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Results-based management model for Brazilian public hospitals

Vidigal Fernandes Martins[1], Vinícius Silva Pereira[2]

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Hospital services, ABC costing, results

ABSTRACT

The present study was based on the growth in demand of hospital services and on the lack of resources of Brazilian public hospitals. It is a proposal of a results-based management model for hospital services supported by process management and ABC costing (activity-based costing) for activities and cost objects. Based on studies that implemented ABC and ABM (activity-based management) models in hospitals, and as a support to build this model, cost principles and methods were studied to determine the most viable system to provide information and help hospital administrators to efficiently manage results of the services offered. Identification of revenue, confrontation of revenue with costs, and identification of results of the services are all phases of this model. After results are identified, value-added (AV) and non-value-added activities are analyzed. After that, opportunities for improvement are assessed and the process is redesigned. The new cost is calculated and confronted with the revenue to determine if the process was improved. This model was applied to the Hemodynamics Sector at the *Hospital de Clínicas de Uberlândia*.

Introduction

This report presents a results-based management model for hospital services. The reasons to propose and implement this model are the growth in demand of hospital services and the lack of resources of Brazilian public hospitals. These reasons justify constant efforts towards economic efficiency in a way to assure quality of service and the survival the organization. The model is supported by two basic principles: process management and ABC costing (activity-based costing).

Hospital processes involve a set of high cost activities that require resources. Because of this, hospitals need to deeply understand their processes and identify all resources involved. This fact points out to the need to use adequate process management tools. After that, it is necessary to develop tools for cost assessment and results-based management.

According to Bittencourt (1999), compared with conventional costing systems, ABC costing is an important tool in the proposed model. When it is applied to health organizations, ABC costing incorporates non-financial data and enables the elimination of non-value-added activities.

Efficient hospital management is crucial to adequately determine prices of hospital procedures. It optimizes resources by eliminating waste in the process and leads to significant improvement in costs and performance.

Public hospitals and process management

Brazilian public hospitals have peculiar characteristics, once the greatest demand is generated by users of the *Sistema Único de Saúde* (SUS).

By means of the SUS, the government manages public health expenses and determines the cost of each procedure or service. Thus, the SUS is a regulatory system in which the government is the main financing agent, reimbursing hospitals, and public and private practices based on a table of procedures created by the Ministry of Health.

In this context, revenue generated by hospital services is a variable dependent of government regulation. Thus, the use of results-based management necessarily involves controlling expenses and improving processes.

Creativity is crucial to improve the process. According to Rados *et. al.* (2000, 57) "creativity drives and broadens organizational knowledge". According to Barbosa *apud* Rados, (2000, 57) "this knowledge is inherent to people and related

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1. Faculdade de Ciências Contábeis - Universidade Federal de Uberlândia – (Facic/UFU), PhD student in Escola de Administração de Empresas de São Paulo EAESP/FGV – vidigal@ufu.br vidigalfgv@gmail.com;
2. Faculdade de Gestão e Negócios - Universidade Federal de Uberlândia – (FAGEN/UFU) – PhD student in Escola de Administração de Empresas de São Paulo EAESP/FGV – Viniciuss56@gmail.com

Endereço para correspondência: Vidigal Fernandes Martins, Universidade Federal de Uberlândia, Av. João Naves de Ávila, 2121 1F 215, CEP 38408-100, Uberlândia, MG, Brasil, 55-34-3239-4164 / 55-34-9171-8400, vidigal@ufu.br vidigalfgv@gmail.com

to their experience. It interacts in a cyclical manner, generating new ideas that lead to new processes and methods".

After the processes and subprocesses are known, and costs and resources are assessed, the whole staff must take part in the model to create opportunities for improvement. This is a way for hospitals to improve their economic results.

Advantages of ABC costing in health services

Ching (2001, 202) shows that the use of ABC costing in health organizations is advantageous because:

It aids the understanding of the productive process by means of process analysis. Information available leads, then, to better evaluation of the costs of the service and to the possibility of improving the productive process.

Other advantages, such as reports generated for each activity, are cited by Lambert & Whitworth *apud* Ching, (2001, 202):

Generation of reports per activity or resource, as a response to the most different objectives, is another advantage of ABC. These reports may require lists in a descending order of cost. Using these reports, managers may evaluate their activities in terms of expected means or standards.

