

Cost equations modeling and optimization for strategic cost management in hospital units

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Health care costs have been increasing extensively over the past years, contributing to the unsustainability of public expenditure in this sector (Devine et al., 2008). Thus, it is essential to control public funds and this goal must be inevitably reached with the participation of clinicians in cost management since one of the main cost drivers is the patient's time spent in the hospital (Cooke, 2010). Today, health care organizations face one of the most important challenges: to decrease the total expenditure without affecting the quality of the services provided to patients. The key to the success to accomplish the so expected financial viability relies on the development of relevant and strict cost information to support strategy, price adequacy and management decision (Demeere et al., 2009).

According to the recent conclusions of the Portuguese Court of Auditors 2011, displayed in a report for the audition of the system of reimbursement and price charged by the hospitals within the National Health Service, the achievement of real and detailed costs for the activities performed by the health care services is essential to sustain the financing model based on unit prices which must be seen as drivers for economic efficiency. The report also suggests that it is important that the methods of cost accounting applied to health care organizations allow the comparability between funding and costs, making them more oriented to the management and the decision-making process.

Indeed, regarding the situation faced by health care sector, it is recognized that there is an urgent need of evaluation of all priorities of investment and expenditure. In addition, we also have the recognition from external entities that cost accounting systems must be reformulated in order to give reliable information for the funding and pricing process, without underline the lack of usage of advanced cost accounting practices (such as Time-Driven Activity-Based Costing - TDABC) in health care organizations.

This research project intends to make an important contribution in the domain of cost accounting practices applied to hospitals showing how the cost structure can be presented through cost equations, how should the modelling process of costs can support the optimisation of resources usage and last but not the least, how should this approach be implemented in Portuguese hospitals in order to succeed.

Current financing system for hospitals is not very flexible and it is based on Diagnosis Related Groups (DRG), as well as additional and strict financing rules. TDABC could be viewed as an effective tool to manage hospitals by supporting the decision-making process in many levels, such as the decision to expand or reduce services based on the patients' needs and services' profitability or efficiency.

TDABC makes it possible to study process' efficiency through the concept of available capacity versus used capacity. On the other hand, time equations are a simpler and less costly method than the traditional activity-based costing (ABC). Among other benefits, TDABC system enables to evaluate the added value of the activities, as well as to simulate the consumption of resources and to test the rationalization of used capacity or to determine the costs borne by the organization with idle time.

This research project intends to demonstrate the usefulness of time and cost equations in cost modelling and optimisation of the cost structure in a hospital. For this purpose, we will conduct a case study in a Portuguese hospital in Guimarães.

From the case study, the hospital processes will be studied and translated into time equations with the respective conditions and restrictions, which will then be transformed into cost equations. These ones will allow to model and solve different problems from different objective functions. For this purpose, we will apply global optimisation techniques. Namely, some meta-heuristics will be used in the solution of the problem, such as the Electromagnetism-like and the Artificial Fish Swarm algorithms.

Thus, with this research project we intend to introduce the innovator concept of cost equation (based on the concept of time equations of TDABC), and a new methodology for modelling and optimising cost structures through problems formulated with cost equations. The research team believes that these models can support strategic cost management in organizations (specially in health care organizations) and assist the design of plans and public policy, mainly in what concerns to the resource allocation, funding process, the design of the national health care services network, etc.