

Conference Paper

Adjusting the Costing/Pricing Systems of Public Health Units in Times of Emergency Health Crises: The Case of Greece

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Abstract

The aim of this research was to examine the costing / payment system applicable to public hospitals in the period before Covid-19 and compare it with adjustments implemented by the Greek Government because of Covid-19, both in payment methods and in the execution of its budgets. In addition, we tried to record the burden on hospitals with the extra costs caused by Covid-19 and how these affected the regular execution of their budget. Quantitative data were collected from a university hospital, which is one of 13 coronavirus reference centers in Greece. Data were collected from the Finance, Supply and Revenue pricing departments. All Greek hospitals have adopted Closed Consolidated Hospitalization – Diagnosis Related Groups (KEN- DRGs) as the pricing system, based on the Australian DRGs. The findings revealed that, due to the inability of the KEN system to readily adjust to a health crisis and due to a lack of time to adapt to the new circumstances, Greek hospitals were called to implement a per-diem reimbursement system as a Covid-19 case pricing system. It was also found that the hospital, in order to keep providing its services for Covid-19 patients at the same pace, was required to incur a large amount of expenses. According to the results, the reimbursement system of public hospitals in no way reflects the actual Covid-19 costs and a reliable cost accounting system for calculating the actual cost per Covid-19 patient (based on actual costs and hospitalization data) is needed. Additionally, there is an evident and urgent need for optimization of the KEN system and its evolution into a more reliable costing/pricing system, such as that of the DRGs.

Keywords: health costing, Public Health Units, Diagnosis Related Groups (DRGs), budget, health economics, coronavirus (Covid-19)

Jel Classification Codes: I18, H51, M41

1. Introduction

Ever since the time the Chinese government imposed a lockdown on the city of Wuhan on 23 January 2020, the world embarked on a journey of a new financial crisis. This crisis was accompanied by a global economic recession with unpredictable consequences. The health sector has been one of the sectors with the greatest financial losses. Specifically, the Public Hospital Units (PHUs) have faced and continue to face, major

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problems adjusting to the new situation both due to the large reduction of their revenues and the increased costs that have occurred. According to Quentin *et al.* (2020) [1], their revenue decrease is due to the following two factors: a) patients have reduced their visits to the PHUs in the fear of possible coronavirus infection and b) the PHUs place importance on the service and treatment of covid cases and have reduced substantially the provision of their health services to non-covid patients. Pre-scheduled hospital appointments, admissions and surgeries have been cancelled. It was also observed that the PHUs were faced with another major problem, that of additional costs which were necessary for the smooth management of the pandemic. New expenses came up such as the creation of new or the expansion of the already existent facilities for the treatment of covid patients, new medical equipment, new Intensive Care Units (ICUs), additional staff and more. The above problems were the reason that pricing and compensation methods of the PHUs had to be redefined as well as the manner of how they would be subsidized.

The purpose of this study is to investigate the possibility of creating a mechanism for adjusting the costing/pricing systems of the PHUs. We examine the effectiveness of the existing pricing/compensation system in providing reliable cost data, especially in times of an emergency health crisis when the restraint and control of the health services cost is crucial.

The present research seeks to put emphasis on the need to readjust the existing pricing / compensation system so that it can be updated to a modern, reliable and fair system, based on which the compensation of the PHUs will correspond to real-time situations in order to rationalize the correlation between expenses and revenues in times of an emergency crisis, such as the covid pandemic we are experiencing. Through the present research emerged the need for the PHUs to adopt a more efficient costing system based on real cost data that will lead to the support of sound decision making.

2. Literature Review

According to research conducted during the pandemic, one of the most important consequences that the PHUs are asked to manage is their revenue reduction from the provision of their health services. Quentin *et al.* (2020) [1] and Cylus & Ginneken (2020) [2], in their research in European and third countries, state that there are two factors that led to this reduction: a) the reduction of patients' visits to public health structures stems from the fear of exposure to the coronavirus at the entrance or during their stay in the hospital. This acts as a deterrent to seeking medical care or attending their scheduled routine appointments (Rosenbaum, 2020) [3] and b) the restriction of a hospital health services provision to non-covid patients due to their switching to covid patient care, in their attempt to save these patients and limit the spread of the coronavirus.

The above is confirmed by research of De Vincentiis *et al.* (2020) [4], according to which the percentage of patients diagnosed with cancer decreased by 40% in 2020 while, as the pandemic continues, this percentage is expected to increase even more. In addition, there was an 80% decrease in referrals of patients suspected of cancer in

the United Kingdom, while according to Maringe *et al.* (2020) [5] a 42% discontinuation (partial or full) of cancer care services was found in countries participating in the survey.

Quentin *et al.* (2020) [1] also observed that, in addition to the revenue decrease, the PHUs are facing the increased costs of covid patients' management, such as investment in new medical equipment and building facilities as well as the cost of protective equipment for their personnel. These additional costs were impossible to predict when the hospitals' revenue-expenditure budget for the year 2020, the year of the pandemic, was drawn up. The above effects of the pandemic, forced the PHUs to proceed to adjustments in order to reduce the consequences, as much as possible.

