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Technical Efficiency of Polish Independent Public Health Care Centres: Data Envelopment Analysis Approach

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Abstract

In the face of the growing demand for health services, which can be observed in Poland (as well as in many other countries), it is extremely important to make effective allocation decisions in relation to financial resources (at the disposal of health sector decision-makers). The pace of demographic, technological and market changes forces an increase in financial expenditures on health, while at the same time the resources allocated to these objectives are still lacking. The present paper assesses the technical efficiency of 24 independent public health care centers (IPHCCs) in 2010–2014 with the use of the data envelopment analysis method and evaluates changes in the examined efficiency categories using the Malmquist Index. The research has shown that independent public health care institutions in Poland are facing the problem of debt and inefficiency. It has also been established that the level and method of financing health services in Poland contribute to a large extent to the technical inefficiency of IPHCCs, and that the increase in IPHCCs' revenues leads to an increase in their technical efficiency. The conclusions of this paper provide, on one hand, the basis for in-depth research into the efficiency of public health entities and, on the other, guidance that can be used in the practical management of public health entities and in the shaping of national health care policy.

Keywords: data envelopment analysis, public health care in Poland, independent public health care centers, efficiency

JEL: I11, I18

Introduction

Numerous reforms of the healthcare sector in Poland, for example those from 1999 and 2011, aimed at introducing some market solutions to the sector (with a view to reducing costs while increasing the quality of the services provided), have not produced the expected results in the form of improving public sector efficiency. The health care system in Poland (especially the public sector) is often negatively assessed, which is indicated by public opinion surveys on the health care system in Poland.[1] Numerous studies point to the poor economic situation of many independent public health care institutions, which often face debt problems, inefficiency or poor quality of services. This in turn significantly destabilizes the health care system. A particularly important issue requiring a solution is therefore to find a balance between economic efficiency and social justice, understood as equal access to health care services.

Evaluation of the efficiency of independent public health care centers is of great importance given the vital role played by the public health sector in Poland. Despite the development of the

1. According to a 2012 Centre for Public Opinion Research survey, 78% of respondents were dissatisfied with the Polish health care system. Only 19% of patients were satisfied with the functioning of the system, and as few as 1% claimed to be definitely satisfied.

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private sector, the public sphere dominates the Polish health system — especially in residential care. An independent public health care entity is the most widespread type of health care unit managed by public entities in Poland. Due to the size and structure of the health care market, it is public entities that play a considerable role in meeting the growing health needs of Poles.

The aim of this study was to assess the technical efficiency of the IPHCCs, which provided a ranking of the entities included in the study and a determination of the source of their lack of effectiveness. Attempts have been made to identify specific solutions to the problem and to choose the best option under existing conditions. The paper applies economic theories to analyze problems occurring in the contemporary health system in Poland, with particular attention paid to: health economics, the economics of the public sector as well as the management of health care resources.

Research on efficiency in the context of health care has long been the subject of growing interest of authors from all over the world (Biorn et al. 2003, 2010; Hollingsworth 2003; Hollingsworth and Peacock 2008; Jacobs, Smith, and Street 2006; Linna and Häkkinen 1999, 2006; Liu and Mills 2007) and, for some time, also from Poland (Kujawska 2013a, 2013b, 2014; Łyszczarz 2009, 2010, 2011, 2014; Łyszczarz and Wyszkowska 2012; Nieszporska 2013, 2014; Nieszporska and Skrodzka 2015; Nojszewska 2011; Rój 2003, 2011a, 2011b). A non-parametric approach was used to assess the technical efficiency of independent public health care centers — the econometric approach, the data envelopment analysis and the Malmquist index, which made it possible to assess the IPHCC activity in terms of their technical efficiency. An important criterion for selecting a method is a literature analysis that demonstrates a widespread use of the econometric approach to performance testing in the health sector, where the data envelopment analysis method is of significant importance (Biorn et al. 2003; Byrnes and Freeman 1999; Hofmarcher, Paterson, and Riedel 2002; Hollingsworth and Peacock 2008; Jewczak and Żółtaszek 2011; Linna and Häkkinen 1999, 2006; Nieszporska 2013; Rebba and Rizzi 2006; Rój 2003, 2011b). Applications that use Malmquist productivity indexes to measure changes in efficiency and productivity over time are also found in the healthcare literature (Burgess and Wilson 1995; Dismuke and Sena 1999; Färe et al. 1992; Giuffrida 1999; Linna and Häkkinen 2006; Maniadakis, Hollingsworth, and Thanassoulis 1999; Tambour 1997).

