

Health Services Quality and Management in Greece

Efficiency and Effectiveness of NHS Secondary Health Care Units

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Abstract

The evaluation of the health units is based on the interpretation of a complex of evaluation dimensions and factors as soon as the verification of the casual relations among them. The principal factors for the evaluation of the health units are: efficiency, effectiveness and equity.

The present Phd thesis suggests a feasible evaluation model for the hospital operation, which is based on measuring the efficiency and the responsiveness of health services delivery. The development of appropriate models for the assessment of the overall (cost) and allocative efficiency in health care sector is an important issue for the Data Envelopment Analysis (DEA) scientific community. At the same time, from the side of health policy, the investigation of the crucial factors which interpret the efficiency of hospitals, leads to the adoption of best practices which are going to improve their operation. The scientific research for “health services quality performance” focuses on the valid and reliable scale development via the determination of robust structure with the use of Structural Equation Models (SEM).

1. Introduction

In a highly competitive environment, in which enterprises operate, the issue of long-term viability is responded into the interactive relationship of efficiency, quality and profitability (Sudit, 1996:9). Each dimension interprets the results of business activity in a special manner and concludes to the forecasting and the reengineering of the developmental course of the economic entities operating in the competitive system. The fundamental aim of public organizations is the safeguard of the public benefit, which is ensured through the satisfaction of the citizens’ needs in terms of efficiency, effectiveness and equity.

The methodology for the interpretation of performance dimensions is communicated through measurement systems that embrace both internal and external evaluations in the directions of economic and quality performance.

The criteria of internal evaluation are usually developed within the organization and refer to cost and quality. For instance, the “internal” cost measures include the productivity and utilization of

resources, while quality measures are connected to procedures as soon as the quality of goods or services provided. External evaluation criteria are concerned with the economic conditions and quality of life. Such criteria are defined by certified bodies that are involved in the measurements. More specifically, the criteria for “external” economic evaluation use data from the current economic situation and the market shares. In the health care industry, such data are collected from the paying parties (insurance funds, individuals). In the field of quality, the basic orientation of measures are patient satisfaction from the health services provided and patient perception for the quality of life after the treatment.

Health care delivery systems are the most complicated and multifunctional systems to be studied. A significant amount of heterogeneous factors of internal and external environment as soon as accidental events, can influence their operation. The challenge of the researcher is how the behavior of health systems will be interpreted. The results of research prove that, the less deterministic the system is the greater the danger for the researcher becomes to be misled from the reality.

The principle of the covariation of factors for the achievement of common goals probably reflects the behavior of a system and the potential methodology for its interpretation.

Due to the continuing pressure for the minimization of spending, in an era of extensive spending in health, and a simultaneous pressure for the improvement of the quality of health services, the evaluation of performance and quality is the fundamental issue of researchers. Several methodologies of econometric and operational research on performance evaluation are compared and tested for the dominance of the most appropriate. While methodologies from other productive areas, try to penetrate in the health service industry for the measurement of quality. (Yfantopoulos, 2003) Many researchers consider that quality is a factor that should not and cannot be judged by the patient, while others consider the patient as being the pole around whom the whole health system should be concentrated (patient-centered perception).

International organizations, as WHO, should introduce evaluation standards for the basic performance dimensions of health systems aiming

in the comparison of nations' trends and in the degradation of the gap between them. The instant problem diagnosis on the health level of citizens and the effectiveness of invested economic funds in an era of globalization can promote health on a global framework and safeguard the preservation of global economic stability.

The Greek Health System has not prioritized the adoption of evaluation standards as repeatedly stated by international economic organizations. This resistance can be explained by several factors: The public character of the system and the already shaped culture of the employees. Overspending in the health system. The absence of skilled administrative employees, who can anticipate the benefit from the application of evaluation systems. The weakness of middle and higher level public administration employees and the understanding of modern theories of strategic analysis and planning. The delay in the development of information technology infrastructure that can support the evaluation needs. All of the above factors have composed a complex that explain the behavior of the system which can be interpreted as resistance to development and to the application of evaluation measures. However, from 2000 and foreword, a positive tendency can be observed for the establishment and operation of control mechanisms and evaluation methodologies, especially after the increased pressure from the International Monetary Fund.

The scientific interest for the evaluation methodology in the health service industry can be observed through the increased bibliography. This PhD thesis suggests the application of models for the evaluation of efficiency and the effectiveness of quality of health services provided by the hospitals. This thesis attempts to cover the gaps of the Greek and international bibliography on properly formatted DEA models for the measurement of hospital performance, resolving the methodological problems as the calculation of overall and allocated efficiency. Concerning the dimension of "responsiveness", the thesis appraises the quality performance of services through the development of a new measurement scale with the use of structural equation models (SEM). The suggested structure is examined towards its reliability and validity and is tested on 498 general surgery patients from three public hospitals. Simultaneously, from the viewpoint of health policy, the relationship between the determinant factors and efficiency and the performance of service quality in the Greek health care delivery system are investigated.

This article is structured as follows. Section 2 includes the literature review on the fundamental dimensions of evaluation on efficiency and service quality. Section 3 explains the methodological

framework, while section 4 describes the results of the study. Finally, the concluding section underlines the main contribution of this research.

2. Performance Evaluation of Health Care Units

The evaluation of medical services can be analyzed in three distinguishable frameworks: efficiency, effectiveness and equity. Each concept constitutes a principle-goal of health delivery systems (Yfantopoulos, 2003). All of these principles compose the equation of social prosperity.