The PHUs were compelled to make significant changes, including the adjustment of their reimbursement systems. The system adopted by most European and third countries as the main reimbursement model of health care costs is the compensation based on the Diagnostic Related Groups (DRGs) (Leister & Stausberg, 2005) [6].

According to Chilingirian (2008) [7] and Davies and Westfall (1983) [8], the country that first implemented the DRG reimbursement system was the United States, in 1983, in an effort to establish a more reliable compensation system to curb the ever-increasing cost of health services. A feature of this system is, the treatment of each patient not as a unit but as a member of a group of patients with common demographic, diagnostic and therapeutic properties that determine the amount of resources required for their treatment. The DRGs, therefore, are diagnostic categories each one representing a specific level of resource utilization. Each of these categories includes patients with a similar medical condition who are expected to absorb the same amount of resources. Each diagnostic category (DRG) is then linked to a predetermined compensation rate that the insurance provider is required to pay, regardless of the resources ultimately absorbed by the patient or the length of its hospitalization. In this way, more accurate pricing is achieved, based on coded diagnoses, knowing in advance the exact amount that the hospital will receive, as reimbursement, from the insurance provider (Cylus & Irwin, 2010) [9].

Over the years, the need to reduce the cost of health services, the reliable recording of hospital activity, as well as the effort to improve the service quality have led to the gradual adoption of this system in many countries such as Australia, Israel, England, Germany, Portugal, Sweden, France, Italy, Poland, Netherlands, Switzerland and Slovakia. Cross country research has revealed several differences in the way the DRG system is implemented among countries depending on the needs and procedures of each (Pirson *et al.*, 2013, Tan *et al.*, 2014) [10, 11].

According to the recent cross country research conducted by Kaitelidou *et al.* (2020) [12] on the effectiveness of the DRGs, their adoption targets seem to be met, to varying degrees for each country, as evidenced by the growing number of countries that are implementing them. Implementation of the DRGs in several countries has succeeded in cost control and increased hospital efficiency with simultaneous increase of admissions and reduced waiting times (Busse & Quentin, 2011) [13]. In addition, a steady decline in the cost of hospital services was observed over time, while the findings of Bocking *et al.* (2005) [14] seem to have been confirmed; in their research they came to the conclusion that with the DRGs reduction of the Average Length of Stay (ALoS) is achieved.

During the implementation of the DRGs, however, malfunctions and failures in the calculation of costs were found in various countries, which, however, proceeded to review the system in order to amend them (Brannen, 1999, Kaitelidou *et al.*, 2020) [12, 15]. As a result, many countries have had to modify these systems to adjust reimbursements, following the demands of the pandemic. In their research, Quentin *et al.* (2020) [1] conducted a cross country survey in order to record these adjustments in different countries. Their findings reveal that countries that already implemented the DRGs, such as France, Germany, Romania, Switzerland, Belgium and the United Kingdom, partially adjusted them to address the hospitalization cost of covid patients. For this reason, the guidelines for coding diagnoses and procedures have been adapted so that they could proceed with the coding of positive covid patients in need of treatment. In Belgium, new reimbursement codes have been created to cover patients in ICU clinics and for additional specialized services. In Germany the average daily nursing fee was increased by 38€, while an extra 50€ initially and 100€ thereafter is allotted to pay for additional expenditures for each inpatient and cover the increased costs of staff protective equipment. In England, hospitals were given the possibility to apply for additional government subsidies, if their operating costs for covid patients exceeded their initial budgets. The same policy was followed by the central government of Finland. In Poland, the National Health Fund established a new list of reimbursements regarding the cost of hospitalization, ICU, isolation, as well as a one-off payment for the readiness to provide not only hospitalization but also transfer of the patients. In the Czech Republic, hospitals receive a new 'per-diem' reimbursement, exclusively for positive patients for both the ICU and the non-ICU care. In addition, their regular monthly compensations increased by 1% as a compensation for the additional costs of protective equipment for the personnel.

At the same time, countries that have not implemented the DRGs or adopted a mixed reimbursement system, have also proceeded to readjustment procedures of their systems so as to meet the demands of the pandemic. In Israel, new per-diem codes have been created, exclusively for covid patients and these payments are not included in the usual budget cap, while Bulgaria has continued to compensate under the existing per-diem reimbursement system.

Simultaneously, central governments have adopted a range of approaches concerning specialized compensation and other facilitations to make up for these losses, recorded by Quentin *et al.* (2020) [1] in their research.

In particular, in countries such as Poland, the Czech Republic and Slovenia, where hospitals apply a DRG-based budget, determined by the activity of the previous year, their regular monthly installments have not ceased although their activity has decreased significantly. The central government of Israel has guaranteed to the hospitals, that it would provide at least 95% of their revenue the year before. England made a radical decision to discontinue their normal payment system, which was based on the DRGs. Instead, it decided to subsidize hospitals according to their average monthly expenditures of the previous year, plus inflation. France, guaranteed to the hospitals that they would receive additional payments for any losses they incurred compared to their usual revenues, while the central government of Finland allocated 200m.€, while giving

hospitals the right to claim compensation for their deficits due to the pandemic. Germany provided compensation of 560€ per day for each bed that would remain empty, until the end of September 2020. Belgium paid 1b.€ to hospitals in advance, to cover their emergency expenses, which would be offset by their next payments regarding covid costs. Finally, in Switzerland financial compensation, as a result of lost revenue, was based on the decisions of each region separately, with the result that some of them were compensated faster and more than others. In addition to the above compensations, further facilitations were provided by the central governments of countries such as the Czech Republic, England, Israel, Malta, Slovakia and Slovenia for the direct purchase and installation of additional necessary fixed equipment and special ventilation systems as well as the personal treatment equipment for each covid patient. In Germany, each hospital received a one-time payment of 50.000€ for each new ICU bed with ventilation capabilities. In England, for the first period of the coronavirus, hospitals could proceed with the purchase of fixed equipment up to 278.000€ without state pre-approval.

