Cost-based pricing of healthcare services.
Relevance of a resource-based costing system

Gertruda Krystyna Świderska*, Monika Raulinajts-Grzybek**

Introduction

The healthcare system is subject to changes which result in a rise in healthcare costs and increasing the share of healthcare expenditure within the general spending structure. They include:

- a change in the social structure, the so-called *ageing society*,
- technological progress,
- a change in expectations of healthcare recipients,
- rising costs of healthcare resources (Walshe, Smith, 2006; Jones, Mellett, 2007).

The Polish literature discusses the low effectiveness of business activity processes, especially the lack of connection between investment decisions and medical activity (for example in the field of purchasing new devices and medical equipment), i.e. improper use of resources (Krasowska-Marczyk, 2007).

These factors translate into the need for an appropriate pricing system of health services. These issues touch on the matter of pricing universal services. Theoretical studies and practical activities performed in different countries increasingly pay more and more attention to the necessity of relating the price of healthcare services to their actual costs. Dylewski and Filipiak (2005) point out that the costs of healthcare services should be the starting point for the construction of unit price. Waters and Hussey (2004) also show the need for basing prices of universal services on their actual costs, using the example of healthcare services. Selected European countries do research whose aim is to assess the healthcare pricing system and the relationship between pricing methods and costs of services (Health Basket, 2005).

The adopted methodology for calculating the cost of health services determines the quality of the cost information, and thus affects their ultimate usefulness in the pricing process. In studies of cost-based pricing of health services the criteria that affect the reliability of the information generated are indicated. These are the causality principle of cost allocation, consistent methodology and promotion of the most efficient healthcare providers. The scope of information on the costs incurred and the

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degree of fulfillment of these criteria depend on the adopted model of cost accounting used by healthcare institutions that provide information for pricing purposes.

The resource-based costing system emphasizes the importance of resources as basic cost objects. From the viewpoint of efficiency it is important to analyze the full cost of resources and their involvement in the provision of activities. Features of the resource-based costing system lead to the conclusion that the pricing of health services based on this methodology will allow for the formulation of prices that will meet all the requirements for this market.

The aim of the article is to assess the possibility of using the resource-based costing system for the pricing of health services and to design guidelines of such a model. The main thesis is: The resource-based costing system provides information determining the correctness of the pricing of health services.

In order to verify the thesis the assumptions of the pricing of health services in selected countries were characterized and the role of cost information in this process was defined. Additionally, the results of a survey testing the significance of criteria for the creation of cost information were presented. These criteria are listed in international studies on cost-based pricing of health services. The significance of the same criteria indicates the possibility of adaptation of solutions for cost accounting used in the cited healthcare systems.

Based on previously conducted research on the theory of activity based costing, and in particular on the desired model of activity based costing (Świderska et al., 2004), in the last part of the study authors designed a theoretical model of resource-based costing system for healthcare.

1. Background

The methodology of cost accounting accepted for the calculation of healthcare services must be clear and transparent and also applied by all healthcare providers as well as in consecutive reporting periods by regulatory bodies. The importance of coherent methods of cost accounting is underlined by Northcott and Llewellyn (2002). It is necessary from the perspective of using costing data for pricing healthcare services and assessment of providers’ economic effectiveness. Atkinson et al. (2003) underline that the needs of the recipients of costing information define the requirements of the costing model. In other words, the range of information about costs incurred depends on the purpose of their calculation and reporting.

The basis for determining the requirements for the cost accounting system is to characterize the pricing system, which is to be supplied by cost information. Features of the pricing system imply assumptions for the construction of the costing model. This section looks at the pricing systems of different countries insofar as is necessary to identify the requirements for cost accounting. On this basis, the features of the costing model specific to pricing purposes were characterized and their relevance to the Polish healthcare were examined.
1.1. Pricing of healthcare services and the role of cost information in this process

The main feature of the pricing system is whether payments are made retrospectively or prospectively and whether the payments for the provider are fixed or variable, depending on the volume of activity, for example the number of patients admitted. Table 1 presents basic provider payment methods.