The evaluation of medical units is concentrated on the axis of operating efficiency and has the special weight on the study on hospital spending. Related analyses performed, added a series of new parameters recognizing the special content of the hospital organizational structure for the understanding of performance. In the recent years, evaluation is connected to another dimension, quality since the productive procedure of hospitals can be better interpreted through a wide framework of traditional economic thought.

The determining factor for the activation of scientific interest in hospital evaluation is the high cost level and high medical spending during 70s and 80s that has led to the need for their control. Governmental and EU pressures as soon as the claims from consumer bodies and insurance companies, activated a series of procedures for the development of performance measurement systems for health care delivery units.

Performance measures that are widely used for the evaluation of organizations are connected to the measurement of efficiency and effectiveness of the services provided, under the basic principle of equity. These measures do not compose a standardized methodology. The main axis of analysis stems from the goals and the interest of the stakeholders in health care provision (suppliers, paying bodies, patients, customers, etc). For instance, concerning patients, the evaluation criterion is the satisfaction of medical services. For doctors, performance can be concerned as the achievement of desired clinical outcomes. Respectively, for managers, performance can be interpreted through the prism of economic viability. Finally, for the payers, the context of performance coincides with customer satisfaction on the basis of cost minimization.

Another general category of performance evaluation, defines the level of activities of health sector and the benefits that accrue. This category refers to the performance of Health Care Systems of different countries and concentrates on the maximization of the health status of the population or the achievement of specific goals (Tandon et al., 2000). The concept of efficiency is associated to the

achievement of social desired goals in relation to the available resources. This means that each Health Care System defines a bundle of goals (financial, social) and efficiency is systematically evaluated for each goal. (Murray et al., 2000; Evans et al., 2000).

The measurement of performance of a health system is performed with the use of indicators that quantify the level of efficiency of the studied goals. For instance:

- The health status of the population and especially its distribution and its level
- The responsiveness of the system to the expectations of the population. This field incorporates the dimension of the interactions that are developed between suppliers and customers as soon as the dimension of customer satisfaction
- The equidistribution in terms of finance and coverage. Their significance is expressed through the protection of households from a sudden economic risk (income loss) that is created from the appearance of a disease (ethical risk) and the safeguard of a relative expense for the low income households in a level that does not exceed their capabilities, compared with higher level income households.

2.1 Efficiency Evaluation of Health Care Units

Efficiency concentrates to the relationship and the economic extensions of inputs and outputs.

The estimation of efficiency constitutes the first step to the evaluation of hospitals and comprises the basic means for the control and rational distribution of human and economic resources. The term corresponds to the utilization rate of the available resources for the satisfaction of the existing demand and the productivity of the medical unit.

In the first case, the content of the utilization of resources is associated to the evaluation of human resources utilization and the utilization of the available technology for the production of a unit of product. At a second level, efficiency is interpreted through productivity. The content of productivity in economic science is formed according to factors that participate to the production process. In the Health care delivery sector, productivity is studied on the level of production of a medical product through the use of system resources.

Health care efficiency lies in two categories: technical and allocative efficiency.

Technical efficiency is connected to the minimum quantity of inputs that takes place in health care.

Technical efficiency is the measurement tool introduced by Farell in 1957 aiming to bypass the disadvantages and problems that appear on other efficiency measurements. The technical efficiency evaluation interprets the performance of a firm comparing technical efficiency level with the productivity equation of a hypothetical ideal firm or organization (benchmark). Consequently, the special weight of the method is covered from the meaning of the efficient production function that is observed as a standard and expresses the potential inputs of a perfect firm to a given combination of inputs. From the viewpoint of health economists this method is the expression of the most efficient technological relationships of the productive factors. Concerning health, technical efficiency refers to the relationships of technological nature of inputs (capital, employment and medical equipments) and the health results. These results can be expressed in terms of intermediate output, as “number of patients subject to specific treatment”, “waiting time”, “treatment days” or even as a result of total usage (i.e. decrease of mortality rates, increase in life expectancy) (Palmer and Torgerson, 1999).

Allocative efficiency refers to the evaluation of interventions (i.e. intervention range for the treatment of different clinical problems) that are selected for the achievement of the best possible improvement of health results. In the framework of production, allocative efficiency refers to the selection of perfect quantities or input proportions, given their prices and their production technology. Facing interventions as inputs, their selection takes part according to the dimension of cost-effectiveness. This analysis concentrates on the selection between different technical efficient input combinations that are used for the production of a higher level of outcomes.

Technical and allocative efficiency together, give the principle of economic efficiency (overall efficiency). The abovementioned analysis combines the endogenous factors of the binary structure of efficiency and expands to the operational force for productive utilization.

The main explanation of economic efficiency focuses on the achievement of both goals, the technical and allocative efficiency. In the case of succeeding in one of the abovementioned goals, the organization operates in a different level from economic efficiency.

Iso-quantity curves, on which the inefficient hospitals are compared, are calculated from the data of the sample and according to Farell, there are two different methodologies for their construction.

- a. with the use of linear programming and especially the non-parametric lineal convex Iso-quantity curve, where the observed data

cannot lie left or below the curve. Economic efficiency is benchmarked with other organizations of the industry. Fundamental methodology is the Data Envelopment Analysis – DEA method.

