

Veterans Health Administration COVID-19 Index to Risk Stratify the Geriatric Population with COVID-19 Infection

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ABSTRACT

The risk for severe illness with coronavirus disease-2019 (COVID-19) increases with age, with older adults at highest risk. Adults 65-years-old and older who were fully vaccinated with an mRNA COVID-19 vaccine had a 94% reduction in risk of COVID-19 hospitalizations, and vaccination was 64% effective among those who were partially vaccinated.

Keywords: Charlson comorbidity index, COVID-19, Vaccination, Veterans Health Administration COVID-19 vaco index.

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HIGHLIGHTS

The risk for severe illness with coronavirus disease-2019 (COVID-19) increases with age, with older adults at highest risk. It is observed that adults above 65 years of age who were fully vaccinated with an mRNA COVID-19 vaccine had a 94% reduction in risk of COVID-19 hospitalizations. Single dose of vaccination was also found to be 64% effective.¹

INTRODUCTION

Multiple studies have identified risk factors for mortality associated with (COVID-19) in inpatients.² Lockdown has been very successful during the first wave in preventing infection for senior citizens. However, as the authorities relaxed the guidelines, we witnessed an unprecedented number of deaths in elderly population especially during the second wave. There is a strong need for a reliable means of identifying those at greatest risk should they become infected to inform personal choice and public policy.

The Veterans Health Administration COVID-19 (VACO) Index incorporates age, sex, and preexisting illnesses to predict 30-day all-cause mortality in patients infected with SARS-CoV-2. VACO Index was developed based on 3,681 SARS-CoV-2-positive patients' records from Veterans Healthcare Administration national electronic health records. It was prospectively internally and externally validated in 9,642 veterans. VACO Index includes age, sex, and comorbidity quantified with the Charlson comorbidity index derived from International Classification of Diseases 10th edition. In this study, we applied VACO index to patients above 60 years presented to our Emergency Department who tested reverse transcription polymerase chain reaction positive for SARS-CoV-2 infection during the period December 1–December 31, 2020.

The primary aim was to validate VACO index and 30-day mortality in the geriatric cohort of COVID-19-positive hospitalized patients. The secondary aims were to find out the correlation between specific comorbidities especially hypertension and alcoholism with 30-day mortality as these were most commonly seen in our patients.

METHODOLOGY

The data of 58 patients were retrieved from their medical records. The study investigators were involved in the initial triage and

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emergency resuscitation of these patients and had no influence on the COVID treatment given to patients in this study. The VACO Index was calculated using MDCalc software that is available online on MDCALC solutions.³ Patients were telephonically interviewed to assess the 30-day mortality. We also evaluated the effect of hypertension and alcoholism on COVID mortality that was not included in the original VACO Index.

All statistical analyses were performed using PSpP version 1.2.0 software. The variables underwent multivariate logistic regression. We assessed the VACO Index and its association with 30-day mortality using logistic regression. A *p*-value of ≤ 0.05 was considered significant. Area under the curve (AUC) was calculated for the parameters that achieved high statistical significance.

RESULTS

Forty-eight point twenty-seven percent of our study population succumbed to the disease; 41 patients had moderate to severe COVID infection and 58.62% of deaths happened in males. The early signs of severe infection, i.e., tachycardia, mean arterial pressure, tachypnea, poor oxygen saturations, and rate pressure product. As compared to nonsurvivors, survivors had better mean pulse rates (101.35 vs 95.06), higher mean arterial pressures (78.78 vs 88.33), less tachypnea (28.28 vs 24.43), better SpO₂ (85.71 vs 89.79), and higher rate pressure product (10515.71 vs 11100.33). The need for O₂ therapy (i.e., >10 L/minute) and early institution of vasopressor therapy (noradrenaline) was seen in 21/28 and 19/28 patients who didn't

