Validation of CURB-65 Scoring System in Indonesian Patients with HAP

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ABSTRACT

Background: *Hospital-acquired pneumonia (HAP) is a common infection occurring in hospitalized patients. CURB-65 (Confusion, Uremic, Respiratory, Blood Pressure, Age over 65) scoring system was developed to assess severity and risk in community-acquired pneumonia (CAP) but its use has not been validated in HAP patients in Indonesia.*
Objective: *To validate the performance of CURB-65 scoring system to predict mortality in Indonesian patients with HAP.*
Methods: *This is a validation study with retrospective cohort design. Data were taken from medical records in Cipto Mangunkusumo Hospital, Jakarta, Indonesia, from January 2006 to December 2012. Among 204 recruited HAP patients, 171 patients with complete data were included. Hosmer-Lemeshow test was conducted to test the accuracy and area under Receiver Operating Curve (ROC) was calculated to discriminate the performance of CURB-65 scoring system. The specificity and sensitivity value of CURB-65 to predict mortality in HAP patients were analyzed. Statistical analysis was performed using SPSS 16.0.*
Results: *The overall mortality proportion is 42.7%. Hosmer-Lemeshow test shows good accuracy (p=1.00). The area under the ROC is 0.376, showing bad discriminating performance of CURB-65 scoring system. Using the cut-off value of score 2, the sensitivity of CURB-65 is 71.2% and its specificity is 42.9% to predict mortality in HAP.*
Conclusion: *CURB-65 has low specificity and sensitivity value to predict mortality in HAP patients.*

Key words: *CURB-65, hospital-acquired pneumonia*

ABSTRAK

Latar belakang: *Hospital-acquired pneumonia (HAP) merupakan infeksi yang umum menyerang pasien rawat inap. Sistem skor CURB-65 (Confusion, Uremic, Respiratory, Blood Pressure, Age over 65) dibuat untuk menilai beratnya penyakit dan risiko kematian pada pneumonia komunitas. Kegunaannya dalam memprediksi mortalitas pada pasien HAP di Indonesia belum divalidasi.*
Tujuan: *Memvalidasi sistem skor CURB-65 dalam memprediksi mortalitas pada pasien HAP di Indonesia.*
Metode: *Studi ini merupakan uji validasi berdesain kohort retrospektif. Data diambil dari rekam medis Rumah Sakit Cipto Mangunkusumo, Jakarta, pada periode Januari 2006 sampai Desember 2012. Dari 204 pasien HAP, terdapat 171 pasien dengan data lengkap yang menjadi subjek penelitian. Uji Hosmer-Lemeshow dilakukan untuk menguji akurasi dan area di bawah Receiver Operating Curve (ROC) dihitung untuk mengetahui kemampuan diskriminasi sistem skor CURB-65. Sensitivitas dan spesifisitas CURB-65 untuk memprediksi mortalitas pasien HAP turut dianalisis. Analisis statistik dilakukan dengan SPSS 16.0.*
Hasil: *Proporsi mortalitas total pasien HAP adalah 42,7%. Uji Hosmer-Lemeshow memperlihatkan akurasi yang baik (p=1,00). Area di bawah ROC bernilai 0,376, yang berarti sistem skor CURB-65 memiliki kemampuan diskriminasi yang kurang baik. Dengan titik potong pada skor 2, sensitivitas dan spesifisitas sistem skor CURB-65 dalam memprediksi mortalitas pasien HAP adalah 71,2% dan 42,9%.*
Kesimpulan: *Sistem skor CURB-65 memiliki sensitivitas dan spesifisitas yang rendah dalam memprediksi mortalitas pada pasien HAP.*

Kata kunci: *CURB-65, hospital-acquired pneumonia*

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INTRODUCTION

Pneumonia is one of the most common nosocomial infections occurring in hospitalized patients. Hospital-acquired pneumonia (HAP) is pneumonia that occurs more than 48 hours after admission and without any antecedent signs of infection at the time of hospital admission.[1] Distinguishing HAP from community-acquired pneumonia (CAP) is important, as patients with HAP are susceptible to pneumonia from a different and potentially more virulent spectrum of organisms. The impact of pneumonia on health care is significant in terms of morbidity, cost and likely patient mortality.[2-4]

CURB-65 (Confusion, Uremic, Respiratory, Blood Pressure, Age over 65) scoring system is a tool for assessing severity and risk in CAP patients. CURB-65 was developed in 2003 by Lim et al and is simpler to use than the Pneumonia Severity Index (PSI).[5] In the United Kingdom, the BTS guidelines promote the use of CURB-65, which is based on four bedside and one laboratory-based prognostic markers.[5] CURB-65 was shown to have 75% sensitivity and 75% specificity for predicting death in 30 days of CAP in the validation set of a large prospective multicenter, multinational derivation/validation study.[5] More recently, compared with the PSI, CURB-65 was shown to have equivalent performance.[6,7]

To date, there is only one study that validated the use of CURB-65 in HCAP.[8] In Indonesia, CURB-65 has been validated in CAP[9] but has never been in patients with HAP. Therefore, this study seeks to validate the performance of CURB-65 scoring system to predict mortality in Indonesian patients with HAP.