3. Research Data and Methodology

According to the Greek Ministry of Health, at the beginning of the pandemic, 13 hospitals were designated covid reference centers for the entire Greek territory. Among them, six were the main reference centers and the other seven the supporting ones. These six hospitals are the general 'Thoracic Diseases General Hospital – Sotiria' and five University hospitals: the 'Attikon University General Hospital', the 'AHEPA University General Hospital', the 'General University Hospital of Larissa', the 'General University Hospital of Patras' and the 'General University Hospital of Heraklion'. As a sample for our research, we chose the Attikon University General Hospital. This particular hospital was selected based on its University character, the size of its annual budget as well as the number of available beds for covid patients. Among the six main hospitals, it had the largest budget in the year 2020, amounting to 184.310.815,79€ compared to the next one, Sotiria, with 167.842.616,87€. In addition, it is the hospital that has the most beds reserved for covid patients as a percentage of its total capacity (39,1%), compared to the second one, AHEPA (37,8%). The investigation of the research question was carried out through the pandemic and the quantitative data were collected by the Finance, Supply, Informatics and Revenue Pricing departments of the hospital. The selected reference hospital has applied since 2012 (Joint Ministerial Decision Y4a/oik.85649/2011) [16] the Closed Consolidated Hospitalization Costs (KEN) as the pricing / compensation system, which are based on the model of the Australian DRGs, abolishing the "per-diem" reimbursement system that had been adopted until then. Prior to the implementation of the KEN, the hospitals were pricing, and therefore the insurance providers reimbursed, based on the treatment of their insured patients according to the invoices of medical supplies, medicines and the length of hospitalization (per-diem system). Since 2012, however, a new model of pricing health services, the KEN, has been introduced in order to simplify the process of pricing, control and compensation of hospitals. According to Hellenic Ministry of Health (2011) [17], the KEN is a generalized price list of treatment costs, which determines the cost and the ALOS for each category

of treatment. These data correspond to the average hospitalization costs and are used for quick and easy invoicing of patients, regardless of the actual hospitalization cost required. Nevertheless, according to a research conducted by Kaitelidou *et al.* (2020) [12], already since the first years of its implementation, the first weaknesses appeared, such as the difficulty of identifying which KEN each medical diagnosis should correspond, mismatching of hospitalization costs and KEN pricing and exceeding the ALoS provided by the KEN. According to research by Polyzos *et al.* (2012) [18], the need for more radical corrective interventions was evident. Although four revisions have already been made since the KEN were implemented, the necessity of an adjustment mechanism in case of emergency health crisis has not yet been met. The Greek state in 2014 decided to proceed with the implementation of an internationally recognized system, the DRGs (Documentation and Costing Centre of Health Services – DRGs Greek Institute, 2020) [19]. The implementation of this system, due to the expected difficulties of its enforcement, has not been completed to date, leaving Greece during this emergency health crisis with a dysfunctional and unreliable system of compensation for hospital expenses.

4. Research Findings

As already mentioned, the compensation / pricing system of the sample hospital is based on the KEN. During the period of the health crisis we noticed that the hospital proceeded to adjustments in the compensation / pricing system of covid cases. As the KEN model is already quite problematic (Polyzos *et al.*, 2012) [18], it could not readily capture the cost of these cases, because there was not enough time to proceed to either its improvement or its new costing. Due to the inability of the KEN system to readily adjust to the health crisis and having no other option, the hospitals were called to implement the per-diem reimbursement system as a covid case pricing system, a system which was implemented up until 2011, was replaced as inadequate by the KEN and its pricing was based on 2011 prices without the possibility of adjusting in times of crisis to reflect real costs, such as covid cases.

Based on the statistical analysis and correlation of the research data, it was found that in 2020 the hospital proceeded in pricing from the provision of health services to inpatients amounting to 60.180.861€ while in 2019 the amount reached 71.471.339€. As shown in Figure 1, there was a reduction in revenues of 15,80% in 2020, which was due to both the reduced number of non-covid patient visits and due to the reduced provision of health services to these patients on behalf of the hospital.

Collection of the above payments from the insurance providers is the main source of income for hospital with which it has to cover its obligations and mainly those towards the suppliers. The collection of revenues for the year 2019 amounted to 27.542.864€ while for 2020 to 29.351.130€. The revenues collection in 2019 corresponded to only 38,54% of the respective invoiced revenues for the year 2019, while in 2020 they slightly increased and reached 48,77%. (Figure 2)

The reduced revenues collected reveal the significant problem that the hospital faces in meeting its obligations, as a result of which the state is led to additional subsidization.

