of imminent deterioration. The data obtained reflect the degree of risk and determine the frequency of monitoring and intervention to the patient [6].

For the construction of this study, the method proposed by Hopia, Lartvala and Liimatainen (2016) was adopted. This method provides the condensation of several previously published results in data sources obtained through different methodological approaches. In this sense, this review adopted the five stages proposed by the authors: identification of the problem, literature search, data evaluation, data analysis and presentation [5].

In order to direct the search, organize and standardize the collection of the sample, a research protocol was elaborated, which was composed of the following items: theme, guiding question, objective, search strategy (database, descriptors and crossings), criteria of inclusion and exclusion criteria.

With the aim of tracing all the components of the problem and answering the guiding question: “What is the applicability of the National Early Warning Score in identifying the clinical deterioration of patients in different care environments?”. The PVO strategy (Population/Problem, Variables, Outcomes/Outcome) was used. For this research, each letter represents: P (Applicability of NEWS); V (Assistance sectors); and, O (Early detection of clinical deterioration).

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The research was carried out in October 2022, based on the consultation of seven data sources, through the Federated Academic Community (CAFe) accessed through CAPES Journal, namely: Virtual Health Library (BVS) and in the databases: Scientific Electronic Library Online (SciELO), National Library of Medicine and National Institutes of Health (PubMed), Cochrane Library, The Cumulative Index to Nursing and Allied Health Literature (CINAHL), Scopus and Web of Science.

In order to carry out the crossings in the databases, the keywords 1# "NEWS" and 2# "Applicability" were used, as well as the descriptor indexed to Descriptors of Health Sciences (DeCS) and to Medical Subjects Headings (MESH): 2# "Clinical Deterioration". In addition, their respective correspondents in English were used: NEWS; Clinic Deterioration; Applicability. The Boolean operator AND was used, resulting in the following intersections: 1# AND 2#, and 1# AND 3#. Keywords were used with the aim of improving and better directing the search, since there is no specific descriptor for the recent scale.

For the selection of articles, the following inclusion criteria were used: publications that addressed the object of studies in the last seven years (from 2015) in order to collect the most recent information about the score and taking into account its creation in 2012, which are available free of charge, in full and that address the subject of study. Exclusion criteria were: reviews (with the exception of systematic reviews and meta-analyses), abstracts, editorials, book chapters, letters to the editor, reviews, previous notes and expert opinions. Repeated articles were counted only once, counting from the first time they were identified by the search.

The articles were pre-selected after reading the title and abstract, identifying the topic to be researched. To guide the analysis and interpretation of the selected studies, a data extraction script was prepared with the following characterization variables: title, type of study, applicable scenario, population, language, year of publication and level of evidence of the studies, as recommended by the Oxford Center for Evidence-based Medicine (2009) [7], as described in Table 1.

Table 1 - Classification of evidence according to Oxford Center for Evidence-based Medicine

GR *	NE*	Types of Studies
	1A	Systematic review of level 1 diagnostic studies.

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A		Diagnostic criteria of level 1B studies, in different clinical centers.
	1B	Validated cohort, with good reference standard. Diagnostic Criteria tested at a single clinical center.
	1C	Sensitivity and specificity close to 100%
B	2A	Systematic review of diagnostic studies at level higher than 2
	2B	Exploratory cohort with good reference standard. Diagnostic Criteria derived or validated in fragmented samples or database.
	2C	-
	3A	Systematic review of diagnostic studies of level higher than 3B.
	3B	Non-consecutive case selection, or inconsistently applied reference standard.
C	4	Case-control study or poor or non-independent reference standard.
D	5	Expert opinion devoid of critical evaluation or based on basic materials (physiological study or animal study).

Source: Oxford Centre for Evidence-based Medicine, 2009.

*GR - Degree of recommendation; NE - Level of evidence.

In addition, a descriptive synthesis of the data was carried out, with the organization of the relevant information presented in the analysis of the included studies, along with this, operationalized the interpretative analysis and discussion of the findings. Thus, the data were analyzed descriptively, pointing out the main results of the application of NEWS, using simple measures.

Initially, the search reached 2467 results, of which: 358 were in VHL, 1312 in PubMed, 530 in Scopus, 138 in Web of Science, 127 in CINAHL, one in Cochrane, and one in Scielo.

Subsequently, 77 articles were selected for reading in full, based on reading the title and abstract and applying the inclusion and exclusion criteria. Finally, after reading in full, 41 were selected to compose the sample. These were organized and presented through tables. Sample values in percentages were obtained using formulas in Microsoft Excel.

The following flowchart represents the methodological process, from the identification of the theme to the sample of studies that composed the research.