- b. with the Cobb-Douglas function, that comprises the econometric (parametric) approach and the opposite exists. The observed data lie either left or below the curve. At the econometric approach, the economic efficiency is evaluated in relation to a pre-fixed level.

The basic differentiation of the DEA method from the econometric methods is the mathematical expression. The econometric models for the determination of the productive relationship, presuppose the definition of parametric functions and a series of economic models. On the contrary, DEA is a non-parametric method and utilizes fewer constraints. Input-output models for the evaluation of medical units, based on the above directions, have been proposed from several researchers. Scuffham et al. (1996) have selected input variables based on the composition of human resources and outputs on the annual number of admissions and the average length of stay per category. In Greece, DEA has been applied by Giokas (2000) in General and University hospitals. From the results of the study emerged that a decrease of 27% can be achieved in total costs of General hospitals and 16% in University hospitals. The special weight of modern studies overcomes the strict hospital environment and imports the thought national and international benchmarking. Especially, in the study of Retzlaff-Roberts et al. (2004), the application of DEA concerns the technical efficiency of resources consumed in health compared to the outputs in OECD countries.

In an attempt to interpret the factors that influence the efficiency aiming to compare hospital performance, several researchers conclude into five fundamental characteristics. (Carter et al., 1997; Eldenburg and Krishnan, 2003; Grosskopf et al., 2004):

- a. The type of ownership of the hospital influences the technical efficiency, the profit levels and costs (per unit of output). There is a significant difference in the operation of non-profit hospitals compared with hospitals that operate on a profit basis.
- b. The argumentation for the Health Care Delivery market and the present competitive circumstances is ambiguous, since it is believed that relative pressures can increase efficiency, whereas others have different beliefs.
- c. University hospitals as they are connected to education increase the probability of

consuming more resources in contrast with hospitals of other degrees.

- d. Illness severity is connected to the resources that are consumed during treatment. For instance, in incidents with high illness severity, the required treatment increases the costs and influences the efficiency of the hospital. Hence, an increase of patients that need acute treatment has a negative result to the efficiency of the hospital.
- e. The General or Specialized type of the hospital influences the cost per unit, that is increased in General hospitals, given the larger amount of admissions.
- f. Other crucial factors that influence the efficiency of hospitals are analyzed on the size and the bed occupancy, quality output, funding methods, structure and location.

2.2 *Measuring Perceived Quality of Health Services*

Quality in health care has acquired great notice, during the past few years. This fact corresponds to the rapid growth of this scientific business field, with the induction of international standards (i.e. ISO 9000), and with the presence of international attitudes for the safeguard of service quality. However, in the health sector, the development of quality to specific models and standards, concentrated in the field of customer satisfaction.

The research on customer satisfaction from the health services provided, becomes one of the most significant parts of hospital evaluation. The health services recipient represents an individual factor in the evaluation of quality in mathematic models. The measurement of customer satisfaction through the multidimensional definition of quality expresses to a significant degree the quality of health services. The development of quality measurement standards of hospital services is of great interest to the scientific community that aims to effective administration and the safeguard of health services.

? Donabedian (1980) defined health care quality as “the kind of care that is expected to maximize patients well being, if the problems and benefits connected to the care process are taken under consideration in each detail”. A high level of care quality is comprised from the scientific-technical part and the interpersonal dimension. Donabedian’s definition has a number of limitations as it is concentrated in the meaning of care and not on health services that includes a wide range of processes, part of which is care. Moreover, emphasis is given to the recipient of care, the patient and the satisfaction of his/her needs, excluding the family environment or the health

professionals opinion. The components of health, according to Donabedian (1988) are closely connected and develop interdependencies. These components are:

- a. The quality of technical care that is relative to the efficiency of health services and is interpreted as the ability to gain maximum improvement for patients' health that science, technology and employees can offer.
- b. Quality is the ability of interpersonal relationships, with special emphasis to the patient and the physician.
- c. The ability for the development of aesthetic characteristics as satisfaction from the health services provided, comfort and relaxation.

The research for the quality of health services has strong influences from the Marketing methodology, where quality is connected to forecasting and the satisfaction of customers expectations. The most widely used estimation and quality monitoring tool is SERVQUAL scale (Parasuraman et al., 1988).

This tool has been criticized from many authors, due to its generality and its methodological deficiencies. (Babakus and Boller, 1992). However, the preference of the researchers to this method can be observed from the amount of studies performed on the evaluation of service quality. Among them, there are studies conducted on customer satisfaction.

Transferring the SERVQUAL model in a hospital environment, one can observe the possibility of its application to the aspect of Avedis Donabedian that patients' perception about health services is a significant quality index. Technical care and interpersonal relationships, as a performance measurement for health professionals, influence quality dimensions as defined in Donabedian's model structure – process - result, due to the fact that health care is a service. Quality dimensions are defined to extend from the SERVQUAL scale that constitutes an interpretation measure for supplier behavior and the characteristics that contribute to patient perception for quality. However, Donabedian's directions can be partly interpreted in the framework of SERVQUAL. The structure includes the concrete elements, while the sum of other processes is included in the directions of SERVQUAL.

The critic of the SERVQUAL method lies on its methodological framework as soon as its deficiencies on creating a general and standardized service quality measure. (Babakus and Boller, 1992; Churchill et al., 1993; Cronin and Taylor, 1992).

The deficiencies of SERVQUAL method can be categorized in four basic categories: a) The use of

gaps (difference or gap scores), b) The lack of convergent validity, c) The ambiguous definition of the structure of expectations, d) The unstable dimensionality.