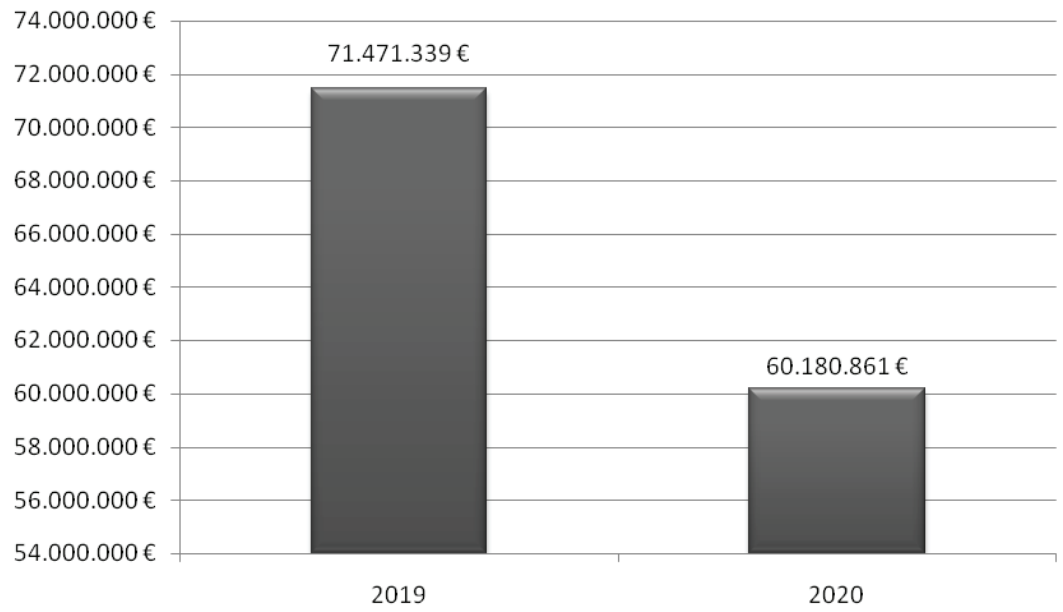


Figure 1: Invoiced revenues for the years 2019-2020

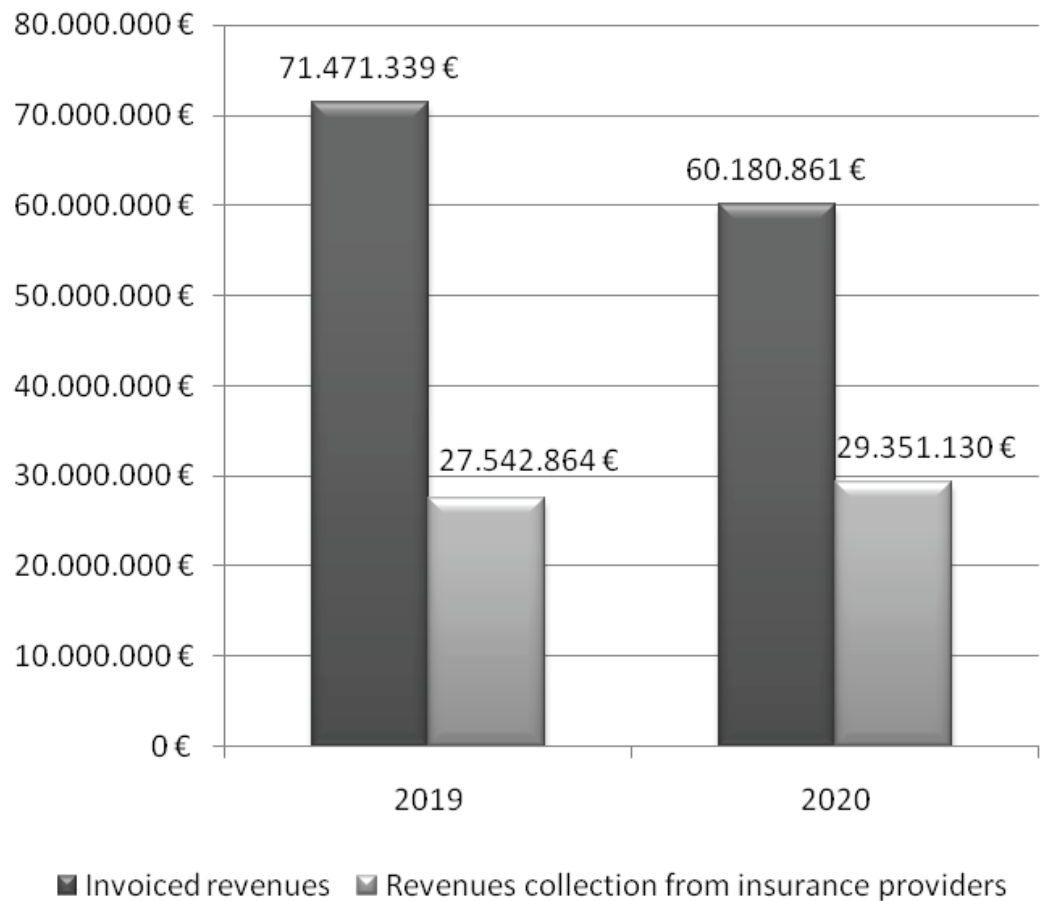


Figure 2: Invoiced revenues collection for the years 2019-2020

However, the need for additional subsidy is also demonstrated by the fact that the hospitalization costs exceed the respective revenues. The inpatient cost for the year 2019 amounted to 97.915.734€ while the corresponding cost for the year 2020 amounted to 88.651.936€. The pricing of the inpatient health provision of 2019 covers only 72,99% of these costs while the corresponding percentage for 2020 reached 67,88%. The disproportion is shown in Figure 3. So, it is obvious that even if the hospital could collect all its revenues owned by the insurance companies, it would still face liquidity and payback difficulties to the suppliers, so the state subsidies would be inevitable.

