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Accounting Reforms and Economic Performance Evaluation: An Effectiveness and Efficiency Comparative Analysis of the Greek Health System

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Abstract: *In this study, an economic assessment of pediatric hospitals in Attica, Greece, is conducted focusing on their financial challenges during the Greek economic crisis and the COVID-19 pandemic. The selection of the hospitals is based on the age group of their patients and the unique financial difficulties they encountered. Additionally, a comparative analysis is undertaken, comparing the performance of these Greek pediatric hospitals with a counterpart in the UK. The objectives of the present study are to discern similarities and differences between the Greek and British health systems and determine the strategic steps for the effective and optimum treatment of the pediatric patients with a simultaneous financial control. The research findings (based on the calculation of financial indicators) underscore the necessity for pediatric hospitals to align their financial accounting practices with a focus on expediting the collection of claims within a shorter time frame. A notable observation is that the UK pediatric hospital is more efficient to promptly collect claims from patients, social security, and private insurance funds. As a conclusion, it is depicted and proven that significant accounting reforms are imperative to curb the costs of hospitalization and expenditures related to pharmaceuticals and other medical materials.*

Keywords: accounting, economic performance, accounting reforms, evaluation, health system, pediatric hospital, efficiency, effectiveness

JEL classification: D61, H51, I11, I18, M49

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INTRODUCTION

The economic crisis experienced by the E.U. in recent years has led to extensive budgetary constraints with a direct impact on health care, financing and the health sustainability of each member state that was led to take measures. In May 2010, the "Economic Adjustment Program for Greece" was voted. The Memorandum between Greece, International Monetary Fund and European Central Bank focused on implementing structural reforms and spending cuts to restore the competitiveness of the Greek economy and limit the existing budget deficit. The health sector has been one of the main sectors from which the public expenditure reduction started due to the extraordinary increase in pharmaceutical expenditure in the last years before the outbreak of the financial crisis in Greece. Based on the limited available resources, the health system had to work within this framework by implementing policies aimed at rationalizing the available reduced public expenditure resources and the given economic hardship of the citizens. The respective public health system, particularly public hospitals that are non-profit entities, has as its main objective the provision of quality services to all citizens without discrimination (equality of access). Nevertheless, public hospitals must also be sustainable in terms of revenue and expenses.

In this study, three pediatric hospitals of Attica ("Agia Sofia", "Aglaia Kyriakou" and "Pentelis") are in the main research interest of this study due to the wide range of services they offer to a great number of pediatric patients per year. A financial analysis is carried out based on the available balance sheets of the hospitals for the year 2016-2021 to evaluate their efficiency and adequate functionality.

As per the literature review performed prior to the study, no current economic performance evaluation on the pediatric hospitals of Athens/ Attica region in Greece has been recently carried out. The assessment shall provide useful information on the effectiveness and efficiency of the pediatric hospitals.

Initially, reference is made to the characteristics and importance of national health systems as they have an important role in improving the health of individuals and, by extension, in increasing life expectancy. The evaluation criteria of health systems are based on three fundamental principles: 1) the principle of effectiveness, 2) the principle of efficiency and 3) the principle of equality and social justice. In Greece, despite ever-increasing health expenditures, the national system appeared a low performance which was worsened during the period of economic crisis and increased fiscal austerity measures. Then the pathogens of Greek National Health System (E.S.Y.) are presented, in combination with the legislative reforms of recent years.

The research methodology of the study performed is analyzed by carrying out a financial analysis based on available data of the balance sheets of the three hospitals in order to compare their financial situation during the period 2017-2021. An assessment

of the operation of the pediatric hospitals is also carried out, taking into account the operational indicators. At the same time, this study assesses the management of each hospital in terms of the distribution of inputs and their impact on output: patient services. A comparative analysis is also carried out between the three pediatric hospitals of Attica and a central pediatric hospital in London (UK) in an attempt to identify substantial differences in their management and efficiency. These differences are also evaluated based on comparing the two health systems (E.S.Y. and NHS). As mentioned before, this is also the first effort to compare the economic performance of Greek pediatric hospitals with pediatric hospital that belongs to the UK-NHS. Having completed the above analysis, an attempt is made to evaluate the efficiency of the three pediatric hospitals, reaching conclusions regarding the improvement of the services provided.

LITERATURE REVIEW

The ultimate purpose of a health system is to ensure and improve the health level of the population and consequently the continuous improvement of the level of quality of life at the individual level (Whitehead, 1991). On the other hand, the objectives for approaching and achieving this primary goal concern the adequacy of the availability of services and goods, to meet the population's needs. The evaluation criteria of health systems are based on 3 fundamental principles:

a. The principle of equality and social justice. Although inequalities are observed in health systems which are not limited to differences in mortality rates between socio-economic classes, the original aim is equal access for equal need of citizens and the fact that no one should be deprived of health care (Whitehead, 1991; Olsen, 2013).
b. The principle of efficiency. It indicates the service's success through measured patient satisfaction/well-being.
c. The principle of efficiency refers to the rational distribution of resources (material and human). Efficiency is related to health expenditure, as it is expressed in monetary units, and it is estimated as the product of input price with quantity (Xenos et al., 2017). One of the most important pillars of the E.U. is the fair and efficient provision of health services (European Health Model). This is also the goal of E.S.Y. Indeed, in 2001 the Göthenburg European Council referred to the growth of Europe’s geriatric population and the impact it is expected to have on health care costs due to long-term health care and more expensive means of treatment as more up to date and innovative technologies and therapeutic methods are being introduced. The specific report aimed to adopt an open method of coordination in the health sector and a single health policy in Europe, through the application of the European Health Model (Universal access, quality of services provided, economic viability). In the case of Greece, the application of the European Health Model unfortunately remains under discussion since the establishment of the E.S.Y., without a particular result. Public hospitals, mainly in the Attica region, show symptoms of declining operating performance and seem to lack effective management. Consequently, it may be imperative the need for immediate, strong and effective hospital administration by people with a strong financial and medical