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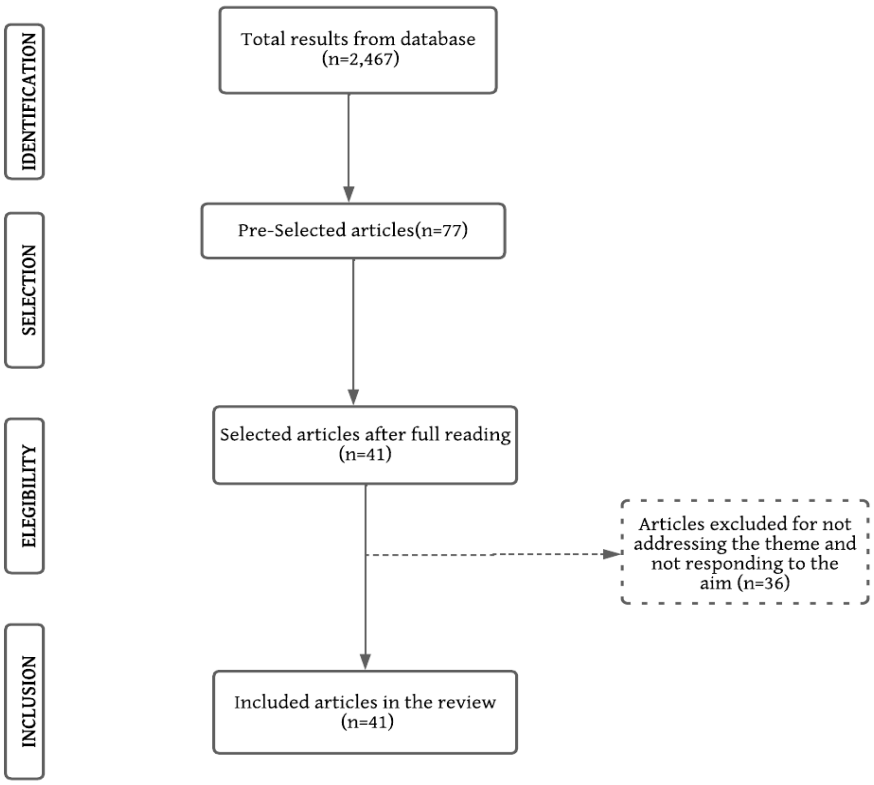
Figure 1- Flowchart representative of the methodological process from the identification of the theme to the final sample of studies. Natal, RN, Brazil,2022.



Source: Elaborated by the authors, Natal, RN, Brazil, 2022.

It is noteworthy that the research involves secondary data and does not require human beings, therefore, it does not require approval by the Research Ethics Committee.

RESULTS

Of the 41 articles selected, 18 were extracted from VHL (43.90%), 9 from Pubmed (21.95%), 6 from Web of Science (14.63%), 4 were selected from CINAHL (9.75%), and 4 from Scopus (9.75%).

Regarding the year of publication, these ranged from 2016 to 2022, with concentration in the year 2018 (36.58%). As for the country of publication, England was responsible for 13 (31.70%), while the United States, six (14.63%); the others had frequencies lower than 6%. Furthermore, the English language was the language of all articles.

According to Table 1, regarding the study methods used by the authors, it was possible to observe the predominance of cohort studies, 21 (51.21%), followed by observational studies, eight (19.51%).

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Table 1 - Distribution of studies according to type of study, year of publication, country and language. Natal, RN, Brazil, 2022.

Variables	N (%)
Type of study	
Cohort Studies	21 (51,21%)
Observational Study	8 (19,51%)
Retrospective Analysis	2 (4,87%)
Others	10 (24,39%)
Year of publication	
2018	15 (36,58%)
2019	1 (2,43 %)
2017	5 (12,19%)
2016	3 (7,31%)
2020	3 (7,31%)
2021	2 (4,87%)
2022	2 (4,87%)
Country	
England	13 (31,70%)
United States	6 (14,63 %)
Northern Hemisphere Countries	18 (43,90 %)
Languages	
English	**41 (100%)**

Source: Data from the survey itself, 2020.

According to the most applicable NEWS environment, it was possible to observe a predominance of the hospital environment of medium and high complexity, with emphasis on the wards with 46.34%, as shown in Table 2.

Table 2 - Number of references to the most applicable environment. Natal, RN, Brazil, 2020.

Applicable Environment	N (%)
Nursery	19 (46,34%)
Pre-hospital	5 (12,19%)

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Intensive Care Units	6 (14,63%)
More than one environment	4 (9,75%)
Department of Urgency and Emergency	3 (7,31%)
Transfers	2(4,87%)
Outpatient clinic	1(2,43%)
Nursing homes	1(2,43%)
COVID-19 assistance	1(2,43%)

Source: Data from the survey itself, 2020.

