Activity-Based Costing Process of a Day-Surgery Unit – from Cost Accounting to Comprehensive Management

Katja Antikainen[1]; Tarja Roivainen[2]; Mirva Hyvärinen[3]; Juhani Toivonen[4]; Timo Kärri[5]

[1]M.Sc., Lappeenranta University of Technology, katja.antikainen@lut.fi
[2]M.Sc., Lappeenranta University of Technology, tarja.roivainen@pp1.inet.fi
[3]M.Sc., South Carelia Central Hospital, mirva.matto@pp.inet.fi
[4]M.D., Ph.D., South Carelia Central Hospital, juhani.toivonen@ekshp.fi
[5]Professor, Lappeenranta University of Technology, timo.karri@lut.fi

Abstract

The public sector has suffered from poor accounting and management systems for a long time. In hospitals, the need for better cost management systems arises from efficiency problems and lack of resources. With activity-based costing, the processes and the costs of activities become more transparent than earlier. This study points out the changes that have taken place during the activity-based accounting process in one day-surgery unit. We show the benefits and advantages that have come true because of the ABC-process and discuss the problems connected to this process. The ABC-process consists of two phases. The phases and their outcomes are described in this research paper. The most concrete result of the whole process is a spreadsheet-based ABC-model. The model can be used as a tool of daily management. It has been used to find out the costs of each activity and operation. This has enhanced the cost awareness of the unit. The model can also be used for simulation. It has been used to find out the profitability of the enlargement investment of the day-surgery unit.

Keywords

activity-based costing, cost accounting, public sector, hospital

Introduction

Background

The public sector has suffered from poor accounting and management systems for a long time. In hospitals, the need for better cost management systems arises from efficiency problems and lack of resources. Hospitals are facing a more and more competitive environment, and at the same time they have to deal with many problems. Hospitals have new patient care guarantees, while lack of money and other resources, such as skilful employees, restrict their work. There is need for better cost management systems in hospitals, and activity-based costing can help with that. With activity-based costing, the patient care process becomes more transparent than earlier. Also the activity costs become clearer for all employees. (Lawson, 1994; Udpa, 1996)

In the background of this study there is a wider project focusing on the processes, costs and quality of the hospital. The project is realized in cooperation with Lappeenranta University of

Technology and South Carelia Central Hospital in years 2003-2006. The financing of this project comes partly from the Foundation for Municipal Development. This study has its origin in a part of this project, focusing on the correctness of the management accounting and evaluating the Diagnosis Related Groups (DRG) pricing, which is widely used in Finnish hospitals.

Methodology

The study was carried out as an experimental case study. The intention was to find out how the activity-based costing suits the public sector, and our case unit was the day-surgery-unit of South Carelia Central Hospital. The purpose was also to find out what benefits and problems are linked to the implementation process. The study includes literature reviews, interviews, modeling and numerical analysis.

Objectives and definitions

The basic structure of the two-pronged activity-based costing process was used as the theoretical framework of the study. It includes the cost view and the process view (Turney, 1991). The aim of this study was to find out whether the cost view can be handled first, followed by the process phase. The separation of these views does not harm the process but it can give additional benefits.

This research paper points out the changes that have taken place during the activity-based accounting process in the day-surgery unit of South Carelia Central Hospital in 2003-2005. The benefits and advantages that have come true because of the ABC-process are clarified. These include both numerical and managerial results. Also the problems connected to this process are discussed. This paper describes the two-pronged ABC-process and gives evidence about the outcomes that this process has had so far.

The structure of this paper

First the theoretical framework of the study is introduced. After that we describe the two-pronged ABC-process in the day-surgery unit of the South Carelia Central Hospital. This part starts with a short introduction of the day-surgery unit. Then the process is described. This includes the objectives of the two phases, the tools used and the main outcomes of both phases. After that the structure of the ABC-model is described. Finally we introduce the results that this project has had so far. First the numerical results are presented, and then the managerial results and changes that have occurred are clarified. Also the problems arisen in this whole process are discussed. In the end of this study, conclusions are made and some ideas concerning the future development are introduced.

Theoretical framework

As a theoretical framework, Turney's (1991) ABC-model is used. This framework consists of the cost view and the process view. The cost view can be seen as the phase of building the ABC-model. The cost view includes the basic steps of the ABC-process and the main focus is in the costs. The resources and their costs are clarified first. Then the costs are allocated with cost drivers to the activities, found out with the help of activity analysis. Finally the costs are

allocated to cost objects. The main purpose of this process is to find out the costs of the activities and the cost objects.

