Function implementation in R software to determine an optimal cut-point for a continuous covariate with competing risks

A first step consisted in the research of an optimal cut-point for the continuous covariate in presence of competing risks. We used maximally selected Gray's statistic.

We worked with a primary event: death on the waiting list and a competing risk: transplantation, in a sample of 584 observations with 353 possible unique values of LVWSI, denoted Z.

For each possible value of the continuous covariate Z fixed μ, we calculated with k=74 times of death on the waiting list:

$$U_\mu = \sum_{i=1}^{k} \left(d_i^+ - d_i \cdot \frac{r_i^{*+}}{r_i^*} \right)$$

With:

- d_i^+: The number of deaths in the group Z > μ at the ith time
- d_i : The total number of deaths at the ith time
- r_i^{*+}: The number at risk in the group Z > μ at the ith time & the number of patients in the group Z> μ which had observed the competing event before the ith time.
- r_i^*: The total number at risk at the ith time & the total number of patients which had observed the competing event before the ith time.

And we calculated the standardized statistic Q as:

$$Q_\mu = \frac{U_\mu}{\sigma\sqrt{D-1}}$$

Where $\sigma = \sqrt{\frac{1}{D-1} \cdot \sum_{i=1}^{D} \left(1 - \sum_{j=1}^{i} \frac{1}{D+1-j} \right)^2}$, with D=102 the total number of deaths.

Then, the optimal cut-point was determined by the maximum value of Q associated to the μ value: μ=64.1.

Bibliography

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