

Title

Predictive Models of the Risk of Hospital Admission and Future Healthcare expenditures: The benefits of recalibration

Introduction

A number of models are available in the US and worldwide which predict the risk of hospitalisation and healthcare expenditures, from general and insured populations. These are being used for a variety of purposes including, screening of patients for Case Management Programs, screening for Disease Management Programs, organisational profiling, and assessing financial risk. These uses are in response to health policies to reduce unnecessary hospital admissions, such as of Pay for Performance (P4P) measures, to a genuine need to support populations in avoiding hospital admissions that are both expensive and a patient safety risk.

Method

The predictive models were derived using patient level data, with classification of diagnostic, pharmaceutical and historic utilisation data, using the Johns Hopkins ACG System to reduce the number of variables and provide measures of multimorbidity. Logistic and Linear Regressions were undertaken to produce models on the outcomes of hospitalisation within 12/6 months, emergency/unplanned hospitalisation within 12 months, and health care expenditures in the preceding 12 months.

The models were validated using split-half method and providing AUC analyses to compare different model performance.

Results

Results will be shown from US populations and multiple general populations in Europe. Although the original models generalise well to other populations, the recalibrated models using local data produce better performance.

Discussion

Comprehensive person-based records are important input to such models, particularly with health policy being orientated to integrated care. Local recalibration of models ensures that models are relevant to the population they will be applied to, provide better overall performance than the original models, and give an opportunity to measure the benefit of new or additional local data variables. Using traditional modelling techniques, such as logistic and linear regression, these models can be created efficiently and provide good face validity for local users of the models.

It is important to make use of casemix classifications to reduce data complexity and provide robust measures of key constructs such as multimorbidity. Whilst the emphasis of work has been on identifying the highest risk individuals, there is an increased interest in recognising earlier and emerging risk, where more preventative methods can be informed such as chronic disease self-management programs. These models in their current form are being used to identify populations, but work on newly emerging data from Electronic Health Records (EHR), Personal Health Records (PHR), and Social Care data is expected to provide greater insight into these populations and those with highest need.