Lima *apud* Abbas (2001) says that ABC offers several advantages for hospitals, such as:

a) providing information on actual costs;

b) offering the choice between providing a service or outsourcing;

c) offering conditions to evaluate costs and diagnoses for different heath insurance plans;

ABC costing aids health service management by allocating indirect production costs, for instance. The costs of resources for the target activity (medical team, nurses and nutrition) are separated as indirect costs of the services offered to the patient. Another factor to be emphasized is that costs of resources are identified before they are attributed to cost objects. Then, managers are able to evaluate and eliminate non-value--added activities: the process becomes more efficient and profitability is improved. Besides, as reported by West e West *apud* Ching (2001), they serve to create new strategies.

According to Bittencourt (1999, 95), in relation to conventional costing systems and when applied to health organizations, ABC costing is highly advantageous because it

(...) incorporates non-financial data. In order to monitor and eliminate non-value-added activities, a health organization needs to develop non-financial controls, as well as financial measures of performance. (LAWSON, 1994)

Lawson *apud* Ching (1994, 204) adds other advantages of ABC:

ABC costing may aid decision-making about expansion projects, branch reduction or strategic alliances because it determines margins accurately, and makes available non--financial information about the productive process.

Cost control and budgeting are fundamental issues in any organization. ABC enables cost control and budgeting in hospitals. Lawson *apud* Ching (2001, 204) underscores the use of ABC for these controls, besides drawing other considerations:

Providing information about each patient to the practitioner is one of the great ideals of the method. When this is done, costs of similar cases and other indicators, such as average hospital stay, may be made available to all peers. Practitioners will have information on financial or non-financial performance levels in a way to sensitize them about problems related to costs, optimization of resources and qualification of the services.

According to Bittencourt (1999, 96), after information is assessed by ABC costing, it is necessary to have managers totally involved to improve the process. However, ABC-generated information is not enough if high management does not want changes. To achieve this aim, it is necessary to understand the organization as made up by processes, in a way to develop products and services that meet the demands of the clients.

Presentation of the model

This model is divided in 10 phases, as shown in Figure 1.

Phase 1 – Making key personnel aware of the management process

In this phase, the management model is discussed with the personnel directly involved in the process: doctors, nurses and technicians. It is necessary to create some material to present the model to these people. The person responsible for the implementation of the model should present this material to the staff over a training course. The project will only evolve adequately if these people involved actually learn. Thus, any doubts that come up should be communicated to this responsible person, who will arrange another technical training course.

Phase 2 – Mapping inputs and outputs of the process

Knowledge about the process is crucial for the application of the model. Therefore, it is necessary to put all personnel together, and make all necessary notes and observations based on these interviews. Inputs and outputs of the process may be identified after all necessary data are collected.

Phase 3 – Tracking subprocesses

After the process is understood, as detailed in the previous phase, subprocesses have to be tracked. Tracking is done based on the interviews with the personnel and on the observation of the process.

After the identification of processes and subprocesses, a diagram will provide a general view of the process and of the activities carried out by the specific hospital sector under study. The whole staff will analyze the diagram in a meeting to determine if the steps are accurate.

