"THE USE OF SMART-COP SCORE IN PREDICTING SEVERITY OUTCOMES AMONG PATIENTS WITH COMMUNITY ACQUIRED PNEUMONIA ADMITTED AT TERTIARY CARE CENTER BELAGAVI - A CROSS SECTIONAL STUDY"

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Sub: Institutional Ethical Clearance for the study.

With reference to the above, we wish to inform you that your proposed research project titled **"THE USE OF SMART-COP SCORE IN PREDICTING SEVERITY OUTCOMES AMONG PATIENTS WITH COMMUNITY ACQUIRED PNEUMONIA ADMITTED AT TERITIARY CARE CENTER BELAGAVI- A CROSS SECTIONAL STUDY",** is ethical and justifiable. The proposed research project has been cleared by the JNMC Institutional Ethics Committee.

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LIST OF ABBREVIATIONS

- CAP - Community-acquired pneumonia
- PSI - Pneumonia severity index
- CURB-65 - Confusion, uremia, RR, blood pressure, age >65 years
- SMART-COP - Severity assessment system used in determining who needs intensive respiratory or vasopressor support
- IRVS - Intensive respiratory or vasopressor support
- ICU - Intensive care unit
- SBP - Systolic blood pressure
- SpO2 - Oxygen saturation
- pH - Potential hydrogen
- COPD - Chronic obstructive pulmonary disease
- CVA - Cerebrovascular accident
- RSV - Respiratory syncytial virus
- HMPV - Human metapneumovirus
- SARS-CoV-2 - Severe acute respiratory syndrome coronavirus 2
- WBC - White blood cell
- ESR - Erythrocyte sedimentation rate
- CRP - C-reactive protein
- CT - Computed tomography
- CBC - Complete blood count
- B/L - Bilateral
- PaO2/FiO2 - Ratio of partial pressure of oxygen in arterial blood to fraction of inspired oxygen
- HAP - Hospital-acquired pneumonia

- CI - Confidence interval
- ACAPS - Australian CAP Study
- MP - Melioidosis pneumonia
- AUC - Area under curve
- SCAP - Severe community-acquired pneumonia
- ATS - American Thoracic Society
- IDSA - Infectious Diseases Society of America
- CRB-65 - Confusion, RR>30, blood pressure (systolic <90 or diastolic <60), age >65
- CORB - Confusion, oxygenation, respiration, and blood pressure
- NPV - Negative predictive value
- PPV - Positive predictive value
- IQR - Interquartile range
- ROC - Receiver operating characteristic
- SE - Standard error
- SD - Standard deviation
- DM - Diabetes mellitus
- PR - Pulse rate
- RR - Respiratory rate
- BP - Blood pressure
- DBP - Diastolic blood pressure
- MAP - Mean arterial pressure

ABSTRACT

Introduction

Community-acquired pneumonia (CAP) is a common cause of death from infection. Severity assessment tools like CURB-65 and PSI are used to guide treatment decisions in CAP. The SMART-COP score is a newer tool that predicts the need for intensive respiratory or vasopressor support (IRVS). This study evaluates the use of the SMART-COP score in predicting severity outcomes for patients with CAP.

Materials and Methods

This was a hospital-based, single-center, cross-sectional study conducted over 12 months at a tertiary care center in India. 80 patients aged 18 years and older, admitted with CAP, were included. Data was collected on patient demographics, medical history, clinical parameters, and severity scores (CURB-65, PSI, and SMART-COP). Statistical analysis was performed using SPSS version 23.

Results

The mean age of patients was 57 ± 15.84 years, with 63.7% males. The most common comorbidities were diabetes mellitus (19%), chronic renal failure (12.5%), and congestive heart failure (11%). The mean respiratory rate was 25.3 ± 7.90 bpm. Severity outcomes included need for non-invasive ventilation (32.5%), intubation (26.3%), inotropic support (28.7%), and death (20%). Mean duration of hospital stay was 12.6 ± 9.62 days. SMART-COP scores showed 55% of patients at low risk, 18.8% at moderate risk, 15% at high risk, and 11.2% at very high risk. SMART-COP had a sensitivity of 61-62% and specificity of 82-88% for predicting the need for inotropic support, intubation, and death.

Conclusion

The SMART-COP score is a useful tool for predicting severity outcomes in CAP patients, particularly the need for intensive interventions. It can help guide early clinical decision-making and resource allocation.

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INTRODUCTION

Community-acquired pneumonia (CAP) is the most common infectious cause of death. Pneumonia is a disease process that involves interstitial lung tissue, the distal airway, and alveolar infection and infiltration [1]. It is clinically defined as a set of symptoms that include tachypnea, increased sputum production, productive cough, chills, increased bronchial lung sounds, fever, or pleuritic chest discomfort, all of which are followed by chest X-ray infiltration [2]. Pneumonia has a prevalence of 20% to 30% in low- and middle-income countries, compared to 3% to 4% in developed nations [3-4]. "is one of the leading, causes of mortality and morbidity. According to studies, it is one of the top causes of death in elderly individuals. And the Patients who required hospitalisation had the highest rates of morbidity from community-acquired pneumonia (CAP), and a 30-day mortality rate of up to 13% was" [5-6].

Although the majority of patients have modest symptoms, 5% experience shock, multiorgan dysfunction, or hypoxaemic respiratory failure [7]. It is critical to identify individuals who might Need advanced care. Several assessment techniques have been created and validated to help doctors manage patients with CAP. Severity assessment methods have been created in helping guide the locations of care for patients with pneumonia, specifically identifying those whose disease may be successfully maintained at home. CURB-65 score (confusion, uremia, RR , blood pressure, age > 65 years) and pneumonia severity index (PSI) are two of the more widely used techniques [8-9]. SMART-COP, which was created by a group in Australia, is a modern approache for evaluating pneumonia severity .

SMART-COP is a severity assessment system used in determining who needs intensive respiratory or vasopressor support (IRVS), and ICU admission due to pneumonia. The SMART-COP score includes parameters like tachycardia, systolic blood pressure (SBP), oxygen saturation (SpO2), potential hydrogen (pH), and acute disorientation [10]. When comparison with earlier scoring systems, this score is comparatively more sensitive and specific in identifying patients at risk of severe disease and also forecasting the need for ICU care based on the likelihood of requiring either intensive respiratory or vasopressor support (2).

When compared to other grading systems. SMART-COP can help detect or recognise people who are at a higher risk of developing a severe version of the condition [2]. As a result, it plays a crucial role in pneumonia management. "It differs from CURB-65 and PSI in that these tools' primary objective is to identify very ill patients who should be admitted to the ICU, whereas the SMART-COP score is more effective at identifying patients who require IRVS care" [10]. ICU admission criteria varies ion different regions, study focuses on variables linked with vasopressor support or severe respiratory-care rather than basic ICU-admission alone , as these are more objective markers.

Using the SMART-COP score in CAP patients to help Physicians determine illness severity and anticipate requirement for early IRVS. It will help minimise their duration of stay in the emergency department by allowing for an early choice on admission . As a result, the purpose of this study was to see how well the SMART-COP score can predict the severity of individuals with pneumonia .

AIMS AND OBJECTIVES

AIM:

To evaluate the utilization of SMART-COP score in the prediction of severity outcomes patients with CAP admitted at Teritiary Care Center, Belagavi.

OBJECTIVES:

1. To predict severity outcomes among patients with community acquired pneumonia using smart cop score
2. To compare pneumonia severity scores like CURB 65 and PSI with SMART COP score

REVIEW OF LITERATURE

COMMUNITY-ACQUIRED PNEUMONIA (CAP)

Community-acquired pneumonia (CAP) is a leading cause of morbidity and mortality worldwide. The clinical presentation of CAP varies, ranging from mild pneumonia characterized by fever and productive cough to severe pneumonia characterized by respiratory distress and sepsis. Because of the wide spectrum of associated clinical features, CAP is a part of the differential diagnosis of nearly all respiratory illnesses.

Aetiology

Community-acquired pneumonia is caused by a variety of pathogens, including bacteria, viruses, and fungus. Bacterial pathogens include

- Gram-positive organisms which include Streptococcus pneumoniae and Staphylococcus aureus, as well as group A and other streptococci.
- Gramnegative agents like H.influenzae and Moraxella catarrhalis
- Atypical bacteria like Mycoplasma, and Chlamydia species. [12]

"Viruses like Rhinovirus, influenza, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), and other respiratory viruses (parainfluenza, respiratory syncytial virus (rsv) , human metapneumovirus (hmpv), etc.) are being identified as pathogens using molecular detection approaches. The most current population-based active surveillance in the United States found that human rhinovirus, influenza virus, and S pneumoniae were the most frequent pathogens" [13. **Risk factors [14, 15]**

Old age - risk of developing CAP increases with age. yearly hospitalisation rate for CAP among persons over 65 years old is around 2000 per 100,000. This is three

times higher than the overall population, implying that about 2% of older =individuals will be hospitalised with CAP.

comorbidities – The comorbidity that puts patients at the most risk of CAP related hospitalization is COPD, which has an annual incidence of 5832 per 100,000. Other comporbidities like chronic lung diseases like broncheactasis , asthma , and congestive heart failure , CVA, diabetes , malnutrition have increased risk of developing community acquired pneumonia

Viral respiratory tract infection – Viral respiratory-tract infections leads to viralpneumonias which predisposes to other bacterial pneumonia secondarily

Impaired airway protection -The conditions that can increase the risks for micro aspirations of the gastric contents opr of the upper airway secretions can increase the risk for CAP such as when patients consciousness is altered or due to dysphagia due to esophageal lesions or dysmotility.

Smoking and alcohol overuse – Smoking, alcohol overuse (eg, >80 g/day), and opioid use are key modifiable behavioral risk factors for CAP.

Other lifestyle factors – Other factors that have been associated with an increased risk of CAP include crowded living conditions (eg, prisons, homeless shelters), residence in low-income settings, and exposure to environmental toxins (eg, solvents, paints, or gasoline).

Pathophysiology

Pathogens colonise the pharynx first, then they enter the respiratory-tract via microaspiration. Once they reach there , the infection activates the pulmonary defences. Pneumonia occurs when the host's defence is compromised or overcome by

a high inoculum or pathogen virulence. Pathogens can also spread via the haematogenous pathway or macro-aspiration.

Pathogenesis

Historically, CAP has been characterized as a lung parenchymal infection predominantly driven by bacterial and viral infections. These pathogens spread through respiratory droplets or, less commonly, aerosol inhalation. Upon entry, they colonize the nasopharynx and reach the lung alveoli through microaspiration. Infection ensues when the pathogen's quantity or the host's weakened immune system allows it to overcome defenses. The subsequent inflammation and lung damage are the result of the pathogen's replication, virulence, and the host's immune reaction." (figure 1).

With discovery of the lung microbiome, that model has shifted [16-18]. respiratory infections may still be introduced into the alveoli during pneumonia pathogenesis, the infecting pathogen will most likely contend with existing bacteria for replication. In addition, local microorganisms may influence or alter the individuals response to pathogen.

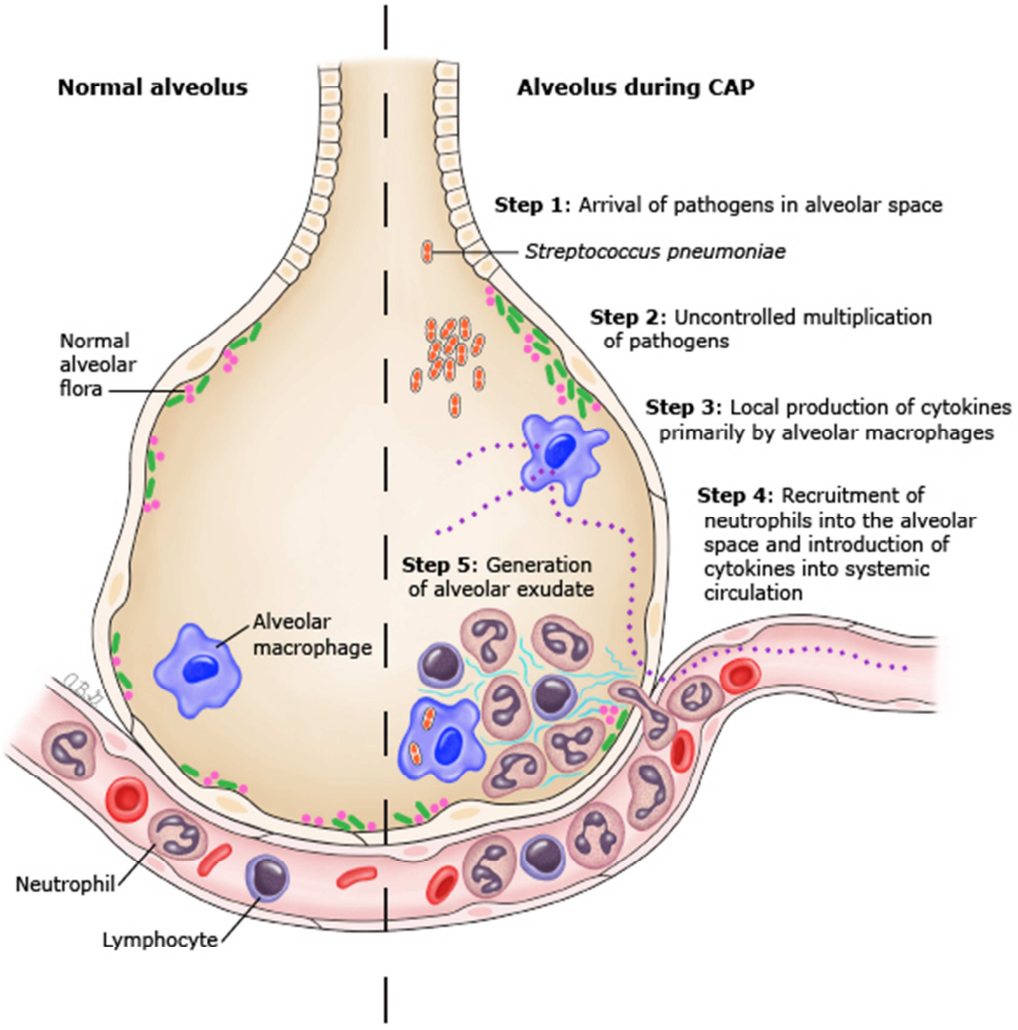


Figure1: Community-acquired pneumonia (CAP) pathogenesis

In other circumstances, "CAP may also result from uncontrolled replication of bacteria that ordinarily live in the alveoli. The alveolar microbiome is comparable to oral flora, consisting mostly of anaerobic bacteria (e.g., Prevotella and Veillonella) and microaerophilic streptococci "[16–18]. Exogenous insults, such as smoke exposure, may alter the composition of the alveolar microbiome, causing specific microorganisms to overgrow. Because organisms that make up the alveolar microbiome are often difficult to cultivate using normal cultures, this idea could explain the low rate of pathogen identification in community acquired pneumonia

The hosts immune response against the microbial proliferation in alveoli is a significant factor in determining the severity of the disease . in some patients, the local inflammation in the lungs may be enough to control infection. In other cases, a systemic inflammatory response is required. In rare cases, the systemic response becomes dysregulated, resulting in tissue injury.

Clinical presentation

The clinical appearance of CAP ranges from mild to severe . Symptom severity is proportional to each patient's local and systemic immune response.

The most common symptoms of CAP include coughing (with or without sputum production), dyspnea, and pleuritic chest discomfort. On physical examination, signs of pneumonia include increased respiratory rate , increased labour of breathing, and added breath sounds such as crepts and rhonchi. Tactile fremitus, egophony, and dull to percussion all point to consolidation caused by pneumonia . These signs and symptoms are caused by the buildup of WBC, fluid, and proteins in the alveolar space. Hypoxaemia can occur from impaired alveolar gas exchange. On a chest radiograph, WBC and fluid accumulation in the alveoli manifests as pulmonary opacities (figure 2).

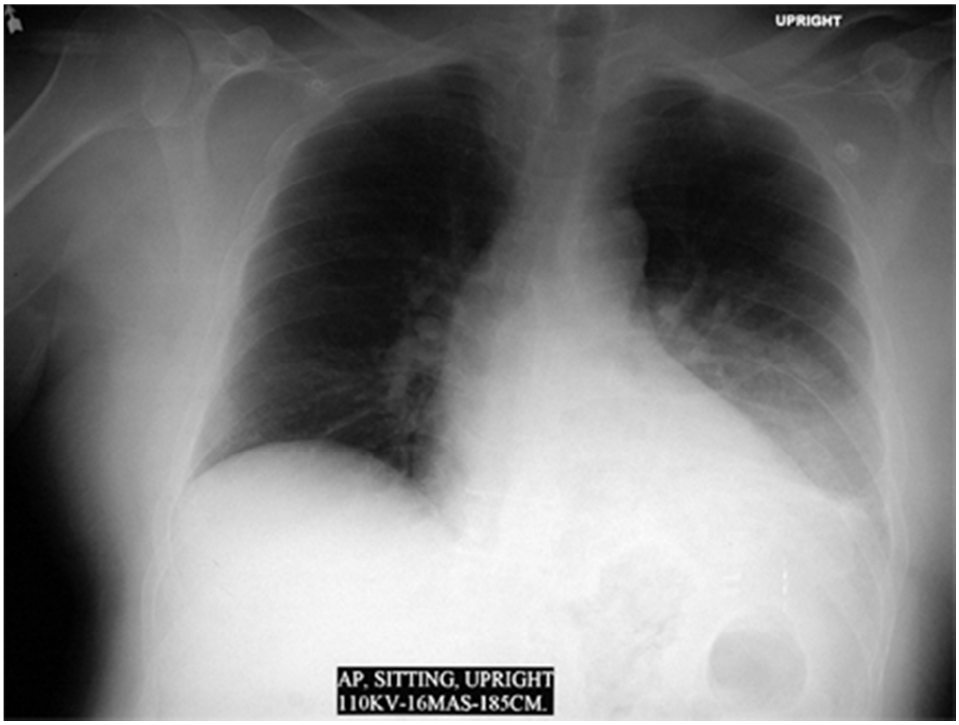


Figure2: Pneumococcal pneumonia: Chest radiograph (left lower lobe opacity)

signs and symptoms – "The majority of CAP patients have a fever. Other systemic symptoms include cold, lethargy, malaise, chest pain (perhaps pleuritic), and anorexia. Tachycardia, leukocytosis and leukopenia are examples of systemic inflammatory response-mediated symptoms. Inflammatory indicators such as the erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), and procalcitonin may increase, albeit the latter is primarily associated with bacterial infections. CAP is also the major cause of sepsis, therefore the earliest symptoms may include hypotension, altered mental status, and other indicators of organ malfunction such as renal dysfunction, hepatic dysfunction, and/or thrombocytopenia"[19].

Although fever/cough/tachycardia/ rales are common among CAP patients, these symptoms are vague and are shared by many other respiratory illnesses. Without chest imaging, no one symptom or cluster of symptoms is sufficient to diagnose the condition. "The combination of fever, tachycardia, rales, and hypoxia (oxygen

saturation <95 percent) among patients with respiratory problems presenting to primary care had a positive predictive value of <60 percent when using a chest radiograph as a reference standard" [20].

Pneumonia symptoms might be mild in individuals with increased age and/or compromised immunesystem, necessitating higher level of suspicion to make diagnosis. For example, older individuals may arrive with changes in mental state without fever or leukocytosis [21]. In immunocompromised patients, pulmonary infiltrates may be undetectable on chest radiographs but can be seen with CT imaging

Evaluation [22-24]

initial workup for pneumonia will include BOTH imaging and blood tests. A chest radiograph will be required to detect any infiltrates or effusions, if present, will increase diagnostic accuracy. A CBC with differentials, as well as serum electrolytes and LIVER AND KIDNEY function tests , can assist in confirming inflammation and characterise its severity. Influenza testing should be suggested during the winter months. If molecular technologies are available, they can be used to test nasopharyngeal swabs for respiratory viruses.

Severity scores such as CURB-65 "confusion, urea greater than or equal to 20 mg/dL, respiratory rate greater than or equal to 30/min, blood pressure systolic less than 90 mm Hg or diastolic less than 60 mm Hg" and the PSI score for severity assessment may help determine the need for admission . However, accuracy is less when utilised without real clinical judgement.

