A new AUC(t) estimator and its statistical properties for competing risks models

Leire Garmendia Bergés[1,2], Irantzu Barrio[2] and Guadalupe Gómez Melis[3]

[1]BCAM - Basque Center for Applied Mathematics

[2]Department of Mathematics, University of the Basque Country UPV/EHU

[3]Department of Statistics and Operations Research, Universitat Politècnica de Catalunya

Abstract

We have developed a competing risks model for patients with severe pneumonia who can transition to two competing events: the need for non-invasive or invasive mechanical ventilation (NIMV or IMV). This model can be used to predict the course of the disease for new patients, therefore measuring its predictive capacity is of great interest, for which the area under the time-dependent ROC curve (AUC(t)) parameter could be used. Different estimators for the partial AUC(t) of each transition ($AUC_k(t), k = 1, \ldots, K$) have been proposed in the literature. In this work, we propose an estimator for the global AUC(t) for a competing risk model ($\widehat{AUC}_{CR}(t)$) as a weighted sum of $\widehat{AUC}_k(t)(t), k = 1, \ldots, K$ with each $AUC_k(t)$ being weighted by the probability of experiencing that event k before time t. We have proved that $\widehat{AUC}_{CR}(t)$ is consistent and asymptotically normal.