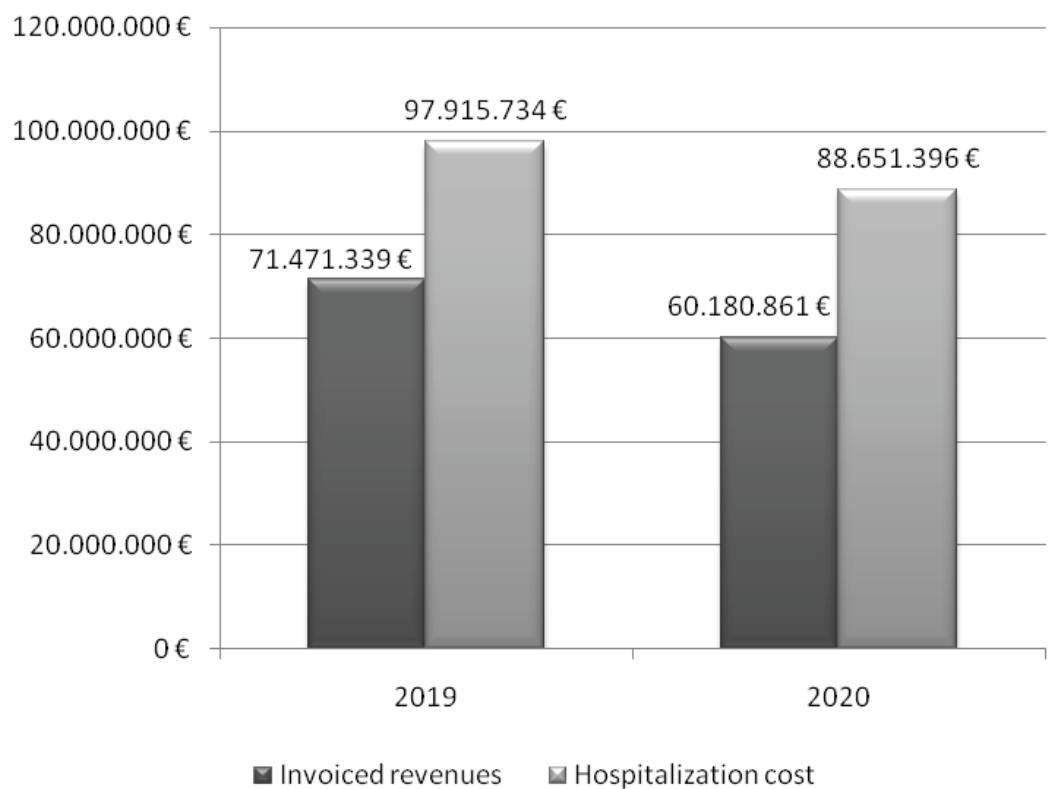


Figure 3: Cost of invoiced revenues for the years 2019-2020

As far as the rate of subsidy collection, there has been no change in the normal procedure during the pandemic by the state which is not based on any political decision to support hospitals due to the emergency health crisis. The PHUs subsidies in our country are not related to the number of patients they treat. Instead, they are intended to cover the inability of paying off a PHU current liabilities, which have also increased dramatically as a result of the pandemic. State subsidies for the years 2019 and 2020 amounted to 25.700.000€ and 34.000.000€, respectively. State subsidies of 2020 are approximately 8.300.000€ more than in 2019, but this is due to the amount of expenditures that had accumulated for repayment in the year 2020 (Figure 4).

Figure 5 illustrates the relation between the total cash available and the expenses to be paid for the years 2019 and 2020. The total cash available for the year 2019

