An improved classifier for mortality prediction in adult critical care admissions

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An improved classifier for mortality prediction in adult critical care admissions

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Introduction

Over the last 25 years there has been significant work carried out in producing risk prediction models for patients admitted to critical care units. The most recent of these models is the Intensive Care National Audit and Research Centre (ICNARC) model developed in 2007 (1) which uses data from 231,930 admissions to 163 critical care units to develop and validate a UK based model outperforming other approaches (with an average c index of 0.863).

Aims

This research aims to present an artificial neural network based model for critical care admissions that improves over the ICNARC model in terms of the discrimination across the data set used in this study.

Results

Figure 1 shows a comparison between the receiver operator characteristics (ROC) curve for our artificial neural network (ANN) model and the ICNARC model presented in (1). This figure shows the ROC curve and point-wise confidence intervals for the true positive values of both our model (in blue) and the ICNARC model (in red).

In comparison, our artificial neural network classification model produces an average c value of 0.8983 in 10 fold cross validation of our data compared to a c value of 0.8306 for the ICNARC model using the same data set (consisting of 642 patients admitted to North Middlesex Hospital critical care unit over a 28 month period. Data excludes 432 patients where data was incomplete).

Conclusion

Our classification model provides a percentage risk score that outperforms the ICNARC model.

This classification model does suffer from some of same issues surrounding the ICNARC model – for instance, the influence of some of the parameters within both models can be unclear to clinicians trying to predict the survival of individual patients. However, further work is ongoing to improve the transparency of this model.

References

1. **Harrison DA, Parry GJ, Carpenter JR, et al**: A new risk prediction model for critical care: the Intensive Care National Audit & Research Centre (ICNARC) model. *Crit Care Med* 2007; 35: 1091–98.

ROC Curves with Pointwise Confidence Bounds

True positive rate vs. False positive rate

ANN classifier
ICNARC model