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Comparative Study of Newer Prognostic Scoring Systems in Predicting Severity in Community Acquired Pneumonia in Hospitalized Patients

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Abstract
Aims & Objectives: *To assess the performance of recently developed scoring systems like Infectious Diseases Society of America /American thoracic society (IDSA/ATS 2007) criteria, SMART- COP, PS-CRUXO-80(Espana et al SCAP rule) in predicting mortality, the need for mechanical ventilation and ICU admission in hospitalized Community Acquired Pneumonia(CAP) in India .*
Methods: *A prospective study was conducted in 128 hospitalized patients with community acquired pneumonia. Data collected during admission were used to calculate IDSA/ATS 2007 criteria, SMART- COP, PS-CRUXO80 and CURB-65 scores. The sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) were compared for adverse outcomes like 30-days mortality(in hospital & post discharge), mechanical ventilation, inotropic support and ICU admission.Also ,reliability of the scoring systems were compared by constructing Receiver Operating Characteristic Curve (ROC).*
Results: *28.12% (n=36) patients were defined as having severe CAP (death within 30 days or need for mechanical ventilation or inotropic support or ICU admission). The 30-day mortality rate was 13.2% (n=17), and the ICU admission rate was 25% (n=32). SMARTCOP and PS-CRUXO80 achieved highest sensitivity (97.22% & 94.44% respectively) and NPV (97.14% and 94.87% respectively) in predicting severe CAP(SCAP). When ICU admission and mechanical ventilation were the outcome measures, the SMART-COP (sensitivity = 96.87% and NPV=97.14%), PS-CRUXO 80 rule (sensitivity = 93.75% and NPV=94.87%) and IDSA/ATS 2007(sensitivity = 87.5% and NPV=94.02%) were the best predictors. For prediction of mortality both SMARTCOP and PS-CRUXO80 had 100% sensitivity and NPV. CURB-65 had a low sensitivity and NPV in prediction of all adverse outcomes than other scoring systems.On construction of ROC ,PS-CRUXO 80 was found to be most reliable with highest Area Under Curve(AUC).*
Conclusion: *The newer scoring systems performed better in predicting severe community acquired pneumonia than the commonly used CURB-65 and could be best used to rule out the need for ICU admission .*
Keywords: *SCAP , SMART-COP,PS-CRUXO80 ,IDSA/ATS2007 ,CURB-65*

I. Introduction

Community acquired pneumonia (CAP) is a common and serious disease in India. Despite the development of potent antimicrobial therapy, pneumonia remains one of the leading causes of death from infectious disease worldwide. Various severity scoring systems have been described to predict whether a given patient can be treated as outpatient or should be admitted in the hospital. Amongst them Pneumonia Severity Index (PSI) & CURB-65 are the most widely studied and validated scoring tools worldwide for predicting mortality and deciding site of care. However, mortality risk doesn't always equate with need for hospitalization or intensive care especially in young and otherwise healthy patients without co-morbidities. Hence newer scoring systems like Infectious Diseases Society of America /American thoracic society (IDSA/ATS2007) criteria, SMART- COP, PS-CRUXO-80 by Espana et al have been developed to accurately predict the requirement of ICU admission in patients with severe CAP(SCAP) or requirement of ventilator or circulatory support.(1)Only PSI and CURB – 65 have been validated in Indian patients(2) and newer scoring systems require further validation worldwide including India. However none of the scoring systems are perfect. All have their advantages and limitations. Hence they are usually considered as "decision support tools" rather than "rules" for site of care.

As there is paucity of data regarding newer prognostic scoring systems of CAP, there is a need for further study to assess the accuracy of these tools in predicting severity and planning therapy.

II. Materials And Methods

Study Design and Setting

This hospital based prospective study was conducted at Vardhman Mahavir Medical College and Safdarjung hospital (VMMC & SJH) during the time period of 2012 -2014 in Department of Internal medicine. The study was conducted on 128 adults(>18yrs,both male and female) admitted with the diagnosis of CAP after fulfilling inclusion and exclusion criteria. CAP was defined as per Infectious Diseases Society of America(IDSA) criteria i.e as an acute infection of the pulmonary parenchyma that is associated with at least some symptoms of acute infection(such as fever or hypothermia, rigor sweats ,new onset cough with or without sputum production, change in colour of respiratory secretion in a patient with chronic cough, chest discomfort and dyspnea), accompanied by the presence of an acute infiltrate on chest radiograph or chest auscultatory findings consistent with pneumonia (such as altered breath sound and/or localized rales) in a patient not hospitalized or residing in a long term care facility for more than 14 days before onset of symptoms. Patients with severe immunosuppression (AIDS, chemotherapy, immunosuppressive drugs), active tuberculosis, patients who were already on mechanical ventilation and / or vasopressor support at the time of admission, health care associated pneumonia and cases with a confirmed alternative diagnosis were excluded from the study.

