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NEXT PANDEMIC? YES, PLEASE! HOW COVID-19 PANDEMIC IMPROVED THE FINANCIAL CONDITION OF POLISH HOSPITALS

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ABSTRACT

The purpose of the article. The study aims to analyze how these special rules of financing during the pandemic affected the financial situation of hospitals in Poland.

Methodology. We analyzed a sample of 86 Polish hospitals from 2019 to 2021. The financial condition is assessed based on financial ratios and the synthetic measure M1. We employ the Kruskall-Wallis test to confirm the differences between the values of financial ratios in the analyzed period.

Results of the research. We confirm that due to the special rules and financing, combined with underperformance, the financial condition of Polish hospitals has slightly improved – especially in the case of operating margin, EAT to debt ratio and ROA.

Keywords: hospital financial condition, pandemic, operating margin, ROA.

JEL Class: I11, H51, M21.

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INTRODUCTION

The COVID-19 pandemic primarily covered the period 2020–2021, in which a significant part of resources was redirected to meet the needs of infected patients. This redirection of resources was accompanied by substantial sanitary and epidemiological restrictions, resulting in limited access to services for other patients.

The financial condition of Polish hospitals is the subject of continual discussion – and despite constant changes in the rules of financing – it has not improved (Miszczyńska and Miszczyński, 2021). The pandemic has created entirely new conditions for the functioning of hospitals. The study aims to analyze how these special rules, forced by the pandemic, have affected the financial situation of hospitals in Poland.

We hypothesize that limiting the number of services provided, combined with a flat-rate financing system and additional funding, could positively impact the financial situation of Polish hospitals.

A research sample covers 86 Polish hospitals from 2019 to 2021 and is limited by the data completeness. The data comes from the Orbis database.

1. HOSPITALS VS. PANDEMIC

The COVID-19 pandemic, which hit in late 2019 and early 2020, has put enormous pressure on health systems, especially in the hospital sector. The vast pressure revealed weaknesses related to the organization, such as personnel and equipment shortages or personal protective equipment.

When it comes to Poland, on March 2, 2020, numerous important solutions from the point of view of the functioning of the healthcare system were introduced, including transforming selected hospitals into infectious facilities, wards into infectious units and creating temporary hospitals (Chmielowiec et al., 2022).

Since then, most resources, especially inpatient care, have been diverted to treating COVID-19 patients, influencing the structure of medical services. As a result, medical rehabilitation activities and planned services have been substantially limited. In primary care, online doctor consultation has become a primal form of service provision. Hospitals began to function in a special sanitary mode, and from the point of view of "non-covid" patients, it created a vital barrier to healthcare services (Cantor et al., 2022). This limited access to health services was observed practically worldwide, and hospital services were affected by this decline to a greater extent than outpatient services (Xiao et al., 2021). Both lower and high-income countries, irrespective of the degree of the COVID-19 outbreak, reported a reduction in healthcare services utilization

(Dopfer et al., 2020; Melnick and Maerki, 2021; Roy et al., 2021; He et al., 2022), especially in the early days of the pandemic (Coughlin et al., 2020; Xu et al., 2021; Kim et al., 2022). Studies indicate a general decrease in the bed occupancy rate (Hu et al., 2022), except for intensive care beds (Trentini et al., 2022).

Without a doubt this decrease in the level of use of health services that was observed during the pandemic, may not only be related to limited access resulting from the redirection of funds for the treatment of infectious patients or the tightened sanitary regime and closure of health facilities but may also be the result of avoiding visits due to fear of infection during the pandemic (Lee and You, 2021; Synhorst et al., 2021).

Also, in Poland, despite the significant number of COVID-19 cases, the activity of hospitals in terms of medical services significantly decreased (Chart 1). The number of patients treated in 2020 fell by 24%, as did the number of medical services. In 2021, we could see a slight increase, but not to pre-pandemic levels (Grudziaż-Sękowska et al., 2022; Narodowy Fundusz Zdrowia, 2022). Patients usually indicated long waiting times and temporary closure of healthcare facilities or their transformation into COVID-19 dedicated centers as the most common barriers that lowered access to health services (Mularczyk-Tomczewska et al., 2022).

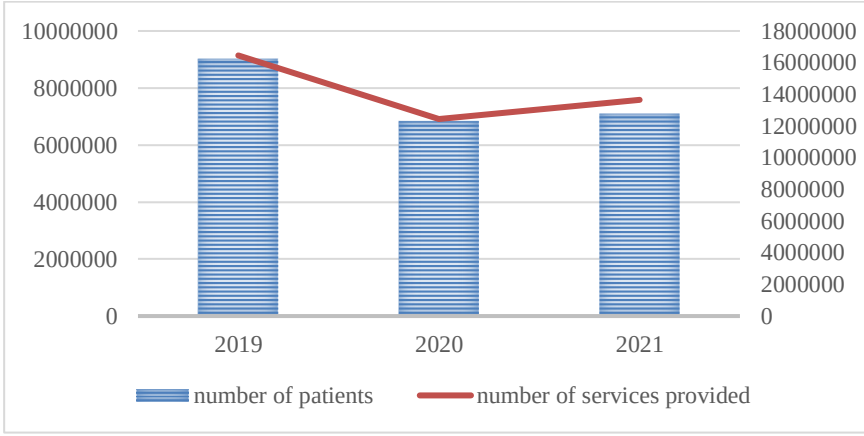

Chart 1. Number of hospital patients and provided services in 2019-2021 (PLN)

Source: own study based on Narodowy Fundusz Zdrowia (2022).

