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Non-financial dimensions of measurement and assessment in the performance model for hospitals

1. Introduction

Performance measurement in the public healthcare system has become a more and more popular research problem throughout Europe and the world. In particular, these studies represent the link between the achievement of its major objectives and the available resources. The professional literature concerning performance measurement in the public healthcare system contains various opinions. There are many opinions that are critical of the idea of implementing a performance-measurement system in the public sector – this idea has been assessed as not credible or, at best, difficult to implement. On the other side, there is the idea of Jones et al. (2000) that performance measurements in the public healthcare sector could be defined and measured through a system of indicators where efficiency measures are especially important.

According to Shaw (2003), performance-measurement systems should be defined in a published national or regional plan that clarifies the values and participation of various stakeholders. Many European countries have developed frameworks for performance measurements at the national level. The concept of performance measurement within public hospitals and public-sector healthcare entities has already been proposed and explained by many authors for several countries, including: Tawfik-Shukor et al. (2007) for Holland; Guisset et al. (2002) for Belgium; Le Pogam et al. (2009) for the United Kingdom; Berg et al. (2005) for France, Sweden, and Denmark; Ștefănescu et al. (2011) for Romania; and Davis et al. (2013) and Gauld et al. (2011) for New Zealand.

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Non-financial factors play a valuable role in the assessment of the performance of hospitals. According to Goddard et al. (1999), some non-financial factors enrich the overall assessment of hospital performance by adding information that goes beyond the factors that are amenable to quantification within the formal system. Non-financial performance assessment can focus on various measures, ranging from the quality of food provided in hospitals to the volume of complaints received in a year. For instance, the indicators relating to waiting times are often connected with national and local targets regarding the effectiveness of the healthcare system. The main function of non-financial indicators in performance assessment is to act as a safety net in order to identify poor quality in hospitals. They could also be used to identify the best practice in order to achieve the aims regarding promoting good performance at the national level.

There are a lot of papers that explore the impact of non-financial factors on the assessment of hospital performance. For instance, according to Byrd (2013), Nelson et al. (1992), and Oszustowicz (1992), non-financial factors such as occupancy and quality are relevant for risk assessment. They have the potential to impact on revenues, expenses, and the ability of a hospital to repay its debt. As shown in a KPMG report (2008), increased risk is reflected in the higher cost of capital for hospitals with poorer quality-of-care ratings. Patients are expected to use the information about quality to choose providers who give better care, which, in turn, will impact the revenues of competing hospitals.

An interesting example showing how non-financial factors can affect the assessment of hospitals on the national level was described by Besley et al. (2009) and Bevan and Hood (2006). In 2001, the star ranking system for annual assessment of hospital performance was introduced in England. This system was based on non-financial indicators which measured targets relating to waiting times, cleanliness, and treatment-specific data. The base for this system were non-financial indicators that measured targets related to waiting times, cleanliness, and treatment-specific data. The number of stars awarded to hospitals was a reference point for many providers. The star ratings were published in the national and local media, and poor performance could end up being a reason for dismissal of hospital management teams. On the other hand, very good performance was a reason for increasing hospital's autonomy from the central government.

In reality, most of the performance-measurement systems for healthcare focus only on quality outcomes. There are not many systems that can connect the measurement of quality performance with financial measurements. In fact, according to Kludacz (2012), a properly designed system for performance measurement would encourage activities that could improve not only the quality of medical services but also the financial situation as well as the utilization of resources within hospitals and the whole healthcare system.

One of the most interesting initiatives undertaken in Poland to develop and implement a system for measuring financing in (as well as the non-financing performance of) Polish healthcare was the research project conducted within the grant of the Polish Minister of Science and Higher Education, entitled 'Conception of hospital reporting for an integrated system of performance assessment' carried out by a team from the Chair of Cost Accounting at the University of Szczecin represented by Hass-Symotiuk et al. (2010). The aim of the project as a whole was to identify and define sets of medical and economic information relevant for the purposes of an integrated performance measurement and assessment system designed for public hospitals, with the use of selected groups of indicators. This goal was realized within a framework of eight research stages:

- 1) defining the concepts, purpose, and components of the performance measurement and assessment system, presentation of the assumptions, and the stages of its construction;
- 2) analysis and evaluation of information sets generated by hospitals, arising from legal regulations and the needs of different healthcare-system stakeholders;
- 3) examining the information needs of the founding bodies of public hospitals (county, marshals' offices, and medical universities) and analysis of indicators that could be used to assess the effects of hospital activities;
- 4) examining the information needs of the National Health Fund regarding contracting and settlement of agreements concluded with hospitals;
- 5) analysis of the role and information needs of the marshals' governor and the Ministry of Health;
- 6) development of a model for measurement and evaluation of the performance of public hospitals, desirable from the point of view of different stakeholders;
- 7) verification of the proposed concept of a performance model using Data Development Analysis (DEA);
- 8) developing an information-reporting standard for the public hospitals that will allow the use of the performance model to assess the achievements of hospitals by the executives of hospitals, founding bodies, and the Ministry of Health.

The aim of this article is to present the results of the sixth stage of this project – a framework of a performance model with the key non-financial dimensions to measure hospital performance and a set of valid and reliable indicators related to these dimensions that could be used for supporting hospitals in assessing their results. In this Polish research project, it was assumed that a comprehensive performance model should be useful, not only for hospitals but also for other entities operating in the Polish healthcare system.