background on the same time to modernize the E.S.Y. (Tsiantou et al., 2014). In recent years, the Greek health system has been in a continuous reform process related to structural and organizational changes, but without having succeeded to be organized, efficient until today. Before the financial crisis, the health system in Greece was completely disorganized as there were overlapping services, driving up administrative costs and malfunctional issues of the patient management and therapy. There was an abundance of social insurance funds: resulting to strong inequalities regarding provision and financing of health services. In the 2010s, after adopting the economic adjustment program and an extensive legislative reform, a unified strategy of harmonizing the benefit packages and merging the insurance funds into the single entity of EOPYY was proposed and finally implemented. The National Organization for the Provision of Health Services (EOPYY) was established based on Greek legislative act 3918/2011 and is under the supervision of the Ministry of Health. It covers the entire population of Greece and in conjunction with the passing of Law 4052/2012, gave impetus to the re-organization and restructuring of the E.S.Y. The Ultimate goals of this reform were the reduction of inadequacies, the promotion of economies of scale and finally, the improvement of the quality of services provided in combination with ensuring greater access to health services (Yfantopoulos et al., 2016).

Efficiency estimation is based on the relationship between inputs and outputs in a health system. It is the first step of evaluating and controlling for a rational distribution of human and material resources. The available resources should be used in such a way as to ensure the productivity of the health entities and satisfy the existing demand for health services. Consequently, a proper allocation of resources to health entities is required after first identifying and understanding the factors contributing to improving their efficiency. Greek hospitals were asked to minimize their costs during the period of the financial crisis and they succeeded in part by changing the distribution of inputs (maximizing productivity and reducing the budget). Despite this fact, at the same time the hospitals were forced to accept a much larger number of patients, since many citizens due to financial hardship, change their preferences from private sources of health services to public hospitals. Consequently, the public expenditure restraining became impossible, leading to a vicious circle.

METHOD

Methodology and objectives of the study

The purpose of the study is to evaluate the effectiveness and efficiency of pediatric hospitals based on the available financial data. The Children's Hospitals, “Agia Sophia”, “Panagiotis and Aglaia Kyriakou and “Pentelis” in Attica were chosen based on the holistic treatment of cases (a large variety of clinical cases are hospitalized and treated and as clinics of all kinds are available) as well as on the specific characteristics of the patients. After all, the pediatric population is a key part of society and the services provided in case of possible illness are important to be of quality and exhibit the necessary specialization.

The balance sheets of the years 2016 to 2021 were retrieved by the Greek Ministry of Health useful to carry out the financial analysis and to assess the hospitals' performance to properly offer their services by optimizing their financial management.

In the context of a comparative analysis, a corresponding pediatric hospital of the British NHS (Great Ormond Street Hospital for Children) is included in the empirical part of this research study in an attempt to identify similarities and differences between Greek and British hospital, highlighting any potential operational problems, especially of Greek pediatric hospitals. It is noteworthy that the UK is also in a period of uncertainty due to BREXIT, therefore the impact or not on the provision of health services and indeed on the pediatric population is of interest.

As far as efficiency indicators are concerned, they will be used to identify possible financial mismanagement in hospitalization and staff costs. Financial statements data concern the years 2021 and 2022, including the COVID-19 pandemic, an operationally and financially difficult period for the Greek health system.

Financial Statements Indicators

In the past, Greek public hospitals recorded all financial data using a simple cash accounting method. Consequently, there was difficulty in capturing the true cost of hospitalization. At the same time, preparing financial statements for their annual financial activity was not mandatory, a fact that made management controlling difficult (Karampli et al., 2014)). Later on, a legislative reform was implemented by introducing the financial accounting (double-entry accounting method) in Greek public hospitals to more efficiently manage available resources attempting to fulfill either management or policy targets. In this way, financial transparency and reliability in the management of public money could be achieved. More specifically, the implementation of the legislative reform concerns the introduction of a double-entry system for registering accounting events, updating financial accounting, cost accounting and public accounting, and applying accounting information systems. This reform also focuses on collecting, grouping and analyzing financial data related to inventories, cash reserves, receivables, operational income/expenses by type as well as information related to the budget carrying out and results generally on the performance of public hospitals.

In the empirical part of this study various financial indicators are estimated and are taken into consideration in the financial statement analysts of hospital. The selection of the appropriate ratio can lead to a better control and parallel comparison of the financial position of an entity over time (improvement of management, etc.), as well as the comparison between entities of the same industry. The main objectives through the estimation and analysis of financial indicators by the respective hospital entities is the formation of the appropriate means of diagnosis and assessment of the conditions under which entities operate in the optimal way, the uniform method of preparation/presentation so as to ensure the possibility of comparing similar financial units and the better evaluation of the financial data of entities.

Liquidity ratios

Liquidity Ratios are distinguished into general and specific liquidity indicators and essentially determine the financial position of a unit and its available liquidity. They are calculated for short periods and demonstrate the financial unit's ability to meet its short-term obligations (Stockton, 2004). The general liquidity indicator (Current assets/Current liabilities) depicts the entity's liquidity measure and the safety margin maintained by its management in order to be able to deal with any undesirable developments in the flow of working capital, while it has no qualitative characteristics (it does not measure the quality of current assets). An increased value of the indicator (greater than unity) means that the amounts the company is expected to collect (its current assets) covers what it has to pay (short-term liabilities) as well as greater ease of repayment of short-term liabilities of each economic unit. The specific (acid) liquidity ratio [Liabilities+Receivables)/ (Current liabilities)] is an indication of how many times the immediately liquidable elements of the financial unit can cover its short-term obligations. If the value of indicator is close to unity, then it is considered satisfactory, and it appears that the entity can repay its obligations without the need to liquidate the inventories. The cash liquidity ratio (Cash available/ Overdue Liabilities) shows the ability of the entity to pay current and overdue obligations with its available assets.

Equity restructuring indicators

This category of financial indicators includes the equity structure and sustainability indicators, with the help of which the company's ability to meet its obligations and the degree of the entity's credibility can be assessed on a long-term scale. The estimation of these indicators examines the possibility of long-term sustainability of an entity, the degree of service of its long-term needs by foreign financing. More specifically, the equity-to-fixed assets ratio provides information about the ways in which each entity finances its fixed investments. This indicator's value change can occur due to various reasons, such as the sale or purchase of fixed assets, extraordinary losses, etc. In addition, the debt burden ratio (equity to foreign capital ratio) is often taken into account in order to show whether the entity operates under an over-leveraged regime.

