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Comparison of performances between risk scores for predicting mortality at 30 days in patients with community acquired pneumonia

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Abstract

Background Risk scores facilitate the assessment of mortality risk in patients with community-acquired pneumonia (CAP). Despite their utilities, there is a scarcity of evidence comparing the various RS simultaneously. This study aims to evaluate and compare multiple risk scores reported in the literature for predicting 30-day mortality in adult patients with CAP.

Methods A retrospective cohort study on patients diagnosed with CAP was conducted across two hospitals in Colombia. The areas under receiver operating characteristic curves (ROC-curves) were calculated for the outcome of survival or death at 30 days using the scores obtained for each of the analyzed questionnaires.

Results A total of 7454 potentially eligible patients were included, with 4350 in the final analysis, of whom 15.2% (662/4350) died within 30 days. The average age was 65.4 years (SD: 21.31), and 59.5% (2563/4350) were male. Chronic kidney disease was 3.7% (9.2% vs. 5.5%; $p < 0.001$) (OR: 1.85) higher in subjects who died compared to those who survived. Among the patients who died, 33.2% (220/662) presented septic shock compared to 7.3% (271/3688) of the patients who survived ($p < 0.001$). The best performances at 30 days were shown by the following scores: PSI, SMART-COP and CURB 65 scores with the areas under ROC-curves of 0.83 (95% CI: 0.8–0.85), 0.75 (95% CI: 0.66–0.83), and 0.73 (95% CI: 0.71–0.76), respectively. The RS with the lowest performance was SIRS with the area under ROC-curve of 0.53 (95% CI: 0.51–0.56).

Conclusion The PSI, SMART-COP and CURB 65, demonstrated the best diagnostic performances for predicting 30-day mortality in patients diagnosed with CAP. The burden of comorbidities and complications associated with CAP was higher in patients who died.

Keywords Pneumonia, Risk score, Mortality, Observational study

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Introduction

Community-acquired pneumonia (CAP) is the leading infectious cause of death worldwide, with a global incidence ranging from 1 to 14 cases per 1,000 individuals annually, resulting in approximately 2.5 million deaths each year [1, 2]. Hospitalization is required for 22–42% of patients, with 10–14% admitted to the Intensive Care Unit (ICU). Mortality rates range from 10 to 12% in hospitalized patients and can reach up to 35% for those requiring ICU care within 30 days [1, 3]. Early recognition of patients at high risk for complications and mortality, using clinical judgment and various risk scoring systems, is recommended by numerous scientific associations and experts [3, 4]. The initial clinical assessment of CAP is crucial for determining the extent of disease involvement, establishing the appropriate site for in-hospital treatment, and estimating the short- and long-term mortality risk [5–7].

The risk scores (RS) most used to predict 30-day mortality in CAP are the Pulmonary Severity Index (PSI) and the CURB-65 (confusion, blood urea nitrogen > 7 mmol/L, respiratory rate ≥ 30/min, systolic blood pression < 90 mmHg or Diastolic Blood Pression ≤ 60 mmHg, age ≥ 65 years) [7–9]. Kaal et al. [10] described that the use of the CURB-65 as a severity assessment tool in patients with CAP in the emergency department was associated with a lower risk of 30-day mortality compared to the PSI (OR: 0.89; 95% CI: 0.83–0.96, $p=0.003$). Mortality risk in CAP patients has been validated and compared with various other scores [11]. For instance, the Pneumonia Shock Score demonstrated the area under receiver operating characteristic curve (ROC-curve) for 30-day mortality of 0.739 (95% CI: 0.709–0.769, $p<0.001$) [12]. Similarly, the ADROP score achieved the area under ROC-curve of 0.846 (95% CI: 0.790–0.903) [11, 12]. However, none of these scores exhibited excellent performances.

Numerous studies have compared the diagnostic performances of up to four or five questionnaires in predicting 30-day mortality in patients with CAP. However, more than ten different scales are currently available for this purpose. This gap in evidence has led to inconsistencies between clinical practice guidelines and expert consensus regarding the best tool for estimating short-term mortality risk [3, 13, 14]. Therefore, the aim of this study was to compare 16 different severity questionnaires, including various clinical variables and radiological findings, to predict 30-day mortality in adult patients with CAP.

Methods

Study design

A retrospective cohort study on patients diagnosed with CAP was conducted across two hospitals in Colombia. Patients were assessed and admitted to emergency room and ICU from January 2010 to December 2019.

