Narrative review

CORB65 scale as an alternative to assess community-acquired pneumonia in primary health care

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Abstract
Community-acquired pneumonia is a frequent cause of consultation and has a high mortality, which implies that health professionals must have the necessary tools to evaluate and refer promptly. Most of the severity assessment scales for community-acquired pneumonia use laboratory values, which represents a problem for the first level of care where these are usually not available. This study aims to propose the CORB-65 scale (Confusion, Oxygenation, Respiratory Rate, Blood Pressure, Age over 65 years) as an alternative to the classic scales used, such as Pneumonia Severity Index (PSI), CURB-65 (Confusion, Urea, Respiratory Rate, Blood Pressure, Age over 65 years) and qSOFA (quick Sequential Organ Failure Assessment), among others. Documentary research was carried out through a search in databases such as PubMed, Scopus, and Google Scholar, in which different studies were compared, showing that the CORB-65 scale maintains similar or higher levels of sensitivity and specificity than the aforementioned scales and given that it does not require laboratory tests for its scoring, it becomes an ideal alternative for the assessment of community-acquired pneumonia at the first level of care.

Keywords
Pneumonia, Primary Health Care, Health, Sensitivity and Specificity.

Resumen
La neumonía adquirida en la comunidad es una causa frecuente de consulta y tiene una mortalidad elevada, lo que implica que los profesionales de salud deben contar con las herramientas necesarias para evaluar y derivar oportunamente. La mayoría de las escalas de valoración de la severidad para la neumonía adquirida en la comunidad utilizan valores de laboratorio, esto representa un problema para el primer nivel de atención donde usualmente no se cuenta con estos. El objetivo del estudio es proponer la escala CORB-65 (Confusión, Oxigenación, Frecuencia Respiratoria, Presión Arterial, Edad mayor de 65 años) como una alternativa a las escalas clásicas utilizadas como Pneumonia Severity Index (PSI), CURB-65 (Confusión, Urea, Frecuencia Respiratoria, Presión Arterial, Edad mayor de 65 años) y qSOFA (*quick Sequential Organ Failure Assessment*), entre otras. Se realizó una investigación documental mediante una búsqueda en bases de datos como PubMed, Scopus y Google Scholar, en la que se compararon diferentes estudios que demuestran que la escala CORB-65 mantiene niveles de sensibilidad y especificidad similares o superiores a las escalas ya mencionadas y dado que no requiere pruebas de laboratorio para su puntaje, la convierte en una alternativa ideal para la valoración de la neumonía adquirida en la comunidad en el primer nivel de atención.

Palabras clave
Neumonía, Atención Primaria de Salud, Salud, Sensibilidad y Especificidad.

Introduction

Community-acquired pneumonia is an acute respiratory infection that affects the lungs and represents one of the leading causes of morbidity and mortality worldwide. Early diagnosis and adequate risk stratification are essential to make appropriate treatment and referral decisions.[i] In the context of the first level of care, where the aim is to promote, prevent and solve the most frequent health needs of the population using simple technologies, the capacity for resolution can be limited. Therefore, having a simple and effective assessment tool is crucial.

The CORB-65 scale (Confusion, Oxygenation, Respiratory Rate, Blood Pressure, Age over 65 years) is presented as an alternative to other pneumonia assessment scales in adult and elderly patients in terms of early referral of the patient and determination of the most appropriate place for management. Unlike other scales, such as CURB-65 and SMART-COP, the CORB-65 is suitable for the first level of care, but laboratory testing is not always available. The CORB-65 scale is based on easily identifiable clinical criteria: mental confusion, oxygenation (SatO$_2$ < 90 %), respiratory rate (≥ 30 breaths per minute), and systolic (≤ 90 mmHg) or diastolic (≤ 60 mmHg) blood pressure, in addition to the patient's age.[i]

Unlike other scales, the CORB-65 is easy to apply and does not require invasive laboratory tests or chest X-rays. These criteria, which can be assessed at the point of care, allow for rapid stratification of patients into categories: low, moderate, and high risk, facilitating clinical decision-making and identification of those requiring referral to a higher level of care.