METHODS

This is a validation study with retrospective cohort design. Data were taken retrospectively from medical records of Cipto Mangunkusumo National Referral Hospital, Jakarta, Indonesia, from January 2006 to December 2012. CURB-65 score is a six-point scoring with one point for each: confusion, urea >7 mmol/l, respiratory rate ≥30/minute, low systolic (<90 mmHg) or diastolic (≤60mmHg) blood pressure and age ≥65 years.[5] The definition of hospital-acquired pneumonia as stated by the Centers for Disease Control and Prevention (CDC) is as follows:[10]

•• Radiology, two or more serial chest radiographs with at least one of the following:
  •• New or progressive and persistent infiltrate
  •• Consolidation
  •• Cavitation
•• Signs/symptoms/laboratory results, at least one of the following:
  •• Fever (>38⁰C or >100.4⁰F) with no other recognized causes
  •• Leukopenia (<4000 white blood cell count per microliter [WBC/mL]) or leukocytosis (>12,000 WBC/mL)
  •• For adults 70 years old or older, mental status changes with no other recognized causes
•• And at least two of the following:
  •• New onset of purulent sputum, or change in character of sputum, or increased respiratory secretions, or increased suctioning requirements
  •• New-onset or worsening cough, or dyspnea, or tachycardia
  •• Rales or bronchial breath sounds
  •• Worsening gas exchange (PaO2/fraction of inspired oxygen [FIO2] <40%), increased oxygen requirements, or increased ventilation demand.

The patients were excluded if they had any one of the following conditions: (1) younger than 18 years old; (2) their pneumonia developed within two days after admission; (3) VAP or HCAP patients; (4) inadequate data for scoring.

A total of 204 HAP patients were recruited and 171 patients with adequate data (with all variables for calculating all scoring indices available at diagnosis) were studied. The study was approved by the institutional ethical committee. We used Hosmer-Lemeshow test for accuracy and area under Receiver Operating Curve (ROC) for discriminating performance of CURB-65 scoring system. We also analyzed the specificity and sensitivity value of CURB-65 to predict mortality in HAP patients. Statistical analysis was performed using SPSS version 16.0.

RESULTS

There were 171 patients included, all with complete data. The overall mortality proportion of our HAP patients is 42.7%. The component and distribution number of patients with CURB-65 are

as follows: confusion 19%, uremia 37%, respiratory rate >30x/minute 16%, low blood pressure 6% and age over 65 years old 22%. There are 63 patients with score 0; 52 patients with score 1; 37 patients with score 2; 17 patients with score 3; and only 2 patients with score 4. No patient has score 5. Hosmer-Lemeshow test shows very good accuracy with p value 1.00. The area under the ROC is 0.376, showing bad discriminating performance of the scoring system.

Mortality proportion increases in accordance to increment of CURB-65 score, from 33% of mortality in score 0, 44% mortality in score 1, 38% mortality in score 2, 76.5% mortality in score 3, to 100% mortality in score 4. Using the cut-off value of score 2, the sensitivity of CURB-65 is 71.2% and its specificity is 42.9% to predict mortality in HAP.

DISCUSSION

This study shows that CURB-65 has good accuracy to predict mortality but bad discriminating performance, with the AUROC (AUC) below 0.70. The AUC is a measure of the accuracy of a test to correctly classify patients with and without a particular outcome and is used frequently in studies of severity assessment in CAP. The AUC describes the relationship between sensitivity and specificity; a higher AUC implies a less steep trade-off between sensitivity and specificity. An AUC is considered to have moderate discriminating power from a value of 0.70 on up.[8] We conducted this retrospective review of 171 medical records and assessed the validity of CURB-65. The sensitivity and specificity was low .

Several predictors of mortality of HAP are old age,
decrease of consciousness, sepsis and septic shock, hypoalbuminemia, compromised immune system, late-onset HAP and the presence of comorbidities. CURB-65 scoring system only addresses some of these predictors. Hypoalbuminemia, comorbidities and immune status are not covered. This, in part, explains the reason CURB-65 is not a good predictive tool to HAP mortality. Secondly, the mortality of HAP is high. In this study, the all-cause in-hospital mortality is 42.7%, differing a lot from mortality of CAP, which is only less than 6%. The third reason is that there is no patient with score 5, which affects the statistical analysis. Moreover, the increment of score is not always
in line with the increment of mortality, as shown in score 1 with 44% mortality but the mortality decrease

to 38% in score 2. For comparison, CURB-65 predicts mortality in CAP as such: score 0, 0.7%; score 1, 3.2%; score 2, 3%; score 3, 17%; score 4, 41.5% and score 5, 57%.[5] This shows a great difference of mortality in CAP and HAP.

Indonesian validation study of CURB-65 in CAP showed that CURB-65 has sensitivity of 13.73% and specificity of 98.13%. The AUC of CURB-65 was 0,625 (95% CI 52,8%-72,3%, with p=0,011). CURB-65 has low AUC (<0.70) in predict ing CAP mortality.[9] In HAP patients, the performance of CURB-65 is even worse, with AUC 0.376 .

CONCLUSION

CURB-65 has low specificity and sensitivity value to predict mortality in HAP patients. Therefore, another scoring system ought to be developed to better predict mortality in Indonesian HAP patients.

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