Cronin and Taylor (1992) suggested the rejection of expectation element from the scale that limits the use of performance measures. Arguing on the limited empirical and theoretical justification of SERVQUAL, they developed a new performance-based model. This alternative model is known as SERVPERF and is based on the measurement of customer perception for a service. Perception is a variable that cannot be observed directly. On a SEM model, perception could comprise a latent variable. In the framework of the development of a model for customer satisfaction measurement, the meaning of perception coincides to the tension of satisfaction as a quality phenomenon.

However, taking into consideration that patient perception for quality is not an obvious variable, the most suitable methodological approach for the perception and the factors that are developed from the casual relations can be considered as being SEM. Although, SEM has not been widely used either in the research for quality in general, or in health service quality, it incorporates as a model, includes the specific conventions of the sector. This means that, asymmetries in the Health Care Delivery sector do not allow the perfect application of the SERVQUAL and SERVPERF models. These models are customized into services that are mainly offered in competitive environments. The distinctiveness of hospital services and the flows that are created, is a significant part of a hospital system that influence the perception patient for quality. The significance of these processes are set aside by these models since the link (linear ¹, concave and convex ² and interactive ³), being the

¹ The linear relationship between two variables is represented with a straight line on the axes X and Y , and reflects the linear relationship of the correlation coefficient r_{XY} . When the relationship is positive, the increase of X results to an increase of Y .

² Concave and convex relationships are non linear quadratic relationships, where the value of a variable (i.e. Y) initially increases with the increase in the other (X) and then diminishes. In cubic relationships the direction (ascending or descending) can be altered more than one time.

³ Interactive relationships introduce the value of a third variable (Z) where the relationship of X and Y is modified in relation to Z . If the eagerness of the personnel in a hospital is expressed with Z and information-communication with X , the positive interaction between X and Y is expected to increase

complex result of relationships. Moreover, these models do not incorporate the creation of hypotheses for their control. The incorporation of SEM with the known models of customer satisfaction measurements develops a quality scale in a health care delivery system. Only a small part of publications, researches and structural equation models concern on the quality measurement (Lee et al., 2000; Brady et al. 2002), and the investigation of determining factors for customer satisfaction. (Miles and Naumann, 2004). This fact indicates the need for further investigation of the already existing scales and the development of new scales with the aim of SEM.

In addition, a significant factor for the quality of measurement outcomes is the control of validity and reliability of a model for health service quality measurement appreciates the value of the proposed model and constitutes a requirement for its acceptance and the application of research for the extraction of useful and reliable results-estimates.

3. Methodological framework

The methodological framework is developed on the basis of the two dimensions of evaluation that are handled by this PhD Thesis: the efficiency and the effectiveness of services. These dimensions, comprise the performance of a hospital, from the viewpoint of the management of the health system for the estimation of economic administration and human resources as well as from the viewpoint of the patient concerning his/her perception of health service quality.

The proposed model covers these two dimensions that are crossed towards the perspective of the efficient operation of the hospital. The centripetal processes of this perspective are Efficiency and Quality. The results of the research investigate specific sub-totals that express productive structures. In the field of efficiency, the measurements focus on inputs in relation with outputs, while in the field of quality the patient-centered orientation composes the research content and patients' opinion in several variables of hospital operation. In this thesis the dimension of the outcomes evaluation is not investigated (The quality of life after treatment). The specialization of the conceptual framework per dimension and the presentation of the suggested models to the dimensions for the evaluation of efficiency and quality of health services, follow.

The fundamental questions that are covered from the research and are attempted to be approached by the methodological framework are: a) the

the value of α that can represent the reliability, confidence level of the patients to the hospital.

development of appropriate efficiency measurement models, b) the investigation in the determining factors of efficiency, c) the development of the appropriate structure for the estimation of service quality, d) the investigation of the determining factors of service quality

The major methodology is: the method of Data Envelopment Analysis (DEA) and the method of Confirmatory Factor Analysis (CFA).

3.1 Linear programming and econometric models

For the investigation of efficiency of hospitals have been developed three input-output models based on relative literature and available data, with the aim of the most adequate representation of productive factors and the produced hospital product.

Mathematical models that are developed in the framework of efficiency evaluation of the hospitals are based on DEA methodology. For the calculation of technical efficiency in Model I (cost efficiency) and in Model II (production efficiency) of a hospital, has been solved under constant and variable economies of scale. Model I, includes inputs that describe the major characteristics of the hospital's economic operation and aims to investigate the relationship of the efficiency with the operation cost (cost efficiency). Model II, includes inputs that reflect the work of human resources and aims to investigate the relationship of the efficiency with production (production efficiency) (Athansopoulos, Gounaris, Sissouras, 1999): The third model (Model III), includes the total of the factors that determine the economic situation of the hospital and has been developed for the calculation of overall economic and allocative efficiency. The outputs of the developed models define in terms of quantity, the product of the main processes of the hospital: operation of pathological section, surgical section, outpatient visits, laboratories.

The mathematic model for the minimization of operating costs (Model III) belongs to the category of models of allocative efficiency. Its advantage lies on the development of the existing methodology for the coverage of the case where input prices are not available. More specifically, the suggested model adapts in the case of health systems where the redistribution of human resources and the limiting of procurement costs comprise basic strategic goal. Furthermore, the existence of a great **amount of prices** per input makes the calculation of allocative efficiency practically impossible. (Athansopoulos and Gounaris, 2001).

