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ORIGINAL ARTICLE

Comparative Study of CURB-65, Expanded CURB-65, PSI and SMART-COP Scoring in the Severity Assessment of Community Acquired Pneumonia

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Abstract:

Background and objective: *Community Acquired Pneumonia is a very common respiratory tract infection in our country. Due to overcrowding and air pollution, the number of patients and hospitalization are increasing day by day. The assessment of disease severity and site of care decisions are very important for patients' safety and optimal use of resources. Late admission in the hospital or intensive care unit (ICU) leads to increased rate of mortality in CAP. Till now, several severity assessment scores are adopted throughout the world, but there is no study in our country regarding appropriate scoring for our population. So, this study aimed to identify the best scoring system from CURB-65, Expanded CURB-65, PSI and SMART-COP in the severity assessment of community acquired pneumonia.*

Patients and Methods: *This study was done in the Department of Respiratory Medicine, National Institute of Diseases of the Chest & Hospital (NIDCH), Mohakhali, Dhaka over a period of two year from July, 2018 to June 2020. It was a cross sectional analytical study. Patients admitted in this hospital with signs/symptoms of pneumonia like cough, haemoptysis, shortness of breath, chest pain, crackles on chest auscultation and consolidation in CXR were enrolled as the study population. Total 54 patients were found fulfilling the inclusion criteria. The outcome of the patients were recorded in terms of hospital stay, need for ICU admission and in hospital mortalily.*

Result: *At the end of the study, it was found that the median length of hospital stay was 8 days, intensive care unit (ICU) admission rate of CAP patients was 12(22.2%), mortality of CAP patients was 3(5.6%). Expanded CURB-65 score (5-8), SMART-COP score (5-9) and PSI class (V) were associated with more frequent ICU admission (66.7%) (n=8) in this study. Sensitivity and specificity in predicting ICU admission were 75.0% and 85.7% for CURB-65 (Ç2=17.14, df=1, p<0.001), 75.0% and 88.1% for Expanded CURB-65 (Ç2=19.34, df=1, p<0.001), 83.3% and 81.0% for SMART-COP (Ç2=17.35, df=1, p<0.001), 91.7% and 85.7% for PSI (Ç2=25.90, df=1, p<0.001) respectively. Sensitivity for predicting mortality was*

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100.0% in all scoring system and specificity of CURB-65 was 76.5% (Ç2=8.25, df=1, p-.004), 78.4% for Expanded CURB-65 (Ç2=9.07, df=1, p=.003), 70.6% for SMART-COP (Ç2=6.35, df=1, p=.012) and 72.5% for PSI (Ç2=6.91, df=1, p=.009). Among the four scoring, Expanded CURB-65 had best specificity both in predicting ICU admission and mortality of CAP.

Conclusion: *The present study concluded that Expanded CURB-65 score is simple, objective and more accurate scoring system for evaluation of CAP severity and can improve the efficiency of predicting ICU admission and mortality better than CURB-65, PSI and SMART-COP scores.*

Key words: *Pneumonia severity scoring, ICU admission, Sensitivity and specificity etc.*

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Introduction:

Pneumonia is a disease known to humanity from antiquity. It is an acute inflammation of the pulmonary parenchyma that can be caused by various infective and non-infective origins, presenting with physical and radiological features compatible with the pulmonary consolidation of a part or parts of one or both lungs.[1]Pneumonia is one of the leading causes of death and morbidity, both in developing and developed countries and is the commonest cause (10%) of hospitalization in adult and children. In United kingdom, 5–15% of patients hospitalized with community-acquired pneumonia (CAP) die within 30 days of admission, results in 29,000 deaths per annum and rising to 30% for those admitted to the intensive care unit.[2] In the United States, it is the fifth cause of death in people aged 65 and older.[3] Although in Bangladesh there are no available data that shows the burden of the disease in the adult population. The severity of the disease increases with the age as the elderly has concomitant co-morbidities. Irfan et al., (2009) showed that co-morbid illnesses were present in 63.5% patients with community acquired pneumonia in a developing country.[4]

Multiple serum biomarkers and several established evaluation scores have been used to assess the severity of CAP for improving management. Also predictors of mortality in individuals with CAP have been developed to identify at risk of poor outcomes early.[5,6] Pneumonia Severity Index (PSI) was the first scoring system, recommended by the American Thoracic Society (ATS)/Infectious Diseases Society of America (IDSA).[7] PSI is composed of demographic variables, co-morbidities, physical exam/vital signs, and laboratory/imaging. It categorizes CAP patients into 5 classes (I,II,III,IV,V). Mortality and recommended site (outpatient, inpatient or ICU) of care can be obtained from PSI score.

