

## **Supplementary Discussion**

### **The controversy about the term “multivariate/univariate”**

The term "multivariable/univariable analysis" instead of "multivariate/univariate analysis" is sometimes recommended for regression analyses by several authors and guidelines because "variate" means random variable in statistics terminology [12]. If we literally follow the definition, "multivariate analysis" may only cover non-regression type analyses for multiple random variables (e.g., principal component analysis and factor analysis) or regression analyses with multiple outcome variables (e.g., multivariate analysis of variance). However, in most situations described as “multivariate analysis”, medical researchers’ intentions are clear: adjust for multiple covariates as explanatory variables in regression models. In fact, we usually model the conditional expectation  $E(Y|X)$  by regression analysis in observational studies where the joint distribution  $(X, Y)$  is not controlled by researchers. We thus believe that “multivariate adjustment” or “multivariate analysis” is not necessarily misuse of the terminology. We therefore adopted "multivariate/univariate analysis" in this study as this usage is more common in today's medical literature [12].