Activity indicators

Activity indicators examine the efficiency of the use of the assets of the entity. These ratios are used to make comparisons between the level of sales and investments in various asset accounts. More specifically, the receivables collection speed indicator (collection effectiveness index, Net sales/Average amount of receivables) shows how many times on average the entity collects its receivables during. Another important indicator is that of the average receivables' collection period (365/collection effectiveness index/365), which basically means the time it takes the entity to collect the receivables from its customers/partners. The credit policy adopted by the entity is also evaluated based on this indicator. The lower its value, the faster the collection of claims from customers/partners. In addition, the financial analysis also includes the short-term obligations repayment speed indicator (Cost of sales/Average amount of short-term liabilities), which essentially shows the ability and speed of repayment of

the short-term obligations of an entity. The short-term obligations repayment speed indicator is directly related with the average period of repayment of obligations indicator, which shows the time (number of days) that the obligations of the entity remain unpaid (365/short-term obligations repayment speed indicator).
All the above indicators are used for the financial analysis of the pediatric hospitals of Attica.

Efficiency indicators

Profitability ratios express an entity's ability to generate profits, as well as the efficient use of both foreign and equity capital. These ratios are necessary for all interest groups such as shareholders, managers, creditors, and employees of a business. In this case, as it is worth to mention that hospitals are not classified as profit-seeking businesses.
The operating profit ratio measures the ability of the management of an entity at a given time and expresses the percentage of operating profit to sales. This percentage expresses the efficiency of the operation of the entity. When the above indicator is increased, there is clear evidence that the entity is becoming more and more efficient and profitable. The operating expense margin ratio shows the percentage of the cost of sales and the operating expenses to sales. This specific indicator is presented as the inverse of profitability (i.e., if the value is high, low profits are expected and if its value is low the opposite result is expected). The return of equity ratio (Net profits/Equity) shows the extent to which the entity's funds were invested and used adequately. Consequently, it shows whether the funds of the entity are sufficient to result to profitability (efficient use of the capital of the entity). A low value of the indicator signals that either the entity is not properly managed, or shows low productivity, or that the economic conditions are not favorable for it. It may also mean a significant number of investments in capital which are not fully employed. Instead, a high return on equity ratio provides an indication that the management of the entity has achieved its objective or that it is managed effectively or that economic conditions favor it.

Effectiveness (performance) indicators

Regarding effective operation of the hospitals of the E.S.Y., the greatest interest is focused on the secondary and tertiary hospitals as they are characterized by exorbitant operating costs (Aletras, 1999). Effective operation refers to the utilization of limited resources to the maximum extent possible outcome, but without sacrificing the quality of the services provided. Hospitals choose in the best possible way its inputs (personnel, pharmaceutical and sanitary materials, beds) so as to minimize the costs of producing a specified output (Collins, 1994). It is worth noting that total costs is the sum of pharmaceutical expenses, expenditures for the purchase of sanitary material, expenditures on orthopedic material, expenses for reagents, expenditures for payroll of staff, expenditures for services and costs included in other categories. In all of the cases below, high values of the corresponding indexes are mainly attributed to counter-economies of scale created within the hospital, the improper management of available resources (financial and operational) and the low service of hospitalized patients. A summarized description of each indicator is provided hereunder. Average total expenditure per hospitalized patient/ inpatient indicator depicts the average cost of a

patient when hospitalized. This specific index is the ratio of total expenditure to total number of inpatients.

Average total expenditure per bed indicator shows which is the average cost to run a bed in a specific hospital/ clinic. If a low bed occupancy rate is observed, the average total expenditure per bed is at low levels and is mainly due to the underutilization of deployed beds. It is estimated as the ratio of total expenditure to number of deployed beds.

The average total cost per day of hospitalization indicator shows how much a day of hospitalization costs on an average basis. This indicator is estimated as the ratio of total cost to hospital days.

Average pharmaceutical expenditure per hospitalized patient/ inpatient indicator shows the average cost of the medicines a patient consumes when hospitalized. It is estimated as the ratio of total medicine expenditure to number of inpatients. Average cost of services per patient indicator shows how much a patient costs in services, on average. High values of the index highlight a waste of resources and an irrational allocation of budget and expenditure. Service Expenses means expenses for cleaning, security, feeding, electricity, telecommunications, etc. This indicator is estimated as the ratio of total cost of services to number of inpatients.
Finally, average cost of sanitary material per inpatient indicator shows the average amount of money spent for a patient when using specific medical equipment. This indicator is estimated as the ratio of total costs of sanitary material to number of hospitalized patients.

RESULTS

Calculation of financial indicators

Liquidity indicators

Table 1 presents liquidity indicators which were estimated based on the available balance sheets of pediatric hospitals for the years from 2016 to 2021.

Table 1. Liquidity indicators for the pediatric hospitals of Attica

Indicator/Year	2016	2017	2018	2019	2020	2021
Agia Sophia						
General liquidity	3.91	5.97	7.85	6.78	6.32	5.27
Acid liquidity	3.79	5.79	7.72	6.55	6.18	5.15
Cash liquidity	0.56	0.35	0.45	0.50	0.36	0.13
Panagioti & Aglaias Kyriakou						
General liquidity	5.84	7.85	9.44	5.71	5.85	4.25
Acid liquidity	5.73	7.77	9.33	5.60	5.74	4.18
Cash liquidity	1.27	1.85	1.95	1.14	0.78	0.34
Pentelis						
General liquidity	9.53	10.20	14.51	9.61	3.04	19.46
Acid liquidity	9.28	9.98	14.19	9.15	2.96	19.16
Cash liquidity	2.86	2.39	1.77	1.41	0.35	1.61

General liquidity indicator analysis

Starting with the general liquidity indicators, a comparative analysis per hospital and per year is carried out. More specifically, regarding the "Agia Sophia" hospital, the general liquidity ratio over time shows an increase up to 7.85 in the year 2018 (double value compared to 2016 when calculated at 3.91). This fact signifies the improvement of the hospital's performance as it appears to be able to cover its short-term liabilities approximately 8 times through current assets. Nevertheless, in the next 2 years, the calculated indicator reduces, but without reaching the levels of 2016. It is characteristic that during the financial crisis in 2016, the total current assets reached approximately €57 million, while in the following years with the improvement of the budget situation, the total current assets double or even triple (e.g., €101 million in 2017 and €156 million in 2018).