The technical efficiency study presented in this article pertained to two dimensions: operational and financial, which is an important diagnostic and informative-comparative measure, defining the area of further research into detailed measures of partial efficiency. The choice of the method and variables used in the study was based on the assumptions of the theories concerning the effectiveness and specificity of the activity of medicinal entities, as well as on the practice applied in this respect in Poland and abroad. A systematic assessment of health sector entities can certainly benefit any of the health system stakeholders, thus not only the government and the payer, who have limited public funds, but also, above all, those subject to the research and, consequently, the whole society.

1 Materials and methods

The relative (technical) efficiency of 24 independent public health care centers was verified with the use of the Data Envelopment Analysis (DEA) — a CCR model (CRS), with constant economies of scale, input-oriented, and BCC model (VRS) with variable economies of scale.[2] The DEA's relative performance categories were also measured with a Malmquist Index calculated over a span of three years. In the study on unit relative efficiency, the methodology developed by Charnes, Cooper, and Rhodes (1979) was used. The efficiency of the entities covered by the survey was calculated in two dimensions — operational and financial (CRS and VRS models), as well as in changes in particular efficiency categories between neighboring years (the Malmquist model with indices).

In the course of the research, inefficient entities were identified and a group of entities whose technical efficiency amounted to 100% were identified, which means that in their case there is no more effective combination of expenditures to achieve the same effects. Entities whose technical efficiency amounts to 100% are considered efficient and constitute a benchmark (in the context

2. CCR — acronym made up from the first letters of the author's names of the model: Charnes, Cooper, and Rhodes; CRS — constant returns to scale; BCC — from authors: Banker, Charnes, and Cooper; VRS — variable returns to scale.

of the inputs consumed to outputs achieved) in relation to entities operating inefficiently. Factors affecting the efficiency of the entities surveyed were also identified. Particular attention was paid to the relation between technical efficiency and elements shaping the financial condition of the entities under examination. Using Pearson's linear correlation coefficients, the relation between the revenue level of the examined units and their technical efficiency was investigated. Assessment of the relation between the calculated dimensions of the efficiency of the IPHCCs was also performed. The evaluation of the technical efficiency of independent public health care centers consisted of several steps, as shown in the diagram below.

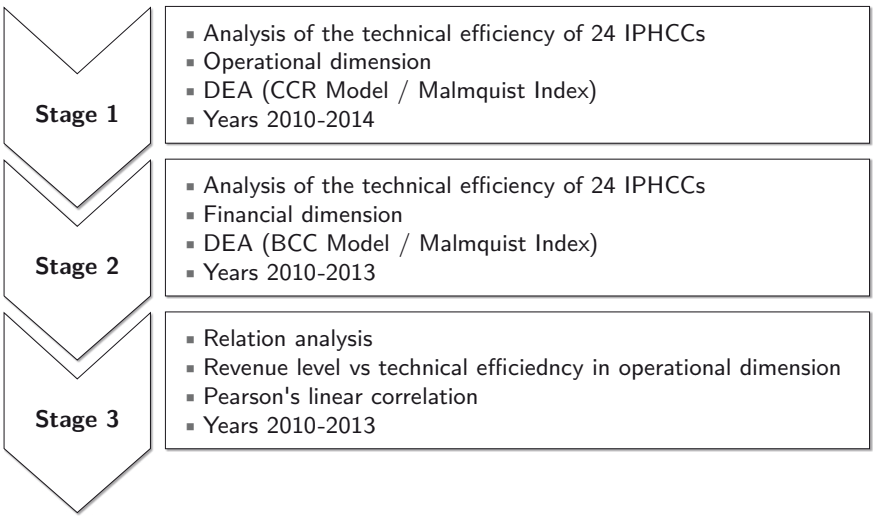

Fig. 1. Stages in the assessment of the efficiency of independent public health care centers

In the selection of variables, empirical studies conducted by various authors worldwide were used as a reference point. Due to some constraints on data access (especially financial data), the following expenditures were used to express the potential of a given entity: the number of beds, the number of doctors and the number of nurses. This is an approach frequently adopted, because it determines the capabilities of every medical entity, among others in the number of patients admitted as well as the number of days spent by patients at the facility. There are numerous examples of studies where the results of the therapeutic activity are expressed in terms of the number of patients treated. Accordingly, also in the case of this study, indices concerning the number of in- and out-patients as well as the number of days spent at a facility by in-patients were assumed to be the output (effect) of the therapeutic activity. This approach in the selection of inputs and outputs is widely used worldwide in research on the technical efficiency of medicinal entities. Beds as a surrogate of capital expenditure, together with human capital — a factor of labor — are considered to be the main determinants of serviceability or a hospital's service capacity (Rój 2011b, 199).

