

## Evaluation of the Efficiency of Economic and Medical Activities in Romanian Hospitals

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### Abstract

Medical work in public hospitals in Romania has a double subordination: strictly speaking the Health Care Directives is coordinated by the Ministry of Health and in terms of economics the activity is funded by the National Health Insurance through its county subsidiaries. This separation of the two fields, medical and economical, has generated problems in many cases of hospital activity in our country

Economic and financial parameters of 39 hospitals were extracted from their economic balance sheets for 2009-2010 and were entered into a multi-criteria analysis to generate an overall score. Then this was checked for possible relationships with the hospitals' competence (established by the Ministry of Health with the help of a national program).

The aim of this study was to assess the relationship between hospital medical competency and economical parameters in the Romanian Health Care System. The lack of correlation of the economic and financial parameters with the health parameters observed by our study reflects the current problems in the Romanian health system, where the impossibility of generating practical management solutions is the consequence of multiple subordination of hospital units, separate assessment of competence and administrative skills.

**Keywords:** Multiple criteria methods; Competence; Management.

### Introduction

Medical work in public hospitals in Romania has a double subordination: strictly speaking the Health Care Directives is coordinated by the Ministry of Health and in terms of economics the activity is funded by the National Health Insurance through its county subsidiaries. This separation of the two fields, medical and economical, has generated problems in many cases of hospital activity in our country.

Funding is a major factor which strongly impacts the long term usage in health system and creates favorable conditions to meet the population needs, health care quality demands and appropriate volume [1]. The correct and timely application of regulatory leverages of the financing system allows increasing the people equitable access to health services ensures rational and efficient use of resources and promotes positive motivation of health care providers.

Although the system's financial stability has increased together with the introduction of compulsory health insurance and has improved public access to basic health services, there is a number of problems not yet solved [2]. Thus, a substantial share of the population remains outside the system of compulsory health insurance, especially among self-employed persons with low income and predominantly living in rural areas.

The lack of competitiveness in the procurement of services and rigidity of payment providers of mandatory health insurance funds, that are not taking into account regional differences and socio-demographic structure, encourages artificial equality, disproportionate distribution of providers with the duplication of functions, which increases the financial burden on the budget and public health funds.

No real mechanisms were implemented to increase efficiency, both technical and management of funds, in the health system, nor were there implemented ways of increasing provider's motivation in performance development. Regarding medical institutions' rights, they remain limited towards managing their own resources and means obtained for a long and durable development. There are still several discrepancies between management functions with decision rights and their delegated responsibilities. The lack of rules of resource usage, imperfect mechanism for calculating health care costs and inefficient bargaining process due to rigid taxes undermines the financial security of health care providers and the motivation of health care staff to act honestly [2].

The involvement of local administration authorities in the local medical infrastructure development is insignificant.

The aim of this study was to assess the relationship between hospital medical competency and economical parameters in the Romanian Health Care System.

## **Material and Method**

The study sample consists of 39 medical units (hospitals) from various regions of the country, having a variety of medical activities. Data collection was possible using the annual balance sheets and public reports: management performance indicators were selected for 2008 - 2010 according to the hospitals websites (9 of the 39 had made their reports public), the other being obtained from upper management structures of these units [3].

Multicriteria analysis methods allow a rigorous classification of medical units by evaluating management performance indicators and they establish a more suitable validation method for their activities than merely quantitative criteria used in health care in Romania at this point [4,5]. Using these methods allows both general and specific analysis: comparisons between units of the same profile or comparisons of the same units in different years for their dynamic evaluation of managerial performances.

Data has been collected in tables or text files and was analyzed for content. The common parameters of most of the units in question have been selected for analysis and have been inserted in an Excel worksheet. Using Microsoft Excel, we implemented an algorithm for multiple criteria analysis which allows to properly quantifying the level of achievement in financial indicators of an institution [3, 6].

During this time, we have collected results from Ministry of Health's evaluation of the health units' competence, a system that classifies hospitals in five categories:

- Class 1 hospitals are the ones with the highest level of competence. It consists of hospitals which can provide health care at regional level, serving the county's population from its territorial and administrative area, but also from others counties. The medical units belonging to this category must have state of the art equipment and qualified staff and to provide highly complex medical services.
- Class 2 hospitals have a high level of competence and will serve the county's population according to its territorial and administrative area, and also from its neighboring counties. These units have high quality equipment and human resources and provide medical services with a high level of complexity.

- Class 3 hospitals have an average competence level. These medical facilities will serve the population from the county's areas, being equipped for handling medical cases of average level complexity.
- Class 4 hospitals have a basic level of competence and will serve the population of a limited administrative area. The level of complexity in handling medical cases is low one.
- Class 5 hospitals, the last one, and offers health care services in dealing with chronic diseases. They have medical services that focus on one area of expertise or palliative services.

