Model of evaluation cost/value of blood in a hospital, a contribution

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Abstract

The Accounting System for Activities in the Hospitals, sistema de custeio por actividades nos hospitais (SCAH), is outlined to evaluate detailed cost elements, understanding cost behaviour, which can facilitate future policy decisions, because policy makers have the opportunity to more fully understand the implications of incremental changes. How blood cost should be measured is an open question. The blood and its components are becoming increasingly costly and scarce. We decided to apply the SCAH to the Blood Bank of IPOFG Lisbon, in order to evaluate a far more appropriate actual cost of the blood in our Institution.

We used an activity-based approach to more fully account for the cost of blood, then present estimates, derived from the concept of activity-based costing (ABC). We applied this method to the process flow charts of activities associated with blood collection facility and the others associated to the transfusion service.

The cost of a packed red blood cells unit was calculated as 356.44 €. There are a lot of ways to obtain blood components. Even the same component could have different prices according to the way it has been collected, which is yet an additional contribution to these prices.

Estimating blood costs is a complex undertaking. The cost of blood is continuing to drive upwards and has up to now been underestimated.

Key words: ABC model, blood costs

Introduction

Activity based costing (ABC) technique is a process concept that involves a series of resource consuming activities which are traversal to all the services within a hospital. In addition, the ABC technique also makes use of the following components: resources, activities, cost objects, resource drivers, activity drivers.

Resources

Resources are the economic elements used by hospitals to develop their activities that can be categorized as physical, human and financial. These resources are transformed as costs and revenues (the hospital accounting service does not include them as accounting elements). Resources can be aggregated in ledgers of the same nature, which will create a resource pool.

According to ABC, resource pool or cost pool is a set of ledgers of similar nature that present an identical common driver (a consumption unit) of cost related activities or objects. Examples of resource pools are buildings (mortgage/rent payments, utilities services, cleaning, security services) and vehicles (lending/leasing payments, maintenance, insurances, taxes).
The resource structure consists of resource pools defined for each department which is a reflection of the conceptual definition developed for the hospital at Instituto Portugues de Oncologia Francisco Gentil, Centro de Lisboa (IPOLFG).

The department is a functional entity responsible for the consumption of resources and execution of activity that generates output of a hospital where output is defined as cost-related services or goods. Every department in a hospital system has a corresponding cost center, defined by the each hospital management structure.

**Activities**

The first and most important stage for implementation of the ABC method is the definition of Activities; precise definition of the processes involved determines further analysis with the goal of developing cost-related services or goods.

Activities can be arranged in a hierarchy that reflects an aggregated relation between macro activities and supportive activities. In this context, macro activities are just an aggregation of support activities, which do not possess the several characteristics of support activities or the details of the resources used by them; the same applies to the driver that computes the cost of objects.

In addition, a basic activity has a cost (a summary cost that reflects the consumption for resources by that activity), a volume (a summary cost value regarding the different costs of every object used), and a unit cost (cost divided by volume).

**Cost objects**

Cost objects (CO) are the many services that a hospital can provide, services that produce final elements the final cost of which has to be determined and measured.

Cost objects can be divided into two groups: middle cost objects and final cost objects.

In addition, a cost object has a driver (a unit of consumption of an object — only for middle cost objects), a cost (a summary cost that reflects the consumption of an object), a volume and a unit cost (cost divided by volume).

**Resource drivers**

Resource drivers are units of measure that represent the amount of resources consumed by an activity or cost objects that are used to bind resources or resource pools to the activities and cost of objects that consume them. For example, the driver regarding the cost of staff is time (the amount of hours necessary to perform a specific activity). The driver regarding the occupied space is a square meter, the amount of space that each department uses. The final cost driver is computed by adding the space of every department and the amount of hours that the staff of each department requires to perform the tasks.

**Activity drivers**

Activity drivers are factors that allow a certain activity to be performed and help to trace the activity to the cost objects such as products, services, etc. These drivers are usually represented by physical units such as the number of discharged patients from a specific diagnosis related group (DRG), the number of outpatients in a specific medical specialty, etc. Figure 1 describes the ABC methodology with interface of all resources, activities and cost objects.

In this way the Accounting System for Activities in Hospitals (SCAH) at IPOLFG allows users to determine the real cost of activities, to identify potential lack of efficiency areas and to obtain objective data on all activity costs. With this method of accounting it was possible to approach the reality of hospital services, and to make the costs more comprehensible to all professionals involved. Analytical accounting was introduced to determine the total amount of resources used during the year 2007.

The national health care system in Portugal is making a huge effort to control the rising costs associated with the provision of health service. One form of related activity is development of new allocation methods for hospitals. In the management of resources the activity-based costing allows to estimate the resource costs and time of a service rendered. In the traditional costing systems many costs are often grouped together as overheads.

Even though many changes have occurred in Portugal as result of the financial crisis and the International Monetary Fund (IM) the presented data are up-to-date.

The price of blood is an area for which all these costs should be determined, analyzed, acknowledged and computed. Estimation of blood costs is a complex undertaking, surpassing simple versus demand economics; it is neither simple nor straightforward. The underlying issues here are whether blood components are billed properly by hospitals and how extensively the value of blood components is calculated.
In the blood banks of IPOLFG the SCAH was applied in 2007 with the aim of defining an effective evaluation model.

The first stage of implementation included identification of the service activities of the blood bank for several production lines, for example donor recruitment, collection and separation of blood components (red cells and platelets), medical consultations, day hospital and laboratory techniques, as well as activity related to hemovigilance within the institution. This was followed by allocation of resources to activities based on time spent by various service professionals to fulfill the tasks.