The second view in Turney's (1991) framework is the process view. While the cost view can be seen as the phase of building the model, the process view can be seen as the phase of using the model built in the first phase. The steps of this view consist of finding out the cost drivers of the activities and using the information for performance measurement. The relation of these two views is presented in figure 1.

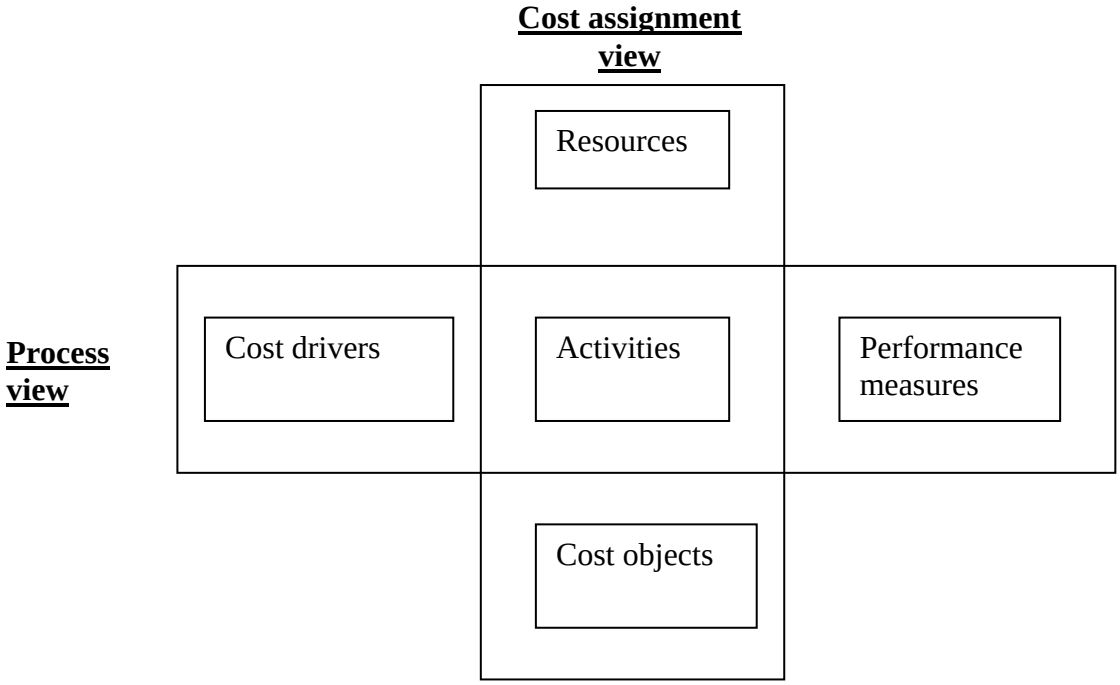

Figure 1. The two views of the ABC-process (Turney, 1991)

The ABC-process of the day-surgery unit

The day-surgery unit of South Carelia Central Hospital

The day-surgery unit works 40 weeks a year, and up to 2500 operations can be done in a year. The capacity comprises three operation rooms and 3.25 operating doctors. The bottlenecks of the unit are the recovery room and the room for receiving patients and sending them home. The day-surgery operations are operations in which the anaesthesia lasts no longer than two hours. The day-surgery care can last up to 12 hours, after which the patient is sent home. (South Carelia Hospital District, 2005a)

The day-surgery unit will be enlarged in years 2004-2007. The enlargement takes place in stages. In September 2005 one more operating room and social and waiting rooms were taken in use, and in 2007 one more operating room will be completed. After the enlargement the capacity of the day-surgery unit will comprise five operating rooms and five operating

doctors. With this capacity it is assumed that up to 4500 operations can be done in a year. Also the number of other staff will be increased. (South Carelia Hospital District, 2005b)

One of the strategic financial objectives of the day-surgery unit for 2004 was to evaluate the DRG prices with the help of activity-based costing (South Carelia Hospital District, 2003). It was commonly admitted that the DRG prices do not reflect the real costs of the operations. Activity-based costing was seen as a good tool to find out the real costs. With the help of the ABC cost information the DRG prices can be modified more accurately.