The first group of variables (examining the operational dimension of efficiency), referred to the inputs and effects on an annual basis incurred by a self-contained public health care institution. These were the following dimension as of 31 December of each year: the total number of beds in the entity, the total number of doctors (including specialists, resident doctors, trainees, dentists) and the total number of nurses. The figures concerning the number of employees (as of 31 December each year) were obtained on a full-time basis and included full-time employees, employees under a contract and those having an additional agreement with an entity. The variables concerning the results (effects) of the activities of the entities under examination on an annual basis are: the number of in-patients, the number of outpatients and the number of days spent in an entity by in-patients. The second group of variables referred to the financial efficiency of the entities, where the following were assumed as an input: total operating cost of each entity (including: depreciation, material and energy consumption, external services, taxes and charges, salaries, social security and other benefits, other costs and the value of goods and materials sold), and net sales income for the result (effect). The selection of this particular category of costs was determined by a personal, subjective

opinion indicating that there is considerable potential to reduce operating costs, among other things in the area of personnel costs. This is due in part to underuse of the diagnostic, therapeutic or personnel potential of many public entities. Limited contracts with the National Health Fund allow sometimes only for about half of the potential to be burdened, which has a significant impact on the increase in the cost of operation of public entities. Costs such as depreciation, repair and operations, labor costs and insurance, are not dependent on the use of the existing service capacity, but constitute fixed costs. They increase the unit costs of the services provided. Moreover, analyses of the cost structures of public health entities conducted by many authors were the main premise for including these costs in the study. The most important expenditure of general hospitals for many years has included personnel costs, which account for more than 53% of the general costs in clinical hospitals and over 65% in poviat (district) hospitals. It was the operating costs that accounted for the largest share of all costs incurred by the IPHCCs under study.

2 DEA Analytical framework

While examining the technical efficiency of 24 independent public health care centers with the help of DEA, a cost-oriented model with fixed economies of scale was used. The production function was determined and the relative technical efficiency values of all 24 IPHCCs were estimated. The calculations are based on the following formulae:

$$Q_o = \max \frac{\sum_{r=1}^{s} u_r y_{ro}}{\sum_{i=1}^{m} v_i x_{io}}, \tag{1}$$

with constraints:

$$\begin{array}{l} \sum_{r=1}^{s} u_r y_{rj} - \sum_{r=1}^{m} v_i x_{ij} \leq 0, \ \forall j \\ u_r, v_i > E, \ \forall \ r, i \end{array}, \tag{2}$$

where:
Q_o — efficiency indicator of object o,
o — index indicating a decision-making unit under examination, $1 \leq o \leq n$,
n — number of decision-making units, ($j = 1, 2, ..., n$),
s — number of outputs created, ($r = 1, 2, ..., s$),
m — number of inputs ($i = 1, 2, ..., m$),
u_r — decision variable; the weight given to output r,
v_i — decision variable; the weight given to input i,
y_{rj} — impact of output r of decision-making unit j,
x_{ij} — impact of input i of decision-making unit j.

Linear form of the model:

$$\min Q_o - \varepsilon \left(\sum_{r=1}^{s} s_r^+ + \sum_{i=1}^{m} s_i^- \right), \tag{3}$$

with constraints:

$$\begin{array}{l} \sum_{j=1}^{n} \lambda_j x_{ij} + s_i^- = Q_o x_{io} \\ \sum_{j=1}^{n} \lambda_j y_{rj} + s_i^+ = y_{ro} \\ \lambda_j, s_i^-, s_r^+ \geq 0, \ \forall j, i, r \end{array}, \tag{4}$$

where:
Q_o — efficiency indicator (lack of constraints for Q_o),
λ_j — decision variable; impact of object j,
s_i^- — decision variable (known as „slack"), associated with input i,
s_r^+ — decision variable (known as „slack"), associated with output r,
ε — infinitesimal constant.

