Classes and scores: How will casemix funding evolve?

Introduction

Casemix classification have been used for payment purposes for over five decades (Fetter et al., 1980; Hornbrook, 1982). Under the approach, each unit of interest, such as an acute episode of care, is assigned to a class within a classification system. Diagnosis Related Groups (DRGs) are the most commonly used system. Payment for the service provider, such as a hospital, is then principally determined by the DRG, whether through a cost weight that is applied to a base price, or through a DRG payment rate. Most payment systems include additional adjusters for episodes to reflect other factors not accounted for by the DRG. Common amongst these are factors indicating the "outlier" nature of the episode and aspects of the care provided, such as treatment in an intensive care unit. The additional payment adjustments applied can be extensive. However, these payments systems are based on the perspective that all episodes within a DRG have a common cost distribution.

In developing casemix systems and defining classes within these system, two main objectives are that the class are "clinically meaningful" and "resource homogenous". The development process therefore typically involves clinical consultation to set and refine the structure of classes, and statistical analysis to assess the evidence around resource homogeneity. Earlier versions of DRGs also set a constraint on the number of classes, and most DRG systems have about 1000 or fewer classes in total.

This paper analyses and discusses an alternative approach to payment. This approach potentially separates and reframes the objectives of "clinical meaning" and "resource homogeneity". In terms of "resource homogeneity", the objective could be reframed to be that the payment system aims to predict the resource requirements for an episode of care, taking into account factors considered to legitimately influence cost. With this objective, the prediction of the expected resources can be reflected in a score that is determined factoring in all information considered legitimate for predicting costs, and not constrained by allocation of the episode to a "class". The objectives for clinical meaning can continue to be achieved through the development of classes, but with a clearer focus on the clinical factors that are relevant.

Methods

We developed a simulation model to represent a hypothetical health system adopting the Australian Refined (AR-)DRG system. We used a subset of AR-DRGs and simulated episode characteristics and costs in 100 hospitals of different volumes of activity. Episode characteristics and costs were simulated based on available data that included the distribution of costs from Australian hospitals at the DRG level, with additional assumptions about variation in costs between hospitals. We applied the latest Australian cost weight calculations to estimate cost weighted activity for each hospital. We developed various regression and neural network models to generate an expected cost for each episode,

taking into account predictors that were used in assigning the AR-DRG class and the cost weights. Expected costs were reflected in a score that, as with a cost weight, reflected the difference between expected costs and the mean cost across all hospitals.

We assessed difference (or error) between actual cost, funding using the standard methodology, and funding implied using expected costs from the prediction model. Differences were quantified as mean squared error and were explored at the hospital and adjacent DRG level.

Results

Detailed results will be presented at the conference. Our broad conclusion is that the alternative models will reduce mean square errors in funding allocation.

Discussion

The results of this simulation study illustrate several issues that need to be considered in applying machine learning models in a payment context. Other issues include achieving transparency in the model for generating expected cost, deciding on which predictors are considered legitimate influences on costs, and implementing complimentary approaches to address the clinical meaning objective.

References

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