Table 1. Provider payment mechanisms

<table>
<thead>
<tr>
<th>Mechanism</th>
<th>Retrospective/prospective</th>
<th>Fixed/Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line item budget</td>
<td>Prospective</td>
<td>Fixed</td>
</tr>
<tr>
<td>Global budget</td>
<td>Prospective</td>
<td>Fixed</td>
</tr>
<tr>
<td>Capitation</td>
<td>Retrospective</td>
<td>Variable</td>
</tr>
<tr>
<td>Per-case (diagnosis-related payment)</td>
<td>Either</td>
<td>Variable</td>
</tr>
<tr>
<td>Fee-for-service</td>
<td>Retrospective</td>
<td>Variable</td>
</tr>
<tr>
<td>Fee for patient-day</td>
<td>Either</td>
<td>Variable</td>
</tr>
</tbody>
</table>


Retrospective payments are fully (or partly, depending on the system) covered ex post. In prospective systems budget or prices of services are set ex ante. They can be established on the basis of historic prices, planned costs of the provider or a centrally set rate. The main disadvantage of the retrospective payment system is the lack of mechanism to control costs as well as their escalation. Prospective systems are becoming more and more popular in developed countries.

In fixed systems of payment the aggregate amount of payment is irrespective of the volume of activity. In variable systems the change in activity level results in the change of payment. In variable systems it is necessary to set price for every additional service provided. Examples of fixed payment systems are a global budget (set for the whole entity, with reallocation of resources among services possible) and a line item budget (which does not allow for any reallocation).

Examples of variable payment systems are capitation payments, payment per patient-day, per-service and per-case. For the first two examples, payments are set proportionally to the number of patients or days of hospitalization. Such a solution does not require collecting detailed information about the treatment process or setting many prices for different services. Simultaneously, when the treatment process is heterogeneous, this method leads to a negative selection of low-risk patients and (when payment is made per patient-day) excessive extension of hospitalization. Paying fee-per-service is much more complicated and requires setting prices (and their mutual relations) of many different healthcare services. It is mentioned that prices of individual services should depend on their cost-intensiveness (Jegers, Kesteloot, De Graeve and Gilles, 2002). The main disadvantage of that approach is the excessive rise in the number of services beyond the actual medical needs.
The major problem in the process of pricing healthcare services is to determine the object of pricing. Currently, the main pricing object in a hospital-based healthcare system is diagnosis-related groups (DRGs). Research conducted around the world shows that payment per-case allows for controlling costs and also supports other healthcare objectives such as responsibility to legitimate expectations and delivery of good services (Leister, Stausberg, 2005). In the case of some patients, for example those treated in psychiatric wards, treatment is priced per patient-day, whereas specific, cost-intensive cases are priced for services rendered.

Pricing DRGs (the so called „case-mix” approach to pricing) is based on the provider’s goal to cure the patient. The authors of the case-mix method view the problem from the perspective of the cause of the treatment process (defined primarily by the diagnosed disease) and not the effects, i.e. the procedures performed or length of hospitalization. Figure 1 presents an exemplary approach to the classification of patients to one of ten DRGs according to the treatment process applied in the Hungarian DRGs system (Homogeneous Disease Groups).

**Figure 1.** Examples of Homogenous Disease Groups in Hungary

The advantage of DRGs is the better adjustment of the pricing system to the actual outlays for the treatment process and an incentive to optimize the treatment. The main disadvantages of the system are the preference of low-risk patients in hospitals, who do not generate additional costs, unnecessary hospitalization or problems with the high quality of healthcare services (e.g. due to too short hospitalization). Within this system, providers also try to upgrade patients to better-paid DRG codes. Nevertheless, the increasing importance of diagnosis-related groups for pricing hospital-based healthcare services is present in most EU countries. From the systemic point of view a major issue are problems regarding setting central weights and prices for a single DRG. The approach to this issue in different countries is presented in table 2.

In almost all countries the pricing system for hospital services, applied or planned, is already based on cost accounting. Payments are made for the services provided. It has been noted in the reports that such a solution motivates providers to maximize their efficiency and allows for better control of expenditures for services which are priced that way. The system of DRGs obliges providers to calculate costs of all cost objects, i.e. individual diagnosis-related groups. Setting the price at a central level (nationally or regionally) requires the comparison of cost information from different providers\(^1\). As a consequence, it is necessary to define the costing methods which enable the comparison of the data and setting prices of individual diagnosis-related groups.

Despite the lack of strict regulations on the necessity to set prices on the basis of the cost of healthcare services, the European Commission undertakes steps to promote the harmonization of national regulations in the field of pricing and financing healthcare services. One of the projects in this area was the *Health Basket – Health Benefits and Service Costs in Europe*, a project executed in 2004-2007 and funded by the European Commission within the 6th Framework Programme. Nine countries participated in the project: Denmark, France, Spain, the Netherlands, Germany, Poland, Hungary, the United Kingdom and Italy.

