

## **ACTIVITY-BASED COSTING IN HEALTH CARE ORGANIZATIONS**

*UDC 657.474*

*614.2*

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**Abstract.** *The concept of Activity-Based Costing (ABC) provides informational support to the performance of key management activities in different organizations. Focused on activities and processes within the organization, this concept, using appropriate cost drivers, provides more accurate information on activity costs and costs objects. The paper analyzes the specificities of applying the traditional and improved model of activity-based costing in health organizations.*

**Key words:** *health care organizations, costing, activities, cost drivers*

### INTRODUCTION

As organizations that exist and work in order to provide the general well-being of society as a whole, certain groups of people and individuals, nonprofit organizations do not have in their focus achieving their own profit or high wages of their individual employees. The primary purpose of establishment and functioning of the nonprofit organizations is contented in providing the goods and services that a society asks for but profit organizations cannot or do not provide. This fact makes the nonprofits significant factor of functioning for many national economies. Nonprofit organizations are, in principle, relatively easy to “identify” if it starts from the fact that these organizations, in order to cover their costs, perform a wide range of operations and activities on a nonprofit base, that are aimed at providing certain services to the wider community. These are public (collective) goods, such as health care, education, social protection, transport infrastructure, culture and arts, which are of common interest and are needed for the particular community to function

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Received July 25, 2016 / Accepted November 25, 2016

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normally. Due to specific effects achieved through the provision of health care and protection, nonprofit organizations in health care sector deserve a special attention. Consequently, the business goals of these organizations are not profit-oriented, but have non-economic nature and their human character is dominant – to provide services that will meet the needs of preserving the health of people in a given community. Therefore, social responsibility in carrying out the objectives is largely expressed in health and other nonprofit organizations.

The dominance of non-economic objectives, that are not easy to follow, as well as to monitor the effects of their realization, make the process of identification, control and improvement the measures of effective functioning of these organizations fairly complex. Thus, the objective function of a health care organization depends on the board of directors, type of services, respective financing, level of competition, and the current financial condition of the organization (Hughes & Luksetich, 2010, p. 121) Various objectives have been formulated in models, including social welfare, quality and quantity maximization, budget, inputs, equity, and even profit. The objective should be consistent with the competitive and legal environment and flexible enough to deal with changing business conditions.

Considering that health care organizations should primarily achieve results deriving from their mission which are not measurable exclusively by financial expression, in these organizations nonfinancial performance indicators are becoming increasingly important and relevant. However, the attribute “nonprofit” does not mean that these organizations cannot make profit (which is, otherwise, determined as a surplus). When realizing their basic objectives, the health care organizations can also undertake activities that could make them certain earnings or profit. The earnings are usually used to increase the quality of health services, or to achieve a higher level of satisfaction with health care as well as to achieve a higher level of setting noneconomic objectives.

However, the absence of traditional profit and adequate quantitative way for monitoring the success of health care organizations is a serious problem, especially in the area of management control. The problem is only partially solved by showing surplus or deficit in the financial statements of these organizations.

In principle, monitoring the success of health care organizations should be based on establishing the appropriate relations between their output and input in order to assess efficiency and effectiveness of health services to a wide range of users. In this sense, the economics of health care organizations means their ability to control the assigned spending of funds received as well as providing a certain amount of inputs quality at the lowest possible cost. This means that the information on the cost of health care services is of particular importance for the managers in health care organizations in making business decisions, regardless of the limits in deciding caused by nature of their activities.

Just starting from the given characteristics of the functioning and monitoring health care organization performance, the activity-based costing, as a modern method of costing, provides the information necessary to determine the precise cost of health care services, more than for business improvement, as well as for identification of the cost drivers. Recently, activity-based costing is used in health care organizations as an important instruments for more efficient use of strategic resources in order to meet the expected requirements and needs of their customers.