Regarding the professionals who most apply this score, nurses and physicians are the most prevalent. Still, it was possible to observe among the study sample that in its minority (5.41%) there were articles that reported low efficiency of this score.

Finally, the publications were equally distributed in levels of evidence 2B and 2C, representing 43.90% of the studies that made up the sample, while levels 1B totaled two studies (4.87%), adding 4 (2.43%) and unidentified resulted in 9.75%.

No publications with level of evidence 1A, 1C and 2A were found, as well as publications with level of evidence 5, since studies of this type were not selected according to the selection criteria.

DISCUSSION

Early warning scores are part of several services that aim to assist patients in clinical deterioration. Studies point out that the use of NEWS can automatically identify patients at risk of instabilities at the time of admission and could improve broader prognoses, such as hospital mortality rate, length of stay and general use of resources. This score can help to detect patients at high risk of deterioration, in addition to triggering early interventions to be performed, and thus saving patients in emergency situations to places where health professionals, facilities and equipment are available [8].

However, the use of NEWS has limitations, as it can generate a predictive value that is not reliable for the deteriorating patient's clinical status, triggering an inadequate response or even a timely non-response, which may be related to errors in the records made [9].

In a study carried out with patients readmitted to an Intensive Care Unit in Turkey, it was found that the application of NEWS is not the only parameter in predicting early clinical deterioration, and other factors were also effective in early clinical deterioration [10].

Some studies demonstrate that the inadequacies of clinical responses to NEWS are significantly worse on weekends, where the main conclusion is that there is a different standard of care today, which has implications for patient safety after hours. In addition, punctuation errors occur more frequently with higher scores [9].

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The results of this research demonstrated that cohort studies were prevalent in relation to the others. This demonstrates the prevalence and importance that this type of method has for research in the health area. This type of study has, over time, improved the quality of information available for decision-making, especially when compared to other types of study, with regard to comparative efficacy research, being able to distinguish further from the clinical trial, mainly by the follow-up time of patients, which is mostly extended, by the larger population studied and by the better analysis of infrequent outcomes [11].

England was the country with the most publications regarding the applicability of NEWS. This, in turn, was the country where the scale was created, through the Royal College of Physicians, in which it recommends the use of NEWS to standardize the assessment of the patient's clinical condition. Furthermore, NEWS can be used as a surveillance system for all patients in hospitals, tracking their clinical condition, alerting staff about deterioration and triggering a timely clinical response [6].

The United States was the second most prevalent country to carry out studies on the subject. In addition, it was possible to observe that countries in the northern hemisphere, especially countries such as Sweden, Thailand and Finland, also dedicated themselves to evaluating the applicability of this score in their services.

The use of NEWS in intra-hospital environments was predominant in this study, especially in wards and intensive care units, in addition to being considered more effective when compared to other types of scores. With regard to its use in the ward, studies have shown that in most cases, NEWS provides early detection of instabilities, leading to rapid intervention and possible transfer from this less complex environment to a more complex one.

The reverse also occurred when patients are transferred from the ICU to the clinical ward. The results of a study showed that patients admitted to the ward had NEWS ranging from medium to high, and thus triggered a rapid response from the health team, providing immediate care and preventing the clinical deterioration of this patient [12].

As for the pandemic scenario faced in recent years, the COVID-19 infection was at a high risk of deterioration, particularly in scenarios where health resources were deficient, so that it promoted the proper use of all available resources. The prognostic accuracy of NEWS in predicting clinical deterioration for patients with COVID-19 shows good discrimination when predicting the combined outcome of need for intensive respiratory support, ICU admission or hospital death [13].

High NEWS values at the time of ICU discharge and admission to the ward may be a marker for a specific physiological assessment, as at this moment the patient's physiological responses are more intense, and require a different look in their assessment [12].

Some studies that composed the sample were able to compare NEWS with other types of

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early warning scores, such as the quick Sequential Organ Failure Assessment Score (qSOFA) and Systemic Inflammatory Response Syndrome (SIRS), obtaining better results in predicting the early detection of clinical conditions critical events, such as sepsis, cardiovascular emergencies and severe respiratory diseases [8].

NEWS showed accuracy equivalent to or better than SIRS and qSOFA scores to predict clinical deterioration in complications of patients infected with SARS-CoV-2, such as Acute Respiratory Distress Syndrome (ARDS) and septic shock. It was able to predict clinical deterioration in patients with a result ≥7. This is justified by the fact that patients with silent hypoxemia seem to breathe comfortably, but oxygen saturation is often low when measured using pulse oximetry. For this reason, SIRS and qSOFA have limitations in predicting outcomes. The high accuracy of NEWS predictions in these clinical outcomes is interpreted through the parameters analyzed in the scale (respiration, hypoxia and oxygen saturation), which are three of the variables in NEWS [8].