Blood and sputum cultures should be taken in hospitalised patients, preferably prior to the administration of antibiotics , but without delay. If cultures are negative, urine

tests for legionella and pneumococcal antigens can be considered as diagnostic aids. In presence of complicating comorbidities, such as congestive heart failure.

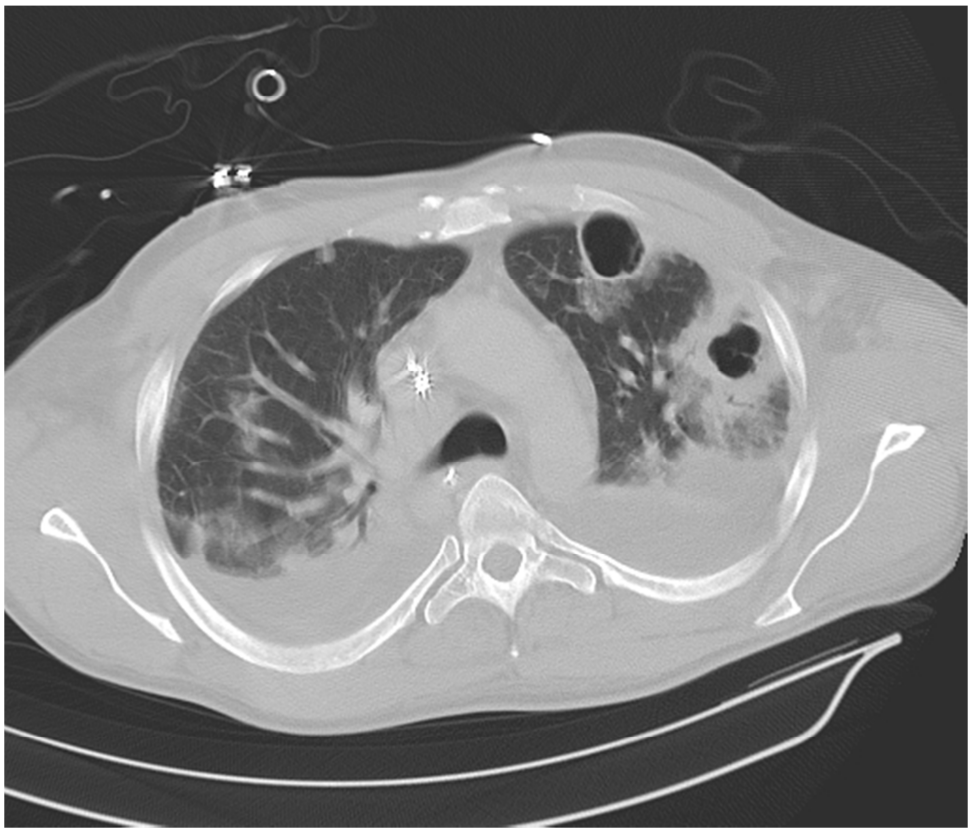


Figure3: Bilateral Pneumonia, CT Scan. B/L pneumonia with abscesses, B/L effusions, and cavities in an adult male

Treatment

Outpatient treatment should consist of a macrolide (erythromycin, azithromycin, or clarithromycin) or doxycycline monotherapy. " In the presence of comorbid illness (chronic heart disease excluding hypertension); chronic lung disease (chronic obstructive pulmonary disease and asthma); chronic liver disease; chronic alcohol use disorder; diabetes mellitus; smoking; splenectomy; human immunodeficiency virus (or other immunosuppression); a respiratory fluoroquinolone (high-dose levofloxacin,

moxifloxacin, gemifloxacin); a combination of oral beta-lactam (high-dose amoxicillin or amoxicillin-clavulanate" [24,25]

Patients having a CURB 65 score of 2 or higher should be treated inpatient. In non-intensive care settings, with either a respiratory fluoroquinolone monotherapy or using a combination therapy of Betalactam antibiotics and macrolide .

Patients exhibiting three or more indicators of early deterioration should be admitted to the critical care unit. These include a respiratory rate greater than 30, PaO2/FiO2 levels less than or equal to 250, multilobar infiltrates, encephalopathy, thrombocytopenia, hypothermia, leucopenia, and hypotension. The combination of a beta-lactam and either a macrolide or a respiratory fluoroquinolone is advised. Patients with suspected aspiration can be treated with ampicillin-sulbactam or ertapenem. Monotherapy isn't suggested.

If Pseudomonas risk factors exist, beta-lactams (piperacillin-tazobactam, cefepime, ceftazidime, meropenem, imipenem) should be used in conjunction with a antipseudomonal fluoroquinolone like ciprofloxacin or levofloxacin or an aminoglycoside with azithromycin combination. If methicillin-resistant S aureus has been obtained in the community, vancomycin or linezolid should be added.

In patients who have a positive clinical response, like no fever for more than 2-3 days , no need for oxygen supplementation , and reduction of tachycardia/tachypnea/hypotension, therapy should last 5 to 7 days. Prolongation of therapy needed for patients with a delayed response, specific infections such as Pseudomonas requires 14-21 days , S aureus for 7-21 days , or Legionella pneumonia for 14 days , and consequences like empyema, lung-abscess, or necrotizing pneumonia. To drain an empyema, a chest tube must be placed, and in cases where

there are many loculations, surgical decortication may be required. Tularaemia pneumonia or psittacosis can be treated with a 14-day macrolide or doxycycline regimen, while pneumonia caused by coccidioidomycosis or histoplasmosis is best treated with itraconazole.

All patients that are positive for the influenza virus , and present to the hospital within 2 days of symptoms onset should receive a 5-day course of oseltamivir; starting oseltamivir after 48 hours has little effect. Nonetheless, any hospitalized patients with influenza should be treated with this medication, regardless of when the illness first manifested itself. Intravenous glucocorticoids can be used as an additional therapy in critically sick patients who do not have risk factors for unfavourable outcomes from steroids (e.g., influenza infection). They have been linked to lower short-term death rates and shorter critical care unit stays [26, 27].

Complications and Prognosis.

Though most patients with CAP will recover fully with appropriate treatment, some will advance and develop complications (i.e., clinical failure) and others will remain symptomatic

Clinical failure:

failure is clearly shown by the progression of the disease to sepsis and/or respiratory failure insoite of proper antibiotic treatment and assistance. Other markers of failure include a increase in subjective-symptoms (e.g., cough, dyspnoea), frequently in conjunction with other objective criteria (e.g., decreased saturation , unremitting fever, or increased wbc count). Though Several criteria have been proposed none are commonly accepted to define failure [28].

Reasons for clinical failure is generally due to

- **Progression of the initial infection** – For few patients, pneumonia can escort to devastating infection despite appropriate antibiotic treatment. In some, this indicates a dysregulated host immune response. In others, this may indicate that the infection has spread beyond the pulmonary parenchyma (eg, empyema, lung abscess, bacteremia, endocarditis).

  Other possibilities include infection with a drug-resistant pathogen or an unusual pathogen not covered by the initial empiric antibiotic regimen. Alternatively, failure to respond to treatment may signify the presence of an immunodeficiency (eg, new diagnosis of HIV infection).

- **Development of complications** – Complications might be both infectious or noninfectious. Nosocomial infections, particularly hospital-acquired pneumonia (HAP), are common causes of clinical failure. In addition to HAP, others include catheter-related bloodstream infections, urinary tract infections, and *C. difficile* infection [29].

  Cardiovascular events are also common complications and include acute myocardial infarction, cardiac arrhythmias, congestive heart failure, pulmonary embolism, and stroke [30]. Older age, preexisting cardiovascular disease, severe pneumonia, and infection with certain pathogens (ie, *S. pneumoniae* and influenza) have each been associated with increased risk of cardiovascular events. Recognition that cardiovascular events and other systemic complications can occur during the acute phase of CAP is also changing our view of CAP from an acute pulmonary process to an acute systemic disease.

Because of these possibilities, we usually widen our initial antibiotic regimen for patients who are advancing despite acceptable empiric treatment and look for alternative diagnoses, less prevalent or drug-resistant infections, and/or infectious and cardiovascular consequences.

Nonresolving CAP – For some patients, the initial symptoms will not advance or improve after at least seven days of proper empiric antibiotic therapy. We commonly refer to these people as having nonresolving pneumonia. Possible causes of non-resolving CAP are:

Some patients, especially those with comorbidities, severe pneumonia, bacteremia, or infection with specific pathogens (e.g., S. pneumoniae), may experience a delayed clinical response. Eight or nine days of treatment may be required before clinical improvement becomes apparent.

- Patients with sequelae like lung abscess, empyema, or other closed space infections may not recover clinically, even with proper antibiotics. Such infections may necessitate drainage and/or prolonged antibiotic therapy.
- Bronchial obstruction, such as a tumour, can lead to postobstructive pneumonia, which may not respond to typical antibiotic regimens for CAP.
- Mycobacterium tuberculosis, nontuberculous mycobacteria (e.g., Mycobacterium kansasii), fungi (e.g., Histoplasma capsulatum, Blastomyces dermatitidis), and less common bacteria can cause subacute or chronic pneumonia that may not respond to standard antibiotic regimens for CAP.
- Failure to improve after seven days of treatment may indicate a different diagnosis, such as cancer or inflammatory lung disease.

Once a patient is diagnosed with nonresolving CAP, a comprehensive physical examination, laboratory evaluation, imaging techniques, and microbiologic workup are required to determine the aetiology [29].

Long-term consequences and death:

majority of the patients with CAP recover without complication, it remains a serious condition , one of the leading causes of death worldwide. CAP can cause mortality both directly (e.g., overwhelming sepsis or respiratory failure) or indirectly through cardiovascular events or other concomitant problems (e.g., advanced chronic obstructive pulmonary disease [COPD]) [31].

Long-term effects from pneumonia are becoming more widely recognised, and the medical profession is shifting to view pneumonia as a systemic condition that can progress to chronic disease [32]. While the exact frequency of long-term problems is unknown, the most common long-term sequelae include the respiratory tract and cardiovascular system [33]. CAP is also connected with an increase in long-term mortality. Comorbidities, such as cancer, COPD, and cardiovascular disease, are the leading causes of long-term mortality [31].

SMART-COP TOOL FOR ASSESSING SEVERITY OF COMMUNITYACQUIRED PNEUMONIA (CAP) IN ADULTS

The SMART-COP score is a clinical tool developed to predict the necessity for intensive respiratory or vasopressor support (IRVS) in patients with community-acquired pneumonia (CAP). It evaluates eight parameters, each contributing to the total score.

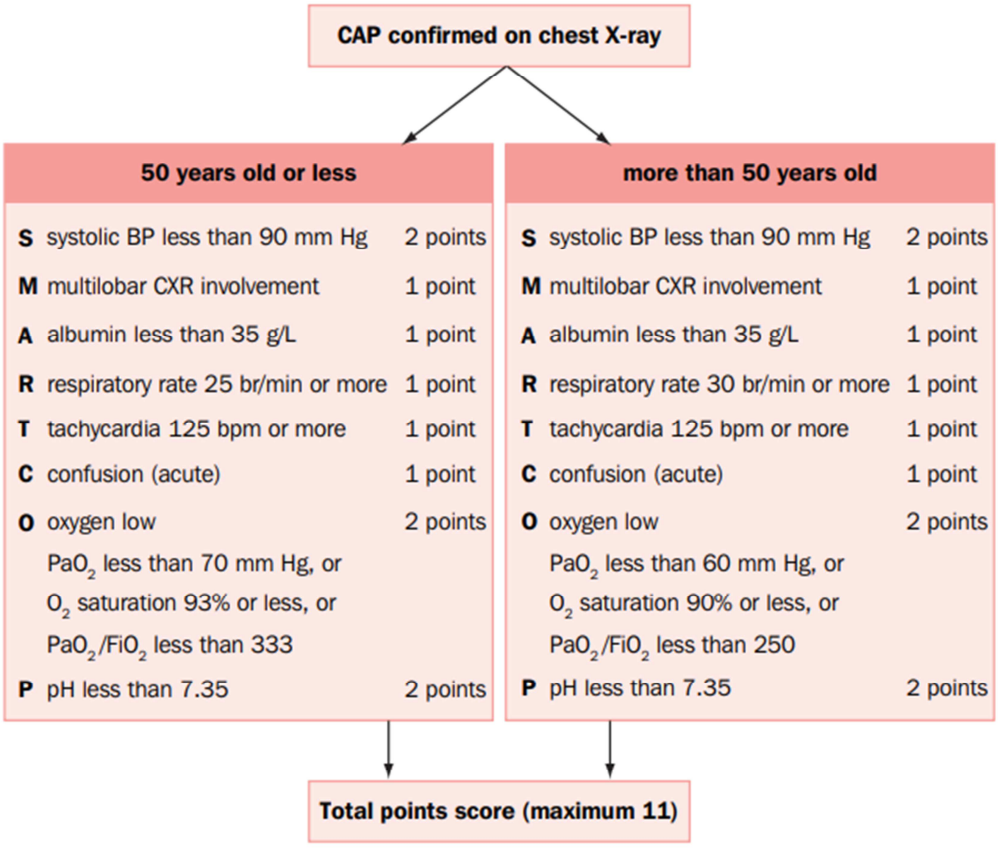


Figure4: SMART-COP Tool[34]

Interpretation of SMART-COP score

- 0 to 2 points indicate a low risk of requiring intense respiratory or vasopressor support (IRVS).
- 3 to 4 points indicate a moderate risk (1 in 8).
- 5 to 6 points indicate a high risk (1 in 3).
- 7 or more points indicate a very high risk (2 in 3).

Severe CAP is defined as a SMART-COP score of 5 or higher.

The cumulative score aids clinicians in assessing the severity of CAP and determining the appropriate level of care. A higher score correlates with an increased risk of requiring IR VS. Specifically, a score of ≥3 points has been shown to identify 92% of

patients who needed IRVS, 84% of those who didnt require immediate ICU admission [35].

In a meta-analysis encompassing nine studies, the SMART-COP score demonstrated a pooled sensitivity of 89% and specificity of 68% for predicting the need for IRVS. For 30-day mortality prediction, the sensitivity was 92%, with a specificity of 39%. These findings underscore the tool's effectiveness in identifying patients at risk for severe outcomes [36].

When compared to other assessment tools like the PSI and CURB-65. SMART-COP score exhibits superior sensitivity in predicting requirement for IRVS. For instance, PSI and CURB-65 have sensitivities of 74% and 39%, respectively, whereas SMART-COP achieves a sensitivity of 92% [35].

In summary, the SMART-COP score is a valuable and practical tool for clinicians to assess the severity of CAP and predict the need for intensive interventions. Its higher sensitivity compared to other scoring systems enhances its utility in clinical decision-making, ensuring timely and appropriate care for patients with severe pneumonia.

EVIDENCE FROM PREVIOUS LITERATURE

1. **Patrick G. P. Charles, et al.,** conducted an Australian CAP Study (ACAPS) which was prospective, multicenter, observational study that assessed the etiology, severity markers, and treatment outcomes of a large population of patients with CAP defined by strict criteria of 882 episodes in which each patient had a detailed assessment of severity features, etiology, and treatment outcomes. Multivariate logistic regression was performed to identify features at initial assessment that were associated with receipt of IRVS. These results were converted into a simple points-based severity tool that was validated in 5 external

databases, totaling 7464 patients. In ACAPS, 10.3% of patients received IRVS, and the 30-day mortality rate was 5.7%. The features statistically significantly associated with receipt of IRVS were low systolic blood pressure (2 points), multilobar chest radiography involvement (1 point), low albumin level (1 point), high respiratory rate (1 point), tachycardia (1 point), confusion (1 point), poor oxygenation (2 points), and low arterial pH (2 points): SMART-COP. A SMART-COP score of ≥3 points identified 92% of patients who received IRVS, including 84% of patients who did not need immediate admission to the intensive care unit. Accuracy was also high in the 5 validation databases. Sensitivities of PSI and CURB-65 for identifying the need for IRVS were 74% and 39%, respectively. SMART-COP is a simple, practical clinical tool for accurately predicting the need for IRVS that is likely to assist clinicians in determining CAP severity [35].

2. **Rahat A. Memon, et al.,** conducted a meta-analysis to determine the performance of the SMART-COP score in predicting the prognosis and severity of patients presenting with CAP. Overall, nine studies were included in the current meta-analysis. "A pooled sensitivity of the SMART-COP score to predict the use of IRVS is 89% (95% CI: 84%- 92%) while its specificity is 68% (95% CI: 65%-70%). The pooled sensitivity of the SMART-COP score to predict 30-day mortality is 92% (95% CI: 89%-94%) while its specificity is 39% (95% CI: 37%-42%). To summarize, SMART-COP is a new, eight-variable instrument that appears to accurately identify patients with CAP who will require IRVS and 30-day mortality. Our findings show that SMART-COP will be a valuable tool for clinicians in accurately predicting illness severity in CAP patients as compared to other scoring systems. SMART-COP can be useful to identify patients who need urgent management"[36].

3. **Akhila Babu, et al.,** conducted a study conducted on patients admitted from March 2016 to July 2016 to the Intensive Care Unit (ICU) to compare ability of 3 severity scoring systems, systolic blood pressure, multilobar chest radiography involvement, albumin level, respiratory rate, tachycardia, confusion, oxygenation, and arterial pH (SMART-COP), confusion, urea nitrogen, respiratory rate, blood pressure < 90/60 mm Hg and age over 65 years(CURB-65), and pneumonia severity index (PSI) to predict the need for mechanical ventilation and inotropic support among adult patients admitted to the hospital. Demographic data, severity scores from CURB-65, PSI, and SMART-COP, were documented. Patients were followed up for the need for mechanical ventilatory/inotropic support. The overall mortality of patients with CAP was recorded. A total of eighty patients with CAP were included in this study. Forty-seven (59%) were male. A CURB-65 severity score ≥2 had a sensitivity, specificity, and negative predictive value (NPV) of 85.7%, 47.5%, and 9.7%, respectively, for ICU admission. For a PSI severity score ≥4, the sensitivity, specificity, and NPV were 71.4%, 46.8%, and 18.6%. SMART-COP severity score >3 had a sensitivity, specificity, and NPV of 85.7%, 62.4%, and 20.7%, respectively. In predicting inotropic support, CURB-65 (PSI, SMART-COP) had sensitivity of 85.4% (80.5%, 90.2%), specificity of 64.1% (64.1%, 81.5%) and NPV of 19.4%. The SMART COP scoring system outperforms CURB 65 and PSI in anticipating the need for mechanical ventilation and inotropic assistance [37].

4. **Lam Nguyen-Ho, et al.,** conducted a cross-sectional study to compare pneumonia scoring systems, likewise the mortality scoring system for acute melioidosis, among melioidosis pneumonia (MP) patients. This study aimed to evaluate the validity of these scores in predicting MP patients. Of 66 MP patients, mean age

was 51±11 years, and male gender accounted for 86.4% (57/66). Patients requiring IRVS constituted 34.8% (23/66) and the mortality rate at discharged was 25.8% (17/66). The areas under receiver operating characteristic curve (AUCs) of PSI, CURB-65, and SMART-COP in predicting the IRVS need were 0.813 [95% confidence interval (CI): 0.684–0.943, P< 0.001], 0.868 (95% CI: 0.767–0.969, P< 0.001), and 0.910 (95% CI: 0.825–0.994, P< 0.001), respectively. The AUCs of PSI, CURB-65, SMART-COP, and the mortality score of acute melioidosis in predicting the death outcome were 0.698 (95% CI: 0.536–0.857, P=0.02), 0.797 (95% CI: 0.665–0.928, P< 0.001), 0.797 (95% CI: 0.673– 0.920, P< 0.001), and 0.663 (95% CI: 0.524–0.801, P=0.05), respectively. CURB-65 score is non-inferior to SMART-COP in predicting MP patients. The sensitivity, specificity, and positive likelihood ratio for CURB65 score ≥2 in predicting the IRVS need were 69.57%, 90.70%, and 7.48, respectively and in predicting the mortality 70.59%, 83.67%, and 11.53, respectively. MP could present mild to severe clinical scenario, with higher mortality in severe MP cases. The CURB-65 score could be simple and useful in predicting the IRVS need or the death outcome among MP patients [38].

