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Impact of Eastern Cooperative Oncology Group Performance Status on hospital mortality in critically ill patients ☆,☆☆

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Validation of Simplified acute physiology score 3 in Korean Intensive care unit (VSKI) study group and the Korean Study Group on Respiratory Failure (KOSREF)

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ABSTRACT

Introduction: This study evaluates the association between the Eastern Cooperative Oncology Group Performance Status (ECOG-PS) and hospital mortality in general critically ill patients.
Materials and Methods: This is a retrospective cohort study that analyzes prospective collected data from the Validation of Simplified acute physiology score 3 in Korean Intensive care unit study. The study population comprised patients who were consecutively admitted to participating intensive care units from July 1, 2010, to January 31, 2011. Univariate and multivariate logistic regression models were used to evaluate the effect of ECOG-PS on hospital mortality.
Results: A total of 3868 patients were included in the analysis. There was a significant trend for increasing hospital mortality as the ECOG-PS grade became higher ($P < .001$). There was a trend of increasing adjusted odds ratio for hospital mortality, with grade 1 of PS 1.4 (95% confidence intervals [CIs], 1.0-1.8), grade 2 of PS 2.0 (95% CIs, 1.5-2.7), grade 3 of PS 2.9 (95% CIs, 2.1-4.1), and grade 4 of PS 2.5 (95% CIs, 1.6-3.9). Also, there was a significant difference in all grades. Subgroup analysis showed a trend of increasing hospital mortality regardless of the presence of cancer.

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Conclusion: Preadmission PS, assessed with ECOG-PS in critically ill patients, has prognostic value in general critically ill patients.

1. Introduction

Physicians evaluate patients' performance status (PS) to assess how a patient's disease is progressing, to assess how the disease affects the daily living abilities of the patient, and to determine appropriate treatment and prognosis. Among the various scales for evaluating PS, the Eastern Cooperative Oncology Group Performance Status (ECOG-PS)—also known as Zubrod score or World Health Organization score—is the most widely used scale in practice [1]. It has been established that ECOG-PS and prognosis are strongly associated in patients with cancer [2-7]. Furthermore, because of its simplicity, the ECOG-PS is very popular and also used in patients with other diseases [8-10].

Performance status of critically ill patients before the event leading to intensive care unit (ICU) admission might be an important prognostic factor regardless of severity of physiologic derangement that patients show at ICU admission. According to the previous studies, PS was associated with mortality of critically ill patients with cancer [11-14], and the same association was found among elderly patients without cancer who were admitted to the ICU [15-17]. However, no study has evaluated the impact of PS using ECOG-PS in general critically ill patients. This study aims to evaluate the association between ECOG-PS and hospital mortality in general critically ill patients.

2. Materials and methods

2.1. Study design and population

This study used data from the Validation of Simplified acute physiology score 3 in Korean Intensive care unit (VSKI) study, a nationwide, multicenter, prospective study to evaluate the prognostic performance of the Simplified Acute Physiology Score 3 (SAPS3) in a large prospective cohort in Korea [18]. The VSKI study was conducted by the Korean Study Group on Respiratory Failure between July 1, 2010, and January 31, 2011. It included patients from 22 ICUs (medical, 14; surgical, 6; and multidisciplinary, 2) in 15 tertiary or university-affiliated hospitals. A total of 4617 patients were admitted to 22 designated ICUs during the study period; after excluding patients younger than 17 years who had uncertain hospital mortality or who were transferred from other participating ICUs, 3868 patients were included in the study. Only the data from the first ICU admission were included in the VSKI study if patients had more than 1 ICU admissions during the same hospital stay. Details of the VSKI study are described elsewhere [18]. For this study, we also excluded patients whose ECOG-PS was not assessed or hospital mortality was uncertain. The study was approved by the institutional review boards of each participating hospital, and the requirement for an informed consent was waived because of the noninterventional nature of the study.

2.2. Measurements

The ECOG-PS was asked of patients or family members by clinicians at each ICU: What were the patients like 1 month before the date of ICU admission. Performance status assigned from grades 0 to 4 according to the ECOG-PS classification. Grade 0 is for patients fully active and able to carry out all predisease performance without restriction; grade 1 is for patients restricted in physically strenuous activities but ambulatory and able to carry out work of a light or sedentary nature, for example, light housework or office work; grade 2 is for ambulatory patients capable of self-care but unable to carry out any work activities, up to more than 50% of their waking hours; grade 3 is for patients capable of limited self-care and are confined to a bed or chair for more than 50% of their waking hours; and grade 4 is for completely disabled patients who cannot carry out any self-care and are totally confined to a bed or chair [1].

Clinical data including age, sex, comorbidity, and presence of cancer were collected from electronic medical records. Comorbidity included hypertension, diabetes mellitus, stroke, ischemic heart disease, congestive heart failure, chronic obstructive pulmonary disease, chronic pulmonary failure, chronic renal failure, or immunosuppressive disease. Location before ICU admission, reasons for ICU admission, surgical status at ICU admission, need of mechanical ventilation, and necessity of renal replacement therapy at ICU were included as ICU-related measurements. As outcome measures, hospital mortality, length of hospital stay, ICU mortality, and length of ICU stay were collected.

Initial Sequential Organ Failure Assessment (SOFA) and SAPS3 score were also calculated and included as confounders. Acute physiologic score (APS) was also made by summing 10 physiologic components of SAPS3. The definitions of variables used in the original SAPS3 model were used for this study [19]. All data were collected using a Web-based database.

2.3. Statistical analysis

Differences in baseline characteristics by ECOG-PS were compared by using analysis of variance or Kruskal-Wallis for continuous variables and χ^2 test for categorical variables, as appropriate. Test for trend was also performed for each variable by ECOG-PS.

Univariate and multivariate logistic regression models were used to evaluate the effect of ECOG-PS on hospital mortality. In the multivariate model, age, sex, comorbidities, presence of cancer, unplanned ICU admission, surgical status, renal replacement therapy, APS, and treating centers were adjusted. With both univariate and multivariate logistic analysis, hierarchical model was used, considering that treating centers could influence the study results. In addition, we performed subgroup analysis according to the presence of cancer and the surgical status. Corresponding odds ratio (OR) and 95% confidence intervals (CIs) were reported. Areas under the receiver operating characteristic curves were used to evaluate discrimination of the final model, and the Hosmer-Lemeshow goodness-of-fit test assessed the applicability of the models to individual cases. Statistical significance in this study was set as $P < .05$. All statistical analyses were performed using STATA 12.0 (StataCorp, College Station, Tex).

3. Results

3.1. Patients and basal characteristics

Of the 4617 patients in the VSKI cohort, 749 patients were excluded either because ECOG-PS was not recorded (n = 394) or because their hospital mortality was not known (n = 355). Although comorbidity (57.5% in included patients vs 61.9% in excluded patients) and location before the ICU admission were significantly different between included patients and excluded patients, key clinical characteristics including age, sex, unplanned admission, and renal replacement therapy were not statistically different between the groups (data not shown). In the final analysis, a total of 3868 patients were included.

The baseline characteristics of included patients stratified according to the ECOG-PS grade are described in Table 1. Among all patients,