Through NEWS, in a highly complex environment, such as the ICU, aggressive measures could be taken in an initial state, in case any of the parameters are altered, which could prevent clinical deterioration that leads to the need for intensive care. With this knowledge, physicians could also, at an early stage, begin to discuss and plan for the level of care that should be provided if the patient deteriorates [14].

Attention is called to another result of this study, which is the use of NEWS in the pre-hospital environment, where agility and immediate clinical reasoning are required, which confirm its effectiveness in predicting the risk of deterioration, which can lead to admission to the hospital. ward or ICU. Accordingly, a study evaluated the use of NEWS in a pre-hospital environment, from the journey in the ambulance to admission to an in-hospital service, in which the scores calculated in the ambulance were responsible for determining which conducts would be initiated [15].

The use of NEWS in pre-hospital care standardizes communication and allows starting interventions before arriving at the hospital, so that the patient is treated in the right conditions and according to his/her clinical condition. Similarly, another study showed that NEWS in a prehospital environment can identify deterioration in critically ill patients and those at risk of adverse outcomes. Patients classified as high or medium risk based on the NEWS were more likely to be admitted to the ICU or die in the emergency department. This prediction was effective regardless of age group and gender among participants with different demographic characteristics [16].

A systematic review carried out in 2021 found evidence that many risk early warning scores are reliable tools, therefore, mostly results were obtained showing a great ability to predict short-term mortality, including the pre-hospital phase. At the same time, they are agile and simple to apply, configuring an important quality

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in outpatient settings, in which the availability of time and care conditions are generally unfavorable and the need to make quick decisions with very limited information is a constant in the routine of the work of professionals inserted in these services [17].

NEWS scores assess the severity of clinical situations, contributing to the recognition of critical and potentially critical patients linked to the decision-making process and the quick response of care teams [18].

The applicability of the national early warning score in carrying out transfers, both between the extra-hospital environment, such as primary care, and from the ward to the ICU, has been evaluated in some studies of this sample, where their results were satisfactory and demonstrated sensibilities for predicting physiological complications of the patient. The study demonstrated that despite its relative simplicity, this scale becomes potentially useful and a convenient method of communicating risks to the next immediate care provider in a chain of care from the community to the hospital [19].

Increased NEWS scores obtained in the community during transfer to hospital and admission after evaluation by a general practitioner are associated with an increased risk of 5- and 30-day outcomes. Communicating the correct value to the admission team can allow subsequent care to be performed correctly and according to the patient's risk [19].

Nursing professionals expressed a strong commitment to early detection, observing and evaluating patients. A common view was that NEWS objective measurements and observations should be used together to assess patients and then should be reinterpreted in light of each patient's condition and the nurse's clinical judgment [20].

Studies have shown that these professionals play a fundamental role in the health team, especially with regard to the early assessment of clinical deterioration using NEWS. Additionally, NEWS was reported to give them clear instructions on what to do if a patient triggers and allow them to better prioritize their care, as well as trigger rapid intervention. Still, almost 80% of nurses responded positively to this early warning score, supporting its applicability on an unstable patient.

This is an important finding that adds credibility to NEWS for detecting deteriorating patients [20].

Most studies were classified with level of evidence 2C and degree of recommendation B, this denotes the importance of carrying out studies with level of evidence 1 and degree of recommendation A.

The 2C level of evidence indicates that the evidence is based on observational studies, such as retrospective cohorts, case-control studies or case series, with lower reliability and methodological rigor compared to controlled experimental studies. While recommendation grade B suggests that clinical recommendations are based on well-conducted studies, but that may have some limitations, such as non-randomized clinical trials, long-term

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observational studies or studies with smaller sample sizes [7].

Therefore, despite the consistency found in the studies, the production of new studies is still recommended.

CONCLUSIONS

It is concluded that most publications were developed in hospital settings, where NEWS was tested and showed greater applicability, however it does not exclude its effectiveness in pre-hospital situations. In addition, the importance of carrying out the correct calculation is reinforced both at the time of the initial care and in the constant evaluation of the deteriorating patient.

The importance of early assessment of the patient in clinical deterioration is reinforced, recommending new possibilities for its realization, and proposing to professional nurses a quick and early assistance in the different scenarios in which they are inserted.

Among the limitations of this study is the scarcity of studies produced in Brazil, productions with a level of evidence greater than two, in addition to the lack of understanding of the methodology of some publications, as well as a high number of paid access articles.

Finally, it is suggested to carry out systematic reviews and other studies with a design that allow a higher level of evidence and degree of recommendation regarding the applicability of the NEWS, and how nursing is inserted in the use of this score.

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