The general framework of the performance model was developed through extensive review of the literature on hospital performance projects, empirical studies conducted in hospitals, founding bodies, provincial branches of the National Health Fund and the Ministry of Health, and through a series of workshops that gather experts representing managers and chief accountants working in hospitals. The first selection of dimensions and indicators was based on an analysis of the different models of hospital performance measurement that were applied in various hospitals and countries. The general framework for the model (especially for the dimension and indicator selection) was built on strong empirical material. A survey was carried out in 36 Polish hospitals, in 35 funding bodies, and in 4 provincial branches of the National Health Fund. The problems regarding the framework of the model were also discussed and analyzed with the experts. Finally, the following outcomes were achieved:

- design of the structure of a performance model for measuring hospital performance in various dimensions and in three levels of the Polish healthcare management system;
- identification of four key dimensions for assessing hospital performance: patients, internal processes, development, and finance;
- analysis of nearly 100 performance indicators in order to prepare a core and a tailored set of performance indicators with an operational definition;
- elaboration of descriptive sheets for core indicators to support hospitals in interpreting their results.

Summarizing, one of the main achievements of the research project was to develop a general theoretical model for performance measurement in Polish hospitals as well as the whole healthcare system. This model could support the activities of:

- Managers of hospitals, in the area of evaluating hospital performance.
- The National Health Fund, in the area of contracting medical services.
- Regional Governor's and marshal's offices, in the area of performance of the healthcare system at the regional level.
- The Ministry of Health, in the area of performance of the healthcare system at the central level.

The basis for developing a model for the measurement card of performance improvements in the Polish healthcare system was the balanced scorecard approach (BSC), which was developed by Kaplan et al., (2005) in the early 1990s. This is one of the best-known performance assessment frameworks developed from the organization's strategies and includes indicators related to four perspectives: finances, customers, internal processes, and learning and growth. As shown in Amado et al.

(2012), the main strength of the BSC is its way of integrating different indicators to make links between the different dimensions of performance in a single system.

However, it would be difficult to use the BSC approach in a healthcare organization without any modifications. Grigoroudis et al. (2012) claim that healthcare entities are non-profit, socially oriented organizations, so the financial dimension of the framework should be changed and considered as a constraint rather than as an objective. The remaining dimensions should also have a different emphasis.

2. Construction of a conceptual framework for the performance-measurement model

Lachmann et al. (2015) provided evidence that an effective system for hospital performance measurement depends on the regulatory environment, type of ownership, and internal actors in the hospital. In this study, it was assumed that a comprehensive performance model would be useful not only for hospitals but also for other entities operating in the Polish healthcare system.

A hospital is characterized by a large and diverse group of stakeholders that includes the patients and their families, founding bodies and hospital owners, financial supporters of the healthcare services (National Health Fund), public administration responsible for health policies, Ministry of Health, physicians in cooperation with the hospital staff and their trade unions, suppliers of medicines, service providers (of transport, utilities, energy), financial institutions (lenders, insurers), and local communities. All of these stakeholders have a great impact on the activities of the hospital; therefore, to reflect their needs, the developed model takes into account three levels of a healthcare management system, composed of:

- the central level, represented by the Ministry of Health – at this level, the functions related to the strategic management (monitoring of public health, long-term planning, and the development of national standards) are realized;
- the regional level, represented by the regional governor, the marshal's office, and the regional offices of the National Health Fund – at this level, functions related to the strategic and operational management of mid-level healthcare systems (implementation of national plans in the region, the study of the health needs of the population in the region, and the coordination of the work of local institutions) are realized;
- the local level, represented by hospitals and their funding bodies – at this level, the functions related to the operational management of local hospitals and their funding bodies (e.g., the realization of the health needs of their patients) are realized.

The research project was based on the following assumptions:

- The performance model would be useful not only for hospitals and their founding bodies but also for the provincial branches of the National Health Fund and the Ministry of Health.
- The implementation of this model would require proper identification of the purposes in the most-important areas of hospital activity and the information needs of the stakeholders.
- The number of indicators should be limited so that the structure of the model is based on 23–25 core indicators (depending on the users); but, the users of the card (e.g., individual hospitals) can choose additional complementary indicators.
- The adopted indicators should allow for the evaluation of the degree of completion of the objectives and tasks by hospitals and their stakeholders.
- The implementation of the model would require the development of information standards for public hospitals, which would enable comparisons of data for performance assessment.

The construction of the performance-measurement model for healthcare systems was realized in a few stages. One of the most-important steps was to determine the dimensions of performance measurement that were relevant to the specific operations in hospitals and in the other stakeholders. The next step was to determine a universal set of targets for individual stakeholders to be implemented at three levels of the health management system (micro, meso, and macro). The last step was to choose indicators for each dimension and performance-measurement level. From the beginning, it was assumed that the performance-measurement system would show the relationship between the objectives and indicators in various dimensions of the model.

A very important task in the project was to determine the performance-measurement dimensions for evaluating achievements in hospitals. Especially important was to answer the question: How many, and what kind of dimensions should be included in the performance model to evaluate the most-important areas of hospital activity? The selection of the dimensions was based on an analysis of the literature describing different models of hospital-performance measurements that have been applied in various countries at the central level and in single hospitals.

A very interesting model for measuring the performance of the overall national healthcare system was developed in 2003 by the World Health Organization's Regional Office for Europe. The aim of the WHO project (PATH) was to: develop and disseminate a flexible and comprehensive tool for quality improvements in hospitals; to support them in assessing their performance; to question their own results; and to translate the results into actions for improvement. This project was

carried out in 20 European countries. The final conceptual model presented by Veillard et al. (2005), consisted of six dimensions that were identified for assessing a hospital's performance: clinical effectiveness, safety, patient centeredness, production efficiency, staff orientation, and responsive governance. Groene et al. (2008) reviewed other indicator projects for hospital-performance assessments and compared them to the WHO-PATH model. The problem is that most of the models concentrate mainly on the quality of the care and don't include areas such as finance and technology.