Lower performance, combined with increased hospitalization costs (György and Simionescu, 2021; Lalani et al., 2023), among others, due to the new sanitary regime or a higher number of cases requiring respiratory ventilation, strongly affected the financial situation of hospitals. The financial condition of inpatient facilities deteriorated significantly (Carroll and Smith, 2020; Fried et al., 2020;

Khullar et al., 2020; Behzadifar et al., 2022; Hu et al., 2022; Li et al., 2023). The American Hospital Association estimated that hospital losses reached $202,6 billion between March 1 and June 30, 2020 (Hu et al., 2022) and experienced a 45% decrease in operating revenue (Lalani et al., 2023). This decline was significant in the case of systems where hospitals are paid for performance. Hospitals suffered substantial losses in health systems where activity-based payment is the main financing scheme, and governmental control is limited (Waitzberg et al., 2021).

Several findings report an increased likelihood of financial distress in 2020 – higher by 6,93 p.p. compared to 2019 (Bai et al., no date; Wang et al., 2022). He et al. (2022) reported a negative impact on hospitals' operating margins (OM) in the USA. On the other hand, Li et al. (2023) found that California hospitals experienced a significant increase in total margin (TM), with government hospitals in a particularly good position. In terms of operating margins (OP), they also observed a solid growth, especially for large and medium-sized hospitals, with the growing gap between small and large hospitals. However, this situation should be treated as an emergency – the source of this change may be the increased payments that hospitals received in 2020, which were later corrected (Li et al., 2023). Using a case study method, Carroll and Smith (2020) show how the epidemic caused dramatic financial losses for hospitals and that the bulk of those losses are rooted in lost revenue. Lalani et al. (2023) studied the financial situation of U.S. academic hospitals and reported a deterioration in 2020 and subsequent improvement in 2021, although not all indicators have recovered to pre-pandemic levels. Wang et al. (2022), based on quarterly data, describe substantial volatility of financial indicators in Californian Hospitals during the pandemic. They also stress the role of governmental aid programs, which prevented progressive deterioration of financial performance.

Most European countries have introduced special mechanisms for financing hospitals during the pandemic to prevent the deterioration of hospitals' financial conditions. The solutions in this area were varied – usually, they consisted of introducing new rates for treatment (or updating the budget) or submitting additional payments to existing daily or case rates – expressed as pay rate or percentage (Quentin et al., 2020; Waitzberg et al., 2021, 2022; Küçük, 2022). Maintaining the current level of funding despite lower activity was one of the methods to deal with short-term financial shortages (Quentin et al., 2020).

As a result, in Poland, the reduced medical activity of hospitals was accompanied by a significant increase in funding. During the pandemic, hospitals obtained additional streams of funding to compensate for the extra costs associated with functioning in an increased sanitary regime (3% of the contract value) and financial allowances for medical staff involved in the care of COVID-19 patients (initially 50% and then, 100%, with a limit of up to PLN

15,000) (Narodowy Fundusz Zdrowia, 2021; Niżnik, 2021). At the same time, new rates for providing services for COVID-19 patients were introduced (Quentin et al., 2020). Although the share of expenditure on hospital treatment in total current spending decreased from 41% to 38% in the analyzed period, both expenditure on inpatient treatment and the value of hospital contracts steadily increased (Chart 2).

The new mechanism for financing hospital care, introduced in 2017, probably impacted the behavior of hospitals during the pandemic and, as a result, their financial situation. This reform aimed to ensure comprehensive access to hospital services and to guarantee adequate financing of hospital health services. The transition to a Diagnosis-related group (DRG) – based budget (estimated based on previous activity) was a vital change element. Healthcare providers qualified for the basic hospital provision system ("hospital network") have guaranteed financing of all services but cannot choose the range of services they intend to provide. A flat-rate system means the hospital receives an estimated budget based on previous activity (Mikos and Urbaniak, 2017; Pietryka, 2018; Quentin et al., 2020). In economic terms, this means a considerable change – hospitals have no economic incentive to accept more patients. In earlier periods, the treatment of more patients did not automatically guarantee increased financial resources. Still, finally, the payer usually reimbursed part of the overperformance, and some categories of benefits, such as labor, were financed without limits.

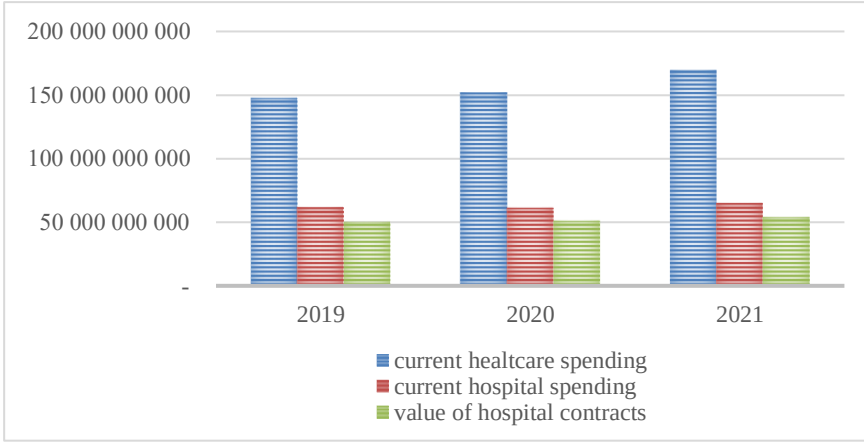

Chart 2. Current spending on healthcare in 2019-2021 (PLN)

Source: own study based on: Narodowy Fundusz Zdrowia (2022) and GUS (2022).