Process description of the first phase of the ABC-process

The first phase of the ABC-process of the day-surgery unit started in 2003 and ended in spring 2004. When this first phase started, there were no plans for a second phase. It was considered as a one-off project. At this point one of the major objectives was to study the process the patient went through and whether there were any dispensable activities in that process. Additionally the interest was merely in costs. What were the actual costs of different operations? (Mättö, 2004)

The process began with activity analysis. The chain of activities was clarified with interviews. The employees were asked about the process and the time each activity took. It was quite clear from the beginning that time would be the main driver, and the interviews confirmed this hypothesis. The outcome of the activity analysis was a very streamlined process that had no dispensable activities. The interviews also confirmed the fact that the recovery room and the receiving and sending home patients were the bottlenecks of the day-surgery unit. (Mättö, 2004)

The process mapping was the basis for an activity-based costing model built with spreadsheet. Most of the costs were staff expenses, which logically were time-driven. The main driver was the time spent in the operating room, but it was only used for staff expenses and other cost items that were clearly time-driven. At this stage other costs were handled rather roughly and a great part of the costs were divided evenly for each activity, which naturally bent the cost information. However, compared to the Diagnosis Related Groups (DRG) costing system in use, the ABC results were considered to be closer to the truth than DRG prices. At this point, there was some dissatisfaction concerning the accuracy of the ABC costs. This dissatisfaction created the need for the second phase. The following scheme clarifies the objectives and outcomes of the first phase, as well as the tools used.

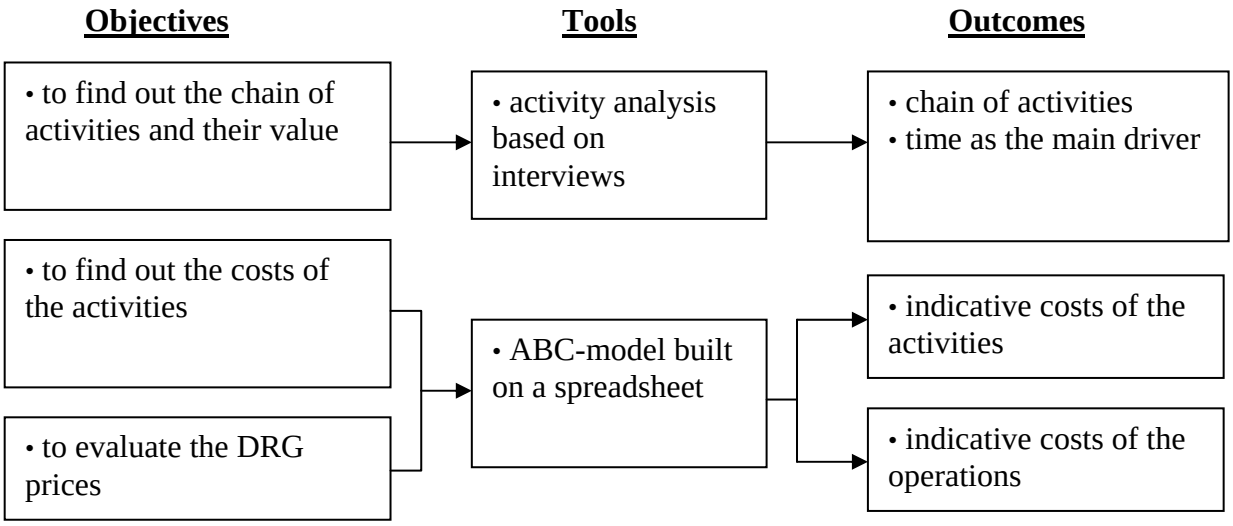

Figure 2. The first phase of the ABC-process in the day-surgery unit

Process description of the second phase of the ABC-process

The second phase of the process was naturally an extension of the first phase. The need for the second phase arose from the need for more accurate cost information. When the objectives for the second phase were discussed, also the managerial use of the ABC-model was pointed out. Most of the basic work for building the model was done in the first phase and the second phase focused mainly on the process view of the ABC. This meant mostly new ways of using the model and also adjustments to the model.

