Example of cost calculation for operating rooms in the hospital

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Abstract: - Costs are involved in all economic activities of the company and are important for its existence. In the current economic situation is putting pressure on hospitals to reduce costs. In hospitals, it is difficult to reduce direct costs, because most often it is a material used in the treatment of the patient, therefore, should focus on overhead costs and their management. The aim of this article is to find an allocation key to allocate costs to the operating rooms.

Key-Words: - cost, hospital, operating room (OR), cost allocation, overhead cost, support cost centers

1 Introduction

Hospitals consume the largest share of health resources in most countries. According to Barnum and Kutzin (1993) hospitals received 50 percent or more of government health resources in 19 out of 29 developing countries for which data were available, and hospitals received on average 54 percent of government health resources in OECD countries. Health insurance companies, the central government, regional governments and citizens themselves currently spend approximately 7.1% of the GDP in the Czech Republic on the health care services. In 2013, total expenditures on health care reached CZK 287.2 billion. Health care costs are currently growing faster than the real economy. The most expensive part of health care is represented by hospital care, what represents approximately the half of all expenditures. (OECD, 2015)

There are continued pressures in all advanced economies to contain the growth in healthcare expenditure. In addition, deteriorating financial position of healthcare providers is leading to an emphasis on cost reduction for economic survival. (Drummond, 2006) Hospitals are in this time under pressure to more effectively manage activities and outputs performed with limited resources. Despite the fact that the reimbursement of hospitals on a fee for service basis is common and European countries as well as the Czech Republic use Diagnosis Related Groups systems (Busse, 2006).

The objective of this study was to answer the question about the cost of the operating room. The aim of this paper is to fine the appropriate allocation base for all cost recorded at cost center operating room.

2 Literature review

The cost evaluation of the use of an operating room (OR) is comparable to the cost of a business company. This cost represents the sum of spending required to produce goods or services. The service is represented here by a surgical procedure under anaesthesia. The total cost contains all the costs incurred by the company - fixed and variable Shared costs are composed of direct and indirect expenses. (Raft, 2015)

2.1 Calculation of operating room

Calculating the cost of the operating room depends primarily on the methodology that we use. Author Balakrishnan et al. (2015) lists as one of the possible methods method Time-Driven Activity Based Costing (TD-ABC). This method can be classified into methods Bottom - up. Author Macario (2010) also discusses a method Top - down, which lists as one of the possible methods of cost - to - charge ratio (CCR). The first of the above mentioned methods is more accurate method for determining the amount of the costs. Raft et al. (2015) also addresses the issue of allocation of variable costs and fixed as well as direct and indirect. In direct costs in the operating room, we can include labor costs (doctors, nurses and other staff in the operating room), medicines, medical devices such as implants etc., depreciation, cost of special

equipment, and the services of external laboratories. It also states that wage costs can represent up to 65% of direct costs. Therefore, the author Balakrishnan et al. (2015) focuses its study on the calculation of the salary costs using TD-ABC. In contrast, indirect costs are cost which is also linked to other departments in the hospital and assigning them to the operating room (rooms) is not easy. To assign these common costs, we use different methods (Finkler, 1999). The reason for determining the costs of operating rooms is the fact that what is not measured cannot be efficiently or effectively manage (Macario, 2010). The aim should be to maximize efficiency, reduce unused capacity and therefore costs (Balakrishnan, 2015).

Many papers relating to the cost of hospital highlight the importance of measuring the profitability, cost and revenue sources of individual decentralized units as operating room. Most studies also have shown that it is appropriate to determine the cost per time unit. The cost of operating room time depends on the resources consumed and the unit costs of those resources. Hospital managers must also decide whether the benefits of more accurate and detailed cost information justify the additional costs of obtaining that information. (Macarino, 2010)

2.2 Overheads cost

Overhead or indirect costs cannot be traced to services/products (costs objects) in an economically feasible way. The big problem in costing is the allocation of these costs.
Different, but entirely reasonable, methods can lead to significantly different results. Although the most common allocation bases are direct labour hours, direct wages, direct materials, machine hours, or direct labour costs, choosing between allocation methods usually depends on which allocation method more closely approximates the factors that generate overhead costs in the long run (Clewer 1998, Lucey 2002, Zimmerman 2003).
In the table 1 are described the most common allocation base and their advantages and disadvantages.

Table 1 - Overhead cost allocation method (Bean and Hussey, 1996)