The second phase of the project, concerning cost calculation, was to find out if there are any official prices or tariffs, what the main characteristics of price regulation are and at which level prices are set or negotiated. Apart from the methodology of setting prices for new services, the methodology of price revision was examined. The main conclusion from this phase of the project is the rising importance of the structure of pricing system in all examined countries.

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\(^1\) Healthcare services are an example of universal services – funded from public sources or of high social importance – for which there is a requirement for transparent and comparable accounting principles (see Raulinaitys-Grzybek, 2012, p. 253).
<table>
<thead>
<tr>
<th>Country</th>
<th>Pricing object</th>
<th>Tariff set</th>
<th>Providers of cost information</th>
<th>Method of calculation</th>
<th>Cost included</th>
</tr>
</thead>
<tbody>
<tr>
<td>England</td>
<td>Healthcare Resource Group (HRG)</td>
<td>Nationally</td>
<td>All NHS providers (HRG-level data)</td>
<td>• Microcosting for most HRGs</td>
<td>• all hospital expenditure in the year</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Each provider calculates cost of cost objects based on their costs and services structure</td>
<td></td>
<td>• including depreciation and cost of capital</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• all hospital expenditure in the year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Denmark</td>
<td>Danish version of diagnosis-related</td>
<td>Nationally</td>
<td>All public hospitals (DRG-level data using nationally set cost wages)</td>
<td>• Cost wages for services are set nationally (based on research in a few hospitals) and applied to hospitals</td>
<td>• hospital expenditure excluding depreciation and cost of capital</td>
</tr>
<tr>
<td></td>
<td>groups (DkDRG)</td>
<td></td>
<td></td>
<td>• A few of the larger hospitals have their own systems for weighting services</td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>French version of diagnosis-related</td>
<td>Nationally</td>
<td>52 public and private non-for profit hospitals (GHM, fr. Groupes homogènes de malades)</td>
<td>• Direct costs are associated with patient stays and indirect costs allocated per day, per episode, or per</td>
<td>• costs of some procedures and high cost drugs and medical devices are excluded</td>
</tr>
<tr>
<td></td>
<td>groups (GHM, fr. Groupes homogènes de</td>
<td></td>
<td>relative cost index</td>
<td>relative cost index</td>
<td></td>
</tr>
<tr>
<td></td>
<td>malades)</td>
<td></td>
<td>• Indirect costs are adjusted to national average length of stay for GHM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>German version of diagnosis-related</td>
<td>Nationally</td>
<td>332 voluntary hospitals</td>
<td>• Direct costs are associated with patient stays and indirect costs allocated per day or per service</td>
<td>• some costly procedures are priced additionally</td>
</tr>
<tr>
<td></td>
<td>groups (G-DRG).</td>
<td></td>
<td>• Labour costs are allocated based on exact time tracking or manpower requirements</td>
<td>• hospital expenditure excluding cost of capital</td>
<td></td>
</tr>
<tr>
<td>Netherlands</td>
<td>Dutch version of diagnosis-related</td>
<td>Nationally</td>
<td>All hospitals</td>
<td>• Costs of intermediate products (patient-days and medical services) are set by dividing total costs of a cost centre by weighted number of services</td>
<td>• hospital expenditure excluding depreciation and cost of capital</td>
</tr>
<tr>
<td></td>
<td>groups (DBC, nl. Diagnose Behandeling</td>
<td></td>
<td></td>
<td>• Cost of DBC is the sum of intermediate products received by each patient</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Combinatie).</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Country</td>
<td>Pricing object</td>
<td>Tariff set</td>
<td>Providers of cost information</td>
<td>Method of calculation</td>
<td>Cost included</td>
</tr>
<tr>
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</tr>
</tbody>
</table>
| Hungary | Hungarian version of diagnosis-related groups (HBC, hu. Homogén Betegségcsoportok) | Nationally | Selected hospitals | • Hospitals provide information on resource consumption and services performed as well as indirect cost data on the cost centre level  
• Calculation is performed centrally. Indirect cost is allocated based on patient-days | • hospital expenditure excluding cost of capital |
| Italy   | Diagnosis-Related Groups. | Nationally with possibility of different solutions in regions | On the national level: 8 hospitals e.g. Lombardy - majority of regional hospitals | • National level: cost wages for each DRG were set (based on sample study or comparable data from US) and applied to sample hospital costs | • hospital expenditure excluding cost of capital |
| Spain   | Diagnosis-Related Groups. | Regionally | During the HealthBasket programme prices were not based on cost data due to lack of comparability of cost systems | | |