The second phase started by mapping the potential purposes of use of the model. It was pointed out that more accurate cost information was needed if the model was to be used as a tool for managing the unit. Also easier use of the model was needed. One of the objectives was also using the model as a tool for simulating the profitability of the enlargement of the day-surgery unit. (Roivainen, 2005)

The adjustments to the model to get more accurate cost information were started with cost driver analysis (Kaplan & Atkinson, 1998). In the first phase a large part of the costs were allocated evenly for activities and operations. Now these cost items were taken under more precise examination. We found out that many of these cost items were time-related, and also other drivers were taken into account, such as floor area. Also the support activities, such as cleaning, were clarified more accurately with interviews, and the estimated time spent on each activity was used as the cost driver. As a result the costs became much more realistic. (Roivainen, 2005)

The adjustments to the appearance of the model were made so that it would be easier to update it in the future, and the model would not be for one time use only but would be a permanent tool in the unit. Also the reporting was improved. This included the graphics showing instantly the costs of each activity and operation and how the costs are made up. The model now also enables simulation, which shows easily how changes in time, personnel or costs influence the costs of activities and operations. This enables managerial use of the model and helps improving the employees' cost awareness. The simulation possibility was

also used to find out the profitability of the enlargement of the day-surgery unit. In this calculation many simplifications were made, but the model was considered to be a helpful tool in the evaluation. The objectives, outcomes and tools used in the second phase are presented in figure 3.

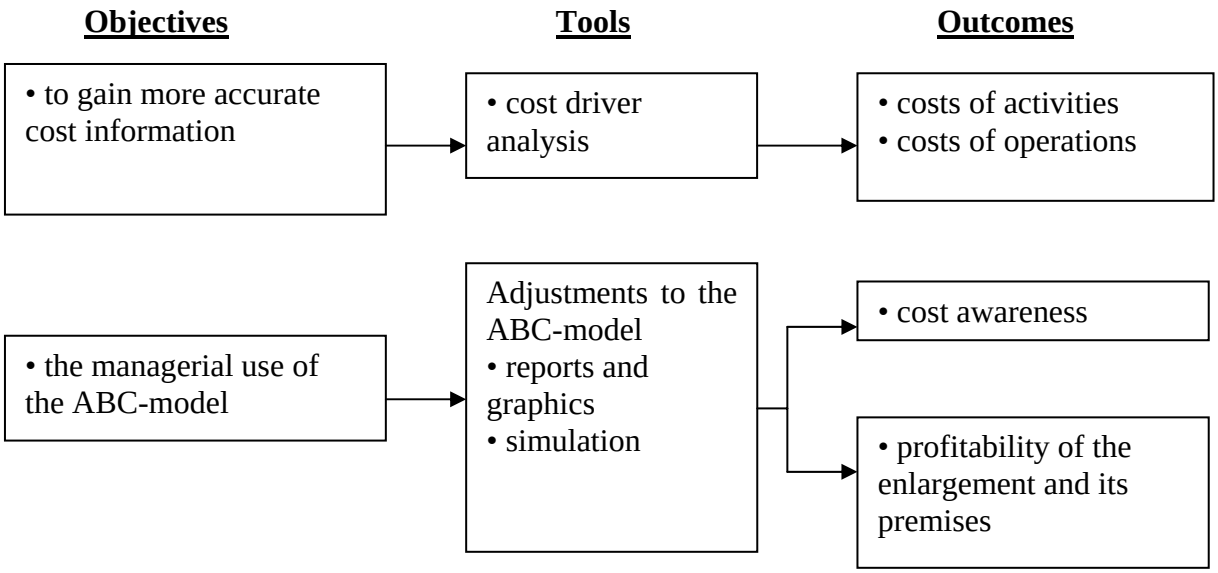

Figure 3. The second phase of the ABC-process in the day-surgery unit

The structure of the ABC-model

The ABC-model of the day-surgery unit was built for a spreadsheet with Microsoft Excel. The capacity of the program was just about enough for the model. Excel was chosen because it is quite easy to use and it is also quite easy to make changes in the model.

The structure of the model follows the following pattern: first there is basic information about the number of employees, which is used to find out the temporal capacity of the unit. This information is used as a cost driver in the model. The costs of the unit have to be entered manually for each year. As cost driver information there are charts in which the average operating room and recovery room times and also the number of operations made are available. Also these have to be updated manually. Finally, the costs of the activities and operations are introduced. Figure 4 presents the basic structure of the ABC-model.

