

Time-Driven Activity-Based Costing (TDABC) method as a tool for assessing health costs.

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Abstract. The general objective of this article was to approach the TDABC as a tool to optimize the resources invested in the health care in addition to showing its benefits such as provide accurate cost information, improve resource allocation, facilitate decision-making, enhances cost transparency, as well as its limitations like depend on accurate time data and time-consuming. The article also shows a framework for how to perform the TDABC of a procedure and find the cost per patient. As the main methodology, a dense literature review was conducted to explore how the method has been applied in several health institutions and countries including a comparison between Brazil, Czech Republic, United States and how much of their GDP is used in their national health care system. The methods showed positive results and overall, the literature suggests that TDABC is a useful tool for healthcare organizations and even countries seeking to improve their financial management and operational efficiency.

Keywords. Time-driven activity-based costing, Cost analysis, Healthcare costs

1. Introduction

Healthcare organizations face ongoing challenges to balance the delivery of high-quality care with cost management. Time-Driven Activity-Based Costing (TDABC) offers a viable costing method that can furnish accurate and valuable cost information to healthcare organizations.

In Brazil, around 10% of GDP has been invested in health, 44% of which come from the Unified Health System, due to population growth, increased life expectancy, reduced infant mortality, increased access to health and the introduction of new technologies for the provision of health care [1]. However, higher expenses are not necessarily consistent with better health conditions or equity in access to services. In addition to focusing on improving the quality of services, the subsidy aimed at health competes with other economic and social development needs [2].

Health care principles include ways to alleviate the burden of high expenses and accurately measure the effects of relevance to patients [3]. Faced with this, economic evaluations in the health area have been essential to support the allocation of available resources and assist in decision-making by health managers for the benefit of the population [4].

But what is TDABC and how to apply it? It is a costing methodology that was first introduced by Robert S. Kaplan and Steven R. Anderson in 2004 and it is a

refinement of ABC. Activity-Based Costing (ABC) is a costing method that identifies the cost drivers of an organization's products or services and allocates costs based on those drivers [5]. It involves identifying all the activities that go into producing a product or providing a service and then assigning costs to each activity based on its usage of resources [5]. Time-Driven Activity-Based Costing simplifies the process of cost allocation. It assumes that the time required to perform an activity is the fundamental driver of costs. TDABC involves estimating the time required to perform each activity in a product or service process and using that time to calculate the total cost of the activity [5]. TDABC is simpler and less time-consuming than ABC, making it a more practical method for many organizations.

The methodology involves important steps, such as mapping the care flow, identify the activities that consume resources, calculate their capacity cost rate, and estimate the cost per patient [6].

The unit time for each activity includes the total time used to execute one unit of each type of activity. In this way, patients can be monitored during treatments using a stopwatch to analyze the time for each activity. As an estimate of unit time per activity for each exam, the median should be used. For structure costs, the capacity of the department can be considered from the sum of the availability of use of exam rooms and/or professionals [7]. The capacity cost rate must be calculated for each of the resources, by dividing the costs allocated to each cost resource

by its respective capacity (Equation 1) [6].

$$CCR = \frac{\text{Distributed costs}}{\text{Capacity}} \quad (1)$$

After calculating CCRs, it is necessary to design time equations that can identify the specific resource consumption per patient unit, it crosses information on time spent on activities and the cost per unit of time for departments and professionals, which includes the cost of medications, exams and materials. Kaplan and Anderson's (2007) time equation (2) represent the calculation that should be used. The calculation of the cost per service is obtained by multiplying the CCR of each resource by the period of each activity. The sum of the costs of the activities results in the cost of the service [8].

$$Ctx = \sum \beta_i X_i + y \quad (2)$$

The calculation should be performed using Equation 2, where: Ctx = cost of the procedure; β_i = time used for each resource; X_i = CCR of each resource; i = number of resources involved and y = direct costs, such as drugs, materials and exams [8].

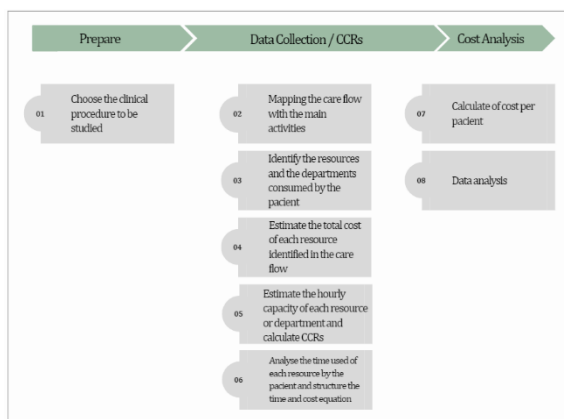


Fig. 1 - Eight-step framework for micro-costing with TDABC [6]

Also, TDABC has several benefits when applied in healthcare organizations, including:

Provides Accurate Cost Information: TDABC provides accurate and meaningful cost information by considering the time required to perform an activity instead of the cost of resources used. This allows healthcare organizations to identify the activities that consume the most resources and allocate resources efficiently.