III. Methodology

Written informed consent and clearance from ethical committee of VMMC & SJH was obtained prior to recruitment of the patients for the study. Patients were recruited after applying the inclusion and exclusion criteria and were subjected to detailed history and thorough physical examination and investigation at the time of admission.

In history emphasis was on smoking status , alcoholism , over-crowding , malnutrition, co-morbidities like COPD , structural lung disease (bronchiectasis), dementia, stroke, epilepsy, diabetes mellitus, chronic cardio vascular disease, chronic kidney disease , chronic hepatic disease , cancer and antimicrobial treatment prior to hospitalization. All patients were subjected to routine laboratory investigation such as complete blood count, blood glucose, renal function test, liver function test, serum electrolytes, arerial blood gas analysis, blood culture (legionella mycoplasma and common community acquired pneumonia organisms), IgG and IgM for Legionella pneumophilla and mycoplasma pneumonia, sputum microscopy for acid fast bacilli and culture and chest X-ray.

Prognostic scoring systems were applied as early as possible, at least within 24 hrs of hospitalization and patients were categorized to Non- Severe CAP and Severe CAP as per below

1. SCORE <3 (Non-severe) AND ≥3(severe) for CURB-65
2. IDSA/ATS 2007 criteria –only minor criteria was considered for stratifying the patients to < 3minor criteria (Non-severe) and ≥3(severe) minor criteria
3. SCORE <3(Non-severe) and ≥3(severe) for SMART - COP
4. SCORE ≤ 10(Non-severe) and>10(severe) for PS- CURXO - 80

Treatment of the patients including the decision for ICU admission, mechanical ventilation and inotropic / vasopressor support was by the treating physician who was blinded to the prognostic score of the patient .All the patients were followed up for clinical outcome i.e.

1. Death (in hospital and post discharge 30 days mortality obtained telephonically)
2. ICU admission
3. Need for mechanical ventilation AND /OR inotropic / vasopressor support.
4. Hospital discharge without any of above complication

Patients with the clinical outcome of death/icu admission/requirement of mechanical ventilation and/or inotropic or vasopressor support either alone or in combination were considered to be having Severe community acquired pneumonia(SCAP).

Statistical method

All data were processed and analysed on SPSS software version 22.0 for windows and Microsoft excel. Descriptive statistics i.e., mean and standard deviation for continuous variables and frequency distribution with their percentage for categorical variables were calculated. Sensitivity , specificity , positive predictive value(PPV) and negative predictive value(NPV) were calculated for different CURB 65, IDSA/ATS2007 , SMART-COP & CRUXO-80 grades with qualitative variables(death, ICU admission , mechanical ventilation and/or inotrope/vasopressor support and hospital discharge) as an outcome .

The categorical data were expressed as percentages and were compared using a Chi-square test . The ability of the four criteria to predict morbidity and mortality was compared by constructing a receiver operating characteristic curve (ROC). A P value of less than 0.05 was considered to be statistically significant.

IV. Results

A total of 128 patients with CAP participated in the study. Depending on the clinical outcome (Table-1)i.e. death, ICU admission, mechanical ventilation and inotropic support, 36 (28.12%) patients were categorized as suffering from severe community acquired pneumonia (SCAP) and 92(71.9%) patients as non-severe community acquired pneumonia(NSCAP) .Of all the patients, 17(13.28%) patients expired and 32(25%) required ICU admission/mechanical ventilation.Distribution of clinical , radiological and biochemical characteristics of the study population as per severity of CAP is as per Table 2. . Cut off values for various parameters are based on the cut off values taken into consideration for calculation of various severity scores. All the clinical and biochemical parameters in table 2 were assessed at the time of admission.

On univariate analysis of various clinical and biochemical parameters as predictor of SCAP, age >80 years had no statistically significant relation to development of SCAP (OR=1.79, p value= 0.296). Also other variables like smoking status , male sex ,alcoholism and presence of comorbidities had no statistically significant relation with SCAP.