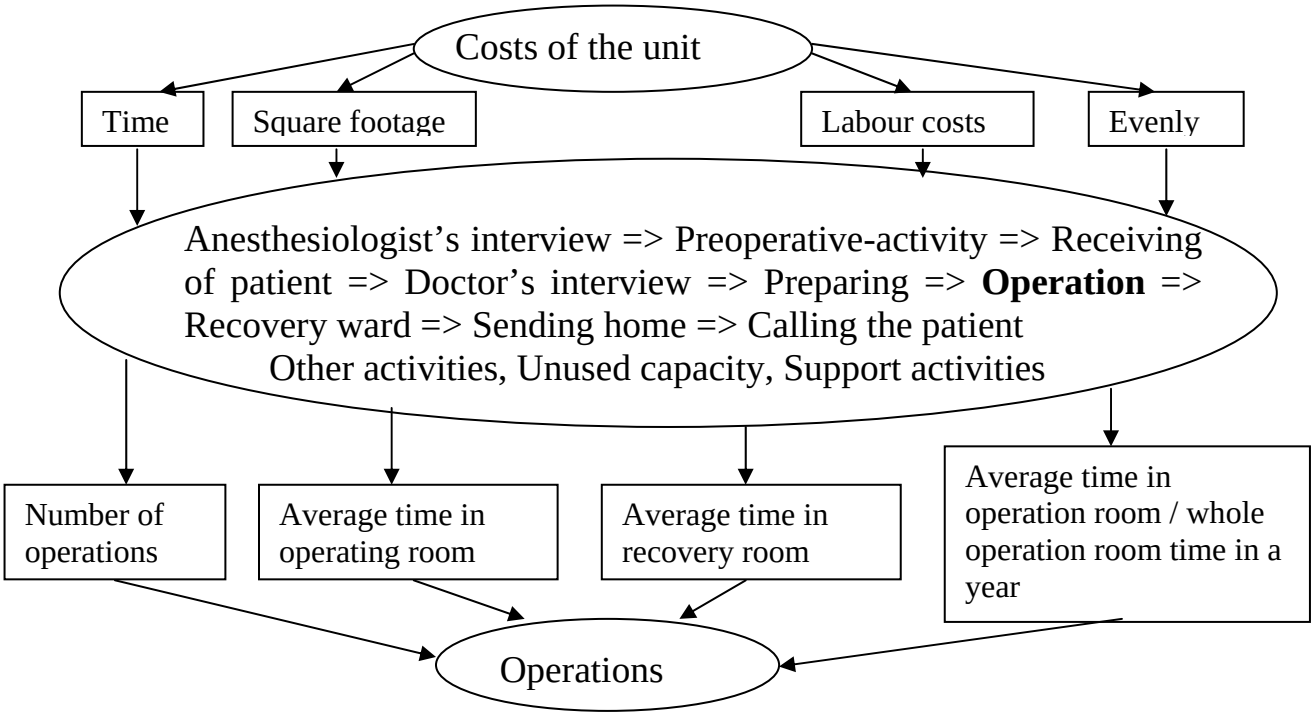

Figure 4. The basic structure of the ABC-model

As shown in figure 4, there are eleven main activities in the model. The first nine activities present the path that the patient follows when he comes to surgery. Additionally, there are other activities, which consist of breaks, meetings etc. These other activities are those that do not belong to the main process but are necessary for the unit to function. Finally there is the unused capacity -activity, which reflects the underutilization of the unit's resources. The support activities are cleaning, equipment maintenance and drug maintenance. The costs of these support activities are divided to the main activities with suitable cost drivers.

Results

Numerical results

The classification of the costs started the numerical part of the ABC-process. As a result it was found out that the Pareto-rule holds also in a hospital. In figure 5 it can be seen that 20 % of the operations create 80 % of the costs. Operations done more than 10 times a year are 21.9 % of all the operations made in the day-surgery unit and they create 79.5 % of the total costs of the unit. The conclusion made from this classification was that it was most important to focus on these operations, because they create most of the costs.