Inclusion criteria

Subjects aged 18 years or older, regardless of gender, who had received a diagnosis of CAP in accordance with the guidelines of the American Thoracic Society and the Infectious Diseases Society of America (ATS/IDSA) [2, 14, 15], were included in the study. Patients were required to present the following: respiratory symptoms (including cough, purulent sputum, and dyspnea), systemic involvement (fever and altered consciousness), radiographic findings suggestive of pneumonia, observed in either chest X-rays or chest computed tomography scan (alveolar and/or interstitial opacities, the presence of pulmonary consolidations, and unilateral or bilateral pleural effusion).

Furthermore, the medical records were required to contain sufficient information to calculate the following scores: CURB-65, CRB-65, SCAP, SOAR, CORB, ADROP, NEWS, Pneumonia Shock, REA-ICU, PSI, SMART-COP, SMRT-CO, SRIS, qSOFA, CAPSI and Charlson Comorbidity Index. The variables for each questionnaire are described in Supplementary File 1. Patients with incomplete medical records, those who developed nosocomial pneumonia, individuals with decompensated heart failure, pulmonary fibrosis, and pulmonary embolism were excluded from this study.

Variables

The study included the following variables: sociodemographic variables (age and sex), vital signs, level of consciousness, comorbidities, radiographic finding, arterial blood gas analysis, pulse oximetry, white blood cell count, blood glucose level, blood urea nitrogen, serum albumin, serum sodium, need for ICU admission, invasive mechanical ventilation (IMV) and/or vasopressor support. The dependent variable was survival at 30 days following the diagnosis of CAP. To minimize potential errors in classifying the studied outcomes, the research team obtaining information from clinical records had medical experience for diagnosing CAP. To reduce the risk of data entry errors, at least two team members reviewed the information during the transcription process into the database.

Sample size

To calculate the sample size, data from the study by Lim et al. [16] which reported a sensitivity of 75% and specificity of 69% for CURB-65, and data from España et al. [17] which reported a sensitivity of 92.1% and specificity of 73.8% for SCAP, were used. Using the formula for sample size for paired diagnostic tests, with an expected mortality rate of 14%, a power of 90%, and a statistical

significance level of 0.05, a minimum of 2168 subjects were required.

Statistical analysis

The data was obtained directly from medical records and subsequently transcribed into the Research Electronic Data Capture (REDCap) software [18, 19]. Then it was analyzed using licensed SPSS 25 software (IBM Corp. IBM SPSS Statistics for Windows. Version 25.0). Qualitative variables were reported in percentages and frequencies, while quantitative variables were summarized as mean and standard deviation (SD) for those with a normal distribution and median and interquartile range for those with a non-normal distribution. Bivariate analysis was conducted using the chi-square test for qualitative variables and the T-student test or Mann-Whitney U test for quantitative variables, depending on their distribution. Sensitivity, specificity, the areas under ROC-curves, positive predictive value (PPV), negative predictive value (NPV), positive likelihood ratio (LR+), and negative likelihood ratio (LR-) were calculated for the outcome of survival or death at 30 days using the scores obtained from all the analyzed questionnaires.

The established cutoff point for each questionnaire, as detailed in Supplementary Table 2, was used. The calculated the areas under ROC-curves were compared using the DeLong test. The interpretation of the areas under ROC-curves were as follows: 0.50 indicated an absence of discriminatory capacity; 0.51 to 0.60 indicated nearly no discriminatory capacity; 0.61 to 0.69 indicated poor discriminatory capacity; >0.7 to 0.8 indicated acceptable discriminatory capacity; >0.80 to 0.90 indicated excellent discriminatory capacity, and >0.90 indicated outstanding discriminatory capacity [20, 21]. Statistical significance was considered when the p-value was <0.05.

Missing data

An imputation analysis addressed missing data, employing weighted mean imputation for quantitative variables and logistic regression for qualitative variables with a loss of less than 10% [20]. Variables with more than 10% data loss were excluded. A comparison between non-imputed and imputed results ensured that imputation did not introduce bias or significantly alter the original data.

