TITLE: Calculating economic outcomes of using innovative technology using a novel health-economic modeling tool

Introduction

In decisions concerning the adoption of healthcare innovations, the decisive assessment pertains to the comparative efficacy and economic feasibility against the current standard of care. A new procedure seems an economically viable alternative if it offers direct cost reduction or yields savings in infrastructure and personnel resources.

In health-economic evaluations, Markov models have served as proven methodology. These models visually represent the singular steps of the patient pathway as decision trees, with "knots" (or "branches") representing treatment alternatives or outcomes deviates, such as the choice between existing and new procedures or the grouping to different DRG codes. Markov models are commonly built using conventional software tools such as Microsoft Excel today. However, because Excel cannot model the multitude of interconnected variables interactively, manual modelling can often take several days and even a later adaptation becomes time-consuming. To address these challenges, a specialized, interactive tool for mapping variables along the patient pathway is needed.

Methods

PathModeler is a pioneering web-based tool for the expedited design of interactive health-economic models and the standardized integration of data. It contributes to a reduction in manual effort and enhances calculation efficiency, enabling to quantify the added benefit of novel therapies through the augmented comparative presentation layer.

First, PathModeler reflects the inherent complexity and variability of the patient pathway. Each step of the treatment which lead to divergent resource consumption or payment as well as treatment variables (e.g. proportion of cases with overnight stays) represents nodes in the model. Second, current costs, personnel time, length of stay and reimbursement of specific DRG codes are retrieved from official databases and integrated into the model. Third, scenarios specific to hospitals – with individual process times, codes population, and average length of stay – are created and compared. This practical assessment allows to draw conclusions on the impact on resources and financials.

Results

A pertinent case study focused on the health-economic modelling of the new cardiac ablation closure system (Perclose™ ProStyle™ by Abbott Medical) in Germany which prevents complications and enables earlier post-operational discharge. When applying the closure system in 75% of cases, PathModeler showcased the potential to reduce length of stay per case by 2,35 days and nursing time by 786 minutes per case, among others, compared to the German average. The innovative adoption results in a differential profit of 13,850 € and total saving of 2,261 hours nursing hours on 300 patients compared to Z-sutures and pressure bandage where patients have to lie flat for approximately 6 hours..

Discussion

The quantification on the added health-economic benefit facilitates stakeholders' decision-making in the adoption of innovations. Further considerations pertain to the capability to assist higher patient volumes, which could also be calculated using PathModeler.

The use of a specialized, interactive modelling tool allows for displaying not only the health-economic superiority of an innovative intervention compared to the standard-of-care, but also the numeric conditions under which the adoption remains economically viable. Intricate data can be hereby distilled into value messages, affording clarity in communication and visual representation for stakeholders.