## 1. PROBLEMS AND SPECIFICITIES OF MEASURING SUCCESS OF HEALTH CARE ORGANIZATIONS

It is a fact that measuring and monitoring business success of nonprofit organizations is different and not so simple as in profit organizations. It is rather complicated, because it is based on their multiobjective orientation, in which it is quite difficult to identify all individual objectives and allocate some of them as dominant. The complexity also arises from the numerous methodological problems in expressing certain categories, due to noneconomic character of the effects of these organizations functioning.

Health care organizations, as nonprofit ones, have different objectives. Namely, depending on the area of operation, each nonprofit organization defines its objectives. So for most health care organizations it may be relevant to some general strategic goals which they should seek and these are (Kaplan & Norton, 1996, p. 185.):

- Maximizing the volume of health care services provided from available resources (input),
- Maximizing revenues and financial surplus,
- Target use of resources aimed at better meeting the wider social needs,
- Fully (partially) cover the costs and minimizing subsidies,
- Maximize budget – the extent of possible resources (funds) to achieve the setting goals,
- Maximizing satisfaction of customers - patients,
- Realizing the public image of a socially responsible organization.

After analyzing the above general objectives of health care organization it may be noted that most of them coincide with the objectives that can be found in profit oriented organization. However, the essential difference is that nonprofit organizations are not funded by the users of their services, but by the government, so their objectives to a large degree are limited by the approved budget. Consequently, obtaining additional resources in these organizations is usually caused by the current policy and the volume of provided services, so the link between success in achieving the objectives and obtaining additional funds is almost non-existent. In many cases, failure in business entails even greater investment. On the other hand, health care as nonprofits have to provide services regardless of whether they are efficient or effective and to provide services to all users, without exception. All this points to the absence of market competition and „profit initiative“ in nonprofit organizations, so these organizations are not subject to sanctions of financial markets as profit-oriented organizations. But, nonprofit organizations are exposed to latent threat of domination of individual and selfish interests of their managers, especially those at the top, that may not be consistent with corporate interest and goals. Eliminating this danger assumes considering the performance of nonprofit organizations through the monitoring of achieving strategic goals, not through controlling the achieved financial excess or surplus.

In principle, particularities of health care as nonprofit organizations disable the use of measures where budget is based on profit or other financial indicators in monitoring their performance. Therefore, most authors agree that in a number of nonprofit organizations such measures are not present (Anthony & Govindarajan, 2007, p. 628, Poister, 2003, pp. 8-10, Kaplan & Norton, 2001, pp.97-99.) The reason is primarily noneconomic character of the objectives of these organizations, but also the existence of a serious control and managerial problem which concerns the lack of a single, relatively satisfactory quantitative and comprehensive indicator of their performance.

Since it is assumed to correlate the generated output with the invested (spent) resources, the efficiency of health care organizations is quite difficult to determine. Namely, the fact is that outputs of these organizations do not usually have a market value or they are generally difficult to measure. So, there arises the greatest number of problems related to measuring the efficiency of these organizations. It should be added that the nonprofits, including the health care organizations, are characterized by a wide range of different objectives, which enables comparing the efficiency of one with the efficiency of the other activities to realize the set objectives. In addition, many nonprofit organizations provide services for which is difficult to calculate average costs. Also, in most nonprofit organizations, there is very little opportunity to determine the optimum level of spending (investment). In such a situation, the managers of these organizations are trying to spend as much as the approved budget allows, although the predicted amount of spending in budget may be higher than the objectively required one. To this end, it is important to conduct more frequent budgetary control, concerning the control of economy of spending in relation to the financial plan (approved budget) of health care organizations.

A particular problem of efficient business activities of health care organizations relates to the financial constraints to which they are exposed. In fact, these organizations have very little control over the funds they receive and the goals to achieve, but also a completely limited ability of their management to provide additional financial resources. Also, health care organizations are often asked to provide a full range of services regardless of the fact that some of them surely know that they are not cost efficient. Finally, functioning and monitoring business performance of these organizations is significantly burdened with political, social, and legal restrictions.