Results

In total, there were 7454 potentially eligible patients, and 4350 entered the final analysis, of which 15.2% (662/4350) died within 30 days Fig. 1. The average age was 65.4 years (SD: 21.31), and 59.5% (2563/4350) were male Table 1. Altered consciousness was present in 33.1% of patients who died compared to 10.1% (371/3688) of patients who survived. The prevalence of systemic hypertension and chronic obstructive pulmonary disease was 12.4% (46.1% vs. 58.5%; $p<0.001$) and 3.7% (18.1% vs. 21.8%; $p<0.001$) lower in the group of living patients compared to those

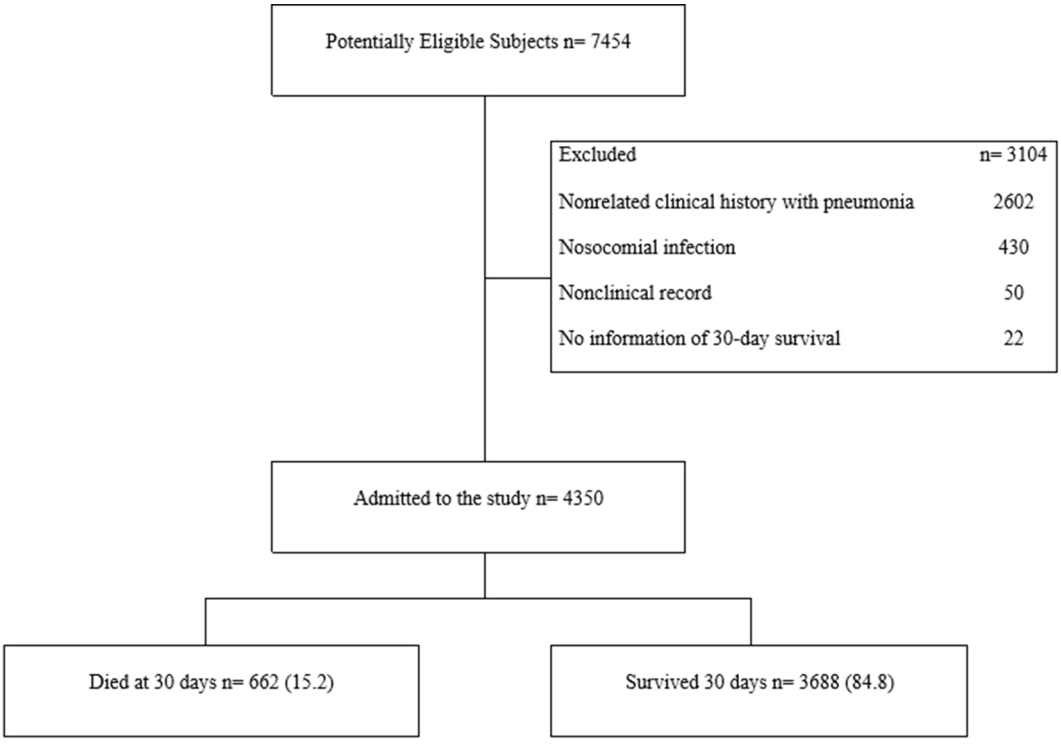

Fig. 1 Patient admission flowchart

Table 1 General characteristics of the population

	Total *n* = 4350	Alive *n* = 3688	Death *n* = 662	*P* value
Age years, m(SD)	65.4 (21.31)	63.5 (21.39)	76.3 (17.23)	< 0.001
Male, n(%)	2563 (59.5)	2188 (58.9)	375 (63.8)	0.197
Days of symptoms, m(SD)	4.9 (3.83)	5.1 (3.87)	4.3 (3.5)	< 0.001
Headache, n(%)	329 (7.6)	311 (8.4)	18 (2.7)	< 0.001
Altered consciousness, n(%)	590 (13.6)	371 (10.1)	219 (33.1)	< 0.001
Oxygen saturation %, m(SD)	88.7 (7.45)	89.1 (6.7)	86.1 (10.28)	< 0.001
Initial FiO2%, m(SD)	29.8 (13.79)	28.5 (12.34)	36.1 (17.99)	< 0.001
Systemic hypertension, n(%)	2086 (48)	1699 (46.1)	387 (58.5)	< 0.001
Chronic heart failure, n(%)	605 (13.9)	447 (12.1)	158 (23.9)	< 0.001
Acute myocardial infarction, n(%)	220 (5.1)	168 (4.6)	52 (7.9)	< 0.001
Cerebrovascular disease, n(%)	366 (8.4)	258 (7)	108 (16.3)	< 0.001
COPD, n(%)	1158 (26.6)	941 (25.5)	217 (32.8)	< 0.001
Diabetes Mellitus, n(%)	134 (3.1)	104 (2.8)	30 (4.5)	0.019
Immunosuppression, n(%)	191 (4.4)	148 (4)	43 (6.5)	0.004
Chronic kidney disease, n(%)	262 (6)	201 (5.5)	61 (9.2)	< 0.001

