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NEWS AND NEWS 2: USEFUL TOOLS IN PREDICTING THE OUTCOME OF ADULT AND ELDERLY PEOPLE WITH COVID-19?

NEWS E NEWS 2: FERRAMENTAS ÚTEIS NA PREDIÇÃO DO *OUTCOME* DA PESSOA ADULTA E IDOSA COM COVID-19?

NEWS Y NEWS 2: HERRAMIENTAS ÚTILES EN LA PREDECCIÓN DEL *OUTCOME* EN LA PERSONA ADULTA Y ANCIANA CON COVID-19?

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ABSTRACT

Introduction: The Covid-19 pandemic has led to an exponential increase in the influx of people to health services, limiting the response capacity of professionals and material resources. This has led to the adoption of tools to stratify the clinical risk of people with Covid-19, which are essential for optimizing resource management and improving patient safety.

Objective: To analyze the contributions of the National Early Warning Score and the National Early Warning Score 2 in predicting clinical deterioration and the risk of death in adult and elderly people with Covid-19.

Methodology: An integrative literature review was carried out based on the analysis of 11 articles, obtained through searches carried out in the EBSCOHost search engine, in accordance with the PI(C)O methodology. The search was based on the time period from December 2019 to March 2023 and the organization of the selection process for the articles in the sample followed the PRISMA methodology.

Results: NEWS and NEWS2 showed good predictive capacity regarding the occurrence of clinical deterioration, the need for Intensive Care Unit admission and the risk of death of adult and elderly people with Covid-19, even when compared with scores specifically designed to apply in people with Covid-19.

Conclusion: Early identification of the risk of clinical worsening through NEWS and NEWS2, allows timely intervention regarding stabilization and prevention on complications, revealing to be a useful tool for managing patient safety and resources allocation.

Keywords: Clinical Deterioration; Covid-19; Mortality; National Early Warning Score.

RESUMO

Introdução: A pandemia de Covid-19 originou um aumento exponencial na afluência de pessoas aos serviços de saúde, tendo-se verificado constrangimentos na capacidade de resposta dos profissionais e dos recursos disponíveis. A adoção de ferramentas que permitem estratificar o risco clínico da pessoa com Covid-19, revelaram a sua importância na otimização da gestão de recursos e na promoção da segurança dos doentes.

Objetivo: Analisar os contributos do *National Early Warning Score* e do *National Early Warning Score* 2, na predição da deterioração clínica e do risco de morte da pessoa adulta e idosa com Covid-19.

Metodologia: Realizou-se uma revisão integrativa da literatura com base na análise de 11 artigos, obtidos através de pesquisas realizadas no motor de busca EBSCOHost, de acordo

com a metodologia PI(C)O. A pesquisa incidiu no período de dezembro de 2019 a março de 2023 e a organização do processo de seleção dos artigos seguiu a metodologia PRISMA.

Resultados: O NEWS e o NEWS2 evidenciaram boa capacidade preditiva relativamente à ocorrência de deterioração clínica, à necessidade de admissão em Unidade de Cuidados Intensivos (UCI) e ao risco de morte da pessoa adulta e idosa com Covid-19, inclusivamente quando comparados com scores concebidos especificamente para aplicar a pessoas com Covid-19.

Conclusão: A identificação precoce do risco de agravamento clínico através do NEWS e do NEWS2, oferece a possibilidade de uma intervenção atempada com vista à estabilização do doente e à prevenção de complicações, promovendo uma gestão eficaz da segurança do doente e dos recursos disponíveis.

Palavras-chave: Covid-19; Deterioração Clínica; Mortalidade; National Early Warning Score.

RESUMEN

Introducción: La pandemia de Covid-19 provocó un aumento exponencial de la afluencia de personas a los servicios de salud, lo que se tradujo en limitaciones de la capacidad de respuesta de los profesionales y en los recursos disponibles. La adopción de herramientas que permiten estratificar el riesgo clínico de las personas con Covid-19 reveló su importancia para optimizar la gestión de recursos y promover la seguridad del paciente.

