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ORIGINAL ARTICLE

Predictive value of different scoring systems for critically ill patients with hospital acquired pneumonia

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KEYWORDS

SMART-COP;
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Abstract *Introduction:* Hospital-acquired pneumonia (HAP) and ventilator-associated pneumonia (VAP) are important causes of morbidity and mortality despite improved antimicrobial therapy, supportive care, and prevention. General risk factors for developing HAP include age older than 70 years, serious comorbidities, malnutrition, impaired consciousness, prolonged hospitalization and COPD. The availability of valid criteria for defining severe pneumonia would provide a more reliable basis for improving patients risk assessment. The aim of this study was to assess the prognostic value of 7 different scores: Pneumonia Severity Index (PSI), CURB 65, 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.

Methods: This is a prospective Cohort study performed 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.

Results: 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 $\geqslant$ 2, SMRT-Co Score at Cutoff value $\geqslant$ 2, Modified ATS score at Cutoff value $\geqslant$ 0.5 and PSI (pneumonia severity index) at Cutoff value $\geqslant$ 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

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($R = 0.787$, $p = 0.0001$) 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.

Conclusions: 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%).

Introduction

Hospital-acquired (or nosocomial) pneumonia (HAP) is pneumonia that occurs 48 h or more after admission and did not appear to be incubating at the time of admission. Ventilator-associated pneumonia (VAP) is a type of HAP that develops more than 48 hours after endotracheal intubation as defined by The 2005 American Thoracic Society/Infectious Diseases Society of America (ATS/IDSA) [1].

HAP is the leading cause of death among hospital-acquired infections, with estimates of HAP-associated mortality ranging from 20% to 50%. While some studies indicate an attributable mortality of 33%, another suggests that pneumonia is not a significant risk factor for death after adjusting for other predictors of mortality. The highest risk for HAP is in patients on mechanical ventilation (ie, VAP), in whom the entity has been best studied [2,3].

There are many Risk factors for HAP which include [male sex, coma, COPD (chronic obstructive pulmonary disease), bronchoscopy, tracheostomy, use of antacids, serious disease predating the onset of VAP, infection at other sites and duration of prior antibiotic use >4 days] [4].

Severity assessment of pneumonia is considered the key to deciding the site of care and guiding both general management and antibiotic treatment. Much contemporary research has been directed toward the development of evidence-based measures of illness severity in community-acquired pneumonia (CAP) by relating a number of clinical and laboratory features to significant outcomes, namely mortality [5].

The clinical pulmonary infection score (CPIS) has been investigated in multiple trials but the evidence to date does not support widespread use of the CPIS as a diagnostic, prognostic, or therapeutic decision tool, because it is not an adequate surrogate for the diagnosis of VAP. Its poor sensitivity and specificity in most studies preclude its use as an accurate noninvasive diagnostic device. Of all the components of the CPIS, the measure of oxygenation provides the most information as a time-dependent factor during early VAP for predicting its outcome in response to treatment, and deriving a complex score appears to be superfluous for this purpose [6].

Although the severity of HAP and its effect on the outcome of critically ill patients is much more serious than CAP, yet no formal scoring system – to my knowledge – has been created or validated to stratify HAP which is really needed to tailor the medical care and pick up more serious cases to be subjected to more intensive therapy and care. Considering the overall similar pathology in both categories of pneumonia (CAP & VAP), the idea was to try the application of different scoring systems designed mainly for CAP for risk stratification of VAP and check its validity for this purpose. The idea has been raised in a single retrospective study published in 2011 by a Chinese group who concluded that the CAP scores can be also applied for HAP but they didn't focus too much on the validity of the each single score compared to others [7].

The aim of this study was to assess the prognostic value of different scores including (PSI, CURB65, SMART COP, SMART CO, MODIFIED ATS, IDSA/ATS and SOAR) in patients with hospital acquired pneumonia in predicting 28 day mortality, days on mechanical ventilation and ICU length of stay.

Patients and methods

This study had been conducted on 60 patients admitted to Alexandria University Hospital Critical Care Medicine Department in Egypt who developed hospital acquired pneumonia including ventilator associated pneumonia after approval of the local ethics committee of the faculty of medicine, Alexandria University. All patients met the criteria of developing pneumonia after 48 h of admission and they had new or progressive infiltrates on the chest X-ray with one of the 3 requirements of: fever more than 37.8 °C or purulent

Table 1 Area Under the Curve.

Test result variable(s)	Area	Std. error (a)	Asymptotic sig. (b)	Asymptotic 95% confidence interval	
				Lower bound	Upper bound
PSI (pneumonia severity index)	0.806	0.058	0.000	0.691	0.920
CurB-65	0.747	0.067	0.001	0.616	0.878
Modified ATS	0.772	0.061	0.000	0.651	0.892
IDSA/ATS	0.790	0.061	0.000	0.670	0.910
SOAR	0.734	0.066	0.002	0.605	0.863
SMART-cop	0.820	0.054	0.000	0.714	0.926
SMRT-Co Score	0.807	0.057	0.000	0.695	0.919