This article is based on a literature review that was conducted through an exhaustive search of electronic databases, such as PubMed, Scopus and the Google Scholar search engine, for relevant scientific literature. The search terms used included "pneumonia" "pneumonia scale", "CORB-65", "pneumonia assessment", "first level of care", "lung" and combinations of these terms. Original scientific articles, systematic reviews, case reports and clinical guidelines published in English or Spanish were included. Studies that did not focus on pneumonia assessment or did not specifically address the use of any pneumonia rating scale were excluded. After an initial screening based on titles and abstracts, a thorough reading of the selected articles was performed to assess their relevance and quality. Relevant data were extracted, such as the results of clinical studies, the effectiveness of the CORB-65 scale in pneumonia risk stratification and the need for referral, as well as any other important information on the topic.

Therefore, the aim of this study was to propose the CORB-65 scale as an alternative to the classic scales used, such as: Pneumonia Severity Index, CURB-65, SMART-COP, NEWS2 and qSOFA.

Discussion

Among the scales used for the assessment and referral of patients with community-acquired pneumonia at different levels of care such as outpatient management, hospital or intensive care unit, are the Pneumonia Severity Index (PSI), SMART-COP, CURB-65, CRB-65 and CORB-65scales.[i] The main problem with these scales is that they all require at least one laboratory test for a complete assessment and subsequent decision making.

The CURB-65 scale is one of the most widely used worldwide.[ii,iii,iv] However, one of the elements of analysis in this scale is the value of urea or urea nitrogen, which may not be a viable option in many primary care units or rural areas.

Despite the availability of more intricate scales, studies indicate that the CURB-65 scale demonstrates the highest performance in predicting mortality,[v] with greater specificity than the PSI scale. However, the latter proves to be more sensitive[vi] than the expanded CURB-65 scale.[iv]

Alternative methods have been sought that allow reliable assessment with sensitivity and specificity indices similar to those of the CURB-65 scale. Some authors have investigated the usefulness of the qSOFA criteria, normally used in sepsis, as an assessment scale for patients with community-acquired pneumonia.[vii] This proposal has gained increasing relevance, especially when seeking its direct application for the admission of patients to intensive care units (ICU).

A study conducted between 2017 and 2019 at Beijing Chao-Yang Hospital compared qSOFA plus lactate, qSOFA, PSI, CURB-65, and CRB-65 methods, where the cutoff value for lactate was > 2.0 mmol/L. In this study, qSOFA plus lactate was superior in predicting the need for ICU admission, mechanical ventilation, and 28-day mortality.[viii]

Some authors have explored the possibility of shortening the CURB-65 scale by eliminating the urea or urea nitrogen value, resulting in the CRB-65 scale.[v] These two proposals have been compared in retrospective studies, and it has been shown that the modified CRB-65 scale provides more sensitive and specific results than the qSOFA scale[vii] but is inferior to CURB-65.[ix] The CRB-65 scale has been validated in studies and is considered a reliable method for evaluating patients with community-acquired pneumonia. Its application stands out in primary health care since it does not require additional laboratory tests.[x,xi]

The official American Thoracic Society (ATS) and Infectious Disease Society of America (IDSA) guidelines for the diagnosis and treatment of community-acquired pneumonia recommend the use of the IDSA/ATS criteria.[xii] However, these criteria

include urea nitrogen, leukocyte, and platelet values as minor criteria.[xii,xiii]

In 2017, the National Early Warning Score 2 (NEWS2) was introduced as a new alternative method to predict severity in patients with community-acquired pneumonia (CAP). This method uses parameters such as respiratory rate, and oxygen saturation in two scenarios (room air and with the need for supplemental oxygen due to hypercapnic respiratory failure), temperature, systolic blood pressure, pulse, and patient's state of consciousness.[xiv]

A prospective cohort study conducted at Chiang Mai University Hospital between October 2020 and December 2021 compared the CURB-65 scale, IDSA/ATS criteria, and NEWS2. The study showed that NEWS2 offers higher sensitivity in predicting progression to severe pneumonia compared to IDSA/ATS but has lower sensitivity than CURB-65 and IDSA/ATS in predicting mortality in patients with CAP.[xiii]

This study also compared NEWS2 plus albumin < 3 g/dL plus urea nitrogen ≥ 30 mg/dL, demonstrating a higher sensitivity in predicting mortality compared to CURB65 and IDSA/ATS.[xiii] However, albumin and urea nitrogen values are not available in most primary care clinics.

