A competing risk approach to estimate maximum follow-up for cancer patients

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After curative treatment for cancer, patients enter into post-therapeutic surveillance phase. The main objective of this phase is to detect potential curative events at an early enough stage so as to propose a therapeutic intervention with curative intent. For cancer sites with good prognosis, the hospital resources required for annual follow-up visits are financially significant. It thus seems important to answer the question: "After how many years of post-treatment, can follow-up be stopped without significantly reducing the chance of detecting a potential curative event?"

Mould et al. (1) predicted with a simple formula how long early-stage breast cancer patients should be followed after treatment. The Boag model (2) was used to estimate the proportion of patients with potentially curable loco-regional recurrence after the end of follow-up. However, this method only takes into account one single event type. We propose a generalization of this method, using competing risks, by considering several event types with different probabilities of cure. The direct approach with an improper Gompertz distribution proposed by Jeong and Fine (3,4) was used to model cumulative incidence. The proportion of patients who experienced an event after the end of follow-up and who could have been successfully treated was estimated. Prognostic factors can be taken into account, leading to proportional hazards or proportional odds models. The use of this methodology is illustrated by several examples.

Keywords: Competing Risks, Cumulative Incidence Function, Direct Approach, Follow-Up, Cancer.

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