Improves Resource Allocation: TDABC allows healthcare organizations to allocate resources efficiently by identifying the activities that consume the most resources. This helps healthcare organizations to eliminate waste, reduce costs, and improve the quality of care provided [7].

Facilitates Decision-Making: TDABC provides accurate cost information that can be used to make informed decisions regarding the allocation of resources. This allows healthcare organizations to make informed decisions regarding the expansion of services, the introduction of new technologies, and the elimination of wasteful activities [7].

Enhances Cost Transparency: TDABC enhances cost transparency by providing accurate and meaningful cost information. This allows healthcare organizations to communicate the cost of services to patients, insurers, and other stakeholders [7].

TDABC has some limitations when applied in healthcare organizations, including:

Time-Consuming: TDABC requires a significant amount of time to implement as it involves the identification of activities that consume resources and the estimation of the cost of each activity. This can be a challenge for healthcare organizations that are already stretched for time and resources [7].

Dependent on Accurate Time Data: TDABC is dependent on accurate time data, which can be challenging to obtain in healthcare organizations. Healthcare providers may be reluctant to track their time, leading to inaccurate data and cost estimates [7].

TDABC differs from traditional costing methods as it focuses on the time required to perform an activity instead of the cost of resources used. Traditional costing methods that allocate overhead costs based on a single cost driver such as labor hours or machine time, fail to provide accurate cost information, making it difficult for healthcare organizations to make informed decisions regarding the allocation of resources.

Tab.1 - Traditional costing methods x TDABC

	Traditional costing methods (Top Down)	Time-Driven Activity-Based Costing (Bottom-up)
Measurement	The valuation of relevant costs is made by estimation, based on proportions informed by applicable data sources.	Cost components are measured and valued by direct identification of resources employed by individual patients.
Accuracy	Aggregate information.	Detailed study of patient or unit costs individual analysis.
Feasibility	Simple but not very sensitive.	More complicated to perform, and specific to the context in which it was collected.

2. Research Method

To explore the effectiveness of the time-driven activity-based costing method in evaluating healthcare costs, it was conducted a comprehensive literature review. This involved analysing various published materials, including books, theses, dissertations, scientific articles, periodicals, and reference works. The aim of the review was to critically assess the existing studies and methods related to TDABC in healthcare.

3. Results

Over the past decade, the healthcare industry has increasingly adopted time-driven activity-based costing as a costing method. TDABC builds upon the principles of activity-based costing (ABC), which assigns costs to products or services based on the activities required to produce or deliver them. TDABC expands upon ABC by incorporating time as a cost driver, which enables more precise cost estimation and analysis. Numerous studies have investigated the use of TDABC in healthcare, examining its effects on healthcare operations and financial management [5].

Boston Children's Hospital was a pioneer in utilizing TDABC to gain a more precise understanding of the cost per patient, surpassing prior knowledge. In response to the hospital's lack of competitiveness compared to other medical centers, cost information was analyzed to identify areas where costs could be reduced while maintaining high-quality care [9]. This involved examining length of stay and variability between patients, as well as medical practices among professionals. The TDABC methodology employed by Dr. Meara at Boston Children's Hospital allowed for the acquisition of valuable insights. This enabled the suggestion and implementation of a new remuneration policy known as bundle payment, which covers the cost of treatment from diagnosis to recovery [9]. The package payment approach has been adopted by various procedures such as orthopedic and cardiac surgeries in the hospital, resulting in cost reductions and fostering a more collaborative work environment to deliver high-quality care [9]. This policy has since been adopted by numerous hospitals across the country.

The Journal of Medical Economics published a systematic review in 2017 that examined TDABC in healthcare. The review concluded that TDABC is a promising costing method for healthcare organizations, but further research is necessary to realize its full potential. The review also identified various advantages of TDABC, such as enhanced cost transparency, more precise cost estimation, and the capacity to pinpoint inefficiencies and waste [7].

