Do Polish Hospitals Perform Well? Selected Aspects of Financial Performance

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1 Introduction

Health sector is extremely important for economic development of the country. Problems concerning the performance of public healthcare units are widely analysed both by national centres and foreign ones: Alemi and Gustafson [1], Martin and Smith [2], Vanberkel et al. [3], Smith and Topol [4]. Well organized performance of healthcare units is crucial not only from the perspective of patients' satisfaction but also from the perspective of managers. In the literature, it is commonly assumed, that the performance of healthcare sector in Poland is far from satisfactory. This statement is confirmed in the studies conducted by Nojszewska [5, 6], Suchecka [7, 8], Frączkiewicz-Wronka [9], Hass-Symotiuk [10], Susmarski [11].

The main problems of Polish public hospitals are concentrated upon unsatisfactory financial situation connected with growing indebtedness that adversely affects not only the development of healthcare but also quality of medical services provided.

An interesting study, from the point of view of the analysis of the financial condition of hospitals in Poland, was presented by Dubas-Jakóbczyk [12]. In this study, the assessment of the financial condition of university hospitals in Poland was conducted. As a result, it was concluded that the financial situation of university hospitals varied. Over 70% of the hospitals in question were characterized by a high level of indebtedness.

The study connected with the impact of the founding body on the financial efficiency of hospitals in the Lodz region was carried out in 2014 by Krzeczewski [13]. The aim of this study was to indicate some differences in the financial efficiency of hospitals subordinate to various founding bodies. The analysis, carried

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out in the article has led to the conclusion that the founding body has a significant impact on the financial efficiency of its hospitals.

The use of financial analysis to assess the situation of medical entities was addressed by Łagowski [14]. In this study, indicators from the group of liquidity assessment, indebtedness and profitability were used to analyse the financial situation of medical entities from the Silesian Voivodeship. In the final stage of the study, the Poznań model was used to assess the risk of bankruptcy and the most endangered individuals were identified.

Cygańska [15], in her research, used financial analysis to assess the profitability of hospitals. The aim of the study was to verify whether the financial situation of hospitals operating in the form of capital companies and independent public healthcare institutions differed significantly in terms of statistics. The assessment of the financial standing of hospitals was made by means of sales profitability ratios. As a result, there was no statistically significant relationship between the size of the hospital and the moment of its transformation.

As a results of in-depth analysis of professional literature and economic situation of healthcare sector in Poland, the main subject of the study is referred to the problem of financial stability of public hospitals, which has a negative impact on the quality of services provided and, as a consequence, on the development of health protection. Referring to the subject of the study the following main goals were identified:

- checking whether the results achieved by individual hospitals/voivodeships/ founding bodies varied significantly over time.
- identification of the factors causing indebtedness of hospitals.

According to the goals set in the study, a research hypothesis was made on whether the founding body has any impact on hospitals' indebtedness?

2 Methodology and Data

2.1 Methodology

The study was conducted on public general hospitals operating in Poland in years 2007–2015. The scope of the research period was related to the availability of data. During the analysis, a particular emphasis was put on the features that differentiate the units in question. The founding body was the feature that distinguished the hospitals and constituted the basis for conducting further in-depth analyses. Therefore, the following groups of units were distinguished: Universities (abbr. "U") Poviat-Commune (abbr. "P-G"), Marshal's office (abbr. "W") and Ministry hospitals (abbr. "R").

In order to achieve the goals and verify the hypotheses put forward in the study, a spatial analysis of time-series and a one-way analysis of variance (ANOVA) were carried out. What is more, the analysis of trends in the value of financial ratios,

carried out as a part of spatial analysis of time-series, was made from three different perspectives:

- individually
- divided into homogeneous groups of hospitals from the perspective of the founding body

In order to verify whether the founding body has an impact on the financial condition of the hospital, the ANOVA analysis (one-way analysis of variance) has been conducted. This parametric test examines the differences among many groups, i.e. hospitals with different founding bodies. The ANOVA method is based on comparing the measures of variance in each of the identified groups. ANOVA is carried out in the following steps:

- checking the assumptions of the test and its implementation
- interpretation of a one-way analysis of variance
- conducting a posteriori tests—checking which groups differ.

