

ACTIVITY BASED COST SYSTEM APPLIED IN SURGICAL CENTER OF A BRAZILIAN LARGE HOSPITAL

*SISTEMA DE CUSTOS BASEADO EM ATIVIDADE (ABC) APLICADO NO CENTRO CIRÚRGICO DE UM
GRANDE HOSPITAL BRASILEIRO*

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Resumo

Os hospitais brasileiros administram os custos usando o método tradicional de custo por absorção. Esta prática gera distorções no cálculo de custos indiretos e produz relatórios contábeis incapazes de contribuir para o controle e gerenciamento de recursos hospitalares. O presente estudo teve como objetivo relatar a implementação do Método de Custeio Baseado na Atividade (Método ABC) no centro cirúrgico de um grande hospital brasileiro, identificando as etapas, atividades e indicadores relevantes. É uma pesquisa aplicada, descritiva e qualitativa, com procedimentos técnicos de estudo de caso. Os resultados mostram as principais atividades e fatores de custo e sugerem que o rastreamento de despesas possibilita monitorar vários níveis de consumo de recursos e atividades para efetivamente atingir os objetivos do centro cirúrgico. Os resultados também revelaram benefícios e dificuldades de implementação do método ABC no centro cirúrgico. Este trabalho pode contribuir como referência para futuras melhorias na gestão dos custos hospitalares.

Palavras-chave: Método ABC; Gestão Hospitalar; Custeio.

Abstract

Brazilian hospitals manage costs using the traditional absorption cost method. This practice generates distortions in calculation of indirect costs, and produces accounting reports unable to contribute to control and management of hospital resources. The present study aimed to report the implementation of the Activity Based Costing Method (ABC Method) in the surgical center of a large Brazilian hospital, identifying the relevant steps, activities and indicators. It is an applied, descriptive and qualitative research, with technical procedures of case study. The results show the main activities and cost drivers, and suggest that the tracking of expenses makes it possible to monitor various levels of resource consumption and activities to effectively achieve the goals of the surgical center. The results also revealed benefits and difficulties of implementing ABC method in the surgical center. This work can contribute as a reference for future improvements in management of hospital costs.

Keywords: ABC Method; Hospital Management; Costing.

INTRODUCTION

Health economics plays a relevant role throughout the world due to limited resources used to provide medical care and growing demand for health needs, which justify studies and practices in this area. Moreover, increase in health care costs is a trend, according to Auerbach and Kellermann (2011), explained by factors such as population aging, technological complexity, new diseases emergence and coverage extension.

Correio and Leoncine (2014) argue that continuous improvement of care quality and service offered efficiency to population, with rationalization of resources, has been a constant concern of health service institutions. According

to Dallora and Forster (2013), in the health system, the management process traditionally adopted is lacking information on costs. The activity optimization privileges resource economy without, however, consider the search for efficiency. Martins (2000) says that if there is no culture of measuring costs and results, efficiency discourse is empty.

Hospital costs are expenses related to materials and services used in hospital medical production. Every day, medicine improves in an instrumental and technical way, incorporating in hospital activities, more specialized labor and new equipment acquisitions, which have higher operating and maintenance costs (JERICÓ and CASTILHO, 2010).

Over the last years, diverse experiences have been developed in hospital environment to apply quality management systems and management philosophy by total quality. Several models have been followed, several tools have been tested and several approaches have been attempted (GARIBALDI and BURKE, 1991; HFMA, 2015; TOPIC et al., 2015).

In the continuous assessment of quality, productivity and impact of programs and services on population health, institutions use management tools called indicators (BITTAR and NOGUEIRA, 1996; HFMA, 2014), which are measures of performance, that is, instruments focused on the expected result and essential process to obtain results related to quality of services (PERROCA, JERICÓ and FACUNDIN, 2007). However, professional, social and organizational complexity of a hospital has a higher requirement for creation of a quality management system that seeks to involve all stakeholders. Difficulties lies mainly in multiplicity of interests that need to be reconciled, in technical specialties variety that take part in hospital life, in human beings permanent contact with completely different

cultures, origins and formations (VALENTE, ESTEVES and PADILHA, 2012).

On the other hand, strategic positioning of any organization depends on broad knowledge of the environment in which it operates and its ability to develop and maintain competitive factors for this environment. Thus, it is imperative recognize the potential of resources it has, and those it needs, to implement actions (ROSA and SANTOS, 2003).

