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Influence of Non-financial Factors on Cost-efficiency of a General Hospital in Slovenia

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Abstract

BACKGROUND: Hospitals account for the largest share of health-care expenditures, which are mainly financed by public funds. In health care, it is of paramount importance that the management focuses not on reducing costs at the expense of patient health, but on improving the value and thus the health-care outcomes. In addition to the economic factors used to determine a hospital's cost-efficiency, non-economic or soft factors should be considered.

AIM: The aim of this study was to elucidate the influence of non-financial factors on a hospital's cost-efficiency.

METHOD: An online survey was conducted among the staff at the Novo mesto General Hospital (n = 150) in 2021. Data were analyzed using factor analysis and multiple linear regression as statistical methods.

RESULTS: Self-assessment of cost-efficiency was influenced by communication in the hospital, satisfaction, and cooperation within the multidisciplinary team, willingness of employees to innovate, cooperation with external providers, and evaluation of the quality of health care. Communication with the patient had the greatest impact, followed by communication with external providers and communication with the management.

CONCLUSION: To reduce costs while maintaining or even improving health-care outcomes, communication with patients is extremely important.

Introduction

Health-care spending is an important element of any developed country's government budget. The most common way to measure spending is a percentage of gross domestic product (GDP) spent on health care [1]. In developed countries, spending ranges on average between 7% and 11% of GDP. The latest available Organisation for Economic Co-operation and Development (OECD) data [2] show that the highest share of GDP for health care is spent in Germany (12.5%), France (12.4%), Austria (11.5%), Sweden (11.4%), and the Netherlands (11.2%); in Hungary (6.3%), Romania (5.7%), and Luxembourg (5.4%), these shares are the lowest. In Slovenia, the health-care spending is higher (9.7%) than the average of OECD countries. The amount of funds for health care requires an analysis of their effective use.

In general, health-care systems typically seek to improve health outcomes through the provision of health-care services. Measuring the performance of health-care systems is important to determine whether resources are being used to achieve the best value for money. However, inefficiency is a widespread problem in health-care systems. The World Health Organization estimates that on average, 20–40% of all global health spending is spent inefficiently [1].

In health care, it is not so important to focus on reducing costs at the expense of health-care outcomes, but it is much more important to improve the value that health-care professionals can provide to their patients. Current studies on health-care cost analysis focus on input goods and economic indicators. However, some studies conclude that cost-efficiency is influenced not only by economic factors, but also by soft factors such as communication, the relationship of the management with employees, and employee satisfaction [3], [4]. The strategy of hospitals is to improve the quality of outcomes while maintaining the same level of resources or even to reduce operating costs without compromising the quality of health care. Health-care professionals are responsible for the safety of their patients and the quality of their work, whereas patients must receive the highest quality of health care [3].

Hospital management is not only responsible for supervising administrative staff and administrative tasks but also plays a key role in planning individual patient care. To be effective in this, it is imperative to maintain open communication with staff and facilitate information sharing between hospital departments and other facilities. Olanrewaju and Okorie [5] found that the accessibility of the manager is considered one of the most important characteristics of effective leaders. Importantly, lack of accessibility has little to do with the leader's individual characteristics and may be the

result of external factors that are typical of the field of medicine, such as time pressures or high workload and management needs of the facility [6]. If the accessibility of the leader is limited or uneven among members, this can negatively influence the overall climate of the group [7]. In addition, there is evidence that improving leadership skills (e.g., coaching) and communication can positively influence team outcomes (e.g., engagement) [8].