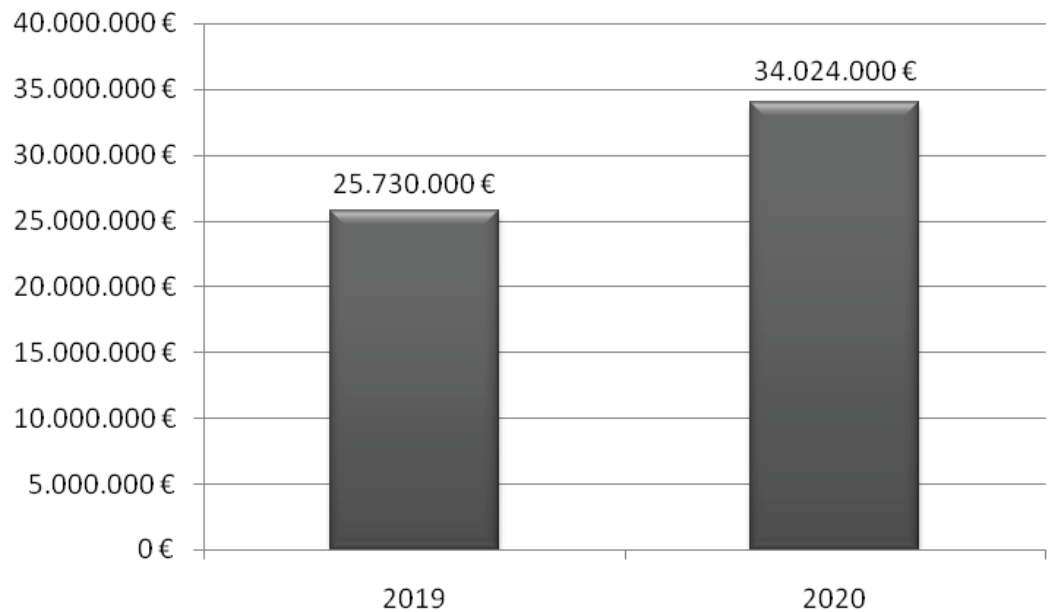


Figure 4: State subsidies

amounted to 77.272.864€ consisting of the cash balance of the previous year amounting to 24.000.000€, the revenues collected by the insurance providers amounting to 27.730.000€ and the state subsidies amounting to 25.730.000€. The amount of expenses to be paid by the end of the year reached 114.678.000€, resulting in leaving 38.000.000€ unpaid for the following year. Consequently, in 2020 the total amount of expenses to be paid as a result of the emergency covid pandemic amounted to 128.716.197€, while the total cash available to 78.375.130€. Specifically, the cash balance of 2019 amounted to 15.000.000€, the revenues collected by the insurance providers to 29.351.130€ and the state subsidies to 34.024.000€. The expenses owed for the next year 2021, reached 65.000.000€.

The pandemic, in addition to the reduction in revenues, also induced a rapid increase in costs required to treat covid patients. In particular, for the year 2020, the hospital exclusive covid expenses reached 7.300.000€ and which can be classified as follows: 23% for medical supplies/materials (1.698.000€), 21% for covid reagents (1.545.000€), 20% for medicine supplies (1.420.000€) and 19% for the recruitment of new, temporary, staff (1.401.000€). The above expenses absorbed 83% (6.064.000€) of the total covid expenses. The remaining 17% was used to cover additional cleaning needs amounting to 680.000€, space modifications amounting to 310.000€ as well as the maintenance of medical equipment amounting to 246.000€. (Figure 6)

The amount of the above classified expenses, without the burden of covid expenses, regarding the years 2019 and 2020 amounted to 74.728.000€ and 75.417.000€ respectively, that is at levels similar to those if the pandemic had not broken out. However, due to the additional cost of 7.300.000€ to deal with the pandemic, total expenses for the year 2020 increased by approximately 10%. This additional burden in relation to the respective costs of the years 2019 and 2020 is shown in Figure 7.

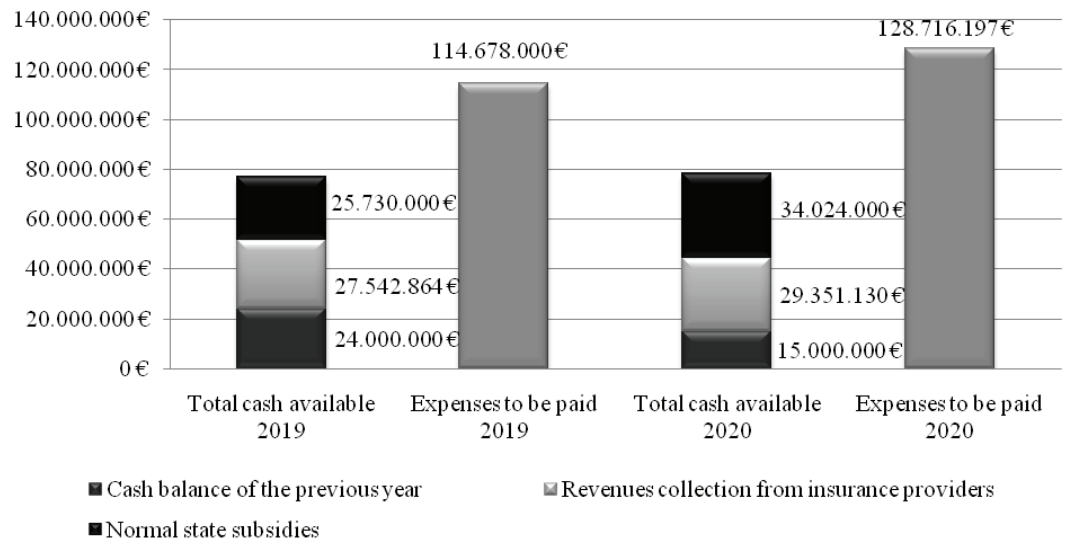


Figure 5: Total cash available and total expenses to be paid for the years 2019-2020