However, confusion(MMSE<8) , respiratory rate ≥30, systolic BP <=90 mmHg, diastolic BP<60 mmHg and pulse rate >125 were found to be significantly associated with severity of CAP(p= 0.00 for all). Of the various clinical parameters assessed, patients with low systolic BP <=90 mmHg(OR=57.2), diastolic BP<60 mmHg(OR=18.2) and confusion MMSE<8(OR=11.79) had the maximum risk of developing SCAP.Among the various investigations done at the time of admission arterial blood pH <7.3 (OR=7.4), PaO2/FiO2 < 250 (OR=54) and BUN >20 mg/dl (OR=10.14) were found to be significantly associated with severity of CAP.(p values=0.00 for all) .Also, multi lobar chest infiltrates on x-ray chest was significantly associated with SCAP(OR=3.877, p=0.001).

Distribution of outcome of the study according severity scales (Table no-3)

Severe community acquired pneumonia developed in 28.12% (n=36) of patients out of which 17(13.28%) patients expired and 32 (25%) patients required ICU admission / mechanical ventilation.Out of the patients who expired 2.5%(3) died in ward / emergency department and 10.93%(14) expired in the ICU. The patients classified into the high risk group by scoring systems i.e. PS-CRUXO80 >10, SMARTCOP ≥ 3,IDSA/ATS2007 minor criteria ≥3 and CURB65≥3 had a high mortality rate (19.1%,18.27%,22.9% and 20.8% respectively) and increased rate of ICU admission and mechanical ventilation(33.7%,33.3%,45.90% and 45.8% respectively).

Scoring systems and prediction of ICU admission and mechanical ventilation(Table no-4)

ICU admission and/or mechanical ventilation was required in 32 (25%) patients who were admitted with community acquired pneumonia. The maximum sensitivity in prediction of ICU admission was seen with SMARTCOP (96.87%) followed by PSCRUXO80 (93.75%),IDSA/ATS2007 (87.5%) and CURB65 (68.75%) respectively. Even though SMARTCOP and PSCRUXO-80 had high sensitivity in prediction of ICU admission and mechanical ventilation, the specificity (35.41% and 38.54% respectively) and positive predictive value (33.3% and 33.70% respectively) of both scoring system was low showing a high over prediction rate. The negative predictive value for prediction of ICU admission was maximum for SMARTCOP (97.14%) followed by PS-CRUXO80 (94.87%). An ROC was constructed to assess the ability of various scoring systems to predict ICU admission and mechanical ventilation. The maximum area under the curve(AUC) was seen with PS-CRUXO80(AUC=0.945) followed by IDSA/ATS 2007 minor criteria(AUC=0.932). Hence PS-CRUXO80 was found to be the most reliable scoring system in predicting ICU admission and mechanical ventilation

Scoring systems and prediction of mortality(Table no-5)

When considering the ability to predict mortality both SMARTCOP and PS-CRUXO80 had 100% sensitivity. CURB65 had the maximum specificity of 65.76% followed by IDSA/ATS2007 of 57.65%. The positive predictive value for prediction of mortality was highest for IDSA/ATS2007 (22.9%). The negative predictive value was highest with PS-CRUXO80 and SMARTCOP with a value of 100%. On constructing an ROC curve to assess the ability of scoring systems to predict mortality PS-CRUXO 80 had the maximum area under curve of 0.915 followed by IDSA/ATS 2007 minor criteria with an AUC of 0.861.Thus the ideal screening tool for predicting mortality is PS-CRUXO80.

Scoring systems in prediction of severe community acquired pneumonia(Table no-6)

Among the scoring systems analyzed SMARTCOP had the maximum sensitivity in prediction of severe community acquired pneumonia (97.22%) followed by PSCRUXO80 (94.44%) and IDSA/ATS 2007(86.11%). The specificity was maximum for CURB65 (73.91%) followed by IDS/ATS2007 (67.39%). The negative predictive value was shown maximum by SMARTCOP (97.14%) followed by PSCRUXO80(94.87%) and IDSA/ATS2007(92.53%). On constructing an ROC curve to assess the ability of scoring systems to predict

SCAP PS-CRUXO 80 had the maximum area under curve of 0.962 followed by IDSA/ATS 2007 minor criteria with an AUC of 0.926.Thus the ideal screening tool for predicting SCAP is PS-CRUXO80.