5. **Christophe Marti, et al.,** conducted a systematic review and meta-analysis to identify CAP patients requiring ICU admission or intensive treatment. Sufficient data were available to perform a meta-analysis on eight scores: PSI, CURB-65, CRB-65, CURB, ATS 2001, ATS/IDSA 2007, SCAP score, and SMART-COP. The estimated AUC of PSI and CURB-65 scores to predict ICU admission was 0.69. Among scores proposed for prediction of ICU admission, ATS-2001 and ATS/IDSA 2007 scores had better operative characteristics, with a sensitivity of 70% (CI, 61 to 77) and 84% (48 to 97) and a specificity of 90% (CI, 82 to 95) and

78% (46 to 93), but their clinical utility is limited by the use of major criteria. ATS/IDSA 2007 minor criteria have good specificity (91% CI, 84 to 95) and moderate sensitivity (57% CI, 46 to 68). SMART-COP and SCAP score have good sensitivity (79% CI, 69 to 97, and 94% CI, 88 to 97) and moderate specificity (64% CI, 30 to 66, and 46% CI, 27 to 66). Major differences in populations, prognostic factor measurement, and outcome definition limit comparison. Our analysis also highlights a high degree of heterogeneity among the studies. New severity scores for predicting the need for ICU or intensive treatment in patients with CAP, such as ATS/IDSA 2007 minor criteria, SCAP score, and SMART-COP, have better discriminative performances compared with PSI and CURB-65. High negative predictive value is the most consistent finding among the different prediction rules [39].

6. **İbrahim Onur Alıcı, et al.,** prospectively analyzed 84 patients who were admitted to outpatient clinics and emergency rooms between May 1, 2009 and April 30, 2010 and who were diagnosed with CAP to compare the yields of three scoring systems (CURB-65, pneumonia severity index, and SMART-COP) in predicting 30-day mortality and the need for intensive respiratory and vasopressor support (IRVS). The mean age of patients was 58.6±18.7 years. The 30-day mortality level for CAP was 7.1%. Fourteen of 84 patients (16.7%) with CAP were followed in ICU. The area under curve (AUC) values of the three systems (CURB-65, PSI, and SMART-COP) for 30-day mortality were 0.89, 0.89 and 0.91, respectively, and for the need for IRVS was 0.88, 0.91 and 0.93, respectively. The three systems accurately detected the need for IRVS and the 30-day mortality, but none individually demonstrated any advantage over the others [40].

7. **Enas Elsayed Mohamed, et al.,** conducted a study to assess the clinical applicability of pneumonia scores to determine CAP patients who will be hospital admitted. One hundred CAP patients were subjected to routine investigations, general and local chest examination, radiological evaluation, culture and sensitivity from bronchoalveolar lavage fluid, and different pneumonia assessment scores such as PSI, CURB-65, SMRT-CO and SMART-COP. Sensitivities for predicting the need for mechanical ventilation with the PSI and the CURB-65 were 50 and 60%, respectively, while sensitivity for SMART-COP and SMRT-CO was 50 and 85%, respectively, with the highest specificity of 88.67% was for the SMART-COP. Sensitivities for predicting the need for intensive respiratory or vasopressor support (IRVS) with the PSI and the CURB-65 were 53.85 and 65.38%, respectively, while sensitivity for SMART-COP and SMRT-CO was 53.85 and 88.46%, respectively, with the highest specificity of 100% was for the SMART-COP. PSI and CURB-65 are less sensitive in predicting the requirement of CAP patients to be admitted in the ICU and receive IRVS. The new scores SMART-COP and SMRT-CO are more specific in predicting the requirement of those patients for admission in the ICU and the necessity for IRVS [41].

8. **A Abouelela, et al.,** conducted a prospective Cohort study conducted to assess the prognostic value of 7 different scores: Pneumonia Severity Index (PSI),CURB65, Modified ATS rule, infectious Diseases Society of America/American Thoracic Society Consensus Guidelines (IDSA/ATS), SMART COP, Simplified SMART-COP (SMART CO) and SOAR) in assessing the severity of HAP and outcome of patients on a sixty patients admitted to critical care medicine department of Alexandria University Hospital in Egypt over 12 months. All patients were diagnosed as HAP. Calculation of the mentioned 7 scores was done once

diagnosis of HAP was confirmed. The Area Under the Curve was highest in SMART-cop (AUC:= 0.820) followed by the SMART-CO score (AUC: = 0.807) and PSI score(AUC: = 0.806). All the previous scores SMART-cop score at Cutoff value ≥ 2, SMRT-Co Score at Cutoff value ≥ 2, Modified ATS score at Cutoff value ≥ 0.5 and PSI (pneumonia severity index) at Cutoff value ≥ 3. have the highest sensitivity (sensitivity 100% for each) in predicting 28-day mortality. regarding Specificity, SMART-cop score is the most specific one (Specificity= 93%) in predicting 28-day mortality followed by Modified ATS score (Specificity= 90%). regarding the duration of Mechanical Ventilation it was found that SMART-cop (R = 0.824, p = 0.0001) followed by IDSA/ATS scores (R= 0.787, p = 0.0001) had the highest correlation in predicting duration of Mechanical Ventilation in critically ill patient with VAP as a higher SMART-cop and IDSA/ATS score reflect that the pneumonia was complicated with septic shock and respiratory failure. SMART - cop score is the most sensitive score in predicting 28 day mortality in the studied patient followed by SMART - co and PSI score). SMART-cop score is the most specific one (Specificity= 93%) in followed by Modified ATS score (Specificity= 90%) [42].

9. **Charlene Yang, et al.,** conducted a retrospective study of CAP patients and radiological evidence of a new pulmonary infiltrate to compare these severity scoring tools with the Pneumonia Severity Index (PSI) in the identification of severe CAP. Pneumonia severity scoring was calculated retrospectively using PSI, SMART-COP and CORB. Severe CAP is defined by PSI Class V, SMART-COP score ≥ 5, or CORB score ≥ 2. Comparison was made between these scoring systems to identify severe CAP, and inpatient mortality was recorded. A total of 211 patients were included. Inpatient mortality rates were significantly higher for

severe CAP compared to non-severe CAP classified with all 3 scoring methods. SMART-COP classified significantly less patients with severe CAP compared to both PSI (14.2% vs 25.6%, p<0.001) and CORB (14.2% vs 22.7%, p=0.001). There was no difference between PSI and CORB (25.6% vs 22.7%, p=0.47), but 50% (27/54) of patients classified as severe CAP on PSI were considered non-severe with the CORB score and 43.8% (21/48) of patients classified as severe CAP on CORB score were considered non-severe on PSI. Similar misclassifications were observed between the PSI and the SMART-COP score. There are significant discrepancies between pneumonia severity scoring methods in the identification of severe CAP. These findings have major implications in empirical antibiotics selection, depending on the scoring method used to assess pneumonia severity [43].

10. **Hajime Fukuyama, et al.,** conducted a prospective study of patients with CAP who were hospitalized at our hospital from April 2007 till May 2009. Clinical and laboratory features at presentation were recorded and used in order to calculate España rule, the pneumonia severity index (PSI), CURB-65, A-DROP, the 2007 Infectious Diseases Society of America/American Thoracic Society (IDSA/ATS) prediction rule and SMART-COP. The sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) were compared for adverse outcomes. We also assessed the association of the España rule criteria and adverse outcomes. A total of 505 patients were enrolled in the study. The overall in-hospital mortality rate was 6.5%, and 6.3% of patients were admitted to the intensive care unit (ICU). Sixty-two (12.3%) patients were defined as having severe CAP (in-hospital death or need for mechanical ventilation or septic shock). España rule achieved highest sensitivity and NPV in predicting severe CAP.

When ICU admission was the outcome measure, the IDSA/ATS rule and SMART-COP were regarded to be good predictors. España rule performed well in identifying patients with severe CAP. As a result, each of theseverity scores has advantages and limitations for predicting adverse outcomes [44]

MATERIALS AND METHODS

STUDY DESIGN:

This study was a hospital-based single centered, cross-sectional study.

STUDY SETTING:

The hospital based study was conducted in the Medical Intensive Care Unit in the Tertiary Care Centre, Belagavi, India.

STUDY PERIOD:

The study was carried out for duration of 12 months from January 2023 to December 2023 after obtaining approval from IRB (Ethical and Scientific Clearance).

STUDY POPULATION:

It included patients admitted to Tertiary Care Centre, Belagavi, India with clinical symptoms of acute pancreatitis and elevated serum amylase and lipase levels to three times the upper limit of normal.

Inclusion criteria:

- Age > 18 years
- All patients diagnosed with community acquired pneumonia
- Chest radiograph within 24 h after hospital admission demonstrating features consistent with acute pneumonia; and at least 2 symptoms consistent with pneumonia (e.g., fever or hypothermia, rigors, sweats, new cough [with or without sputum], chest discomfort, or new-onset of dyspnea).

Exclusion criteria:

- Pregnant females
- Patients with history of hospitalisation 2 weeks prior to presentation
- Severly immunocomprimised patients
- Patients with other pulmonary conditions like copd, interstitial lung disease
- Onset of symptoms 48 hours following hospital admission or discharge from an acute-care facility. 2 weeks before hospital admission.
- Active thoracic malignancy

SAMPLE SIZE:

Formula used for sample size calculation is,

$$n = \frac{(1 -)Z\underline{\propto}^{2}}{(1 - Prev) * d^{2}}$$

where n is the sample size required, Sp is the pre-determined values of specificity, d is the maximum marginal error required, Zx/2 is the value corresponding to level of confidence required and prevalence is the prevalence of disease. Specificity of SMART-COP in predicting need for mechanical-ventilation is found to be 88.67% in patients with community acquired pneumonia. Considering similar result with 50% prevalence, at 95% confidence level and 10% maximum error, the sample size was give by,

$0.8867x(1-0.8867)x1.96^{2}$

$n=(1-0.5)x0.1^{2}$

$n=77.18782\approx77$

Hence minimum sample size required was 77. As sample size increases, accuracy of results increases. For convenience sake, a final sample of 80 was taken.

SAMPLING TECHNIQUE:

A total of 80 patients at the Tertiary Care Centre, Belagavi, India satisfying the inclusion and exclusion criteria were selected by convenient sampling and were included.

METHOD OF COLLECTION OF DATA AND METHODOLOGY:

- This is a single centered, cross-sectional study; conducted among patients admitted to a Tertiary Care Centre, Belagavi, India.
- After taking Ethical clearance, an informed written consent was obtained.
- Patients and attendees were informed about the study's implications and outcomes in their preferred language. They were told that they may choose whether or not to participate in the study, and that doing so would have no effect on the therapy procedure.
- A study at KLE Dr Prabhakar Kore Hospital included patients with a primary diagnosis of community-acquired pneumonia who experienced at least three symptoms, including productive cough, dyspnoea, pleuritic chest pain, haemoptysis, fever (>37.8°C), headache, and new infiltrates on chest radiographs.
- Patients were included in the study if they presented with a new infiltrate on a chest radiograph and had 3 of the following symptoms or signs: cough, sputum production, breathlessness, pleuritic chest pain, hemoptysis, fever, headache, and signs consistent withpneumonia on chest auscultation.

- In addition to applying these criteria, data were reviews at a follow up (including chest radiograph reports), to ensure that the diagnosis of pneumonia was correct and that no exclusion criteria had developed.

- At hospital admission, all patients with community-acquired pneumonia were given a pro-forma that included their blood pressure, pulse, respiratory rate, and temperature. Standard blood tests such as a full blood count, urea and electrolyte analysis, and liver-function tests were also performed.
- The severity scores analysed included the CURB65 and PSI, which have been validated for predicting 30-day mortality, as well as the SMART-COP (systolic blood pressure, multilobar chest radiography involvement, albumin level, respiratory rate, tachycardia, confusion, oxygenation, and arterial pH).
- The primary outcome was the need for mechanical ventilation and/or inotropic support.\These methods were used to predict the need for extensive respiratory and vasopressor support, as well as analyse death rates for adult patients admitted with CAP.
- Attending physicians made the decision to commence mechanical breathing and/or inotropic assistance.
- Patients with CAP had their overall prognosis evaluated.

Assessment of parameters:

- Detailed history was taken from the patients or attendants including demographic details and past medical history.
- A complete physical examination with monitoring of vitals (temperature, PR, RR, and BP) was done.

Methodology:

- Informed consent was taken from the patient.
- A pre-structured and pretested proforma was used to collect the data.
- Baseline data including socio-demographic data and medical history were collected.
- Clinical examination and relevant investigations were done.
- CURB65 score and the PSI, and the SMART-COP score were analyzed.

STATISTICAL ANALYSIS

- • Data was imported into MS Excel and analysed with Statistical Package for Social Sciences software version 23.
- Descriptive statistics were used to summarise quantitative factors in clinical data. The standard deviation was determined as a measure of variability.
- Qualitative factors were reported as percentages with 95% CI.
- Statistical significance was examined for mean value differences across groups using the student's t test or Mann Whitney test for non-normal distributions.
- Chi-square and Fisher's exact tests were used to compare proportional differences.
- Applicability of SMART-COP score to predict severity outcome was checked by Logistic regression and Receiver Operating Characteristic (ROC) curves.
- Cut off values are obtained by simultaneously maximizing sensitivity and specificity.
- The level of significance [P-Value] was set at $P<0.05$.

ETHICAL CONSIDERATIONS

As per the guidelines prescribed by ICMR (1994) and Helsinki Declaration (modified 2000) the following were adhered to in all patients enrolled in the study.

- The patients enrolled in the study were informed participants
- Each patient was adequately informed of the aims, methods, sources of funding, any possible conflicts of interest, and institutional affiliations of the researcher, the anticipated benefits and potential risks of the study and the discomfort it may entail to him/her and the remedies thereof.
- Every precaution was taken to respect the privacy of the patient, the confidentiality of the patient's information and to minimize the impact of the study on his/her mental and physical integrity and personality.
- All the possible treatment options were given and none were withheld.
- There was no discrimination of patients and all were treated in the best interest of the patient.
- The patient was given the right to abstain from participation in the study or to withdraw consent to participate at any time of the study without reprisal.
- Due care and caution were taken at all stages of the research to ensure that the patient is put at minimum risk, suffers from no irreversible adverse effect and, generally, benefit from and by the research or experiment.
- Informed consent was taken from all the patients included in the study.
- The management for the participants was as percurrent standard departmental protocol.

RESULTS

Table 1: Distribution of subjects according to age

Age	Frequency	Percentage
< 30 years	3	3.8%
30 – 49 years	25	31.2%
50 – 69 years	33	41.2%
≥ 70 years	19	23.8%
Total	**80**	**100%**
Mean (years)	**57 ± 15.84**	

Figure 1: Pie chart showing age distribution among subjects

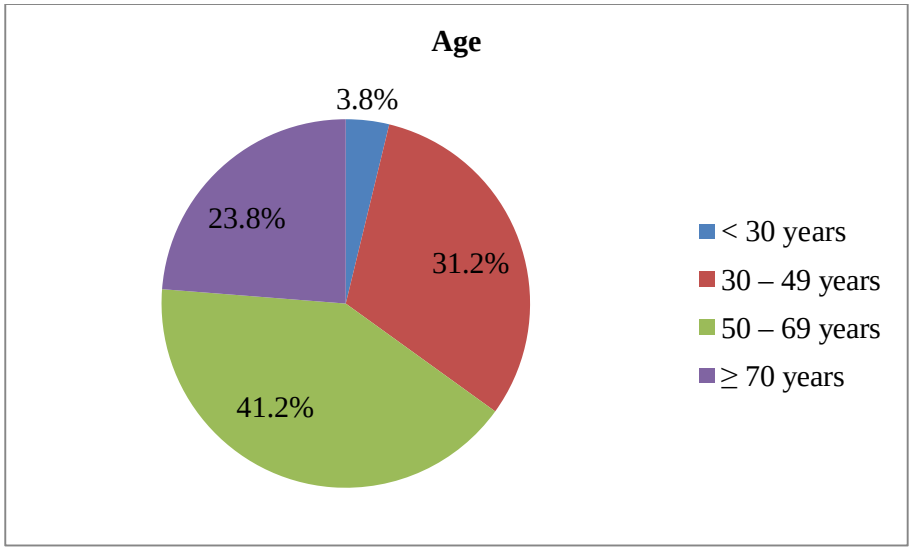


Table 1 depicts the age distribution. 3 were of age < 30 years, 25 - 30 and 49 years, 33 between 50 and 69 years and 19 were of age ≥ 70 years. The mean age in the current study was 57 ± 15.84 years. Majority were aged between 50 - 69 years (41.2%).

Table 2: Distribution of subjects according to gender

Gender	Frequency	Percentage
Male	51	63.7%
Female	29	36.3%
Total	**80**	**100%**

Figure 2: Pie chart showing gender distribution among subjects

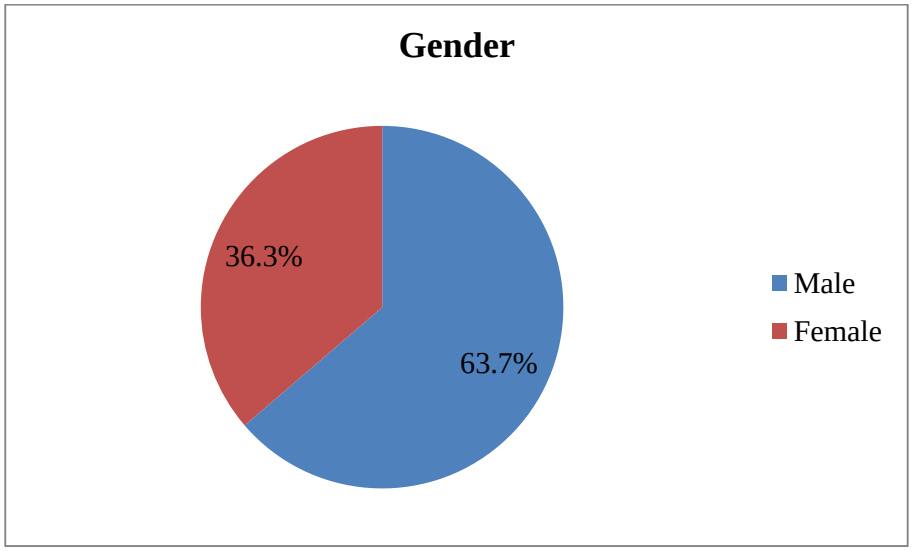


Table 2 depicts the gender distribution. 51 were males and only 29 females. M:F ratio was 1.8:1.

Table 3: Distribution of subjects according to comorbidities

Comorbidities	Frequency	Percentage
Diabetes mellitus	15	**19%**
Chronic renal failure	10	**12.5%**
Congestive heart failure	9	**11%**
Chronic liver failure	7	**9%**
Cerebrovascular disease	5	**6.3%**
Neoplastic disease	5	**6.3%**

Figure 3: Bar diagram showing distribution according to comorbidities

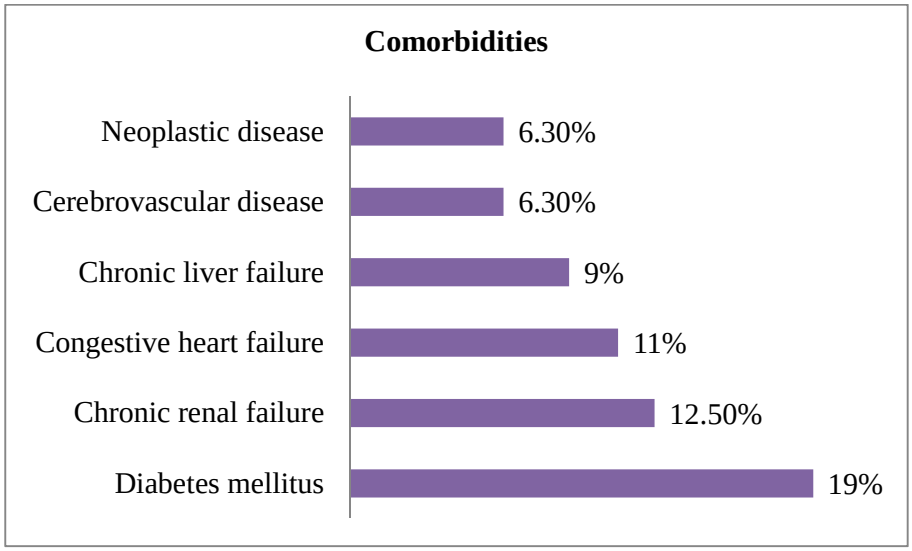


Table 3 shows the distribution of subjects according to their comorbidities. Among those who had co morbidities, DM was present in 15 subjects; chronic renal failure in 10 subjects; congestive heart failure in 9 subjects and chronic liver failure was present in 7 subjects. Cerebrovascular disease and neoplastic disease were present in 5 subjects each.