It is also complex to monitor the effectiveness of health care organizations, through which the relationship between output and set objectives is tested in order to assess the degree of their achievement. Since most of the objectives of health care organizations can not be expressed in financial terms, nonfinancial objectives shall be established. Consequently, the effectiveness is measured as the degree of realization of the planned nonfinancial objectives, where new problems arise in monitoring business performance in this area. First of all, almost every health care organization can have several different objectives that are quite difficult to reconcile, and it can happen that the achievement of a particular goal is possible only at the expense of other goals. Also, there is a limitation of health care organizations regarding the use of available funds. Finally, the objectives of health care organizations are not directly comparable and, since they are not expressed through profit, the attitude on their effectiveness can be significantly influenced by the opinion of some managers.

Essentially, monitoring the business performance of health care organizations as the nonprofit ones is complex, specific and associated with numerous methodological but also essential problems. Therefore, success in business activities of these organizations should be established and evaluated in the context of achieving the purpose of their existence and setting strategic goals. Lately, activity-based costing and activity-based management are more used in health care organizations as important instruments for more efficient use of strategic resources for achieving the set objectives and complete satisfaction of the expected demands of their service users.

## 2. THE MAIN SETTINGS AND DEVELOPMENT OF ACTIVITY BASED COSTING

Reliable and accurate information on the costs of activities that are carried out, the products produced and services provided, are crucial for any organization that wants to maintain and improve the competitive position in the globalized business environment. In that sense, managers in health care organizations continually search for methods of costing which will result in information that will be a good basis for making decisions on limited resources allocation, planning and control. As one of the most commonly used concepts of costing for those purposes, which is used in a number of organizations in the field of health care, is activity-based costing. Designed in the 80s of the last century, as a response of accounting theory on criticism on hitherto applied methods of costing, so-called traditional methods, was first applied in manufacturing companies. Later, with realizing the information potential of this concept of costing, its use has expanded to nonprofit organizations.

In the basis of this concept are the activities carried out by the organization, which are necessary for the production of products or services provision and for whose performing it is necessary to consume the adequate resources. In order to implement the concept it is necessary to analyze in detail all activities performed in the organization and choose the ones that will be kept on record on costs. This can be done by analyzing the business activities of organizational units, business processes, business functions, etc. (Brimson, 1991, pp. 85-91) and using different techniques for collecting data on activities, such as conducting interviews, using records of employees, directly studying the units to be analyzed (Brimson, 1991, pp.86-89; Mowen & Hansen, 2011, p. 147).

This is the kind of way that organizations review their business activities to receive an answer to the question whether all the activities carried out add value, in order to eliminate those activities that do not add value and increase the time and expenses, as well as whether the activities that add value are performed efficiently. Accordingly, the primary role of activity-based costing to provide accurate information on the costs of activities, products, and services, is expanded on the use of its information for making business decisions on product-service assortment, customer relationships, improvement of business activities and others. Activity-based costing enables the organization to monitor, control and manage costs more efficiently.

The conceptual basis of costing are the activities that are carried out within an organization, which can be classified in different ways: repetitive and nonrepetitive activities, activities that have a high degree of influence on the market and activities that have a low impact on the market, primary and secondary activities, activities that add value and activities that do not add value (Brimson, 1991, pp.54-55). The hierarchy of activities performed in the organization can be calculated in different ways, but the most common are differentiation on the activities at the level of product unit that are performed every time when the unit of product is produced, then the activities at the level of series that are performed each time a series of product is launched, the activities at the product level that are performed every time when it is needed to provide support to a variety of products that the organization produces, and the activities at the level of resources related to the maintenance of resources in order to perform the production process (Cooper, 1990). In addition to these activities, Institute of Management Accountants (1993) adds the activities related to customers/market.

Activity-based costing is based on the following assumptions: to produce a product or provide a service it is necessary to perform appropriate activities, to perform the activities

it is necessary to spend resources, the activities are the basis of cost allocation and the cost drivers do not have to be related to the volume of production (Antić & Georgijevski, 2010, p. 501).