V. Discussion

The mortality rate of patients who require admission to hospital for treatment of CAP, averages 12% overall but increases to 30- 40 % for those with sever CAP who require admission to ICU compared to mortality rate of 1% among patients with CAP treated on outpatient basis. In a study by Woodhead et al of 301,871 CAP cases the ICU mortality was 34.9% and ultimate hospital mortality 49.4%. Mortality was 46.3% in those admitted to the ICU within 2 days of hospital admission rising to 50.4% in those admitted at 2 to 7 days and 57.6% in those admitted after 7 days following hospital admission.(3)This shows that the determination of site of care based on severity of illness is a very important component of patient management, affecting both diagnostic work up and antibiotic therapy. Because of the high mortality of patients in whom ICU admission is delayed it is essential to identify patients with severe CAP as early as possible and manage them aggressively.(3-6)

The commonly used severity assessment tools, Pneumonia Severity Index (PSI) and the British Thoracic Society CURB-65 were developed primarily to identify those patients who can safely be treated as outpatients. They have been extensively validated in several studies, and it allows the confident separation of patients with a high mortality risk. They are useful tools for identifying patients who can be discharged safely, and managed at home. However, these tools have limitations in identifying all patients with severe pneumonia who require ICU admission.(3-6)

In our study we compared the newer scoring systems- PS-CRUXO80(SCAP score by Espana et al), SMARTCOP and IDSA/ATS2007 with commonly used CURB65 score.

A total of 128 patients with CAP participated in our study. Severe community acquired pneumonia was found in 28.12% of the study population(n=36), of which 32(25%) patients were admitted to ICU requiring mechanical ventilation or inotropic support and 17(13.3%) patients died. The mortality of patients admitted to ICU was 44%(14/32) and overall mortality among patients with SCAP was 47%(n=17) in our study. The incidence of ICU admission in our study is higher than the previous study by Buising et al,(6) which showed that about 10% of all hospitalized patients with CAP required admission to the intensive care unit (ICU). However the mortality of our study is comparable to the results of study by Woodhead et al (3) in which ICU mortality was 34.9 % and ultimate hospital mortality was 49.4%.

We conducted a univariate analysis of various clinical and biochemical parameters at the time of admission in predicting the risk of developing SCAP. On statistical analysis age >80 years had no statistically significant relation to development of SCAP (OR=1.79, p value= 0.296). Previous studies have shown that incidence of severe CAP increases with age and increasing age probably adversely affects outcome. Analysis of 11 studies of CAP in the elderly by Woodhead M, (7) showed that more than 90% of pneumonia deaths occurred in patients over the age of 70. This is not consistent with our study findings, may be because of the less no. of patients in the age group >80 years (n=8) in our study and small sample size.

In this study. *patients classified into the high risk group by scoring systems i.e. PS-CRUXO80 >10, SMARTCOP≥ 3,IDSA/ATS2007 minor criteria≥3 and CURB65≥3,had high mortality rate (*19.1%,18.27%,22.9% and 20.8% respectively) and increased rate of ICU admission and mechanical ventilation(33.7%,33.3%,45.90% and 45.8% respectively). These findings were consistent with the previous study by Yandiola etal , in which patients classified as high risk by the PSCRUXO80 and SMARTCOP showed higher rates of adverse outcomes (ICU admission, 35.8%; mechanical ventilation, 16.4%) than PSI and CURB-65 high-risk classes(8).

In our study, ICU admission and mechanical ventilation was required in 32 (25%)patients.. The maximum sensitivity in prediction of ICU admission was seen with SMARTCOP (96.87%) followed by PSCRUXO80 (93.75%), IDSA/ATS2007 (87.5%) and CURB65 (68.75%) respectively. Even though SMARTCOP and PSCRUXO-80 had high sensitivity in prediction of ICU admission and mechanical ventilation, the specificity (38.5 % for PSCRUXO80 and 35.41% for SMARTCOP) and positive predictive value (33.70% for PSCRUXO80 and 33.3% forSMARTCOP) of both scoring system was low showing a high over prediction rate. The negative predictive value in prediction of ICU admission was maximum of for SMARTCOP (97.1%) followed by PS-CRUXO80 (94.87%). In a previous study by Fukayama etal the maximum sensitivity and negative predictive value in prediction of ICU admission and mechanical ventilation was seen with SMARTCOP (100% sensitivity and 100% NPV) followed by PS-CRUXO80 (93.5% sensitivity and 97.9% NPV), IDSA/ATS 2007 minor criteria (93.5% sensitivity and 98.5% NPV) and CURB65 (77.4% sensitivity and 96.4% NPV).(9) In a meta- analysis by Chalmers JD etal, the maximum sensitivity and NPV for ICU admission and mechanical ventilation was seen with PS-CRUXO 80 (94.3% sensitivity and 99.3% NPV) compared to SMARTCOP, IDSA/ATS and CURB65.(10) Our study was found to be consistent with previous studies and statistically significant with a p value of 0.005. ROC was constructed to assess the ability of various