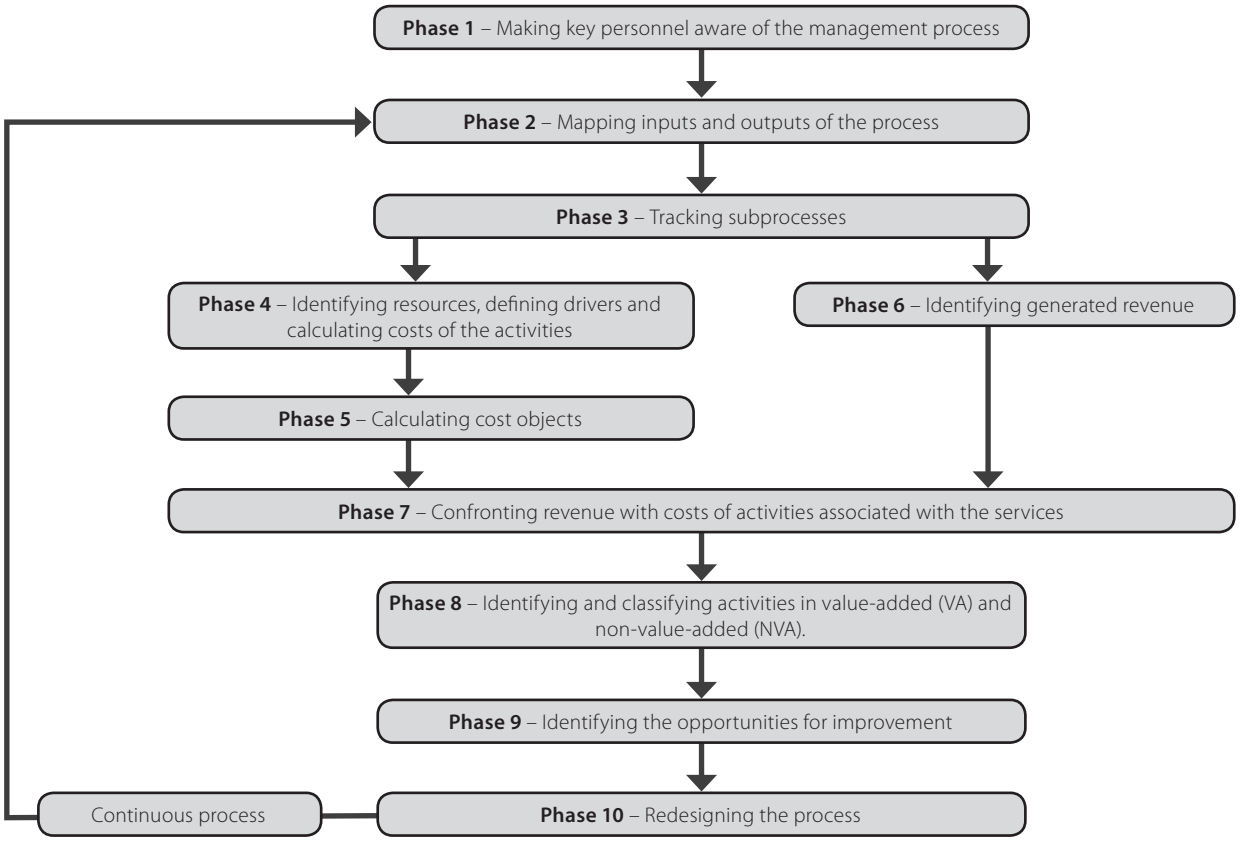

Figure 1: Results management model for hospital services.

Phase 4 – Identifying resources, defining drivers and calculating costs of the activities

In order to understand which resources are used by the activities identified in the previous step, the resource and the activities in which they are consumed have to be analyzed. A matrix of the resources involved in the process makes the analysis easier, as shown below:

Resources	Value – R$	Individual share- %
Resource 01	...	...
Resource 02	...	...
Resource 03	...	...
Resource N	...	...
TOTAL	...	...

Figure 2: Matrix of the resources involved in the process.

This matrix shows the type of resource, its value and its individual share in the total of resources.

Once resources are identified, resource drivers have to be defined to determine all costs. Drivers are factors that determine the occurrence of costs in a process. A new matrix showing the resources and their drivers makes this analysis easier.

Resources	Resource drivers
Labor	Time in hours
Energy	Kwh
Water	Volume in liters
Consumables	Quantity in kg or g
Machinery depreciation	Running time in hours

Figure 2: Matrix of resources vs. resource drivers

After that, cost of the activities should be determined. This means distributing resources - by means of their drivers - to the different activities identified in the process. A new matrix shows distribution of resources to each activity, as presented below:

Resources	Resource drivers	Value
Direct labor	Number of hours at work	...

Consumables	Quantity in kg or g	...
Energy	Kwh	....
Machinery depreciation	Running time in hour	...
Cost of the activity	-	...

Figure 4: Matrix showing distribution of resources to one activity.

Based on this matrix, it is possible to understand how resources are used and, based on their drivers, how they are distributed to different activities.

Phase 5 – Calculating cost objects

After determining the cost of the activities, the next phase of the process involves defining cost drivers or secondary drivers that will be used to associate the activity to the cost object. It is useful to create a matrix to calculate the costs of a given period, as shown below:

	Cost object A		Cost object B		
Activities	**Driver**	**Value**	**Driver**	**Value**	**TOTAL**
Activity 01	...	...	...	...	...
Activity 02	...	...	...	...	...
Activity N	...	...	...	...	...
Total cost	...	...	...	...	...
Unit cost	....	...	...	...	...
Driver = cost driver					

Figure 5: Matrix used to calculate costs.

This matrix demonstrates the contribution of each activity to form the cost object.

Phase 6 – Identifying generated revenue

A price chart with the description of the services invoiced in a given period may be used to identify the revenue. This chart may be requested to the invoicing sector. It is useful to draw a matrix describing the service, the total invoiced for it, and a description of the costumer.

Procedure or exam	**Total invoiced**	**Costumer**
Service A	...	X
Service B	...	Y
Service B	...	X
Service C	...	Z
TOTAL	...	