Bittar and Castilho (2003) note that commitment to cost and profitability in health area should not be different from those of other organizations, but they point out that professionals in this area tend to reject administrative problems, arguing that control of assistance costs may lead to a decrease in resources and consequent loss of quality services.

According to Bonacim and Araujo (2010), insufficient resources in public health system, in a competitive market environment, justify the need for research and practices in this area. Controlling and reducing costs, forming services sales prices and designing operational structure, are relevant activities to the proper functioning of any organization, including hospitals (CORREIO and LEONCINE, 2014). Costing complexity is greater in hospital establishments, a direct consequence of diversity and standardization lack of provided services, which require, among other conditions, cost centers delimitation and an efficient information system. And to achieve adequate levels of performance, cost information should effectively contribute to the process of evaluation, decision-making and a high degree of reliability, by providing control, planning and analysis functions (BONACIM; ARAUJO, 2010).

Most of hospitals in Brazil use the absorption cost method, which has led to distortions in treatment of indirect costs and generated accounting reports that do not help the manager in

management decisions (JERICÓ and CASTILHO, 2010). Thus, aiming to contribute to modify this characteristic of hospital management culture, this paper focuses on how to apply Activity Based Costing model (ABC model) in the surgical center of a large hospital in Brazil. We aim to describe the implementation process of ABC model, identifying steps, activities and indicators, to compare costs calculated by traditional absorption method used in Brazilian hospitals with costs established by ABC model; and to relate main advantages and difficulties encountered in the process.

LITERATURE REVIEW

Miranda et al. (2007) analyzed the use of Activity Based Costing method in 34 Brazilian university hospitals and results showed that costing systems used, all based on absorption, had few possibilities to provide relevant management data.

The research done by Wensing et al (2008) aimed at mapping the implementation of a cost system based on activity in the maternity of a philanthropic hospital. Results showed that ABC method generated reliable data for decision making, promoted waste and unnecessary activities reduction, as well as helping to set medical procedures prices. In general, it led to expenses reduction and improved hospital resources allocation.

The work of Ubiali et al (2008) revealed that it is possible to apply ABC method in a hemotherapy area of a Brazilian hospital and that, despite direct costs making up most of blood collection operation average cost, indirect costs are also relevant, which is why ABC method was timely.

Souza et al. (2009) performed a multisystem research in surgical centers of three large Brazilian hospitals aiming to propose a model for

an activity-based costing system implementation. These paper pointed to serious restrictions on implementation process, such as absence of an integrated information system, lack of IT resources and lack of financial management professionals. They proposed seven steps to implement the ABC method, ranging from mapping of activities to identifying resources and activities drivers. They concluded that ABC method improves the surgical centers management.

Bonacim and Araújo (2009) also carried out a case study in a large Brazilian hospital aiming to identify procedures of costing and to propose ABC method. They focused the hospital garment processing center. They also emphasized the importance of an institutional restructuring to eliminate activities that do not add value. They concluded that knowing costs of activities and integrate medical procedures, can represent a significant differential in quality and effectiveness of hospital management.

Considering the importance of knowing deeply each activity performed in a nursing sector, Souza et al. (2010) investigated the use of ABC method in a public Brazilian hospital. So did Jericó and Castilho (2010) that investigated the sterilizing material center of a Brazilian teaching hospital. Both papers related difficulties in implementation process, given data complexity, high cost of implementation process, large volume of activities to be mapped, difficulties in setting standards, and requirements for activity and cost drivers permanent monitoring. However, despite these difficulties, they concluded that ABC method promotes better and more reliable information to support financial and administrative decisions in general.

Kaplan, Cooper and Porter (2011) investigated the inefficiency of certain costing systems that erroneously remunerate procedures, harming the

quality of hospital services. They simulated an ABC method perform at the MD Anderson Cancer Center of University of Texas. Using ABC method to detect whether there would be greater accuracy in costing and a better analysis of results on changes cost of assistance processes, they founded positive responses in both cases.

Souza et al (2012) again sought to model activities and identify cost drivers, aiming to use ABC method, this time, in clinical engineering sector of a Brazilian public hospital. They proposed a four-stage implementation roadmap. In first step, they developed an activity dictionary. In second stage, they identified financial costs of each activity. In third, they identified products, services and customers. Finally, in fourth step, they chose activities cost drivers to associate them with products, services and customers. The results showed the presence of several difficulties in the implementation process, already pointed out in other papers, such as: information complexity, modeling and implementation barriers, difficulty in standardizing internal procedures, lack of knowledge of administrative area by some managers, among others.