scoring systems to predict ICU admission and mechanical ventilation. The maximum area under the curve (AUC) was seen with PS-CRUXO80 (AUC=0.945) followed by IDSA/ATS 2007 minor criteria(AUC=0.932) SMARTCOP (AUC=0.891) and CURB65 (AUC=0.87). Hence, in this study PS-CRUXO80 was found to be the most reliable scoring system in predicting ICU admission and mechanical ventilation with a high AUC , sensitivity and NPV. In the meta-analysis by Chalmers etal the maximum AUC for predicting mechanical ventilation and ICU admission was seen for IDSA/ATS2007 (AUC=0.85) followed by SMARTCOP (AUC=0.83).(10) The difference in findings ROC chart of our study with previous studies may be because of lower study population. In our study, when considering the ability to predict mortality both SMARTCOP and PS-CRUXO80 had 100% sensitivity and NPV. CURB65 had the maximum specificity of 65.76% followed by IDSA/ATS2007 of 57.65%. The positive predictive value in prediction of mortality was highest for IDSA/ATS2007 (22.9%). On constructing an ROC curve to assess the ability of scoring systems to predict mortality PS-CRUXO 80 had the maximum area under curve of 0.915(0.852-0.978) followed by IDSA/ATS 2007 minor criteria with an AUC of 0.861(0.766-0.957) and SMARTCOP(0.851) and CURB65(0.779).Thus the ideal screening tool for predicting mortality is PS-CRUXO80 with maximum AUC and high sensitivity and NPV . In a previous study by Fukuyama et al, the maximum sensitivity and negative predictive value in prediction of mortality was seen with PS-CRUXO80 (96.7% sensitivity and 99% NPV) followed by SMARTCOP (93.3% sensitivity and 98.4%), IDSA/ATS 2007 minor criteria (86.7% SENSITIVITY and 97.6% NPV) and CURB65 (86.7% sensitivity and 93.9% NPV).(9) In a meta- analysis by Chalmers JD etal, the maximum sensitivity and NPV for mortality was seen with PS-CRUXO 80 (93.8% sensitivity and 99.5% NPV) compared to SMARTCOP, IDSA/ATS and CURB65. In this study maximum AUC for predicting mortality was seen with SMARTCOP (AUC=0.79).(10) Our study was found to be consistent with previous studies and statistically significant with a p value of 0.005.

Among the scoring systems analyzed SMARTCOP had the maximum sensitivity of 97.22% in prediction of SCAP followed by PSCRUXO80 (94.44%) and IDSA/ATS 2007(86.11%). The specificity was maximum for CURB65 (73.91%) followed by IDS/ATS2007 (67.39%). The negative predictive value was shown maximum by SMARTCOP (97.14%) followed by PSCRUXO80 (94.9%) and IDSA/ATS2007 (92.53%). The ROC curve constructed showed that PS-CRUXO80 was the most reliable scoring system to predict SCAP with a maximum AUC of 0.962 followed by IDSA/ATS2007 minor criteria (0.926) , SMARTCOP (0.883) and CURB65(0.872) . Previous studies by Espana etal ,(11) Chalmers etal(10) and Fukuyama etal(9) have shown that the best scoring system to predict SCAP is PS-CRUXO80 with a high sensitivity(92.1%-98.2%), high NPV(99%) and high AUC(0.75-0.83) which was consistent with our study .