Objetivo: Analizar las contribuciones del National Early Warning Score e do National Early Warning Score 2, en la predicción dela deterioración clínica y del riesgo de muerte en la persona adulta y anciana con Covid-19.

Metodología: Se realizó una revisión integrativa de la literatura a partir del análisis de 11 artículos, obtenidos a través de búsquedas realizadas en el buscador EBSCOHost, de acuerdo con la metodología PI(C)O. La investigación abarcó el período de diciembre de 2019 a marzo de 2023 y la organización del proceso de selección de artículos siguió la metodología PRISMA.

Resultados: NEWS y NEWS2 mostraron buena capacidad predictiva sobre la aparición de deterioro clínico, la necesidad de ingreso en Unidad de Cuidados Intensivos y el riesgo de muerte de en la persona adulta y anciana con Covid-19, incluso cuando se comparan con puntajes diseñados específicamente para aplicarse a personas con Covid-19.

Conclusión: La identificación temprana del riesgo de deterioración clínica a través de NEWS y NEWS2 ofrece la posibilidad de una intervención oportuna con el objetivo de estabilizar al paciente y prevenir complicaciones, por lo que es una herramienta útil para gestionar la seguridad del paciente y asignar recursos.

Descriptores: COVID-19; Deterioro Clínico; Mortalidad; National Early Warning Score.

INTRODUCTION

The Covid-19 pandemic was one of the greatest challenges for 21st century society. Caused by the Sars-CoV-2 virus, its first reports trace back to Wuhan (China), in December 2019. The impact and fast dissemination of this virus around the world led the WHO to declare it a pandemic in March 2020[1-3]. The exponential increase in cases and the influx of people in health services showed that the capacity of professionals and the material resources were too limited to provide a response[4]. In this regard, ensuring timely and safe care depended on fast assessments and care provision to Covid-19[5]. Thus, the fast use of efficient and effective tools to stratify the clinical risks of a person with Covid-19 has become important, as it allows identifying the most severe situations and the risk of clinical deterioration, helping overcome the difficulties imposed by the pandemic[6-12]. In the clinical approach to the Covid-19 patient, more severe cases must be prioritized, in order to efficiently allocate available resources and ensure that adequate care is provided[9,12].

Early Warning Scores (EWS) are strategic tools in resource management and patient safety, being used to identify early people at risk of clinical deterioration in order to stabilize them early and prevent complications. Based on the premise that clinical deterioration is often preceded by subtle changes in physiological parameters, these tools are based on the periodical evaluation of vital parameters to calculate a score. They attribute points according to the severity of alterations in each parameter, reflecting their variance when compared to the norm[13-16].

The NEWS, firstly published in 2012 by the Royal College of Physicians, and the NEWS 2, an update of this first version released in 2017, these scores are widely validated and used for early detection of people in critical conditions and/or at risk of clinical deterioration. These scores were developed according to the ideas mentioned above, including respiratory rate, peripheral oxygen saturation, cardiac rate, systolic arterial pressure, temperature, state of consciousness, and, finally, oxygen therapy[5,13]. The NEWS2 recognized confusion as a physiological parameter suggestive of clinical decompensation. It also integrated two scales to evaluate peripheral oxygen saturation, in order to value global respiratory failure[5,13,16].

In 2020, guidelines from the Royal College of Physicians and the WHO[17,18] recommended using the NEWS2 to identify and detect Covid-19 early, and continue its use throughout the treatment of the disease.

Objective

To analyze the contributions of the National Early Warning Score and the National Early Warning Score 2 in predicting clinical deterioration and risk of death of adult and elders with Covid-19.

METHODOLOGY

An integrative literature review (ILR) is a type of study based on research, critical analysis, and synthesis of the scientific evidence available regarding a certain topic. This contributes for a systematic update of knowledge and clinical practice[19].