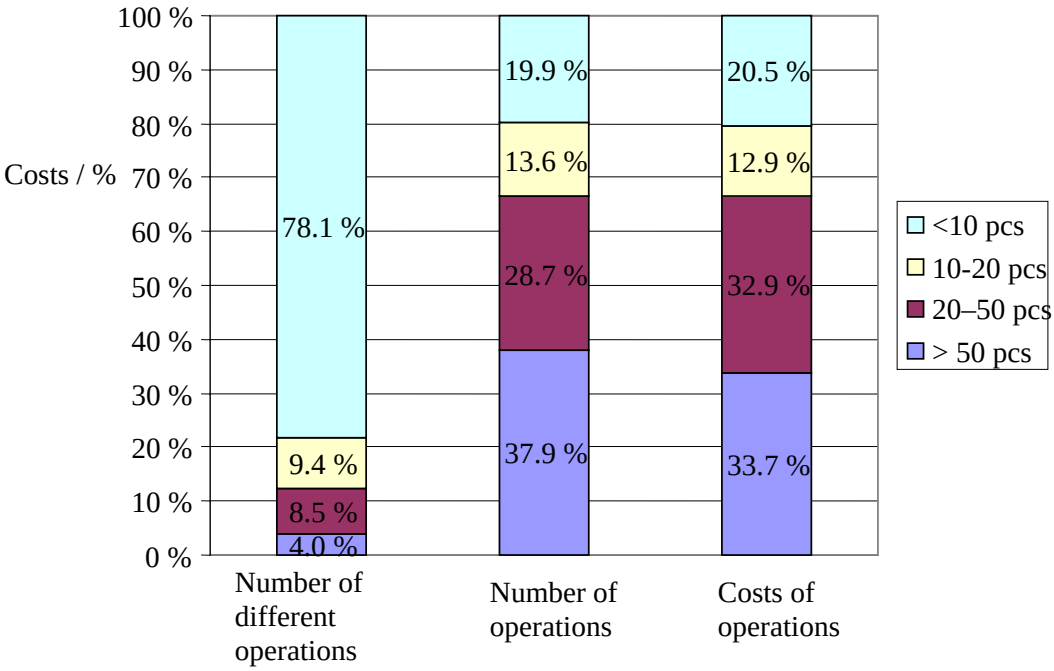

Figure 5. Classification of the costs of different operation groups

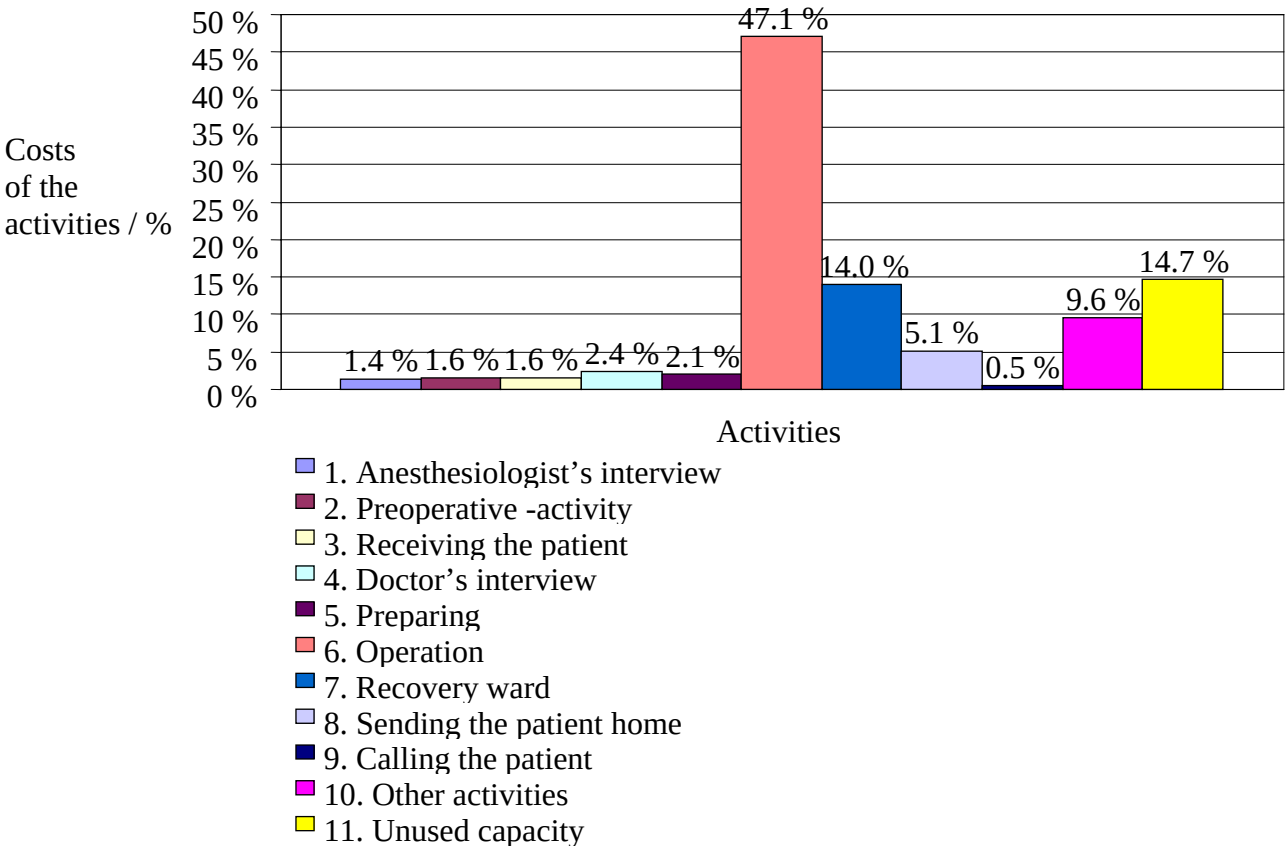

Figure 6. Costs of the activities of the day-surgery unit

When looking at the costs of the activities, presented in figure 6, the diagram seems fairly clear. The operation activity carries most of the costs and the recovery ward comes second in this comparison of the main activities. What is worrying in this result is that the costs of unused capacity are quite high. They are even higher than the costs of the recovery ward. 14.7% of the total costs are costs of unused capacity. There are naturally explanations for this, but what is important is that the employees and the management of the hospital are aware of the costs of the unused capacity.

When comparing the ABC costs to the DRG prices, the differences are big. Basically the ABC costs are higher than the DRG prices. One explanation for this is that the costs of the unused capacity are high. The DRG pricing takes into account the nature of the surgery but it does not take into account the local problems in using the whole operating capacity. If the whole capacity were in use, the differences would not be as high as they are now. Table one presents some examples of the differences between the ABC costs and DRG prices for the most common operations.

Table 1. Examples of the differences between ABC costs and DRG prices

Operations that are done over 50 times a year	**ABC costs**	**DRG price**	**Difference**
NGD05	1 096.00	1006.00	90.00
JAB30	1 074.09	897.00	177.09
EMB30	744.88	647.00	97.88
LGA11	1 011.13	830.00	181.13
ACC59	952.68	830.00	122.68
NBG15	1 585.30	741.00	844.30
LCH00	518.98	361.00	157.98
HAB40	853.16	1 751.00	-897.84
DCA20	580.77	830.00	-249.23

The profitability of the enlargement of the day-surgery unit was simulated with the ABC-model, few simplifications were made to the simulation to keep it controllable. It was assumed that part of the costs, such as rents were fixed and part of the costs were variable, which would grow either in relation to the growth of the operations (from 2500 to 4500) or in relation to the growth