From medical point of view, the competence evaluation of hospitals has been correlated using different regression methods without previous results, in order to evaluate the existence of a link between the wealth care quality and financial-economical management quality of those specific units [7-9].

### Statistical Analysis

Quantitative data was presented numerically by mean, standard deviation, minimum, maximum standard error, 95% confidence interval bounds, and graphically as error bar plots. Normality of data was assessed with quantile-quantile plots. Comparisons of multiple groups were done with ANOVA. Comparisons of two groups were done with t-test with equal or unequal variances assumptions based on variance tests. Equality of variances was assessed with Levene test. Subgroup analyses were corrected for alpha error inflation. Relationship between quantitative variables was assessed with scatterplots and Spearman correlation coefficient with its statistical significance test. The minimum effect size to be observed with an alfa of 0.05, and a power of 80%, was computed for the correlation coefficient (using exact tests) and for the tests. For all tests the level of significance chosen was 0.05, and two tailed p values were used.

The data was processed statistically using R environment for statistical computing and graphics, version 1.13.1 [10]. The sensitivity power analysis calculation was done with G\*Power 3.1.2 [11].

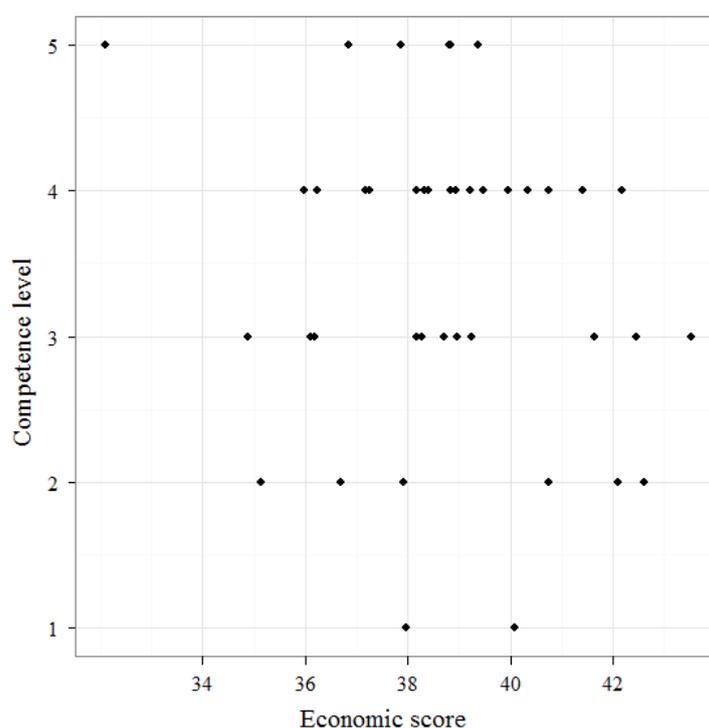
### Results

The data obtained by statistical analysis using the five levels of competence in which the hospitals have been classified is presented in Table 1.

**Table 1.** Distributions of economic mean scores value for each level of competence for the hospitals analyzed

Competence	Number of hospitals	Scores' mean	Standard deviation	Standard error	95% CI for the mean (Bound)		Minimum	Maximum
					Lower	Upper		
1	2	39.038	1.498	1.059	25.580	52.496	37.979	40.097
2	8	38.863	2.714	0.960	36.594	41.132	35.127	42.607
3	11	38.924	2.718	0.820	37.098	40.750	34.892	43.525
4	16	38.916	1.761	0.440	37.978	39.854	35.986	42.172
5	4	37.034	3.348	1.674	31.707	42.362	32.098	39.360
Total	41	38.730	2.349	0.367	37.989	39.471	32.098	43.525

The comparison drawn between economic efficiency scores and competence for all hospital units (globally considering all units), Figure 1, showed that there was no correlation between these values (Spearman correlation coefficient was -0.052 with a probability test significance of 0.747). The minimum effect size (correlation coefficient) that our study might have observed for an alfa of 0.05 and power of 80% would have been 0.42.



**Figure 1.** Diagram of distribution of economic efficiency scores compared to those for medical competence in the hospitals reviewed

Due to the fact that in this analysis we did not obtain statistically significant results in order to account for this finding, we proceeded in reducing the distribution complexity by reducing the number of categories and by applying an analysis of ANOVA variance. Reducing the number of categories has done in two methods:

- the union of higher competences (1 and 2), thus to generate a "super-category" of hospitals with high skills that can be compared with other hospitals, resulting in four distinct categories (1 and 2, 3,4,5),
- the union of higher competences (1.2 and 3) used to generate a "super-category" of hospitals with high skilled and the union of those with low skills (4 and 5).