Formulating the investigation question is an essential step to guide the ILR and make it more objective. The question for the present investigation was elaborated using the PI[C]O methodology, which stands for population (P), intervention (I), comparison (C), and outcomes (O): "Does the application of the National Early Warning Score and the National Early Warning Score 2 (intervention) contribute to predict the clinical deterioration and risk of death (outcome) of adults and older persons with Covid-19 (population)?".

The process of research and data collection took place from March 2023, in the databases MEDLINE Complete and CINAHL Complete, accessed using the search engine EBSCOHost and using the following descriptors: "National early warning score", "Early warning system", "Early warning score", "News 2", "News2", "Covid-19", "Coronavirus", "2019-ncov", "Sars-cov-2", "Cov-19", "Mortality", "Mortality rate", "Death", "Death rate".

To outline and delimit the research, we only considered primary studies. Inclusion criteria considered texts in Portuguese, English, and Spanish; the relevance of the results for the issue at hand; publication date (from December 2019 to March 2023); and articles that studied people older than 18 years of age. We excluded all duplicates found in the research, as well as any studies unrelated with the topic at hand, and those whose methodology was ambiguous, that were published before December 2019, and that involved the pediatric population.

Three authors identified and selected the studies independently. 301 articles were found. After duplicates were removed, 249 were left. In the second stage, after reading the title and abstract, we 36 considered were considered potentially interesting and relevant for the ILR. In the third stage, the integral reading and minute analysis of the articles to verify their relevance and their ability to answer the research question, 11 articles were selected.

To make the process of article selection and analysis clearer, we elaborated a PRISMA Flow-chart (Figure 1ª)[20].

To ensure that the results found in the studies were reliable and precise, we resorted to the Levels of Evidence and Grades of Recommendation[21] and the Critical Appraisal Tools[22], both by the Joanna Briggs Institute, in order to determine the scientific evidence levels of the studies and evaluate their methodological quality, respectively.

RESULTS

After we analyzed the 11 studies comprised in this research, we organized the most relevant data to answer the research question (Chart 1ª). This method aims to facilitate and optimize the analysis process and provide a global view of the sample.

DISCUSSION

The eleven articles included in this ILR are from countries whose health systems are organized in distinct manners, allowing us to reach broad conclusions regarding the application of these scores in different contexts. Simultaneously, the similarity found in the objectives and methodologies that these studies present, associated with the relative agreement between their results and conclusions, enables us to generalize the results into other contexts.

Admissions to the ICU (± 11.52%), the development of a serious disease (± 26.83%), and mortality (± 16.12%) in the samples were, as a consensus, associated with males, older persons, people with associated comorbidities, need for oxygen therapy, and deteriorating respiratory function, indicating there is a relationship between these variable and an increased risk of death and/or the development of serious diseases caused by Covid-19[1,3,5,6,7,8,11,12,23,24].

In general, the studies advocate that the NEWS and NEWS2 show good results as predictors of clinical deterioration, ICU admission, and risk of death of people with Covid-19, standing out from other scores analyzed, and even when compared to early warning scores developed specifically for application during this pandemic.

The three articles developed by Richardson *et al* (2021)[5], Chikhalkar *et al* (2022)[3] and Martín-Rodriguez *et al* (2022)[12] explored the application of the NEWS and the NEWS2 over time, specifically, at admission, hospitalization, and follow-up of patients, showing that the time of evaluation is an essential variable for the results found. Myrstad *et al* (2020)[6], Holten *et al* (2020)[23] and Pokeerbux *et al* (2021)[7] highlighted that the predictive capacity of the scores is evidently more limited when they are only applied once. As a result, they advocate for an application of the score over time, depending on the initial results found at admission. Lalueza *et al* (2022)[10] are also in agreement in this regard. Nevertheless, Pokeerbux *et al* (2021)[7] and Lalueza *et al* (2022)[10] reiterate how important it is to perform an initial assessment using the score at time of admission, since a significant association was shown between its result and clinical deterioration after an average of 1 to 2.5 days.