Figure 6: Matrix used to identify generated revenue.

This matrix shows both the revenue and the type of costumer that contributes to it. This analysis is important in a hospital mainly because of the different kinds of health insurance plans - with different totals invoiced - that exist nowadays.

Phase 7 – Confronting revenue with costs of activities associated with the services

This phase shows the first economic result to be considered in the model, by confronting revenue (identified in the previous phase) with cost objects (identified in Phase 5). The following matrix is useful to demonstrate these results:

Service	**Costumer**	**Total invoiced**	**Cost of the service**	**Result of the service**
Service A	X	...	...	...
Service A	Y	...	...	...
Service C	X	...	...	...
Service D	Z	...	...	...
TOTAL	...	...	...	...

Figure 7: Matrix used to calculate the economic results of the service.

This matrix enables the analysis of the economic result of a same service offered to different costumers. In a hospital, the costumer may be a SUS patient, or a patient of different private insurance health plans, or an out-of-network patient.

It should be emphasized that the cost of each service is only changed if there is a specific activity in the process that is directed to different patients. However, revenue may change, once it depends of the health insurance plan of the patient. Thus, in this phase, management becomes aware of the economic result of the service offered to different types of patients.

The economic result of the services offered is essential information for any organization. Based on this information, it is possible to determine and implement actions aiming at improved results. These actions should be carried out by me-

ans of analysis of the process and activities associated with the service, which may be classified in value-added and non-value-added activities.

Phase 8 – Identifying and classifying activities in value-added (VA) and non-value-added (NVA).

This is considered to be a key phase to improve results. The objective of this phase is to create a basis to identify and classify activities in value-added and non-value-added. When non-value-added activities are eliminated, reduced, changed or simplified, the process becomes more efficient and costs less. The following matrix may be used for the analysis of the activities:

Activity	VA	(NVA)	Recommendations
Subprocess X1			
Activity 01	●		
Activity 02		▤	
Activity 03	●		
Activity 04		▤	

● Value-added activity (VA)

▤ Non-value-added activity (NVA)

Figure 8: Matrix used to classify activities.

This matrix has to be created in a meeting with the whole staff involved in the process. In this meeting, and based on the diagram proposed in Phase 3, each activity is evaluated by the employees. During this evaluation, the non-value-added activities should be justified in the recommendations. The next phase of the process involves the identification and discussion of opportunities to improve the process.

Phase 9 – Identifying the opportunities for improvement

Once processes and subprocesses are known, the opportunities to improve performance are identified. Using the observations drawn in previous phases, the team meets again and the opportunities for improvement are discussed. It should be emphasized that this discussion has to be carried out with the whole staff because, at this moment, it is necessary to find creative solutions. According to Rados *et. al.* (2001, 52), "the greatest advantage human beings have over other animals is their ability to create new concepts based on past experiences, and on the observation and analysis of events in the world around them". Thus, employees of these services have the most important role in this phase, and discussion will bring forth new ideas.

A matrix of opportunities for improvement is useful in this phase:

Opportunity for improvement	Recommendations
1. Opportunity for improvement A	Recommendation for the opportunity for improvement A
2. Opportunity for improvement X	Recommendation for the opportunity for improvement X
3. Opportunity for improvement Y	Recommendation for the opportunity for improvement Y

Figure 9: Matrix of opportunities for improvement.

After the opportunities for improvement are identified, it is necessary to present them to the higher management to search for alternatives to implement them.

Phase 10 – Redesigning the process

The objective of this phase is to redesign the hospital service process, considering the elimination of non-value-added activities and the identification of suggested improvements that were approved by higher management.

The new process will tend to be more efficient in terms of performance, and to have a lower cost. Lower costs lead to improved economic results of the service. This analysis should continuous and periodic: in a world where information and technology are quickly changing, processes should be constantly reviewed.

Factors involved in the application of the model

The human factor is of high importance in the application of the proposed cost and revenue model, once commitment is crucial for efficient implementation.

Participation of all people involved in the process is essential, because information on the time spent in the activities and on which activities are carried out has to be accurate. Besides, when people are committed to the project, they are not resistant to change, and follow-up tend to be smooth.

Application of the model

The model was applied in the *Hospital de Clínicas da Uberlândia* (HCU), a public, teaching and research hospital, linked to the *Universidade Federal de Uberlândia*.