Generally, a national healthcare system can be examined in terms of various aspects, such as human resources, facilities, health information systems, the technology used in direct patient care, financing, governance, and health policies. According to Phua et al., (2014), the problem is to focus on the areas in a national healthcare system that don't meet specific standards or minimal requirements and that should be improved through public policy interventions.

The final framework of the Polish model consists of four key dimensions for assessing healthcare performance: patients, internal processes, development, and finance. The model also includes a fifth area of assessment that reflects the needs of various stakeholders representing the three levels of the healthcare-management system. This area is called 'perspective of assessment' and consists of three elements:

- macro perspective – at the central level, represented by the Ministry of Health;
- meso perspective – at the regional level, represented by the governor, the marshal's office, and the regional offices of the National Health Fund;
- micro perspective – at the local level, represented by hospitals and their funding bodies

It should also be noted that high hospital achievements should be coupled with the needs and demands of the society and integrated with the whole healthcare system, including the promotion of health. The structure of the developed model is presented in Figure 1.

The essence of the performance model is to simultaneously present and analyze the hospital's achievements in four dimensions of evaluation: patients, internal processes, development, and finance. All of these dimensions are important from three perspectives: microeconomic, mesoeconomic, and macroeconomic. They have been taken into account during the development of a set of indicators for various kinds of stakeholders: hospital managers and hospital owners, the governor, the National Health Fund, and the Ministry of Health. For example, the health of the patient (the 'patient' dimension) is important for the hospital (to provide adequate medical care), for the Ministry of Health (to ensure the appropriate availability of healthcare resources throughout the country), and for the National Health Fund (to control the quality and availability of medical services).

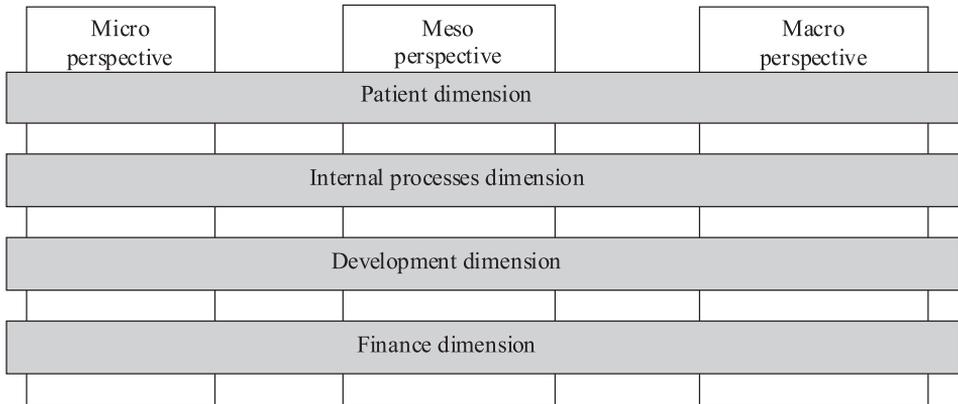


Figure 1. The conceptual performance model for the Polish healthcare system

3. Determining the goals for each dimension of the performance-measurement model

The multidimensional assessment enables a systematic and parallel concentration on the key areas of hospital activities by different stakeholders. It prevents the optimization of one area of activity at the expense of the others. It is worth noting that the objectives and indicators for each dimension can communicate directly with the other dimensions, and they can influence each other. For example, the appropriate organization of hospital wards (an 'internal processes' dimension) and the training activities of the medical staff (a 'development' dimension) affect the quality and efficiency of patient care and, therefore, the level of patient satisfaction (a 'patient' dimension). Finally, it also affects the costs of the medical service and the hospital financial performance (a 'finance' dimension). The dimensions of hospital performance are described in Table 1.

It is worth noting that the key dimension in the performance model is the patient dimension, which brings together the key issues related to the quality of the medical services and of the final product. The quality of the medical services can be measured as the attentiveness of care providers to patient needs and expectations (e.g., the quality of the medical equipment and the quality of the 'hotel' functions of a hospital). Santiago (1999) underlines that the quality of the product can affect the final result of treatment – whether the health of patient is improved and whether he is able to avoid death, disability, discomfort, and further disease.

Table 1
The dimensions of the hospital performance-measurement model

Dimension	Description
Patient	<p>This dimension of performance wherein a hospital places patients at the center of care and pays particular attention to the needs of the patients, their expectations, their autonomy, their access to a hospital support network, communication, confidentiality, trust, dignity, their choice of a provider, and their desire for prompt, timely care [WHO, 2000a].</p> <p>From the micro perspective – the dimension wherein the hospital properly takes care of high-quality medical services for all patients and achieves the desired results (appropriate care, treatment outcomes, clinical effectiveness).</p> <p>From the macro/meso perspective – the responsibility to address social needs, ensure continuous and coordinated care, health promotion, and ensure healthcare for all citizens of the country/region regardless of their race, physical, cultural, social, demographic, or economic characteristics.</p>
Internal processes	<p>This dimension is concerned with the operational aspects of medical activities that ensure better use of the resources as the key processes of the hospital and healthcare system. It indicates the most-important factors that influence the efficiency of the hospital, its position on the medical market, and its ability to generate value for the patients.</p> <p>From the micro perspective – this dimension focuses on the optimal use of resources in the key internal processes that hospitals should realize in order to create a foundation for long-term development. The selection of targets and measures in this dimension requires an analysis with a consideration of hospital resources.</p> <p>From the macro/meso perspective – this dimension should take into account the state of all material resources available in the national/regional healthcare system (medical equipment, drugs, medicinal preparations) that are necessary for the proper performance of medical services.</p>
Development	<p>This dimension attempts to identify the factors, skills, and tools necessary to stimulate the development of the hospital and to create its value. An important task is to look for new methods of improving medical activities and analyzing the key areas that are important for development.</p> <p>From the micro perspective – this dimension examines the aspects of medical activities that are crucial for the development of the hospital. The important areas in this dimension are: information systems within the organization and medical technologies as well as the employees and their potential, skills, experience, and satisfaction. An especially essential area in the analysis of this dimension is the degree to which hospital staff are appropriately qualified to deliver the required patient care, have opportunities for continued learning and training, work in good conditions, and are satisfied with their work (Klazinga et al., 2001).</p>