Table 4: Distribution of subjects according to general physical examination findings

General Physical Examination	Mean	SD
Pulse Rate (bpm)	93.4	19.60
SBP (mmHg)	104.6	17.48
DBP (mmHg)	66.2	11.99
MAP (mmHg)	77.6	6.44
Respiratory Rate (bpm)	25.3	7.90

Figure 4: Line Graph showing distribution according to general physical examination findings

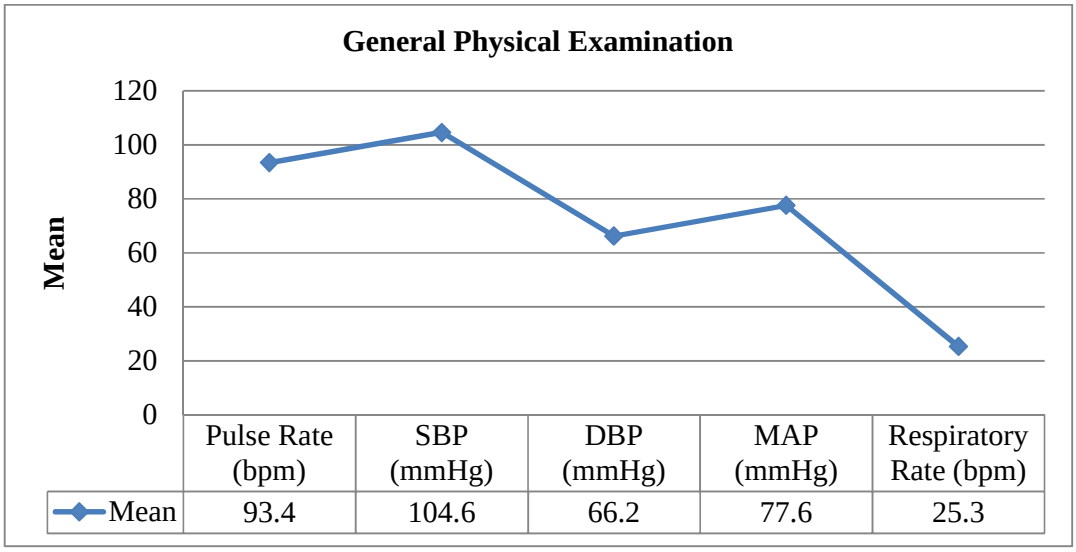


Table 4 shows the distribution of subjects according to their general physical examination findings. The mean values of PR were 93.4 ± 19.60 bpm, SBP and DBP were 104.6 ± 17.48 and 66.2 ± 11.99 mmHg respectively and MAP was 77.6 ± 6.44 mmHg. The mean value of RR was 25.3 ± 7.90 bpm.

Table 5: Distribution of severity outcomes among CAP patients

Severity Outcomes	Frequency	Percentage
Need for Non-invasive ventilation	26	**32.5%**
Need for Intubation	21	**26.3%**
Need for inotropic support	23	**28.7%**
Death	16	**20%**

Figure 5: Bar diagram showing distribution according to severity outcomes among CAP patients

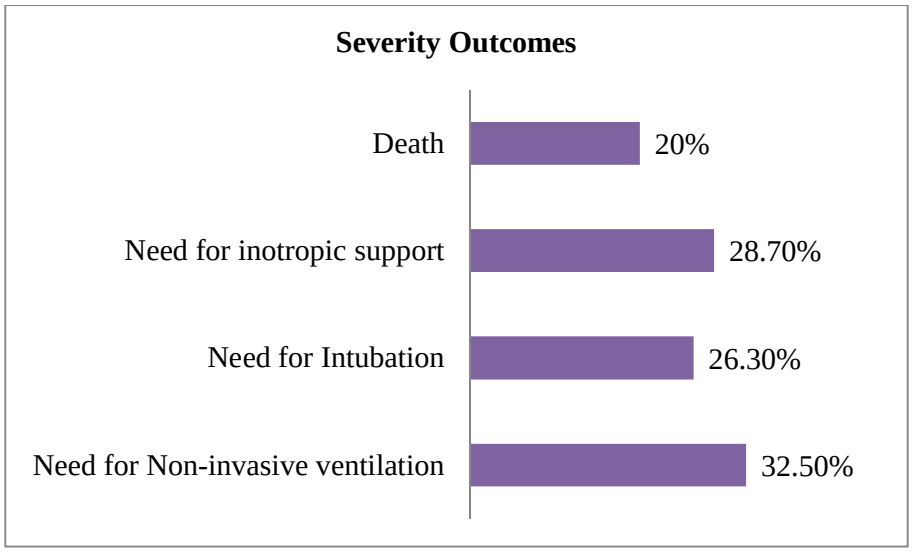


Table 5 shows distribution of subjects according to their severity outcomes. The mortality was 20% (16 subjects), 26 subjects had need for non-invasive ventilation (32.5%), 21 subjects needed intubation (26.3%) and 23 subjects needed inotropic support (28.7%).

Table 6: Distribution of participants as per duration of hospital stay

Duration of stay	Mean ± SD
Duration of hospital stay (days)	12.6 ± 9.62
Duration of ICU stay (days)	8.4 ± 3.15

Figure 6: Line Graph showing distribution according to duration of hospital stay

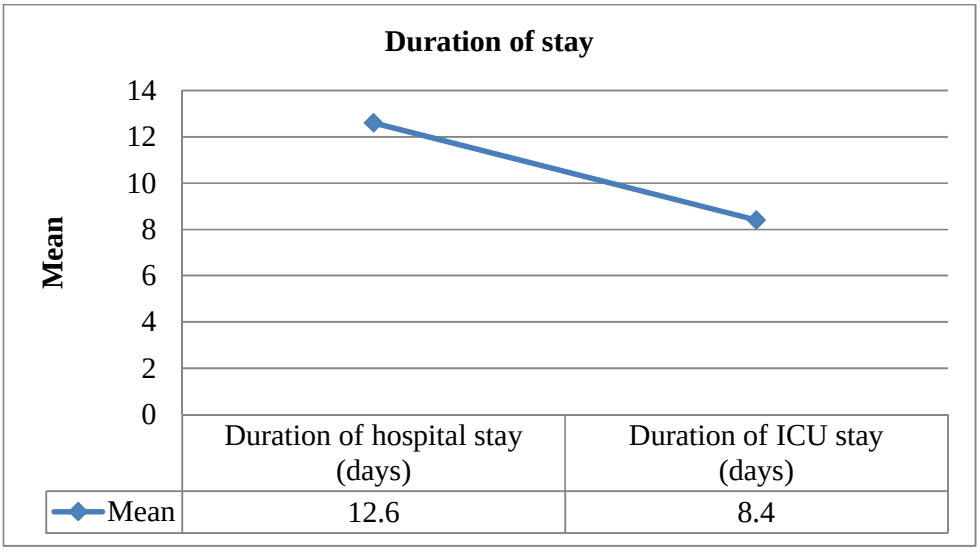


Table 6 depicts distribution of participants as per the duration of hospital stay. with mean duration of hospital stay being 12.6 ± 9.62 days and the mean ICU stay of 8.4 ± 3.15 days.

Table 7: Distribution of subjects according to various classes of SMART-COP score

SMART-COP class	Frequency	Percentage
Score 0 - 2 (Low risk)	44	**55%**
Score 3 - 4 (Moderate risk)	15	**18.8%**
Score 5 - 6 (High risk)	12	**15%**
Score ≥ 7 (Very high risk)	9	**11.2%**
Total	**80**	**100%**

Figure 7: Pie chart showing distribution according to various classes of SMART-COP scoring system

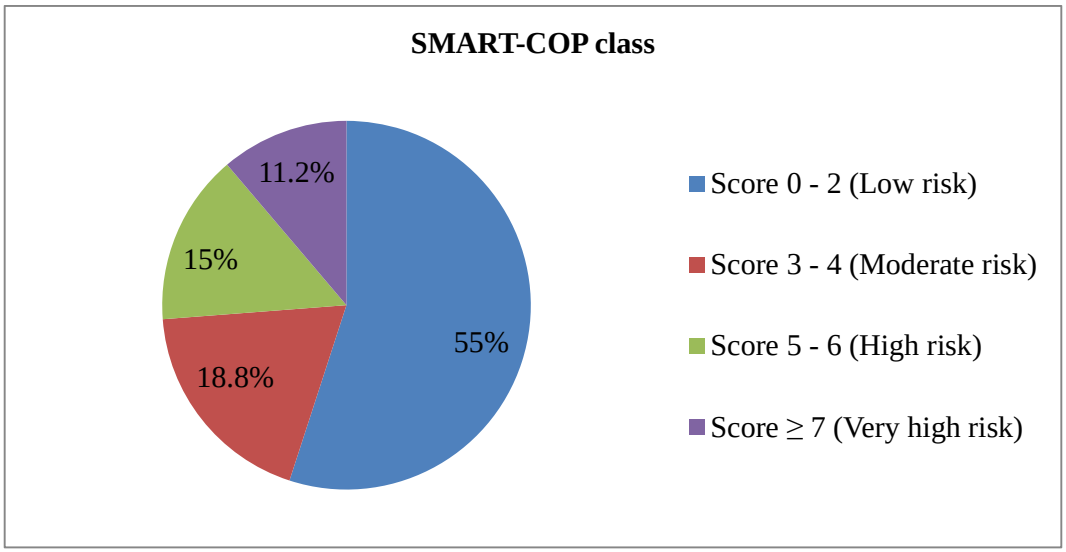


Table 7 shows distribution of subjects according to their various classes of SMART-COP scoring system. Regarding the SMART-COP scoring system, 55% (44 subjects) were at low risk with score being 0 – 2, 15 subjects were at moderate risk with score being 3 – 4 (18.8%), 12 subjects were at high risk with score being 5 – 6 (15%) and 9 subjects were at very high risk with score being ≥ 7 (11.2%).

Table 8: Distribution of subjects according to different PSI classes

PSI class	Frequency	Percentage
class I (Low risk)	0	**0%**
class II (Low risk)	22	**27.5%**
class III (Low risk)	14	**17.5%**
class IV (Moderate risk)	31	**38.8%**
class V (High risk)	13	**16.2%**
Total	**80**	**100%**

Figure 8: Pie chart showing distribution according to different PSI classes

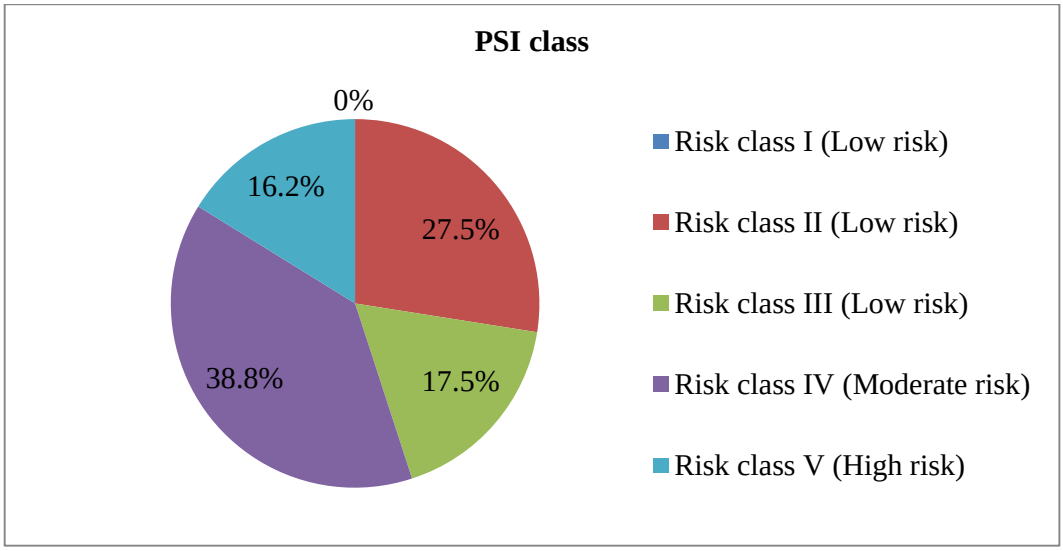


Table 8 shows distribution of subjects according to their different PSI classes. Regarding the PSI scoring system, 35% (36 subjects) were at low risk (Risk class II and III), 31 subjects were at moderate risk (Risk class IV) (38.8%) and 13 subjects were at high risk (Risk class V) (16.2%).

Table 9: Distribution of subjects according to various classes of CURB-65

CURB 65 class	Frequency	Percentage
Score 0–1 (Low risk)	46	**57.5%**
Score 2 (Moderate risk)	20	**25%**
Score 3–5 (High risk)	14	**17.5%**
Total	**80**	**100%**

Figure 9: Pie chart showing distribution according to various classes of CURB-65

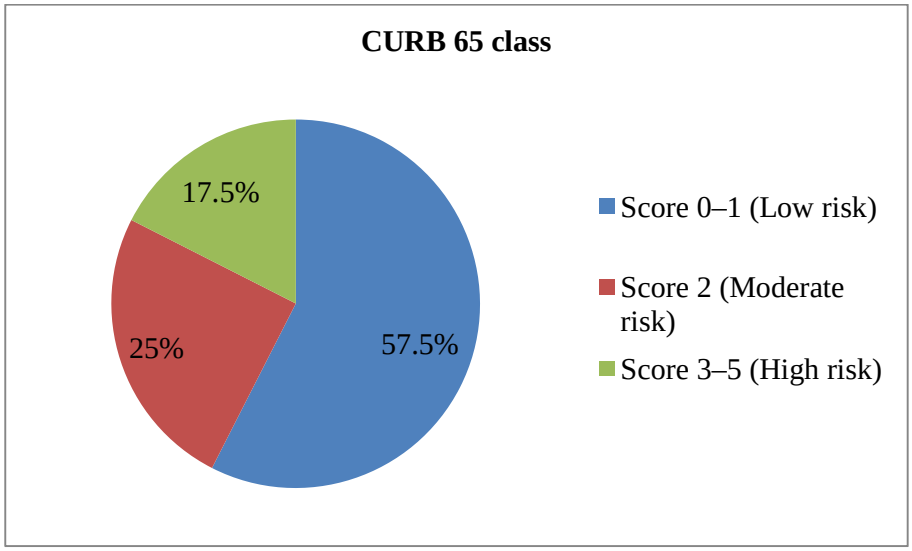


Table 9 shows distribution of subjects according to their various classes of CURB-65. Regarding the CURB-65 scoring system, 57.5% (46 subjects) were at low risk with score being 0 – 1, 20 subjects were at moderate risk with score being 2 (25%) and 14 subjects were at high risk with score being 3 – 5 (17.5%).

Table 10: Analysis of SMART-COP scoring system in prediction of severity outcomes among CAP patients

Test variable	Inotropic support	Non-invasive ventilation	Intubation	Death
Sensitivity	61%	46%	62%	57%
Specificity	88%	83%	87%	82%
Positive Predictive Value	67%	58%	62%	43%
Negative Predictive Value	85%	76%	87%	88%
Diagnostic Accuracy	80%	72%	80%	77%

Table 10 shows analysis of SMART-COP scoring system for predicting severity outcomes among patients with community acquired pneumonia.

Regarding SMART-COP scoring system for predicting the need for Inotropic support, the sensitivity was 61%, the specificity was 88%, PPV and NPV were 67% and 85% respectively and the diagnostic accuracy was 80%. Regarding SMART-COP scoring system for predicting the need for Non-invasive ventilation, the sensitivity was 46%, the specificity was 83%, PPV and NPV were 58% and 76% respectively and the diagnostic accuracy was 72%. Regarding SMART-COP scoring system for predicting the need for intubation, the sensitivity was 62%, the specificity was 87%, PPV and NPV were 62% and 87% respectively and the diagnostic accuracy was 80%. Regarding SMART-COP scoring system for predicting the mortality, the sensitivity was 57%, the specificity was 82%, PPV and NPV were 43% and 88% respectively and the diagnostic accuracy was 77%.

Table 11: Analysis of PSI classes scoring system in prediction of severity outcomes among CAP patients

Test variable	Inotropic support	Non-invasive ventilation	Intubation	Death
Sensitivity	35%	35%	32%	38%
Specificity	91%	93%	39%	89%
Positive Predictive Value	62%	70%	54%	47%
Negative Predictive Value	78%	75%	35%	85%
Diagnostic Accuracy	75%	74%	38%	79%

Table 11 shows analysis of PSI classes scoring system in prediction of severity outcomes among CAP patients.

Regarding PSI scoring system for predicting the need for Inotropic support, the sensitivity was 35%, the specificity was 91%, PPV and NPV were 62% and 78% respectively and the diagnostic accuracy was 75%. Regarding PSI scoring system for predicting the need for Non-invasive ventilation, the sensitivity was 35%, the specificity was 93%, PPV and NPV were 70% and 75% respectively and the diagnostic accuracy was 74%. Regarding PSI scoring system for predicting the need for intubation, the sensitivity was 32%, the specificity was 39%, PPV and NPV were 54% and 35% respectively and the diagnostic accuracy was 38%. Regarding PSI scoring system for predicting the mortality, the sensitivity was 38%, the specificity was 89%, PPV and NPV were 47% and 85% respectively and the diagnostic accuracy was 79%.

Table 12: Analysis of CURB-65 scoring system in prediction of severity outcomes among CAP patients

Test variable	Inotropic support	Non-invasive ventilation	Intubation	Death
Sensitivity	44%	31%	39%	44%
Specificity	93%	89%	90%	90%
Positive Predictive Value	72%	58%	58%	50%
Negative Predictive Value	80%	73%	80%	87%
Diagnostic Accuracy	68%	70%	77%	80%

Table 12 shows analysis of CURB-65 scoring system in prediction of severity outcomes among CAP patients.

Regarding the CURB-65 score in predicting the need for Inotropic support, sensitivity was 44%, the specificity was 93%, PPV and NPV were 72% and 80% respectively and the diagnostic accuracy was 68%. Regarding CURB-65 scoring system for predicting the need for Non-invasive ventilation, the sensitivity was 31%, the specificity was 89%, PPV and NPV were 58% and 73% respectively and the diagnostic accuracy was 70%. Regarding CURB-65 scoring system for predicting the need for intubation, the sensitivity was 39%, the specificity was 90%, PPV and NPV were 58% and 80% respectively and the diagnostic accuracy was 77%. Regarding CURB-65 scoring system for predicting the mortality, the sensitivity was 44%, the specificity was 90%, PPV and NPV were 50% and 87% respectively and the diagnostic accuracy was 80%.

Table 13: Receiver operating characteristic analysis of SMART-COP scoring system in prediction of severity outcomes among CAP patients

SMART-COP scoring system	ROC results		SMART-COP scores cut-off	AUROC	SE	p-value
	Sensitivity	Specificity				
Inotropic support	95.7	78.9	> 3	0.837	0.052	< 0.001
Non-invasive ventilation	92.3	79.6	> 3	0.651	0.065	0.030
Intubation	90.5	78	> 4	0.877	0.042	< 0.001
Death	93.8	79.7	> 4	0.826	0.053	< 0.001

SE: Standard error, AUROC: Area under curve - ROC

Table 13 shows ROC analysis of SMART-COP scoring system in prediction of severity outcomes among CAP patients.

The SMART-COP score demonstrates statistically significant associations with several critical clinical outcomes. Like Inotropic Support: the Area Under the Receiver Operating Characteristic curve (AUROC) of 0.837 indicates strong predictive ability. A score greater than 3 predicts the need for inotropic support with a sensitivity of 95.7% and a specificity of 78.9% ($p < 0.001$).

Non-Invasive Ventilation (NIV): An AUROC of 0.651 indicates moderate predictive ability A score greater than 3 predicts the need for NIV with a sensitivity of 92.3% and a specificity of 79.6% ($p = 0.030$).

Intubation: An AUROC of 0.877 indicates strong predictive ability. A score greater than 4 predicts the need for intubation with a sensitivity of 90.5% and a specificity of 78% ($p < 0.001$).

Death: An AUROC of 0.826 indicates strong predictive. A score greater than 4 predicts death with a sensitivity of 93.8% and a specificity of 79.7% ($p < 0.001$).

SMART-COP scoring system significantly predicted the severity outcomes among CAP patients.