Leoncine, Bornia and Abbas (2013) evaluated different costing methods applied in a Brazilian hospital. They concluded that ABC method was most indicated, but pointed out enormous difficulty in applying it in all hospital departments, as a highly complex and difficult system. Diverging from other papers, they recommended using ABC method for specific areas of hospitals. One of findings of their work is that cost center method, while not as powerful in generating reliable information, is more generally applicable in hospitals.

Mercier and Naro (2014) aimed to analyze the use of different costing systems in the abdominal surgery center in a large French university hospital, and recommended ABC method too.

Abbas et al. (2015) focused on a comparative study between ABC method, indicated by papers published from 2004 to 2013, as most appropriate method for hospitals and others costing methods used by Brazilians hospitals. They observed that, although ABC method was the most indicated, Brazilians hospitals use integral absorption costing method. They also observed that there is a lack of studies that address possible causes of this non-adoption of ABC method.

In general, authors of researches carried out in Brazil report that the use of ABC method in hospitals is still small. In other countries, such as USA and England, the use of ABC method is much more widespread. And although difficulties and limitations in its implementation are practically same, those reported in all studies, same does not happen with advantages of applying ABC method. Each new research shows different benefits, in addition to those published in literature, depending on particularities of each application.

METHOD

This research was based on a single case study approach. The appropriateness of this method is related to the uniqueness of this case, which differentiates this investigation from previous contributions to the literature related on ABC method. The study was performed at the surgical center of a philanthropic hospital, located in northwest region of São Paulo State, Brazil. The hospital serves the population of 53 cities, estimated at 470 million people.

Data was collected using different sources: public documentation, interviews, visits, and assisted access to the organization's information systems. The visits to the organization provided the main

data for the analysis, in particular interviews. Dozens of interviews were carried with key actors in determination of costs. These key actors had different positions within the organization including senior managers, operational managers, business manager, laboratory directors, doctors, clinical directors.

RESULTS

The surgical center consists of ten operating rooms, seven of which were active during the research period. One of the rooms is for obstetrics, another for normal childbirth and other five for varied surgeries. The surgical center complies with Brazilian legislation that deals with its purpose, the Resolution of Collegiate Board of Directors (RDC) No. 50, 2002, of National Agency of Sanitary Surveillance, being organized in: preoperative room, surgical room, anesthesia supplies room, sterile room or arsenal, brushing area, equipment room, sterile supplies center, cleaning room, secretarial, locker rooms, operating room pharmacy, room support for specialized surgeries or perfusion, medical comfort, X-ray room, waiting room and corridors. The staff is made up of 54 professionals. Comprise table of suppliers: pharmacy, material sterilization center, laundry, cleaning staff and doctors.

The costing method currently used by the hospital is absorption costing, ascertained by controller department in partnership with accounting in an integrated information system. The method was adopted from beginning of activities because it is the most common and is the system recognized by governmental entities to which hospital has a service contract. The controlling team counts on assistance of a private cost consultancy, whose objective is to help standardize costing processes in 14 hospitals that serve Brazilian public health

system. They are part of a study that seeks to calculate these numbers in order to demonstrate the discrepancy of remuneration paid for services rendered to public entity.

