Abstract No: PO-28

Factors Associated with the Post-operative Mortality following Vascular Surgeries: A Case Study

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Vascular surgery is a subspecialty of surgeries performed on vascular system, which is a combination of arteries, veins and lymphatic system, excluding intracranial (brain connected) and coronary (heart connected) arteries. Vascular surgeries are performed on patients with comorbidities. Thus, there exist a high risk of vascular surgical mortality. The study aims to identify factors associated with mortality following vascular surgeries. The complete case analysis was performed using 658 complete cases of patients followed vascular surgeries at National Hospital of Sri Lanka, during the period from Jan-2016 to July-2018. Data were gathered from National Intensive Care Surveillance (NICS), Ministry of Health, Sri Lanka. Random forest technique was applied to identify the important variables displaying strong association with mortality status which is a dichotomous variable. Binary Logistic Regression and Bias Reduction in Generalized Linear Models were used to identify the factors associated with the response with randomly selected train set of 80% of the data. The mortality rate of patients of the cohort was 5.02%, which lead the data to owe issues related to rare event analysis. 70.52% of the patients under study were males. Patient presenting complaint on left side or right side when compared to patient presenting complaint on both sides would decrease the probability of death by 1.9864×10^{-5} and by 1.9178×10^{-5} respectively. Patient having minor operative severity when compared to patient having major operative severity would decrease the probability of death by 1.9424×10^{-5}. Increase in White Blood Cell composition of patient by one unit, (from 0 cells/μl to 1 cells/μl), would increase the probability of mortality by 6.5183×10^{-6}. Increase in age of patient by one unit, (from 0 to 1 yrs), would increase the probability of mortality by 2.2826×10^{-6}. Increase in platelet composition of patient by one unit, (from 0 cells/μl to 1 cells/μl), would decrease the probability of mortality by 2.1475×10^{-7}. Increase in potassium composition of patient by one unit, (from 0 mmol/L to 1 mmol/L), would increase the probability of mortality by 1.0557×10^{-4}. Thus, White blood cell composition (WBC) in blood of the patient, presenting side (left) of the complaint, presenting side (right) of the complaint, age of the patient, operative severity (minor) of the wound, platelets composition and potassium composition in blood of the patients have been significant at 5% level of significance for patients following vascular surgeries with a model accuracy of 96.21% on randomly selected test set of 20% of the data for the Binary Logistic Regression model.

Keywords: Vascular Surgical Mortality, Binary Logistic Regression, Bias Reduction in Generalized Linear Models