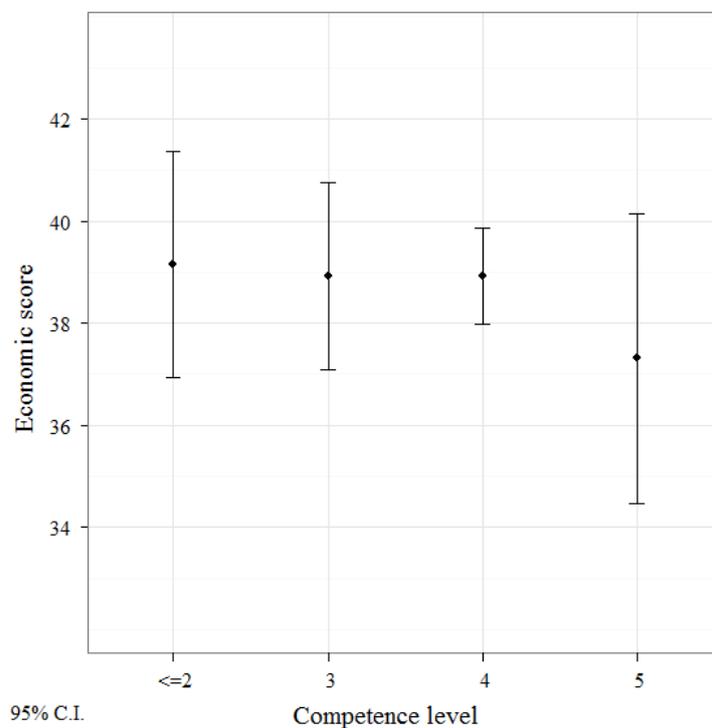
Table 2 presents the results of descriptive statistical analysis results of the 4 groups by linking combining skills of Level 1 and 2, this table reflects the very close values of the average economic scores scores which clash in terms of distribution given the relatively important standard deviations.

**Table 2.** Distribution of economic scores' mean values for each competence level of hospitals analyzed (skills level 1 and 2 were combined)

Competence	Number of hospitals	Scores' mean	Standard deviation	Standard error	95% CI for the mean (bound)		Minimum	Maximum
					Lower	Upper		
<=2	10	38.898	2.45	0.77	37.148	40.648	35.127	42.607
3	11	38.924	2.72	0.82	37.098	40.750	34.892	43.525
4	16	38.916	1.76	0.44	37.978	39.854	35.986	42.172
5	4	37.034	3.35	1.67	31.707	42.362	32.098	39.360
Total	41	38.730	2.35	0.37	37.989	39.471	32.098	43.525

The analysis of ANOVA variance proved by Fischer's score of 0.756 (3, 37 d.l.) and a probability of 0.526 in the ANOVA test that there are no statistically significant differences

between the economic mean scores regarding hospital competence. The minimum effect size  $f$  that our study might have observed for an  $\alpha$  of 0.05 and power of 80% would have been 0.54.



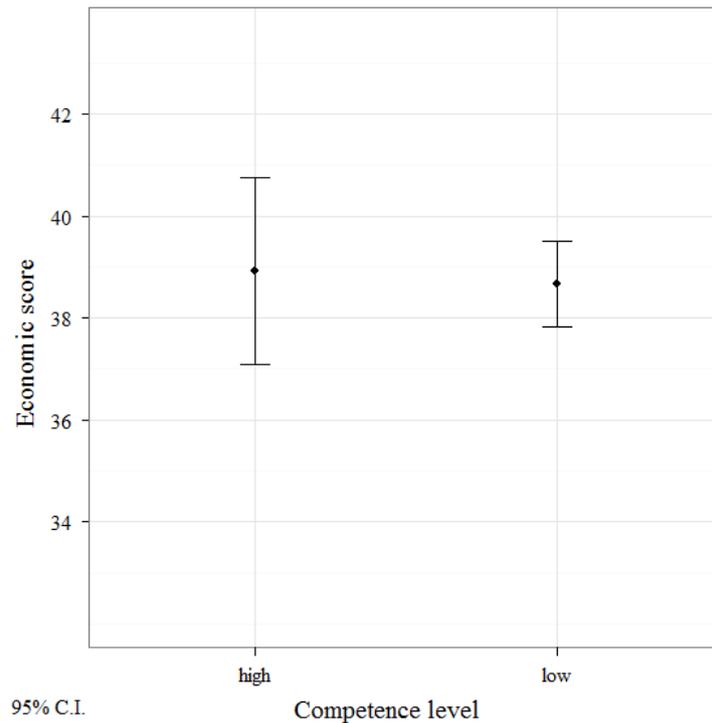
**Figure 2.** Distribution diagram of efficiency economic scores opposed to the medical competence in hospitals analyzed for the 4 categories of general competence

Table 3 presents the descriptive statistical analysis results of the 4 groups by linking skills into two classes: competence level 1, 2 and 3 were combined to form a high competence group, while 4 and 5 were combined to form a low competence group. The results reflect the very close values of the average economic scores which overlap in terms of distribution given the relatively important standard deviations.