Cost allocation in the activity-based costing is done on two levels. First, the resource costs are allocated to the activities performed in the organization by using the appropriate resource drivers. Then, the cost of activities are allocated on the cost objects by using the appropriate activity drivers. Activity-based costing at both levels of allocation uses the bases for the allocation that are related to the volume of production, but also those that are independent of production volume, and whose importance is growing in the changed, globalized business environment.

To be able to respond to the information management requirements of organizations in the business environment that is subject to constant changes, the concept of Activity-Based Costing (ABC) is continuously improved and developed from the original one-dimensional model through the two-dimensional model to the improved time driven activity-based costing. Development of activity-based concept is similar to the life cycle of mature and successful technology because it features two milestones relating to the improvement of concept performance over time, the learning that has been cumulated through concept using and the enhancement in systems technology, as well as improvement of behavioral response to the concept that begins from user enthusiasm, through their disappointments, to eventual acceptance of technology's relevance to business success (Turney, 2008). Accordingly, Turney (2008) distinguishes several stages in development of ABC concept. The period from 1984 to 1987 was characterized by innovation in the costing with the aim of finding new methods of calculation which produce more accurate and reliable information on the product costs than those which were produced by the traditional costing methods and which are necessary for making business decisions. The organizations that implement activity based costing manage to sustain and improve competitive advantage, which is an important step in the development of the first generation of ABC model. The period from 1987 to 1991 was characterized by the expansion of articles in leading magazines and numerous conferences on the subject of the new concept of costing and cost management. At this stage, the importance of information produced by activity-based costing for analyzing and review of the product profitability was recognized, eliminating those activities that do not add value, reducing costs, and increasing profitability. In the period from 1991 to 1995 there was a reduced interest in the ABC concept due to high costs of its design, implementation and maintenance. However, in the period from 1995 to 2000, the information contained in the ABC method data bases was identified, which was useful for the analysis of customer profitability, markets, distribution channels, while its implementation expanded from manufacturing to service organizations, which, thanks to the implementation of ABC concept, fought successfully with the increased competition in the 90-ies. In the period from 2000 to 2006 the interest in ABC concept has again increased. The benefits of information produced by ABC have been recognized, while the effort and costs of implementing and maintaining the system have been reduced thanks to ERP (Enterprise Resource Planning) models and BI (Business Intelligence) tools. In the period up to 2006 ABC concept has become an integral component of new solutions in the field of business performance management.

### 3. THE SPECIFICS OF ACTIVITY-BASED COSTING IN HEALTH CARE ORGANIZATIONS

In the changed business environment, managers of nonprofit organizations, and therefore the managers in health care sector, can not make significant business decisions and maintain the competitiveness without reliable information on the costs of activities performed and services provided. In this sense, applying activity-based costing comes to the fore. Similarly to the manufacturing organizations, in health care organizations it is possible to identify a large number of activities that need to be done in order to provide a service with adequate quality, with a rational use of limited resources at an acceptable cost.

In contrast to activities of manufacturing organizations that are most oftenly of the same or similar type and are performed in a similar manner and in which the outputs can be precisely defined, in health care institutions it is possible to identify many different activities that are performed by using different procedures and which do not yield simply and easily defined output. For example, the output in health care institutions can be defined as a stay and treatment of the patient, whereby it is possible to identify many different types of rooms and treatment (Hansen & Mowen, 1994, p. 226).

Kalhor et al. (2016) in the paper where they deal with the establishing cost of radiology services and compare it with governmental tariffs identify the main groups of activities, activity centers and give the description of activities as shown in Table 1.

