We appreciate the comments by Yamamoto et al. [1] regarding our recent article [2]. We understand the questions regarding our statistical methods with respect to the propensity matching, but in our opinion, the methods used were appropriate in addressing the question of whether video assisted thoracic surgery (VATS) lobectomy is oncologically equivalent to open lobectomy with respect to overall and disease-free survival.

By using propensity score matching (PSM), we attempted to reduce the bias due to confounding variables that could be found in an estimate of the open vs VATS lobectomy effect obtained from simply comparing overall survival outcomes among subjects [3]. It is well known that in observational studies, the treatment group often exhibits imbalance on covariates. This imbalance will also be confounded with treatment, and it is difficult to attribute differences in main outcome to the treatment, as the covariates are also believed to influence the outcome. Inability to balance confounders through some mechanism, will show that the treatment groups are not sufficiently overlapping with respect to these confounders and that selection bias may not be resolvable. Therefore, our use of PSM was an attempt to mimic randomization by creating a sample of patients who had open lobectomy, which is comparable on most available covariates to a sample of subjects who had VATS lobectomy. In particular, in our study we were interested in matching patients who were similar except for the operative approach so that we could compare the lung cancer survival for each approach. Among the five covariates we used, histology was known preoperatively because of a preoperative biopsy. We used pathological stages as we were interested in survival, and pathological stage is more accurate than clinical stage. For example, a patient may be clinical T1 N0 but pathological stage T1 N1 or T1 N2, which would give them a significantly different prognosis.

Shadish et al. [4] argue that PSM requires large samples, overlap between treatment and control groups must be substantial, and hidden bias may remain after matching, because the procedure only controls for observed variables (to the extent that they are perfectly measured), to be more accurate, as one of the disadvantages. Hence, our work was focused on investigating any difference in survival outcome after balancing the impact of the covariates including pathological T and N, which was known to predict oncologic prognosis.

The other point mentioned as an option was the use of simple multivariable analysis as adjustment. We agree that one can proceed in that direction if the research question directs to that. However, in our case, as our research interest was to see the impact of operative approach, it was advantageous to have patients comparable in most aspects. Liem et al. [5] further explained the advantages of propensity score-stratified vs traditional multivariable-adjusted modeling. One of the advantages of the PSM model is that it does not need to be parsimonious and is easy to understand because it is not the focus of the study other than balancing the covariates included in the model.

In conclusion, we believe that PSM allowed us to compare two groups of patients who were essentially identical in terms of key variables that are known to affect survival after lung cancer surgery with the exception of the operative approach. If clinical staging had been used rather than pathological staging, we would have undoubtedly compared apples and oranges. Thus, the only significant difference between the two groups of patients in our study that may have influenced their overall and disease-free survivals was whether their lung cancer was resected by open lobectomy or VATS lobectomy. A propensity-matched analysis is therefore appropriate for minimizing selection bias and allowing us to compare two very similar groups.

Although a randomized study would be ideal to address this question, lack of equipoise on the part of the public and surgeons likely precludes completion of such a study.

REFERENCES