The Colombian Association of Pneumology recommends applying the CURB-65 or CRB-65 scale and adding the measurement of oxygen saturation level by pulse oximetry in the evaluation The Australian guidelines for the management of pneumonia recommend using the SMARTCOP or CORB scale for decision making.[i]

A study performed in 272 patients with COVID-19-associated pneumonia in Istanbul, Turkey, showed that the noninvasive parameter SpO_2/FiO_2 correlates with PaO_2/FiO_2 obtained by arterial blood gas analysis and has been widely used as an early predictor of the need for mechanical ventilation.[xvi] Another study carried out in three Spanish hospitals concluded that there is a good relationship between the SpO_2/FiO_2 parameter and PaO_2/FiO_2.[xvii]

The Istanbul study showed that a SpO_2 value of less than 90 % or a $SpO2/FiO_2$ index of less than 300 has a predictive value of 30-day mortality for pneumonia. The CRB-65 scale shows a sensitivity of 51 % and a specificity of 80 %, but when the SpO_2/FiO_2 value is added, these values increase to 81 % and 72 %.[xvi]

The inclusion of hypoxemia in the CURB-65 scale has already been explored. In Valencia, between 2003 and 2004, a study was carried out using hypoxemia as an added value to the predictor of severity,

which increased the predictive capacity in patients with severe CAP.[xviii]

Hypoxemia is an individual poor prognostic marker used in the assessment of pneumonia, including that caused by COVID-19.[xix] Pulse oximetry is a reliable method to determine hypoxemia. A study conducted by the Bangladesh National Childhood Illness Care Program (NCCIP) between 2020 and 2021 showed that pulse oximetry could detect up to 97 % of hypoxemia cases, whether by doctors, nurses, or paramedical staff.[xx]

Based on the evidence from previous studies, it is recommended to modify an element of the CURB-65 scale with the oxygen saturation value, resulting in the CORB-65 scale.[i] The CORB-65 scale assesses five aspects: confusion, oxygen (pulse oximetry), respiratory rate, blood pressure, and age over 65 years.[xxi] Parameters and scores are in Table 1.

The interpretation of the score obtained is performed similarly to the CURB-65 scale. Values between zero and one are classified as "ambulatory or home treatment"; score two should be considered "hospital treatment"; and score three or higher are classified as patients who require mandatory "hospital management" and should be considered for referral to ICU.[i]

The CORB-65 scale has been tested in several studies that have proven its clinical utility in risk assessment in patients with community-acquired pneumonia. A prospective observational study compared different scales for the assessment of community-acquired pneumonia in 618 Australian patients. The investigation concluded that the CURB-65 and CORB-65 scales had the highest specificity for CAP with values of 93 % and 94 %, with CORB-65 being superior.[i]

A case-control study compared both scales in 60 patients in the hospital-at-home modality and 54 patients in the hospital control group. In both study groups, no differences were found between the CURB-65 and CORB-65 scale.[xxii]

In 2014, a prospective analytical observational prospective study was conducted that included a total of 120 patients who attended the Hospital General Provincial Docente "Dr. Antonio Luaces Iraola" in Cuba, with a diagnosis of CAP.[xxiii] The study proposed a standardized care protocol for patients with CAP using the CORB-65 scale. At the end of the study, it was concluded that the scale was useful for assessing patient severity and prognosis.

The study showed that the majority of patients who were discharged without

complications belonged to group one. These are patients who can be managed on an outpatient basis. Conversely, most of the patients who died were classified in group three, which consists of those requiring ICU management.[xxiii]

At the "Hospital Universitario de Los Andes" (UANDES) an open study was carried out with a first cross-sectional phase and a subsequent follow-up phase, in which a total of 54 patients were studied, comparing the classification of the different groups between both scales. The results are shown in Table 2.

In this study, it was found that the CORB-65 scale showed greater sensitivity for the classification of patients with CAP into groups two and three, which are the groups requiring hospital care.

A retrospective study performed with patient data from January 2012 to February 2020 at La Sabana University Hospital in Colombia evaluated 1811 patients and compared the results obtained on the CURB-65 and CORB-65 scales.[xxi] The cut-off value for oxygen saturation obtained by pulse oximetry was 90 %.[xxi]

The study showed that the CORB65 scale had a higher predictive value for patients who required mechanical ventilation or vasopressor support, i.e., those patients who had to be admitted to an Intensive Care Unit.