2.2 Data

The financial hospital characteristics were obtained from the audited annual financial reports originated from the Amadeus database. From these each hospital's financial indicators were calculated. The conducted study was based on liquidity and debt ratios. Benchmarks (reference values) were also assigned to all indicators, which enabled a later assessment of the performance of the analysed hospitals. Table 1 contains a list of indicators with reference values.

For the whole period descriptive statistics of all hospitals in question were calculated. The descriptive statistics for these hospital characteristics are included in Table 2.

Table 1 List of indicators with reference values

Field	Ind.	Formula	Reference value
Indebtedness	Debt-to-Equity [DtER]	$\frac{current liabilities + long - termdebt}{shareholder's funds}$	0.01–0.5
	Debt ratio [DTR]	$\frac{current liabilities + non - currentliab.}{total assets} \cdot 100$	≈30%
	Financing of fixed assets [FFA]	$\frac{long\text{-}term\ debt + shareholder's funds}{fixed\ assets}$	≈1
Liquidity	Current ratio [CR]	$\frac{current\ assets}{current\ liabilities} \cdot 100\%$	1.2–1.7
	Quick ratio [QR]	$\frac{current\ assets - stock}{current\ liabilities} \cdot 100\%$	1–1.2

Table 2 Descriptive statistics for indebtedness and liquidity ratio in the year 2015

	N	Minimum	Maximum	Mean	Stand. dev.
DtER2015	343	–79.194	157.63	1.02	13.3851
DBR2015	343	0.0734	2.9918	0.78	0.43664
FFA2015	343	–5.2632	2.8648	0.45	0.64061
CR2015	343	0.0789	6.8646	0.69	0.74445
QR2015	343	0.0735	6.6846	0.63	0.70235
N observations	343				

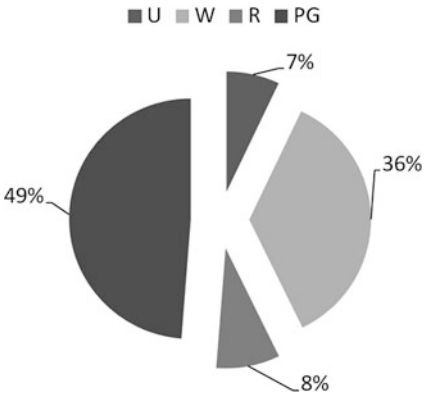

Fig. 1 Public general hospitals—population structure

3 Results

The analysis was conducted on the basis of 343 public general hospitals, from over 600 operating units located in Poland and operating in the years 2007–2015. According to the data collected from the Amadeus database almost 49% from 600 public general hospitals constituted poviat-commune hospitals ("P-G"). Detailed statistics on the population structure is presented in Fig. 1. As it was earlier described hospitals have been divided according to their founding body as follows: Universities (abbr. "U") Poviat-Commune (abbr. "P-G"), Marshal's office (abbr. "W") and Ministry hospitals (abbr. "R").

Due to the fact that the choice of the sample was dictated by the availability of data, it was necessary to verify some assumptions regarding the distributions of both samples. The distribution of the analysed sample is presented in Fig. 2.

This procedure was necessary to generalize the results on the entire population. In order to compare the distribution of those samples, the unit's selection test—χ^2 test was carried out.

