Estimating Relative Survival and Heterogeneity in Treatment Effect for Stage IV Non-small Cell Lung Cancer Patients

Yunting Fu *, Winson Cheung ‡, Truong-Minh Pham *, Lorraine Shack *

* CancerControl Alberta, Alberta Health Services; ‡ Departments of Medicine, & Community Health Sciences, University of Calgary

Methods

1. Relative Survival Analysis
   1) The Ederer II method (Ederer and Heise, 1959)
   2) Hakulinen-Tenkanen additive model (1987)

2. The Heterogeneity of Treatment Effect
   1) The Stabilized Inverse Probability Weighting
      - Balance the covariates across treated and control groups
   2) FindIt Method
      - Subgroup analysis method developed from the penalized regression framework with a Lasso penalty

Results

• Our data included 9717 patients, with 71.3% of them received chemotherapy treatment
• The patients in the non-chemotherapy group were older, compared to the chemotherapy group (age ≥ 70: 56.1% vs. 29.8%)
• Most of the patients in the chemotherapy group were female (50.4%) and had a Charlson index equal to 0 (52.6%)
• The chemotherapy group shows a higher ASRS rate, ranging from 37.2% to 2.6% for the first five years, compared to another group (ranging from 10.1% to 0.9%)
• This trend is more obvious among female patients, with five year ASRS ranging from 41.9% to 3.0% for the chemotherapy group and from 11.4% to 1.3% for non-chemotherapy group
• After adjusting for the covariates such as age, gender, diagnosis year and Charlson Index, the chemotherapy group shows a lower risk, with a hazard ratio equal to 0.68 (95% CI: 0.67, 0.69)
• Subgroup analysis: female patients between age 60 and 70, with a Charlson index smaller than or equal to 2, and an upper or lower lobe tumor

Conclusions

• NSCLC patients have a higher relative survival rate after receiving chemotherapy treatment, especially for a short-term period
• The estimation obtained from the Hakulinen-Tenkanen additive model also echoes the positive finding, that patients received chemotherapy show a lower risk
• The subgroup analysis results shed some lights on the potential patient subgroups who are more likely to benefit from chemotherapy. It could provide research hypotheses for future studies as well as developing personalized medicine