The cost-effectiveness was verified with the DEA method, using a BCC (VRS) input-oriented model with variable economies of scale. Each of the IPHCCs examined, as in the case of the previous method, is an independent DMU (Decision Making Unit). Each of them generates a specific value of actual net operating revenue (Y_j), using specific inputs in the form of total operating expenses (X_j). The aim of the model is to calculate for individual IPHCCs minimum values of inputs assuming that net income is maintained at the same level, including finding the most efficient entities that will create the efficiency curve. Unlike in the CCR model, the measure obtained in the BCC model informs us about so called pure technical efficiency — i.e., it determines how much less effort could be used to generate the same number of outputs. In order to obtain a specific VRS efficiency value for a given IPHCC, as in the case of the CCR model, the problem should be solved within the framework of linear programming, according to formula:

$$\min Q_o - \varepsilon \left(\sum_{r=1}^{s} s_r^+ + \sum_{i=1}^{m} s_i^- \right), \tag{5}$$

with constraints:

$$\begin{aligned} &\textstyle\sum_{j=1}^{n} \lambda_j x_{ij} + s_i^- = Q_o x_{io} \\ &\textstyle\sum_{j=1}^{n} \lambda_j y_{rj} + s_i^+ = y_{ro} \\ &\textstyle\sum_{j=1}^{n} \lambda_j = 1 \\ &\lambda_j, s_i^-, s_r^+ \geq 0, \ \forall\ j, i, r \end{aligned} \tag{6}$$

In order to compare the obtained results over time, it was necessary to use the Malmquist index, which illustrates changes in technical efficiency between particular years t and $t + 1$:

$$M = \frac{D^{t+1}(y^{t+1}, x^{t+1})}{D^t(y^t, x^t)} \sqrt{\frac{D^t(y^{t+1}, x^{t+1})}{D^{t+1}(y^{t+1}, x^{t+1})} \frac{D^t(y^t, x^t)}{D^{t+1}(y^t, x^t)}}, \tag{7}$$

where:

$D^t(y^{t+1}, x^{t+1})$ — the efficiency of unit o with the use of production technology from year one to the data from year two,

$D^{t+1}(y^t, x^t)$ — the efficiency of unit o with the use of production technology from year two to the data from year one,

$D^t(y^t, x^t)$ — the efficiency of unit o for year one within the available technology and variable values,

$D^{t+1}(y^{t+1}, x^{t+1})$ — the efficiency of unit o for year two within the available technology and variable values.

As a result of the calculations, technical efficiency in the operational (material and personnel) dimension of the IPHCCs in 2010–2014 and technical efficiency in the financial (cost and revenue) dimension of the entities under evaluation in 2010–2013 were examined. The Malmquist index was also used to identify changes in particular efficiency measurements over time. The results obtained may serve as a basis for seeking the sources of inefficiencies of the surveyed entities, which are likely to be found in both internal and external regulations, such as the existing legislation or erroneous management decisions. In order to determine whether there is a link between the level of revenues and the technical efficiency of the IPHCCs under examination, the relation between the amount of revenues generated by the IPHCCs and their technical efficiency was investigated, based on Pearson's linear correlation coefficient.

3 Results

Table 1 presents the results of the technical efficiency analysis (in the operational dimension) of the IPHCCs under evaluation. Individual IPHCCs have been marked, successively, in Arabic numerals. The measure calculated is called the total technical efficiency of the decision-making unit and determines a possible proportional reduction of inputs, while maintaining at least the same number

of outputs. The entities with the best input/output ratio determine the production capacity curve, whereby it is possible to calculate the relative technical efficiency for each individual IPHCC, relative to all other entities covered by the study. The IPHCCs whose value of technical efficiency ratio amounted to 100% are considered to be technically efficient. These are model reference entities, referred to as "best practice," where no further input reduction is possible if at least the same amount of output is to be maintained. Entities for which the technical efficiency ratio takes values below 100% are considered inefficient. In the case of such entities, there is scope for input reduction — achieving a more efficient combination of inputs with a view to achieving at least the same number of outputs. Entities identified as inefficient can obtain accurate information on how much they should reduce their inputs in order to fully exploit their potential and thus improve their technical efficiency.