Allocation base	Allocation method	Advantages	Disadvantages
Flat rate	Shared equally between service areas	Simple and transparent	May be unfair because allocation is not based on actual utilisation of overheads. Cross-subsidisation could distort costs/prices and undermine competitiveness. No financial incentive to reduce overhead costs
Square footage	Proportion to the amount of floor occupied for service delivery.	Simple and transparent, may be appropriate for accommodation costs	May not be suitable for all kind of overhead costs. May be unfair because allocation is not based on actual utilisation of overheads. Cross-subsidisation could distort costs/prices and undermine competitiveness.
Employee numbers	Proportion to the direct number of staff engaged in service delivery.	Simple and transparent, and could also be fair for human resource intensive services	Human resource costs may not be a good proxy for actual use of overheads; Service delivery may require significantly different human resources (human resource mix) which could cause cross-subsidisation
Employment costs	Proportion to the direct human resource costs of service delivery	Simple and transparent, and could also be fair for human resource intensive services	Human resource costs may not be a good proxy for actual use of overheads;
Budget size	Proportion to the direct expenditure budget of each service area	Simple and transparent, and could also be seen as equitable	Budget may not be a good proxy for actual use of overheads; as a result services could be cross subsidised.
Capital asset value	Proportion to the assets used in the service delivery	Suitable for overheads relating to medical equipment and premises	Difficulties in the case of old equipment and assets. May not be suitable for non-equipment related overheads
Output	Proportion to the units of service outputs	Strong link between overheads and productivity Reducing price/cost distortion	Transaction costs could be relatively high. If output is low, mid-term adjustment may be required to absorb all the overheads
Number of patient days	Shared equally between patients	Simple and transparent	May be unfair because allocation is not based on actual utilisation of overheads. Cross-subsidisation could distort costs/prices and undermine competitiveness. Little financial incentive to reduce overhead costs.
Actual utilisation	Proportion to actual utilisation of overhead costs	Fair, Creates a financial incentive to reduce overhead costs	Transaction costs could be relatively high, may require a sophisticated internal accounting system and a mix of different allocation (apportionment) methods.

2.3 Utilization

Utilization is expressed as a ratio. There are several definitions of utilization, the numerator refers to the total hours of elective cases and the denominator equals the number of hours the operating room is staffed to perform cases. One way how hospitals try to achieve profitability is to maintain relatively high (e.g.,90%) operating room utilization to cover all fixed (overhead) costs. (Macario, 2001)

3 Problem Solution

The aim of the study is to evaluate the cost of operating room (OR). The whole hospital is divided into 170 cost centers. Almost all of these centers are assigned according to the focus of each department of the hospital. However, there are 49 centers that they are supporting cost centers - hospital management, administrative staff and transportation. The costs of the hospital in 2015 were 41 174 703 EUR and the costs of operating rooms were 1 862 796 EUR (it is 4.52% of all costs).

Several data sources had been used for the study. From financial accounting reports was obtained elementary cost elements. Additional cost data was obtained from management accounting evidence, which is performed additionally to the financial accounting evidence in order to register the consumption of services and related costs between operating rooms.

Additional information has been collected from internal materials and the information system, it was eg. fixed assets for individual rooms, energy consumption, utilization of operating rooms.

In the hospital have been identified six of operating rooms. (see Table 1)

Table 1 – Operating rooms (own work)

Nr.	Operating rooms	Number of hours	Number of operations
1	Orthopedics	1450 h 10 m	1383
2	Traumatology	801 h 55 m	885
3	Surgery (1)	839 h 11 m	778
4	Ophthalmology	490 h 50 m	982
4	ORL	811 h 25 m	868
5	Urology	1141 h 52 m	1315
6	Surgery (2)	1152 h 34 m	1073

In the hospital are costs on operating room reported as one amount. Individual operating room assigns only a portion of material consumption through the established system of scanning individual items used in room. The structure of the costs is in Table 2.

Table 2 – Structure of direct and indirect cost in operating rooms (own work)

Title of items	Direct cost	Indirect cost
Material	X	x
Assets	X	x
Repairs of assets		x
Travel cost		x
Representation costs		x
Service		x
Personal costs		x

3.1. Overhead costs

In this section we will focus on the allocation of indirect costs. Material can be divided into three groups, which are influenced by various parameters.

- The cost depends on the number of operation
- Costs associated with the percentage of consumption of direct material
- Costs associated averaging

Materials allocated according to the number of operations, includes material that is directly related to the operation and its consumption is dependent on a number of operations. This is a surgical draping member of surgical teams, personal protective equipment, cleaning disinfectants and laundry. Materials allocated in proportion to the direct consumption of material directly related to the operation, but its consumption may not be directly dependent on the number of operations, these are bandages, sutures, etc. Materials allocated equally to individual operating room include material that is not directly related to the operation - supplementary material, including material maintenance, office material, etc.

Assets hospital is divided according to the purchase value – assets up to 740 EUR and more than 740 EUR. Assets with a value of over 740 EUR are depreciated. Assets up to 740 EUR include surgical instruments, furniture operating rooms and computer equipment such as computer, scanner, etc. Assets of 740 EUR cover mainly instrumentation

operating theaters. The most demanding of these assets is a urological operating room, is home to more than 18% of the total purchase price of the property. For ophthalmic operating room it is also a high proportion of assets in the amount of 17.46%, although it is used only two days a week.

Costs for repair machines to individual operating room were determined according to the cost of that asset.

Services include a large range of costs - the cost of telephone service, laundry, staff training, service tools, etc. dosimetry. The largest item, there are costs associated with washing clothes, which make up 74.19%. The key for the allocation of these costs is the number of operations at individual theaters. The rest of the cost was divided either by direct assignment (dosimetry) or by expert estimates the hospital.

