Reviewer's report

Title: A straightforward approach to designing a scoring system for predicting outcome of critical patients

Version: 2 Date: 23 April 2013

Reviewer: Ollivier Hyrien

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Major Compulsory Revisions

1) In the cross validation section, the prior probabilities are set to 0.5 without any explanations. There might be situations where such a choice may be sound, but it should be clearly motivated. Also, are the authors suggesting these values as general choices (since no alternative is presented)?

As an alternative, in the analysis reported in the subsequent section, the prior probabilities could have been estimated using the proportions of patients with positive (resp., negative) outcome. It would be useful to evaluate how the choice of these prior probabilities affect the classification error rate.

2) The analysis plan includes multiple steps:

The first step of the analysis involved selecting variables that are associated with outcome at the 1% significance level using univariate analyses. The second step consists of fine tuning the model using some model selection criterion. These two steps appear to have been performed on the entire data set. The final step of the analysis uses cross-validation to assess the overall performance of the score at classifying patients.

The number of variables does not appear to be too large compared to the size of the data set (p = 36 variables vs. n = 3256 patients). Why not select variables using a multivariate logistic regression analysis (combined with model selection tools, e.g., best subset or stepwise procedures) applied to all 36 variables?

The last step of the analysis assesses the predictive power of the model. Since the model appears to have been constructed using the entire data set, the estimate of the proportion of subjects that are correctly classified is likely biased. Could model selection and validation be done on separate data sets instead?

The cross-validation step is not clear. More details are needed to understand what was done exactly.

3) Many variables were significantly associated with outcome (even at the 1% significance level). Were these variables preselected among an initial, larger set of variables? Are there other explanations?

4) The method relies on the assumption that the variables are conditionally
independent. the rationale behind this choice is that this assumption leads to classifiers that are simpler to use. While I can believe that the assumption does indeed simplify things, the discussion about the advantages and disadvantages of the conditional independence assumption is yet complete. For example, it eludes the fact that classifiers that do not rely on such an assumption might perform better. It would have been useful to compare the classifier constructed under the conditional independence assumption with a classifier that does not rely on such an assumption. The manuscript could include measures of dependencies among variables, at least among the variables that were entered in the final model.

**Level of interest:** An article whose findings are important to those with closely related research interests

**Quality of written English:** Acceptable

**Statistical review:** Yes, and I have assessed the statistics in my report.

**Declaration of competing interests:**

'I declare that I have no competing interests'