On average, the least efficient IPHCC in the whole period under analysis turned out to be the one marked No. 6. Its average technical efficiency in 2010–2014 was 13% of the value it could have obtained had it used inputs following the example of the best IPHCCs marked Nos. 8, 9, 13, 19 and 21. For example, Entity No. 6 with an average efficiency at 13%, would become efficient if it maintained the output level, using on average 87% less input. The entities marked green in table 1 are DEA-efficient in the group under evaluation because they have parameter $\theta = 100\%$ and slacks equal 0. IPHCCs deemed inefficient could reduce their input in particular years. In the case of the efficient entities, further input reduction (with at least the same number of outputs) is not possible.

After applying the Malmquist Index, it can be concluded that improvement in technical efficiency takes place on average in each of the periods under analysis (in a given year as compared

Tab. 1. The technical efficiency (operational dimension) of 24 IPHCCs in 2010–2014 (in %)

IPHCC	2010	2011	2012	2013	2014	Average
1	56,0	55,9	61,9	69,3	69,0	*62,0*
2	88,9	84,8	84,8	92,1	95,4	*89,0*
3	60,2	54,7	51,0	49,8	48,9	*53,0*
4	89,8	74,7	99,5	92,9	87,3	*88,0*
5	46,8	41,7	40,2	41,2	36,6	*41,0*
6	16,8	16,1	10,8	11,0	13,5	*13,0*
7	98,6	100,0	99,2	98,5	96,0	*98,0*
8	100,0	100,0	100,0	100,0	100,0	*100,0*
9	100,0	100,0	100,0	100,0	100,0	*100,0*
10	72,4	75,1	76,3	79,1	74,7	*75,0*
11	97,2	95,1	100,0	100,0	100,0	*98,0*
12	84,7	85,3	92,0	97,5	72,6	*86,0*
13	100,0	100,0	100,0	100,0	100,0	*100,0*
14	88,1	98,7	95,5	99,2	95,4	*95,0*
15	89,1	92,2	91,3	94,8	97,8	*93,0*
16	94,8	100,0	100,0	100,0	100,0	*99,0*
17	100,0	79,1	73,0	78,4	77,0	*81,0*
18	61,7	53,5	53,5	55,7	53,5	*55,0*
19	100,0	100,0	100,0	100,0	100,0	*100,0*
20	80,3	64,8	78,4	79,9	79,6	*76,0*
21	100,0	100,0	100,0	100,0	100,0	*100,0*
22	92,5	100,0	99,3	100,0	99,2	*98,0*
23	34,9	25,5	20,7	19,8	24,0	*24,0*
24	96,6	100,0	100,0	100,0	100,0	*99,0*
Average	*81,0*	*79,0*	*80,0*	*82,0*	*80,0*	

[In the journal European practice of number notation is followed — for example, 36 333,33 (European style) = 36 333.33 (Canadian style) = 36,333.33 (US and British style). — Ed.]

to the previous year), with the exception of 2011, when, compared to 2010, the technical efficiency deteriorated on average by 2,3%, as the average value of the index amounted to 0,977. The biggest improvement in efficiency was in 2012 as compared to 2011, where the average value of the index was 1,019, which represents an average improvement of 1,9%. Entities numbered 1 and 24 achieved the highest efficiency improvement in the period under analysis (with an average index value being 1,061). The lowest average index value (0,934) was recorded by No. 23 IPHCC.

The technical efficiency (in financial terms) is presented in table 2. The least efficient entities in the whole period under analysis are those marked Nos. 8, 16 and 19. Their average efficiency in 2010–2013 amounted to 87%. Entities whose efficiency was equal to 100% in all the years under study are IPHCCs marked Nos. 22 and 24. As is the case with the CRS, it is possible to obtain information on the optimal operating costs for the IPHCCs identified as inefficient.

By analyzing the Malmquist Index average values obtained for each period, it can be concluded that on average there was a deterioration in the efficiency (in financial terms) of the entities under evaluation, and only in 2013, as compared to 2012, was there a slight improvement in their efficiency (with an average value for the 2013/2012 period being 1,003). Entities No. 19 and 24 achieved the highest efficiency improvement in the period under evaluation (the average index value being 1,043 and 1,041, respectively). On average, this meant a slight increase of about 4%. Nine out of the 24 entities reached an average value below 1, which means that, on average, in the case of these entities there was a deterioration of efficiency. The lowest average index value was recorded by IPHCC No. 23 (with a decrease in technical efficiency by 4,5% on average) and No. 3 (with a decrease in technical efficiency by 4% on average).