The parameter is even higher when SpO_2 less than 90% is replaced by SpO_2/FiO_2 less than 300.[xxi] The 2007 IDSA/ATS criteria mention a PaO_2/FiO_2 value of less than 250.[xii] However, the study demonstrated that the CORB-65 scale did not show a higher predictive value for mortality compared to the CURB-65 scale.[xxi]

Another retrospective study conducted between 2017 and 2019 at the "Metropolitan Hospital Center" in New York, USA, compared the CURB-65 scale and the CORB-65 scale in 100 patients admitted to the Emergency Department. The study showed that the CORB-65 scale has a higher predictive value about patients requiring ICU admission compared to the CURB-65 scale. In addition, it also found that the CORB-65 scale is more accurate in determining patients requiring mechanical ventilation.[xxiv] Both scales showed similarity in predicting the length of in-hospital stay of patients, and neither showed greater utility compared to patient mortality.[xxiv]

Pneumonia is a dynamic process and multiple variables can complicate the patient's condition, including associated or added comorbidities. The CURB-65 scale is considered more specific than more complex scales, such as the PSI or SMARTCOP; however, the predictive value of the PSI scale is superior to that of CURB-65 according to other authors.[i]

The CORB-65 scale is a valid method for risk assessment and stratification in patients with community-acquired pneumonia and has a specificity similar to that of the CURB-65 scale[i,xv,xxi,xxiv], or even higher.[xxv] However, it should be considered that multiple studies mention that the sensitivity of the CORB-65 scale may be slightly lower than that of CURB-65, especially in patients classified in category one or requiring outpa-

Table 1. Parameters evaluated by the CORB-65 Scale

Modified CORB-65 scale		
Parameter	Value	Score
Confusion	Present	1
Pulse oximetry	Less than 90 %	1
Respiratory rate	Greater than 30 rpm	1
Blood pressure	Less than or equal to 90/60 mmHg	1
Age	Older than 65 years	1

Source: Performance of the CORB (Confusion, Oxygenation, Respiratory Rate, and Blood Pressure) Scale for the Prediction of Clinical Outcomes in Pneumonia[xxi].

Table 2. Comparison between CURB-65 and CORB-65 scales

CURB-65 scale	n (%)	CORB-65 scale	n (%)
Group 1	26 (48.1 %)	Group 1	14 (25.9 %)
Group 2	11 (20.4 %)	Group 2	19 (35.2 %)
Group 3	17 (31.5 %)	Group 3	21 (38.9 %)

Source: Utility of the CURB65 Score for the Evaluation of Severity of Community Acquired Pneumonia in Adults of the Emergency Setting[iv].

tient management.[i] This situation is reversed in those patients classified in categories two or three.[i,xv,xxi,xxiii,xxiv]

It is important to emphasize that the CORB-65 scale does not have a defined oxygen saturation value taken by pulse oximetry to add to the overall score. Some authors have performed studies using the SpO_2 cut-off value of 92 %,[xv] while others have the SpO_2 value of 90 %.[xxi] However, given that the SpO_2 parameter of less than 90 % is equivalent to a PaO_2 of less than 60 mmHg,[xvii,xxvi] a value that is also shared as a parameter within the PSI4 and SMART-COP[xxvii,xxviii] scale criteria, it is logical to use this as the cut-off point. On this same point, some studies recommend the inclusion of the variable SpO_2/FiO_2 less than 300 as a criterion of the scale for the summation of the respective point.[xxi]

It is important to consider that some diseases, such as chronic obstructive pulmonary disease, can generate SpO_2 values lower than those found in a patient without such pathologies. These comorbidities, added to community-acquired pneumonia, require modified scales such as BAP-65 or adjustments in the parameters of the classic scales, such as CURB-65,[xxix] so the CORB-65 scale should be included.

In addition, it is imperative to mention that the scales should not replace at any time the integral and complete study of the patient together with his or her clinical history. The CURB-65, qSOFA or CRB-65 scales have been shown in multiple studies to be ineffective tools on their own for predicting mortality and admission to the ICU,[v] so they should be used in conjunction with all patient data.[xxi]

Conclusion

The CORB-65 scale is an alternative for the evaluation of patients presenting with community-acquired pneumonia and presents levels of specificity comparable to the CURB-65 scale. It is a useful tool in the first level of care, given that the measurement of oxygen saturation value by pulse oximetry is a more accessible resource compared to the resources, equipment, and personnel necessary for taking urea or urea nitrogen or other laboratory data required by the CURB-65 scale and other scales.

The available evidence suggests that CORB-65 can provide accurate assessment without the need for invasive laboratory testing, making it suitable for resource-limited settings. However, further studies are recommended to confirm these findings and optimize their use in diverse patient populations.

Funding

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