The χ^2 test belongs to the group of non-parametric tests, the algorithm of which is based on the comparison of the frequency of events resulting from experience with the expected ones. The condition for the applicability of the test is a large data population, which in case of this study is fulfilled. The χ^2 test was introduced in accordance with the following notation—Eq. (1):

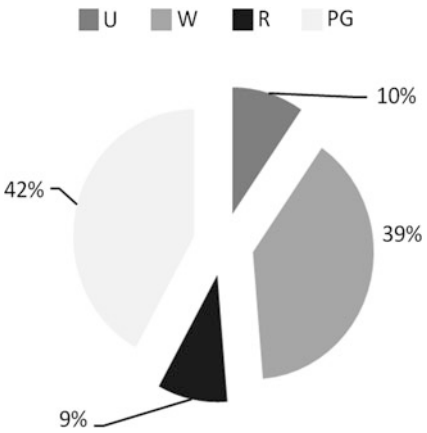

Fig. 2 Public general hospitals—structure of the sample

Table 3 Verification of χ^2 test

Events	U	W	R	PG	Sum
Observed events [Oj]	10	39	9	42	100
Expected events [Ej]	7	36	8	49	100
Eq. (1)	0.9	0.3	0.1	0.9	2.29
$\chi^2_{0.05} = 7.815$					

$$\chi^2 = \sum_{j=1}^{k} \frac{(O_j - E_j)^2}{E_j} \tag{1}$$

where,

Oj—observed events;
Ej—expected events.

The tested hypotheses were as follows:

H_0: Distribution of hospitals according to the founding body in the sample is consistent with the distribution for the entire population.
$H_0 \sim H_1$

The results of conducted χ^2 test are presented in Table 3.

The value χ^2 test was 1.258 and that is why the condition: $\chi^2 < \chi^2_{0.05}$ was fulfilled. Hence, there was no basis for the rejection of the null hypothesis. Thus, with a 95% probability it was stated that the distribution of hospitals according to their founding body in the sample was consistent with the distribution of the entire population. According to these results, the outcomes of the analysis carried out in this study could be generalized to the entire population.

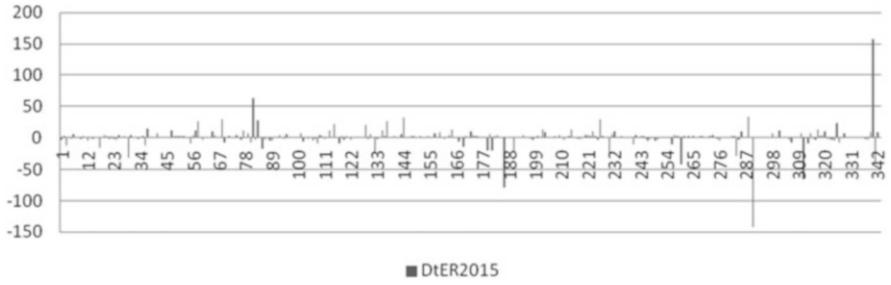

Fig. 3 Public general hospitals—debt-to-equity ratio [year 2015]

Fig. 4 Public general hospitals—debt ratio [year 2015]

3.1 Financial Situation: Individual Entities

The financial situation of the analysed public hospitals did not evolve between years 2007–2015. The hospitals were characterized by alarming indices of indebtedness and liquidity.

The Debt-to-Equity ratio exceeded in most cases the level of 4, which means that those hospitals had the possibility of losing the ability to regulate their liabilities. A similarly large group of units were characterized by index values below 0.0, which indicated lack of ability of effective application of external financing. Units that stand out as to the value of the indicator were poviat-commune hospitals. Negative values of this indicator were connected with negative level of shareholder's funds. On the other hand, extremely high levels related to negative level of shareholder's funds in the previous year and very low level in currently analysed year. Figure 3 presents values of debt-to-equity ratio in the year 2015.

As for the values of debt ratio it should oscillate up to 0.3 and almost all the analysed hospitals exceeded this reference value. In 2015, only 39 out of 344 hospitals did not exceed the reference value. What is more, 35 out of 344 hospitals had an FFA ratio of between 0.9 and 1.1. Figure 4 presents values of debt ratio in the year 2015.

In terms of the current ratio, in 2015, only 33 hospitals were characterized by the values of this ratio within the reference values. What is more, only 16 units acquired the reference values of quick ratio. At the same time, almost all other units had the ratio values under 1.