Table 14: Receiver operating characteristic analysis of PSI classes scoring system in prediction of severity outcomes among CAP patients

PSI classes scoring system	ROC results		PSI scores cut-off	AUROC	SE	p-value
	Sensitivity	Specificity				
Inotropic support	91.3	71.9	> 132	0.687	0.068	0.009
Non-invasive ventilation	96.2	90.7	> 110	0.718	0.065	0.002
Intubation	95.2	91.5	> 134	0.665	0.070	0.025
Death	93.8	70.3	> 132	0.709	0.068	0.010

SE: Standard error, AUROC: Area under curve - ROC

Table 14 shows ROC analysis of PSI classes scoring system in prediction of severity outcomes among CAP patients.

Regarding PSI score for predicting the inotropic support, there exists a statistically significant association. The AUROC is 0.687. By using ROC curve, PSI score > 132

(optimum cut off criterion) predicts inotropic support with a sensitivity being 91.3% and specificity 71.9% (p-value = 0.009).

Regarding PSI score for predicting the non-invasive ventilation, there exists a statistically significant association. The AUROC is 0.718. By using ROC curve, PSI score > 110 (optimum cut off criterion) it had sensitivity which was 96.2% and specificity which was 90.7% (p-value = 0.002).

Regarding PSI score for predicting the intubation, there exists a statistically significant association. The AUROC is 0.665. By using ROC curve, PSI score > 134 (optimum cut off criterion) predicts intubation with a sensitivity of 95.2% ,specificity of 91.5% and had p-value = 0.070 which was significant .

Regarding PSI score for predicting the death, there exists a statistically significant association. The AUROC is 0.709. By using ROC curve, PSI score > 132 (optimum cut off criterion) predicts death with a sensitivity of 93.8% and 70.3% specificity (p-value = 0.010).

PSI scoring system significantly predicted the severity outcomes in CAP patients.

Table 15: Receiver operating characteristic analysis of CURB-65 scoring system in prediction of severity outcomes among CAP patients

CURB-65 scoring system	ROC results		CURB-65 scores cut-off	AUROC	SE	p-value
	Sensitivity	Specificity				
Inotropic support	78.3	70.2	> 3	0.820	0.049	< 0.001
Non-invasive ventilation	96.2	70.4	> 2	0.702	0.060	0.004
Intubation	71.4	71.2	> 3	0.756	0.057	0.001
Death	81.3	73.4	> 3	0.788	0.057	< 0.001

SE: Standard error, AUROC: Area under curve - ROC

Table 15 shows ROC analysis of CURB-65 scoring system in prediction of severity outcomes among CAP patients.

Regarding CURB-65 score for predicting the inotropic support, there exists a statistically significant association. The AUROC is 0.820. By using ROC curve, CURB-65 score > 2 (optimum cut off criterion) predicts inotropic support with sensitivity of 78.3% and specificity 70.2% and was significant (p-value < 0.001).

Regarding CURB-65 score for predicting the non-invasive ventilation, there exists a statistically significant association. The AUROC is 0.702. By using ROC curve, CURB-65 score > 2 (optimum cut off criterion) predicts non-invasive ventilation with the sensitivity of 96.2% and the specificity of 70.4%

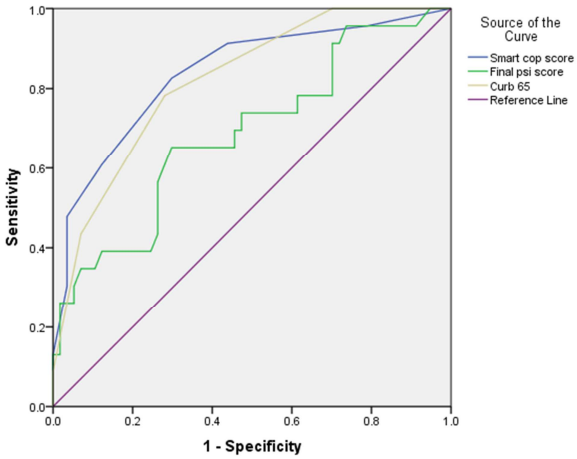
Regarding CURB-65 score for predicting the intubation, there exists a statistically significant association. The AUROC is 0.756. By using ROC curve, CURB-65 score > 3 (optimum cut off criterion) predicts intubation with sensitivity being 71.4% and specificity being 71.2% (p-value = 0.001).

Regarding CURB-65 score for predicting the death, there exists a statistically significant association. The AUROC is 0.788. By using ROC curve, CURB-65 score > 3 (optimum cut off criterion) predicts death with a sensitivity of 81.3% and specificity of 73.4% and was significant (p-value < 0.001).

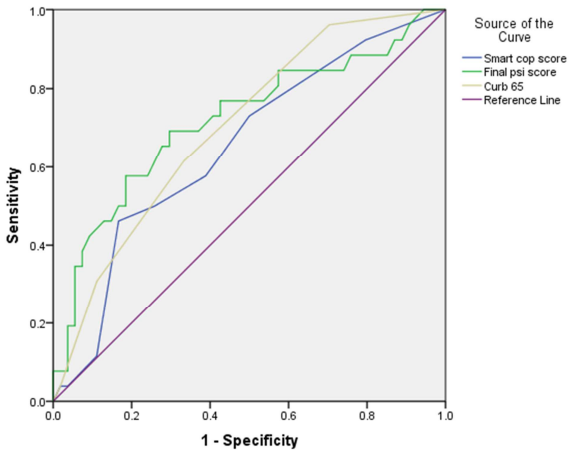
CURB-65 scoring system significantly predicted the severity outcomes in CAP patients.

Figure 10: Receiver operating characteristic analysis of scores in prediction of severity outcomes among CAP patients

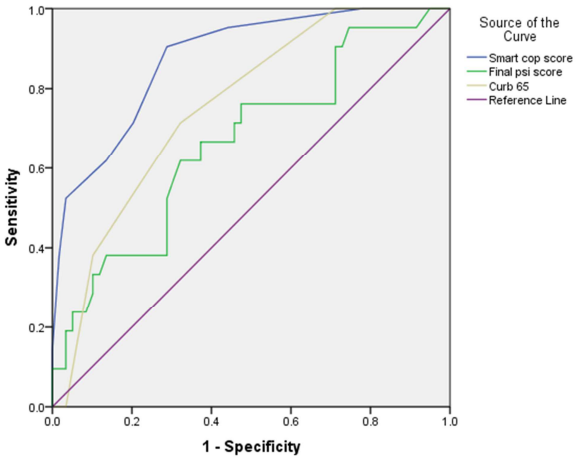
Need for inotropic support



Need for noninvasive-ventilation



Need for mechanical ventilation Death



DISCUSSION

Community-acquired pneumonia (CAP) remains a major cause of **morbidity and mortality**, especially among hospitalized patients. Timely identification of patients who are at risk for severe outcomes is critical for effective management. Various scores, including **CURB-65, PSI, and SMART-COP**, have been developed to aid clinicians in risk stratification. This study evaluated the effectiveness of **SMART-COP score** in prediction of severity outcomes in CAP individuals admitted to a tertiary care center.

The findings indicate that **SMART-COP is useful in predicting severity in CAP**, particularly in identifying the individuals requiring **intensive care unit (ICU) admission, mechanical ventilation, or inotropic support**. The study reaffirms previous research suggesting that SMART-COP performs well in recognizing patients who require aggressive management, making it a **valuable tool for early clinical decision-making**. Unlike CURB-65, which primarily predicts **mortality**, SMART-COP focuses on the need for intensive respiratory and circulatory support, which is crucial for guiding **hospital resource allocation**.

Baseline characteristics of study subjects:

The subjects' age distribution was as follows: the majority (41.2%) were between 50 and 69 years old, 3.8% were under 30 years old, 31.2% between 30 and 49 years old, 41.2% between 50 and 69 years old, and 23.8% were over 70. The average age in this study was 57 ± 15.84 years. The majority of them were male, accounting for 63.7%. 36.3% of patients were female. The male to female ratio was 1.8:1.

Patrick G. P. Charles et al. [35] conducted a prospective, multicenter observational study to evaluate the aetiology, severity markers, and treatment outcomes of a large group of patients with CAP. Of the 537 patients, 24.1% were aged ≤ 50 years. The majority of them were male, accounting for 60.9%. The participants in this study had similar baseline characteristics in terms of age to those in the current investigation.

Rahat A. Memon et al. [36] conducted a meta-analysis to investigate the effectiveness of the SMART-COP score in predicting the prognosis and severity of patients presenting with CAP. The final study population consisted of 58 patients, the majority of whom were women (63.8%), with an mean age of 48.5 (range 20-86). .

The observational study by Akhila Babu et al. [37] aimed to compare the ability of three severity scoring systems, systolic blood pressure, multilobar chest radiography involvement, albumin level, respiratory rate, tachycardia, confusion, oxygenation, and arterial pH (SMART COP), confusion, urea nitrogen, respiratory rate, blood pressure < 90/60 mm Hg and age over 65 years (CURB 65), and pneumonia severity index (PSI) to predict the need for mechanical ventilation. There were 47 (59%) males and 33 (41%) females, with an average age of 53 (±17) years (SD)

Lam Nguyen-Ho et al. [38] conducted a prospective cross-sectional study to assess pneumonia scoring systems, as well as mortality scoring systems for acute melioidosis, among MP patients. The mean age was 51±11 years, with males accounting for 86.4% (57/66). The majority (56.06%) were freelancers, while 16.67% were farmers.

Christophe Marti et al. [39] conducted a systematic review and meta-analysis to evaluate the effectiveness of clinical prediction algorithms in identifying CAP patients who require ICU admission or intensive care. Out of the 225 cases, 122 were female

and 103 were male. The median age was somewhat above 65. The baseline characteristics of the participants in this study did not match those of the present study participants.

In a prospective cross-sectional analysis, İbrahim Onur Alıcı et al. [40] compared three scoring systems (CURB-65, pneumonia severity index, and SMART-COP) to predict 30-day mortality and the requirement for intense respiratory and vasopressor support (IRVS). average age of these patients was 58.6 ± 18.7 years. 30% of patients were female, and 70% were male. The participants in this study had similar baseline characteristics in terms of age to those in the current investigation.

Enas Elsayed Mohamed et al. [41] conducted a clinical trial to evaluate the clinical usefulness of pneumonia scores in determining which CAP patients would be admitted to the hospital. , with 48% under 65 and 52% over 65. Women accounted for 32% of the cases analysed, while men made up 68%. The participants in this study had similar baseline characteristics in terms of age to those in the current investigation.

Abouelela et al. [42] conducted a prospective cohort study to assess the prognostic value of seven different scores: Pneumonia Severity Index (PSI), CURB65, Modified ATS rule, Infectious Diseases Society of America/American Thoracic Society Consensus Guidelines (IDSA/ATS), SMART COP, Simplified SMART-COP (SMART CO), and SOAR) in assessing the severity of HAP and patient outcome. The participants in this study had similar baseline characteristics in terms of age to those in the current investigation.

Charlene Yang et al. [43] conducted a retrospective analysis to evaluate these severity grading systems with the Pneumonia Severity Index (PSI) in identifying severe CAP.

The baseline characteristics of the participants were similar to those of the current study participants.

Hajime Fukuyama et al. [44] conducted a prospective study to determine the España rule, pneumonia severity index (PSI), CURB-65, A-DROP, IDSA/ATS prediction rule from 2007, and SMART-COP. The median age was 76. The majority of them (339) were males, while 166 were ladies. Which was similar to current study participants.

Morbidity profile of study participants:

In this study, among those who had co morbidities, DM was present in 19% subjects; chronic renal failure in 12.5% subjects; congestive heart failure in 11% subjects and chronic liver failure was present in 9% subjects. Cerebrovascular disease and neoplastic disease were present in 6.3% subjects each.

Patrick G. P. Charles et al. [35] conducted a prospective, multicenter, observational investigation and found that the features of the individuals in this study were similar to those of the current study participants.

Akhila Babu et al. [37], in an observational research, found that the most common comorbidities among patients with CAP were chronic renal failure (40%), congestive heart failure (30%), and chronic liver failure (25%).

.The study by Lam Nguyen-Ho et al., [38], which was a prospective cross-sectional study, found that the features of the participants in this study were similar to those of the current study participants.

Clinical characteristics of study participants:

In this study, regarding general physical examination findings, mean values of PR were 93.4 ± 19.60 bpm, SBP and DBP were 104.6 ± 17.48 and 66.2 ± 11.99 mmHg respectively and MAP was 77.6 ± 6.44 mmHg. The mean value of RR was 25.3 ± 7.90 bpm.

In a prospective cross-sectional research by Lam Nguyen-Ho et al. [38], 89.39% of cases had clinical symptoms of acute pulmonary melioidosis lasting less than one month. Patients with an extrapulmonary lesion accounted for 43.94%.

Enas Elsayed Mohamed et al. [41] conducted a clinical investigation and discovered "30% of the investigated cases had low systolic blood pressure and 70% had normal blood pressure. Sixty-eight percent of the cases were tachypnic, with 32% having regular breathing. Tachycardia was detected in 26% of patients, the majority of whom had chronic atrial fibrillation (AF); 40% of cases showed new beginnings of confusion, while 60% had normal cognitive function"

Severity outcomes in patients with community acquired pneumonia

In this current study, mortality was 20% (16 subjects), 26 subjects had need for non-invasive ventilation (32.5%), 21 subjects needed intubation (26.3%) and 23 subjects needed inotropic support (28.7%).

Patrick G. P. Charles et al. [35] conducted a prospective, multicenter, observational study and found that admission to the ICU occurred in 118 (13.4%) of 882 episodes, and IRVS was required in 91 (10.3%) of 882 episodes; of the 91 patients involved, 40 (44.0%) were intubated, 41 (45.1%) received non-invasive ventilation, and 38 (41.8%) received vasopressor support. Of the 91 patients who got IRVS, 53 (58.2%)

were admitted to the ICU immediately from the emergency department, whereas the remaining 38 (41.8%) were initially admitted to general wards before being moved to the ICU.

Rahat A. Memon et al. [36] conducted a meta-analysis and found that "the rate of IRVS use in the included research ranged from 6.38% to 65.48%, with a pooled incidence of 12% among the five papers. The 30-day mortality rate in the analysed trials ranged from 5.56% to 23.48%. The aggregated incidence of 30-day death across the six studies was 18% (95% CI: 16%-19%)."

Lam Nguyen-Ho et al. [38], in a prospective cross-sectional analysis, found that the rate of IRVS requirement was 34.8% and mortality at discharge was 25.8%.

In a prospective cross-sectional study by İbrahim Onur Alıcı et al. [40], "14 out of 84 patients (16.7%) with CAP were followed up in the intensive care unit. Invasive mechanical breathing was used on twelve patients (85.7%), and three patients (21.4%) required vasopressor support. Nine patients (64.2%) were promptly admitted to the ICU, with five (35.8%) moved from the general wards. The 30-day death rate for CAP was 7.1% (6 instances), and all patients were monitored in the ICU with mechanical breathing support. There was no mortality in the patients who received vasopressor treatment." .

Enas Elsayed Mohamed et al. [41] conducted a clinical trial and found that there were 28 deaths and 72 patients were completely cured; deaths occurred in cases when patients were taken directly to the ICU or were originally admitted to the ward and subsequently deteriorated and were transferred there. The features of the participants in this study were similar to those of the current study participants. A Abouelela et al. [42], in a prospective cohort research, found that inpatient death rates were

considerably higher for severe CAP than for non-severe CAP classified using all three scoring methods.

Hajime Fukuyama et al. [44], in a prospective analysis, found that the total in-hospital death rate was 6.5%, with 6.3% of patients admitted to the ICU. Sixty patients (11.9%) were classified as having severe CAP (in-hospital death, mechanical ventilation, or septic shock).

SMART-COP score of study subjects:

In this current study, regarding the SMART-COP scoring system, 55% (44 subjects) were at low risk with score being 0 – 2, 15 subjects were at moderate risk with score being 3 – 4 (18.8%), 12 subjects were at high risk with score being 5 – 6 (15%) and 9 subjects were at very high risk with score being ≥ 7 (11.2%).

Regarding SMARTCOP score for predicting need for Inotropic support, sensitivity was 61%, the specificity was 88%, PPV and NPV were 67% and 85% respectively and the diagnostic accuracy was 80%. Regarding SMART-COP scoring system for predicting the need for Non-invasive ventilation, the sensitivity was 46%, the specificity was 83%, PPV and NPV were 58% and 76% respectively and the diagnostic accuracy was 72%. Regarding SMART-COP scoring system for predicting the need for intubation, the sensitivity was 62%, the specificity was 87%, PPV and NPV were 62% and 87% respectively and the diagnostic accuracy was 80%. Regarding SMART-COP scoring system for predicting the mortality, the sensitivity was 57%, the specificity was 82%, PPV and NPV were 43% and 88% respectively and the diagnostic accuracy was 77%.

Regarding SMART-COP score for predicting the inotropic support, there exists a statistically significant association. The AUROC is 0.837. By using ROC curve, SMART-COP score > 3 (optimum cut off criterion) predicts inotropic support with 95.7% sensitivity and specificity of 78.9% and was statistically significant

Regarding SMART-COP score for predicting the non-invasive ventilation, there exists a statistically significant association. The AUROC is 0.651. By using ROC curve, SMART-COP score > 3 (optimum cut off criterion) predicts non-invasive ventilation high sensitivity and specificity (p-value = 0.030).

Regarding SMART-COP score for predicting the intubation, there exists a statistically significant association. The AUROC is 0.877. By using ROC curve, SMART-COP score > 4 (optimum cut off criterion) predicts intubation with a sensitivity 90.5% and specificity of 78% and with significant p value (p-value < 0.001).

Regarding SMART-COP for mortality prediction , there exists a statistically significant association. The AUROC is 0.826. By using ROC curve, SMART-COP score > 4 (optimum cut off criterion) predicts death with sensitivity 93.8% and specificity 79.7% and had a significant p-value < 0.001. SMART-COP scoring system significantly predicted the severity outcomes in CAP patients.

In a prospective, multicenter observational trial, Patrick G. P. Charles et al.[35] found that "a SMART-COP score of ≥3 points indicated 84 (92.3%) of 91 patients who got IRVS. In comparison, a two-point SMRT-CO score identified 82 (90.1%) of the 91 cases. An increase in SMART-COP score was connected with a higher rate of IRVS receipt. An increasing score was likewise associated with increased mortality, with 42 (84%) of the 50 patients who died having a SMART-COP score of three points. A SMART-COP score of 3 points exhibited a positive predictive value (PPV) of 22.2%.

Each additional 1-point increase in the score increased the PPV by approximately 10% (data not shown). A SMART COP score of 3 points correctly identified 52 (98.1%) of the 53 patients who got IRVS and were admitted directly to the ICU from the ED. Of the 38 patients transported from the emergency department to the general ward and then to the ICU, 32 (84.2%) had a SMART COP score of three points. Patients who got IRVS but had SMART-COP scores ≥3 showed severe clinical deterioration at least 24-48 hours after hospital admission. All but one of these patients received noninvasive ventilation."

Rahat A. Memon et al. [36] conducted a meta-analysis and found that "the pooled sensitivity of the SMART-COP score to predict the usage of IRVS is 89% (95% CI: 84%-93%), while its specificity is 68% (95% CI: 65%-70%). The pooled AUC equals 0.84. The SMART-COP score has a pooled sensitivity of 92% (95% CI: 89%-94%) in predicting 30-day death, with specificity 39% (95% CI: 37%-42%). The pooled AUC is 0.501."

Akhila Babu et al. [37] conducted an observational study and discovered that "in SMART COP, severity class 3 indicated the need for mechanical breathing and inotropic support with good sensitivity and specificity. Out of 80 patients, 59 required mechanical ventilation, whereas 41 required inotropic support during their hospital stay. The majority were classified as low severity in CURB 65 and PSI, while thirty were classified as severe in SMART COP." This study demonstrated that SMART COP is a more accurate predictor of mechanical ventilation and inotropic support than CURB 65 and PSI. Nearly 75% of patients survived community pneumonia, demonstrating the effectiveness of early antibiotic therapy

Lam Nguyen-Ho et al. [38] conducted a prospective cross-sectional investigation and found that "the medium scores and IQR for CURB-65, SMART COP, and PSI were 1 (0-2), 3.0 (1.0-4.25), and 91.50 (73.75-116.50), respectively. The median score and IQR for the score predicting mortality were 4 [3-6]. There was no significant difference in calculated scores (including CURB-65, SMART-COP, PSI, and mortality prediction score) between two MP groups with and without extrapulmonary lesion (all P values >0.05). CURB-65, SMART-COP, and PSI shown validity in predicting IRVS requirement and mortality at discharge time among MP patients. PSI, CURB-65, and SMART-COP had AUCs of 0.813 [P<0.001], 0.868 (P<0.001), and 0.910 (P<0.001) for predicting IRVS requirement, respectively. PSI, CURB-65, SMART COP, and mortality score of acute melioidosis had AUCs of 0.698 (P=0.02), 0.797 (P<0.001), 0.797 (P<0.001), and 0.663 (P=0.05), respectively, for predicting death result."