The second stage of implementation included definition and determination of the cost objects at the hematology service. Since a blood bank represents a very complex and traversal hematology service, it was mandatory to fully understand the sequence of events that takes place there and to identify the various cost objects by dividing them into elementary objects of cost and final cost objects. The final cost objects result from a sum of several elementary cost objects.

The definition of elementary cost objects was based on the records and statistics produced by the bank itself. The final cost objects that corresponded to all blood components were determined by the blood bank, allowing a comparison of the costs defined by IPS (Instituto Portugese do Sangue; Portuguese Blood Institute).

Once the costs of carrying out various activities were determined and the cost objects were defined it was then necessary to proceed to the allocation of the cost of activities to cost objects. To this purpose the activities which contribute to the achievement of various objects of costs had to be identified as well as types of relationships; one-to-one, for an activity that corresponds to the realization of an object costing and one-to-many for an activity that corresponds to the realization of various cost objects.

In cases of indirect relationship the effort index of professionals is applied to determine a risk weight, dividing the costs of carrying out an activity by different cost objects. This risk weight should give attention to the time spent by each employee on each cost object. This study is very important not only because there are cost objects that involve more than one professional, one or several professional categories, but also because

Figure 1. ABC methodology
the time spent in the execution of the objects of cost may vary.

After allocation of activities to cost objects, the remaining costs (those that are not quantifiable in terms of activities such as medicinal products, medical consumables, reagents, because some material can be degraded or lost during the process) are considered as non-countable ABC costs.

Finally, it is necessary to allocate utility costs (electricity and water consumption, rent, etc.) and costs common to the whole institution (administration, financial management, human resources, procurement and other general services, etc.).

Let us now consider an example of cost determination for Packed Red Blood Cells delivered by the blood bank. To determine the cost of this blood component we need to include: the cost of whole-blood- donor examination, the cost of separation and storage of packed red blood cells, the cost of blood tests and the costs of blood preparation with pre-transfusion tests, irradiation and transfusion of blood products. Each of these costs corresponds to elementary cost object items. Figure 2 presents the cost of packed red blood cells divided into different elementary cost objects that contribute to cost determination (donor recruitment, blood collection, etc.) in the perspective of the blood bank. The cost of packed red blood cells is also presented in Table 1 but in this case we consider the resources allocated to packed red blood cells that contribute to their production.

Table 1. Resources contributing to the cost of Packed RBC

<table>
<thead>
<tr>
<th>Description</th>
<th>Price (€)</th>
<th>% 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personnel</td>
<td>25.32</td>
<td>90.26</td>
</tr>
<tr>
<td>Material to blood collection</td>
<td>6.47</td>
<td>23.07</td>
</tr>
<tr>
<td>Equipment</td>
<td>1.03</td>
<td>3.67</td>
</tr>
<tr>
<td>Common costs</td>
<td>5.03</td>
<td>17.92</td>
</tr>
<tr>
<td>Reagents</td>
<td>3.69</td>
<td>13.15</td>
</tr>
<tr>
<td>Outsourcing</td>
<td>1.83</td>
<td>6.52</td>
</tr>
<tr>
<td>Structures</td>
<td>1.01</td>
<td>3.60</td>
</tr>
<tr>
<td>Laboratory analysis</td>
<td>15.85</td>
<td>56.50</td>
</tr>
<tr>
<td>Transfusion session</td>
<td>39.77</td>
<td>141.75</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>356.44</td>
</tr>
</tbody>
</table>

Figure 2. Cost of Packed RBC considering donor selection, blood collection, laboratory testing and application

Figure 3. Resources contributing to the cost of Packed RBC

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Table 2. Cost of transfusion therapy in out-patient ward

<table>
<thead>
<tr>
<th>DRG for medical ambulatory</th>
<th></th>
<th>DRG for surgical ambulatory</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Average cost of each procedure in 2007</td>
<td>143.89 €</td>
<td>Average cost of each procedure in 2007</td>
<td>143.89 €</td>
</tr>
<tr>
<td>Disease Related Group (DRG) for medical ambulatory to National Health Service (Valor de Ref. Contrado Programa 2007), unit cost</td>
<td>320.86 €</td>
<td>The relative medical cost of transfusion therapy in DRG for ambulatory</td>
<td>44.85%</td>
</tr>
<tr>
<td>The relative medical cost of transfusion therapy in DRG for ambulatory</td>
<td></td>
<td>The relative medical cost of transfusion therapy in DRG for ambulatory</td>
<td>11%</td>
</tr>
</tbody>
</table>

In result we can say that the cost of blood in IPOFG represents 1.2% of the hospital budget. This cost however will increase to 4–5% if all steps (from blood bank activities to patient application) are accounted for.

According to a recent literature review the population-weighted mean cost of transfusing 2-units of red blood cells (RBC) in Western Europe was estimated at 877.69 € [1]. In an article published in 2010 by Shander et al. [2] the price per RBC unit cost was calculated at $761 ± $294.

The above data reflect the importance of methodology selected for calculation as well as the differences between hospitals (which may have specific case mix). The use of the ABC model confirms that blood costs have been underestimated and that they vary geographically. The model is also helpful for identifying opportunities for cost containment.

Conclusion

The cost/value of blood represents an important allotment of hospitals budgets, which in most parts are underrated. Blood cost estimation is a complex undertaking. The cost of blood is gradually rising and it has been so far underestimated. The goal of minimizing risks and costs can be attained through efficient management of blood supplies/stock and cautious blood administration to patients.

The hemovigilance system has not been included notwithstanding its value having also been calculated. We estimate its cost at about 30 € per transfusion.

References