

Letter to the Editor

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Letter by Zheng and Niu Regarding Article, “Cerebrovascular Accidents During Mechanical Circulatory Support: New Predictors of Ischemic and Hemorrhagic Strokes and Outcome”

To the Editor:

We read with great interest the article by Izzy et al¹ in a recent issue of *Stroke*. The results of the study showed that chronic obstructive pulmonary disease increases the risk of ischemic stroke in patients on left ventricular assist devices (LVADs) support, whereas dialysis may increase the risk of hemorrhagic stroke. In addition, the authors concluded that post-LVAD hemorrhagic stroke was associated with higher mortality compared with ischemic stroke. We have several concerns about the study.

First, the results of the multivariable logistic regression showed that both post-LVAD ischemic stroke (odds ratio, 3.17; 95% CI, 1.13–8.85; $P=0.028$) and post-LVAD hemorrhagic stroke (odds ratio, 3.92; 95% CI, 1.34–11.45; $P=0.013$) were associated with increased mortality. Even though the effect estimates (ie, odds ratios) are somewhat different, the 95% CIs overlap considerably. Hence, on basis of the current analysis, it is not possible to conclude that post-LVAD hemorrhagic stroke was associated with higher mortality compared with post-LVAD ischemic stroke.

Second, a recently published study suggested that the risk of post-LVAD stroke and death is bimodal, with the highest risk at the time of implant and increasing risk again after 9 to 12 months.² In addition, risk factors for ischemic and hemorrhagic stroke vary in the immediate postoperative period compared with the postdischarge period, which may be because anesthesia and surgery-related stroke risk factors are critical in the immediate postoperative period, whereas antithrombotic status and conventional stroke risk factors are critical in the postdischarge period.² If that is the case, the clinical reference value of the conclusions of the study by Izzy et al could be comprised because the lack of the implementation of distinguishing between immediate postoperative period and postdischarge period.

Third, it seems that all of the 18 variables were included in the multivariate logistic regression model at the same time when investigating the variables associated with post-LVAD mortality.

Including too many variables in the model may lead to a mathematically unstable outcome with decreased generalizability beyond the current study sample and lead to large SEs with wide and imprecise CIs.^{3,4} On the other hand, if included variables are highly correlated with one another (known as multicollinearity), the effect of each variable on the regression model becomes less precise.⁴ Table 2 in the study by Izzy et al showed that many variables were independently associated with stroke. For example, dialysis was highly associated with post-LVAD hemorrhagic stroke with a high hazard ratio (hazard ratio, 9.57; $P=0.005$). Thus, we recommend the authors using proper statistical methods such as inputting variables potentially related to mortality (eg, $P\leq 0.10$) into a multivariable logistic regression model and using a certain selection method (eg, stepwise backward selection).

Disclosures

None.

Bing-Kun Zheng, MSN

Neonatal Intensive Care Unit

The First Affiliated Hospital of Zhengzhou University

Zhengzhou, China



Peng-Peng Niu, MD, PhD

Department of Neurology

The First Affiliated Hospital of Zhengzhou University

Zhengzhou, China.

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Bing-Kun Zheng and Peng-Peng Niu

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