The study by Christophe Marti et al., [39], which was a comprehensive review and meta-analysis, found that the "pooled sensitivity of SMART-COP to predict the need for vasopressors or mechanical breathing was 79% and specificity was 68%. Two studies assessed this rule's ability to predict ICU admission, with a pooled sensitivity of 79% and specificity of 64% on 1,567 patients, including 112 ICU admissions (7.1%). " with features of the study population in both the studies being similar .

A prospective cross-sectional study by İbrahim Onur Alıcı et al. [40] found that patients in groups 3 and 4 of the SMART-COP system accounted for 92.8% of ICU patients. System scores of ≥3 points were associated with a 100% projected ICU stay. Five of these patients were in SMART-COP group 4; one was in group 3. The ROC analysis showed that all three systems accurately predicted 30-day mortality and the

requirement for Invasive respiratory and vasopressor support ($p<0.01$, respectively). None of the systems indicated an advantage over the others.

The study by Enas Elsayed Mohamed et al.[41], which was a clinical study, showed that "sensitivities for predicting the need for mechanical ventilation with the PSI and the CURB 65 score were 50 and 60%, respectively, while sensitivity for SMART-COP and SMRT-CO was 50 and 85%, respectively, with the highest specificity of 88.67% being for the SMART-COP score. Sensitivities for predicting the need for IRVS with the PSI and CURB-65 score were 53.85 and 65.38%, respectively, whereas sensitivity for SMART COP and SMRT-COP was 53.85 and 88.46%, respectively, with the highest specificity of 100% for the SMART-COP score".

A prospective cohort research by A Abouelela et al. [42] found that the Area Under the Curve was highest in SMART-cop (AUC:= 0.820), followed by the SMART-CO score (AUC:= 0.807) and PSI score (AUC:= 0.806). Cutoff values for SMART-cop, SMRT-Co, and PSI were > 2, 0.5, and 3, respectively. have the highest sensitivity (100 percent for each) in predicting 28-day mortality. In terms of specificity, the SMART-cop score is the most specific (93%) in predicting 28-day mortality, followed by the modified ATS score (90%). Regarding the duration of Mechanical Ventilation, it was discovered that SMART-cop ($R = 0.824$, $p = 0.0001$) followed by IDSA/ATS scores ($R = 0.787$, $p = 0.0001$) had the highest correlation in predicting the duration of Mechanical Ventilation in critically ill patients with VAP, as a higher SMART-cop and IDSA/ATS score indicates that the pneumonia was complicated with septic shock and respiratory failure.

A retrospective study by Charlene Yang et al.[43] found that " SMART-COP identified fewer patients with severe CAP compared to PSI (14.2% vs 25.6%, $p<0.001$) and

CORB (14.2% vs 22.7%, p=0.001). There was no difference between PSI and CORB (25.6% vs 22.7%, p=0.47), although 50% (27/54) of patients classified as severe CAP on PSI were deemed non-severe on the CORB score, whereas 43.8% (21/48) of patients classified as severe CAP on the CORB score were considered non-severe on PSI. Similar misclassifications were found between the PSI and the SMART-COP score". Hajime Fukuyama et al. [44] conducted a prospective analysis and found that when ICU admission was the end measure, the IDSA/ATS rule and SMART-COP were considered good predictors. The features of the patients in this study were similar to those of the current study.

PSI score of study subjects:

In this study, regarding the PSI scoring system, 35% (36 subjects) were at low risk (Risk class II and III), 31 subjects were at moderate risk (Risk class IV) (38.8%) and 13 subjects were at high risk (Risk class V) (16.2%).

Regarding PSI scoring system for predicting the need for Inotropic support, the sensitivity was 35%, the specificity was 91%, PPV and NPV were 62% and 78% respectively and the diagnostic accuracy was 75%. Regarding PSI scoring system for predicting the need for Non-invasive ventilation, the sensitivity was 35%, the specificity was 93%, PPV and NPV were 70% and 75% respectively and the diagnostic accuracy was 74%. Regarding PSI scoring system for predicting the need for intubation, the sensitivity was 32%, the specificity was 39%, PPV and NPV were 54% and 35% respectively and the diagnostic accuracy was 38%. Regarding PSI scoring system for predicting the mortality, the sensitivity was 38%, the specificity was 89%, PPV and NPV were 47% and 85% respectively and the diagnostic accuracy was 79%.

Regarding PSI score for predicting the inotropic support, there exists a statistically significant association. The AUROC is 0.687. By using ROC curve, PSI score > 132 (optimum cut off criterion) predicts inotropic support with the sensitivity being 91.3% and with a specificity of 71.9% and was significant (p = 0.009).

Regarding PSI score for predicting the non-invasive ventilation, there exists a statistically significant association. The AUROC is 0.718. By using ROC curve, PSI score > 110 (optimum cut off criterion) predicts non-invasive ventilation with a sensitivity of 96.2% and specificity of 90.7% and was significant (p = 0.002).

Regarding PSI score for predicting the intubation, there exists a statistically significant association. The AUROC is 0.665. By using ROC curve, PSI score > 134 (optimum cut off criterion) predicts intubation with sensitivity 95.2% and specificity 91.5% was significant (p = 0.070).

Regarding PSI score for predicting the death, there exists a statistically significant association. The AUROC is 0.709. By using ROC curve, PSI score > 132 (optimum cut off criterion) predicts death with sensitivity of 93.8% and specificity 70.3% and was significant (p = 0.010).

PSI scoring system significantly predicted the severity outcomes in CAP patients.

Patrick G. P. Charles et al. [35], in a prospective, multicenter, observational analysis, found that PSI classifications IV and V predicted 67 (73.6%) of the 91 patients who got IRVS. However, nine (9.9%) of the 91 patients were in PSI class I and II, and fifteen (16.5%) were in PSI class III.

Akhila Babu et al. [37] found "a statistically significant difference (P < 0.005) between the sensitivity and specificity of the scoring method, with the PSI score better predicting the requirement for mechanical ventilation and inotropic support."

Lam Nguyen-Ho et al.[38] conducted a prospective cross-sectional study and found that "the medium scores and interquartile range (IQR) for CURB-65, SMART COP, and PSI were 1 (0-2), 3.0 (1.0-4.25), and 91.50 (73.75-116.50), respectively. The median score and IQR for the score predicting mortality were 4 [3-6]. There was no significant difference in calculated scores (including CURB-65, SMART-COP, PSI, and mortality prediction score)" " between two MP groups with and without extrapulmonary lesion (all P values >0.05). CURB-65, SMART-COP, and PSI shown validity in predicting IRVS requirement and mortality at discharge time among MP patients. PSI, CURB-65, and SMART-COP had AUCs of 0.813 [P<0.001], 0.868 (P<0.001), and 0.910 (P<0.001), respectively, for predicting IRVS requirement. PSI, CURB-65, SMART COP, and mortality score of acute melioidosis had AUCs of 0.698 (P=0.02), 0.797 (P<0.001), 0.797 (P<0.001), and 0.663 (P=0.05), respectively". The features of the participants in our study were similar to ours

According to Christophe Marti et al. [39], "the PSI score category of IV or higher had a pooled sensitivity of 75% and a specificity of 48%. A cut-off of V raised specificity to 84% while decreasing sensitivity to 38%. PSI's global performance in predicting ICU admission was moderate, with an AUC of 0.69. PSI outperformed an alternative definition of SCAP, including mortality, with a pooled sensitivity of 92.4% and specificity of 56.2% in four cohorts of 3,195 patients." The features of these participants in the study were similar to those of the current study participants.

In a prospective cross-sectional investigation, İbrahim Onur Alıcı et al. [40] found that all patients who died within 30 days were in PSI class V. The ROC analysis showed that all three systems accurately predicted 30-day mortality and the requirement for IRVS ($p<0.01$, respectively). None of the systems indicated an advantage over the others.

The study by Enas Elsayed Mohamed et al.[41], which was a clinical study, showed that "sensitivities for predicting the need for mechanical ventilation with the PSI and the CURB 65 score were 50 and 60%, respectively, while sensitivity for SMART-COP and SMRT-CO was 50 and 85%, respectively, with the highest specificity of 88.67% being for the SMART-COP score. Sensitivities for predicting the need for IRVS with the PSI and CURB-65 score were 53.85 and 65.38%, respectively, whereas sensitivity for SMART COP and SMRT-CO was 53.85 and 88.46%, respectively, with highest specificity of 100% for SMART-COP score." The features of participants were similar to those of the current study participants.

CURB-65 score of study subjects:

In current study, regarding the CURB-65 scoring system, 57.5% (46 subjects) were at low risk with score being 0 – 1, 20 subjects were at moderate risk with score being 2 (25%) and 14 subjects were at high risk with score being 3 – 5 (17.5%).

Regarding the CURB-65 score in predicting need for Inotropic support, sensitivity was 44%, the specificity was 93%, PPV and NPV were 72% and 80% respectively and the diagnostic accuracy was 68%. Regarding CURB-65 scoring system for predicting the need for Non-invasive ventilation, the sensitivity was 31%, the specificity was 89%, PPV and NPV were 58% and 73% respectively and the diagnostic accuracy was 70%. Regarding CURB-65 scoring system for predicting the

need for intubation, the sensitivity was 39%, the specificity was 90%, PPV and NPV were 58% and 80% respectively and the diagnostic accuracy was 77%. Regarding CURB-65 scoring system for predicting the mortality, the sensitivity was 44%, the specificity was 90%, PPV and NPV were 50% and 87% respectively and the diagnostic accuracy was 80%.

Regarding CURB-65 score for predicting the inotropic support, there exists a statistically significant association. The AUROC is 0.820. By using ROC curve, CURB-65 score > 2 (optimum cut off criterion) predicts inotropic support with the sensitivity being 78.3% and had a specificity of 70.2% with significant p value ($p < 0.001$).

Regarding CURB-65 score for predicting the non-invasive ventilation, there exists a statistically significant association. The AUROC is 0.702. By using ROC curve, CURB-65 score > 2 (optimum cut off criterion) predicts non-invasive ventilation with sensitivity 96.2% and specificity of 70.4% and it was significant (p-value = 0.004).

Regarding CURB-65 score for predicting the intubation, there exists a statistically significant association. The AUROC is 0.756. By using ROC curve, CURB-65 score > 3 (optimum cut off criterion) predicts intubation with a sensitivity of 71.4% and specificity of 71.2% and had a significant p value ($p = 0.001$).

Regarding CURB-65 score for predicting the death, there exists a statistically significant association. The AUROC is 0.788. By using ROC curve, CURB-65 score > 3 (optimum cut off criterion) predicts death with sensitivity of 81.3% and specificity of 73.4% and had a significant p value . ($p < 0.001$).

CURB-65 scoring system significantly predicted the severity outcomes in CAP patients.

The study by Patrick G. P. Charles et al. [35], which was a prospective, multicenter, observational analysis, indicated that CURB-65 group 3 predicted the need for IRVS in 35 (38.5%) of the 91 patients, whereas 30 (33.0%) and 26 (28.6%) of the 91 patients were in groups 1 and 2, respectively.

Akhila Babu et al.[37] conducted an observational study and discovered that "sensitivity and specificity for CURB 65 were greater in Class 2, which is statistically significant and provides a better prognosis for mechanical ventilation and inotropic support." The features of the participants in the study were similar to our study.

Lam Nguyen-Ho et al. [38] conducted a prospective cross-sectional investigation and found that "the medium scores and IQR for CURB-65, SMART COP, and PSI were 1 (0-2), 3.0 (1.0-4.25), and 91.50 (73.75-116.50), respectively. The median score and IQR for the score predicting mortality were 4 [3-6]. There was no significant difference in calculated scores (including CURB-65, SMART-COP, PSI, and mortality prediction score) between two MP groups with and without extrapulmonary lesion (all P values >0.05)". They also stated that "CURB-65, SMART-COP, and PSI have validity in predicting IRVS requirement and mortality at discharge time among MP patients.in their study the PSI, CURB-65, and SMART-COP had AUCs of 0.813 [P<0.001], 0.868 (P<0.001), and 0.910 (P<0.001) for predicting the need for IRVS, respectively. PSI, CURB-65, SMART COP, and mortality score of acute melioidosis had AUCs of 0.698 (P=0.02), 0.797 (P<0.001), 0.797 (P<0.001), and 0.663 (P=0.05), respectively, for predicting death result".

According to a systematic review and meta-analysis conducted by Christophe Marti et al.[39] , "CURB-65 has a pooled sensitivity of 56% and a specificity of 74% at the standard cut-off value of 3 or higher. CURB-65's global performance in predicting ICU admission was similar to PSI, with an AUC of 0.69. Three papers examined the performance of CURB-65 in predicting the need for ventilation or vasopressors, including 2,951 patients, 264 of whom required extensive therapy. The results were similar, with a pooled sensitivity of 57.2% (CI, 37–75) and specificity of 77.2% (CI, 73–81). For a threshold of three or more, the pooled sensitivity was 34% and specificity was 91%. The performance of CURB to predict ICU admission was investigated in four cohorts of 1,418 patients and 161 ICU admissions (12.1%). The pooled sensitivity of a CURB score of 2 or more to predict ICU admission was 76.8%, with a specificity of 68." The features of the participants in this study were similar to those of the current study participants.

A prospective cross-sectional study by İbrahim Onur Alıcı et al.[40] found that 35.7% of ICU cases were classified into groups 1 and 2 based on the CURB-65 score. Five patients (31.3%) in CURB-65 group 3 and one patient in group 2 passed away. The ROC analysis showed that all three systems accurately predicted 30-day mortality and the requirement for IRVS ($p<0.01$, respectively). None of the systems indicated an advantage over the others. The features of the participants in this study were similar to those of the current study participants.

The study by Enas Elsayed Mohamed et al[41} which was a clinical study, showed that "sensitivities for predicting the need for mechanical ventilation with the PSI and the CURB 65 score were 50 and 60%, respectively, while sensitivity for SMART-COP and SMRT-COP was 50 and 85%, respectively, with the highest specificity of 88.67% being for the SMART-COP score. Sensitivities for predicting the need for IRVS with

the PSI and CURB-65 score were 53.85 and 65.38%, respectively, whereas sensitivity for SMART COP and SMRT-COP was 53.85 and 88.46%, respectively, with the highest specificity of 100% for the SMART-COP score". The features of the participants in this study were similar to those of the current study participants.

Strengths of study:

1. The study provides valuable insights into the predictive accuracy of the SMART-COP score, which can help clinicians in risk stratification and timely intervention for CAP patients.
2. As the study demonstrated that SMART-COP is effective in predicting severe outcomes, it could guide decision-making regarding ICU admission, ventilation support, and aggressive treatment strategies.
3. Conducting the study in a tertiary care center ensures access to well-documented patient records, laboratory tests, and imaging, leading to high-quality data collection.
4. The SMART-COP score is an objective tool that includes clinical, laboratory, and radiological parameters, reducing subjectivity in severity assessment.
5. Since it is a cross-sectional study, data can be collected and analyzed efficiently, providing relatively quick results for clinical implementation.
6. The study generates region-specific data on CAP severity, which may help refine guidelines for pneumonia management in Belagavi and similar settings.
7. The findings can serve as a foundation for future prospective studies or randomized controlled trials to validate and compare SMART-COP with other severity scoring systems.

Limitations of the study:

1. Since the study is conducted in a single tertiary care center, the findings may not be generalizable to other healthcare settings, such as rural hospitals or primary care centers.
2. A cross-sectional study captures data at a single point in time, which limits the ability to establish causality or assess the progression of CAP severity over time.
3. As the sample size is small, it may reduce the statistical power of the study and limit the ability to detect significant associations.
4. The study population may not represent all CAP patients, as the inclusion is based on hospital admissions, which may exclude milder cases managed in outpatient settings.
5. The accuracy of SMART-COP depends on completeness and accuracy of clinical and laboratory data, which could be affected by documentation errors.
6. Other factors like comorbidities, prior antibiotic use, and variations in treatment protocols may influence patient outcomes but may not be fully accounted for in the study.
7. The study may not capture long-term outcomes, such as mortality beyond hospital discharge or long-term complications of CAP.
8. The interpretation of clinical and radiological findings for calculating SMART-COP scores may vary between different physicians, affecting score consistency.
9. The SMART-COP score may perform differently in various demographic or geographic populations, and its predictive accuracy in the Belagavi setting may require further validation.

CONCLUSION

This study demonstrates that the **SMART-COP score** is a reliable and practical tool for predicting severity outcomes in patients with **community-acquired pneumonia (CAP)** admitted to a tertiary care center. The results indicate that SMART-COP effectively identifies high-risk patients who may require **intensive care unit (ICU) admission, respiratory support, or aggressive management**, thereby aiding in timely clinical decision-making.

The **objective and easy-to-use** nature of the SMART-COP score makes it a valuable addition to existing severity assessment tools, potentially improving **resource allocation, early intervention, and patient outcomes**. However, considering the study's **limitations, including its single-center design and cross-sectional approach**, further **multicenter, prospective studies** with larger sample sizes are needed to validate its effectiveness across diverse populations.

Integrating SMART-COP into routine clinical practice, alongside other severity assessment models, may enhance the **early recognition and management of severe CAP**, ultimately reducing complications, hospital stays, and mortality.

BIBLIOGRAPHY

1. Ewig S, Birkner N, Strauss R, et al.: New perspectives on community-acquired pneumonia in 388 406 patients. Results from a nationwide mandatory performance measurement programme in healthcare quality. Thorax. 2009, 64:1062-9.
2. Ehsanpoor B, Vahidi E, Seyedhosseini J, Jahanshir A: Validity of SMART-COP score in prognosis and severity of community acquired pneumonia in the emergency department. Am J Emerg Med. 2019, 37:1450- 4.
3. Hak E, Bont J, Hoes AW, Verheij TJ: Prognostic factors for serious morbidity and mortality from communityacquired lower respiratory tract infections among the elderly in primary care. Fam Pract. 2005, 22:375-80.
4. Kontou P, Kuti JL, Nicolau DP: Validation of the Infectious Diseases Society of America/American Thoracic Society criteria to predict severe community-acquired pneumonia caused by Streptococcus pneumoniae. Am J Emerg Med. 2009, 27:968-74.
5. Flannery MT, McCool MJ: Community-acquired pneumonia guidelines and resident behavior . Am J Med. 2005, 118:929-30.
6. Aleva RM, Boersma WG: Guideline 'Diagnosis and treatment of community-acquired pneumonia' from the Dutch Thoracic Society [Article in Dutch]. Ned Tijdschr Geneeskd. 2005, 1:2501-7.
7. Wu Z, McGoogan JM: Characteristics of and important lessons from the coronavirus disease 2019 (COVID19) outbreak in China. Summary of a report of 72 314 cases from the Chinese Center for Disease Control and Prevention. JAMA. 2020, 323:1239-42.