For Polish hospitals, this may mean an improvement in their permanently difficult financial situation. Naruć (2022) reports, based on a sample of infectious

hospitals, an increase in revenues during the pandemic, accompanied by an improvement in EBIT and EBITDA.

2. DATA AND METHODS

2.1. Research Method

Although each sector, including healthcare, has certain specificities, standard financial indicators are used in assessing financial condition. The evaluation of the financial health of hospitals should include the following six areas: profitability, fixed capital, efficiency, capital structure, fixed assets life, working capital efficiency and liquidity (Prędkiewicz and Prędkiewicz, 2013; Bem et al., 2014a; Bem et al., 2014b; Bem et al., 2014c; Prędkiewicz et al., 2014; Bem et al., 2015a, 2015b; Hu et al., 2022).

According to the gradient taxonomic measure, the M1 value for a company is determined as follows:

$$M1 = \frac{1}{m}\sum_{i=1}^{m}\frac{x_{ij} - \min(x_{ij})}{\max(x_{ij}) - \min(x_{ij})}$$

where:
x_{ij} – is the financial ratio,
i – is the indicator,
j – is the company,
m – number of companies,
$x_{ij} \in$ R.

Hence, the coefficients and the intercept are as follows:

$$coefficient_i = \frac{1}{\mathrm{m}(\max(x_{ij}) - \min(x_{ij}))}$$

$$intercept = \sum_{i=1}^{m}\frac{\min(x_{ij})}{\mathrm{m}(\max(x_{ij}) - \min(x_{ij}))}$$

In the study, we analyze the values of individual indicators but also use a synthetic measure of financial condition assessment developed using the gradient method, which is one of the taxonomic methods measuring the distance of a given object from the pattern. Measure values range from 0 to 1, where one

is the reference object (Bem et al., 2015c; Siedlecki et al., 2015; Bem et al., 2017, 2019). The indicators used in the construction of the synthetic measure of financial condition (M1) are summarized in Table 1.

Table 1. Financial indicators employed to create the synthetic measure (M1)

Formula	Abbreviation	Character	Group
EBIT/ Operating Revenue	OPM	Stimulant	Profitability
Current Assets/Current liabilities	CR	Nominant	Liquidity
Total Debt/Total Assets	DEBT	Destimulant	Debt
(Net Profit)/Long-term Debt	EAT/DEBT	Stimulant	Debt
Operating Revenue /Total Assets	TAT	Stimulant	Efficiency
Receivables/ Operating Revenue *365	DSO	Destimulant	Efficiency
(Net Profit)/Total Assets	ROA	Stimulant	Profitability

Source: own study.

After the transformations, we get the following formula of the synthetic indicator of the assessment of financial condition M1:

$$M1 = 0{,}1080OPM - 0{,}0662(CR - 0{,}26) - 0{,}0436DEBT + 0{,}0126\left(\frac{EAT}{DEBT}\right) + 0{,}0199TAT - 0{,}0009DSO + 0{,}1084ROE + 0{,}5995$$

The interpretation of M1 measure is presented in Table 2. It should be taken into account that the measure M1 is relative – i.e. in its construction the maximum and minimum values in the research group are employed. The ranges are determined on the basis of quartile analysis (Q1;Q2;Q3).

Table 2. Interpretation of the synthetic measure values (M1)

Financial condition	Range
Difficult (less than Q1)	0 – 0,541961
Poor (Q1-Q2)	0 ,541961- 0 ,573414
Good (Q2-Q3)	0 ,573414 - 0 ,59669
Very good (higher than Q3)	higher than 0 ,59669

Source: own study.

In subsequent stages, the following were analyzed:

- location measures for variables (median, min, max, quartiles),
- the condition of hospitals was assessed on the basis of the M1 measure in subsequent years (with interpretation ranges built on the basis of data from 2019),
- the significance of differences between years was tested based on the Kruskal-Wallis test.

The Kruskal–Wallis test by ranks (or one-way ANOVA on ranks) is a non-parametric method for testing whether samples originate from the same distribution, allowing to tell that not all groups are equal, but it doesn't specify which pairs of groups are different. The Kruskal–Wallis test does not assume a normal distribution of the residuals. It evaluates the following hypotheses:

- H0: the average ranks are all the same,
- H1: at least one average rank is different.

2.2. Research Sample

Data comes from Orbis Database and covers the years 2019–2021. Initially, data covered 612 entities identified by NACE code 8610 (Hospital activities). We introduced the initial condition that the income from sales must be higher than PLN 5 million. Next, we excluded entities other than hospitals (like sanatoriums or renal dialysis facilities). After removing observations lacking data, we finally obtained the sample of 86 hospitals.

The dataset has been tested to detect outliers using Grubbs' test. In this test the hypotheses are defined as follow:

- H0: There are no outliers in the data set,
- H1: There is exactly one outlier in the data set.