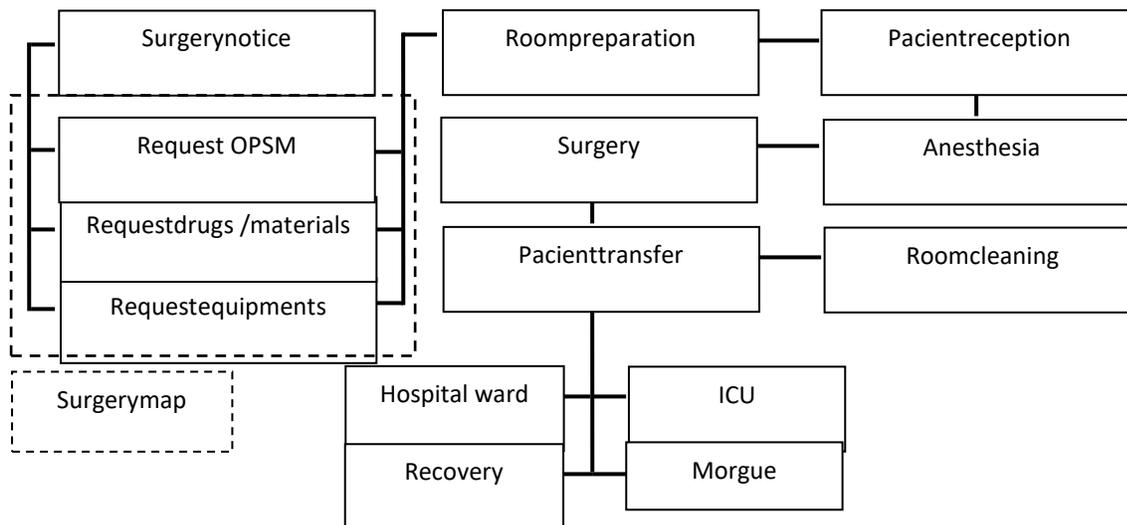
In this work, a simulation of ABC method application was made in the hospital's surgical center. For that, the following tasks were performed: process mapping; identification of activities developed in surgical center; recognition, classification and measurement of performed activities costs; and the definition of respective cost drivers. Next, the consumption trajectory drivers of activities involved in surgical procedures were identified and, finally, services costs were measured. With the information provided by ABC method, we compared with

values provided by absorption costing system, used by hospital managers. Finally, results of simulation and detected improvements evaluation were analyzed.

Mapping of Surgical Center Processes

The beginning of surgical center processes is based on a need for a patient, whether or not they are hospitalized. The starting point is the generation of a surgery notice that is posted on an information system. Although the surgical procedures are distinct, activities performed to occur follow same sequence and routines flow, as shown in Figure 1.

Figure1 –Mapping of Surgical Center Processes



The scheduling of surgery is performed by the secretary of the Surgical Center. Registration is done by a surgery notice in hospital information system. The system sends a request for Orthotics, Prosthetics, Special Materials (OPSM) and equipment to pharmacy of the Surgical Center, which accompanies surgical map and verifies availabilities. According to request for surgical procedure at time of appointment. The materials and medicines are organized into kits for each type of procedure practiced.

Then, the surgery room receives materials, medicines and equipments. The equipments are checked, electrical parts are verified and gases (oxygen, nitrogen, carbon dioxide, etc.) are available. All items required for surgery procedure are organized and ordered on the spot.

The surgical procedure is performed by doctors, assisted by nursing team. Surgeries that require perfusion activity are performed simultaneously. After surgical activity, the patient is transferred to the hospital wing, or to the recovery room, or to the ICU (Intensive Care Unit), or to the morgue, according to each case. Each type of transfer obeys a previously established protocol.

The surgical room treatment stages, after surgery, are: cleaning; return of unused materials; separation of materials and utensils for washing and sterilization; disposal of residuals and secretions to waste; and environment disinfection made by Hospital Infection Control Service (SCIH).

Identification, classification and measurement of costs

In order to identify costs consumed in the surgical center, after surveying through direct observation and interviews, we checked all surgical center costs using the expense account analytical ratios associated to cost centers. We then

grouped items considering different categories of costs shown in Table 1.

Table 1 – Identification and classification of consumed resources

Category	Costs
Human Resources	Salaries, Provisions and charges, Benefits, Coordination and Plantings.
Materials	Drugs, Gases, Hospital, Linen Room, consumption, Cleaning.
Depreciation	Depreciation Property, Depreciation Furniture, machinery and equipment.
Support services	CME, Laundry, Higiene e limpeza, SCIH, Farmácia, SESMT, Telefonia.
Maintenance	Installations, Machines e equipments, Software.
Water	Water
Energy	Energy

It is important to note that resources identified in Table 1 represent only the expenditures consumed in the surgical center processes, not the entire hospital.

When the surgeons use orthoses and prostheses, the SUS (Brazilian public health care system) pays to hospital the value set in a contractual table and private health care plan operators pay the purchase note value, which is authorized before surgery. The same is true to particular procedures. The patient pays the amount previously agreed upon, as stated in the purchase note of those items.