The "Panagiotis and Aglaias Kyriakou" hospital presents a general liquidity indicator equal to 5.84 in 2016 which increases significantly in the years 2017 and 2018 (7.85 and 9.44 respectively) but decreases again to the initial levels in the years 2019 and 2020 (5.71 and 5.85 respectively). The major decrease is observed in 2021, a year in which the general liquidity ratio is estimated at 4.25. Despite the fact that the total current assets increased from approximately €73 million in 2016 to €94.5 million in 2021, at the same time the short-term liabilities of the hospital increased to a great extent (approximately double) from €7.24 million in 2016 to €15.2 million in 2021. This increase in liabilities led to a decrease in the organization's general liquidity.

Regarding Pentelis hospital, the value of the general liquidity indicator is much higher in all years except for 2020 where a significant reduction to 3.04 was found.

Nevertheless, the hospital seems to be increasing its current assets significantly (from €15.3 million in 2016 to €25.5 million in 2021) and at the same time reducing its short-term liabilities (from €1.61 million in 2016 to 1.3 million € in 2021). The year 2020 seems to be a "bad" year for the hospital since current liabilities increase to €5.54 million despite high current assets at €16.8 million. However, the hospital seems to be dealing with this liquidity problem effectively resulting to general liquidity indicator equal to 19.46 in 2021.

Acid liquidity indicator analysis

The acid liquidity ratio usually shows the same trend as general liquidity over time. More specifically, regarding the "Agia Sophia" hospital, the acid liquidity ratio trend (excluding inventories) is the same as that of general liquidity, increasing from 3.79 in 2016 to 5.15 in 2021, reaching a top level of 7.72 in 2018. This fact indicates that the level of inventories does not affect health services. Furthermore, the fact that the indicator remains significantly higher than unity in all years prevents the hospital from liquidating the inventories to repay its short-term obligations.

Regarding "Panagioti and Aglaias Kyriakou" hospital, the acid liquidity ratio is calculated at 5.84 in 2016, it increases significantly to 7.85 and 9.44 in the years 2017 and 2018 respectively, showing that the hospital is able to deal with its obligations using only its available cash. However, the index appears a downward trend during the year 2019, ending at 4.25 in 2021 which is lower than that of 2016. Even though this value of the index does not imply difficulty for the hospital to meet its obligations to the creditors, hospital's management may adopt additional measures such as faster collection of its claims and reduced credit time to prevent any decrease further decrease of this indicator.

The "Pentelis" hospital appears much higher values of the acid liquidity indicator than the other two hospitals, with the exception of 2020 where, as with general liquidity, it significantly declines. While the values of the indicator are 9.53 in 2016, 10.20 in 2017, 14.51 in 2018 and 9.61 in 2019, suddenly it drops to 2.96 in 2020. This fact may be due to the prevailed uncertainty in 2020 as the closure of the hospital was discussed as well as its parallel operation as a great vaccination center and not as a pediatric clinic. However, it seems that the removal of the closure uncertainty in 2021 resulted to a significant recovery the acid liquidity ratio estimated at 19.16.

Cash liquidity indicator analysis

Regarding the "Agia Sophia" hospital, the cash liquidity ratio is steadily decreasing (starting from 0.56 in 2016 and ending at 0.13 in 2021). This fact may signal that at the end of the year 2021 the hospital's cash is quite limited compared to the hospital's overdue liabilities resulting to an immediate need to borrow. The "Panagiotis and Aglaia Kyriakou" hospital also indicates an upward trend of the cash liquidity ratio (from 1.27 in 2016 to 1.85 and 1.95 in 2017 and 2018 respectively) which finally ends at much lower levels in 2021 (estimated value at 0.34). Regarding the "Pentelis"

hospital, the estimated values are higher compared to the other two pediatric hospitals, even when the hospital showed a decline in 2020 (0.36 the value of the cash flow index due to the uncertainty of the hospital and the parallel operation as a major vaccination center against the disease COVID-19).

Equity restructuring indicators

Table 2 presents equity restructuring indicators which were estimated based on the available balance sheets of pediatric hospitals for the years from 2016 to 2021.

Table 2. Equity restructuring indicators for the pediatric hospitals of Attica.

Indicator/ Year	2016	2017	2018	2019	2020	2021
Agia Sophia Hospital						
Equity / debt	5.49	8.55	7.97	8.12	7.45	5.76
Equity / fixed assets	12.26	24.44	41.68	42.22	43.67	53.52
Panagioti & Aglaias Kyriakou Hospital						
Equity / debt	6.47	8.04	8.51	6.37	6.30	4.44
Equity / fixed assets	2.07	2.42	2.81	2.22	2.47	2.59
Pentelis Hospital						
Equity / debt	18.02	18.30	25.33	18.83	5.60	30.56
Equity / fixed assets	1.95	2.10	2.25	1.96	2.37	3.16

Equity to debt indicator analysis

Starting with the "Agia Sophia" hospital and evaluating its capital structure indicators, the equity/foreign capital (debt) indicator is calculated at 5.49 in 2016, increasing to 8.55 and 7.97, 8.12 and 7.45 in the years 2017, 2018, 2019 and 2020 respectively, while in 2021 it reduces to the levels of 2016 (5.76). Nevertheless, it appears that over the years the ratio of equity to foreign capital remains high demonstrating significant ability of the hospital to meet its obligations through equity financing. The "Panagioti & Aglaias Kyriakou" hospital appears similar values of the equity/debt indicator. This indicator starts at 6.47 in 2016, increases in the intervening years, and is finally estimated at 4.44 in 2021, significantly lower than the estimated value in 2016. Finally, regarding the "Pentelis" hospital, the indicator is much higher than the other two hospitals except for 2020, when it declined to 6.3. This year the hospital was mainly operated as a vaccination center against COVID-19 resulting to significant decrease in revenue and its equity.