Later, the British Thoracic Society recommended CURB-65 score for CAP management (Confusion, Blood Urea>7 mmol/L, Respiratory rate>30/min, Blood pressure-systolic<90 mm of Hg or diastolic<60 mm of Hg and Age over 65). It is used to determine the treatment criteria in outpatient, inpatient or ICU.[8] SMART-COP score (Systolic blood pressure, Multilobar infiltrates, Albumin, Respiratory rate, Tachycardia, Confusion, Oxygen saturation and Blood pH) was developed in Australia.[9] It can give better accuracy for prediction of the need for intensive respiratory or vasopressor support.

The Expanded CURB-65 is a modification of commonly used CURB-65 scoring system.[10] There are 3 additional markers (total 8) in the new scoring system which are Serum Albumin (<3.5 gm/L), Serum LDH (>230 u/L) and total platelet count (<100 x 10^9). S. Albumin, S. LDH and low platelet count are independent marker of pneumonia severity.[11,12,13] This assessment is divided into 3 classes according to the parameters. Class I>score 0-2=low risk (outpatient treatment), Class II>score 3-4=intermediate risk (inpatient treatment) and Class III>score 5-8=high risk (ICU treatment).It expands the independent risk factors into 8 variables in assessing CAP severity, significantly increases high-risk patient identification, through decreasing the relative weight of age and blood pressure, and excluding the use of imaging and

co-morbid illnesses in the calculation. This new scoring system is found to be more accurate for the severity classification in comparison with CURB-65 and PSI scores.[14]

In CURB-65, age is not a reliable marker for severity assessment in our country. For instance, many young patients are incorrectly categorized as low risk because of age less than 65 years, thus missing one point which reduces the scoring. Conversely the older patients above 65 years are sometimes falsely referring as severe. Also, many patients would be hypertensive, so low blood pressure will not be found frequently in severe CAP which also incorrectly reduces the severity score. Pneumonia severity index is determined by PORT prediction score which is composed of 20 variables. It is quite complicated, needs extensive investigations and time consuming to calculate, thus, limits regular clinical application. SMART-COP only emphasizes the need for ventilator/ vasopressor support in hospitalized patients. It does not categorize the patients of CAP for outpatient or inpatient management. This scoring also needs ABG analysis which is a sophisticated procedure and requires special analyzer which is not always available. The new Expanded CURB-65 scoring is simple which includes both the physical signs as well as important blood markers that can be done district level lab. So, this scoring is possible in the general medical practice, secondary or tertiary level hospital. Serum Albumin level and serum LDH are recognized marker of pneumonia severity. Septicemia and DIC can lead to low platelet count. Thus, addition of these three biomarkers in the existing CURB-65 scoring would be more accurate for early and proper management of complicated patients with special attention and by referring them to ICU when appropriate. This will reduce the financial burden, morbidity and mortality in Community Acquired Pneumonia. However, its effectiveness in Bangladesh setup has not been reported yet. That is why this study was done to see the superiority of this score comparing others.

Materials and methods:

This cross-sectional study was carried out in the Department of Respiratory Medicine, National Institute of Diseases of the Chest & Hospital (NIDCH), Mohakhali, Dhaka over a period of two year between July, 2018 to July 2020. Patients aged over 18 years attending in the hospital with the diagnosis of community acquired pneumonia based on two or more clinical signs and symptoms related to pneumonia (fever $>38^0$ C, cough, dyspnea, haemoptysis, chest pain or crackles on auscultation) and a chest radiograph showing feature of consolidation were the study population. Patients having pulmonary tuberculosis or respiratory fungal infection were excluded from this study. A total of 54 patients were enrolled meeting the inclusion and exclusion criteria. After taking written consent from each CAP patients, clinical examination (eg. Blood pressure, pulse, respiratory rate) and biochemical tests (Blood Urea, serum LDH, total platelet count, serum albumin etc.) were done and recorded. PSI, CURB-65, Expanded CURB-65 and SMART-COP scores were calculated. Finally, sensitivity, specificity, PPV and NPV were calculated for above scoring systems to predict ICU admission and mortality. Statistical analysis was done by SPSS (Statistical Package for Social Sciences) software version 22. Numerical data were presented as mean with standard deviation and categorical data were presented as frequency & their percentage. A p value <0.05 was considered statistically significant. The summarized data were present in the table.