Table 1 cont.

Dimension	Description
Development	<p>From the macro/meso perspective – it is important to take care of the appropriate availability of medical staff in the national/regional healthcare system and predict the demand for new professionals in the future. This dimension also focuses on the national/regional development of new technologies and information infrastructures supporting innovation as well as initiating research and development work in healthcare.</p>
Finance	<p>The financial dimension of the model mirrors the hospital's mission statement regarding financial safety. This dimension refers to a hospital's financial health, efficiency, profitability, and determines the possible ways to reach financial success.</p> <p>From the micro perspective – it indicates the most rational management of the hospital's funds. Financial-dimension measures are usually associated with profitability. Typical measures would include operating profits, return on assets, and profit margins. In a public hospital (where the main objective is to balance the budget and to settle liabilities), the performance assessment should focus on such problems as how to balance costs with revenues and how to maintain financial liquidity.</p> <p>From the macro/meso perspective – it will be important to answer the following questions: What are the national/regional costs of the healthcare system? Are the medical entities operating in the national/regional healthcare system financially stable? How should the optimal financing of medical services be ensured?</p>

According to Shaller (2007), patients are the most-important group of customers in the healthcare system, and they should be at the center of the performance-assessment system. The patient should be the main focus of the strategies in each hospital. From the patient dimension, it is important to determine who is a patient in a hospital and which medical services are the most expected and desirable from the point of view of the patients. From the macroeconomic perspective, it is also important to determine the level of satisfaction of the patient and to improve the availability of medical services in different regions of the country. The active participation of patients and their full involvement in the treatment process (as well as their acceptance of treatment methods) are necessary to achieve the desired results. This acceptance is dependent on the quality of the medical services and patient trust towards the doctors.

An important stage of the project was determining the key questions for each dimension to meet the information demands of all stakeholders. Such questions

are often identified in other performance-measurement models and help to choose the indicators for measuring hospital performance, (as shown by Griffith et al., 2000; and Niven, 2011). The dimensions (along with strategic questions) are presented in Figure 2.

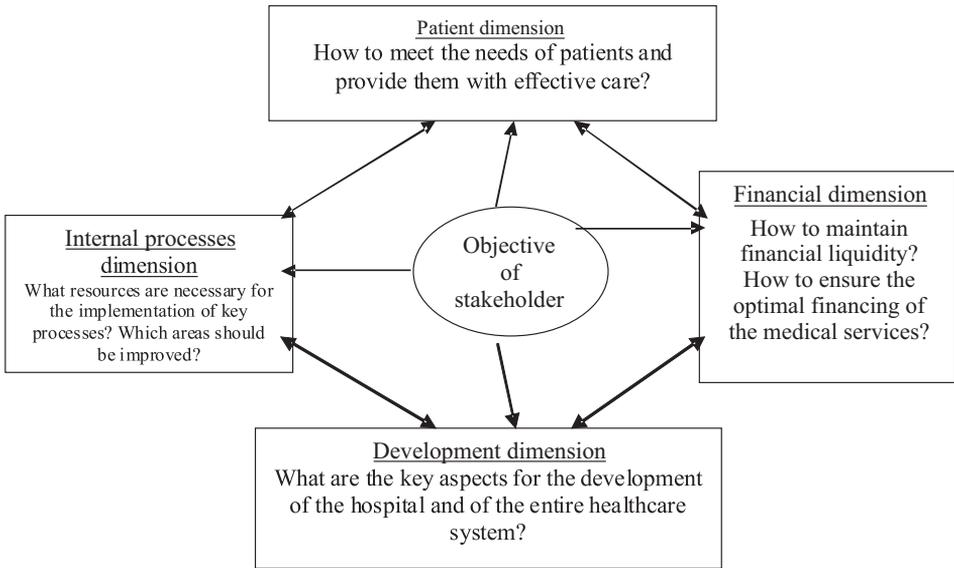


Figure 2. The dimensions of a performance model with strategic questions

All of these dimensions were analyzed independently. This multi-dimensional approach to measuring performance was based on the assumption that satisfactory achievements in the healthcare system should rely on:

- highly qualified medical staff who can use current medical knowledge,
- available medical technology and resources,
- professional medical care and high quality medical services,
- optimal health outcomes.

Assessing the performance of a healthcare system begins with defining its goals. The model takes into account the universal goals that a hospital and the individual stakeholders should realize in all of the defined dimensions of performance. The determination of these goals was conducted through the analysis of tasks carried out by the various stakeholders representing the three levels of the healthcare system.