8. Fine MJ, Auble TE, Yealy DM, et al.: A prediction rule to identify low-risk patients with community-acquired pneumonia. N Engl J Med. 1997, 336:243-50.
9. Lim WS, van der Eerden MM, Laing R, et al.: Defining community acquired pneumonia severity on presentation to hospital: an international derivation and validation study. Thorax. 2003, 58:377-82.
10. Charles PG, Wolfe R, Whitby M, et al.: SMART-COP: a tool for predicting the need for intensive respiratory or vasopressor support in community-acquired pneumonia. Clin Infect Dis. 2008, 47:375-84.
11. Gadsby NJ, Musher DM. The Microbial Etiology of Community-Acquired Pneumonia in Adults: from Classical Bacteriology to Host Transcriptional Signatures. Clin Microbiol Rev. 2022 Dec 21;35(4):e0001522.
12. File TM, Ramirez JA. Community-Acquired Pneumonia. Reply. N Engl J Med. 2023 Oct 26;389(17):1633-1634.
13. Jain S, Self WH, Wunderink RG, Fakhran S, Balk R, Bramley AM, Reed C, Grijalva CG, Anderson EJ, Courtney DM, Chappell JD, Qi C, Hart EM, Carroll F, Trabue C, Donnelly HK, Williams DJ, Zhu Y, Arnold SR, Ampofo K, Waterer GW, Levine M, Lindstrom S, Winchell JM, Katz JM, Erdman D, Schneider E, Hicks LA, McCullers JA, Pavia AT, Edwards KM, Finelli L., CDC EPIC Study Team. Community-Acquired Pneumonia Requiring Hospitalization among U.S. Adults. N Engl J Med. 2015 Jul 30;373(5):415-27.
14. Almirall J, Bolíbar I, Balanzó X, González CA. Risk factors for community-acquired pneumonia in adults: a population-based case-control study. Eur Respir J 1999; 13:349.
15. Torres A, Peetermans WE, Viegi G, Blasi F. Risk factors for community-acquired pneumonia in adults in Europe: a literature review. Thorax 2013; 68:1057.

16. Dickson RP, Erb-Downward JR, Martinez FJ, Huffnagle GB. The Microbiome and the Respiratory Tract. Annu Rev Physiol 2016; 78:481.

17. Dickson RP, Erb-Downward JR, Huffnagle GB. Towards an ecology of the lung: new conceptual models of pulmonary microbiology and pneumonia pathogenesis. Lancet Respir Med 2014; 2:238.

18. Faner R, Sibila O, Agustí A, et al. The microbiome in respiratory medicine: current challenges and future perspectives. Eur Respir J 2017; 49.

19. Annane D, Renault A, Brun-Buisson C, et al. Hydrocortisone plus Fludrocortisone for Adults with Septic Shock. N Engl J Med 2018; 378:809.

20. Moore M, Stuart B, Little P, et al. Predictors of pneumonia in lower respiratory tract infections: 3C prospective cough complication cohort study. Eur Respir J 2017; 50.

21. Waterer GW, Kessler LA, Wunderink RG. Delayed administration of antibiotics and atypical presentation in community-acquired pneumonia. Chest 2006; 130:11.

22. Torres A, Chalmers JD, Dela Cruz CS, Dominedò C, Kollef M, Martin-Loeches I, Niederman M, Wunderink RG. Challenges in severe community-acquired pneumonia: a point-of-view review. Intensive Care Med. 2019 Feb;45(2):159-171.

23. Pickens CI, Wunderink RG. Principles and Practice of Antibiotic Stewardship in the ICU. Chest. 2019 Jul;156(1):163-171.

24. Nuttall JJC. Current antimicrobial management of community-acquired pneumonia in HIV-infected children. Expert Opin Pharmacother. 2019 Apr;20(5):595-608.

25. Froes F, Pereira JG, Póvoa P. Outpatient management of community-acquired pneumonia. Curr Opin Pulm Med. 2019 May;25(3):249-256.
26. Bergmann F, Pracher L, Sawodny R, Blaschke A, Gelbenegger G, Radtke C, Zeitlinger M, Jorda A. Efficacy and Safety of Corticosteroid Therapy for Community-Acquired Pneumonia: A Meta-Analysis and Meta-Regression of Randomized, Controlled Trials. Clin Infect Dis. 2023 Dec 15;77(12):1704-1713.
27. Peng B, Li J, Chen M, Yang X, Hao M, Wu F, Yang Z, Liu D. Clinical value of glucocorticoids for severe community-acquired pneumonia: A systematic review and meta-analysis based on randomized controlled trials. Medicine (Baltimore). 2023 Nov 17;102(46):e36047.
28. Menéndez R, Torres A, Zalacaín R, et al. Risk factors of treatment failure in community acquired pneumonia: implications for disease outcome. Thorax 2004; 59:960.
29. Arancibia F, Ewig S, Martinez JA, et al. Antimicrobial treatment failures in patients with community-acquired pneumonia: causes and prognostic implications. Am J Respir Crit Care Med 2000; 162:154.
30. Violi F, Cangemi R, Falcone M, et al. Cardiovascular Complications and Short-term Mortality Risk in Community-Acquired Pneumonia. Clin Infect Dis 2017; 64:1486.
31. Bruns AH, Oosterheert JJ, Cucciolillo MC, et al. Cause-specific long-term mortality rates in patients recovered from community-acquired pneumonia as compared with the general Dutch population. Clin Microbiol Infect 2011; 17:763.

32. Dela Cruz CS, Wunderink RG, Christiani DC, et al. Future Research Directions in Pneumonia. NHLBI Working Group Report. Am J Respir Crit Care Med 2018; 198:256.

33. Corrales-Medina VF, Alvarez KN, Weissfeld LA, et al. Association between hospitalization for pneumonia and subsequent risk of cardiovascular disease. JAMA 2015; 313:264.

34. Charles PG, Wolfe R, Whitby M, Fine MJ, Fuller AJ, Stirling R, et al. SMART-COP: a tool for predicting the need for intensive respiratory or vasopressor support in community-acquired pneumonia. Clin Infect Dis 2008;47(3):375- 84.

35. Patrick G. P. Charles, Rory Wolfe, Michael Whitby, Michael J. Fine, Andrew J. Fuller, Robert Stirling, Alistair A. Wright, Julio A. Ramirez, Keryn J. Christiansen, Grant W. Waterer, Robert J. Pierce, John G. Armstrong, Tony M. Korman, Peter Holmes, D. Scott Obrosky, Paula Peyrani, Barbara Johnson, Michelle Hooy, Australian Community-Acquired Pneumonia Study Collaboration, M. Lindsay Grayson, SMART-COP: A Tool for Predicting the Need for Intensive Respiratory or Vasopressor Support in Community-Acquired Pneumonia, *Clinical Infectious Diseases.* 2008;47(3):375–384.

36. Memon RA, Rashid MA, Avva S, Anirudh Chunchu V, Ijaz H, Ahmad Ganaie Z, Kabir Dar A, Ali N. The Use of the SMART-COP Score in Predicting Severity Outcomes Among Patients With Community-Acquired Pneumonia: A Meta-Analysis. Cureus. 2022 Jul 25;14(7):e27248.

37. Babu A, Jose N, Jose J. A prospective observational study to evaluate the severity assessment scores in community-acquired pneumonia for adult patients. Indian J Respir Care 2017;6:820-3.

38. Lam Nguyen-Ho, Hong-Linh Hoang-Thi, Vu Le-Thuong, Ngoc Duong-Minh, Thong Dang-Vu, Mai Le-Phuong, Phu Truong-Thien, Ngoc Tran-Van. Severity assessment in melioidosis pneumonia: validity of PSI, CURB-65, and SMART-COP scoring criteria. AME Med J 2025;10:23.
39. Marti C, Garin N, Grosgurin O, Poncet A, Combescure C, Carballo S, Perrier A. Prediction of severe community-acquired pneumonia: a systematic review and meta-analysis. Crit Care. 2012 Jul 27;16(4):R141.
40. Alici, Ibrahim & Capan, Nermin & Erturk, Arzu & Canbakan, Sema. (2015). Comparison of Severity Scoring Systems in Community-Acquired Pneumonia. Eurasian Journal of Pulmonology. 17. 10.5152/ejp.2014.68077.
41. Mohamed, Enas Elsayed; Abd Allah, Alaa ElDeen Ali. Assessment of clinical applicability of pneumonia scores to determine patients with community-acquired pneumonia who will need hospital admission. The Egyptian Journal of Chest Diseases and Tuberculosis 2019;68(2):224-230.
42. Abouelela et al.: Predictive value of different scoring systems for critically ill patients with hospital acquired pneumonia. Intensive Care Medicine Experimental 2015 3(Suppl 1):A345.
43. Charlene Yang Meow-Cheong Yaw Julie Robinson. Comparison of pneumonia severity scoring methods in identification of severe community acquired pneumonia. European Respiratory Journal 2017 50(suppl 61): PA4098.
44. Fukuyama H, Ishida T, Tachibana H, Nakagawa H, Iwasaku M, Saigusa M, Yoshioka H, Arita M, Hashimoto T. Validation of scoring systems for predicting severe community-acquired pneumonia. Intern Med. 2011;50(18):1917-22.

ANNEXURE – I - INFORMED CONSENT FORM

KAHERs JNMC
BELAGAVI
INFORMED CONSENT FORM

"The use of smartcop tool in predicting severity outcomes among patients with community acquired pneumonia admitted at a tertiary care centre,belagavi"
Name of Student/Principal Investigator:
Name of Guide/Co Investigators:

MD GENERAL MEDICINE
ASSOCIATE PROFESSOR
JN MEDICAL COLLEGE BELAGAVI

Introduction:
Dear Mr./Mrs./Dr. _____ you are requested to enroll yourself in a research study titled "The use of smart cop tool in predicting severity outcomes among patients with community acquired pneumonia admitted at a tertiary care centre,belagavi" being conducted by post graduate student in MD general medicine and the study will be carried out under the direct supervision and guidance of professor department of general medicine jawaharlal Nehru medical college belgaum

you have been requested to participate in this as you fit into the laid out croiteria for a study subject / participant

Severity assessment is an essential first step in the management of community-acquired pneumonia, and it guides decisions regarding route and type of antibiotic therapy, as well as decisions to discharge patients from the hospital or to admit them to higher levels of care . Existing severity-assessment tools such as the CURB65 (confusion, urea, respiratory rate, systolic or diastolic blood pressure, and age 65 years) score and the Pneumonia Severity Index (PSI) are based on the risk of 30-day mortality. They may be less accurate for consideration of other outcomes, such as the need for admission to the intensive care unit . Although these scores have been widely used and validated for predicting mortality in large populations, no studies exist of outcomes of community-acquired pneumonia that affects young people. Death due to community-acquired pneumonia is rare in previously fit young adults [6]. As a result, the widely used severity indexes are based almost exclusively on the risk of death among older people. It is recognized that the presenting features of elderly patients with pneumonia are different from those in younger patients

SMART-COP (systolic blood pressure, multilobar infiltrates, albumin, respiratory rate, tachycardia, confusion, oxygen, and pH), developed by a group of Australian academics, is one of the most recent methods for assessing pneumonia. SMART-COP is a severity score method designed to identify individuals who require intensive respiratory or vasopressor support (IRVS) support and intensive care unit (ICU) admission due to pneumonia. The SMART-COP score includes tachycardia, systolic blood pressure (SBP), oxygen saturation (SpO2), potential hydrogen (pH), and acute confusion . In comparison to previous scoring systems, this score is more sensitive and specific in identifying patients at risk of severe disease and predicting the requirement for ICU care based on the likelihood of requiring intense respiratory or vasopressor support .

Explanation of procedure: if u agree to enroll yourself in my study you will be interviewed regarding your present past and family history then you will be clinically examined in detail and investigated accordingly

Withdrawal from participation in the study: Participation in this study is voluntary. You will be free to decide whether to participate in this study or continue participation once enrolled. In case you decide to withdraw your participation, you are free to do so. However, please convey the decision to the principal investigator.

Possible benefits from participating in the study: You will not get any benefits by participating in this study. The study helps gather data which will be used for understanding the scoring system for community acquired pneumonia which will help us to identify patients requiring intensive care The data gathered will help population at large.

Possible risks from participating in the study: There are no risks involved in participating in this study.

Privacy and confidentiality: The information collected from you will be coded, to prevent any person to identify you. Your identity will never be revealed. The data collected from you will be kept confidential and only processed or aggregated data will be used for publication.

Financial incentives: You will not receive any payment for participating in this study.

Cost of investigations done during the course of study will be paid by the **principal investigator**

Authorization for publication of aggregated data: Results obtained after processing of the aggregated data will be published for scientific purpose and or presented to scientific groups. However, your identity will never be revealed.

Questions: In case of any questions with regard to this study, you are free to contact: **"Dr** If you have any question or complaints with regard to your right as study participant you may contact Dr Harsha Hegde, Chairperson, Ethical committee of JNMC, 0831-2473777 Extension 4052.

Legal rights: By signing this consent form, we are not waving any of your legal rights

CONSENT STATEMENT

I am making a voluntary decision to participate in the study ""**The use of smartcop tool in predicting severity outcomes among patients with community acquired pneumonia admitted at tertiary care centre belagavi**"". My signature below indicates that I have decided to participate and I have read the information provided above or the information provided above has been read to me in the language that I understand best. I was given the opportunity to ask questions and that they have been answered to my satisfaction.

Name of the participant:

Signature or left thumb impression of the participant:

Name of the witness:

Signature or left thumb impression of the witness:

Name of the investigator:

Signature of the investigator:

ANNEXURE – II – PROFORMA

PROFORMA

CASE NO	
NAME	
IP NO	
AGE	YEARS
SEX	MALE FEMALE
ADDRESS	
OCCUPATION	

Complaints at presentation	
Past history	
Family history	
Personal history	
Treatment history	

Vitals :

Temperature	
Pulse	
Respiratory rate	
Blood pressure	

PHYSICAL EXAMINATION:

	Yes	No
Pallor		
Icterus		
Lymphadenopathy		
Cyanosis		
Clubbing		
Edema		

SYSTEMIC EXAMINATION:

C.V.S	
R.S.	
C.N.S	
PER ABDOMEN	

INVESTIGATIONS:

Hemoglobin		ALP		Na^+	
Total Count		Total Bilirubin		K^+	
Neutrophils		Direct Bilirubin		Mg^{2+}	
Lymphocytes		Total Protein		Sr. Creatinine	
Eosinophils		Albumin			
Monocytes		A/G ratio		.	
Basophils		SGOT			
ESR		SGPT			
RBS		PA02			