**Table 3.** Distribution of economic mean scores' values for each competence level of analyzed hospitals (1, 2 and 3-level skills were combined in scores 1, while 4 and 5 were combined to form score 2)

Reunited competence groups	Number of hospitals	Mean	Standard deviation	Standard error
high	21	38.912	2.527	0.552
low	20	38.540	2.194	0.491

For comparing the means of two resulting groups a Student test was used, showing between the two competence categories there is no statistically significant difference viewed as economic scores ( $p=0.92$ ), Figure 3.



**Figure 3.** Distribution diagram of economic efficiency scores to the medical competence in hospitals analyzed for the two competence generated categories

## Discussion

The study showed a lack of correlation of the economic parameters with the health care ones. The post hoc calculations showed the study was powered to observe a relatively medium correlation coefficient and relative large effect sizes for ANOVA. The centrality descriptive statistics were almost identical between groups. The scatterplot showed no systematic tendencies. The group of hospitals assessed was diverse, the competence levels relatively balanced, especially after the grouping in less classes. These observations favor the opinion of no relationship between competence levels and economic scores, without statistically proving them

This lack of correlation reflects the current problems in the Romanian health system, where the multiple subordination of hospital units, separate assessment of competence and administrative capacity leads to the practical impossibility to generate management solutions.

The efficient exercise of management is an important prerequisite in the provision of quality health services to proper ensure the health system with qualified medical staff and modern equipment. An appropriate management of the system allows needed financial resources mobilization, allows applying the mechanisms of identifying priorities and ensures rational and efficient use of available resources to achieve desired results [12].

Strategic planning, which is the basic premise in the efficient management process, requires information from a solid monitoring and evaluation system [13], which currently is not yet sufficiently developed to present the necessary data flow. Existing monitoring and evaluation systems operate with data generated and collected by several operating institutions, which lack adequate analytical capacity to turn data into relevant and reliable evidence to influence the decision process.

## **Conflict of Interest**

The authors declare that they have no conflict of interest.

## **References**

1. Richardson J, McKie J. Economic evaluation of services for a National Health scheme: the case for a fairness-based framework. *J Health Econ* 2007;26(4):785-99.
2. Tan A, Freeman JL, Freeman DH Jr. Evaluating health care performance: strengths and limitations of multilevel analysis. *Biom J* 2007;49(5):707-18.
3. Susca P, Drugan T, Iancu M, Urda A, Achimaș A. Evaluarea performanțelor și costurilor în sistemul de sănătate prin metode multicriteriale. *Clujul Medical* 2012;85(1):49-53.
4. Cimoca G. Aplicații ale unor metode de decizie multicriterială și multiatribut. Comunicare privată, Cluj-Napoca, 2000.
5. Istrate D, Țigan Ș, Achimaș A, Coman I, Drugan T. About Some Multiple Criteria Ranking Methods with Multiple Weighting and Random Evaluations. Application in the Evaluation and Ranking Medical Offices. *Appl Med Inform* 2007;20(1-2):73-83.
6. Sandea C, Achimaș A, Coman I, Drugan T, Țigan S. Multiple Criteria Decision Making in Evaluating and Ranking Medical Process Models. *Appl Med Inform* 2007;20(1-2):56-65.
7. Stancu-Minasian IM. Stochastic Programming with Multiple Objective Functions. Editura Academiei & D. Reidel Publishing Company; București & Dordrecht, Boston, Lancaster; 1984.
8. Hwang C-L, Yoon K. Multiple Attribute Decision Making. New York & Berlin-Heidelberg: Springer Verlag; 1981.
9. Țigan Ș, Achimaș A, Coman I, Drugan T, Iacob E. Decizii multifactoriale. Cluj-Napoca: SRIMA; 2001.
10. R Development Core Team. R: A Language and Environment for Statistical Computing. 4th Ed. Vienna, Austria: R Foundation for Statistical Computing; 2004. [Accessed November 2011] Available from: URL <http://www.R-project.org>.
11. Faul F, Erdfelder E, Lang AG, Buchner A. G\*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods* 2007;39:175-91.
12. Vlădescu C. Sănătate publică și management sanitar. Bucuresti: Cartea Universitară; 2004.
13. Marcu MG. Sănătate publică și management sanitar. Bucuresti: Editura Universitară "Carol Davila"; 2003.