According to the World Health Organization (2000b), the main goal of a health system is the delivery of effective, preventative, and curative health

services to the full population, equitably and efficiently, while protecting individuals from catastrophic healthcare costs. Kruk et al. (2008) adds that the state is, therefore, responsible for the needs and demands of the population and is obligated to ensure the availability, accessibility, acceptability, and quality of health services.

The universal objectives determined for a healthcare system, together with the key clinical and economic goals of hospitals and other stakeholders, were a significant reference point for constructing a set of indicators for the performance model. The objectives determined in the three non-financial dimensions of the model are presented in Table 2.

Table 2

The goals of hospitals and other stakeholders for the non-financial dimensions of the performance-measurement model

Dimension	Perspective	Goals
Patient	micro	<ul style="list-style-type: none"> – improving the satisfaction of patients and their families, and taking care of their safety – improving the quality of medical services and treatment conditions – optimizing treatment results – improving the clinical effectiveness of the medical services
	meso/ macro	<ul style="list-style-type: none"> – developing health policies – improving the health of the society in the region/country – ensuring high-quality medical services in the region/country – promoting health and health programs in the region/country
Internal processes	micro	<ul style="list-style-type: none"> – optimizing treatment processes in hospitals – improving the availability of medical services in hospitals – improving employee productivity in hospitals – optimizing material resources in hospitals and improving the efficiency of resource usage
	meso/ macro	<ul style="list-style-type: none"> – improving the availability of medical entities in the region/country – improving the availability of medical staff in the region/country – improving the availability of material resources (medical equipment, hospital beds, drugs) in the region/country – increasing access to treatment and reducing waiting times for health services in the region/country

Table 2 cont.

Development	micro	<ul style="list-style-type: none"> – improving the satisfaction and qualifications of the medical staff in the hospital – developing modern medical technology in the hospital – improving the information systems in the hospital – implementing new medical procedures and their standardization – improving the management systems in hospitals
	meso/ macro	<ul style="list-style-type: none"> – improving the training systems for medical staff in the country/region – developing the hospital infrastructure in the region/country – distributing information about the healthcare system – improving the healthcare management system – developing the DRG (Diagnostic Related Groups) system in the country

It is worth noting that the goals of hospitals vary by their ownership type. For instance, Villa et al. (2013) underlines that for-profit hospitals have to maximize profits, whereas private non-profit hospitals must balance multiple objectives such as profits, quality of care, quantity of care, and charitable care. The goals presented in the micro perspective of the model were selected only for public hospitals.

4. Selection of indicators for the performance-measurement model

The next step in the project was to define the indicators for each dimension and perspective of the model. The idea was to select such indicators that could measure whether the goals specified for all dimensions and all three levels of the health management system were realized.

Performance indicators are seen as a promising answer to the demands for increased transparency, accountability, and quality within healthcare (Berg et al., 2005). The literature abounds with definitions of the indicators that can be used to evaluate many aspects of a hospital's achievements. However, most of the performance indicators concern the dimensions connected with the quality of medical services; e.g., patient-safety, clinical effectiveness, safety, and appropriateness of the care (as well as its equitable delivery). On the other hand, we required indicators that could also measure the efficiency and resource use of medical facilities.

Hundreds of different indicators were analyzed in order to establish the set of indicators for the model. Also, each key indicator was checked for its appropriateness to the activities of public hospitals. As a result of this work, a group was selected consisting of dozens of measures, taking into account empirical research conducted in hospitals, founding bodies, provincial branches of the National Health Fund, and the Ministry of Health.

In the course of the study, it was necessary to decide how many indicators should be chosen for different dimensions and perspectives of the model. In the literature, there is a wide range in the number of indicators recommended for use in various systems of evaluations – ranging from 13 to 44. The upper limit of this range seems to be significantly above the levels recommended in the literature and definitely exceeds the ability of managers to focus on such numbers. The problem with the amount of indicators also encompasses both the resources and the costs involved in the process of measurement, data collection, and the analysis and interpretation of the indicators.

Using opinions obtained during the survey, the authors of the project choose 30 indicators. The indicators that were the highest rated by the respondents of the survey were further evaluated by experts working in hospitals (hospital managers, chief accountants), and the final selection of indicators for the model was completed using the following selection criteria:

- Ability for use and implementation – it was important to answer the following questions: Can the indicators be accepted by their potential users? Are the indicators easy to calculate?
- Importance and validity – it was important to answer the following questions: Do the indicators reflect aspects that are relevant for their users and important for the current healthcare system? Do the experts and users agree that the measurement of the indicator is necessary? Do the indicators measure achievements in the appropriate dimension? Are the indicators related to the objectives in the various dimensions of measurement?
- Availability – it was important to answer the following questions: Is the measurement data readily available? Is the measurement data available at a reasonable price?
- Credibility, reliability and usefulness – it was important to answer the following questions: Does the information obtained as a result of measurement reflect the achievements of the hospital? Is it possible to control it? Can hospitals rely on these indicators in case of problems? Is the measurement data reliable? Can the indicator be used for benchmarking? Is the indicator related to other indicators that measure the achievements of hospitals? Does the indicator measure the trait for analysis?

As a result of the research, the indicators were divided into two groups:

- A set of core indicators, including a limited group of 23–25 standard indicators in each perspective.
- A set of 70 complementary indicators, including non-standard indicators used only in specific situations and adjusted to the individual needs of hospitals.

The set of core indicators selected for non-financial dimensions and all perspectives of the model is presented in Table 3, while the set of complementary indicators for a microeconomic perspective is presented in Table 4. Similar sets of complementary indicators can be developed for the meso and macro perspectives.