The majority of countries have implemented a pricing system based on the type of healthcare services for in-patient and out-patient services whereas they often lack long-term care, rehabilitation and some other services. In the United Kingdom the basic price\(^2\) for each diagnosis-related group is set centrally by the Ministry of Health at the beginning of the reporting period on the basis of historical data on the mean costs of services attained from all public hospitals in England (Epstein, Mason, Smith, 2005). A similar process of pricing diagnosis-related groups is used in Denmark. In other countries data are collected from selected providers. Their number varies from 8 in Italy to 52 in France. The exception is Poland and Spain where prices of healthcare services were not calculated based on their costs.

Cost accounting models in each country differ in the details but they are based on the same basic criteria: the usefulness of cost allocation, coherent methodology and promotion of effectiveness. One of the objectives of the Health Basket project was to analyse the methodologies applied in cost calculation and pricing in healthcare in different European countries in order to find the „best practices”. The British system of pricing deserves a high grade. The British report indicates that cost information used for pricing purposes should be generated on the basis of homogeneous methodology, uniform for all providers because it results in a greater comparability of results of calculation and finally allows for pricing healthcare services (Epstein, Mason and Smith, 2005).

Another important feature of such cost information should be using the cause-and-effect principle between cost and cost objects. In other words, costs should be properly allocated to objects of calculation. The British report underlines that costs should be attributed only to those services which are responsible for the occurrence of these costs. Also the use of direct allocation is recommended and if it is not possible, providers are advised to use standard methods of cost attribution based on the matching principle.

The third condition is to build a pricing system that will promote most efficient providers. In the editorial to the special issue of „Health Care Management Science” summing up the results of the project, the authors point to the use of diagnosis-related groups as basic pricing objects for hospital services and conclude that the reason for such an approach is the rising importance of providers’ efficiency (Busse, Schreyögg and Smith, 2006). The British report also underlines that separate pricing of a single medical consultation gives rise to „an incentive for the provider to engage in malpractice of generating excessive income by transferring patients unnecessarily between specialists within the same in-patient stay” (Epstein, Mason and Smith, 2005: 17). The approach used in all examined countries considers the treatment of a single patient from registration to discharge as one case.

\(^2\) The methodology of setting the price is much more complicated and takes into account different algorithms for selected groups of patients (e.g. children) whose treatment is much more resource intensive. There is also different pricing for long stay patients.
1.2. Resource-based costing system as a tool to generate cost information for cost-based pricing processes

The generation of cost information requires the implementation and maintenance of the appropriate costing model by providers. The literature indicates the possibility of the application of activity-based costing for the healthcare industry (West, Balas and West, 1996; Bienia, Wizor and Stankiewicz, 2009; Suthummanon, Omachonu and Akcin, 2005; Lawson, 2005; Young, 2007; West and West, 1997; Mućko, 2007). Some foreign publications report on the usefulness of this model also for the pricing of health services. The evidence for the importance and validity of the problem is the work of Kaplan and Porter (2011) which indicates that activity based costing applied for pricing of health services can serve as a remedy for cost crisis in healthcare. Verification of this utility has been carried out as part of a study presented in the next section.

There are several models in the area of activity-based costing concept to fulfil the basic criteria and at the same time have different structure and features. As a result of research, implementation and research projects connected with theoretical models, the team from the Department of Management Accounting in the Warsaw School of Economics (SGH) defined two activity-based costing models: minimal and optimal (Świderska et al., 2004; Świderska et al., 2005).

The minimal model fulfills only the criteria defined by Kaplan and Cooper (1998). The minimal model must have a set of activities, defined activity drivers based on cause-and-effect relations between activities and final cost objects as well as costs attributed to activities (directly or with the use of cost drivers) (Świderska, Warowny, 2007). Such a model is most frequently based on historic data, which limits its usefulness for the planning process. Additionally, due to its structure there is limited access to information „for assessment of effectiveness of resources and activities, as well as information about costs of new products and information necessary for cost control” (Świderska, Warowny, 2007, p. 20).