Table 3. Grubbs' test for analyzed variables

Variable	Mean	Grubbs' statistics	p-value
OPM2019	-0,02863	4,184947	0,000877
CR2019	0,43966	4,522447	0,000127
DEBT2019	1,01848	4,480145	0,000160
EAT/Debt2019	-0,22109	7,066059	0,000000
TAT2019	1,53529	5,876484	0,000000
DSO2019	36,81931	6,462924	0,000000
ROA2019	-0,04877	4,493807	0,000147
M1 2019	0,56826	3,192678	0,088614

OPM2020	-0,02243	3,921897	0,003488
CR2020	0,45660	4,409087	0,000252
DEBT2020	1,04767	5,117736	0,000002
EAT/Debt2020	-0,15533	5,573227	0,000000
TAT2020	1,50040	5,986708	0,000000
DSO2020	41,23874	7,514710	0,000000
ROA2020	-0,03463	4,295262	0,000473
M1 2020	0,56670	2,970660	0,203559
OPM2021	0,00556	3,955724	0,002941
CR2021	0,46009	4,863873	0,000014
DEBT2021	1,04132	3,511366	0,023816
EAT/Debt2021	0,19829	5,660053	0,000000
TAT2021	1,68904	3,761476	0,007632
DSO2021	35,48312	3,112309	0,120663
ROA2021	-0,00934	3,321542	0,053016
M1 2021	0,59014	4,250236	0,000610

Source: own study.

The results show that almost every variable is biased (Table 3). However, removing all outliers would reduce the sample size to 44 units, reducing the analysis possibilities. Therefore, the study used non-parametric methods and positional measures that are not sensitive to outlier observations.

3. RESULTS

First of all, what should be noted are the generally poor condition of hospitals in the analyzed period, which can be seen in the very low level (or even negative) of operating margin and ROA and high total debt ratio. However, the values of almost all financial indicators are improving in the analyzed period, especially in 2021 (Table 4).

Table 4. Measures of location for analyzed variables (2019–2021)

Variable	Median	Min	Max	Lower quartile	Higher quartile
OPM2019	-0,02673	-0,32518	0,2253	-0,06843	0,01098
CR2019	0,26229	0,06004	2,4214	0,19451	0,52473
DEBT2019	0,92458	0,21881	3,4838	0,68105	1,17180
EAT/Debt2019	-0,18374	-3,97275	7,3321	-0,44945	0,05382

TAT2019	1,35231	0,25382	7,4333	0,97793	1,82159
DSO2019	34,47556	2,75027	157,2237	27,99922	39,49940
ROA2019	-0,03184	-0,72432	0,5930	-0,09797	0,01026
M1 2019	0,57341	0,41423	0,7299	0,54188	0,59691
OPM2020	-0,00790	-0,35417	0,1713	-0,04441	0,01326
CR2020	0,30931	0,07754	2,2297	0,21993	0,53659
DEBT2020	0,97738	0,24463	3,8425	0,72457	1,18746
EAT/Debt2020	-0,09700	-6,68685	5,1876	-0,35952	0,06096
TAT2020	1,30741	0,30139	7,4500	0,89071	1,73647
DSO2020	38,49436	2,31497	200,5787	32,85872	44,94376
ROA2020	-0,01689	-0,55811	0,3620	-0,06157	0,00936
M1 2020	0,57783	0,41305	0,7285	0,54566	0,59612
OPM2021	0,00356	-0,27785	0,2188	-0,02715	0,03352
CR2021	0,32703	0,08532	2,3247	0,21839	0,58325
DEBT2021	0,94336	0,23300	2,9109	0,73457	1,20423
EAT/Debt2021	0,00870	-8,44872	15,0200	-0,28106	0,18346
TAT2021	1,50521	0,31959	5,1627	1,09909	1,99092
DSO2021	35,26776	4,22633	72,7115	28,73080	40,37499
ROA2021	0,00122	-0,41095	0,3776	-0,05141	0,03025
M1 2021	0,59112	0,44359	0,8436	0,56250	0,61187

Source: own study.

An increase in the median operating margin can be observed – the median value of OPM in 2021 reaches a positive value (0,00356 compared to -0,02673 in 2019). A similar improvement can be observed in the case of ROA, where median values improve (change from -0,03184 to 0,00122). At the same time, we observe an increase in liquidity (CR) and total debt ratio (DEBT). When it comes to the values of the M1 measure, we observe a slight increase in the median value of the indicator.

In 2019, the financial condition of 22 units was assessed as difficult and 22 hospitals' condition as very good. However, in 2021, only 14 hospitals were assigned to the group with financial problems, while 26 hospitals had a good and 35 - very good financial situation (Table 5).

Table 5. Hospitals' financial condition (2019–2021) interpretation based on the values from 2019

2019			
Financial condition	**Range**	**Number of hospitals**	**Median**
Difficult	0 - 0,541961	22	0,515281
Poor	0,541961- 0,573414	21	0,561105
Good	0,573414 - 0,59669	21	0,58242
Very good	higher than 0,59669	22	0,613052
2020			
Financial condition	**Range**	**Number of hospitals**	**Median**
Difficult	0 - 0,541961	20	0,492868
Poor	0,541961- 0,573414	20	0,557999
Good	0,573414 - 0,59669	26	0,586737
Very good	higher than 0,59669	20	0,610375
2021			
Financial condition	**Range**	**Number of hospitals**	**Median**
Difficult	0 - 0,541961	14	0,522511
Poor	0,541961- 0,573414	11	0,559037
Good	0,573414 - 0,59669	26	0,58632
Very good	higher than 0,59669	35	0,616549

Source: own study.