**Table 1** Activity centers and the nature of related activities

Main group of activity	Name of activity center	Nature of activity
Clinical	Surgery	Delivering clinical services directly to the surgery patients
	Internal	Delivering clinical services to patients
	ICU	Delivering clinical services to patients that need special care
Para clinical	Laboratory	Performing diagnostic tests to inpatient and outpatient
	Imaging	Radiography performed for inpatients and outpatients
	Physiotherapy	Delivering rehabilitation services to inpatients and outpatients
Supporting	Kitchen	Cook and distribute food to patients and staff
	Laundry	Washing dirty clothes of patients
	Reception	Reception of patients that need treatment in the inpatient departments
Educational	Library	Delivering educational books to the students
	Educational classes	Educational classes for students
	Head of educational department office	Delivering educational services to the students
Other	Office of insurance agents	Review patient records for insurance organizations
	Bank	Delivering financial services to the employees and patients
	Prayer house	Holding prayer ceremonies

Source: (Kalhor et Al, 2016, p.2020)

Laurila et al. (2000, p. 192) indicate a growing interest in using ABC method in health care and identify the following activities: time scheduling and registration, direct procedure, assistant procedure, film developing, interpretation of procedure and typing, conferences for clinicians, quality assurance and product development and research and teaching. Their intention is to get an informative and detailed picture of the resource utilization in a radiology department in order to support its pricing and management.

Ergun et al. (2013) in their paper demonstrate the real cost data of the pathology examinations by using ABC method and identify the following activity centers: patient registry and sample acceptance, the delivery of material to the laboratory, determination of the material and macroscopic examination, the tissue follow up procedure of the part, the paraffin block procedure of the part, paraffin cutting procedure of the part, staining, sealing and control procedure of the paraffin section, microscopic investigation, report writing, result reporting, archive. This clearly shows the diversity of activities performed and can be identified in various health care organizations to implement activity-based costing and provide the information of costs for different purposes.

Hansen & Mowen (1994, p.226-227) in the case of day care services illustrate the application of ABC in health institutions. According to the steps in implementing the ABC method it is firstly necessary to identify activities whose resources and costs can be recorded. Day Care of the patient involves the following activities: the activity of providing space for a stay of the patient, the activities of providing food for the patient, and the activity of nurturing the patient. In this case the output can be defined as a day stay patient.

The initial assumption is that the annual activity costs of providing space and food are 1,000,000 m.u., nurturing patient activities 1,000,000 m.u., the total number of days of patient stays annually amounts to 11,000 days, and the total number of hours of care amounts to 50,000 hours.

The difference in the costs calculated on the basis of the traditional costing method and activity-based costing will be presented in the case of mothers, where there will especially be analyzed mothers who had normal childbirth, those who gave birth by Caesarean section and those who have had childbirth with complications (the example adapted from: Hansen and Mowen, 1994). Table 2 presents the data necessary for calculation.

**Table 2** Data on patient type, patient days of stay, and hours of care

Patient type	Days of stay	Hours of care
Normal childbirth	7,300	27,000
Birth by Caesarean section	1,800	12,000
Childbirth with complications	900	11,000
Total	10,000	50,000

The traditional costing method for cost allocation uses one cost driver – patient days of stay, regardless of the patient type and differences in the requirements for the activities. The traditional costing method determines the costs per patient day in the amount of 200 m.u. by dividing the annual costs of space, food and nurturing (2,000,000 m.u.) with the number of patient days of stays (10,000 days).

Activity-based costing takes into account the type of patient in the allocation of costs. To allocate activity costs of providing space and food as cost driver the number of patient days



of stay is used, so these costs per day amount to 100 m.u. (1,000,000 m.u. : 10,000 days), and for allocation of costs of patient care activities the cost driver is the number of hours of patient care so these costs per hour of care is 20 m.u. (1,000,000 : 50,000 hours). Using these cost drivers leads to different costs per patient day for different types of patients.