Equity to fixed assets analysis

Regarding the "Agia Sophia" hospital, the ratio of equity to fixed capital is constantly increasing during the six-year period and it seems to quintuple in 2021 compared to 2016 (53.52 against 12.26). This fact shows that the greater share of capital is cash rather than fixed assets. Therefore, the hospital has the ability to repay its obligations without the need to liquidate its fixed assets. For the remaining two pediatric hospitals, the value of the indicator, even though it is clearly lower than that of "Agia Sophia"

hospital, is considerably above the unit indicating satisfactory liquidity for both hospitals.

Activity indicators

Table 3 presents activity indicators which were estimated based on the available balance sheets of pediatric hospitals for the years from 2016 to 2021.

Table 3. Activity indicators for the pediatric hospitals of Attica

Indicator/ Year	2016	2017	2018	2019	2020	2021
Agia Sophia Hospital						
Receivables' collection speed	0.43	0.68	0.36	0.47	0.48	0.49
Short-term debt repayment speed	2.73	4.03	3.47	3.80	4.53	3.44
Average receivables' remaining period	854.45	535.08	1022.99	774.19	761.29	752.45
Average period of repayment of liabilities	133.50	90.48	105.10	96.10	80.52	105.96
Panagioti & Aglaias Kyriakou Hospital						
Receivables' collection speed	0.34	0.45	0.38	0.37	0.35	0.28
Short-term debt repayment speed	4.56	5.56	5.44	5.33	4.49	3.40
Average receivables' remaining period	1069.88	817.04	960.26	974.02	1042.85	1281.67
Average period of repayment of liabilities	80.04	65.70	67.07	68.43	81.20	107.42
Pentelis Hospital						
Receivables' collection speed	0.31	0.41	0.38	0.39	0.83	0.42
Short-term debt repayment speed	5.37	7.71	9.38	10.61	5.36	4.74
Average receivables' remaining period	1164.39	880.85	950.69	935.12	441.03	866.34
Average period of repayment of liabilities	67.97	47.32	38.91	34.40	68.09	77.07

Starting with the "Agia Sophia" hospital, the speed of repaying the obligations is quite high and shows an increasing trend compared to the value of 2.73 it had in 2016. However, the receivables collection speed shows stability over time but remains at quite low levels (0.49 in 2021). Respectively, the average receivables' remaining period varies at best from 535 days in 2017 to approximately 1023 days in 2018, ending up at approximately 752.5 days in 2021. It is therefore perceived that the hospital does not have a fixed policy of collecting claims (which largely come from the social insurance funds –EOPYY). It is characteristic that the indicator of the values of average period of repayment of liabilities range from 133.5 days in 2016, 80.5 days in 2020 and end at about 106 days in 2021. This indicator is much lower than that of average receivables' remaining period. This fact combined with the exact opposite financial policy adopted by the hospital's management to repay its own obligations led to a significant decrease in the cash liquidity indicator and may also affect the ability to repay its suppliers in the future.

Similarly, the speed of repayment of obligations for the "Panagioti & Aglaias Kyriakou" hospital is quite high and shows an upward trend compared to the value of

2.73 calculated back in 2016. Instead, the receivable collection speed shows a stability over time but remains at quite low levels (0.28 in 2021). The average receivables' remaining period varies at best from 817 days in 2017 increasing to approximately 1280 days in 2021. The hospital seems to be steadily faced problems to collect its claims. On the contrary, the repayment of obligations shows a stable pattern, leading to approximately 100 days in 2021. And in this particular case, a reduction in the hospital's cash flow indicator is expected which may result to liquidation of fixed assets and/or borrowing if the receivables collection capacity of the hospital does not change.

Finally, regarding the "Pentelis" hospital, the speed of repayment of obligations is very high and significantly higher than that of the other 2 hospitals. In fact, it increases to 9.38 and 10.27 respectively in the years 2018 and 2019 to end up at 4.74 in 2021, a value that is still quite high. Instead, the receivables collection speed shows stability over time but remains at quite low levels (0.42 in 2021). Nevertheless, it is at a slightly better level than that of "Agia Sophia" hospital and the "Panagioti & Aglaias Kyriakou" hospital. the average receivables' remaining period varies from approximately 441 days in 2020 to approximately 1164 days in 2016 and ends at approximately 866 days in 2021. The hospital does not apply a specific policy for collecting claims from partners/providers. The average period of repayment of liabilities reaches about 77 days in 2021 which is lower than the average receivables' remaining period. This empirical evidence indicates the increased liquidity of the hospital as well as the financial policy adopted by the hospital management regarding its obligations towards suppliers.

Efficiency indicators

Table 4 presents efficiency indicators which were estimated based on the available balance sheets of pediatric hospitals for the years from 2016 to 2021.

Table 4. Efficiency indicators for the pediatric hospitals of Attica

Indicator/ Year	2016	2017	2018	2019	2020	2021
Agia Sophia Hospital						
Operating profits	0.02	0.26	0.15	0.23	0.18	0.33
Operating expense margin	1.91	1.48	1.67	1.33	1.74	1.45
Return on equity	0.01	0.10	0.04	0.11	0.06	0.12
Panagioti & Aglaias Kyriakou Hospital						
Operating profits indicator	0.02	0.05	0.15	0.07	0.003	-0.11
Operating expense margin	2.66	2.65	2.51	2.85	2.96	3.04
Return on equity	0.005	0.01	0.03	0.02	0.001	-0.02
Pentelis Hospital						
Operating profits indicator	-0.20	0.14	0.24	-0.26	0.14	0.10
Operating expense margin	2.95	3.16	2.99	3.07	2.43	2.75
Return on equity	-0.03	0.02	0.04	-0.05	0.04	0.02

Operating profits indicator analysis.

For all three hospitals, the operating profits indicator is low. In the case of the "Pentelis" hospital and the "Panagiotis and Aglaia Kyriakou" hospital, the indicator received negative values. In general, the efficiency of hospitals is quite low.