The results of the Kruskal-Wallis test confirm the statistical significance of the difference between the financial situation of hospitals in 2021 and their condition in 2020 and 2019 (Table 6). The overall financial condition of hospitals in 2021 was better than in 2019 and 2020.

Table 6. Kruskal-Wallis test for M1

	Mean	**Standard deviation**	**Min**	**Max**	**Range**	**Standard Error**	**Inter-quartile range**
YEAR2019	0,52	0,04	0,39	0,65	0,25	0	0,04
YEAR2020	0,52	0,05	0,36	0,67	0,3	0	0,04
YEAR2021	0,54	0,05	0,39	0,77	0,38	0,01	0,04
Pairwise comparisons using the Wilcoxon rank sum test with continuity correction							
Kruskal-Wallis chi-squared = 9.1864, df = 2, p-value = 0.01012							

p-value	YEAR2019	YEAR2020	
YEAR2020	0,841	-	
YEAR2021	0,017	0,017	

Source: own study.

Similarly, we can confirm the improvement in the value of the operating margin, EAT to debt ratio and ROA – the differences between 2021 and 2020 and 2019 are statistically significant – in the case of ROA, only the difference between 2021 and 2019 is statistically significant (Tables 7–9).

Table 7. Kruskal-Wallis test for OPM

	Mean	**Standard deviation**	**Min**	**Max**	**Range**	**Standard Error**	**Inter-quartile range**
YEAR2019	-0,03	0,07	-0,33	0,23	0,55	0,01	0,08
YEAR2020	-0,02	0,08	-0,35	0,17	0,53	0,01	0,05
YEAR2021	0	0,07	-0,28	0,22	0,5	0,01	0,06
Pairwise comparisons using the Wilcoxon rank sum test with continuity correction							
Kruskal-Wallis chi-squared = 12.245. df = 2. p-value = 0.002193							
p-value	YEAR2019	YEAR2020					
YEAR2020	0,1603	-					
YEAR2021	0,0014***	0,0628*					

Source: own study.

Table 8. Kruskal-Wallis test for EAT/Debt

	Mean	**Standard deviation**	**Min**	**Max**	**Range**	**Standard Error**	**Inter-quartile range**
YEAR2019	-0,22	1,07	-3,97	7,33	11,3	0,12	0,5
YEAR2020	-0,16	1,18	-6,69	5,19	11,87	0,13	0,41
YEAR2021	0,2	2,63	-8,45	15,02	23,47	0,28	0,45
Pairwise comparisons using the Wilcoxon rank sum test with continuity correction							
Kruskal-Wallis chi-squared = 9.5051, df = 2, p-value = 0.00863							
p-value	YEAR2019	YEAR2020					
YEAR2020	0,2032	-					
YEAR2021	0,0073***	0,0982*					

Source: own study.

Table 9. Kruskal-Wallis test for ROA

	Mean	Standard deviation	Min	Max	Range	Standard Error	Inter-quartile range
YEAR2019	-0,05	0,15	-0,72	0,59	1,32	0,02	0,11
YEAR2020	-0,04	0,12	-0,56	0,36	0,92	0,01	0,07
YEAR2021	-0,01	0,12	-0,41	0,38	0,79	0,01	0,08
Pairwise comparisons using the Wilcoxon rank sum test with continuity correction							
Kruskal-Wallis chi-squared = 7.9769, df = 2, p-value = 0.01853							
p-value	YEAR2019	YEAR2020					
YEAR2020	0,270	-					
YEAR2021	0,015**	0,136					

Source: own study.

We also observe a shortening of the cash conversion cycle (DSO) in the hospitals studied. The difference is statistically significant between 2021 and 2020 (Table 10).

Table 10. Kruskal-Wallis test for DSO

	Mean	Standard deviation	Min	Max	Range	Standard Error	Inter-quartile range
YEAR2019	37,17	18,45	2,75	157,22	154,47	1,99	11,36
YEAR2020	41,58	21,09	2,31	200,58	198,26	2,27	11,81
YEAR2021	35,82	11,6	4,23	72,71	68,49	1,25	11,12
Pairwise comparisons using the Wilcoxon rank sum test with continuity correction							
Kruskal-Wallis chi-squared = 11.014, df = 2, p-value = 0.004059							
p-value	YEAR2019	YEAR2020					
YEAR2020	0,0071	-					
YEAR2021	0,7144	0,0071***					

Source: own study.

At the same time, the statistical significance of the differences in liquidity (CR), debt (DEBT) and operating revenue to total assets (TAT) ratios was not confirmed (Tables 11–13).

Table 11. Kruskal-Wallis test for CR

	Mean	Standard deviation	Min	Max	Range	Standard Error	Inter-quartile range
YEAR2019	0,44	0,44	0,06	2,42	2,36	0,05	0,34
YEAR2020	0,46	0,41	0,08	2,23	2,15	0,04	0,32
YEAR2021	0,47	0,39	0,09	2,32	2,24	0,04	0,37
Pairwise comparisons using the Wilcoxon rank sum test with continuity correction							
Kruskal-Wallis chi-squared = 2.0936, df = 2, p-value = 0.3511							

Source: own study.