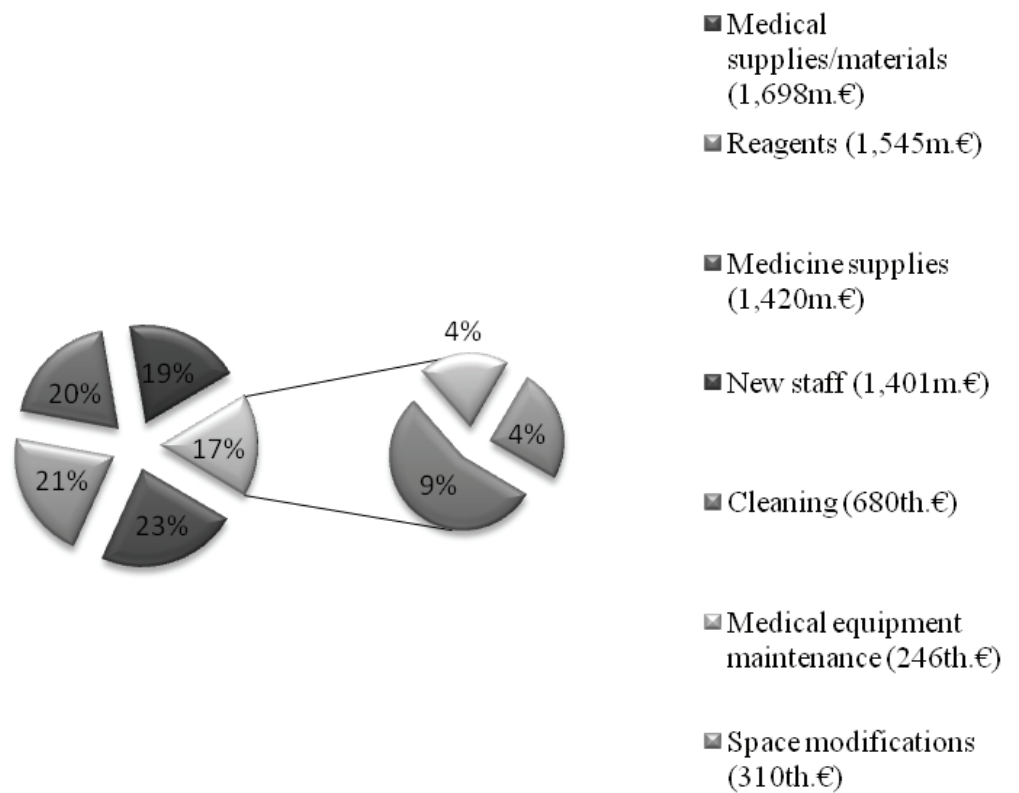


Figure 6: Covid expenses allocation

Nevertheless, in addition to the above expenses that the hospital was called to cover, a significant part of these emergency costs was covered by private initiative. The amount

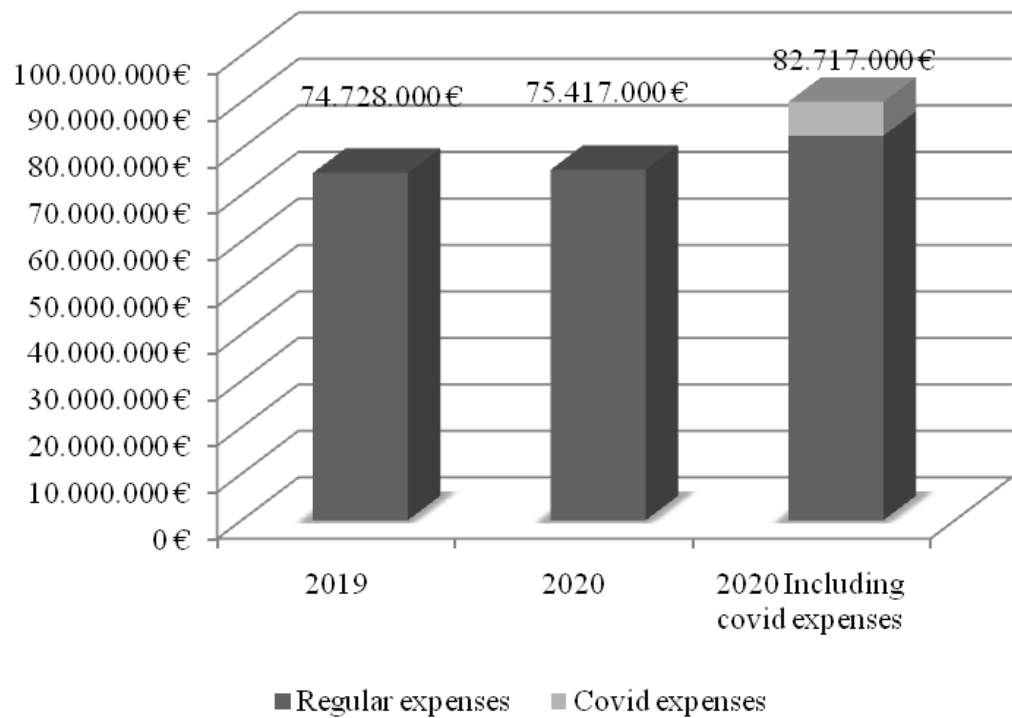


Figure 7: Regular and covid expenses for the years 2019-2020

of private donations to the hospital in medical supplies, reagents, medicines, technical and medical equipment exceeded 4.500.000€ in 2020. Therefore, the total additional costs for the pandemic amounted to approximately 11.800.000€ of which 62% was covered by own resources and the remaining 38% by donations. (Figure 8).