In the case of normal childbirth, which accounts for the largest percentage of the total number of patients days of stay and the total number of hours of care, because this type of patients is most commonly used, the costs per patient day amount to 174 m.u. On average, 3,7 hours of care per day of stay should be spent (27,000 h : 7,300 days). Accordingly, the costs calculated by using the activity-based costing method are for 26 m.u. lower than the costs calculated by using the traditional methods. Costs per patient day are calculated as follows:

$$[(7,300 \text{ days} \times 100 \text{ m.u.}) + (27,000 \text{ h} \times 20 \text{ m.u.})] : 7,300 \text{ days} = 174 \text{ m.u.}$$

In the case of Caesarean section there is less number of patient days and the number of hours of care on the annual basis compared to a normal childbirth, but in this case an average of 6,7 hours of care per day should be spent – twice as many hours of care per day than in the case of normal childbirth, because, by nature of the problem, these patients require more care. Costs per patient day calculated by using the activity-based costing method amount to 233 m.u. and are higher for 33 m.u. in comparison to the costs calculated by the traditional method. Costs per patient day are calculated as follows:

$$[(1,800 \text{ days} \times 100 \text{ m.u.}) + (12,000 \text{ h} \times 20 \text{ m.u.})] : 1,800 \text{ days} = 233 \text{ m.u.}$$

Patients with complications make up the smallest percentage number of patient days and the least number of hours of care per year. However, an average of 12,2 hours of care per day should be spent - twice as many hours of care per day than in the case of Caesarean section and three times more hours of care in relation to the normal childbirth. By nature of the problem, these patients require more care. Costs per patient day calculated by using the activity-based costing method amount to 344 m.u. and are higher for 144 m.u. in comparison to the costs calculated by the traditional method. Costs per patient day are calculated as follows:

$$[(900 \text{ days} \times 100 \text{ m.u.}) + (11,000 \text{ h} \times 20 \text{ m.u.})] : 900 \text{ days} = 344 \text{ m.u.}$$

Hansen & Mowen (2011, p.147-156), also detail the process of designing and implementing ABC in health institutions in the case of the department of cardiology. By applying well thought interview that was conducted with the head nurse in the department of cardiology the information on the performed activities was collected, resources that are necessary to spend on the performed activities, resource drivers that are used for allocating the resource cost on activities, activity drivers that are used for allocating activity costs on cost drivers, as well as information about potential cost objects. On the basis of data obtained from the interview it was created an activity dictionary which next to the activity name contained a description of each activity, the classification into primary and secondary activities, cost objects and activity drivers, as shown in the Table 3.

**Table 3** Activity Dictionary: Cardiology Unit

Activity name	Activity description	Activity type	Cost object(s)	Activity driver
Supervising nurses	Scheduling, coordinating, and performance evaluation	Secondary	Activities within department	Percentage of time nurses spend on each activity
Treating patients	Administering medicine and changing dressings	Primary	Patient types	Number of treatments
Providing hygienic care	Bathing, changing bedding and clothes, walking patients	Primary	Patient types	Labor hours
Responding to patient requests	Answering calls, counseling, providing snacks, etc.	Primary	Patient types	Number of requests
Monitoring patients	Checking vital signs and posting patient information	Primary	Patient types	Monitoring hours

Source: (Mowen & Hansen, 2011, p.149)

Data from the table are a good starting point for the implementation of the activity-based costing in health care organizations. There are many examples of the application of ABC in health care organizations. The present case related to day care services is given as an insight into the differences between the traditional method of costing and the activity-based costing and it is quite simple. However, in practice, it is necessary to spend a lot of time and not to carry out cheap interviews and researches to identify and classify activities, resource drivers and activity drivers, in order to determine the cost for each activity and various cost objects. The answer of accounting to overcoming the perceived shortcomings of activity-based costing is to find an improved time driven activity-based costing model, which has also found wide application in health care.

#### 4. APPLYING THE IMPROVED MODEL OF ACTIVITY-BASED COSTING IN HEALTH CARE ORGANIZATIONS

As it has been noted in previous presentations, during the implementation of activity-based costing the constraints and problems that were identified related to: the high costs of implementing the concept, the purchase or development of software, payment of consultations, reorganization and possible costs of firing employees; resistance of staff who are afraid of possible layoffs or changed modes; a large number of activities and cost drivers which enable to more precise costs allocation, but increase the cost of implementation of the concept and complexity of its processing and understanding (Gowthrope, 2009, pp.84-85).