The HCU has 2,776 employees and an annual budget of R$ 35 million; it provides services to patients from Uberlândia

and more than 80 neighboring towns, an estimated population of 3 million inhabitants. The public health system SUS, *Sistema Único de Saúde,* is responsible for 100% of the admitted patients and 100% of the appointments in the hospital.

Current physical structure involves 466 beds, 215 medical offices, 10 classrooms, 8 beds in adult ICU, 4 beds in the pediatric ICU, 9 beds in the neonatal ICU, 12 surgery rooms, and 4 delivery rooms.

This model was applied to the Hemodynamics sector of the HCU. In the initial phase, the importance of the model was discussed with key personnel in the hemodynamics sector (nurses, physicians), the existing process was mapped in a flow chart, employees were interviewed, data on resources were collected, activities were timed, and several exams were observed.

Besides these observations, the invoicing sector provided data on revenue; the cost center report provided costs of materials and drugs, and these costs were confronted with information from the storage sector, to check if the data were correct.

Two types of exams were carried out in the hemodynamics sector: catheterization and angioplasty, as demonstrated in the table below:

Description of the service	Costumer	Total invoiced	Cost of the service	Result of the service
Catheterism	SUS	22,578.24	15,997.44	6,581.00
Angioplasty	SUS	30,795.28	25,894.16	4,901.12
TOTAL		53,373.52	41,891.60	11,481.92

Figure 10: Results of the exams carried out in the hemodynamics sector in July, 2003.

The next phase analyzed value-added activities, which may be improved in the process, and the non-value-added activities. After that, opportunities for improvement were identified in a meeting with the whole team. The following issues were raised:

General considerations

Results of the application of the model showed to be satisfactory. Positive points of the model were: collaboration, involvement and commitment of the whole team in the he-

Opportunity for improvement	Recommendations
1. Substitution of the traditional X-ray machine by a digital one.	Analysis of cash flow and assessment of opportunity for investment. A project to evaluate the feasibility of buying the equipment was recommended.
2. Optimization of human resources by sharing employees with other sectors.	It was observed that the high level of radioactivity faced by employees in the hemodynamics sector during the exams led to idle hours: when one team worked, the other waited for its turn in the nurse's room. To prevent this waste of time, the hemodynamics sector has to negotiate sharing nurses and nurse assistants with other sectors of the hospital that do not work with radioactivity. A work schedule has to be created to prevent the progress of the service from being affected. This measure will be beneficial in terms of cost, and will not have a negative impact on the process.
3. Hiring a new doctor for the sector.	Assess the viability of hiring a new doctor - who may also work in other areas in the hospital - in order to better optimize this resource.
4. Substitution of the current hemodynamics equipment for a more modern one, that produces less radiation.	In an interview with the physician of the sector, the hypothesis of substituting the current equipment for a more modern one as raised. Radiation impact may be less than 80% of the current equipment, and would lead to better use of human resources. Employees would work in two shifts of 5 hours a day, making it necessary to hire one more physician for the afternoon shift. The equipment would cost about US$ 1 million. A project to evaluate the financial viability of buying the equipment was recommended.

Figure 11: Matrix used in the classification of the activities.

modynamics sector. Another point to be emphasized was the enthusiasm in the analysis of the activities, a process that had never been carried out in the organization. New ideas for cost reduction and process improvement were constantly generated during the application of the model.

It was observed that some opportunities for improvement, such as replacing the equipment, were not immediately adopted, and the proposal was being studied by the hospital administration, because of the lack of financial resources.

Other opportunities for improvement, such as hiring one more physician for the sector and extending office hours, were expected to be implemented until the end of 2003. According to the nurse who was the chief of the sector, sharing employees with the echocardiography sector was expected to start in one year. However, before that, these employees have to be trained. After the new doctor is hired, office hours will be extended and work shifts will be optimized.

After these improvements are established, costs will be reduced without affecting performance. The actual amount will not be evidenced in this study due some issues - such as the negotiations in sharing employees - that have not been settled by the time this report was written. However, when these changes take place, economic results of these services will be even better.

Based on these observations, the model was considered to be perfectly applicable to hospital organizations. The ability of the model to generate information on the process justifies its validity.

Conclusion

The model proposed here is perfectly applicable to health services.

Integrating cost and process management gives crucial support to identify and evaluate value-added and non-value-added activities. Thus, opportunities for improving the process are identified, optimizing economic results.

ABC costing gives a relevant contribution to hospital organizations because besides recognizing the cost of each phase of the process, it assesses the total cost of services and shows their economic results by confronting costs with generated revenue. In this case, revenue is a variable defined in terms of procedures, that is, activities.

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