Tab. 2. The efficiency (the financial dimension) of 24 IPHCCs in 2010–2013 (in %)

IPHCC	2010	2011	2012	2013	Average
1	98,6	96,4	99,0	97,7	*98,0*
2	96,2	98,2	100,0	100,0	*99,0*
3	100,0	96,6	96,7	94,2	*97,0*
4	91,6	92,2	96,8	97,5	*94,0*
5	98,6	96,4	98,6	98,6	*98,0*
6	88,4	89,6	99,4	96,6	*93,0*
7	88,3	92,6	100,0	96,5	*94,0*
8	84,7	83,2	90,2	88,4	*87,0*
9	88,2	88,4	93,0	88,6	*90,0*
10	94,0	92,0	99,1	99,9	*96,0*
11	89,6	94,6	96,9	94,2	*94,0*
12	88,7	92,1	93,4	95,0	*92,0*
13	91,4	92,7	99,4	99,0	*96,0*
14	86,2	87,5	100,0	95,2	*92,0*
15	92,2	98,0	99,5	100,0	*97,0*
16	83,0	85,5	89,2	90,7	*87,0*
17	93,7	90,6	96,0	92,0	*93,0*
18	84,4	90,8	89,3	96,8	*90,0*
19	80,7	82,3	90,8	96,2	*87,0*
20	94,6	93,4	95,1	93,7	*94,0*
21	95,6	92,1	98,0	97,2	*960,*
22	100,0	100,0	100,0	100,0	*100,0*
23	97,2	100,0	95,5	89,9	*96,0*
24	100,0	100,0	100,0	100,0	*100,0*
Average	*91,9*	*92,7*	*96,5*	*95,8*	

In order to determine whether there is a link between the level of revenues and the technical efficiency of the IPHCCs under evaluation, the relation between the amount of the revenue generated by the IPHCCs and their technical efficiency was investigated, based on Pearson's linear correlation coefficient. The value of the linear correlation coefficient (as based on the 2010–2013 data) showed that there is a low positive correlation between the level of revenues and the efficiency values of the IPHCCs under study. Therefore, it can be concluded that an increase in revenues results in an increase in the technical feasibility of the entities under evaluation (both in operational and financial terms).

4 Discussion

Model values for inefficient IPHCCs are the values that characterize the best IPHCCs. In the case of these entities, there is scope for input reduction — achieving a more efficient combination of inputs in order to achieve at least the same quantity of effects. Therefore, for technically inefficient units, in operational terms, it is possible to reduce the input in terms of the total number of beds, the number of doctors and nurses, and to admit at least the same number of patients as in the model entities. As in the case of technically inefficient units, there is scope for input reduction in terms of total operating expenses and achieving at least the same level of revenues, which is the case with the efficient entities. There are no logical links between revenues and costs, which in the case of the private sector is automatically regulated by market mechanisms; in the case of the public sector, it often leads to inefficient allocation of resources, which in turn is reflected in inefficiency.

Despite the fact that benchmark units, considered efficient, were selected in the course of the research, it should be remembered that this is a relative efficiency, showing that among the entities surveyed there are such ones that can consume less money in order to achieve at least the same effects. This does not mean that they do not face financial difficulties. Increase of effects in the form of e. g. the number of patients cured (even with relatively small inputs) can result in a huge wave of costs which, exceeding revenues, lead to IPHCC's debt growth, which thesis is confirmed by the profit and loss analysis of the IPHCCs under examination.

It can hardly be denied that the payer (NHF) does have an impact on the income of an IPHCC within the scope of contracted medical services. The most important source of funding for independent public health care centers is the contract drawn up with a public payer for the provision of public health insurance benefits, which account for over 90% of the total revenues of IPHCCs (Paszkowska 2010). The situation in the non-public sector is similar. An audit conducted by the Supreme Audit Office in 2011–2014, which assessed the impact of transforming hospitals into capital companies and their financial situation,[3] indicated that over 90% of the total revenues of the entities under examination were derived from contracts with the National Health Fund, and only approximately 5% were revenues from sales of paid medical services.[4]