Notes SD: Standard deviation; n: number; FiO2: Fraction of inspired oxygen; COPD: Chronic obstructive pulmonary disease

who died. respectively. Chronic kidney disease was 3.7% (9.2% vs. 5.5%; $p<0.001$) higher in subjects who died compared to those who survived.

Laboratory tests

The oxygen arterial pressure/fraction of inspired oxygen in the patients who survived was 233 (SD: 69.7), compared to 203.8 (SD: 88.5) in the patients who died ($p<0.001$) Table 2. The pH was 7.38 in the deceased patient's group versus 7.42 in the surviving group (OR: 4.02 CI: 95%. $p<0.001$). Likewise, lactate was 1 unit higher (3 vs. 2; $p<0.001$) in the deceased subjects compared to the survivors. Creatinine and blood urea nitrogen were 0.2 (1.3 vs. 1.5; $p=0.041$) and 13.2 (23.3 vs. 36.5; OR: 3.92 CI: 95%; $p<0.001$) lower in the subjects who survived compared to the deceased group.

In-hospital treatment and complications

Among the patients who died, 33.2% (220/662) presented septic shock compared to 7.3% (271/3688) of the patients who survived ($p<0.001$) Table 3. The use of systemic corticosteroids and vasopressor support was 32.8% (217/662) and 33.2% (159/662), respectively, in the mortality group. The ICU requirement was 25.4% (168/662) in deceased patients versus 11.2% (414/3688) in living patients ($p<0.001$). Of the patients who deceased, 24% (159/662) required invasive mechanical ventilation, whereas 7.2% (266/3688) of the subjects who survived needed ($p<0.001$).

Table 2 Laboratory tests

	Total population *n* = 4350	Alive *n* = 3688	Death *n* = 662	*P* value
pH, m(SD)	7.41 (0.07)	7.42 (0.06)	7.38 (0.1)	< 0.001
PO2, m(SD)	62.5 (19.87)	62.1 (19.32)	64.2 (22.26)	0.023
PCO2, m(SD)	33.2 (8.85)	33 (8.32)	34.4 (10.96)	0.001
HCO3, m(SD)	20.9 (4.31)	21 (4.02)	20.3 (5.47)	0.002
BE, m(SD)	-2.8 (4.31)	-2.5 (3.92)	-4.0 (5.7)	< 0.001
Lactate, m(SD)	2.2 (1.75)	2.1 (1.32)	3.0 (2.76)	< 0.001
PaO2/FiO2, m(SD)	228 (74.19)	233 (69.7)	203.8 (88.95)	< 0.001
White cells count cell x 10^3, m(SD)	12.1 (6463.95)	12.4 (6204.46)	12 (7748.81)	0.543
Hemoglobin g/dL, m(SD)	13.4 (2.39)	13.5 (2.27)	12.4 (2.83)	< 0.001
Hematocrit %, m(SD)	40 (7.11)	40.4 (6.78)	37.7 (8.35)	< 0.001
Platelets microliters, m(SD)	256.9 (104.1)	259.6 (102.24)	242.1 (112.78)	< 0.001
Sodium meq/L, m(SD)	137.5 (6.86)	137.2 (5.86)	138.7 (9.86)	< 0.001
Glucose mg/dL, m(SD)	135.3 (69.31)	134.1 (67.66)	140.7 (75.97)	0.036
Albumin mg/dL, m(SD)	2.9 (1.17)	3 (1.29)	2.8 (0.47)	< 0.001
Creatinine mg/dL, m(SD)	1.4 (2.97)	1.3 (3.2)	1.5 (1.3)	0.041
BUN mg/dL, m(SD)	25.5 (18.92)	23.3 (16.83)	36.5 (24.42)	< 0.001

Notes SD: Standard deviation; PO2: Partial pressure of oxygen; PCO2: Partial Pressure of Carbon Dioxide; HCO3: Bicarbonate; BE: Base excess; PaO2/FiO2: The ratio of partial pressure of oxygen in arterial blood to the fraction of inspiratory oxygen concentration; BUN: Blood urea nitrogen