of the labour costs (approximately 69.3 %). In this simulation the default value was that all the capacity could be used. As a result of this simulation it was found out that when looking at the costs of the activities, the most obvious change was the decline in the costs of unused capacity. The costs decreased from 14.7 % to 2.4 %. In the costs of operations the average cost of an operation decreased from 1100 € to 837 €. The sensitivity analysis showed that if the benefits are to be realized the target level of the operations should be 4000 operations in 2007. This requires also professionally skilled personnel, which cannot be taken as granted.

Managerial results

In the previous chapter some of the numerical results of the whole ABC-process were presented. One of the main objectives was also the managerial use of the model. This means activity-based management (ABM). When the costs are calculated they have to be used in the daily management if any of the benefits are to be realized.

When looking at the results of the whole process, one of the major benefits is that the staff has become more aware of the things they do. The activity analysis made them think about the work they do and the efficiency of their work. Also the ABC-model and the numerical results encourage the employees to see the difference in the way they do things. As we can see from the results, the process was very streamlined and there were no dispensable activities. This information calmed many of the opponents down. The model was seen as a good tool to guide the doctors so that they will not keep the operating room waiting. It was pointed out that every minute of waiting in the operation room costs over 8 euros/minute.

One of the most significant results from the management's point of view was the fact that in 2004 14.7 % of costs were costs of unused capacity. This was mainly due to the fact that there was lack of operating doctors. Another way to look at the unused capacity is that there is margin for business. There is no point in letting the operating rooms stand. The remaining time can be sold for example to doctors outside South Carelia Central Hospital.

