Surgery plays a principal role in the exact management, diagnosis and staging of non-small cell lung cancer. Lung resection offers the most probable of cure for localized primary lung cancer patients, which is highly associated with mortality, a risk of decreased postoperative lung function, and other complications [1,2]. One of the most fundamental criteria of fitness for lung resection surgery is a preoperative forced expiratory volume in 1 second (FEV1) >2.0 litre (for pneumonectomy), or >1.5 litre (for lobectomy), which shows the suitability for surgery. However, lower FVE1 values invite further diagnosis of respiratory function. Thus, the principal hypothesis in the report is: what are the variables/factors that decrease or increase the FEV1 values? Note that the response FEV1 is a continuous, positive and non-constant variance random variable. The determinants of FEV1 can only be derived with suitable probabilistic modeling. As FEV1 is a positive and heteroscedastic, it should be modeled by joint generalized linear models (JGLMs) with Gamma or Log-normal distribution, which is clearly explained in [3-5]. The report examines the above hypothesis with a real data set using JGLMs.

The considered data set was obtained from 470 primary lung cancer patients having major lung resections during the years 2007 to 2011 at Wroclaw Thoracic Surgery Centre. The data set is displayed in UCI Machine Learning Repository. The data collection method, and along with 17 covariates description is given in [6]. For necessary use of the covariates, they are restated as follow.

- Diagnosis (DGN)-specific combination of ICD-10 codes for primary (=1), secondary (=2), and multiple tumours (=3) if any (DGN3, DGN2, DGN4, DGN6, DGN5, DGN8, DGN1),
- Volume that has an exhaled at the end of the first second of forced expiration (FEV1),
- Forced vital capacity (FVC),
- Performance status in Zubrod scale (PRZ) (PRZ2=3, PRZ1=2, PRZ0=1),
- Haemoptysis before surgery (HBS) (True (T)=2, False (F)=1),
- Pain before surgery (PBS) (True (T)= 2, False (F) =1),
- Dyspnoea before surgery (D8S) (T=2, F=1),
- Weakness before surgery (T=2, F=1),
For the above data set, the determinants of FEV1 are identified in the report using JGLMs. Here FEV1 has been considered as the response and the remaining others are considered as the explanatory variables of it. It has been modeled using both the distributions Log-normal and Gamma distributions [3-5]. Final model has been accepted based on model diagnostic check and the lowest value of Akaike information criterion value [7]. Some related studies are given in [8,9]. Based on the approximately true derived model of FEV1, the following influential factors of FEV1 can be noted.

- FEV1 is positively associated with force vital capacity (FVC) (P<0.0001), indicating that FEV1 is higher if FVC is higher. Note that FEV1 is the air quantity that an individual can forcefully exhale in 1s of the FVC test.
- FEV1 variance is negatively associated with FVC (P<0.0001), implying that it increases as the FVC decreases.
- FEV1 variance is negatively associated with age (P<0.0001), concluding that it is higher at younger age than older.
- FEV1 variance is negatively associated with performance status (PRZ) (PRZ2=3, PRZ1=2, PRZ0=1) at level (PRZ2) (P<0.0001) and (PRZ1) (P<0.0001), interpreting that it is higher at level PRZ0 than for lung cancer patients at levels PRZ1 & PRZ2.
- FEV1 variance is positively associated with haemoptysis before surgery (HBS) (T=2, F=1) (P<0.0001), implying that it is higher for lung cancer patients with HBS than without.
- FEV1 variance is positively associated with dyspnoea before surgery (DBS) (T=2, F=1) (P<0.0001), implying that it is higher for lung cancer patients with DBS than without.
- FEV1 variance is positively partially associated with smoking habit (T=2, F=1) (P=0.0837), concluding that it is higher for smoker lung cancer patients than non-smokers.

Note that in Epidemiology, partially significant effects are known as confounders. Here the confounders around 15% level of significance are included in the model. The above associations of FEV1 are summarized in (Table 1). It is found herein that younger lung cancer patients with performance status PRZ=0 have higher FEV1. Older lung cancer patients...
without pain or dyspnoea before surgery should be diagnosed very carefully.

ACKNOWLEDGEMENT

This research was supported by the Brain Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Science, ICT & Future Planning (2014M3C7A1062896).

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