The application of the optimal model broadens the functionality of the costing system. The minimal and optimal model are presented in figure 2. The research held by G.K. Świderska and P. Warowny showed that enterprises which implemented the minimal model including some elements of the optimal model obtained much wider scope of management information. The optimal model:

- is characterized by a cost object-based approach to activity-based costing which means that this cost model is built on the basis of cost objects related to each other through the causality principle and therefore are more flexible;
- uses the resource-based approach to cost calculation. Costs are calculated for individual resources. This concept will be fully presented later;

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calculation is based on planned values which are the basis in the process of decision-making and control. The planned use of the resources is calculated for the practical productivity of each resource which allows for the exclusion of costs of unused potential from the calculation of cost objects.

**Figure 2. Minimal versus optimal ABC model**

The importance of standard costs for planning was already pointed out in relation to traditional cost accounting models (e.g. Schmalenbach, 1956; Winkelmann, 1928; Kilger, 1988; Horngren, 2006). The importance of planned values is also emphasized today due to their usefulness for planning and decision making (e.g. Cokins, 1996; Shank and Govindarajan, 1993). The application of the activity-based costing model, in which all calculations are based on planned values and costs are calculated for separate resources, enables users to exclude costs of unused potential and access information about the level of usefulness of every single group of resources. A model which gathers data on utility and unused potential of each resource is referred to as resource-based costing model.

Resources are economic factors applied or used up in the company in the course of production and customer service (Schmalenbach, 1926). Resources which are most frequently used in companies are materials, equipment, people and buildings. This is an economic definition of resources regardless of accounting classification of costs. In the same way, costs are classified by CAM-I organization which defines resources as economic elements used or applied during the performance of activities (Karmańska et al., 2006). Miller (2000) defines resource as an economic component used or involved in an activity performed in the company. An interesting approach to resource identification in German process cost accounting (Prozesskostenrechnung) is assignment of their costs to the elementary processes (Horvath and Mayer, 1993). Kaplan
and Cooper (2002) divide economic resources into dedicated (attained by a company in a non-continuous way) and flexible (which are attained in a continuous way). Świderska et al. (2010) use a similar classification of involved and flexible resources.

The resource-based approach to activity-based costing puts pressure on the significance of resources as elementary cost objects (Świderska et al., 2004). According to this approach, costs of economic resources are calculated by adding all the costs related to that resource, directly or with the use of cost drivers. From the point of view of resources and what the results activity costs, it is necessary to analyse the full costs of resources, including costs of a different nature. For example, the analysis of costs of an operating theatre requires taking into consideration all costs related to this resource, including costs of depreciation, utilities, wages of staff responsible for cleaning, security, repair etc. The main advantage of such an approach is the easy identification of unused resources and management of unused potential (Świderska et al., 2010).

2. Methods

The first step to building a cost accounting model specific for pricing purposes on the healthcare market is the definition of criteria to be met by the cost information. These criteria should also reflect the benefits of the system application.

In order to verify the criteria for cost information, a survey was conducted in June-September 2010. The study was conducted using a computer-assisted telephone interview. The questionnaire was developed based on research literature and a pilot study conducted on a selected group of dozens of providers. The respondents were representatives of healthcare institutions involved in the preparation of management information, including cost information, for pricing purposes and price-setting or negotiations with the public payer. The survey was sent to 150 organisations and the response rate was 98.7% (148 organisations).

The survey was addressed to healthcare providers, because according to the recommendation of the European Commission in relation to another market with regulated prices (telecommunications), regulators should undertake „a public consultation with market players on the appropriateness and effectiveness of cost accounting systems” (The Commission recommendation, 1998). The opinion of healthcare institutions in this matter is especially important because an effective pricing system is not possible without costing information provided in the proper format and quality. Providers as price takers are also interested in setting the price of healthcare services properly.

Based on the results of the survey, a resource-based costing system has been designed specifically for healthcare providers and healthcare services. The defined criteria intend this model to suit the requirements for a model to produce information used for price-setting purposes.
3. Results of research

3.1. Criteria for generating cost information used for pricing purposes

The respondents were asked to assess different criteria of cost information, suggested by the authors, in the light of functions of the pricing system based on that information. They were asked to give weights on a scale of 1 to 5 depending on their view of the importance of individual features of the pricing system. The results are presented in table 3.