Table 12. Kruskal-Wallis test for DEBT

	Mean	Standard deviation	Min	Max	Range	Standard Error	Inter-quartile range
YEAR2019	1,02	0,55	0,22	3,48	3,26	0,06	0,48
YEAR2020	1,05	0,55	0,24	3,84	3,6	0,06	0,45
YEAR2021	1,05	0,53	0,23	2,91	2,68	0,06	0,44
Pairwise comparisons using the Wilcoxon rank sum test with continuity correction							
Kruskal-Wallis chi-squared = 2.0936, df = 2, p-value = 0.3511							

Source: own study.

Table 13. Kruskal-Wallis test for TAT

	Mean	Standard deviation	Min	Max	Range	Standard Error	Inter-quartile range
YEAR2019	1,55	1	0,25	7,43	7,18	0,11	0,79
YEAR2020	1,51	0,99	0,3	7,45	7,15	0,11	0,83
YEAR2021	1,7	0,92	0,32	5,16	4,84	0,1	0,88
Pairwise comparisons using the Wilcoxon rank sum test with continuity correction							
Kruskal-Wallis chi-squared = 4.3195, df = 2, p-value = 0.1154							

Source: own study.

CONCLUSIONS

Based on the results, we can confirm that, although the condition of hospitals is still not satisfactory, it improved in 2021 (the last year of the pandemic) compared

to the period before the pandemic (2019) and in its first year (2020). The values of many key indicators – including the operating margin and return on assets – have improved, and the differences between the average values in subsequent years are statistically significant for the examined group of hospitals. It is also confirmed by relocating hospitals to groups with better financial conditions using the synthetic M1 measure.

The results support the conclusions of Li et al. (2023), who found that California hospitals experienced a significant increase in total margin (TM) and operating margin. However, we cannot confirm the impact of the hospital's size on improving the financial situation presented in this study. Conversely, we can confirm Naruć (2022) findings, which observe the EBIT improvement, although it analyses a narrow group of infectious hospitals. The results are also in line with Wiśniewski (2023), who reports a slight improvement in financial condition, mainly profitability, during the pandemic, generally due to additional funding.

As the literature review shows, the research results are very inconsistent, although the findings that present the deterioration of the financial situation during the pandemic are dominant. The change in the condition of hospitals during the pandemic largely depended on the reaction of public authorities – in Poland, as in many European countries – hospitals received additional funding with a lower volume of services provided. It can, therefore, be considered that this is a crucial factor influencing the observed improvement.

DISCLOSURE STATEMENT

The authors report no conflicts of interest.

BIBLIOGRAPHY

Bai G., Jiménez D., Phan P., Quintero LE, Rebucci A., Sunal X., (no date), *The Financial Fragility of For-profit Hospitals: Evidence from the COVID-19 Pandemic*, National Bureau of Economic Research.

Behzadifar M., Aalipour A., Kehsvari M., Darvishi Teli B., Ghanbari M. K., Gorji H. A., Bragazzi N. L. (2022), *The effect of COVID-19 on public hospital revenues in Iran: An interrupted time-series analysis*, PLoS ONE, https://doi.org/10.1371/journal.pone.0266343.

Bem A., Prędkiewicz K., Prędkiewicz P., Ucieklak-Jeż P.(2014a), *Hospital's Size as the Determinant of Financial Liquidity*, in: European Financial Systems 2014. Proceedings of the 11th International Scientific Conference, pp. 41–48.

Bem A., Predkiewicz K., Predkiewicz P., Ucieklak-Jez, P. (2014b), *Determinants of Hospital's Financial Liquidity*, 17th International Conference Enterprise and Competitive Environment 2014 (preprint), https://doi.org/10.1016/S2212-5671(14)00317-7.

Bem A., Predkiewicz K., Predkiewicz P., Ucieklak-Jez P. (2014c), *Hospital's Size as the Determinant of Financial Liquidity*, In Proceedings of the 11th international scientific conference European financial systems, pp. 41-48

Bem A., Prędkiewicz P., Ucieklak-Jeż P., Siedlecki R.(2015a), *Impact of Hospital's Profitability on Structure of its Liabilities*, Strategica 2015 proceedings, pp. 657-665

Bem A., Predkiewicz P., Ucieklak-Jez P., Siedlecki R. (2015b), *Profitability versus Debt in Hospital Industry, European Financial Systems 2015: Proceedings of the 12th international scientific conference, pp. 20-27.*

Bem A., Siedlecki R., Prędkiewicz P., Ucieklak-Jeż P., Hajdikova T. (2015c), *Hospital's financial health assessment. Gradient method's application*. *In Enterprise and competitive environment. Conference proceedings, pp. 76-85*

Bem A., Siedlecki R., Ucieklak-Jeż P., Hajdikova T. (2017), *Model of Hospitals' Financial Distress Forecasting: Comparative Study*, in: New Trends in Finance and Accounting, pp. 709–721, https://doi.org/10.1007/978-3-319-49559-0.

Bem A., Siedlecki R., Prędkiewicz P., Gazzola P., Ryszawska B., Ucieklak-Jeż P. (2019). *Hospitals' financial health in rural and urban areas in Poland: Does it ensure sustainability?* Sustainability, 11(7), https://doi.org/10.3390/su11071932

Cantor J., Sood N., Bravata D. M., Pera M., Whaley C. (2022), *The impact of the COVID-19 pandemic and policy response on health care utilization: Evidence from county-level medical claims and cellphone data*, Journal of Health Economics, 82, 102581 https://doi.org/10.1016/j.jhealeco.2022.102581.