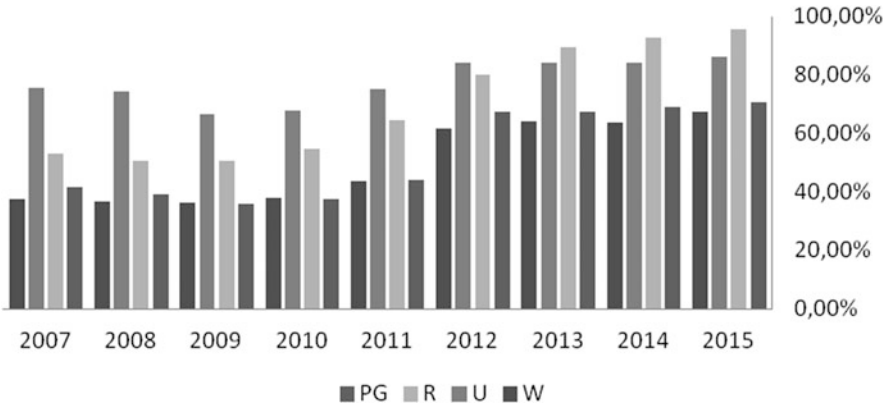

Fig. 5 Public general hospitals, founding body perspective—debt ratio [year 2015]

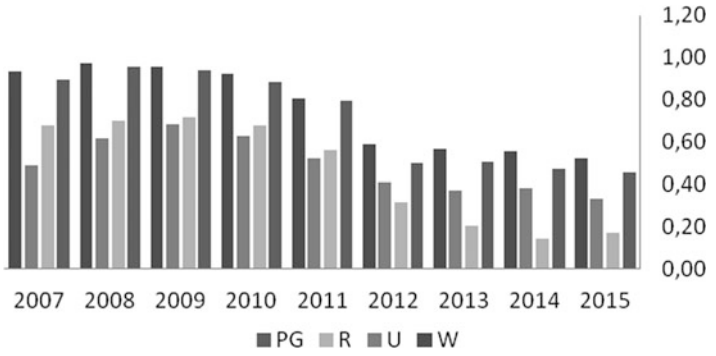

Fig. 6 Public general hospitals, founding body perspective—financing of fixed assets [year 2015]

3.2 Financial Situation: Founding Body Perspective

The financial situation of Polish hospitals was also examined from the perspective of their founding bodies. The hospitals have been attached to homogeneous, in terms of founding bodies, groups.

Neither in terms of the current ratio, nor in terms of quick ratio, the reference level had not been exceeded. This situation confirmed the inability to regulate current liabilities.

As for the indebtedness indicator, none of the analysed groups reached the reference values. All the groups were characterized by the undermining of credibility due to too high values of indicators. Figure 5 presents the detailed results.

As for the financing of fixed assets, none of the analysed groups reached the reference values. None of the units exceeded the reference level, which means that non-current assets were financed by short-term liabilities. This situation could lead to bailiffs' activities. Figure 6 presents detailed the results.

Table 4 Homogeneity of variance test

Year	Levene'a test	df1	df2	Signific.
2015	2.605	3	336	0.052
2014	3.756	3	336	0.011
2013	2.883	3	336	0.036
2012	3.981	3	336	0.008
2011	3.639	3	336	0.013
2010	2.69	3	336	0.046
2009	3.442	3	336	0.017
2008	6.297	3	336	0.01
2007	5.971	3	336	0.011

3.3 Financial Situation: ANOVA Analysis

In order to verify the research hypothesis, whether the founding body has an impact on the financial condition of the hospitals, the ANOVA analysis has been conducted. Before starting the ANOVA procedure, several assumptions have been checked. First of all, the dependent variable was classified as qualitative (financial indicators) and the independent variable was measured on nominal scale with four different values (U, R, W, and PG), which divided the sample into four groups.