Table 2 –Identification of resource drivers

Recursos	Direcionador
R1 –HumanResources	Time consumed
R2 –Doctoroncall	Direct allocation
R3 –Drugs	Direct allocation - consumption
R4 –Medical Gases	Direct allocation - consumption
R5 –Hospital material	Direct allocation - consumption
R6 – Rouparia	Direct allocation - consumption
R7 –Consumption material	Direct allocation - consumption
R8 –Cleaning material	Direct allocation - consumption
R9 –Depreciation	Equipments –Direct allocation / Others – Hours of activity
R10 –CMESevices	Numberofrequisitions
R11 –Laundry	Numberofrequisitions
R12 – Cleaning and Hygiene Services	Direct allocation - consumption
R13 –SCIH	Direct allocation - consumption
R14 –Pharmacy	Numberofrequisitions
R15 – SESMT	Direct allocation - consumption
R16 –Telephony	Direct allocation - consumption
R17 –InstallationMaintance	Direct allocation - consumption
R18 –EquipmentMaintance	Direct allocation - consumption
R19 –SoftwareMaintance	Hours ofactivity
R20 –Water	Percentageestimate
R21 –Energy	Percentageestimate

Identification of cost drivers

Due to specificities of activities in the surgical center, we identified duration drivers related to execution time, intensity drivers related to amount of resources, and transaction drivers

related to number of surgeries. Table 2 shows the drivers identified.

After identifying the cost drivers, we allocate the costs to activities identified, as shown in Table 3.

Table 3 – Mapping Resource Consumption by Activities

Resources	Drivers	Activities
R1 –HumanResources	Time consumed	A1 a A8
R2 –Doctoroncall	Direct allocation	A3 e A4
R3 –Drugs	Direct allocation - consumption	A3, A4 e A6
R4 –Medical Gases	Direct allocation - consumption	A3, A4 e A6
R5 –Hospital material	Direct allocation - consumption	A3, A4, A5 e A6
R6 – Rouparia	Direct allocation - consumption	A1 a A8
R7 –Consumption material	Direct allocation - consumption	A1 a A8
R8 –Cleaning material	Direct allocation - consumption	A8
R9 –Depreciation	Equipments – Direct allocation Others – Hours of activity	A1 a A8
R10 – CMESevices	Numberofrequisitions	A3, A4 e A6
R11 –Laundry	Numberofrequisitions	A1 a A8
R12 – Cleaning and Hygiene Services	Direct allocation - consumption	A8
R13 –SCIH	Direct allocation - consumption	A8
R14 –Pharmacy	Numberofrequisitions	A3, A4, A5 e A6
R15 – SESMT	Direct allocation - consumption	A2 a A8
R16 –Telephony	Direct allocation - consumption	A1
R17 –InstallationMaintance	Direct allocation - consumption	A1 e A4
R18 –EquipmentMaintance	Direct allocation - consumption	A1, A3 e A4
R19 –SoftwareMaintance	Hours ofactivity	A1 a A8
R20 –Water	Percentageestimate	A1 a A8
R21 – Energy	Percentageestimate	A1 a A8

After allocating the resources, we calculate the total cost of activities, which is the sum of all allocated resource values.

Identification of activity drivers

Table 4 shows activities measures drivers for surgical procedures. These drivers determine how much of each activity is consumed by a given procedure and were defined through

Table4 –Identification of activity drivers

Code	Activities	Activity drivers
A1	Schedule surgery	Numberofsurgeries
A2	Prepare room for surgery	Time spentonactivity
A3	Applyanesthesia	Time spentonactivity
A4	Performsurgery	Time spentonactivity
A5	Assistant Medical Staff	Time spentonactivity
A6	Perfusion	Time spentonactivity
A7	Transferpatient	Numberofsurgeries
A8	Clean room	Time spentonactivity

observations and interviews and discussed with Surgical Center management, accounting department and hospital controller, seeking greater consistency in activities consumption capture.

The computer system of the hospital allows determine consumption measures of activities for each procedure, and record information of each surgery performed. The nursing team records the start and end times of each activity. The activities of scheduling surgery and transferring patients use directives of quantity of scheduled surgeries, which are extracted from the surgical map. The information system does not record the time of surgery room preparation. We recorded this time by direct observation, during two weeks, with four surgeries per day, randomly chosen and supervised by the Surgical Center management. We identified a mean time of 20 minutes for each procedure and calculated total time by type of procedure multiplying the number of hours of activity by the number of surgeries performed. Table 5 shows the calculated activity costs.

The calculation of total cost per procedure demonstrates that values are significantly different from one procedure to another. Figure 2 shows average costs of surgical procedures performed in ascending order of values.

There is great variation among unit costs of the activities carried out. This variation is due to diversity of resources used in each activity and particularities that exist in the consumption of resources in each activity.