Results:

Table-I

Demographic profile of the study subjects (N=54)

	Frequency (n)	Percentage
Age (years)		
≤30	13	24.1
31 - 50	19	35.2
>50	22	40.8
Mean ±SD	46.74 ± 18.98	
Gender		
Male	40	74.1
Female	14	25.9
Residence		
Urban	34	62.96
Rural	20	37.04

Table I shows maximum patients were >50 years old followed by 35.2% in age group 31-50 years and 24.1% ≤30 years. Mean age of the study subjects was 46.74 ± 18.98 years. Males (74.1%) were predominant than females (25.9%) and male to female ratio was 2.85:1. 62.96% patients were urban people and 37.04% patients were from rural area.

Table-II

Clinical profile of the study subjects (N=54)

	Frequency (n)	Percentage
GCS [Mean ±SD]	14.44 ± 1.30	
Respiratory rate(≥30/min)	26	48.1
Respiratory rate (/min) [Mean ±SD]	29.24 ± 4.00	
Systolic BP (mm of Hg) [Mean ±SD]	116.59 ± 17.78	
Diastolic BP (mm of Hg) [Mean ±SD]	71.30 ± 9.12	
SBP<90 or DBP ≤60	11	20.4
Heart rate (/min)[Mean ±SD]	78+13.4	

Table-III

Laboratory investigation findings of the study subjects (N=54)

	Mean ±SD	Min - max
Blood urea (mmol/L)	6.09 ± 3.55	1.85 - 22.00
High blood Urea (>7mmol/L)	14 (25.92%)	
Total platelet count	276074 ± 123355	41000 – 596000
Thrombocytopenia(<1,50,000/μL)	4 (7.4%)	
Serum LDH (U/L)	512.50 ± 317.83	119 – 1560
High serum LDH (>230 U/L)	46 (85.2%)	
Serum Sodium (mmol/L)	138.65 + 6.79	107- 150
Hyponatremia (<135 mmol/L)	8 (14.81%)	
Serum Potassium (mmol/L)	4.1 + .6	2.4-6.1
Hypokalemia (mmol/L)	5 (9.26%)	
Serum albumin (g/dl)	3.35 ± 0.73	1.90 - 6.20
Hypoalbuminemia, (<3 g/dl)	29 (53.7%)	
Sputum C/S (growth)	10 (18.15%)	

Table II shows mean GCS was 14.44 + 1.30, mean respiratory rate was 29.24 ± 4.00 /min and 48.1% of the study subjects had respiratory rate e"30/ min. 20.4% of the study subjects had SBP<90 or DBP d"60.Mean heart rate was 78+13.4/min.

Table III shows mean value of blood urea, platelet count, serum albumin, serum LDH were 6.09 ± 3.55 mmol/L, 276074 ± 123355, 3.35 ± 0.73 g/dl and 512.50 ± 317.83 U/L respectively. Culture of sputum was positive in 18.15% cases. High blood Urea was found in 25.92 % cases, high serum LDH was in 85.2% cases, thrombocytopenia was in 7.4% cases and hypoalbuminemia in 53.7% cases. Hyponatremia was found in 14.81% and hypokalemia in 9.26%.

Table-IV

Distribution of patients according to management output at hospital ward

	Frequency (n)	Percentage
ICU admission	12	22.2
Length of hospital stay in days [Mean ±SD]	8.16 ± 3.41	
Mortality	3	5.6

Table IV shows intensive care unit (ICU) admission rate of CAP patients was 22.2%, the median length of hospital stay was 8 days. The overall mortality rate was 5.6%.