The studies by Myrstad *et al* (2020)[6] and Pokeerbux *et al* (2021)[7], suggest that a repeated application of the scores at different moments shows more precise results, providing knowledge about an unstable prognosis and the clinical evolution of a person with Covid-19, since this facilitates the recognition of situations at risk of deteriorating.

The study by Richardson *et al* (2021)[5] reported that the predictive values of NEWS and NEWS2 when it comes to death became more reliable in shorter time intervals, with the best results in the last 24 hours prior to death. The results obtained by this study allows authors to conclude that NEWS and NEWS2 value alterations associated with the deterioration of physiological parameters as the disease progresses.

The sensitivity and specificity of NEWS and NEWS2 is similar, especially with cut-off points from 4 to 6, showing that the higher the value, the better the predictive capacity of the scores, translating stronger changes in the physiological parameters of the patient. Therefore, it can be said that the predictive capacity of NEWS2 is directly and proportionally impacted by how serious the symptoms are.

Covino *et al* (2020)[1], Kostakis *et al* (2021)[24] and Richardson *et al* (2021)[5] proved that NEWS2 did not perform better than the NEWS, although NEWS2 is a newer, updated version of NEWS, being different from its previous iteration due to the fact it includes a scale for peripheral oxygen saturation, in order to give more consideration to the person with global respiratory failure. Richardson *et al* (2021)[5] explain this result considering the low prevalence of type II respiratory failure in the sample.

The fact that the studies came from different origins and calculated scores and outcomes at different times may explain the variation in the results of comparisons of the performance of these scores. For example, the origin of the studies is seen as a source of heterogeneity because health systems and contexts of clinical practice are different, as well as the criteria used for admission to the ICU, which can contribute to the results found here.

Covino *et al* (2020)[1] state that the NEWS showed the best results when predicting the risk for ICU admission at 48 hours and at 7 days after admission, even when compared to scores developed specifically to evaluate those with suspected infections, such as the qSOFA. According with the authors, the criteria of this score were not assessed in most of the population studied here, since its main focus is the extrapulmonary organic dysfunctions, which take place at a later period of the development of Covid-19. Similarly, the NEWS-C, a modified version of NEWS that includes those whose age is ≥ 65 years that has been recently suggested to evaluate patients with Covid-19, did not have a better performance than that of the NEWS score, although the variable age is associated with an increase in the risk of baseline mortality. This result may have been affected by the old age of the population investigated, which could soften the difference this variable could have in a more heterogeneous population. Additionally, in the study by Myrstad *et al* (2020)[6], it was found that older people with Covid-19 showed atypical and milder signs and symptoms than younger people.

Regarding the study by Martín-Rodriguez *et al* (2022)[12], predictive values of the NEWS were higher than those of qCSI at all the different moments it was assessed over the 90 days, though the qCSI is specifically designed for application in Covid-19 patients. In the first two days, the performance of the scores was not affected by age, gender, or comorbidities of participants; however, from the 7th to the 90th days, all these factors were significantly related to mortality. The authors stated that this result can be explained by the fact that, in the early stages of the disease, the deterioration of one's state of health is a result of the severity of the disease, as opposed to intrinsic factors. Both scores evaluate the respiratory function of the patient, but the fact that the NEWS also assesses temperature, cardiovascular function, and neurological function makes it a more complete score when compared to the qCSI, which only considers respiratory function. Agreeing with these authors, Lalueza *et al* (2022)[10] also believe that the NEWS was more precise in the prediction of respiratory failure.

The studies by Holten *et al* (2020)[23] and Myrstad *et al* (2020)[6] integrated a score analysis that is usually used in the context of sepsis, in the case of those with Covid-19. As opposed to sepsis, which frequently leads to multi-organ failure, one characteristic of Covid-19 is the isolated respiratory failure, which directly influences three of the seven NEWS2 parameters, which is why this score is more effective in this context than the qSOFA, Sirs, and CURB-65. Most studies, such as the one by Socio *et al* (2021)[8], also showed that the NEWS and the NEWS2 had a better predictive capacity than other scores which had been conceived specifically for Covid-19 patients, such as Covid-Gram, qCSI, and NEWS-C.