Table 3

The set of core indicators for non-financial dimensions of the performance model

Dimension	Indicators	
	micro perspective	meso/macro perspective
Patients	<ul style="list-style-type: none"> - average wait time for medical services (in days) in the hospital - patient satisfaction in the hospital - number of patient complaints - rate of nosocomial infections in the hospital - mortality rate in the hospital - average length of stay for curative care in the hospital 	<ul style="list-style-type: none"> - Healthy Life Years in the region/country - life expectancy in the region/country - self-perceived health in the region - psychological well-being (Energy and Vitality Index) in the region/country - average length of stay for curative care in the region/country - average wait time for medical services (in days) in the region/country
Internal processes	<ul style="list-style-type: none"> - number of physicians and nurses per patient in the hospital - rate of labor productivity - surgical theatre usage - curative care bed occupation rate in the hospital - medical technology per patient in the hospital - number of available beds in the hospital 	<ul style="list-style-type: none"> - number of physicians and nurses per capita in the region/country - medical technology per capita in the region/country - curative care bed occupancy rate in the region/country - operation theatres per capita in the region/country - number of available beds per capita in the region/country - number of hospital wards in the region/country

Table 3 cont.

Dimension	Indicators	
	micro perspective	meso/macro perspective
Development	<ul style="list-style-type: none"> - place of the hospital in the national ranking for quality - training costs per employee in the hospital - value of the new investments in the hospital per year - level of the employee satisfaction in the hospital - value of new medical technologies in the hospital per year - degree of computerization in the hospital 	<ul style="list-style-type: none"> - value of the new investments per capita in the region/country - value of new medical technologies per capita in the region/country - number of accredited hospitals in the region/country - level of development of a national/regional "e-health" program - level of development of a DRG (Diagnostic Related Groups) system in the region/country - number of young specialists per capita in the region/country

Table 4

The set of selected tailored indicators of non-financial dimensions for the micro perspective

Dimension	Indicators
Patients	<ul style="list-style-type: none"> - number of statements of claim against the hospital - average length of stay in the various wards of the hospital - percentage of patients with individual treatment plans - average length of treatment for various patients (DRG cases) - number of Acute Oncology Services (AOS) - number of patients discharged without a health improvement - readmission rate - number of emergency admissions - blood culture contamination rate - mortality rate in the hospital wards - agreement between the initial and final diagnoses
Internal processes	<ul style="list-style-type: none"> - number of midwives per patient in the hospital - number of hospital wards by specialty - hospital beds by type of care; e.g., psychiatric, long-term-care beds, other beds - physicians by medical speciality per capita; e.g., oncology, radiology, cardiology - laboratory utilization rate - average age of the medical equipment - number of outpatient departments - number of theatre rooms - curative care bed occupation rate in various hospital wards

Table 4 cont.

Development	<ul style="list-style-type: none"> - number of hours of training per employee per year - number of Clinical Practice Guidelines - number of implemented innovations - rate of implementation of accreditation standards - number of key management areas covered by the information standards - number of employees who have upgraded their skills - staff turnover - value of modern medical equipment purchased in the last two years divided by the total value of the equipment - degree of computerization in the medical part of the hospital
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Both sets of indicators were selected based on scientific evidence after the surveys were carried out in hospitals, branches of the NHF, and the funding bodies. The results of discussions with experts were also taken into account. The performance model deliberately avoids presenting operational definitions of indicators. Hospitals and stakeholders can use core and tailored indicators from a micro and meso perspective and adapt them to their needs, but these indicators have to be operationally defined by them. Tailored indicators from a macro perspective should reflect national specific priorities and can be used for comparisons of hospitals.

There is much discussion in the literature about the problems of measuring some indicators regarding the quality of health care. One such broadly discussed indicator is patient satisfaction. According to Al-Abri and Al-Balushi (2014), there is no consensus among the literature on how to define the concept of patient satisfaction in healthcare. For instance, Nelson et al. (1992) defined patient satisfaction as a degree of congruency between patient expectations of ideal care and their perceptions of real care received. On the other hand, Mohan and Kumar (2011) pointed out that patient satisfaction is related to emotions, feelings, and [individual] perception of the healthcare services.

Another problematic indicator is labor productivity. Productivity is usually defined as a measure of the effectiveness and efficiency of an organization in generating output with the available resources. Labor productivity is a measure of economic output per unit of labor input. According to Brill (2015), hospital labor productivity is notoriously difficult to assess because of problems with measuring a hospital’s output.

The labor input means the quantity of utilized labor and is not complicated to measure. Wulong and Morin (2014) claim that labor input should be measured by the total worked hours of doctors, nurses, and administrative staff. Also, according to OECD (2001), the most-appropriate measure for the volume of labor

input is the number of hours actually worked. However, labor input should also include such factors as sick leave and holiday leave.

The challenge is to measure the actual hospital output, because hospitals provide different types of services to different types of patients. In the past, the volume of output was measured by the labor costs for medical and administrative staff, but this did not allow for measurement of labor productivity at the national or regional level. According to Chansky and Garner (2015), current labor-productivity indicators usually rely on volume-based measurement of hospital services, which are separated into outpatient visits and inpatient courses of treatment. So they developed and analyzed two concepts to measure a physical count of the services provided – one based on the number of procedures and the second based on the number of complete administered treatments adjusted for disease severity. Chansky et al. (2013) proposed the measurement of inpatient services on the basis of patient discharge data. Each discharge should be assigned to an appropriate Diagnosis-Related Group (DRG) that corresponds to the primary diagnosis as well as to the procedures and services used during treatment.