Communication is at the heart of health care because it represents a vital tool - communication takes 24% of physicians' work time [9]-and may make the difference between life and death. When communication is inadequate, the efficiency of any process is naturally reduced and can lead to unnecessary costs or may even endanger the patient [10]. Continuity of care, the integration of separate and discrete elements of care into a long-term process, can be compromised by inadequate communication, which can also affect current decisions about patient care. Lack of or incomplete information about previous events may lead to adverse events that would otherwise be preventable. Similarly, poor communication often results in several types of delays, such as response to consultation, diagnosis, or treatment, inadequate follow-up, medication errors, and increased polypharmacy [11], [12]. Furthermore, the literature provides many examples of the consequences of poor communication with economic implications. First, ineffective communication leads to avoidable hospital admissions [13] and readmissions. Interestingly, interventions to improve communication and coordination have been found to reduce hospital admissions [14]. Other avoidable health-care expenditures are seen in unnecessary testing, and inappropriate, and repeated referrals that are not properly addressed at the first visit [10]. For health-care providers, poor communication adds to the workload by reducing confidence in their decisions [11], [15] and reduces patient trust and satisfaction [10]. The inefficiency of communication between staff members in the hospital environment causes enormous losses [10]; Vermeir and colleagues [10] have found that communication inefficiencies among physicians in hospitals in the USA are estimated to result in losses of more than $800 million annually. The economic impact of communication inefficiencies in nursing is estimated to be approximately $4.2 billion per year. Unnecessary costs due to poor communication leading to overlong hospital stays were ranked as the third resource utilization factor, estimated at 5.35 billion euros annually [10].

Less tangible factors such as satisfaction with work have economic impacts through other processes. Dissatisfaction with work leads to staff turnover and thus to higher costs for hiring and training new employees requiring a learning curve, which in turn means less efficiency [9]. So-called multidisciplinary teams have become established as best practices for optimal patient care in many health-care settings. While the benefits of multidisciplinary teams are clear (e.g., larger pool of skills and knowledge and better information flow), working with team members from diverse backgrounds can be challenging [16]. Practical barriers that prevent these teams from reaching their full potential include differences in education, professional values, problem-solving approaches, and understanding of critical issues [17]. Each team member also brings his/her own unique personality, values, and communication preferences, which affects the way team members interact and, consequently, their ability to achieve common goals and maximum efficiency [18].

Innovations that improve health care and reduce costs in the long term can also be classified as indirect contributors to cost-efficiency. The health-care industry relies on research to develop and improve tools and practices. However, a systematic challenge to the adoption and diffusion of innovations is the resistance of health-care professionals who are affected by the change [19]. Adopting innovations typically involves much more than just implementing them-it requires understanding the connection between people and technology, mobilizing and engaging staff to embrace the changes, and encouraging them to think about how the innovation will make their work easier. The studies have described the impact of innovations in terms of their effect on patient health status, waiting times, length of hospital stays, demand and consumption of health-care services, workforce productivity and utilization of physical capacity, and efficiency of health-care providers [19].

Since the impact of non-financial factors on the cost-efficiency of a hospital has been poorly investigated, the aim of this study was to determine the impact of non-financial factors on the cost-efficiency in a typical Slovenian general hospital. The main hypothesis was that cost-efficiency was influenced by non-economic factors such as staff willingness to innovate, communication on different levels, quality of health care, satisfaction and cooperation of the multidisciplinary team, and collaboration with external providers.

Methods

We conducted a cross-sectional study. Data collection took place within the project "Impact of clinical pathways on patient outcomes, communication, and cost-effectiveness" funded by the Research Agency of the Republic of Slovenia (No. L7-2631-3824-2020). The research was approved by the National Medical Ethics Committee of the Republic of Slovenia (No. 0120-189/2021/3).

The research was conducted at the Novo mesto General Hospital. This hospital was chosen because it represents a typical general hospital in Slovenia, one of the ten. The research population consisted

of health-care professionals (physicians of various specialties, nurses, pharmacists, psychologists, other health professionals, and occupational groups) who treated patients with chronic kidney disease, stroke, and hip arthroplasty, as these are among the most frequently treated conditions in the elderly population.

The questionnaires were collected from June 7 to July 15, 2021, at the Departments of Nephrology, Neurology, and Orthopedics. All members of the three interprofessional teams (over 200 members) were invited by email containing a link for the online survey. At the request of some participants, the questionnaire was also distributed in printed form. Of the 176 completed questionnaires, 150 were correct.

