

Update on the Charlson and Elixhauser conditions as predictors of 12-month mortality

Introduction

The Charlson Index is a widely used co-morbidity score for hospitalised patients, initially developed to include patients with co-morbidities into clinical trials (Charlson et al., 1987). It was derived from a study of 604 patients and validated using a separate cohort of 685 patients. A 2021 review found over 36,000 citations of the index, noting 15 subsequent adaptations (Charlson et al., 2022). In Australia, the Charlson index informs hospital pricing adjustments for complications and readmissions.

However, the index's transferability to different populations is debated, as original data were from a single hospital (Romano et al., 1993). Changes in mortality for some conditions over time, like the decreased mortality risk for AIDS, further question its current applicability.

Elixhauser et al. (1998) created an alternative co-morbidity index based on data for more than three million hospital separations. They identified a list of conditions which could be used for casemix adjustment. They used hospital outcomes, but many authors argue it is a better predictor of 12-month mortality than the Charlson Index. However, it was also developed a long time ago and has AIDS as a very high-risk condition.

Methods

A linked dataset of over 3 million randomly selected Australians aged over 15 years was created for the evaluation of the Health Care Homes trial. The dataset contains all hospitalised episodes for people in the sample that occurred between January 2015 and July 2021. We selected the first overnight hospitalised event in 2015 as our cohort. We compared the performance of the Charlson and Elixhauser conditions for predicting 12-month mortality, readmission within 12 months, and having a hospital acquired complication (HAC), with and without the addition of demographic adjusters.

Logistic regression was used to model each outcome. The Area under the Receiver Operator Characteristic Curve (AUC) was used as the metric for comparing models.

Results

There were 199,667 hospitalisations and 7.1% died within 12 months. Almost half the people had another hospital episode within 12 months, and 4% experienced a HAC. Age and sex together (AUC = 0.804) were better predictors of all outcomes compared with the Charlson score (AUC = 0.737) and the conditions included in the Charlson score (AUC = 0.747). When the Charlson conditions were added to the model with age and sex the AUC increased to 0.868, which was similar but slightly lower than when the model with the conditions in the Elixhauser score added to age and sex (AUC = 0.878).

The pattern was similar for the outcome of readmission to hospital within 12 months. However, the Elixhauser conditions (AUC = 0.830) performed better than the Charlson conditions (AUC = 0.749) when added to the model examining the predictors of having a HAC, which also included age and sex.

Discussion

These findings are consistent with other studies. The Elixhauser conditions perform as well as, if not better than, the Charlson Conditions when predicting 12-month mortality. A

surprising finding was that the Elixhauser conditions were much better predictors of a person having a HAC than the Charlson conditions.

References

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