In our study ,we took only IDSA/ATS 2007 minor criteria into account . However, use of the minor criteria only does not seem to have reduced the specificity of the ATS/IDSA 2007 score, as suggested by our results, with a sensitivity of 87.5% for ICU admission, 82.35% for mortality and 86.11% for SCAP. Previous study by Liapikou A et al showed that the IDSA/ATS 2007 predictive rule had a sensitivity of 71% and a specificity of 88% for determining need for ICU admission when major criteria was included in analysis(12). These findings were statistically significant with p value <0.05.Inclusion of major criteria in the ATS rules (mechanical ventilation and shock) improves their diagnostic performance but is not useful clinically, because these patients have an obvious indication for ICU admission. . In a recent prospective cohort excluding patients with major criteria or therapeutic limitations, ATS-IDSA minor criteria had an AUC of 0.85 to predict ICU admission which was similar to the AUC of IDSA/ATS 2007 minor criteria in our study(AUC=0.861) ,showing that minor criteria alone can significantly predict severe community acquired pneumonia.(13)

In our study, performance of the commonly used CURB65 score in predicting ICU admission, mortality and SCAP was inferior to IDSA/ATS 2007 minor criteria, SMARTCOP and PSCRUXO80. In our study, CURB65 had a low sensitivity of 66.67%, 58.82% and 68.75% in predicting SCAP, mortality and ICU admission respectively and the findings were comparable to the previous study by Capelastegui *et al* (14) in which CURB-65 could not predict the need for ICU admission. In our study mortality in patients with CURB-65 score >=3 was 20.8% and in patients with score <3 was 8.75%.

VI. Conclusion

Thus our study highlights that S CAP is a common occurrence(28%) in hospitalized CAP patients and has high mortality rate(47%).Although the newer generation of scoring systems have shown to have enhanced operative characteristics to predict ICU admission , due to very low positive predictive value,,many more patient will land up in ICU than really needed. High negative predictive value has been the most consistent finding among the different studies including ours and suggests that these scores could be more relevant to exclude the presence of severe CAP(SCAP) than to aid in performing triage in patients for ICU admission **.**

Study limitations

An important limitation of the study was the small number of patients included in the study. Secondly , there is no universally accepted definition exists for severe CAP. The commonly used criteria i.e ICU

admission, is heavily influenced by ICU beds availability, local ICU admission policy, or subjectivity of the ICU specialist's evaluation. The use of subjective decision as a gold standard can lead to errors, because a perfect rule would be the one fitting usual practice. However, alternative definitions of SCAP, such as receipt of intensive treatment, do not seem to modify importantly operative characteristics of the prediction rules.Thirdly , there can be a situation of false positive or unrequired ICU admission, which is unclear as even though a patient may not receive inotropic support or mechanical ventilation in the ICU they may be benefited from the intensive monitoring and better resuscitation.

Since these scoring systems are screening tools for SCAP they need to be evaluated in a larger population before being considered as an standard predictive tool.

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Table no – 1 Distribution of Patients According To Clinical Outcome (n=128)

OUTCOME	NUMBER n(%)
DISCHARGE(NSCAP)	92(71.9%)
SCAP	36(28.12%)
1.EXPIRED	17(13.28%)
2.ICU ADMISSION/MECHANICAL VENTILATION/IONOTROPIC SUPPORT	32(25%)

SCAP=Severe Community Acquired Pneumonia ,NSCAP=Non Severe Community Acquired Pneumonia

Table 2:- Distribution of clinical and biochemical parameters according to severity of CAP

Clinical parameters						
	SCAP(n=36)		**NSCAP(n=92)**		**odds ratio**	**p value**
	N	**%**	**N**	**%**		
Age>80 years	4	11	6	7	1.79	0.296
Male sex	22	61	63	68	0.723	0.428
Presence of comorbidities	22	61	56	61	1.01	0.98
Smoking	21	58	55	60	0.948	0.881
Alcoholic	18	50	57	62	0.61	0.217
Confusion(MMSE<8)	23	64	12	13	11.79	0
Pulse rate ≥125	26	72	25	27	6.99	0
Respiratory rate≥30	29	81	42	46	4.93	0
Temperature<96.8	5	14	2	2	7.25	0.09
Systolic blood pressure<=90 mmHg	26	72	4	4	57.2	0
Diastolic blood pressure<=60 mmHg	29	81	17	18	18.28	0
Multi lobar chest infilterates	25	69	34	37	3.877	0.001
Biochemical and laboratory parameters						

	SCAP(n=36)		NSCAP(n=92)		odds ratio	p value
	N	%	N	%		
Leukopenia(tc≤4000/mm3)	5	14	9	10	1.48	0.35
Thrombocytopenia(platelet count≤1lakh/mm3)	16	44	18	20	3.28	0.04
Serum albumin≤3.5gm/dl	15	42	35	38	1.163	0.706
Arterial bloodph≤7.3	29	81	33	36	7.4	0
Pao2/fio2<250	34	94	22	24	54	0
Bun>20 mg/dl	27	75	21	23	10.14	0

Cut off values for various parameters are based on the cut off values taken into consideration for calculation of various severity scores.