The questionnaire was completed by nursing assistants (34.0%), registered nurses (39.3%), physicians (14.0%), and other professionals (12.7%). The sample was dominated by women (86.7%). About 32.0% of respondents had a secondary school degree, 52.0% had a college degree, 13.0% had a specialty or master's degree, and 3.0% had a Ph.D (Table 1).

Table 1: Sociodemographic characteristic of the sample (n = 150)

Variables	N	%
Gender		
Male	20	13.3
Female	130	86.7
Age		
To 30 years	44	29.3
31–50 years	79	52.7
51 years and more	27	18.0
Educational level		
Secondary school	48	32.0
Bachelor's degree	78	52.0
Specialization or master's degree	19	13.0
Doctoral degree	5	3.0
Professional qualification		
Nursing assistants	51	34.0
Registered nurses	59	39.3
Physicians	21	14.0
Other health-care professionals	19	12.7

The questionnaire was based on a careful study of the literature [10], [20], [21]. A total of 29 variables were included in the analysis of the results, of which 4 were sociodemographic variables. The reliability of the measurement was checked by calculating the Cronbach reliability coefficient α. The results showed that the items had satisfactory discriminatory power, as α was above 0.7 for all constructs.

Due to a large number of variables, we used factor analysis, a data reduction method that permitted us to examine the relationships among various variables. The validity of the factor analysis was tested for sphericity using Bartlett's test; the characteristic level was <0.05 in all cases (α < 0.001). The list of variables and the results of the factor analysis are shown in Table 2.

We used factor analysis and multiple linear regression as statistical methods. Data were coded and analyzed using SPSS Statistics for Windows, v. 24.0.

Table 2: Variables included in the model

Variables and factors	% variance	Significance
Cost-efficiency of health care		
Quality of health care		
Prioritization of cost considerations over quality		
Willingness of staff to innovate		
Outcomes of health care	-	-
Management support		
Communication with patients		
Communication with relatives		
Communication with external providers		
Collaboration with external providers		
Factor 1: Communication in multidisciplinary team	71.41	<0.001
Exchange of views		
Mutual information		
Joint planning and coordination of work		
Joint decision-making		
Factor 2: Satisfaction and collaboration of a multidisciplinary team	71.41	<0.001
Connecting and collaborating for a comprehensive approach		
Team member satisfaction		
Satisfaction with communication within team		
Factor 3: Communication with management	72.31	<0.001
Satisfaction with communication		
Management listens to the team's suggestions		
Adequate management communication with the team		
Appropriate conflict resolution through communication		
Assessment of team communication with management		
Factor 4: Intra-hospital communication	76.2	<0.001
Communication with management		
Communication within team		
Communication with patients		

Results

To test the hypothesis that cost-efficiency is influenced by non-economic factors, the multiple linear regression method was used. The following variables were included in the model: Willingness of staff to innovate, collaboration with external providers, quality of health care, communication with external providers, and two-factor variables, communication and satisfaction and collaboration of a multidisciplinary team (Figure 1).

In the calculation, we used the backward method and excluded the variable communication with external providers as statistically uncharacteristic (α = 0.422); thus it had no effect on cost-efficiency. The statistical model was set up in the form of the following equation:

$$Y'_{SU} = \alpha + \text{ß}_I x_1 + \text{ß}_{SZI} x_2 + \text{ß}_K x_3 + \text{ß}_{IK} x_4 + \text{ß}_{ZST} x_5 + \varepsilon$$

The calculation showed that the multiple correlation coefficient was 0.798, i.e., the dependence between cost-efficiency and the five independent variables was strong. The multiple coefficients of determination were 0.615, i.e., 61.5% of the variance of cost-efficiency was explained by the linear influence of staff innovativeness, cooperation with external providers, quality of health care, communication, and satisfaction and cooperation among members of the multidisciplinary team. The F-test value was 29.429, and because the specificity level was <0.05 (α < 0.001), we rejected the null hypothesis and concluded that at least one of the partial regression coefficients was different from 0.