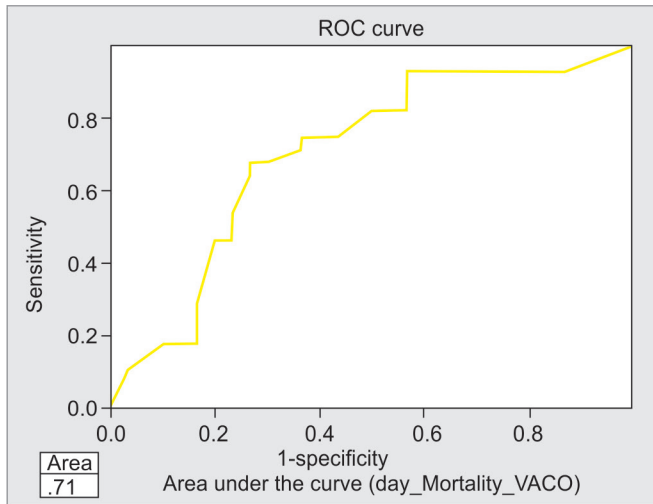


Fig. 1: Receiver operating characteristic curve_VACO index

survive the disease. The O_2 requirement was almost similar among those who survived, but the need for hemodynamic support was distinctly very less.

VACO index and mortality in our 58 patients have positive association and are significant with a p -value of 0.022 with an AUC of 0.71 (Fig. 1). Significant correlation was present between history of diabetes ($p = 0.006$), chronic alcohol abuse ($p = 0.015$), and 30-day mortality in our study. However, the association of hypertension was not found to be a statistically significant factor pointing to mortality ($p = 0.435$). The other parameter that achieved individual statistical significance was a history of chronic obstructive lung disease ($p = 0.054$).

DISCUSSION

Various epidemiological studies from India and all over the world have identified old age as a risk factor for mortality in COVID infection.^{4,5} The risk is substantially amplified in the presence of comorbidities. The original authors of VACO index King et al.⁶ had studied 13,323 individuals who tested positive for SARS-CoV-2 with a median age of 63 years and 91% males with 42% being non-Hispanic Blacks. 480/3,681 (13%) deaths were observed during the development phase of the index which could be correctly predicted with the index. Similarly, 253/2,151 (12%) deaths in the early validation cohort and 403/7,491 (5%) deaths in the late validation cohort were noted. Age, multimorbidity described with Charlson comorbidity index, and a history of myocardial infarction or peripheral vascular disease were independently associated with mortality, and no other individual comorbid diagnosis provided additional information. These were statistically significant when expressed as receiver operating characteristic curves. The VACO Index discriminated mortality in development [AUC = 0.79, 95% confidence interval (CI): 0.77–0.81] and in early (AUC = 0.81, 95% CI: 0.78–0.83) and late (AUC = 0.84, 95% CI: 0.78–0.86) validations. The VACO Index allows individualized estimates of 30-day mortality after COVID-19 infection. For example, among those aged 60–64 years, overall mortality was estimated at 9% (95% CI: 6–11%). The Index further discriminated risk in this age stratum from 4% (95% CI: 3–7%) to 21% (95% CI: 12–31%), depending on sex and comorbid disease.

Further, the same group of authors have verified their score in 428,531 patients for predicting short-term mortality. They concluded that among COVID-19-positive individuals, the VACO Index accurately estimates risk of early death among a wide variety of patients. Recent trials have shown overestimation of the risk of short-term mortality using VACO index, however, it is consistent in identifying the elderly with greatest relative risk.⁷

Our study had a small sample size due to less number of elderly patients admitted to our center with proven infection. The score was developed in the early phase of pandemic. The mortality rates have come down now as the testing and treatment algorithms have improved significantly. As a single parameter, age did not show statistically significant correlation for 30-day mortality in our study as all the participants were more than 60 years of age. The limitation of the score is that it does not help to differentiate mortality risk for patients with variable severity of infection. Patients who were hypoxic and had severe COVID at the onset did not change the score if they got more sick.

CONCLUSIONS

VACO index can help the policy makers at hospital and government levels in identifying and alerting patients who are at high risk so that they should take measures to avoid exposure, even though the numbers of infected cases is presently decreasing. It can also guide the healthcare workers to provide admission and inpatient monitoring for patients with high scores. Most importantly, it can help the public to understand the need for definitive prioritization of vaccines for the senior citizens in every home.

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