Carroll N.W., Smith D.G. (2020), *Financial Implications of the COVID-19 Epidemic for Hospitals: A Case Study*, Journal of Health Care Finance, 46(4), pp. 11-22

Chmielowiec B., Raczek M., Chmielewski J., Puścion M., Florek-Łuszczki, M. (2022), *Accessibility to healthcare services in Poland at the initial stage of SARS-CoV-2 pandemic – patient perspective*, Medycyna Ogólna i Nauki o Zdrowiu, 28(3), pp. 208–216, https://doi.org/10.26444/monz/154663.

Coughlin T.A., Ramos C., Samuel-Jakubos H. (2020), *Safety Net Hospitals in the Covid-19 Crisis: How Five Hospitals Have Fared Financially Data and Methods*, Washington, DC: Urban Institute, 13

Dopfer C., Wetzke M., Zychlinsky Scharff A., Mueller F., Dressler F., Baumann U., Happle C.(2020), *COVID-19 related reduction in pediatric emergency healthcare utilization - A concerning trend*, BMC Pediatrics, 20(1), https://doi.org/10.1186/s12887-020-02303-6.

Fried J.E., Liebers D.T., Roberts, E.T. (2020), *Sustaining Rural Hospitals after COVID-19: The Case for Global Budgets*, JAMA - Journal of the American Medical Association, pp. 137–138, https://doi.org/10.1001/jama.2020.9744.

Grudziaż-Sękowska J., Sękowski K., Kobuszewski B. (2022), *Healthcare Utilization and Adherence to Treatment Recommendations among Children with Type 1 Diabetes in Poland during the COVID-19 Pandemic*, International Journal of Environmental Research and Public Health, 19(8), https://doi.org/10.3390/ijerph19084798.

GUS (2022), *Wydatki na ochronę zdrowia w latach 2019-2021*.

György A., Simionescu I. (2021), *The Impact of COVID-19 on the Romanian Hospitals' Expenses. A Case study Toward the Financial Resilience After the Pandemic*, Transylvanian Review of Administrative Sciences, pp. 22–36, https://doi.org/10.24193/tras.SI2021.2.

He M., Jessri M., Zhang H. (2022), *The impact of COVID-19 on hospitals' financial performance: Evidence from California hospitals*, International Journal of Healthcare Management (Preprint), https://doi.org/10.1080/20479700.2022.2118168.

Hu X., Jin W., Yang A., Hu Z. (2022), *Management of capital liquidity in public hospitals under the epidemic situation of COVID-19*, Frontiers of Public Health, 10(977221), pp. 1–5.

Khullar D., Bond A.M., Schpero W.L. (2020), *COVID-19 and the Financial Health of US Hospitals*, JAMA - Journal of the American Medical Association, 323(21), pp. 2127–2128, https://doi.org/10.1001/jama.2020.6269.

Kim Y., Gordon A., Rowerdink K., Scott L. H., Chi,W. (2022), *The Impact of the COVID-19 Pandemic on Health Care Utilization Among Insured Individuals With Common Chronic Conditions BRIEF REPORT*, Medical Care, 60(9).

Küçük A. (2022), *Financial Impacts of Covid-19 Pandemic for Turkish Public Hospitals*, Süleyman Demirel Üniversitesi Vizyoner Dergisi, 13(34), pp. 354–363, https://doi.org/10.21076/vizyoner.993956.

Lalani K., Helton J., Vega F. R., Cardenas-Turanzas M., Champagne-Langabeer T., Langabeer J. R. (2023). The Impact of COVID-19 on the Financial Performan-ce of Largest Teaching Hospitals. Healthcare (Switzerland), 11(14). https://doi.org/10.3390/healthcare11141996

Lee M., You M. (2021), *Avoidance of healthcare utilization in south korea during the coronavirus disease 2019 (Covid-19) pandemic*, International Journal of Environmental Research and Public Health, 18(8), https://doi.org/10.3390/ijerph18084363.

Li K., Al-Amin M., Rosko M.D. (2023), *Early Financial Impact of the COVID-19 Pandemic on U.S. Hospitals*, Journal of Healthcare Management/American College of Healthcare Executives, NLM (Medline), pp. 268–283, https://doi.org/10.1097/JHM-D-22-00175.

Melnick G., Maerki S. (2021), *The Financial Impact of COVID-19 on California Hospitals*, California Health Care Foundation, Retrieved January, 12, 2021

Mikos M., Urbaniak M. (2017), *Dostępność świadczeń zdrowotnych finansowanych ze środków publicznych w Polsce a funkcjonowanie sieci szpitali*, Zdrowie Publiczne i Zarządzanie, pp. 197–206.

Miszczyńska K., Miszczyński P. (2021), *Debt, ownership, and size: The case of hospitals in Poland*, International Journal of Environmental Research and Public Health, 18(9). https://doi.org/10.3390/ijerph18094596.

Mularczyk-Tomczewska P., Zarnowski A., Gujski M., Jankowski M., Bojar I., Wdowiak A., Krakowiak J.(2022), *Barriers to accessing health services during the COVID-19 pandemic in Poland: A nationwide cross-sectional survey among 109,928 adults in Poland*, Frontiers in Public Health, pp. 1–11.