The National Health Fund is an important employer with a significant influence (in economic terms) upon the functioning of the IPHCCs. The problem is the evaluation of treatment procedures that, in many cases, allow only partial payment of a patient's medical treatment costs, which, by covering the difference in costs, generates losses and thus exposes itself to being accused of lack of cost-effectiveness. On the other hand, medicinal entities maximize employment, increase salaries for physicians and purchase new medical equipment, which is uneconomical and contrary to the logic of efficient action. It is not making profits that an IPHCC cares about, it is maximizing salaries, which, among other factors, are decisive when it comes to the quality and quantity of healthcare services provided. The effect of such actions is deficit and debt transfer, which is a result of the

3. The audit was conducted in six voivodships — Mazowieckie, Pomorskie, Opolskie, Podkarpackie, Świętokrzyskie, and Zachodniopomorskie — and involved 18 entities for which local government units acted as founding organs. Also, two hospitals supervised by the Minister of Internal Affairs were inspected, which, due to the specific nature of the industry, had additional opportunities to obtain revenues outside contracts with the National Health Fund.

4. For information on the audit results, see: Działalność szpitali samorządowych przekształconych w spółki kapitałowe. Informacja o wynikach kontroli, kzD-4101–004/2014, nr ewid.196/2014/p/14/061/kzD, NIK, Warszawa 2015, [@:] https://www.nik.gov.pl/plik/id,8411,vp,10488.pdf.

inefficiency of these entities. Other "players" in the healthcare market — e.g., the National Health Fund, the founding body, are also having a significant impact on the functioning of the health care system. Such impacts at the time are thus not economic, but political.

The way of financing the health care system in Poland is therefore a mechanism that can induce an uncontrollable increase in the costs of independent public health care centers, which, with a frequent lack of opportunities for revenue growth, may lead to a constantly deteriorating financial situation of an entity. Not insignificantly, Poland has developed the so-called disintegration system of health care financing, which is conducive to the emergence of the phenomenon of patient selection by healthcare providers. Moving from one provider to another, a patient is treated as a new case that generates revenues and costs (profit or loss). A patient is either a "cost-effective patient" to be attracted and retained, or an "unprofitable patient" to be redirected as soon as possible. In most cases, public entities do not have such a choice, and the financial viability of providing a given service depends on the official evaluation of benefits, which in turn are very often subject to pressure from particular interest groups, and thus have little in common with reality. Striving to maximize their revenues, IPHCCs maximize the amount of health care services. At the same time, the largest revenue can be generated by providing the most costly services. Accordingly, they mainly provide services based on more expensive procedures so as to increase their revenues. They also increase the number of beds to sign up for more profitable services. With limited financial resources, however, the National Health Fund can only finance a certain number of services. As a rule, these are too low in relation to the demand for them and the capacity of health care providers to supply them, which results in a market imbalance — excess demand over supply, and, consequently, among other stressors, a long waiting time for patients to receive health care services.

Due to the lack of data on the results of treatment received by the IPHCCs, the conclusions presented in the article have only an informative character. In addition, the research methods used in the article are only a diagnostic and informative-comparative tool that can help identify the reasons of inefficiency in public health entities, however at the same time — due to its diagnostic nature — does not take into account the criterion of treatment effectiveness.

Conclusion

Changes in the financing of health care and the increase in the efficiency of health care institutions are important goals for the health care system in Poland. While reforming the health care sector, due consideration should be given to the idea of restoring previous solutions that would integrate health care providers in one institution, on the basis of integrated health care models to tackle the phenomenon of patient selection. Another important element is the improvement of the efficiency of functioning of medicinal entities, especially public entities, and a proper application of mechanisms of competition in healthcare. This naturally leads to savings which appear to be crucial in the perspective of underfunding of the health care system in Poland. The use of economic information, cost accounting and management decisions based on analyses and comparisons are also issues of vital importance, as is the performance measurement of any organization, whether or not profit-driven, which is the case with non-profit organizations.

The process of assessing the efficiency of health service providers should be preceded by in-depth analysis and review of the methods applied to measure multi-criteria effectiveness in the health sector, and by an identification of these methods, which will provide a solid basis for efficient health policy and efficient management at all levels of the health system.

The technical efficiency which has been examined in this paper in two dimensions: operational and financial, is an important diagnostic and informative-comparative measure delineating the area of further research into detailed measures of partial efficiency that require in-depth analysis of the entities under evaluation. Based on the method used, the IPHCC ranking should be treated as an impulse for further analyses in order to better understand the phenomena occurring within the entities.

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