One of the controversies in the development of scores adapted to Covid-19 patients is he need to add parameters such as age or comorbidities in order to improve prognostic sensitivity. Nevertheless, the methodology used by Kostakis *et al* (2021)[24] allowed exploring this issue, causing the authors to argue that changes to the scores are unnecessary.

It is also important to highlight some gaps in the application of NEWS and NEWS2 in clinical practice. Some authors have reported hypoxia as a common condition in Covid-19 patients. This condition is characterized by severe arterial hypoxia, with no signs or symptoms to suggest serious changes in respiratory function and no pronounced alterations in physiological parameters in its early stages[1,5,6,24,25]. According to Cjanding (2022)[25], nearly 41% of those with Covid-19 are asymptomatic, and an increase in the need of oxygen intake has a small impact on the value of the score, since the parameter that corresponds to supplementary oxygen therapy is determined by a qualitative binary value, which indicates only the presence or absence of such treatment. Therefore, a growing need for oxygen intake does not have a direct, linear repercussion on the score calculated; the use or lack thereof of oxygen therapy does[1,5,6,9,24,25].

CONCLUSION

The scientific evidence found by this ILR leads to the conclusion that the application of NEWS and NEWS2 helps predict the clinical deterioration and risk of death of adults and older people with Covid-19. The early identification of these patients enables timely interventions in order to stabilize and prevent complications. Thus, these are useful tools to manage the patient and allocate resources.

The articles found in this ILR unequivocally attribute a good predictive capacity to the NEWS and NEWS2 regarding clinical deterioration, the need for ICU admissions, and the risk of death of Covid-19 patients, standing out from among the other scores analyzed, including those specifically designed to be applied in the context of this pandemic.

The moments chosen to calculate these scores are extremely important variables, as it was found that re-applying them over time is correlated with better results, when it comes to predictions. In this regard, the effectiveness of these tools tends to increase when they are applied in shorter intervals, and when the patient is closer to the outcome being predicted.

The predictive capabilities of these scores is higher for values ≥ 4-6 and tend to increase with the presentation of serious symptoms, which manifest as increasingly significant alterations to the physiological parameters of the diseased.

In addition to their good performance, the NEWS and NEWS2 are easy to apply regarding the physiological parameters needed to calculate them, making these tools practical, simple, and effective.

Although the results from different parts of the globe did converge, the authors suggest further research using larger samples of Covid-19 patients in different contexts, in order to facilitate external validation and the generalization of the results found.

The main limitation of this revision is the methodology of the studies involved, since most of them are retrospective and do not allow analyzing how beneficial these scores would be in the practice of health workers, nor measuring their impact on the outcomes of the diseased.