In order to overcome the perceived problems, the activity-based costing model was promoted to the time driven activity-based costing (Time Driven Activity-Based Costing - TDABC), which is simpler, cheaper, faster to implement and enables that the rates for cost allocation are based on the practical capacity of provided resources (Kaplan & Anderson, 2003).

The process of calculating the costs of cost objects within the TDABC implies a somewhat different methodology compared to the ABC method. Namely, the TDABC method simplifies the first stage in the cost allocation – allocation of resource costs to activities through eliminating the need for detailed interviews and researches in order to determine the resource drivers. (Mowen & Hansen, 2011, p. 154)

In applying this concept, the different groups, the amounts and the total cost of the resources needed to perform activities should firstly be identified. The practical capacity is often calculated as a percentage, in the range of 80% to 85% of the theoretical capacity. The resource costs per unit of time are calculated by sharing the costs of the available capacity with the practical capacity of available resources, expressed in hours of work. The costs for each activity are calculated by multiplying the resource costs per unit of time with the number of time units necessary for performing the activity.

TDABC requires to calculate the time needed to perform each activity, by direct observation or conducting interviews. TDABC in costing includes the variations in the demand for time, depending on the category of patients who are treated, for example. If it assumes that it takes 0.4 hours to reply to requests from patients that require normal care, than an additional 0.3 hours when it comes from the patients in the semi-intensive care and an additional 0.8 hours for the patients in the intensive care, in a particular department in health care institution it should define new activities for these situations. TDABC introduces the equation of time. In general terms, the equation of time of given activities is a function of  $n$  potential factors of this activity and is expressed as follows (Kaplan & Anderson, 2003):

$$T = \beta_0 + \beta_1 X_1 + \dots + \beta_n X_n,$$

where are:

$T$  – the time required to perform the activities,

$\beta_0$  – the standard time required to perform the activities,

$\beta_i$  – the estimated additional time required to perform the activity  $i$ , ( $i = 1, \dots, n$ ),

$X_n$  – the amount of incremental activity  $i$ , ( $i = 1, \dots, n$ ).

or in the example:

$$\begin{aligned} \text{Response time} &= 0.40 + 0.30 \text{ (for the patient in the semi-intensive care)} \\ &+ 0.80 \text{ (for the patient in the intensive care)} \end{aligned}$$

For its simplicity and advantages over the traditional ABC, TDABC has found wide application in health care organizations.

Therefore, Demeere et al. (2009) through a case study showed how to perform TDABC of five patient in clinic's departments and provide evidence of the benefits of such an analysis. They pointed out the advantages of TDABC in terms of two parameters necessary for determining the costs: the unit cost of supplying capacity and the time required to perform a transaction or an activity, as well as concerning possibility to provide many opportunities to design cost models in an environment with complex activities as in health care organizations and provide accurate and relevant information to health care managers and physicians which assisted them in operational improvements, making a profitability analysis per department and deciding on future investments.

Kaplan et al. (2015, pp. 43-48) implemented TDABC to assess the cost of benign prostatic hyperplasia across the entire care pathway, from initial primary care visit to urologic consultation through surgical intervention, to improve value at their institution.

Campanale et al. (2014) presented and discussed an IR project that involved all the 16 hospitals of Tuscany in the designs the TDABC, whose results showed the extent to which TDABC provided support to and could help health care organizations to face new challenge of managing available limited resources in order to satisfy a growing demand of users - patients.

On the example of cardiology unit Hansen & Mowen (2011, pp.155-156) illustrated the basic concepts of TDABC. The needed information to calculate the capacity cost rate for the cardiology unit and calculate the activity rate and the cost of the activity Treating patients (a total of 3,000 hours were spent to perform this activity) and Monitoring patients (a total of 5,400 hours were spent to perform this activity) are given in the Table 4.