Table-V

Distribution of the study subjects according to the grading of different scoring systems (N=54)

	Frequency (n)	Percentage
CURB-65 score		
0 – 1 (PP-OPD)	39	72.2
2 – 3 (PP-IPD)	14	25.9
4 – 5 (PP-ICU)	1	1.9
Expanded CURB-65 score		
0 – 1 (PP-OPD)	20	37.0
2 – 4 (PP-IPD)	23	42.6
5 – 8 (PP-ICU)	11	20.4
SMART-COP score		
0 – 1 (PP-OPD)	23	42.6
2 – 4 (PP-IPD)	20	37.0
5 – 9 (PP-ICU)	11	20.4
PSI score		
Class I –II (PP-OPD)	24	44.4
Class III-IV (PP-IPD)	20	37.1
Class V (PP-ICU)	10	18.5

(PP-OPD= Patient predicted for outpatient management, PP-IPD= Patient predicted for inpatient management, PP-ICU= Patient predicted for intensive care unit management)

Table V shows distribution of the study subjects according to different scoring systems. High risk was similar in Expanded CURB, SMART-COP and PSI scoring. According to CURB-65 score, 72.2% patients were suggested for outpatient treatment, 25.9% inpatient and 1.9% ICU; according to Expanded CURB-65 score, 37.0% patients were suggested for outpatient treatment, 42.6% inpatient and 20.4% ICU; according to SMART-COP score, 42.6% patients were suggested for outpatient treatment, 37.0% inpatient and 20.4% ICU; according to PSI score, 44.4% patients were suggested for outpatient treatment, 37.1% inpatient and 18.5% ICU.

(PP-OPD= Patient predicted for outpatient management, PP-IPD= Patient predicted for inpatient management, PP-ICU= Patient predicted for intensive care unit management)

Table VI shows different initial scores of 12 patients who later got admitted in the ICU. Of them 25.0% were predicted to be treated in outpatient setting, 66.7% in inpatient and 8.3% in ICU according to CURB-65 score. 8.3% were suggested to be treated in outpatient setting, 25.0% in inpatient and 66.7% in ICU according to Expanded CURB-65 score. 8.3% were suggested to be treated in outpatient setting, 25.0% in inpatient and 66.7% in ICU according to

Table-VI

Distribution of severity scoring systems during admission in patients required ICU management (N=12)

	CURB-65	ExpandedCURB-65	SMART-COP	PSI
Outpatient(PP-OPD)	3 (25.0%)	1 (8.3%)	1 (8.3%)	0 (0.0%)
Inpatient(PP-IPD)	8 (66.7%)	3 (25.0%)	3 (25.0%)	4 (33.3%)
ICU(PP-ICU)	1 (8.3%)	8 (66.7%)	8 (66.7%)	8 (66.7%)

Table-VII

The accuracy of different scoring systems in predicting ICU admission (N=12)

Scoring system	Threshold	$Ç^2$	df	p-value	Sensitivity	Specificity	PPV	NPV
CURB-65	≥2	17.14	1	<0.001	75.0	85.7	60.0	92.3
Expanded CURB-65	≥4	19.34	1	<0.001	75.0	88.1	64.3	92.5
SMART-COP	≥4	17.35	1	<0.001	83.3	81.0	55.6	94.4
PSI	≥4	25.90	1	<0.001	91.7	85.7	64.7	97.3

(Chi-square test was done to measure the level of significance. For CURB-65, $Ç^2$ = 17.14 with df=1 and p-value <0.001. For Expanded CURB-65, $Ç^2$ = 19.34 with df=1 and p value<0.001. For SMART-COP, $Ç^2$ = 17.35 with df=1 and p-value<0.001. For PSI, $Ç^2$ = 25.90 with df=1 and p-value<0.001)

Table-VIII

Distribution of the severity scoring systems during admission who died in the hospital (N=3)

	CURB-65	ExpandedCURB-65	SMART-COP	PSI
Outpatient(PP-OPD)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Inpatient(PP-IPD)	3(100%)	0 (0.0%)	1 (33.3%)	2(66.7%)
ICU(PP-ICU)	0 (0.0%)	3 (100.0%)	2 (66.7%)	1 (33.3%)

(PP-OPD= Patient predicted for outpatient management, PP-IPD= Patient predicted for inpatient management, PP-ICU= Patient predicted for intensive care unit management)

Table-IX

The accuracy of different scoring systems in predicting mortality (N=3)