A 2018 study published in the Journal of Medical Systems investigated the utilization of TDABC in a hospital emergency department. The research discovered that TDABC offered a more precise

assessment of the actual cost of providing care, encompassing both direct and indirect expenses. This, in turn, enabled the hospital to gain a better comprehension of the profitability of various services and to identify areas where costs could be reduced without sacrificing the quality of care [10].

In 2023, the Journal of the American College of Radiology published a study that investigated the implementation of TDABC in a radiology department. The study's findings showed that TDABC enhanced the department's comprehension of the expenses associated with various procedures, resulting in better-informed decision-making regarding pricing and resource allocation. In today's climate, with rising volumes of radiology procedures and declining payments, TDABC has become an essential tool to showcase instances where changes in radiology practices can lead to hospital-wide and departmental cost savings [11]. Moreover, TDABC helped identify operational inefficiencies in the department, leading to process enhancements and cost reductions [11].

The US Navy provides an example of how the TDABC approach can guide decision-making to redesign health services. By delving into patient costs and requirements, the TRICARE program was enhanced with a focus on women's unique health concerns, such as regular and early prenatal care to guarantee healthy pregnancies [12]. This enables the estimation of how enhanced health status in employees and their families leads to a reduction in Navy expenses, such as staff departures due to complications in their partner's pregnancy. Ultimately, this investment leads to a decrease in expenses related to more complex interventions in the long term [12].

The challenge and opportunity for the next decade is to use VBHC principles like TDABC to transform regional and national health systems. Today, this movement is at a critical turning point [13].

The COVID-19 pandemic has accelerated this transition. This global crisis has brought to the forefront a range of long-standing challenges that healthcare systems have faced for years, exposing their inherent vulnerabilities, and revealing critical structural weaknesses. The pandemic has highlighted the urgent need for more agile and coordinated approaches to managing patient care and the global healthcare sector, not just in response to new infectious diseases but as a whole [13].

To address these challenges, many countries, including Denmark, Estonia, the Netherlands, New Zealand, Portugal, Singapore, Spain, Sweden, Switzerland, the U.K., and the U.S, have implemented outcome-based healthcare measures [13]. These approaches aim to identify best practices, reduce variations in outcomes, improve quality, and develop new models for integrated care delivery across various disease domains. In 2018, the Dutch government announced a 5-year Plan for Outcome-Based Healthcare as a first step toward developing a national strategy for the value-based transformation

of the Dutch health system [13]. The United States is a significant outlier in terms of healthcare expenditure, allocating almost 20% of its GDP to this sector, which is nearly twice the proportion spent by other developed nations [13]. Unfortunately, healthcare costs are on the rise globally, as we can see in figure 2, the rising costs in the healthcare system in Brazil, Czech Republic and the United States.

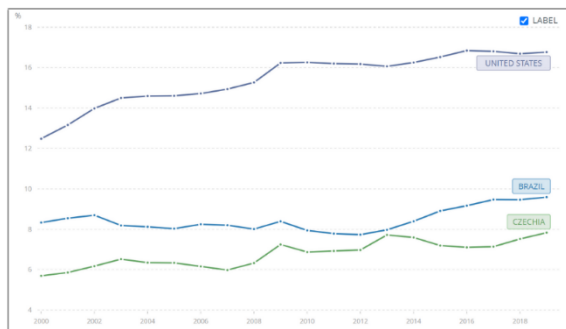


Fig. 2 - Current health expenditure (% of GDP) - Brazil, Czechia, United States [14]

4. Conclusions

TDABC is an effective costing methodology that can provide healthcare organizations with accurate and insightful cost information. This method enables healthcare providers to identify the activities that require the most resources, allocate resources efficiently, and make informed decisions on resource allocation. Despite some drawbacks such as being time-consuming, and dependent accurate time data, TDABC has several advantages, including enhancing cost transparency, facilitating decision-making, and improving resource allocation.

By optimizing resource utilization and improving cost management practices, healthcare organizations can enhance their financial sustainability, making TDABC an essential tool for achieving these goals. Therefore, even with its limitations, TDABC remains a valuable approach for healthcare providers looking to streamline operations and improve financial outcomes.

To successfully implement TDABC, healthcare organizations must carefully evaluate their needs and resources. They must have accurate and reliable data to support the TDABC implementation process and the necessary expertise and resources to conduct the time-consuming task of collecting and analysing data. While TDABC is a powerful costing methodology, healthcare organizations should recognize its limitations and supplement it with other costing methodologies as required.

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