Table 3 Medical treatment and complications

	Total population *n* = 4350	Alive *n* = 3688	Death *n* = 662	*P* value
Septic Shock, n(%)	491 (11.3)	271 (7.3)	220 (33.2)	< 0.001
Vasopressor support, n(%)	419 (11.3)	260 (7.3)	159 (33.2)	< 0.001
Corticosteroid use, n(%)	984 (22.6)	767 (20.8)	217 (32.8)	< 0.001
Hydrocortisone, n(%)	351 (35.7)	252 (32.9)	99 (45.6)	< 0.001
Methylprednisolone, n(%)	299 (30.4)	233 (30.4)	66 (30.6)	0.969
Prednisone, n(%)	297 (30.2)	257 (33.5)	40 (18.5)	< 0.001
ICU admission, n(%)	582 (13.4)	414 (11.2)	168 (25.4)	< 0.001
Length of stay in ICU, m(SD)	10.6 (17.6)	11.6 (20.25)	8 (6.41)	< 0.001
Mechanical ventilation, n(%)	425 (9.8)	266 (7.2)	159 (24)	< 0.001

Notes n: number; SD: Standard deviation; ICU; Intensive care unit

Performances of RS for 30-day mortality prediction

The best performances at 30 days were observed in the PSI, SMART-COP, and CURB 65 scores with the areas under ROC-curves of 0.83 (95% CI: 0.8–0.85), 0.75 (95%

CI: 0.66–0.83), and 0.73 (95% CI: 0.71–0.76), respectively, Table 4. Scores with lower performances were SIRS and SOAR with the areas under ROC-curves of 0.53 (95% CI: 0.51–0.56) and 0.65 (95% CI: 0.62–0.68), respectively. The DeLong's test was significant with a result minor than 0.05.

Discussion

The analysis revealed that PSI, SMART-COP, and CURB 65 emerged as the top-performing predictors, while SIRS and SOAR demonstrated comparatively lower efficacy. PSI exhibited excellent performance in forecasting 30-day mortality, and SMART-COP and CURB 65 demonstrated acceptable accuracy. Noteworthy factors associated with fatal outcomes included advanced age, the presence of comorbidities (specifically cardiovascular, respiratory, and tobacco smoking-related), altered consciousness, acidosis, kidney dysfunction, reliance on vasopressor support, and admission to the ICU.

The PSI risk score has demonstrated greater discriminatory capacity due to variables such as age and comorbidities, which have a significant correlation with increased mortality in individuals over 75 years old with chronic kidney disease, lung neoplasms, and cerebrovascular disease [7, 22–25]. Zaki et al. [22] mention that the PSI identifies patients who can be treated on an outpatient basis, but it may overestimate severity, especially in young patients with severe respiratory failure and no comorbidities. Our data show that the PSI has greater discriminatory capacity for predicting short-term mortality due to the variables that structure it, which may support the published medical evidence.

Marti et al. [23] performed a meta-analysis to determine the performances of RS in pneumonia prognosis. They concluded new severity scores such as

Table 4 Performances of risk scores in community acquired pneumonia for 30-Day mortality prediction