Operating expense margin indicator Analysis

The operating expenses margin indicator should not be taken into consideration in our analysis based on their actual theoretical meaning, since public hospitals are not considered profit-making entities. The operating expenses of all three hospitals are quite high and significantly exceed any revenues. For the "Agia Sophia" hospital and the "Panagioti & Aglaia Kyriakou" hospital, the expenses are three times the revenues indicating crucial issues in the management performance as they run the risk of supplier defaults, severe shortages of medical supplies, etc.

Return on equity indicator analysis

The return on equity indicator is pointed out to be at low levels for all three hospitals. This fact cannot be interpreted as low productivity, since these are not profit-making entities. But it can demonstrate the administrative weaknesses of the hospital as well as the possible underfunding and the limited collection of claims that significantly reduce revenues and lead to an increased equity financing of the hospital's expenditures.

Effectiveness indicators

Tables 5-8 present the effectiveness indicators for the pediatric hospitals of Attica during the years 2021 and 2022 providing information for the nursing movement, the purchases of raw and auxiliary materials, other expenditures (salary cost, social contributions, cleaning services, energy, gas, electricity food supplies etc.)

Table 5. Nursing movement of pediatric hospitals in Attica in the years 2021 and 2022

Nursing movement 2021			
Hospital	**Number of beds (December 2021)**	**Number of inpatients**	**Days of hospitalization**
AGIA SOPHIA	631	51325	119958
PANAGIOTI & AGLAIAS KYRIAKOU	474	18031	54080
PENTELIS	150	5954	13041
Nursing movement 2022			
HOSPITAL	**Number of beds (December 2021)**	**Number of inpatients**	**Days of hospitalization**
AGIA SOPHIA	632	52009	128685
PANAGIOTI & AGLAIAS KYRIAKOU	371	18651	62484
PENTELIS	158	8110	18958

Table 6. Purchases of raw and auxiliary materials of pediatric hospitals for the year 2021 and 2022

Purchases of raw and auxiliary materials (€), 2021

Hospital	Medicine cost	Sanitary material cost	Orthopedic material cost	Reagents cost	Other material cost	Total
AGIA SOPHIA	28,750,645.58	3,895,820.88	184,164.89	3,442,028.75	531,169.67	36,803,829.77
PANAGIOTI & AGLAIAS KYRIAKOU	5,134,197.66	1,232,902.41	335,256.89	1,166,679.22	158,037.78	8,027,073.96
PENTELIS	3,014,100.55	318,460.52	143,358.34	214,079.53	118,612.35	3,808,611.29

Purchases of raw and auxiliary materials (€), 2022

Hospital	Medicine cost	Sanitary material cost	Orthopedic material cost	Reagents cost	Other material cost	Total
AGIA SOPHIA	32,489,615.91	4,266,302.15	349,681.90	3,542,167.44	661,487.94	41,309,255.34
PANAGIOTI & AGLAIAS KYRIAKOU	7,421,636.22	1,456,538.31	458,241.63	1,607,680.45	257,626.34	11,201,722.95
PENTELIS	3,016,392.54	343,665.84	168,586.96	235,196.78	153,594.80	3,917,436.92

Table 7. Expenditures of pediatric hospitals for the years 2021, 2022

Expenditures (€) 2021

Hospital	Salaries	Salaries (additional cost)	Energy services	Insurance	Cleaning services	Nutrition cost	Other cost	Total
AGIA SOPHIA	3,806,621.86	0.00	2,333,978.79	1,057.85	1,478,998.12	348,502.33	4,606,409.43	12,575,568.38
PANAGIOTI & AGLAIAS KYRIAKOU	1,469,614.16	84,234.57	1,164,306.03	2,555.00	1,016,674.90	35,547.80	2,254,190.65	6,027,123.11
PENTELIS	907,226.21	280,419.39	1,592.00	45.46	316,666.67	233,376.17	962,319.64	2,701,645.54

Expenditures (€) 2022

Hospital	Salaries	Salaries (additional cost)	Energy services	Insurance	Cleaning services	Nutrition cost	Other cost	Total
AGIA SOPHIA	3,972,207.35	325,059.28	5,876,489.66	1,057.85	1,319,304.53	332,853.41	5,109,921.99	16,936,894.07
PANAGIOTI & AGLAIAS KYRIAKOU	1,939,228.33	243,314.34	3,052,945.42	2,474.00	1,309,827.24	13,512.18	3,148,220.58	9,709,522.09
PENTELIS	899,596.28	357,277.03	419,897.46	0.00	421,766.52	189,510.96	1,716,458.47	4,004,506.72

Table 8. Total costs of pediatric hospitals for the years 2021 and 2022

Hospital	Total cost (purchase - €)	
	2021	2022
AGIA SOPHIA	49,739,398.15	60,196,191.99
PANAGIOTI & AGLAIAS KYRIAKOU	14,649,738.00	21,893,921.33
PENTELIS	7,006,388.75	8,566,413.76

Table 9. Total revenues of pediatric hospitals for the years 2021 and 2022

Hospital	Total revenues – Social security insurance (€)		Total revenues – Individuals (€)	
	2021	2022	2021	2022
AGIA SOPHIA	22,821,492.81	16,164,787.24	405,624.36	509,737.32
PANAGIOTI & AGLAIAS KYRIAKOU	2,995,109.27	5,038,251.10	358,023.04	631,237.81
PENTELIS	2,350,910.81	0.00	235,210.33	262,598.95

Table 10. Hospital performance indicators for the years 2021 and 2022

Agia Sophia hospital			
INDICATOR (€)	**YEAR**		**% INCREASE**
	2021	**2022**	
Average total expenditure per inpatient	992.90	1157.42	16.57
Average total expenditure per bed	80761.81	95247.14	17.94
Average total cost per day of hospitalization	424.82	467.78	10.11
Average pharmaceutical expenditure per inpatient	560.17	624.69	11.52
Average cost of services per inpatient	245.02	325.65	32.91
Average cost of sanitary material per inpatient	75.90	82.03	8.08
Panagioti & Aglaias Kyriakou hospital			
INDICATOR (€)	**YEAR**		**% INCREASE**
	2021	**2022**	
Average total expenditure per inpatient	812.48	1173.87	44.48
Average total expenditure per bed	30906.62	59013.27	90.94
Average total cost per day of hospitalization	270.89	350.39	29.35
Average pharmaceutical expenditure per inpatient	284.74	397.92	39.75
Average cost of services per inpatient	334.26	520.59	55.74
Average cost of sanitary material per inpatient	68.38	78.09	14.20
Pentelis hospital			
INDICATOR (€)	**YEAR**		**% INCREASE**
	2021	**2022**	

