Methods to evaluate the relationship between survival times

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Abstract.

For two groups of patients selected by the value of a prognostic factor from a larger set, the common practice is to evaluate the difference by the logrank test with some variants. Now if we have a set of indexed rules that link the survival times of the two groups it is natural to choose the rules which minimize the logrank test. To find this minimum is a difficult task in the general case because the functions are not analytical ones. Our strategy is to transform the observations of one group by a set of predefined indexed rules to identify at least one rule that minimize the log rank test. If T is survival time for one group, let say basic group, we solved the problem for the sets of rules as $\{aT | a \ real \ value\}$, $\{a + T | a \ real \ value\}$ and $\{a + bT | a, b \ real \ value\}$. Mathematical foundations for an algorithm and a generalization for $\{ag(T) | a \ real \ value\}$, $\{a + g(T) | a \ real \ value\}$ and $\{a + bg(T) | a, b \ real \ value\}$ with $g(.)$ an increasing function are presented. For breast cancer, some examples solved by Mathematica programs are presented.

References

[1] Breslow, N. E. and Day N.E. *Statistical Methods in cancer research: volume II – The design and analysis of cohort studies*, IARC scientific publications, Lyon, 1987

[2] Collett, D., *Modelling survival data in medical research*, Chapman & Hall / CRC, London, 2003

[3] Crowley, J. and Ankerst, D. P., *Handbook of statistics in clinical oncology, 2-nd edition*, Chapman and Hall, London, 2006

[4] DeVita, V. T., Hellman, S. and Rosenberg, S. A., *Cancer principles & Practice of Oncology, 7-th edition*, Lippincot Williams & Wilkins, New York, 2004

[5] Esteve, J., Benhamou, S. and Raymond, L., *Methodes statistiques en epidemiologie descriptive*, INSERM, Paris, 1993

[6] Gill, R. D. and Keiding, N., *Statistical Models Based on Counting Processes*, Springer Verlag, London, 1993

[7] Hill, C., Com-Nouguee, C., Kramar, A. et al. *Analyse statistiquedes donees de Survie*, Flamarion, Paris, 1990

[8] Vitoc, C., Ghilezan, N., Todor, N. et al. *Ten Years Results for Operable Breast Cancer: Cancer Institute Cluj Experience – 1995-1996 Period. Abstract at http:www.srrom.ro*, Radioterapie si Oncologie Medicala, **13** (2007), No. 2, 219-228

[9] Wolfram, S., *Mathematica, A System for Doing Mathematics by Computers*, Addison-Wesley, New York, 1991

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