Table 3: Multiple regression model of non-financial determinants

Variables	B	Standard error	t	P	Partial correlation	Tolerance factor	VIF
(Constant)	1.079	0.477	2.264	0.026			
Staff innovativeness	0.234	0.087	2.676	0.009	0.280	0.573	1.746
Cooperation with external providers	0.248	0.081	3.056	0.003	0.316	0.526	1.901
Quality	0.374	0.092	4.076	0.000	0.406	0.326	3.067
Intra-hospital communication	0.279	0.107	2.610	0.011	0.274	0.444	2.254
Satisfaction and cooperation among members of multidisciplinary team	0.272	0.094	2.896	0.005	0.301	0.336	2.973

The equation of the regression line was as follows:

$$Y'_{SU} = 1.079 + 0.234 x_1 + 0.248 x_2 + 0.374 x_3 + 0.279 x_4 + 0.272 x_5 + \varepsilon$$

The values of the variance inflation factors (VIFs) and the tolerance factors showed that both VIFs were below the value of 10 and that both tolerance factors were above the value of 0.2, therefore, there was no problem of multicollinearity in the model (Table 3).

Since communication with the management has been shown to have an impact on cost-efficiency, we wanted to find the determinants of communication that affect health-care professionals' satisfaction with communication with the management. Table 4 shows the descriptive statistics of the variables included. The results show that, on average, health-care professionals were quite dissatisfied with communication with the management, the lowest rated statement being that the management listens to the suggestions of the multidisciplinary team ($\mu = 2.97$).

Multiple linear regression was again used to test the hypothesis, with three independent variables included in the model: Listening to team suggestions, adequacy of management communication, and solving communication problems (Table 5). The backward method was used in the calculation, with the variable adequacy of management communication excluded as statistically non-significant ($\alpha = 0.979$). Thus, we concluded that the adequacy of management communication had no effect on health-care professionals' satisfaction with communication. The statistical model was written in the form of the following equation:

$$Y'_{SC} = \alpha + \beta_{MPP} x_1 + \beta_{RTK} x_2 + \varepsilon$$

The calculation showed that the multiple correlation coefficient was 0.754, which means that the dependence between cost-efficiency and the two independent variables was positive and strong. The multiple coefficients of determination were 0.561, which means that 56.1% of the variance of cost-efficiency was explained by the linear influence of the management's willingness to listen to the team's suggestions and solve communication problems. The F-test value was 88.700, and since the characteristic level was <0.05 ($\alpha < 0.001$), we assumed that the predictive power of the model was statistically significant.

The estimated regression constant was 0.667, therefore, we estimated that the first partial regression coefficient was equal to 0.550. The equation of the regression line was as follows:

$$Y'_{ZK} = 0.667 + 0.550 x_1 + 0.216 x_2 + \varepsilon$$

The values of VIFs and tolerance factors showed that both VIFs were below the value of 10 and that both tolerance factors were above the value of 0.2. Based on this, we concluded that there was no problem of multicollinearity in the model.

Discussion

Although there is widespread agreement at the policy level that both cost containment and quality improvement are critical, the relationship between cost and quality in health care is one of the most contentious issues in health-care policy. On the one hand, the quality improvement could increase costs (or, conversely, cost reduction could decrease quality). On the other hand, quality improvements could lower costs by reducing complications or hospitalizations. The results of the survey, based on the views of health-care professionals, indicate that there is a positive and moderately strong relationship between health-care quality and cost-efficiency, whereas a review of the literature shows that there is inconsistent evidence on the direction and magnitude of the relationship between health-care costs and quality. While some studies have reported statistically significant associations in