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VS: Study design, data analysis, review and discussion of results.
DI: Study design, data analysis, review and discussion of results.
JP: Study design, data analysis, review and discussion of results.
TM: Study design, data analysis, review and discussion of results.
RF: Study coordination, study design, data collection, storage and analysis, review and discussion of the results.
JV: Study design, data analysis, review and discussion of results.
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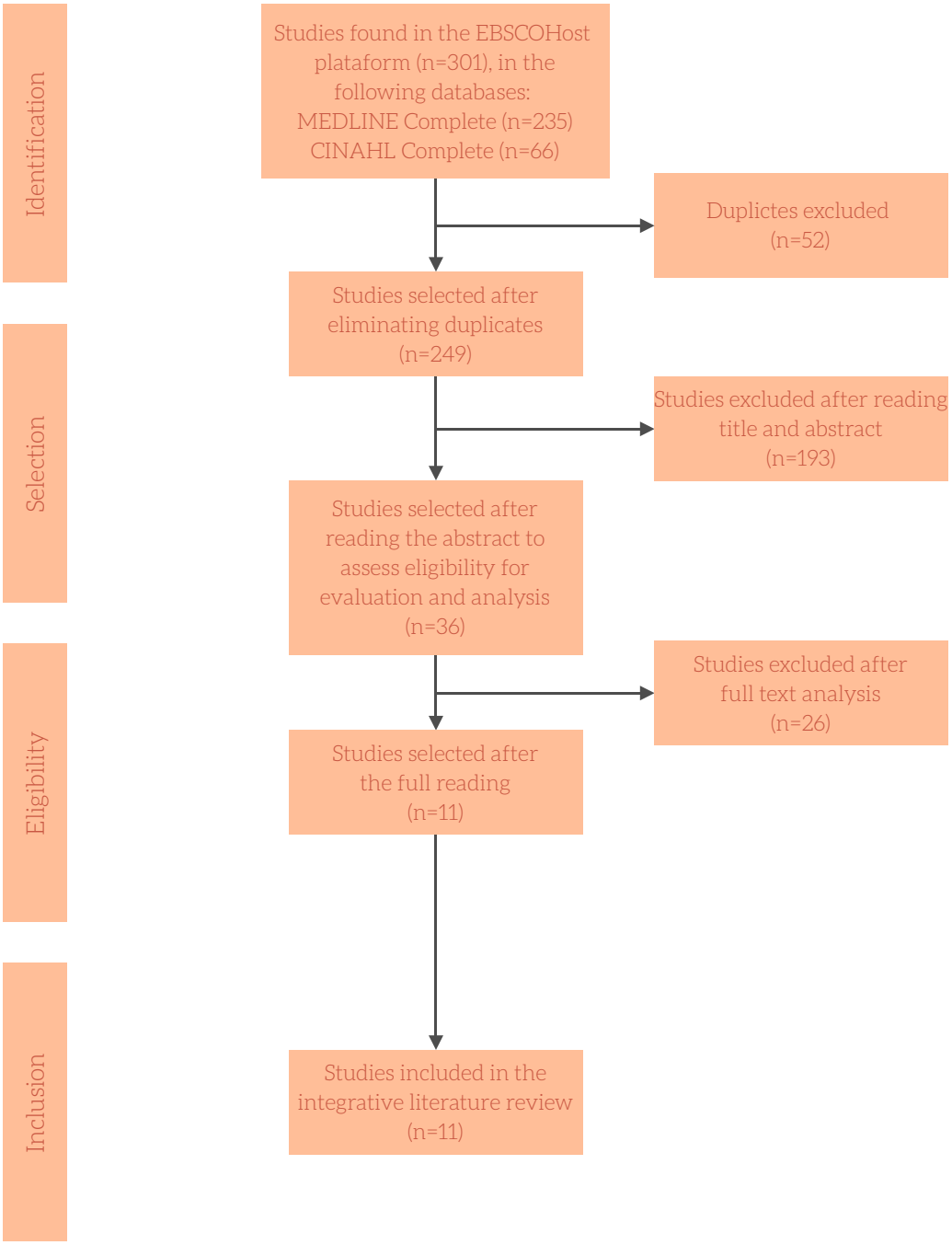

Figure 1 – PRISMA *Flowchart*.[↖]

Chart 1 – Synopsis of Results.