Model III

$$\text{Min} \left[\sum_{i \in D_a} p_i x_k + \sum_{i \in D_p} I_j c_{ij} \right],$$

$$\sum_j I_j y_{rj} \geq y_{rk},$$

$$\sum_j I_j x_{ij} - x_k = 0, \quad i \in D_a,$$

$$\sum_j I_j c_{ij} \leq x_k, \quad i \in D_p,$$

$$\sum_j I_j c_{ij} \leq x_k, \quad i \in D_p,$$

$$\sum_j I_j = 1,$$

$$I_j \geq 0, x_k > 0, i \in D_a$$

Where:

$j = \{1, \dots, n\}$, hospitals

$i = \{1, \dots, m\}$, inputs

x_{ij} : input quality i for hospital j

$r = \{1, \dots, s\}$ system outputs

y_{rj} : output quantity r for hospital j

The solution of the model yields information about the optimal cost mix of each hospital. The model yields estimates about the resource levels for the x_{ij} of input i of the hospital k for inputs with known prices ($p_i, i \in D_a$) and overall cost levels

$$\left[\sum_{i \in D_p} I_j c_{ij} \right]$$

For inputs with unknown prices ($i \in D_p$). The third input category ($i \in F$) is used as the guide for the formation of the frontier, while it does not take part to the objective function. The specific model does not make a one-dimensional estimation of the hospital's operations at the level of minimum cost for the inputs where prices are known but also when they are unknown, and provides additional information for potential profit from the production of more outputs or the utilization of fewer inputs that do not take part in the objective function. The overall efficiency can be calculated according to the formula:

$$O_{ik} = \frac{\sum_{i \in D_a} p_i x_{ik} + \sum_{i \in D_p} I_j c_{ij}}{\sum_{i \in D_{a,p}} [\text{observed cost of each input}]}$$

For the investigation of the determining factors TOBIT econometric models are being used.

TOBIT analysis for the overall (economic) efficiency includes the following variables:

Dependent:

Inefficiency indicator = (1/ overall efficiency indicator of Model ??)- 1

Independent:

Bed Occupancy

Average Length of Stay

Number of Medical Examinations at the outpatient clinic and emergency clinic as a fraction of the length of stay.

Number of operations as a fraction of Patients

Human Resource Productivity Indicators, IE = [(Patients) * t] / [(Personnel) * 365]

Average Doctor's Salary

Overtime work percentage to salaries as a fraction of patients

Dummy Variable of location (0=rural areas hospitals, 1=urban areas hospitals)

Dummy Variable of size (-1= large hospitals, 0=medium-sized hospitals, 1=small-sized hospitals)

3.2 Performance Models (SEM)

The second part of the research is developed in the framework of responsiveness of the hospital to the patient needs through the "satisfaction" with the application of the SERVPERF method. The research aims to the estimation of the health services performance in general surgery patients, based on satisfaction rate in three fundamental axes: a) human resources, b) process flows, c) physical evidence.

The research framework includes all the stages for the valid and reliable development of a measurement instrument and its application in the hospitals of the Greek National Health Care System as defined from the bibliography (Zeithalm and Bitner, 1996).

The research framework constitutes a combination of preview into three dimensions: a) the investigation of the relationships between factors (dependent and independent variables). b) the investigation of factor analysis (EFA) for the detection of the efficiency dimensions, and c) the confirmatory factor analysis (CFA) for the definition of the final model for measuring service efficiency. Initially, an appraisal of the data that shape the performance dimensions, has been attempted, ensuring the validity of the contents and

the relatively reliable measurement of quality performance. Further, for the parsimony (limited number of factors) and the precision (indices, factors and weights) it is suggested a measurement model, through the use of SEM. According to the model, the accurate dimensions are measured with validity and reliability, through corresponding indices and the efficiency characteristics are determined for services and general surgery patients.

Taking into consideration the weakness of incorporating all of the characteristics of services quality efficiency into one single model, the present research develops a flexible model (parsimonious set of measures) that includes measurement indicators that estimate critical service characteristics and adequately describe the feature of quality efficiency. The development of the scale follows a process of four phases as suggested in literature. The process has been developed from Churchill (1979) and Sethi and King (1994). The four phases included in the research are: a) development of conceptual framework and initial measurement indices, conceptual redefinition and customization of indices, c) data gathering, and d) data analysis and validity control of the measurement (Weidong and Gwanhoo, 2005).

The final model suggests new dimensions of service performance differentiated from the already existing SERVQUAL scales and approaches the real structure that is concerned from the patient as being significant, given that is differentiated from respective structures of quality performance measures of other kind of services.

SERVQUAL scale defines the relative weights with the use of Exploratory Factor Analysis. SEM (structural equation models) method is considered as the most appropriate for the definition of critical estimation factors of service performance, given that a) the relationships between latent and observed variables (indices and factors) are better charted and controlled with the use of structural regressions b) the measurement error is better calculated, and c) the reliability and validity are statistically estimated with specific indicators (Spanos E.Y. and Lioukas S. 2001).

Therefore the aim of the research is structured in two quests:

- a. the development of a valid and reliable measurement instrument of hospital service quality performance concentrated on the operated patients, and
- b. the extraction of conclusions on the behavior of patients (satisfaction) on the quality of health services used in the Greek Public Hospitals of the research.