	SE (CI 95%)	SP (CI 95%)	PPV (CI 95%)	NPV (CI 95%)	LR+ (CI 95%)	LR- (CI 95%)	The areas under ROC-curves (CI 95%)	*P* value*
CURB-65 ≥ 2	81.3 (79.9–82.7)	51.4 (49.6–53.2)	25.1 (23.6–26.7)	93.2 (92.3–94.1)	1.67 (1.527–1.836)	0.36 (0.331–0.398)	0.73 (0.71–0.76)	< 0.001
CRB-65 ≥ 2	55.2 (53.7–56.8)	78.5 (77.2–79.8)	32.1 (30.7–33.6)	90.5 (89.6–91.4)	2.57 (2.196–2.999)	0.57 (0.488–0.666)	0.72 (0.69–0.74)	< 0.001
SCAP ≥ 20	42.4 (40.3–44.5)	86.9 (40-133.7)	41.4 (39.3–43.5)	94 (93-126.9)	1.21 (0.371–3.929)	0.29 (0.089–0.947)	0.73 (0.7–0.76)	< 0.001
CORB ≥ 2	43.2 (41.6–44.8)	80.3 (79-81.6)	28.9 (27.4–30.3)	88.4 (87.4–89.4)	2.19 (1.85–2.596)	0.71 (0.597–0.838)	0.66 (0.63–0.68)	< 0.001
ADROP ≥ 3	58.6 (58.6–58.6)	74.3 (72.7–75.9)	31.8 (30.1–33.4)	89.8 (88.7–90.9)	2.28 (1.96–2.654)	0.56 (0.479–0.649)	0.71 (0.69–0.73)	< 0.001
NEWS ≥ 7	62.4 (60.7–64.1)	64.2 (62.5–65.9)	24.1 (22.5–25.6)	90.4 (89.3–91.4)	1.74 (1.536–1.976)	0.59 (0.517–0.665)	0.69 (0.66–0.72)	< 0.001
PNEUMONIA SHOCK ≥ 3	74.7 (32.2-117.3)	57.7 (55.7–59.6)	30.3 (28.5–32.1)	90.3 (89.1–91.5)	1.77 (1.586–1.967)	0.44 (0.393–0.488)	0.72 (0.69–0.74)	< 0.001
REA ICU ≥ 7	37.2 (35.8-0)	87.2 (86.2–88.2)	25.9 (24.6–27.2)	92 (91.2–92.9)	2.9 (2.27–3.715)	0.72 (0.563–0.921)	0.71 (0.68–0.73)	< 0.001
PSI ≥ 91	86.2 (85.2–134)	57.9 (56.4–59.5)	13 (12-14.1)	98.3 (97.9–98.7)	2.05 (1.781–2.36)	0.24 (0.206–0.273)	0.83 (0.8–0.85)	< 0.001
SMART-COP ≥ 3	66.6 (65.2–68)	51.7 (50.2–53.2)	19.8 (18.7–21)	89.6 (88.7–90.5)	1.38 (1.27–1.497)	0.65 (0.595–0.701)	0.75 (0.66–0.83)	< 0.001
SMRT-CO ≥ 3	62.6 (61.1–64.2)	64.8 (63.3–66.3)	25 (23.7–26.4)	90.2 (89.3–91.2)	1.78 (1.593–1.988)	0.58 (0.516–0.644)	0.67 (0.64–0.69)	< 0.001
SOAR ≥ 2	69.4 (67.5–71.2)	53.1 (51-55.1)	23.7 (21.9–25.4)	89.2 (87.9–90.5)	1.48 (1.327–1.645)	0.58 (0.519–0.643)	0.65 (0.62–0.68)	< 0.001
qSOFA ≥ 2	32.2 (30.8–33.6)	89.5 (88.5–90.4)	35.4 (34-36.8)	88 (87.1–89)	3.05 (2.432–3.827)	0.76 (0.604–0.951)	0.66 (0.64–0.69)	< 0.001
SRIS	61 (59.6–62.5)	44 (42.5–45.5)	16.4 (15.3–17.5)	86.3 (85.3–87.3)	1.09 (1.014–1.172)	0.89 (0.824–0.952)	0.53 (0.51–0.56)	0.001
CAPSI ≥ 4	68.4 (66.7–70)	62.7 (60.9–64.4)	26.6 (25.1–28.2)	90.9 (89.9–91.9)	1.83 (1.631–2.056)	0.5 (0.449–0.567)	0.71 (0.69–0.74)	< 0.001
CHARLSON ≥ 3	86.4 (85.4–87.4)	40.3 (38.9–41.8)	20.6 (19.4–21.8)	94.3 (93.6–95)	1.45 (1.359–1.544)	0.34 (0.316–0.359)	0.71 (0.69–0.74)	< 0.001

Notes SE: sensitivity; SP: specificity; PPV: positive predictive value; NPV: negative predictive value; LR: like hood ratio; The areas under ROC-curves: the area under operating characteristic curves

*DeLong test

SMART-COP had better discriminative performance in predicting intensive respiratory or vasopressor support, as previously mentioned fatal outcomes, compared to PSI and CURB-65. Also, Saldías et al. [24] determined the performances of RS in predicting 30-day mortality with an area under ROC-curve of 0.77 (95% CI: 0.74–0.81) for SMART-COP. Consistent with our data, the performance of SMART-COP was also acceptable for predicting mortality compared to questionnaires such as PSI, CURB-65, SCAP, among others.