Table 3. Assessment of functions of the pricing system based on cost information

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ability to compare costs of services provided by different healthcare institutions</td>
<td>6.1%</td>
<td>4.1%</td>
<td>12.8%</td>
<td>33.1%</td>
<td>43.9%</td>
<td>4.0</td>
</tr>
<tr>
<td>Better identification of causes of cost generation</td>
<td>8.8%</td>
<td>5.4%</td>
<td>16.2%</td>
<td>31.8%</td>
<td>37.8%</td>
<td>3.8</td>
</tr>
<tr>
<td>Promotion of most effective providers</td>
<td>4.0%</td>
<td>4.1%</td>
<td>15.5%</td>
<td>39.9%</td>
<td>36.5%</td>
<td>4.0</td>
</tr>
<tr>
<td>Greater competitiveness between providers</td>
<td>6.1%</td>
<td>6.1%</td>
<td>20.9%</td>
<td>33.8%</td>
<td>33.1%</td>
<td>3.8</td>
</tr>
<tr>
<td>Better negotiating position in relation to the public payer</td>
<td>11.5%</td>
<td>4.8%</td>
<td>20.4%</td>
<td>34.7%</td>
<td>28.6%</td>
<td>3.6</td>
</tr>
<tr>
<td>Lowering of mean costs of healthcare services</td>
<td>9.5%</td>
<td>10.1%</td>
<td>25.0%</td>
<td>33.1%</td>
<td>22.3%</td>
<td>3.5</td>
</tr>
</tbody>
</table>

Legend: 1 – Not important, 2 – A little important, 3 – Pretty important, 4 – Important, 5 – Decisive


The ability to compare costs of services provided by different healthcare institutions was assessed as being of the utmost importance. This reflects the significance of coherent methodology. Almost 44% of providers considered this criterion decisive for the pricing system to operate properly.

The studies on pricing healthcare services often quote an argument used by healthcare managers about the lack of comparability of costs of patient treatment when cost calculation is only based on patient-days or medical procedures (Kozierkiewicz and Łanda, 1998). This argument was crucial for the implementation of diagnosis-related groups in Poland. But even if the product is defined in a uniform way, different methods of cost calculation result in the lack of comparability of the results. The importance of
this criterion is assessed higher by public than non-public institutions. However, as within the whole population, this feature is regarded most important also by non-public healthcare institutions.

In order to assess the level of comparability of current costing systems, the respondents were asked about the cost structure in final cost centres and the share of direct and indirect costs. Figure 3 presents the results.

**Figure 3.** Cost structure in final cost centres

![Cost structure in final cost centres](image)


The share of direct costs in the cost of operating activity centres varies significantly. These costs include gross wages and materials (including medicines) and on average account for a little more than 70%. So far all costs of final cost centres were distributed among cost objects:

- based on the value of direct costs in case of medical procedures,
- based on the total volume in case of patient-days.

Such a substantial difference in the cost structure of individual providers indicates the need to implement a cost accounting model in which the cost allocation will be based on cause-effect relationships.

The application of the causality principle in cost allocation, which better identifies reasons for cost occurrence, was regarded as decisive by almost 38% of the respondents. The average assessment of this feature is comparable among the respondents from public and non-public healthcare providers. What is interesting is that the assessment of the causality principle for generating cost information depends on the general opinion about relevance of cost-based pricing. This relation is statistically significant. Table 4 presents the results.

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4 According to the guidelines for the costing model for healthcare organizations functioning in the years 1998–2011.

5 In Chi-square test the p-value is 0.000.
Table 4. Assessment of causality principle in generating cost information depending on assessment of relevance of cost-based pricing

<table>
<thead>
<tr>
<th>Should pricing of healthcare services be based on cost information?</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>47.40%</td>
<td>0.00%</td>
<td>26.30%</td>
<td>5.30%</td>
<td>21.10%</td>
</tr>
<tr>
<td>Yes</td>
<td>3.10%</td>
<td>6.20%</td>
<td>14.70%</td>
<td>35.70%</td>
<td>40.30%</td>
</tr>
</tbody>
</table>

Legend: 1 – Not important, 2 – A little important, 3 – Pretty important, 4 – Important, 5 – Decisive


75% of providers who support the idea of cost-based pricing consider the causality principle in cost allocation important or decisive. Cost information should allow for better identification of reasons of costs occurrence. Simultaneously, almost half of the respondents who acknowledge that cost-based pricing is not the right solution regard the causality principle meaningless for the generation of cost information.