An accurate method to measure patient satisfaction is the quantitative approach. According to Jose et al. (2006), the most-popular assessment tool for conducting patient satisfaction studies are standardized questionnaires. Veillard et al. underline that there are three broad approaches to patient surveys. They can measure patient experience regarding received care, patient satisfaction, or the gap between patient expectations and perceived experience. These three approaches should be complementary.

Freeman (2002) emphasized the importance of distinguishing the use of internal and external indicators. It is worth noting that the performance model contains both kinds of indicators. External indicators can be used by governments, regional governors, and funding bodies to assess the availability of medical services, the health of the population, and the quality of care by healthcare providers, and they can be compared on a macro level. Internal indicators, on the other hand, can be used by healthcare providers to monitor and improve the outcomes of their care processes.

For each indicator in the core set of indicators, a descriptive sheet has been developed, which contains the following information:

- name and description of indicator,
- calculation formula,
- frequency of measurement,
- links to the dimension and goals of measurement,
- person responsible for measurement,
- indicator target value and interpretation guidance,

- information about data collection needed to calculate index,
- supplementary indicators to measure similar areas.

The model for the descriptive sheet is presented in Table 5.

Table 5
Model of the descriptive sheet

Elements of descriptive sheet	Characteristics of indicator
The name of indicator	
Dimension of measurement	
Calculation formula	
Description of indicator	
The frequency of measurement	
Indicator target value	
Sources of data necessary for measurement	
Supplementary indicators	
The person responsible for measurement	

Descriptive sheets were prepared for core indicators, with a detailed description of each indicator, formulas for the calculation, reference values, rules for frequency of measurement and analysis, as well as a recommendation for the appropriate usage. The results should relate to external references, together with internal comparisons over a period of time, and give guidance on interpretation. I tend to agree with the WHO (2007), that the descriptive sheets for indicators are not able to answer all questions regarding the definition and other information about the indicators, especially their reference values.

For a portion of the indicators, the reference values set as parameters were based on evidence from the literature, but such a situation was observed mainly for indicators from the finance dimension. For most of the indicators from non-financial dimensions, the reference values weren't standardized at the hospital, regional, or national levels, and further work will be required to find an optimal reference value for hospitals. In the line 'indicator target value', there was often a suggestion that this value should be based on the historical results obtained by the hospital.

The reference value can be established as average hospital points, or it can be described as percentages. In some cases, references are based on exclusion

criteria. Each year, the reference values should be reviewed in conjunction with any new information from the collected data, and additional modifications should be documented.

According to Gaev (2010), reference values for the indicators may be established using internal or external benchmarking or by regulation. At the hospital level, the reference value should be established by comparing the performance of the hospital against itself. For example, if a hospital achieved an average monthly curative care bed occupation rate of 72 percent last year, it may choose to use this as the reference value this year. Also, according to Stausberg et al. (2011), a reference value should be established based on a direction for better results.

Sometimes, it will be enough to connect a reference value with hospital management evaluation guidelines; for instance, establish if higher or lower indicator values indicate better performance. It is not always possible, however, to present one set of reference values for all kinds of hospitals. According to Ferretti and Zangrandi (2013), it is clear that the performance of hospital models is diverse due to the specific historical data and specifics of the organization.

For meso and macro perspectives, reference values for the indicators should be established on the basis of an external benchmark; i.e., by comparing the performance of one hospital with its peer group. In such cases, the reference values should be calculated from the merged data of all hospitals from the group. As a result of such benchmarking, a reference-values database for all types of indicators could be published and used in performance systems at the national and regional levels.

According to Shaw (2003), the reference values and objectives of hospital performance-measurement systems should be made explicit and agreed with by stakeholders. We should remember that performance-measurement systems should aim to manage and improve hospital performance rather than to generate unreliable rankings and comparisons.

Esders (2008) stressed that it is good to have such an already-established set of reference indicators that can be used by all kinds of different stakeholders with differing information needs, but it is not easy to realize this goal. Even if the selected set of indicators is stable, the descriptions of indicators are not static and are, therefore, still open to further development.

It is worth noting that the achievements of hospitals measured by the designed set of indicators should be periodically monitored. In such case, it is possible to use the card for monitoring the achievements presented in Table 6.

The performance model for monitoring the achievements of the hospital assumes a possibility for comparing the selected indicators on a quarterly basis. Such a comparison seems to be the most optimal for most of the indicators. However, in the case of large fluctuations in the monitored indicators, it is possible to compare them more often.

Table 6
Card for monitoring achievements of the hospital

Selected indicators	Quarters			
	I	II	III	IV
Patient dimension				
Indicator 1				
Indicator 2				
Internal processes dimension				
Indicator 1				
Indicator 2				
Development dimension				
Indicator 1				
Indicator 2				
Financial dimension				
Indicator 1				
Indicator 2				

Implementation of the performance model involves ensuring access to the right data as well as the political and cultural issues. Hospitals need educated people who will understand the goal and use of the performance model. Kurien and Qureshi (2011) claim that the challenge in implementing any performance-measurement system is a cultural shift in many organizations.

It is not easy to effectively implement the performance model. Bourne et al. (2003) suggest that implementation of any performance-measurement framework is fraught with complexity at varying levels and; therefore, implementation issues are critical to its success. Thakkar et al. (2009) mention four critical factors that impact the successful implementation of performance models at the hospital level, being strategy, leadership, culture, and capability. Each of these elements is interconnected with the others. Charan et al. (2008) suggest that critical factors such as these are not the only ones of relevance. According to them, successful implementation depends on; e.g., an effective information system, employee commitment, partnership with stakeholders, appropriate performance indicators, overcoming mistrust, funds for implementation, commitment by top management, awareness about performance model, and consistency with strategic goals.