Apart from the costs already mentioned, the following also have to be taken into consideration: a) the private hospitals service cost required by making their capacity available for treating non-covid patients due to the reduced capacity of the PHUs, which were too busy taking care of covid positive patients. The State proceeded to specific reimbursement agreements with private hospitals regarding the patients who could not be treated in PHUs and b) the payroll costs of hiring both retired public sector doctors and active private doctors, in order to offer their services to PHUs as long as the pandemic exists. The State made a special agreement with them regarding their monthly salaries while simultaneously it granted to retired doctors the right to retain most of their pension and to private doctors to continue their private work.

5. Conclusions -- Suggestions

The advent of the unprecedented health crisis found Greek PHUs unprepared. The most important problems they had to deal with were the revenue shortfalls from the provision of their health services combined with the increased costs of treating covid patients. Unlike other countries, the problem of reduced revenues was not readily met by the State's new measures since the subsidies of the Greek PHUs are not related

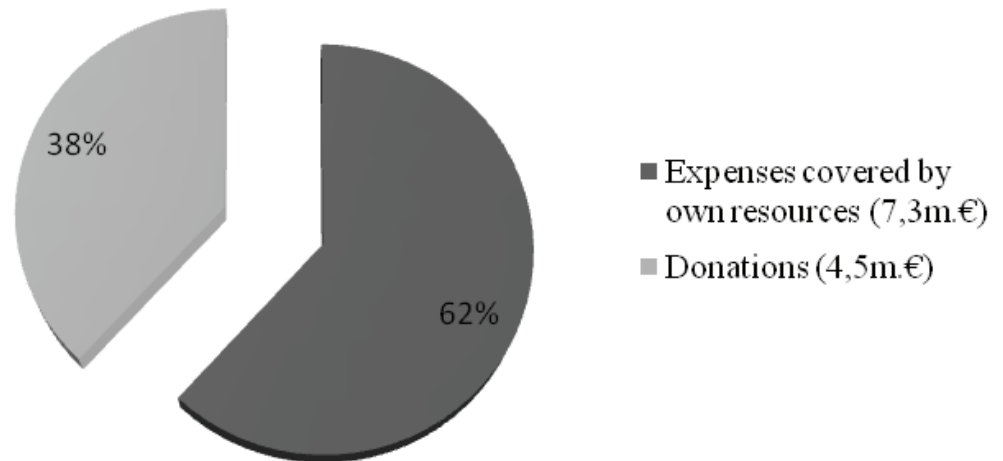


Figure 8: Donations vs Own Revenues

to their revenues but to their inability of paying their liabilities. In this sense, the State continued paying subsidies at the same rate, so as previous liabilities could be paid off. However, the increase in their liabilities and the inability to pay them back from their own revenues is also due to the unreliable pricing/reimbursement system that is adopted. We found that the PHUs continue to implement the KEN as reimbursement system of inpatients. This system has been discredited for many years as it is defective and which has led to incomplete costing / pricing. This is also confirmed by its inability to reliably price the covid patients' cost and as a result, the PHUs were instructed not to apply the KEN in such cases. The emergency solution given was that the state applied the per-diem reimbursement model for pricing covid cases. This system was applied before the implementation of the KEN and was used for the last time in 2011. The result of this incomplete per-diem costing / pricing system is that the Attikon University hospital will be reimbursed for the treatment of covid patients by the insurance providers approximately the amount 700.000€ for 2020 while, as we examined, the respective covid expenses amount to 7.300.000€. The above clearly shows the need to adopt a more reliable and sophisticated costing / pricing system such as the DRGs. Therefore, the need to accelerate the adoption of this model, which started in 2014, becomes imperative. This system, implemented by many European and third countries, will undoubtedly lead to a more reliable costing/pricing and therefore to rationalization of reimbursement by the insurance providers. As a result, the PHUs will be able to cope with their own revenues in a better way, burdening the national budget with fewer subsidies. However, even with the DRGs in place, it turns out that the countries that have already adopted them had to adjust them to approach reality as much as possible. This research reveals the urgent need of the Greek National Health System to create a costing mechanism that will be adapted in a timely and successful manner to any emergency health crisis. Pandemics

and emergency health crises are unlikely to disappear in the future. The Organization for Economic Cooperation and Development (OECD) [20], in a survey carried out in 2015, records an increasing trend in health expenditures worldwide, predicting that it will be intensified in the coming years due to demographic change and co-morbidity. Furthermore, our country has one of the lowest rates of public spending on public health among the EU countries (OECD/European Observatory on Health Systems and Policies, 2017) [21], less than two thirds of the EU average. All the above reveals the necessity to develop a costing / pricing model that will go beyond the limitations of a static system and will be based on the logic of a flexible comparable system that will be able to incorporate urgent real data. The implementation of the Presidential Degree 54 (2018) [22] regarding the adaptation of the new 'General Government Accounting Framework' could be the appropriate tool for extracting real data and would be the basis for the development of a costing tool, necessary for the objective approach to the costing/pricing process of medical procedures.

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