In the next step the homogeneity of variance was checked.

The hypothesis stands as follows:

H0: the difference between the variances in the examined groups is homogeneous (or similar)
H1: variances in the studied groups are different.

According to the results of the test there is no basis for rejecting H0 with equality of variance (see Table 4). Therefore, ANOVA can be performed.

In the next step, variance analysis has been performed, according to which:

H0—means in the studied groups do not differ (they are equal),
H1—at least one medium pair is different from one another (we do not assume equality of variance)

The results of the analysis constitute that according to the debt ratio in 2007–2008 the H0 was rejected in favor of H1. It means that at least one medium pair was significantly different from each other (see Table 5).

After the rejection of H0 hypothesis in 2007 and 2008 post hoc tests were conducted. These tests allow us to assess which groups differ from each other. The tests are divided into liberal ones (which do not require restrictive assumptions) to show a statistically significant difference between the means in groups, and conservative ones—requiring such assumptions. In this study a restricted Tuckey test has been applied. Table 6 presents the results.

According to the results obtained in the study, it can be claimed that marshal hospitals differ from university hospitals in terms of the debt ratio in both years: 2007 and 2008.

Table 5 ANOVA test

Year	Sum sq.	df	Mean sq.	f	Signific.
2015	0.378	3	0.126	0.653	0.582
2014	0.693	3	0.231	1.156	0.327
2013	0.511	3	0.17	0.777	0.508
2012	1.429	3	0.476	1.869	0.135
2011	1.814	3	0.605	3.038	0.029
2010	1.715	3	0.572	3.366	0.019
2009	1.642	3	0.547	3.509	0.016
2008	2.497	3	0.832	4.67	0.003
2007	2.677	3	0.892	3.268	0.022

Table 6 Post hoc test [year 2008]

Founding body		Mean difference	Standard err.	Sing.	95% confidence interval	
					Lower limit	Upper limit
U	W	0.297∗	0.0822	0.002	0.084	0.509
	R	0.201	0.1047	0.221	–0.069	0.472
	PG	0.189	0.0815	0.095	–0.021	0.400
W	U	–0.297∗	0.0822	0.002	–0.509	-0.084
	R	–0.095	0.0833	0.663	–0.310	0.120
	PG	–0.107	0.0510	0.154	–0.239	0.024
R	U	–0.201	0.1047	0.221	–0.472	0.069
	W	0.095	0.0833	0.663	–0.120	0.310
	PG	–0.012	0.0825	0.999	–0.225	0.201
PG	U	–0.189	0.0815	0.095	–0.400	0.021
	W	0.107	0.0510	0.154	–0.024	0.239
	R	0.012	0.0825	0.999	–0.201	0.225

∗The average difference is significant at the level of 0.05

4 Conclusions

According to the results of the analysis conducted in this study it should be underlined that the situation of Polish hospitals tends to be alarming. Only a small percentage of the analyzed units achieved the reference values of financial ratios in the analyzed years. Almost 90% of hospitals exceeded the level of 0.3, which undermines the credibility of the hospital. More than 15% of units were characterized by the loss of ability to regulate their commitments, and more than 38% of hospitals were characterized by ineffective use of external financing. Less than 10% of analysed units acquired referenced values of the current ratio and even less of the quick ratio. A great majority of hospitals had low value of liquidity ratios. This indicated lack of ability to regulate current liabilities. Over 14% of hospitals was characterized by excessive liquidity, i.e. inefficient management of the funds possessed, e.g. excessive stocks or overdue receivables.

As for the research hypothesis it was positively verified in the years 2007 and 2008. It these years the founding body had an impact on the financial condition of hospitals. What is more, marshal hospitals differ from university hospitals in terms of the debt ratio in both years: 2007 and 2008.

To sum up, it should be underlined that an attempt to identify factors that determine the process of units' indebtedness and their financial problems, which was presented in this paper, will be a starting point for further, more advanced studies in the area of financial management of public hospitals in Poland.

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