Allocation activity costs for surgeries

Table 6 presents the activities for each surgery. We allocate activity costs based on cost drivers obtained in the mapping of surgeries performed.

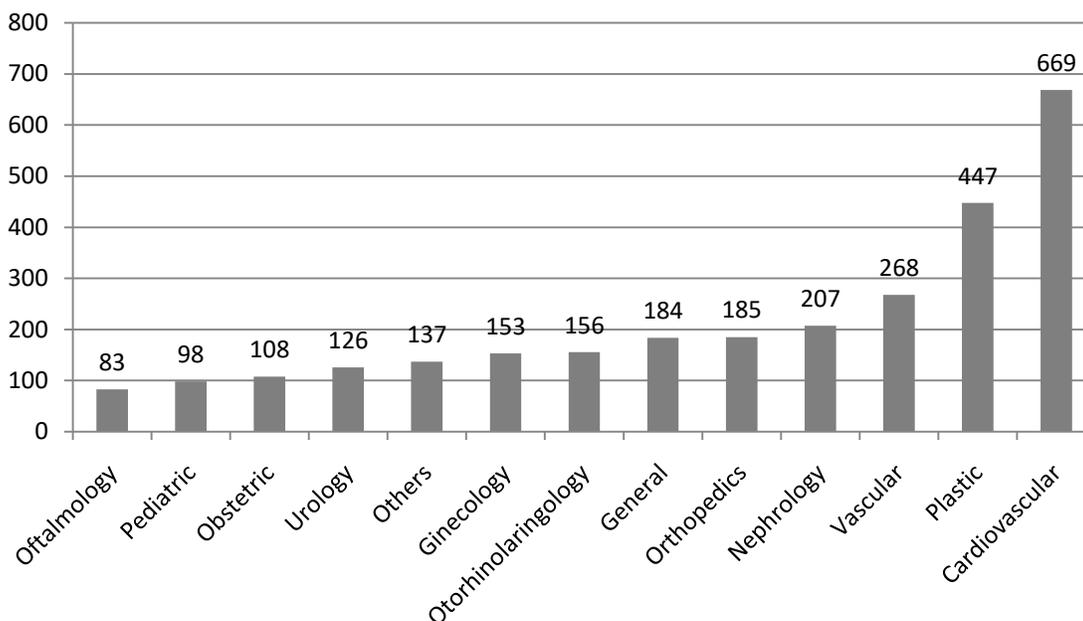
Table 5 –Definition of each activity measure cost

Code	Activity	Activity Total Value [US\$]	Activity Driver	Cost of unit measure of activity [US\$]
A1	Schedule surgery	14.840,18	10.406 surgeries	1,42
A2	Prepare room for surgery	65.515,59	3.468,67 hours	18,89
A3	Applyanesthesia	514.987,20	15.705,88 hours	32,79
A4	Performsurgery	991.751,60	12.589,02 hours	78,78
A5	Assistant Medical Staff	236.719,00	12.589,02 hours	18,80
A6	Perfusion	80.428,22	1.062,02 hours	75,73
A7	Transferpatient	37.174,94	10.406 surgeries	3,57
A8	Clean room	92.723,66	1.449,68 hours	63,96

Table6 –Activities performed for each surgery

ActivityCode	Activity Drivers	Procedure Codes
A1 e A7	Numberofsurgeries	P1 a P13
A6	Time spentonactivity	P6
A2, A3, A4, A5 e A8	Time spentonactivity	P1 a P13

Figure2 –Costs of surgical procedures [US\$]



This information is relevant to cost management and should be analyzed considering whole process and not just value of each procedure. The decision whether or not to perform a particular procedure needs to be studied by weighing other variables, such as demand, production capacity, room availability, process time and revenue value. The application of ABC method also allows the financial manager a better knowledge of entire resource consumption process in Surgical Center.

Comparison between costs calculated by current method and ABC method

Based on the study carried out at the Surgical Center, we observed that the main advantage of ABC method is tracking of the resource consumption by each surgery performed in that items usually referred to as expenditure. Thus, it is possible to calculate the cost of any surgery performed, respecting their particularities.

For comparative purposes between the current costing method of the hospital and ABC method, we chose, randomly, three surgeries of three distinct specialties (coronary artery bypass grafting, bariatric surgery and ureterolithotomy surgery). We do not include OPME costs and medical fees in calculation because they differ from patient to patient and are charged separately. Figure 4 shows the result of criteria differences for costs allocation between the two methods compared.