Another feature of the cost-based pricing system should be, according to the respondents, the promotion of most efficient providers. Among the group of public healthcare institutions, this criterion is of equal importance as the comparability of providers. Over 75% of healthcare institutions regard this feature as important or decisive. Interestingly, in the group of non-public providers this feature was assessed as far less important and took the last but one position with an average grade of 3.71. However, this relationship isn’t statistically significant. It is surprising in the light of the discussion about the higher level of efficiency and resource application by non-public healthcare institutions. This high grade among public providers might result from the complaints about improper pricing of costly areas provided only by public providers – such as intensive care units or emergency departments.

Other features of cost information, such as promotion of competitiveness, better negotiating position in relation to the payer and lowering of the average cost of healthcare services were given lower grades by the respondents. It must be mentioned, however, that all these features were assessed on average as pretty important or important. It is also worth mentioning that a better negotiating position in relation to the public payer was the only feature that was regarded higher by the respondents from non-public institutions than by those from the public ones.

The opinions of the respondents are consistent with the conclusions presented in the foreign studies concerning cost-based pricing systems in healthcare analysed in previous part of the article. The information used for pricing purposes should be generated within coherent methodology, based on the causality principle and in the way to promote most effective providers.
3.2. Resource-based costing system for healthcare providers

Based on results of the survey presented above and practical experiences\(^6\) the authors came to the conclusion that the concept of resource-based costing system fulfils all the criteria set and can be successfully used as a model for generating information to be used for pricing healthcare services.

From the point of view of cost-based pricing of healthcare services, the resource-based approach allows for the calculation of unit costs of the resources involved at the level of practical capacities of the healthcare provider and the exclusion of inefficiency related costs from the final cost object – the cost of a single case (health services provided to a single patient). The price of healthcare services based on providers’ costs (for example at the level of the average cost of an individual diagnosis-related group increased by a set profit margin) should only include the cost of resources involved in the process of treatment – without the cost of unused potential. This method results in transmission of inefficiency-related costs to providers. Figure 4 presents the scheme of calculation and allocation of costs of economic resources.

**Figure 4.** Calculation and allocation of costs of economic resources

\[^6\] The model was designed during the project *Modern Management in Healthcare Institutions – Training in Cost Accounting and Management Information and Tools of Restructuring and Consolidation of Healthcare Institutions* held by Polish Ministry of Health and the Warsaw School of Economics. G.K. Świderska is the chairperson of the project team. M. Raulinajtys-Grzybek is a team member. Participants of the project included 60 representatives of medical and management personnel from healthcare institutions.
The model is based on the planned values, both in terms of quantitative standards for resource consumption, as well as pricing standards, meaning the planned cost of each resource. This approach enables calculation even before obtaining information on the actual costs for the period. The exception to this approach is the allocation of direct costs – drugs and medical items of a significant cost\(^7\). They are added based on actual consumption.

The model is based on the bottom-up approach, for which the starting point is the calculation of the unit cost of each object in the model and the final point is the calculation of medical cost of a patient. The cost of treating a patient is the sum of costs of all activities performed during hospitalization. Figure 5 presents the model.

**Figure 5.** Model of resource-based cost system for healthcare providers

![Diagram of resource-based cost system](image)

Source: internal materials of the project *Modern Management in Healthcare Institutions – Trainings in Cost Accounting and Management Information and Tools of Restructuring and Consolidation*.

The basis for determining the cost of any object in the model is the calculation of costs of economic resources.

Economic resources – such as employees, premises, equipment and materials (including medicinal products and medical items) – are used to conduct medical activities. The total cost of an economic resource in the reporting period (e.g. in a month) is

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\(^7\) The concept of cost significance is further developed in the costing manual (see Świderska (ed.), 2011, pp. 18–19).
the sum of all prime costs of an individual resource. Prime costs can be attributed directly (if they are related to only one resource) or using a cost driver which best reflects the cause of cost occurrence. What is important is that the total cost of economic resources reflects the full cost of the resource – for example, in the case of human resources, also including costs of professional equipment.

Another step is to determine the cost of a unit of economic resources based on cost drivers. An exemplary driver for human resources can be working hours and, for equipment, machine hours. In order to determine the cost per unit of economic resources, the total cost of a resource must be divided by the number of units of a cost driver set for practical capacity. Practical capacity is calculated by adjusting the theoretical capacity (which assumes 100% efficiency of resources) with appropriate adjustments, the value of which stems from past experiences and plans. Examples of adjustments for the human resources are unpaid leave, sick leave or training.