Scoring system	Threshold	$Ç^2$	df	p-value	Sensitivity	Specificity	PPV	NPV
CURB-65	≥2	8.25	1	0.004	100.0	76.5	20.0	100.0
Expanded CURB-65	≥4	9.07	1	0.003	100.0	78.4	21.4	100.0
SMART-COP	≥4	6.35	1	0.012	100.0	70.6	16.7	100.0
PSI	≥4	6.91	1	0.009	100.0	72.5	17.6	100.0

(Chi-square test was done to measure the level of significance. For CURB-65, $Ç^2 = 8.25$ with df=1 and p-value=0.004. For Expanded CURB-65, $Ç^2 = 9.07$ with df=1 and p value=0.004. For SMART-COP, $Ç^2 = 6.35$ with df=1 and p-value=0.012. For PSI, $Ç^2 = 6.91$ with df=1 and p-value=0.009)

SMART-COP score. 33.3% were predicted to be treated in inpatient and 66.7% in ICU were according to PSI score.

Table VII shows accuracy of different scoring systems in predicting ICU admission. Among four scoring, PSI had better sensitivity but Expanded CURB-65 had better specificity. Sensitivity, specificity, PPV and NPV were 75.0%, 85.7%, 60.0% and 92.3% respectively according to CURB-65 score at a cutoff value 2; sensitivity, specificity, PPV and NPV were 75.0%, 88.1%, 64.3% and 92.5% respectively according to Expanded CURB-65 score at a cutoff value 4; sensitivity, specificity, PPV and NPV were 83.3%, 81.0%, 55.6% and 94.4% respectively according to SMART-COP score at a cutoff value 4; sensitivity, specificity, PPV and NPV were 91.7%, 85.7%, 64.7% and 97.3% respectively according to PSI score at a cutoff value 4 in predicting ICU admission. UK guidelines on admission to and discharge from intensive care and high dependency units (1996) protocol was taken as the gold standard for predicting severely ill patients who needed ICU admission.

Table VIII shows different initial scores in 3 patients who later died in the hospital.. Of them, all were suggested to be treated in inpatient setting according to CURB-65 score; all were suggested to be treated in ICU according to Expanded CURB-65 score; 33.3% were suggested to be treated inpatient and 66.7% in ICU according to SMART-COP score; 66.7% inpatient and 33.3% in ICU according to PSI score.

Table 4.9 shows accuracy of different scoring systems in predicting mortality. Among four scoring, Expanded CURB-65 had better sensitivity & specificity. Sensitivity, specificity, PPV and NPV were 100.0%, 76.5%, 20.0% and 100.0% respectively according to CURB-65 score at a cutoff value 2; sensitivity, specificity, PPV and NPV were 100.0%, 78.4%, 21.4% and 100.0% respectively according to Expanded CURB-65 score at a cutoff value 4; sensitivity, specificity, PPV and NPV were 100.0%, 70.6%, 16.7% and 100.0% respectively according to SMART-COP score at a cutoff value 4; sensitivity, specificity, PPV and NPV were 100.0%, 72.5%, 17.6% and 100.0% respectively according to PSI score at a cutoff value 4 in predicting mortality. UK guidelines on admission to and discharge from intensive care and high dependency units (1996) protocol was taken as the gold standard for predicting severely ill patients who needed ICU admission.

Discussion:

In this study, maximum patients were >50 years old followed by 35.2% in age group 31-50 years and 24.1% d" 30 years. Mean age of the study subjects was 46.74±18.98 years. Mean age was comparatively higher in other studies.[14,15] Males (74.1%) were predominant than females (25.9%) and male to female ratio was 2.85:1. Male predominance was also observed in other studies.[14,15]Mean respiratory rate was 29.24 ± 4.00 /min and 48.1% of the study subjects had respiratory rate ≥30/min. 62.0% patients had respiratory rate ≥30/min.[14] 20.4% of the study subjects had SBP<90 or DBP ≤60. 36.8% patients had SBP<90 or DBP ≤60.[14]In the study of Shindo et al., (2008) 30.7% patients had SBP<90 or DBP ≤60.[15]

Mean value of blood urea, platelet count, serum albumin, serum LDH were 6.09 ± 3.55 mmol/L, 276074 ± 123355, 3.35 ± 0.73 g/dl and 512.50 ± 317.83 U/L respectively. High serum LDH was found in 85.2% cases, thrombocytopenia was in 7.4% cases and hypoalbuminemia in 53.7% cases. Hyponatremia was found in 14.81% and hypokalemia was in 9.26% patients. In the study of Shehata et al., (2017) high LDH was in 44.8% cases, thrombocytopenia in 22.8% cases and hypoalbuminemia was in 33.2% cases.[14]