We found that the change in methods of consumed resources allocation caused variation in final results. The traditional absorptive method, used by the hospital, provides apportionment of several types of resources (structure expenses, labor, hygiene, cleaning, sterilization, consumables, clothes, SCIH, SESMT, maintenance and depreciation) considering the same cost

driver (hours of surgeries), as well as, considers the same surgical value per hour rate for the three procedures studied, not making differentiation in relation to practices that require perfusion activity of those that do not use. On the other hand, in ABC method, these costs were allocated to activities considering individual criteria, more consistent for each type of resource and we allocated activity costs only to surgeries that used them, according to exact quantities consumed.

Figure 3 shows that myocardial revascularization surgery costs 12.6% higher when measured by ABC method. Bariatric surgery costs 9.5% less and ureterolithotomy surgery costs 18.4% less if costs are determined by ABC method. The percentage variations refer to the costs calculated by conventional absorption method that the hospital uses routinely.

Analysis of ABC method results

ABC method presented good results in two strands. In the vertical view, the method revealed the occurrence of wastes of materials and labor idleness. Due to high level of detail required, the ABC method generated more accurate figures for costs and better results management conditions.

In the horizontal view, the mapping of surgical center processes showed actions complexity, synchrony among them and activity, material and human resource interrelationships. This has made it easier to bring about improvements in people processes and attitudes.

In summary, the benefits, obtained using ABC method at surgical center, were as follows:

- Better understanding of processes;
- More reliable numbers;
- Possibility of a clear analysis of material resources consumption;
- Better activity management;

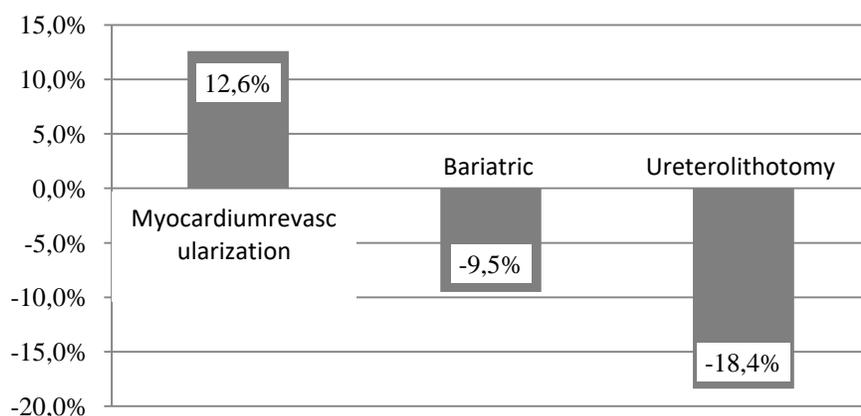
- Wastereduction;
- Better budget forecasting;
- Monitoring of service contracts feasibility;
- Reduced idleness and rework;
- Promote changes in processes and attitudes;
- Encourage use of ABC method in other areas of the hospital.

In summary, difficulties encountered for implantation of ABC method in the surgical center were as follows:

- Elaborate a detailed protocol of procedures to use ABC model;
- Mapping actions and tasks performed in the surgical center;

- Unawareness of costing tool by surgical center staff;
- Motivate the team to adopt the cost model change;
- A busy schedule of professionals involved;
- Too much time spent on observations and interviews;
- The complexity of the surgical center and its dynamics;
- Classification of material resources and medicines used in each activity;
- Require reliable records and permanent data maintenance;
- Delay in confrontation of data between different departments.

Figure 3 –Percent change in costs withABC method



CONCLUSIONS

Knowledge of costs, cost drivers and resource consuming activities, obtained from application of ABC method, allows information for analysis and decision making, which improves services provided quality and financial results.

The implementation of ABC method at the hospital offered advantages such as greater knowledge of processes, activities and services

performed, points of waste and the integration of activities performed in the surgical center with other sectors.

This paper proposed the ABC model as an instrument for managing financial and economic results for a surgical center of a large hospital. For this, we identified steps, activities and indicators, and detailed description of the system implementation process.

It was possible to implant the costing model and results showed that there are differences between surgery costs calculated by ABC method of those calculated by absorption cost method. The differences reveal that criteria for apportionment of indirect costs in absorption method can disguise losses on sale of certain medical services.

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