Average total expenditure per inpatient	1176,75	1056,28	-10,23
Average total expenditure per bed	46709,26	54217,81	16,08
Average total cost per day of hospitalization	537,26	451,86	-15,89
Average pharmaceutical expenditure per inpatient	506,23	371,93	-26,53
Average cost of services per inpatient	453,75	493,77	8,82
Average cost of sanitary material per inpatient	53,49	42,38	-20,77

The "Agia Sophia" hospital appears that the average expenditure per bed (Table 10) is quite high on an annual basis and is actually increasing as from approximately €80,000 in 2021 reached €95,000 in 2022 due to the obvious increase in the cost of the services provided per inpatient (increase by 32.91%) and the simultaneous smaller but significant increase in the average pharmaceutical expenditure per hospitalized patient (11.52%). Based on table 9, we notice that the hospital's revenues decrease in year 2022 compared to 2021 which worsens the performance of the hospital since the cost of hospitalization increases without increasing the number of patients who were hospitalized in the same degree.

Regarding the performance of the "Panagioti & Aglaias Kyriakou" hospital, the increases observed on an annual basis are much greater than at the "Agia Sophia" hospital. It is characteristic that the cost per bed doubled in 2022 compared to 2021 while the number of hospitalized patients was the same (Table 10). However, the significant reduction in the number of beds (from 474 to 371) increases costs at all levels despite increasing revenues from social security insurance funds and individuals. The cost for "Pentelis" hospital appears to be decreasing in all cases except average expenditure per bed and expenditure on services per inpatient (Table 10). This situation may be worsened due to lack of revenues from social security insurance funds. Nevertheless, the hospital is trying with the available resources to manage the incidents that are increased in 2022 compared to 2021 (8110 vs. 5954) and with increased hospitalization days in total (18958 vs. 13041). Noticing these results, the hospital has the ability to properly manage the cases despite the reduced financing focusing on providing services (8.82% increase) to the patient.

Comparative analysis: NHS – E.S.Y.

NHS - UK (National Health System – UK)

In the operational structure of the National Health System of Great Britain (NHS – UK) the primary health units play a significant role. Each such unit is responsible for approximately 250 thousand people and includes medical diagnostic centers, with a wide range of examination/diagnosis capabilities for incoming patients. PCTs, as they are called, decide on the health services provided and on the hospital a patient to be cured within the wider health system. They have their own budget and act independently to provide health services through NHS Trusts. These operational structures are mainly made up of qualified general doctors who decide to send the

patients to specific hospitals judging the seriousness of the situation. The salary of these doctors is determined per patient. In general, primary health units are under local government. As far as hospital care in Great Britain is concerned, it covers all the British people regardless of income. All medical services are provided and in fact there are a large number of doctors and paramedical staff curing the patients. NHS offers the clinical pharmacist profession with disease-specific specialization who prescribes and monitors patients, a concept that completely lacks in the Greek health system. In conclusion, it is an entirely state-funded health system with adequate coverage of the health needs of the population that ensures equality in therapy and the provision of health services almost always free. The Greek health system (E.S.Y.) it has not yet managed to create such primary health structures that are sufficient for the entire population, while the annually approved budget has been decreasing in recent years, resulting in the difficulty for patients to access the health services provided. In general, a direct comparison of the philosophy of the two health systems cannot be clearly made, neither on the basis of the financing resources provided nor on the level of services.

Great Ormond Street Hospital

Financial statements of the pediatric Great Ormond Street hospital the London concerning the years 2020 and 2021 are taken into consideration in our analysis to assess any similarities and differences between the Greek health system (E.S.Y.) and the British one (NHS).

Table 11. Main indicators for Great Ormond Street Hospital

Indicator/ Year	2020	2021
General liquidity	1.73	1.85
Acid liquidity	1.62	1.73
Cash liquidity	0.60	1.21
Equity / debt	5.97	5.91
Equity / fixed assets	1.12	1.15
Receivables' collection speed	4.55	5.42
Short-term debt repayment speed	5.93	5.49
Average receivables' remaining period	80.21	67.33
Average period of repayment of liabilities	61.50	66.50
Operating profits	0.05	0.02
Operating expense margin	1.17	1.01
Return on equity	0.04	0.02

Table 11 indicates that the Great Ormond Street hospital is a well-organized hospital that manages its financial resources rationally. It has relatively good general and acid liquidity indicators. The cash liquidity indicator seems to double in 2021 compared to 2020 (a year in which it was less than unity signaling a reduction in cash available for the hospital) pointing out the adoption of a correct collection policy and management

of available cash. This is also confirmed by the receivables' collection speed indicator which is quite high (4.55 and 5.42 for the years 2020 and 2021 respectively) combined with a low average receivables' remaining period (80 days in 2020 and 66.5 days in 2021).

Comparison with Greek pediatric hospitals

Comparing the liquidity indicator (Tables 1 and 11) between the British hospital and the three Greek hospitals, we ascertain that the UK hospital appears lower general and acid liquidity ratios in both 2020 and 2021 and it ends up having equal or better cash liquidity indicator for these two years.

Regarding the equity restructuring indicators (Tables 2 and 11), the British hospital presents a ratio of equity to foreign capital quite high, showing that the hospital relies mainly on its own equity and does not depend on borrowing and capital from foreign investors. The equity to fixed assets ratio is 1.12 and 1.15 for the years 2020 and 2021 respectively which shows that the fixed assets of the hospital are quite increased compared to the current assets. Therefore, in this case, attention should be paid based on the available cash of the hospital. The equity/fixed assets indicator of the "Agia Sophia" hospital appears the highest value for both 2020 and 2021, which seems to have sufficient liquidity on its fixed assets. The equity to debt indicator of "Pentelis" hospital increases in the year 2021 compared to year 2020 even the ratio of equity to fixed assets remains unchanged. This fact may indicate that the increase in equity, which is ultimately valued in terms of fixed assets of the hospital rather than in cash available.