The above mentioned research questions compose a frame of research sub-questions:

- a. Which are the dimensions for quality of health service provided?
- b. Which are the measurement indices that construct the performance dimensions discussed?
- c. How performance is connected to the loyalty, demographics and case mix of a hospital?
- d. How is the reliability dimension measured in the case of hospital services?
- e. Can generic questionnaires be used in the case of pathological and surgical patients?
- f. What are the factors that affect the estimation of patients for the perceived service quality?

4. Research and Empirical Results

The methodological framework of this study includes the results of the controls for the study hypotheses that concern efficiency and responsiveness in health care services of the hospitals examined. The present thesis presents specific methodological approach for the estimation of hospital performance. It aims in the development of models for the estimation of two critical factors of evaluation that concern on the estimated or perceived efficiency and the quality of health care delivery. The application of the methodology allows not only to control the validity and reliability of the models, but the investigation in their practical application for the extraction of helpful conclusions for the improvement of the hospitals of the Greek NHS.

This work includes methodologies for the measurement of efficiency and the health service quality that for the first time are applied in the Greek NHS. The appropriateness of the suggested models for the utilization and valid estimation of the above mentioned parameters of hospital evaluation is proved, taking into consideration the limitations and the special characteristics of the Greek NHS. Furthermore, the statistical significance of the determining factors of efficiency and health service quality of the Greek hospitals is investigated.

Concerning efficiency, the estimations are expanded on all of its partial dimensions, the technical, the allocative, the overall and the scale efficiency. Efficiency has been applied in systematic models that contain financial and human resources. The hospital product is defined by quantity, due to the lack of appropriate information in national level. For the estimation of the overall and allocative efficiency, a complete model of

economic resources has been suggested. The estimation of efficiency leads to a the saving of resources, through their decrease or redistribution. From the result analysis, it can be observed a connection between efficiency and the size of the hospital, its location, the case mix, illness severity, bed coverage, human resource productivity, doctors' wages etc.

The estimation of efficiency indicators and the investigation of the determining factors contribute to the determination of deviation causes from the goals and the policy making for improvement. The quantification of goals and the highlighting of the causes against efficiency due to inefficient resource allocation and the operation above the level of minimum costs, forecast a complete picture for the future progress of secondary and tertiary health care delivery units.

From a close examination of the system, it can be observed that financial and human resources are concentrated in urban centers that do not use their resources efficiently. Based on the existing constraints that stem from the public character of the system, the redistribution of financial and human resources among the hospitals is thought of as the best possible solution. Simultaneously, the rational allocation of resources through price control and the quantities of consumables, will improve the efficiency of the system and will minimize deficit.

NHS hospitals do not operate on the maximum of their capacity and indicate economies of scale. The scale efficiency is connected to the location and the size of the hospital.

The role of the hospital is differentiated from its location and its size, factors that lead to the creation of economic inefficiencies and the need for the redistribution of the service mix. Small hospitals provide primary medical services and have a limited secondary role. Medium sized hospitals usually provide secondary health services, while the large hospitals provide the whole range of services, including tertiary services. Greek NHS hospitals have better provide a different case mix. For this reason, it is suggested the division of the product based on the size and the location of the hospital. The safeguard of the service of the best possible range of incidents based on the needs of the population advances the improvement of hospitals efficiency.

The case of overall efficiency, the interest moves to the deviation of the hospital operation from the minimum costs. For the calculation of economic overall efficiency a complete model has been developed that includes all the categories of economic resources. The methodological problem can be resolved with the development of a customized model of linear programming.

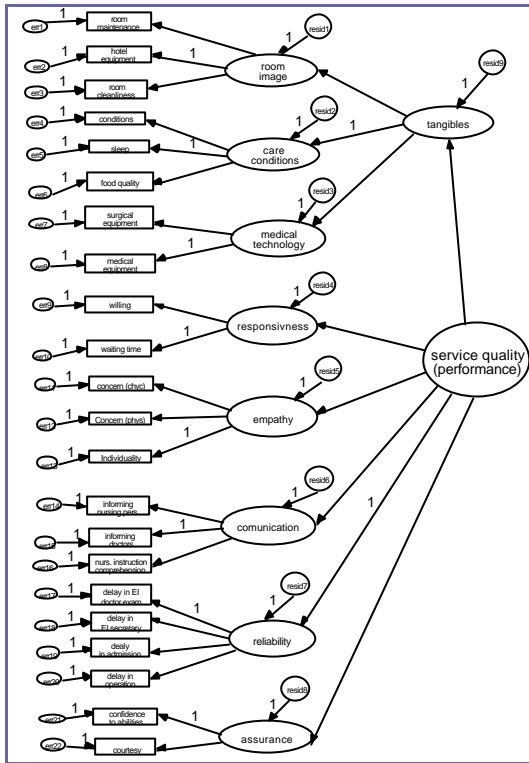
Controlled inputs with known prices in the model constitute the categories of human resources, while other inputs participate as overall cost in the equation of cost minimization.