As regards patients' outcomes, it was found that intensive care unit (ICU) admission rate of CAP patients was 22.2% and the median length of hospital stay was 8 days. The overall mortality rate was 5.6%. Shehata et al., (2017) found in their study that ICU admission rate of CAP patients was 29.6%, the median length of hospital stay was 8 days and 30-day mortality rate was 11.2%.[14] Irfan et al., (2009) found that the overall mortality in their study population was 11%.[4] On the other hand, Zhang et al., (2016) found that the overall 30-day mortality rate was 15.7%, Intensive care unit (ICU) admission rate was 5.8% and the median length of hospital stay was four days.[16] Also, Liu et al., (2016) concluded that the median length of stay (LOS) was 10 day and the 30-day mortality was 8.48%.[10] Buising et al., (2006) and Shah et al., (2010) stated that ICU admission rates were 6.6% and 23.3%, respectively.[17,18] Shindo et al., (2008) found 30-day mortality (9.4%), ICU admission (14.6%) and median length of hospital stay 13 days.[15]

Expanded CURB-65 score (5-8), SMART-COP score (5-9) and PSI class (V) were associated with more frequent ICU admission (66.7%) in this study. So, expanded CURB-65, SMART-COP and PSI scores can identify the severe CAP patients who need ICU admission, better than CURB-65 score. Expanded CURB-65 score (5–8) was associated with more frequent ICU admission about 49.4% than PSI class (IV-V) and CURB-65 score (3–5) (Shehata et al., 2017).[14] Charles et al., (2008) suggested that neither PSI nor CURB-65 was designed to identify patients who need ICU referral.[9]

In predicting ICU admission, sensitivity of CURB-65, Expanded CURB-65, SMART-COP and PSI were 75.0%, 75.0%, 83.3% and 91.7%. Specificity of CURB-65, Expanded CURB-65, SMART-COP and PSI were 85.7%, 88.1%, 81.0% and 85.7% respectively. Among four scoring, PSI had better sensitivity but Expanded CURB-65 had better specificity. In this study of Shehata et al., (2017), the sensitivity of the Expanded CURB-65 score for prediction of ICU admission was higher than other two scores (p-value 0.0003).[14] So the Expanded CURB-65 score was better than the other two scores in predicting the severe patients who needed ICU admission.

In predicting mortality, sensitivity was 100.0% in all scoring systems. Specificity of CURB-65, Expanded CURB-65, SMART-COP and PSI were 76.5%, 78.4%, 70.6% and 72.5% respectively. Among four scoring, Expanded CURB-65 had better specificity. The study of Shehata et al., (2017) demonstrated that the Expanded CURB-65 score gave the most sensitive prediction of mortality (75%) with the highest NPV (95.9%).[14] The Expanded CURB-65 scoring system was the best predictor of 30-day mortality in CAP patients as it had the largest AUC (0.793) p-value < 0.0001). These results were comparable with other study in which the overall sensitivity and specificity of expanded-CURB-65 were superior (AUC = 0.826) to other score systems, of which the AUCs were 0.801, 0.756 for PSI, CURB-65 respectively in predicting the 30-day mortality.[10]

So among the four scoring, Expanded CURB-65 had better specificity in predicting ICU admission and mortality.

Limitation of the study:

Small sample size is the main limitation of the study. Also the study should be done in the outpatient department which would give the prediction of hospitalization for different scoring. Some patient received antibiotic prior admission to this hospital which might interfere the outcome of the patients.

Conclusion:

Pneumonia Severity Index or PSI is used to predict the mortality of CAP, but its complexity and extensive investigations limits its use in outpatient setting. SMART-COP scoring is used for hospital admitted patient who require vasopressor or mechanical ventilation. CURB-65 is easier but too simple and less reliable for identifying high risk patient. On the other hand, Expanded CURB-65 is objective, more accurate in categorizing the patients for outpatient treatment, hospital care or ICU support. It can be done at GP level, specialist chamber or hospital setting. It also improves the efficiency of predicting mortality in CAP patient better than CURB-65, PSI or SMART-COP scoring.

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