Despite its recognized role as a predictor of mortality [26–29], none of the examined RS in our study incorporated mechanical ventilation as a variable. Our findings underscored that the need for mechanical ventilation emerged as a significant risk factor for mortality, mirroring the observations made in a cohort of 3719 patients studied by Cilloniz et al. [30]. Mermiri et al. [31] highlighted the association of vasopressor use with increased 30-day mortality (RR: 2.97; 95% CI: 1.72–5.14; $p<0.001$) and a heightened risk of acute kidney injury (RR: 3.17: 95% CI: 2.21–4.54; $p<0.001$). In our investigation, only one RS identified vasopressor use as a factor linked to elevated mortality. It is noteworthy that a majority of existing RS omit vasopressor support and mechanical ventilation as variables impacting mortality, potentially limiting the predictive accuracy of severity assessments. Hence, the incorporation of these two variables into prevailing questionnaires could enhance their efficacy in predicting 30-day mortality in patients with CAP.

In the context of pneumonia, the interplay with pH is intricately tied to shifts in the body's acid-base equilibrium. The severity of pneumonia, notably in complex cases featuring respiratory failure, can precipitate respiratory acidosis. Hypoxemia, acidosis, and cognitive disorientation serve as indicators of tissue hypoperfusion and correlate with elevated mortality rates in CAP patients [32]. Acidosis in CAP patients aligns with altered consciousness [25], identified as a risk factor for 30-day mortality in those with comorbidities [33], particularly within the initial 5 days of hospitalization [32, 33]. Addressing these acid-base imbalances holds pivotal importance in pneumonia management, especially in severe cases impacting respiratory function. Notably, risk assessment tools with enhanced discriminatory capabilities, such as SMART-COP and PSI, incorporate acidosis (pH less than 7.35) as a variable in their evaluation.

Altered consciousness is correlated with acidosis, azotemia, acute kidney injury, and chronic kidney disease [7, 26], all of which increase fatal outcomes in patients with CAP [34]. In a cohort of 1474 patients with CAP, Fernández et al. [35] demonstrated that in patients over 80 years old, 49% of those who died had altered consciousness (OR: 4.92 CI: 95%; $p<0.001$). Zhang et al. showed that in the population over 85 years old who had altered consciousness, mortality increased 3.3 to 6.1 times, respectively [28]. Chronic kidney disease has been described as an independent factor for early mortality in CAP. One possible explanation for this finding is the immunosuppressive state that advanced chronic kidney disease can generate. In this scenario, there is immune deficiency caused by a decrease in dendritic cells and T and B lymphocytes, as well as a proinflammatory state [36, 37].

Limitations

Among the limitations of our study is its observational nature, with information obtained from clinical records, which may have omissions. Furthermore, we did not include a characterization of the microbiological etiology of CAP, or the treatments received by the patients. However, measures were implemented to minimize information bias, such as continuous training of personnel responsible for data collection and constructing the manuscript according to the STROBE checklist Supplementary Table 4. We believe that the achieved sample size supports the conclusions drawn. Additionally, the similarity of our population characteristics to those in other series and the use of ATS/IDSA [2, 14, 15] criteria help reduce the variability or differences with the cohorts described in other observational studies.

Conclusion

The PSI, SMART-COP and CURB 65 demonstrated the best diagnostic performances in predicting 30-day mortality in patients diagnosed with CAP. Older age, the presence of comorbidities, altered consciousness, acidosis, renal dysfunction, vasopressor support, and admission to the ICU were more prevalent in the group of deceased patients.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12879-024-09792-1.

Supplementary Material 1

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Author contributions

ETQ, ARB, GGG, MCM, DT, CS, JC, GB, DC, PR, YF, EG, DA, SR, DA, and LFRcontributed substantially to the study design, data analysis and interpretation, and manuscript writing. ETQ, ABG, GGG and DT had full access to all study data and takes responsibility for data integrity as well as for accuracy of the included data analysis and, especially, any adverse effects. All authors read and approved the final manuscript.

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Data availability
The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate
The study was conducted in accordance with the principles of the current Helsinki Declaration, as well as local, regional, and international regulations pertaining to clinical research, including Colombian Law on Biomedical Research. Ethical approval was obtained from the Medical Ethics Committee of the Clínica Universidad de La Sabana (approval number 20220102). The confidentiality of their data was strictly maintained throughout the study.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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