Overtime work, mainly of medical staff, constitutes a critical factor in the calculation of the overall efficiency, given that it differentiates the prices (from the mean). Non rational administration of overtime work is the cause of low economic efficiency. Hospitals with low demand are rewarded at the same rates with hospitals with high demand. The improvement of overall efficiency stems from the redistribution of resources

In the measurement of health service quality, there have been suggested scales on the base of SERVQUAL. In the present thesis, it can be concluded the weakness of the above scale to provide reliable and valid results for health services. The measurement before and after the provision of the service, increases the probability of measurement error. In the case of health services, the estimation of expectations is problematic, given the negative psychological state of the patient, high expectations emerged and the measurement can be conducted with difficulty, since the gathering of the questionnaire should be performed before the admission to the hospital. The alternative SERVPERF method, with the direct performance measurement, through the level of satisfaction can be thought of as being the most appropriate. Simultaneously, the developed scales are not checked concerning their structures. The structure of the measurement changes according to service characteristics. The different types of hospital patients (i.e. pathological, surgical) can use different distribution chains (flows).

The present PhD thesis investigates the measurement of service quality of surgical department patients and suggests concrete structure for its measurement. The structure is performed with the use of a structural equation model (SEM). The structure is third order. The observed variables are interpreted from eight first order factors: room image, care conditions, medical technology, responsiveness, empathy, communication with the medical staff, reliability and the assurance provided by the staff. The three first order factors can be interpreted by second order factors and constitute the tangible factors. The abovementioned second order factor and the rest five first class factors can be interpreted by a third order factor that express the performance of the system to the health care service.

The conceptual framework for the measurement of service quality performance is illustrated below:



The composition of the scale's structure is focused on the hospital services and especially on surgical patients. The measurement indicators reflect the variable that adequately interprets the variation. The model is governed by the principle of parsimony and is comprised from twenty two indicators. The statistical control indicates reliability in the measurement, so as in the structure, as in the extracted variation and validity of the content, the structure and the differentiation.

5. Conclusions

In correspondence to the evaluation of health care systems, the estimation of hospital performance can be observed in the dimensions of efficiency, effectiveness and equity of access. The hospitals constitute the most expensive part of the NHS, employing the greater percentage of health professionals and show high consumption of valuable resources. The result of the ever increasing hospital spending in many health systems was the development and application of cost control policies. The eminence of scientifically healthy policies is connected to the evaluation of hospital units (Li and Benton, 1995) and empirical analysis.

The evaluation of the quality dimension lacks both in subjective and objective levels. The isolated approaches and researches of customer satisfaction performed by several bodies, signal the weakness of generalization and complex presentation of the existing situation, given that a specific conceptual

estimation framework of service and output quality is presupposed.

From the preview of national and international literature, can be seen the scientific interest of the efficiency measurement with the use of DEA. The present thesis, attempts to cover the literature gap that is observed in the application of DEA in Greece, taking into consideration that it is introduced in its first research application of the hospital units of the Greek NHS (Gounaris et al., 2000).

In the field of technical efficiency, the study is developed to the validity control of two models that include financial and human resources as inputs. Further, their appropriateness is being checked, the relationship between them is investigated and finally, efficiency is interpreted through its determining factors.

Concerning the economic-overall efficiency and the allocative efficiency, appropriate linear programming DEA models have been developed, methodologically resolving the problem of the supply price definition at hospital units. Simultaneously, the economic-overall efficiency is interpreted based on the determining factors.

International literature on health policy, thoroughly investigates the determining factors that influence efficiency, taking into consideration the comparison of the characteristics among the countries. (WHO, 2000; Lauer et al., 2001; and Duckett and Jackson, 2000; Hughes 2000;). In the case of the general hospitals of the Greek NHS, the following factors of efficiency have been detected: a) location, b) hospital size, C) illness severity, d) bed coverage, e) case mix (primary versus secondary services, f) the surgical role (operations to days of treatment), g) productivity of human resources, and h) health professional salaries.

Drawing data of methodological weaknesses of the existing scales, in the present research it is suggested a new reliable and valid measurement scale that is structured on the base of a theoretical frame of psychometric estimation of the service performance. The performance factor is interpreted through the structure of a third order confirmatory model, while it is comprised from twenty two measurement indices. The measurement indices describe the distribution characteristics of the service and compose the respective latent variables. The significance of those factors is concentrated on the understanding and interpretation of the patient satisfaction on the specific service features.

The investigation of the determining factors of the service quality comprised significant research target and promotes the development of specific guidelines for health services, in relation to the future patient preferences.

At the level of quality research, the suggested model of quality service measurement comprises the first developed structural equation model (SEM) in hospital services that uses patient satisfaction as the tool for evaluation. Simultaneously, it incorporates for the first application in Greece the method SERVPERF and the direct measurement of patient perception. The already published studies involve measurement of patient satisfaction, without the development of specific theoretical frame. The specific model has been developed in the base of a specific theoretical structure, that has been checked for its reliability and its validity.

Finally, the present PhD thesis suggests the application of specific models of efficiency evaluation and the effectiveness of the hospital units, that can significantly contribute to the development of health policy. The saving of financial resources and the assurance of quality at the delivery of hospital services constitutes a goal of any health care system. The adoption of the directions of the international organizations on the evaluation of health system, forms the starting point for the conscious decision making on new productive and investing activities.