Reference	Methodology and Level of Evidence	Sample and Participants	Score	Scores Calculation	Outcome	Results and conclusions
Covino *et al* (2020)	Retrospective 3.e	334 (215 men and 119 women; age: 66 (54.78)).	MEWS, NEWS, NEWS2, NEWS-C, qSOFA and REMS.	ER admission.	ICU admission or death, at 48 hours and 7 days after admission.	The NEWS2 did not present a better performance than the NEWS. This could be explained by the low prevalence of type II respiratory failure in the sample. The NEWS and the REMS, assessed in the admission of participants with Covid-19 to the ER, were the most precise scores in regard to predicting the need for ICU and the risk for mortality, respectively. They were also effective in identifying participants with low clinical risk.
Wibisono *et al* (2022)	Retrospective 2.d	112 (66 men and 46 women; age: 52 ± 13 (19-61)).	NEWS2.	ER admission.	Death or survival.	The NEWS2 was considered to be a good method to evaluate the prognosis and identify risks of death in those with Covid-19.
Kostakis *et al* (2021)	Retrospective 2.d	5 cohorts.	NEWS and NEWS2.	Admission.	ICU admission or death, at 24 hours after score calculation.	The NEWS and NEWS2 are good predictors of mortality and ICU admission in the 24 hours prior to the event.
Richardson *et al* (2021)	Retrospective 3.c	620 (age > 18).	NEWS and NEWS2.	In-hospital death and in the first 24 hours, 48 hours, and 72 hours after admission.	Death or survival.	For any value of NEWS and NEWS2, participants with Covid-19 presented a substantially higher risk of death (+ 24%) than other patients, showing the higher baseline risk of mortality in these patients. The predictive values of the scores improved in shorter time intervals related to death, especially in the prior 24 hours.
Martín-Rodriguez *et al* (2022)	Retrospective 3.c	2961 (1504 men and 1457 women; age: 79 (18,104)).	Quick Covid-19 Severity Index and NEWS.	During the 90-day follow-up period, respectively: 1, 2, 7, 14, 30, and 90 days since admission to the ER.	Cumulative death rate from all causes, at 1, 2, 7, 14, 30, and 90 days from admission.	Predictive values were higher using NEWS at all points in time selected. In the first two days, the performance of the scores was not affected by age, gender, or comorbidities of participants. However, after 7 days of hospitalization, all these factors were significantly related to mortality.

Chart 1 – Synopsis of Results.

Reference	Methodology and Level of Evidence	Sample and Participants	Score	Scores Calculation	Outcome	Results and conclusions
Myrstad *et al* (2020)	Prospective 2.b	66 (38 men and 28 women; age: 68 (30,95)).	NEWS2, SIRS, qSOFA and CURB-65.	ER admission.	Severe illness or death.	The NEWS2 was better in the prediction of severe illness. The results highlight that the continued application of NEWS2 over time provides more robust results, better able to predict the outcomes than a single evaluation at admission.
Lalueza *et al* (2022)	Retrospective 3.e	237	NEWS, quick NEWS, SOFA and qSOFA.	ER admission.	Respiratory failure or death during the 30 days of follow-up.	The NEWS applied at admission was precise in predicting respiratory failure.
Socio *et al* (2021)	Retrospective 3.e	121 (79 men and 42 women; age: 65 ± 13 (31,90)).	NEWS2 and Covid-Gram.	Admission.	ICU admission, need for invasive ventilation, or death.	It was proven that the NEWS2 is a practical, simple, and effective tool for the fast identification of participants at risk of clinical deterioration and ICU admission. It was also more effective and easy to use than the Covid-Gram score.
Pokeerbux *et al* (2021)	Retrospective 2.d	202 (78 men and 124 women; age: 65 (52,78)).	NEWS.	Admission.	Admission to the ICU or death.	Many participants who died out of the ICU had a high score in the NEWS. This situation may be due to the fact that these patients had a high number of comorbidities in a context of lack of vacancies for intensive care, which explains the low correlation between high scores and ICU admissions in this study.
Holten *et al* (2020)	Prospective and Retrospective 3.e	175 (102 men and 73 women; age: 59).	NEWS2, qSOFA, SIRS, CURB-65 and PSI.	ER admission.	Severe illness, within 14 days	The authors stated that NEWS2 is a practical, simple, and easily applicable score, since it includes accessible clinical parameters, in addition to presenting a high predictive capacity.
Chikhalkar *et al* (2022)	Retrospective 3.e	814 (564 men and 250 women; age: 45).	NEWS2.	ER admission and throughout hospitalization.	Death or hospital, after the follow-up of participants was finished.	The use of NEWS2 in the ER was effective, and should be carried out simultaneously with the monitoring of patients with Covid-19.