The success of implementing the performance system lies especially in choosing the right indicators. In the opinion of Moreira (2008), the main disadvantage

of the approaches based on balance scorecards is their partial nature, which, according to the indicators selected, may lead to contradictory conclusions. One way to solve this problem is to aggregate several partial indicators into one efficiency index. Some authors recommend the use of such aggregate measures to improve assessments from various stakeholders (e.g., funding bodies, regional and government agencies) at the national and regional levels. For instance, according to Shwartz et al. (2008) and Staiger et al. (2009), such aggregate measures can eliminate the limitations associated with individual indicators and are often used to summarize hospital performance and enhance their accountability. The approaches that are based on the aggregated efficiency measures usually involve two steps: the estimation of an efficiency frontier, and the calculation of each unit's deviation from that benchmark.

Most research that has a goal to measure efficiency is based on either parametric or non-parametric methods. Madl et al. (2008) underline that the main difference between the parametric and the non-parametric methodology is the approach to constructing an efficiency frontier that provides a benchmark by which the efficiency performance can be assessed.

The most-commonly used parametric method is Stochastic Frontier Analysis (SFA). This is a statistical technique that allows one to estimate the deviations of performance scores from the efficient frontier. In this method, a usual function with constant parameters is specified a priori, which is one of the main drawbacks of this approach. The efficiency is measured using the residuals from the estimated equation where the error term is divided into two components: inefficiency, and a statistical residual. According to Kontodimopoulos et al. (2011), the basic concept of SFA models is that the deviations are not entirely due to inefficiency, since they acknowledge that random effects outside the control of the units may affect output. Usage of this parametric method is mostly found in the econometric literature.

While the parametric techniques require the ex-ante definition of the functional form of the efficiency frontier, the non-parametric approach is primarily data-driven, because it constructs an efficiency frontier using input/output data for the whole sample. A very popular non-parametric methodology that uses mathematical-programming techniques is DEA (Data Envelopment Analysis). This allows for the measurement of efficiency without requiring the specification of a functional form. However, the existence of exogenous factors is not taken into account in the analysis.

According to Hollingsworth (2008), 75% of the papers regarding the problems of efficiency measurement in healthcare use the DEA methodology. For instance, Fragkiadakis et al. (2013) used the DEA methodology, allowing for the identification of input and output variables that should be considered, as well as their aggregation into a multi-dimensional efficiency analysis context. The analysis was based on a comprehensive set of variables related to the volume and type of

services provided by Greek hospitals, their size, personnel, and costs structure. A similar methodology was used by Steinmann et al. (2004), who extended the analysis to comparisons with other EU countries.

The value developed by the authors of the integrated system of performance assessment based on the performance model is reflected in the possibility of using it not only in individual hospitals but also at the regional and central levels of the healthcare system. In such a case, it can be used to compare hospital achievements and prepare their rankings. The method that can best be used to conduct comparative analysis at the meso and macro levels using the indicators from different areas of the performance model was DEA. This method was chosen in the final stage of the research project for verification of the model Hass-Symotiuk et al. (2010).

5. Conclusions

According to Lowe et al. (2011), a financial emphasis still persists among many users of performance-measurement tools based on the BSC. Their findings indicate that an emphasis on short-term financial outcomes is a problem in many organizations.

The recently developed Polish performance model exceeds the scope of the financial dimension and enriches it with three non-financial dimensions: patients, internal processes, and development. This allows experts to concentrate not only on the tasks of the hospital but also on the objectives of other stakeholders. This model, therefore, puts an emphasis not only on financial indicators but especially on non-financial indicators. The growing importance of non-financial indicators stems from the following weakness of financial indicators:

- Financial indicators are determined on the basis of data from the past, so they are not able to warn about changes in the market of medical services.
- They are not sufficient for determining the financial results in the future. It is not possible to use them to assess the healthcare system of the future.
- Financial indicators mainly measure the effectiveness of material resource management (hospital facilities, medical equipment, information systems, medicine and medical supplies, cash, etc.) that have less and less importance in the economic value of the hospital.

The performance model developed at the level of a hospital can be the basis for the development of cards for individual hospital wards, because the indicators developed for each dimension may also be made more detailed. In addition, each department can supplement the card with indicators that are considered essential for its development. At the ward level, there can be more freedom and

flexibility. The performance model also provides a clear and comprehensive interpretation, which helps one understand the results and suggest areas for improvement. The implementation of this model at the microeconomic level may be of fundamental importance for:

- the application of modern hospital management methods,
- the construction of hospital incentive schemes,
- the proper allocation of resources.

The performance model presented in the article reflects the universal non-financial goals of hospitals and key entities operating in the healthcare system. Taking into account the needs of all stakeholders makes this card not only an instrument for hospital management but also a tool for health policies. Therefore, this model can be a practical tool for monitoring as well as for internal quality improvements throughout the healthcare system. The implementation of this model at the macroeconomic level can be used by various stakeholders to:

- collect data about the achievements of Polish hospitals,
- compare the achievements of hospitals,
- initiate activities to improve the quality of medical services,
- determine the rankings of hospitals,
- improve the availability of healthcare services.

The use of a model at the macro and meso levels can also provide an opportunity to make comparisons between hospitals according to various criteria (regions, sizes) to better understand the differences between hospitals and provide opportunities for improvements in individual hospitals.

In implementing the performance-measurement model, it is very important to use tools that could enable the monitoring and benchmarking of the efficiency of hospitals using aggregated indicators from various dimensions and facilitate the implementation of the best practice guidelines and policies.

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