The allocation of resources to other cost objects, for example patient-days or medical procedures, is performed on the basis of predefined drivers of resource consumption by individual healthcare services. Medical standards are very useful in this process as they present typical consumption of resources by all healthcare services. The part of costs of each resource which has not been attached to any cost object in the reporting period constitutes costs of unused resources. Costs of unused resources in this model are not included in the cost of the patient and are therefore not subject to pricing. It places a financial risk connected with unused capacity on healthcare providers. This approach motivates healthcare managers to minimize costs of unused resources.

The only exception to this rule is the readiness for the treatment process. Readiness costs are the costs of the resources which are unused due to the obligation of the provider to keep ready for health services e.g. in case of an emergency. An example of readiness costs is the costs of an operating theatre (the part indispensable to carry out public security policy), costs of surgeons on duty, or an intensive therapy ward. Because a hospital cannot minimise these costs, readiness costs should be included in the cost basis for pricing.

The created model is an example of a resource-based cost system because the basis for the calculation of costs of procedures are not separate costs but calculated costs of economic resources. With regard to each resource, an entity has access to information on the level of utilization of these resources and the existing costs of unused resources.

**Conclusions**

The rising costs of healthcare require actions to be taken by politicians dealing with the area of healthcare. One of the directions is the reform of payment system and implementation of payment regulations in order utilise public funds best. Due to the
high complexity of healthcare processes and existence of many healthcare products, it is necessary to create a system based on cost-intensiveness of individual services. That would prevent the supply structure from deforming as a result of extraordinary profits from rendering some services, and losses made executing some others (due to improperly set prices).

The survey conducted among a group of Polish service providers shows that the model of a cost system which could be used for cost-based pricing should use coherent methodology, implement a causality principle in cost allocation and promote the most effective providers. The opinions of service providers are important as they are the source of cost information and final price takers.

The resource-based costing system is a modification of activity-based costing in which costs of individual resources used in the treatment process are calculated. Unused capacity costs are identified at the level of each resource. Due to this approach, the full cost of treatment does not take into consideration costs resulting from ineffective resource management by providers. The application of the activity-based costing model is connected with building a model based on the causality principle of cost allocation while the application of the resource-based variation enables more effective execution of the criterion of promoting the most efficient providers.

This model provides unit costs of each patient with the specification of all services provided to him. In order to construct an efficient cost-pricing system these data must be analysed and grouped correctly. The methodology of setting a price based on cost data is an interesting subject for future research.

References


Summary
The authors propose a costing model for cost-based pricing of healthcare services. The current European Commission project shows that in most European countries the prices of healthcare services are cost based, which involves the need for the application of a costing system to generate cost information for pricing purposes. In the survey conducted in Poland we examined the basic criteria that should be met by the costing system. According to the respondents, the system should use a coherent methodology based on the causality principle and earmark for promotion the most effective providers. We have come to the conclusion that the resource-based costing system, which is a modification of activity-based costing, best fulfils these criteria. We present a theoretical structure of resource-based model for the healthcare provider.

Keywords: cost-based pricing, resource-based costing, activity-based costing, healthcare services.

Streszczenie
Ustalanie cen na podstawie kosztów w jednostkach opieki zdrowotnej. Przydatność zasobowego rachunku kosztów
Autorki proponują model rachunku kosztów na potrzeby wyceny świadczeń opieki zdrowotnej. Projekt finansowany przez Komisję Europejską wskazuje, że w większości krajów europejskich ceny usług zdrowotnych są oparte na kosztach, co wiąże się z koniecznością stosowania systemu rachunku kosztów do tworzenia informacji o kosztach do celów wyceny. W ankiele przeprowadzonej w Polsce zbadaano
Cost-based pricing of healthcare services. Relevance of a resource-based costing system

podstawowe kryteria, które powinny być spełnione przez system rachunku kosztów. Według respondentów, system ten powinien zostać stworzony przy wykorzystaniu spójnej metodyki oraz z uwzględnieniem zasady przyczynowości i promować najbardziej efektywnie działających świadczeniodawców. Autorzy dochodzą do wniosku, że modelem najlepiej spełniającym te kryteria jest zasobowy rachunek kosztów będący modyfikacją rachunku kosztów działań. W artykule zaproponowano teoretyczną konstrukcję zasobowego rachunku kosztów dostosowanego do specyfiki opieki zdrowotnej.

Słowa kluczowe: wycena oparta na kosztach, zasobowy rachunek kosztów, rachunek kosztów działań, usługi zdrowotne.