Table 3:- Distribution outcome of the study according severity scales

OUTCOME		PSCRUXO80		SMARTCOP		IDSA/ATS2007		CURB65	
		≤10	>10	<3	≥3	<3	≥3	<3	≥3
SCAP	EXPIRED	0(0%)	17(19.1%)	0(0%)	17(18.27%)	3(4.47%)	14(22.95%)	7(8.75%)	10(20.8%)
	ICU ADMISSION/MECHANICAL VENTILLATION/INOTROPIC SUPPORT	2(5.12%)	30(33.7%)	1(2.86%)	31(33.3%)	4(5.97%)	28(45.90%)	10(12.5%)	22(45.8%)
NSCAP		37(94.87%)	55(61.79%)	34(97.14%)	58(62.36%)	62(92.53%)	30(49.18%)	68(85%)	24(50%)
	TOTAL	39	89	35	93	67	61	80	48

SCAP=Severe Community Acquired Pneumonia , NSCAP=Non Severe Community Acquired Pneumonia

Table No- 4 Sensitivity/Specificity/Positive Predictive Value /Negative Predictive Value Of Various Scoring Systems In Predicting Icu Admission/Mechanical Ventilation / Inotropic Support (n=32)

Score	Sensitivity	Specificity	PPV	NPV	ROC-AUC
PS-CRUXO-80	30/32(93.75%)	37/96(38.54%)	30/89(33.70%)	37/39(94.87%)	0.945
SMART COP	31/32(96.87%)	34/96(35.41%)	31/93(33.33%)	34/35(97.14%)	0.891
IDSA/ATS2007	28/32(87.5%)	63/96(64.58%)	28/61(45.90%)	63/67(94.02%)	0.932
CURB-65	22/32(68.75%)	70/96(70.83%)	22/48(45.83%)	70/80(87.5%)	0.87

PPV=Positive Predictive Value , NPV=Negative Predictive Value , AUC=Area Under Curve,ROC=Receiver Operating Characteristic Curve

Table no- 5 Sensitivity/Specificity/Ppv/Npv Of Various Scoring Systems In Predicting Mortality (N=17)

Score	Sensitivity	Specificity	PPV	NPV	ROC-AUC
PS-CRUXO-80	17/17(100%)	39/111(35.13%)	17/89(19.10%)	39/39(100%)	0.915(0.852-0.978)
SMART COP	17/17(100%)	35/111(31.53%)	17/93(18.27%)	35/35(100%)	0.851(0.766-0.957)
IDSA/ATS2007	14/17(82.35%)	64/111(57.65%)	14/61(22.95%)	64/67(95.52%)	0.861
CURB-65	10/17(58.82%)	73/111(65.76%)	10/48(20.83%)	73/80(91.25%)	0.779

PPV=Positive Predictive Value,NPV=Negative Predictive Value,ROC=Receiver Operating Characteristic Curve ,AUC=Area Under Curve , SCAP=Severe Community Acquired Pneumnia

Table no - 6 Sensitivity/Specificity/Ppv/Npv Of Various Scoring Systems For Predicting Scap (N=36)

Score	Sensitivity	Specificity	PPV	NPV	ROC-AUC
PS-CRUXO-80	34/36(94.44%)	37/92(40.21%)	34/89(38.20%)	37/39(94.87%)	0.962
SMART COP	35/36(97.22%)	34/92(36.95%)	35/93(37.63%)	34/35(97.14%)	0.883
IDSA/ATS2007	31/36(86.11%)	62/92(67.39%)	31/61(50.81%)	62/67(92.53%)	0.926
CURB-65	24/36(66.66%)	68/92(73.91%)	24/48(50%)	68/80(85%)	0.872

PPV=Positive Predictive Value,NPV=Negative Predictive Value ,ROC=Receiver Operating Characteristic Curve ,AUC=Area Under Curve , SCAP=Severe Community Acquired Pneumonia