**Table 4** Resources, activities and time/unit of activity on a cardiology unit

Resources	Activities	Time/ Unit of activity
Supervision	\$50,000 Treating patients	1.40 hrs.
Supplies&uniforms	60,000 Providing hygienic care	1.00 hr.
Salaries	340,000 Responding to requests	0.60 hr.
Computer	10,000 Monitoring patients	1.00 hr.
Monitor	26,000	
Total	\$486,000	
Total nursing hours	18,000 (practical capacity)	

Source: (Mowen & Hansen, 2011, p.155)

Capacity cost rate is \$27 per hour and it is calculated by dividing the total resources cost in the amount of \$486,000 with the practical capacity of 18,000 hours. In a very simple way the activity rate and the cost of the activities Treating patients and Monitoring patients can be determined.

Treating patients

Activity rate:  $\$27 \times 1.40 = \$37.80$

Cost of activity:  $\$37.80 \times 3,000 = \$113,400$

Monitoring patients

Activity rate:  $\$27 \times 1 = \$27$

Cost of activity:  $\$27 \times 5,400 = \$145,800$

TDABC demonstrated numerous advantages over the use of other concepts of costing, which are reflected in the fact that the model can be quickly and easily implemented and updated, allow assessment of the efficiency of the processes that are carried out as well as the capacity utilization, the model can be used for what-if analysis and provide information for planning and control, and the like. A well-designed TDABC model provides a complete picture of the performance of activities and processes in health-care organizations and necessary information for making strategically important decisions.

## CONCLUSION

Nonprofit organization form the backbone of any society in terms of providing goods of common interest and creating a more humane society. Due to specific effects achieved through the provision of health care and protection, nonprofit organizations in health care sector are of special importance. In order to survive in an economy that requires greater efficiency and greater accountability, nonprofit organizations need to adapt to changes, to maintain their mission and the reason for their existence, which is quite a complex task. One of the ways to improve the efficiency and effectiveness of operations of these organizations, accompanied by their performance, is to improve the control and management of certain activities in their business. This can be achieved by respecting and strengthening the role of management accounting in these organizations, especially in the field of providing information on the costs of services.

Namely, in the process of decision making in health care organizations, as socially responsible nonprofit organizations, information about the cost of services they provide is very important. In that sense, the activity-based costing, and the improved model of time driven activity-based costing as a modern method of cost accounting that is used in health care organizations, provide necessary information to determine the precise cost of providing health services, to improve business activities, to eliminate the activities that do not add value for customers – patients, to identify cost drivers, and to plan and create corporate strategy. The pieces of information that the activity-based costing provides for the management of health care and other nonprofit organizations, due to their high level of reliability are very useful for making various business decisions, particularly related to the planning and allocation of resources and assessment of performance of activities.

**Acknowledgement:** *The paper is a part of the research done within the project 179066 »Improving the competitiveness of the public and private sector in Serbia by networking competences in the process of european integration of Serbia« financed by the Ministry of Science and Technological Development of the Republic of Serbia.*

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## OBRAČUN TROŠKOVA PO AKTIVNOSTIMA U ZDRAVSTVENIM ORGANIZACIJAMA

*Koncept obračuna troškova po aktivnostima pruža informacionu podršku obavljanju ključnih aktivnosti menadžmenta u različitim organizacijama. Fokusiran na aktivnosti i procese u organizaciji, ovaj koncept, korišćenjem odgovarajućih uzročnika troškova, pruža preciznije informacije o troškovima aktivnosti i nosilaca troškova. U radu se analiziraju specifičnosti primene tradicionalnog i unapređenog modela obračuna troškova po aktivnostima u zdravstvenim organizacijama.*

Ključne reči: *zdravstvene organizacije, obračun troškova, aktivnosti, uzročnici troškova*