Narodowy Fundusz Zdrowia (2021) *sprawozdanie z działalności Narodowego Funduszu Zdrowia za 2020 rok*.

Narodowy Fundusz Zdrowia (2022), *Sprawozdanie z działalności Narodowego Funduszu Zdrowia za 2021 rok*.

Narućˊ, W. (2022). *The impact of the COVID-19 pandemic on the financial and asset situation of Polish infectious diseases hospitals*. WSEAS Transactions on Business and Economics, 19, pp. 542-554.

Niżnik, J. (2021), Wpływ Covid-19 na systemy ochrony zdrowia w Czechach i Polsce, *Horyzonty Polityki*, 12(40), pp. 133–155, https://doi.org/10.35765/HP.2132.

Pietryka E. (2018), *Finansowanie systemu opieki zdrowotnej w Polsce w kontekście wprowadzenia systemu sieci szpitali*, Zarządzanie i Finanse Journal of Management and Finance, 16(3), pp. 229-244

Prędkiewicz K., Prędkiewicz P. (2013), *Zarządzanie kapitałem obrotowym szpitali samorządowych w Polsce*, Zarządzanie i Finanse, 2(2), pp. 311–323

Prędkiewicz K., Prędkiewicz P., Węgrzyn M. (2014), *Rentowność szpitali samorządowych w Polsce*, Nauki o Finansach, (20), pp. 28–43

Quentin W., Albreht T., Bezzina A., Bryndova L., Dimova A., Gerkens S., Kowal-ska-Bobko I., Mantwill S., Or Z., Rajan S., Theodorou M., Tynkkynen L.-K., Waitzberg, R., & Winkelmann, J. (2020), *Adjusting Hospital Inpatient Payment Systems for COVID-19*, Eurohealth, 26(2), pp. 88–92.

Roy C. M., Brennan Bollman E., Carson L. M., Northrop A. J., Jackson E. F., Moresky R. T. (2021), *Assessing the indirect effects of COVID-19 on healthcare delivery, utilization and health outcomes: A scoping review*, European Journal of Public Health, Oxford University Press, pp. 634–640, https://doi.org/10.1093/eurpub/ckab047.

Siedlecki R., Bem A., Predkiewicz P., Ucieklak-Jez P. (2015), MEASURES OF HOSPITAL'S FINANCIAL Condition - empirical Study, In Strategica. Local versus global. International academic conference, pp. 666-675

Synhorst D. C., Bettenhausen J. L., Hall M., Thurm C., Shah S. S., Auger K. A., Williams D. J., Morse R., Berry J. G. (2021), *Healthcare Encounter and Financial Impact of COVID-19 on Children's Hospitals*, Journal of Hospital Medicine, 16(4), pp. 223–226, https://doi.org/10.12788/jhm.3572.

Trentini F., Marziano V., Guzzetta G., Tirani M., Cereda D., Poletti P., Piccarreta R., Barone A., Preziosi G., Arduini F., Della Valle P. G., Zanella A., Grosso F., Del Castillo G., Castrofino A., Grasselli G., Melegaro A., Piatti A., Andreassi A., … Merler S. (2022), *Pressure on the Health-Care System and Intensive Care Utilization During the COVID-19 Outbreak in the Lombardy Region of Italy: A Retrospective Observational Study in 43,538 Hospitalized Patients*, American Journal of Epidemiology, 191(1), pp. 137–146, https://doi.org/10.1093/aje/kwab252.

Waitzberg R., Gerkens S., Dimova A., Bryndová L., Vrangbæk K., Jervelund S. S., Birk H. O., Rajan S., Habicht T., Tynkkynen L. K., Keskimäki I., Or Z., Gandré C., Winkelmann J., Ricciardi W., de Belvis A. G., Poscia A., Morsella A., Slapšinskaitė A., … Quentin W. (2021), *The Structure and Financing of Health Care Systems Affected How Providers Coped With COVID-19*, Milbank Quarterly, 99(2), pp. 542–564, https://doi.org/10.1111/1468-0009.12530.

Waitzberg R., Quentin W., Webb E., Glied S. (2022), *Balancing financial incentives during COVID-19: A comparison of provider payment adjustments across 20 countries*, *Health Policy*, 126(5), pp. 398–407, https://doi.org/10.1016/j.healthpol.2021.09.015.

Wang Y., Bai G., Anderson G. (2022), *COVID-19 and Hospital Financial Viability in the US*, JAMA Health Forum, 3(5), https://doi.org/10.1001/jamahealthforum.2022.1018.

Wiśniewski T. (2023), *Efficiency of Polish Hospitals in Years 2012–2021*, Scientific Papers of Silesian University of Technology. Organization and Management Series, pp. 653–684, https://doi.org/10.29119/1641-3466.2023.187.35.

Xiao H., Dai X., Wagenaar B. H., Liu F., Augusto O., Guo Y., Unger J. M. (2021), *The impact of the COVID-19 pandemic on health services utilization in China: Time-series analyses for 2016–2020*, The Lancet Regional Health - Western Pacific, https://doi.org/10.1016/j.lanwpc.2021.100122.

Xu S., Glenn S., Sy L., Qian L., Hong V., Ryan D. S., Jacobsen S. (2021), *Impact of the COVID-19 pandemic on health care utilization in a large integrated health care system: Retrospective cohort study*, Journal of Medical Internet Research, 23(4), https://doi.org/10.2196/26558.