X RAY FINDINGS

ANNEXURE – III

MASTER CHART

o	IP NO	SEX	AGE	HEART RATE	RESPIRATORY RATE	Temp >103	Bp	CONFUSION	Icu admission	Intubation	Inotropic support	NIV	Death	Serum bun	Albumin	BUN/ALBUMIN	Creat	Liver disease	Renal disease	Spo2	ACIDOSIS	Na	K	Bilirubin	HB	alp	TLC	sgpt	Sgot	MULTILOBAR INVOLVEMENT IN IMAGING	Curb 65	Smart cop score	Final psi score	Pleural effusion on xray	Congestive heart failure	Cva	Hyperglycemia	Neoplastic disease
1	10072150	M	42	126	30	FALSE	140-90	TRUE	YES	YES	YES	YES	YES	76.24	3.1	24.59354839	0.96	FALSE	FALSE	88	TRUE	138	3.3	0.68	14	92	10800	42	37	TRUE	3	10	172	FALSE	FALSE	TRUE	TRUE	FALSE
2	10065959	M	45	90	30	TRUE	150-80	TRUE	YES	YES	YES	YES	YES	60.06	3	20.02	0.9	FALSE	FALSE	92	FALSE	130	3.6	1.1	14	90	26000	30	40	FALSE	3	3	170	FALSE	TRUE	FALSE	FALSE	TRUE
3	10064454	F	50	130	30	TRUE	110-70 ON NORAD	TRUE	YES	NO	YES	NO	DAMA	48.42	2.8	17.29285714	0.79	FALSE	FALSE	92	FALSE	139	4.4	0.45	13	96	30500	17	38	TRUE	4	7	155	FALSE	FALSE	TRUE	FALSE	FALSE
4	10076120	M	62	80	17	FALSE	120-80	TRUE	NO	NO	NO	NO	NO	62.64	2.6	24.09230769	0.46	FALSE	FALSE	92	FALSE	120	3.3	0.48	12	147	10600	61	264	FALSE	2	2	152	FALSE	FALSE	FALSE	FALSE	TRUE
5	10052583	M	81	120	35	FALSE	120-70	FALSE	YES	YES	YES	YES	YES	14.21	4.3	3.304651163	1.94	FALSE	FALSE	86	TRUE	138	3.2	1.55	14	65	8800	20	25	FALSE	2	5	151	FALSE	FALSE	FALSE	TRUE	FALSE
6	10072209	M	86	100	26	FALSE	100-60	TRUE	YES	YES	YES	YES	NO	21.92	3.8	5.768421053	2.48	FALSE	FALSE	86	TRUE	132	4.9	0.67	10	46	13800	82	57	TRUE	2	7	146	FALSE	FALSE	FALSE	FALSE	FALSE
7	10072167	M	75	87	30	FALSE	120-80	TRUE	YES	NO	YES	YES	NO	46.82	4.1	11.4195122	1.88	FALSE	FALSE	96	FALSE	134	4.2	0.67	12	77	14000	14	41	FALSE	4	2	145	FALSE	TRUE	FALSE	FALSE	FALSE
8	10091238	M	64	100	30	FALSE	110-70	TRUE	YES	YES	NO	NO	YES	14.02	3.2	4.38125	1.28	FALSE	FALSE	88	FALSE	115	4.8	1.23	11	120	17600	31	27	TRUE	3	7	144	TRUE	FALSE	FALSE	FALSE	FALSE
9	10042391	M	51	122	40	FALSE	120-70	FALSE	YES	NO	NO	YES	NO	7.01	4.2	1.669047619	0.72	TRUE	FALSE	84	TRUE	135	4.9	3.92	19	87	11200	40	36	FALSE	1	5	141	FALSE	TRUE	FALSE	FALSE	FALSE
10	10023012	M	70	96	33	FALSE	100-60	TRUE	YES	NO	YES	YES	NO	17.85	3.4	5.25	1.52	FALSE	FALSE	70	FALSE	136	4.4	0.94	4.9	130	11300	167	143	FALSE	3	5	140	FALSE	TRUE	FALSE	FALSE	FALSE
11	10076727	M	55	130	34	FALSE	90-60 on norad	TRUE	YES	YES	YES	YES	YES	20.37	2.6	7.834615385	1.38	FALSE	FALSE	86	FALSE	132	3.4	1.66	12	94	7600	29	94	FALSE	3	7	135	FALSE	FALSE	FALSE	FALSE	FALSE
12	10064327	M	75	78	28	FALSE	140-80	TRUE	YES	NO	NO	YES	NO	58.46	2.9	20.15862069	2.1	FALSE	FALSE	88	FALSE	150	3.1	0.92	13	78	12400	186	366	FALSE	3	4	135	FALSE	TRUE	FALSE	FALSE	FALSE
13	10069601	M	54	114	17	FALSE	110-70 ON NORAD	TRUE	YES	YES	NO	NO	YES	19.21	2.4	8.004166667	2.88	FALSE	FALSE	96	FALSE	135	4.2	0.39	8.8	65	22500	11	23	FALSE	2	3	134	FALSE	FALSE	FALSE	FALSE	TRUE
14	10020489	F	70	106	33	FALSE	100-60	FALSE	YES	NO	NO	YES	NO	7.1	3.6	1.972222222	0.67	FALSE	FALSE	90	FALSE	129	4.2	0.66	11	88	9700	34	21	FALSE	2	1	130	FALSE	FALSE	FALSE	FALSE	TRUE
15	10072876	F	76	105	32	FALSE	90-60 on norad	FALSE	YES	NO	NO	YES	NO	15.33	1.7	9.017647059	1	FALSE	FALSE	88	FALSE	133	2.4	0.42	9.7	94	14000	35	32	FALSE	3	5	126	FALSE	TRUE	FALSE	FALSE	FALSE
16	10080104	M	76	97	28	FALSE	100-70	FALSE	YES	YES	YES	NO	YES	66.82	3.1	21.55483871	5.79	FALSE	TRUE	90	FALSE	127	5.4	0.74	10	67	9200	10	26	TRUE	2	3	126	FALSE	FALSE	FALSE	FALSE	FALSE
17	10074660	F	38	120	38	TRUE	100-60 ON NORAD	FALSE	NO	NO	NO	NO	NO	19.35	2.4	8.0625	0.89	FALSE	FALSE	92	FALSE	129	4.5	1.79	3.8	135	32400	28	44	FALSE	2	3	123	TRUE	FALSE	FALSE	FALSE	FALSE
18	10023498	M	83	90	35	FALSE	110-80	FALSE	YES	NO	NO	YES	NO	18.64	4.3	4.334883721	1.25	FALSE	FALSE	90	FALSE	126	4.9	0.58	14	87	12400	42	45	FALSE	2	1	123	FALSE	FALSE	FALSE	FALSE	FALSE
19	10076009	M	73	74	18	FALSE	110-70	FALSE	YES	NO	NO	NO	NO	62.15	2.7	23.01851852	1.54	TRUE	FALSE	96	FALSE	141	4.3	7.98	7.7	155	17000	23	70	FALSE	2	1	123	FALSE	FALSE	FALSE	FALSE	FALSE
20	10093488	M	71	77	16	FALSE	120-80	FALSE	NO	NO	NO	NO	NO	40.19	3	13.39666667	1.37	FALSE	FALSE	96	FALSE	120	5.6	1.05	9	190	18700	32	32	FALSE	2	1	121	TRUE	FALSE	FALSE	FALSE	FALSE
21	10078735	F	58	109	28	FALSE	130-80	FALSE	YES	NO	NO	YES	NO	35.42	2.9	12.2137931	4.99	FALSE	TRUE	88	TRUE	133	2.6	0.56	9.5	72	15200	87	69	FALSE	1	5	118	FALSE	FALSE	FALSE	FALSE	FALSE
22	10041354	M	78	110	32	FALSE	100-60 ON NORAD	FALSE	NO	NO	NO	NO	NO	21.03	3.4	6.185294118	1.04	FALSE	FALSE	90	FALSE	133	4	0.65	12	90	18700	21	37	TRUE	3	5	118	FALSE	FALSE	FALSE	FALSE	FALSE
23	10035592	M	45	142	30	FALSE	160-90	FALSE	NO	NO	NO	NO	NO	62.62	3.5	17.89142857	1.3	FALSE	FALSE	92	FALSE	129	4.8	1.2	11	109	20000	44	37	TRUE	2	4	115	FALSE	FALSE	FALSE	FALSE	FALSE
24	10074935	M	84	88	18	FALSE	150-80	FALSE	YES	NO	YES	YES	NO	45.65	4	11.4125	5.22	FALSE	TRUE	90	FALSE	153	4.6	0.34	12	76	14100	31	117	FALSE	2	0	114	FALSE	FALSE	FALSE	FALSE	FALSE
25	10033572	M	94	86	18	FALSE	160-90	FALSE	YES	NO	NO	YES	NO	62.62	2.7	23.19259259	1.11	FALSE	FALSE	92	FALSE	144	4.9	0.48	11	49	10500	25	25	FALSE	2	1	114	FALSE	FALSE	FALSE	FALSE	FALSE
26	10021007	M	32	72	28	FALSE	90-60 on norad	TRUE	YES	YES	YES	NO	YES	102.8	3.3	31.15151515	9.28	FALSE	TRUE	88	FALSE	135	4.3	1.57	11	114	14.2	149	84	TRUE	3	8	112	FALSE	FALSE	FALSE	FALSE	FALSE
27	10080084	F	32	90	35	FALSE	90-60 on norad	TRUE	YES	YES	YES	NO	YES	16.36	2.8	5.842857143	1.15	FALSE	FALSE	92	FALSE	136	4.1	2.63	9.3	114	12500	2244	2338	TRUE	3	6	112	FALSE	FALSE	FALSE	FALSE	TRUE
28	10065581	M	41	136	40	FALSE	90-60 on norad	FALSE	YES	YES	YES	NO	NO	12.06	3.2	3.76875	0.77	FALSE	FALSE	84	TRUE	135	4	1.29	12	72	13700	25	50	TRUE	2	10	111	FALSE	FALSE	FALSE	FALSE	FALSE
29	10075921	F	70	84	16	FALSE	100-60	TRUE	YES	YES	YES	YES	NO	28.88	3.3	8.751515152	3.28	FALSE	TRUE	78	FALSE	133	4.1	2.93	10	78	17100	18	28	TRUE	3	6	110	FALSE	TRUE	FALSE	FALSE	FALSE
30	10053980	M	40	73	50	FALSE	120-80	FALSE	NO	NO	NO	NO	NO	36.82	3.4	10.82941176	0.7	TRUE	FALSE	92	FALSE	140	3.2	5.02	7.8	47	8700	40	226	TRUE	2	4	110	FALSE	FALSE	FALSE	FALSE	FALSE
31	10072937	M	60	130	16	FALSE	140-90	FALSE	YES	YES	YES	YES	YES	23.83	3.2	7.446875	0.75	TRUE	FALSE	94	FALSE	130	4.9	11	10	147	12300	236	166	FALSE	1	2	110	FALSE	TRUE	FALSE	FALSE	FALSE
32	10090351	M	60	72	16	FALSE	90-60	FALSE	NO	NO	NO	NO	NO	25.14	3.2	7.85625	1.42	FALSE	FALSE	96	FALSE	122	3.6	1.22	12	60	7600	46	36	FALSE	1	1	110	FALSE	FALSE	FALSE	TRUE	FALSE
33	10070785	M	49	77	16	FALSE	110-70	TRUE	NO	NO	NO	NO	NO	5.09	2.7	1.885185185	0.54	TRUE	FALSE	92	FALSE	129	3.5	19.4	11	145	13400	30	86	FALSE	1	2	109	FALSE	FALSE	FALSE	FALSE	FALSE
34	10076471	F	57	110	36	FALSE	130-80	FALSE	YES	NO	NO	YES	NO	16.03	3.6	4.452777778	0.85	FALSE	FALSE	88	FALSE	127	3.6	0.44	12	59	3400	146	40	FALSE	1	3	107	FALSE	TRUE	FALSE	FALSE	FALSE
35	10089528	M	75	76	18	FALSE	140-80	FALSE	NO	NO	NO	NO	NO	12.9	3.5	3.685714286	0.99	FALSE	FALSE	87	FALSE	126	4	1.56	12	65	5900	13	34	FALSE	1	2	105	FALSE	FALSE	FALSE	FALSE	FALSE
36	10024538	M	42	99	40	FALSE	100-70	FALSE	YES	YES	NO	NO	YES	3.41	3.5	0.974285714	0.34	FALSE	FALSE	88	TRUE	130	3.9	0.22	9.8	89	10200	11	10	TRUE	1	7	102	FALSE	FALSE	FALSE	FALSE	FALSE
37	10000593	F	51	88	18	FALSE	110-70	FALSE	NOI	NO	NO	NO	NO	64.02	2.4	26.675	7.38	FALSE	TRUE	98	FALSE	128	3.4	0.62	9.6	239	9000	30	28	FALSE	1	1	101	TRUE	FALSE	FALSE	FALSE	FALSE
38	10013585	F	79	89	18	FALSE	110-70	FALSE	NO	NO	NO	NO	NO	14.63	3.3	4.433333333	0.65	FALSE	FALSE	92	FALSE	129	4.6	1.35	11	94	8700	16	35	FALSE	1	1	99	FALSE	FALSE	TRUE	FALSE	FALSE
39	10046627	M	48	106	32	FALSE	130-80	FALSE	NO	NO	NO	NO	NO	13.46	2.8	4.807142857	0.73	FALSE	FALSE	92	FALSE	128	4.1	0.76	8.2	635	4800	32	56	TRUE	1	4	98	FALSE	FALSE	FALSE	FALSE	FALSE
40	10079411	F	48	120	26	FALSE	110-70	FALSE	NO	NO	NO	NO	NO	56.54	2.4	23.55833333	3.42	FALSE	TRUE	94	FALSE	129	3	0.7	8.4	53	21600	10	36	FALSE	1	2	98	FALSE	FALSE	FALSE	FALSE	FALSE
41	10038940	F	43	76	29	TRUE	110-70	FALSE	NO	NO	NO	YES	NO	53.74	2.5	21.496	1.96	FALSE	FALSE	96	FALSE	131	3.8	1.94	8.7	113	26600	36	34	FALSE	1	2	98	FALSE	FALSE	TRUE	TRUE	FALSE
42	10073455	M	57	110	23	FALSE	130-80	TRUE	YES	YES	YES	NO	YES	74.9	4.4	17.02272727	0.94	FALSE	FALSE	98	FALSE	132	4.3	0.94	15	94	18000	36	34	FALSE	2	1	97	FALSE	FALSE	FALSE	FALSE	FALSE
43	10038003	M	66	126	38	FALSE	120-70	FALSE	YES	NO	NO	YES	DAMA	6.5	3.7	1.756756757	0.74	FALSE	FALSE	94	FALSE	130	4.4	0.32	13	76	7500	22	20	FALSE	2	2	96	FALSE	FALSE	FALSE	FALSE	FALSE
44	10090446	M	64	130	36	FALSE	120-70	FALSE	YES	YES	YES	NO	YES	23.83	3.6	6.619444444	1.32	FALSE	FALSE	90	FALSE	131	4.5	2.22	9.1	94	11900	50	249	TRUE	3	4	94	FALSE	FALSE	FALSE	FALSE	FALSE
45	10064066	F	62	72	28	TRUE	100-60	FALSE	NO	NO	NO	NO	NO	17.52	4.7	3.727659574	0.96	FALSE	FALSE	94	FALSE	115	2.2	2.49	12	115	26200	19	51	FALSE	0	0	87	FALSE	FALSE	FALSE	FALSE	FALSE
46	10063504	F	67	84	23	FALSE	150-80	FALSE	NO	NO	NO	NO	NO	87.85	3	29.28333333	0.49	FALSE	FALSE	98	FALSE	150	3.8	0.43	9.1	162	10400	17	22	FALSE	2	1	87	FALSE	FALSE	FALSE	TRUE	FALSE
47	10073963	M	65	76	18	FALSE	130-80	FALSE	NO	NO	NO	NO	NO	13.46	2.8	4.807142857	0.73	FALSE	FALSE	94	FALSE	128	4.1	0.76	9.2	635	14000	32	56	FALSE	1	1	85	FALSE	FALSE	FALSE	FALSE	FALSE
48	10080331	M	71	60	18	FALSE	130-90	FALSE	NO	NO	NO	NO	NO	12.52	4	3.13	0.9	FALSE	FALSE	96	FALSE	131	4.4	0.72	12	74	11700	34	26	FALSE	1	0	81	FALSE	FALSE	FALSE	TRUE	FALSE
49	10038050	M	39	70	28	FALSE	130-80	FALSE	NO	NO	NO	NO	DAMA	64.8	3.6	18	1	FALSE	FALSE	96	FALSE	129	4	1.2	13	109	9400	44	40	FALSE	1	1	79	FALSE	FALSE	FALSE	FALSE	FALSE
50	10074662	M	38	69	16	FALSE	110-70	TRUE	YES	NO	NO	YES	DAMA	20.98	4	5.245	0.82	FALSE	FALSE	86	FALSE	132	4.3	2.33	15	82	12700	63	107	TRUE	1	5	78	FALSE	FALSE	FALSE	TRUE	FALSE
51	10074214	F	48	90	29	FALSE	120-70	FALSE	NO	NO	NO	NO	NO	14.86	3.2	4.64375	0.44	TRUE	FALSE	94	FALSE	125	3.7	22.3	9	205	25900	78	158	FALSE	0	2	78	FALSE	FALSE	FALSE	FALSE	FALSE
52	10091165	M	58	90	16	FALSE	180-100	FALSE	NO	NO	NO	NO	NO	7.34	3.1	2.367741935	0.77	FALSE	FALSE	94	FALSE	126	4.3	0.38	10	146	11000	48	38	TRUE	0	3	78	FALSE	FALSE	FALSE	FALSE	FALSE
53	10079824	F	27	120	28	FALSE	110-70 ON NORAD	TRUE	YES	NO	YES	YES	YES	7.99	2.8	2.853571429	3.14	FALSE	TRUE	88	FALSE	139	3.8	0.68	9.4	108	4100	12	17	FALSE	2	6	77	FALSE	FALSE	FALSE	FALSE	FALSE
54	10087889	F	86	106	20	FALSE	160-100	FALSE	YES	NO	NO	NO	NO	16.78	3.1	5.412903226	1.11	FALSE	FALSE	92	FALSE	130	4.3	0.86	9.8	203	23600	46	92	FALSE	1	1	76	FALSE	FALSE	FALSE	FALSE	FALSE
55	10081112	M	34	70	16	FALSE	110-70	FALSE	NO	NO	NO	NO	NO	6.17	4.2	1.469047619	0.87	FALSE	FALSE	94	FALSE	134	4.6	0.92	1.4	87	5600	49	40	FALSE	0	0	74	TRUE	FALSE	TRUE	FALSE	FALSE
56	10049276	M	44	80	16	FALSE	200-100	FALSE	NO	NO	NO	NO	NO	38.64	3.8	10.16842105	8.61	FALSE	TRUE	92	FALSE	139	4.9	0.41	9.8	66	3700	7	13	FALSE	1	0	74	FALSE	FALSE	FALSE	FALSE	FALSE
57	10021502	F	64	76	21	FALSE	130-80	FALSE	NO	NO	NO	NO	NO	9.49	4.2	2.25952381	0.72	FALSE	FALSE	92	FALSE	97	4.4	1.61	13	100	17800	22	42	FALSE	0	0	74	FALSE	FALSE	FALSE	FALSE	FALSE
58	10074226	F	62	78	16	FALSE	150-80	FALSE	NO	NO	NO	NO	NO	8.13	3.1	2.622580645	0.93	FALSE	FALSE	96	FALSE	128	5.1	2.26	13	157	6800	13	53	FALSE	0	1	72	FALSE	FALSE	FALSE	FALSE	FALSE
59	10070315	F	30	100	36	FALSE	110-80	TRUE	YES	YES	YES	NO	YES	12.2	2.6	4.692307692	0.77	FALSE	FALSE	70	FALSE	132	3.8	0.34	12	112	22600	16	39	TRUE	2	7	70	FALSE	FALSE	FALSE	FALSE	FALSE
60	10075179	F	38	96	28	FALSE	160-90	FALSE	YES	YES	YES	NO	YES	36.68	2.8	13.1	0.88	FALSE	FALSE	88	FALSE	136	4.2	0.54	14	108	6300	32	33	FALSE	1	4	68	FALSE	FALSE	FALSE	TRUE	FALSE
61	10077809	F	47	100	32	FALSE	120-70	FALSE	YES	YES	YES	NO	NO	13.69	3.5	3.911428571	0.4	FALSE	FALSE	92	FALSE	140	3.7	0.49	12	85	7000	40	63	TRUE	1	3	67	FALSE	FALSE	FALSE	TRUE	FALSE
62	10035589	M	66	78	24	FALSE	140-80	FALSE	NO	NO	NO	NO	NO	11.68	4.2	2.780952381	0.85	FALSE	FALSE	94	FALSE	136	4.6	0.37	14	97	6200	8	17	FALSE	1	0	66	FALSE	FALSE	FALSE	FALSE	FALSE
63	10069948	M	35	81	26	FALSE	100-60 ON NORAD	FALSE	YES	YES	YES	YES	NO	18.6	3.9	4.769230769	1.05	FALSE	FALSE	86	FALSE	141	3.9	2.11	17	102	21600	28	42	TRUE	1	6	65	FALSE	FALSE	FALSE	FALSE	FALSE
64	10038498	F	65	98	26	FALSE	120-70	FALSE	NO	NO	NO	NO	NO	7.85	3.1	2.532258065	0.85	FALSE	FALSE	94	FALSE	137	4.4	0.23	9.2	119	10600	18	19	FALSE	1	1	65	FALSE	FALSE	FALSE	TRUE	FALSE
65	10075534	F	63	74	21	FALSE	100-60	FALSE	NO	NO	NO	NO	NO	10.51	2.3	4.569565217	0.62	FALSE	FALSE	98	FALSE	139	3.2	0.55	9.2	134	13400	32	24	FALSE	0	1	63	FALSE	FALSE	FALSE	TRUE	FALSE
66	10092559	M	62	78	18	FALSE	120-70	FALSE	NO	NO	NO	NO	NO	29.02	3.6	8.061111111	2.37	FALSE	FALSE	96	FALSE	135	4.5	1.78	14	57	10200	17	18	TRUE	1	2	62	FALSE	FALSE	FALSE	FALSE	FALSE
67	10074983	M	50	77	28	FALSE	130-80	FALSE	NO	NO	NO	NO	NO	10.51	4	2.6275	1.14	FALSE	FALSE	94	FALSE	139	5.4	0.51	4.5	79	24000	37	32	FALSE	0	0	60	FALSE	FALSE	FALSE	FALSE	FALSE
68	10088931	M	60	80	18	FALSE	110-70	FALSE	NO	NO	NO	NO	NO	20.75	3.7	5.608108108	0.92	FALSE	FALSE	97	FALSE	131	3.3	1.77	12	77	7700	30	38	FALSE	0	0	60	FALSE	FALSE	FALSE	FALSE	FALSE
69	10080640	M	60	88	20	FALSE	130-80	FALSE	NO	NO	NO	NO	NO	8.41	4.1	2.051219512	0.7	FALSE	FALSE	98	FALSE	136	3.6	0.4	14	75	5400	18	11	FALSE	0	0	60	FALSE	FALSE	FALSE	FALSE	FALSE
70	10081893	M	39	100	21	FALSE	130-80	TRUE	YES	NO	NO	YES	NO	20.61	4.6	4.480434783	1.05	FALSE	FALSE	90	FALSE	136	4.2	0.64	16	104	10000	21	19	FALSE	1	1	59	FALSE	FALSE	FALSE	FALSE	FALSE
71	10080385	M	49	69	16	FALSE	130-80	FALSE	NO	NO	NO	NO	NO	10.28	2.6	3.953846154	0.79	FALSE	FALSE	94	FALSE	138	3	0.46	8.6	86	9100	10	20	FALSE	0	1	59	FALSE	FALSE	FALSE	FALSE	FALSE
72	10080418	M	48	104	16	FALSE	140-80	FALSE	NO	NO	NO	NO	NO	7.76	3.2	2.425	0.53	FALSE	FALSE	100	FALSE	139	4.1	2.88	12	116	10100	20	56	FALSE	0	1	58	TRUE	FALSE	FALSE	FALSE	FALSE
73	10071709	F	67	102	18	FALSE	140-80	FALSE	NO	NO	NO	NO	NO	10.51	3.4	3.091176471	0.76	FALSE	FALSE	90	FALSE	131	4	0.34	12	116	2500	69	149	FALSE	1	1	57	FALSE	FALSE	FALSE	FALSE	FALSE
74	10020493	F	57	70	21	FALSE	120-70	FALSE	YES	NO	NO	YES	NO	8.64	3.6	2.4	0.71	FALSE	FALSE	92	FALSE	133	3.6	0.35	15	122	12300	9	16	FALSE	0	0	57	FALSE	FALSE	FALSE	TRUE	FALSE
75	10077578	M	26	97	28	FALSE	120-80	FALSE	YES	YES	YES	NO	NO	25.84	3.6	7.177777778	8	FALSE	TRUE	80	FALSE	130	3.3	0.41	15	59	7300	18	19	TRUE	1	5	56	FALSE	FALSE	TRUE	FALSE	FALSE
76	10072876	F	66	86	16	FALSE	140-80	FALSE	NO	NO	NO	YES	NO	11.4	1.7	6.705882353	0.42	FALSE	FALSE	94	FALSE	133	2.4	0.42	9.7	94	14000	35	32	FALSE	1	1	56	FALSE	FALSE	FALSE	FALSE	FALSE
77	10092958	F	56	60	18	FALSE	140-90	FALSE	NO	NO	NO	NO	NO	12.1	3.5	3.457142857	0.62	FALSE	FALSE	98	FALSE	142	3.8	1.07	9.9	90	8600	31	34	FALSE	0	0	56	FALSE	FALSE	FALSE	TRUE	FALSE
78	10081054	M	55	68	20	FALSE	110-70	FALSE	NO	NO	NO	NO	DAMA	7.2	3	2.4	0.92	FALSE	FALSE	96	FALSE	136	4.2	1.63	12	100	8600	15	43	TRUE	0	3	55	FALSE	FALSE	FALSE	FALSE	FALSE
79	10093585	M	24	90	22	FALSE	170-90	FALSE	YES	NO	NO	NO	NO	16.5	4.1	4.024390244	0.57	TRUE	FALSE	90	FALSE	131	3.6	5.17	2.7	66	2900	28	43	FALSE	0	0	54	FALSE	FALSE	FALSE	FALSE	FALSE
80	10021118	F	64	90	20	FALSE	120-80	FALSE	NO	NO	NO	NO	DAMA	19.21	3.4	5.65	0.76	FALSE	FALSE	94	FALSE	136	2.7	0.69	9.2	89	10100	31	34	TRUE	0	3	54	FALSE	FALSE	FALSE	FALSE	FALSE