The costs of travel and representation are recorded in detail and therefore were averaged and assigned to the individual operating room.

Personnel costs represent the largest cost item of overhead costs operating rooms, the total cost of operating rooms participates in the amount of 20.43%. Hospital records personnel costs as a single entity for operating theaters, allocation was made on the basis of the number of operated hours in individual rooms and hourly wages of individual members of the operating team.

Table 3 - Distribution keys for individual cost items (own work)

Title of items	**Distribution key**
Material	
protective masks, personal protective equipment, cleaning disinfectants, laundry	number of operation
dressing and sewing material	% of direct material
material for maintenance, office material etc.	averaging
Assets	
Assets more than 740 EUR	direct assignment
Assets up to 740 EUR	direct assignment/ expert estimation
Repairs of assets	amount of the purchase price of the assets
Travel cost	averaging
Representation costs	averaging
Service	
laundry service	number of operation
Dosimetry	direct assignment
other services	expert estimation
Personal costs	the number of operated hours in OR and hourly wages of individual members of the operating team

The hospital calculates the depreciation of assets only in terms of financial accounting. For more accurate costs for each operating theaters were established the new amount of depreciation. The furniture was determined lifespan of 10 years and 8 years for devices. For surgical instruments and other medical supplies was determined lifespan individually after consultation with hospital staff.

3.2. Support cost centres

Support cost centers was determined on the basis of the work for surgeries, there are these five support centers:

- Management and administration
- Human resources management
- Information systems and technology
- Facility management
- Transportation

The next section contains the allocation of these costs in relation to the various operating rooms. See Table 4.

Management and administration - It is an activity that includes the common costs for administration and management.
Human resources management – This activity includes costs which are connected with HR activities.
Information systems and technology - This activity includes all costs that is connected with IT and IS in the whole hospital.
Facility management – This activity includes costs on facility management and maintenance.
Transportation – This activity includes costs on transportation e.g. patient transport.

Table 4 - Distribution keys for cost support centres (own work)

Cost support center	key to assign costs to all OR	key to assign costs to each OR
Management and administration	% of the cost of operating rooms to total costs	averaging
Human resources management	% of people working in operating rooms to the total number of employees	according to the average number of people working in the operating room
Information systems and technology	expert estimation	averaging
Facility management	% of the size of operating rooms to the total hospital	according to square meter of each operating room
Transportation	expert estimation	averaging

Based on the calculation of individual items overhead costs of operating theaters, was determined hourly overhead rate by individual operating rooms. The highest overhead costs are on the orthopedic operating room. This hall has a high cost of materials and equipment. In terms of utilization is the most used room.
Total cost and rate per hour of the individual halls are in the table 5.

The most expensive operating room is Ophthalmology, this operating room has highest hourly rate. This OR is capital intensive there are many facilities and a high consumption of material. Conversely, there is the lowest value in personnel costs compared with the total labor costs of operating rooms. At the OR is very expensive equipment but the operations are held only two days.
The cost consumption of OR no.4. (ORL) is lowest. There is a small consumption of indirect materials and the equipment of room is low.

Table 5 – Occupancy and rate for each OR (own work)

Operating room	Cost of OR	Occupancy in hours	Rate per hour
Orthopedics	344 932 €	1450,16	237,86 €
Traumatology	197 601 €	801,9	246,42 €
Surgery (1)	182 560 €	839,2	217,54 €
Ophthalmology	139 444 €	490,83	284,10 €
ORL	121 263 €	811,42	149,44 €
Urology	212 083 €	1141,9	185,73 €
Surgery (2)	216 511 €	1152,6	187,85 €

4 Conclusion

Cost management is an important tool for improving the efficiency and economy of every economic entity, including hospitals. Important is well managed cost database, which can lead to cost savings and to avoid the growing trend of increase in overheads, which is seen by businesses in recent years. Changes in the economic situation forcing companies, often at the expense of quality, reduce costs. For healthcare organizations is a very difficult act to reduce direct costs, because in most cases it is a material used in the treatment of a patient, which is why hospitals should focus on overhead costs, have their point of origin and cause of the accurate overview. Costs for operating theaters can be divided into fixed and variable costs. Their structure is as follows. .... A big part of the costs consist of labor costs, which in our view is fixed costs. This statement is supported by the author Dexter et al. (2001). Their analysis specifically applies to surgical suites that limit the hours that operating room (OR) staff (e.g., nurses, anesthesiologists and nurse anesthetists) are available to care for patients undergoing elective surgery and this means that staffing costs are fixed.
Fixed costs are based on the capacity of the operating room, in Table 6 are given the maximum capacity of each room and take the hourly rate of these halls. Results can be compared with the results in Table 5, where they are given the current rate.

Table 6 – Max occupancy and rate for each OR (own work)

Operating room	Max occupancy in hours	Rate per hour
Orthopedics	2000	172,47 €
Traumatology	2000	98,80 €
Surgery (1)	2000	91,28 €
Ophthalmology	800	174,30 €
ORL	1200	101,05 €
Urology	2000	106,04 €
Surgery (2)	8760	24,72 €

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