6. References

- Athansopoulos A., Gounaris C, Sissouras A. (1999). A descriptive assessment of the production and cost efficiency of general hospitals in Greece. *Health Care Management Science*; 2: 97-106
- Athansopoulos A., Gounaris C. (2001). Assessing the technical and allocative efficiency of hospital operations in Greece and its resource allocation implications. *European Journal of Operational Research*;133:416-431
- Babakus E., and Boller G.W. (1992). An empirical assessment of the SERVQUAL scale. *Journal of Business Research*;24:253-68
- Brady M., Cronin J., Brand R. (2002). Performance-only measurement of service quality:a replication and extension. *Journal of Business Research*; 55: 17-31
- Carter R.B., Massa L.J, and Power M.L. (1997). An examination of the efficiency of proprietary hospital versus non-proprietary hospital ownership structures. *Journal of Accounting and Public Policy*;16:63-87
- Churchill G.A. (1979). A paradigm for developing better measures of marketing constructs. *Journal of Marketing Research*;16(1): 64-73
- Churchill G.A., Brown T.J., and Peter P. (1993). Improving the measurement of service quality. *Journal of Retailing*;69(1):127-139
- Cronin J.J., and Taylor S.A. (1992). Measuring service quality: a reexamination and extension. *Journal of Marketing*;56:55-68
- Donabedian A. (1980). Explorations in Quality Assessment and Monitoring. Vol I, The Definitions of Quality and Approaches to Its Assessment. Ann Arbor, Michigan: Health Administration Press
- Donabedian A. (1988). The Quality of Care. How Can It Be Assessed? In: *Journal of the American Medical Association*; 260(1743-1748)
- Duckett, S.J. and Jackson, T.J. (2000). The new health insurance rebate: an inefficient way of assisting public hospitals. *Medical Journal of Australia*; 172: 439–442.
- Eldenburg L., and Krishnan R. (2003). Public versus private governance: A study of incentives and operational performance. *Journal of Accounting and Economics*;35:377-404
- Evans D., Tandon A., and Murray C., and Lauer J. (2000). The comparative efficiency of national health systems in producing health: an analysis of 191 countries. World Health Organization, Global Programme on Evidence for Health Policy Discussion Paper Series: No. 29
- Farell M.J. (1957). The measurement of productive efficiency. *Journal of Royal Statistical Society*;120, Part III:254-290
- Giokas D. (2000). Greek hospitals: how well their resources are used. *Omega*;29:73-83
- Gounaris C., Sissouras A., Athansopoulos A., "The Problem of Efficiency Measurement of the General Hospitals in Greece". *Equity, Efficiency and Effectiveness in Health services*. (Editor Dolgeras A. – Kyriopoulos J.). Themelio Publications. 2000. Athens
- Grosskopf S., Margaritis D., and Valdmanis V. (2004). Competitive effects on teaching hospitals. *European Journal of Operational Research*;154:515-525
- Hughes, A. and Yaisawarnng, S. (2000). Operating environment adjusted efficiency of acute care public hospitals in New South Wales, in *Proceedings of the 2000 International DEA Symposium, Ipswich, 3–5 July, 2000, University of Queensland*.

- Lauer J.A., Tandon A., Evans D.B., and Murray C.J.L. (2001). Determinants of Health System Performance, Global Program on Evidence for Health Policy Working Paper, World Health Organization. Geneva
- Lee H. Delene. L.M., Bunda M.A. Kim C. (2000). Methods of Measuring Health Care Service Quality. *Journal of Business Research*; 48:233-246.
- Li L. X., Benton W.C. (1995). Performance Measurement Criteria in Health Care Organizations: Review and Future research directions. *European Journal of Operational Research*;93:449 - 468.
- Miles J.A. and Naumann S.E.(2004). The English Patient: A model of patient perceptions of triage in an Urgent Care Department in England. *Management*; 7(1):1-11
- Murray C., Frenk J., Tandon A. et al. (2000). Overall health system achievement for 191 countries. World Health Organization, Global Programme on Evidence for Health Policy Discussion Paper: No. 28
- Palmer S., and Torgerson D.J. (1999). Definitions of efficiency. *British Medical Journal*;318:1136
- Parasuraman A., Zeithaml V.A. and Berry L.L. (1988). SERVQUAL: A Multiple-Item Scale for Measuring Consumer Perceptions of Service Quality. *Journal of Retailing*;64(1):12-40
- Retzlaff-Roberts D., Chang C.F., and Rubin R.M. (2004). Technical efficiency in the use of health care resources: a comparison of OECD countries. *Health Policy*;69:55-72
- Scuffham P.A., Devlin N.J., and Jaforullah M. (1996). The structure of costs and production in New Zealand public hospitals: an application of the transcendental logarithmic variable cost function. *Applied Economics*;28:75-85
- Sethi V.,King W.R.(1994). Development of measures to access the extent to which an information technology application provides a competitive advantage. *Management Science* ;40(12):1601-1627
- Spanos E.Y. and Lioukas S. (2001). An examination into the casual logic of rent generation: Contrasting Porter's competitive strategy framework and the resource based perspective. *Strategic Management Journal*, 22:907-934
- Sudit E.F. (1996). Effectiveness, Quality and Efficiency: a management oriented approach. Kluwer Academic Publishers. Boston
- Tandon A., Murray C., Lauer J., and Evans D. (2000). Measuring overall health system performance for 191 countries. World Health Organization, GPE Discussion Paper Series: No. 30
- Weidong X. Gwanhoo L. (2005). Complexity of Information Systems. *Development Projects: Conceptualization and Measurement Development. Journal of Marketing Information Systems*; 22(1):45-83
- World Health Organization (WHO). (2000). Health Systems: Improving Performance. Geneva.
- Yfantopoulos, I. (2003). Health Economics. Theory and Policy. Athens; se?. 83-88
- Zeithalm V.A. and Bitner M.J.(1996). McGraw-Hill companies Inc.