Regarding the efficiency indicators (Tables 4 and 11), it also appears in the case of the British hospital that it is not a profitable business, therefore the operating profit indicator is marginally greater than zero. A relatively good indicator of total operating expenses margin is observed, which is close to unity (especially for the year 2021), demonstrating that there is a balance between the hospital's income and expenses as well as proper management of the entity's expenses. Small differences are pointed out between the Greek pediatric hospitals and the British.

Activity indicators (Tables 3 and 11) indicate that the main difference between the Greek hospitals and the British one is the margin between the receivables' collection speed and the short-term liabilities repayment speed. This fact reduces the cash available of the Greek hospitals, while the British one seems to improve its cash liquidity in 2021 (1.21). On the contrary, the "Agia Sophia" and "Panagioti & Aglaia Kyriakou" hospitals are in a very unfavorable position with cash liquidity indicator for 2021 at 0.13 and 0.14 respectively. The "Pentelis" hospital depicts a similar dynamic to Great Ormond Street Hospital (cash liquidity indicator in 2021: 1.61). This fact can also be supported from the equity/debt indicator where the share of borrowing proves to be quite high for the "Agia Sophia" and "Panagioti & Aglaias Kyriakou" hospitals in comparison to "Pentelis" hospital.

DISCUSSION

A significant number of legislative reforms implemented by the Greek Ministry of Health concerning mainly the mergers of hospitals, the implementation of the mandatory reimbursement system by the pharmaceutical companies (clawback and rebate) and the drawing up of closed budgets in an attempt to limit the cost of hospitalization and the pharmaceutical expenditure. Even though the economic crisis, the reduction of hospital budgets, the reduction of available staff and the pandemic of the disease COVID-19 had a severe impact on the Greek health system, the personnel of the three Greek hospitals tried to ensure the quality of the provided health services. They succeed to enhance their performance despite the elimination of the available resources/ funding and to maintain a state of dynamic balance between inputs and outputs. Policymakers may focus on accounting reforms by strengthening the financial controls and the financial statement analysis in an attempt to provide accurate and detailed accounting information in public interest.

Even though the pediatric hospitals of Attica have eventually managed to improve the income-expenditure (cost) ratio in the period 2016-2021 during a prolonged period of recession, many reforms are still imperative in the Greek health system. More specifically, a strong national or even European grant may directly contribute to increasing hospitals' efficiency and significantly improving the services provided. For instance, specialized European grant developing programs can provide modern equipment as well as staff training. Furthermore, the targeted recruitment in key positions (medical and general scientific staff) with good salaries may substantially improve the quality of hospital services.

In conclusion, hospitals' economic and comparative evaluation is a complex and long-term process that requires continuously new financial and structural policy making focusing in accounting and financial reforms in order to improve their efficiency and overall performance. It is also crucial to remind that all hospitals (and especially those referring to pediatric patients) are living organizations with a constant change in their dynamics. The hospital personnel are often pushed to the limits of their physical and mental endurance and this fact must be taken into account in financial analysis, as a parameter that can directly affect the data and the estimated indicators.

Even though the empirical analysis of this research study has focused on the evaluation of the efficiency and the performance of three great pediatric hospital in Attica, it is important to point out that this study does not assess whether or not the efficiency of the pediatric hospitals in the years 2016 to 2021 (distribution of available resources, etc.) ensured the main objectives of the Greek health systems, i.e. the equal and free access of all citizens. For instance, it has not estimated whether a share of population prefers to cure in private hospitals because it does not find the expected response from public pediatric hospitals. In addition, no data was found regarding the cost of

hospitalization in Great Britain and whether the services provided have a higher or lower financial impact on the tax-paying British citizen. Thereafter, the conclusions of this study shall be carefully addressed and summarized. The present study can be repeated in the future, taking into consideration all relevant research limitations emphasizing whether the management of hospital resources combined with the implementation of the new reforms will increase the accessibility of hospitals to all citizens without exception. Future research may also focus on the investigation of the effects of possible collaboration of public hospitals even with private insurance companies in terms of high-cost operations and required expertise.

CONCLUSION

In the present study, an attempt was made to evaluate and compare the pediatric hospitals of Attica in terms of their financial management and overall performance. A comparative analysis is also carried out in a pediatric hospital in London to identify any similarities and differences between the Greek and British health systems. The estimation results indicate that the main problem of all three pediatric Greek hospitals' management is the inability to collect the claims in a short time, while the British hospital seems able to collect any claims from the patients, social security, and the private insurance funds in a shorter time horizon.

By comparing the values in the liquidity and efficiency indicators, it is proven that the pediatric hospitals of Attica made a significant effort to use the available resources in the best possible way. It is important to mention that the efficiency indicators cannot be evaluated per se but in combination with all the other calculated indicators as public hospitals are not profit-making entities with no purely economic criteria.

The increase in the hospitals' equity is a principal objective of financial management. Emphasis is given on accounting reforms by reducing the operating costs. Even though it is not always possible to keep them at low levels providing at the same time high-level services. Resources are insufficient and hospital efficiency inevitably declines. A great average receivables' remaining period as well as the deletions of claims from the social security insurance fund the years before 2016 based on Greek national law 4834/2016 contributed to significant shortages in all hospitals, without any exception as it concerns the funding of pediatric hospitals.

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Appendix

Data Sources

Financial data and operation data for the "Agia Sophia" hospital are retrieved by https://paidon-agiasofia.gr/

Financial data and operation data for the "Panagioti & Aglaia Kyriakou" hospital are retrieved by http://www.aglaiakyriakou.gr/

Financial data and operation data for the "Pentelis" hospital are retrieved by https://www.paidon-pentelis.gr/

Financial data and operation data for the Great Ormond Street Hospital are retrieved by https://www.gosh.nhs.uk/

Information about the Greek health system are retrieved by https://www.moh.gov.gr/

Information about the UK health system are retrieved by https://www.england.nhs.uk/

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