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Letter to the Editors-in-Chief

## Analysis of incidence of thrombotic complications in the presence of competing risks



Dear Editor,

The incidence of thrombotic complications reported in the study of Klok et al. is probably overestimated by Kaplan–Meier estimates of survival curves and Cox proportional hazard models [1]. In fact, because the mortality in this series was high, cumulative incidence functions and cause-specific subdistribution hazard model should be used to estimate the incidence of each of the different types of competing risks (i.e. deaths and thrombotic complications) and hazard ratios [2–4]. In fact, the occurrence of death alters the probability of experiencing thrombotic events, which is the event of interest.

In this situation, censoring subjects at the time of death may be unsuitable. First, standard analyses using Kaplan–Meier estimates of survival curves and Cox proportional hazard models may violate the assumption of non-informative censoring [2]. Indeed, it may be unreasonable to assume that patients who died can be represented by those who remained alive. Second, even when the competing events are independent, censoring patients at the time of the occurrence of death may lead to spurious results because the probability of thrombosis is interpreted as occurring in a setting where the censoring (e.g. death) does not occur [2]. As death is a competing risk event for thrombosis, the estimates must be calculated by appropriate models accounting to avoid the overestimation of the event of interest [3].

It is important that investigators be aware of appropriate methods to account for competing risks when analyzing survival data in the field of thrombosis, particularly when absolute

percentages of competing events are > 10% (e.g. cancer related thrombosis or thromboembolism in intensive care units) [2].

### References

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