In general the ABC-process has enhanced the cost awareness of the staff of the unit. It has also pointed out to the management that the pricing of the operations could be done in a more reliable way than with DRG pricing. The competition is growing also at the private sector and hospitals and other municipal activities are competing with each other for the tax payers' money. Knowledge of the true costs is needed when selling the operations to outsiders, which is done if there is unused capacity and there is need for certain operations from other hospitals, for example. The cost information is also needed for making the unit act more efficiently.

Problems

Most of the problems that are linked to this process arise from the resistance of change of the employees. Hospitals are quite hierarchical and conservative institutions and the changes do not happen very quickly. The resistance comes from the top of the organization as well as from the bottom level. Nobody wants their work to be criticized, what the activity-based costing and activity analysis are often seen as. (Cooper & al., 1992)

The operating doctors see their work in a hospital as expertise work, which in their opinion cannot be measured with numbers and time. This is partly true because the most important thing is that the patients survive from the operations and do not die because of the hastiness of the doctors. This fact has to be taken into account when making performance measurement systems, which the ABC-model can be seen as when looking at it from the process view.

One problem related to the work of the doctors is the average operating room times used as cost drivers. Different doctors make the same operations at different pace, which causes dispersion to the averages. What is most important is that the doctors become aware of the fact that time is money and they do not keep the other staff waiting in the operating room without a good reason. When using the averages instead of individual times, the model is easier to update (Kaplan & Anderson, 2004).

Also the lack of accounting skills by all employees is one problem. If the staff does not realize the meaning of the numbers, the benefits can be lost. (Cooper & al., 1992) One important result from the ABC-model is the guidance it can give to the operating workers. Also

updating the model can suffer from poor accounting skills. This problem requires training of all employees. The training can be difficult, however, because of lack of time and how the priorization of work is done. After all, if there already is lack of resources, the accounting training might be seen as a waste of time, although with some training there could be quite good effects on the work as a whole.

Conclusions

When looking at this ABC-project as a whole, it can be said that this two-pronged process was very good, even though it was not planned that way in advance and the process took quite a long time. But also many benefits arose from this process. This project started in the end of 2003 and the last modifications were made in spring 2005. The long time span of this process helped the employees of the day-surgery unit slowly accept the fact that the ABC is going to guide their work.

The fact that there were two phases also helped the employees to see how the ABC works and how the ABC becomes ABM. It was thought to be quite natural that at first we built a model to get the cost information and at the second phase the planning and control point came along.

The ABC-model was considered as a good tool for planning and controlling the activities of the day-surgery unit. In the future it will be used for once a year calculations, so it will not take too much of the unit's resources, but still the needed information is gained from the model.

References

Cooper, Robin. Kaplan, Robert S. Maisel, Lawrence S. Morrissey, Eileen. Oehm, Ronald M. 1992. Implementing Activity-Based Cost Management. Institute of Management Accountants. Montvale.

Kaplan, Robert S. Anderson, Steven R. 2004. Time-driven Activity Based Costing. Harvard Business Review. November 2004. pp.131-138.

Kaplan, Robert & Atkinson, Anthony. 1998. Advanced Management Accounting. New Yersey. Prentice Hall inc. 798 s. ISBN 0-13-080220-4

Lawson, Raef. 1994. Activity-based costing systems for hospital management. CMA Magazine, Jun94, Vol. 68, Issue 5. p.31-35.

Mättö, Mirva. 2004. Päiväkirurgian toimintolaskentamalli ja DRG-hinnoittelu. Lappeenrannan teknillinen yliopisto. Lappeenranta.

Roivainen, Tarja. 2005. Toimintojohtaminen päiväkirurgisessa yksikössä. Lappeenrannan teknillinen yliopisto. Lappeenranta.

South Carelia Hospital District. 2005a. The Website of the South Carelia Hospital District [WWW-document]. Read 11.3.2005. <http://ekshp.fi>

South Carelia Hospital District. 2005b. The Budget of the South Carelia Hospital District [WWW-document]. Read 15.4.2005. <http://www.ekshp.fi/fi/456/993>

South Carelia Hospital District. 2003. The Strategy and Financial Plan of the South Carelia Hospital District 2004-2006, The Budget of the South Carelia Hospital District 2004. Lappeenranta.

Turney, Peter B. B. 1991. Activity Based Costing – The Performance Breakthrough. Cost Technology Inc. Portland USA.

Udpa, Suneel. 1996. Activity-Based Costing for Hospitals. Health Care Management Review. Summer 1996. pp. 83-96.