Table 4: Communication with management

Statements	Answers					μ	σ
	I do not agree at all (%)	I do not agree (%)	I cannot decide (%)	I agree (%)	I completely agree (%)		
As a team member, I am satisfied with communication with hospital management.	11 (7.3)	42 (28.0)	57 (38.0)	24 (16.0)	4 (2.7)	3.03	1.25
Hospital management listens to our team's suggestions.	12 (8.0)	45 (30.0)	57 (38.0)	21 (14.0)	2 (8.7)	2.97	1.26
Hospital management communicates appropriately with our team.	12 (8.0)	43 (28.7)	53 (35.3)	23 (15.3)	5 (3.3)	3.05	1.32
We resolve issues with hospital management through appropriate communication.	13 (8.7)	37 (24.7)	58 (38.7)	23 (15.3)	6 (4.0)	3.03	1.30

Table 5: Multiple regression model of satisfaction with communication with management

Variables	B	Standard error	t	P	Partial correlation	Tolerance factor	VIF
(Constant)	0.667	0.166	4.012	0.000			
Listening to suggestions of the team	0.550	0.088	6.249	0.000	0.474	0.413	2.422
Solving communication problems	0.216	0.078	2.769	0.006	0.232	0.413	2.422

the positive (34.0%) and negative directions (18.0%), others have reported imprecise, statistically non-significant results (36.0%), which does not rule out the possibility of a significant association [10]. For the studies that have reported positive associations, the strength of the association is generally of low-to-moderate clinical significance [22]. The results also show that there is a strong positive correlation between health-care outcomes and cost-efficiency, which means that when hospital cost-efficiency improves, health-care outcomes also improve. In addition, the results show a moderate impact of cost-efficiency on health-care outcomes. Thus, with better quality and cost-efficiency, the likelihood of better health-care outcomes also increases.

In the area of cost-efficiency, many studies have been conducted that focus on economic/financial indicators. The studies differ in terms of performance indicators, measurement methods, and the type of analysis. Nevertheless, no studies can be found that focus on a larger number of different non-financial factors. The results of our study show that communication in the hospital, satisfaction, and cooperation of the multidisciplinary team, willingness of employees to innovate, cooperation with external providers, and evaluation of the quality of health care have a positive impact on cost-efficiency. Non-economic factors have been found to have a strong indirect influence on cost-efficiency, as we did not include actual economic indicators in the study, such as hospital size, number of beds, and number of inpatient days. As expected, the relationship between all factors in the model and cost-efficiency was strong. In hospitals, communication depends on collaboration between health-care professionals, which further affects overall employee satisfaction. Employees' willingness to innovate has a major impact, enabling openness to accept new ideas, procedures, technologies, and ways of working [23].

The results show that communication with external providers has no influence on cost-efficiency. This can be explained by the fact that communication with external providers is extremely poor [24]. However, to make its work more effective, the hospital should strive to maintain open lines of communication to share information with other entities that are directly involved in patient health care [10].

The results also show a statistically insignificant influence of communication within the multidisciplinary team and communication with relatives on cost-efficiency. Although communication with relatives is an important component of health care, it has no direct influence on cost-efficiency. The surprising result is that health-care professionals estimate that communication among the members of a multidisciplinary team has no influence on cost-efficiency. This contradicts the results of other studies that have shown an impact not only on cost-efficiency, but also on increasing patient safety and quality, optimizing performance, reducing the number of complications, and increasing job satisfaction [25]. This can be explained by the fact that due to relatively poor communication within teams and with the management, staff estimates [24] that they cannot influence costs.

Other results of the model confirm the findings of previous studies. Communication with patients proved to be the type of communication that has the strongest impact on cost-efficiency, which was expected. This is because patients are in direct contact with health-care professionals, and if they do not share all the necessary information or express their views or concerns, this can have negative consequences, such as discrepancies and misunderstandings, which also lead to duplicate tests, incorrect health care, and increased costs [26]. Communication with patients can also be viewed from another angle when interpreting its impact on cost-efficiency, namely, in case of negative
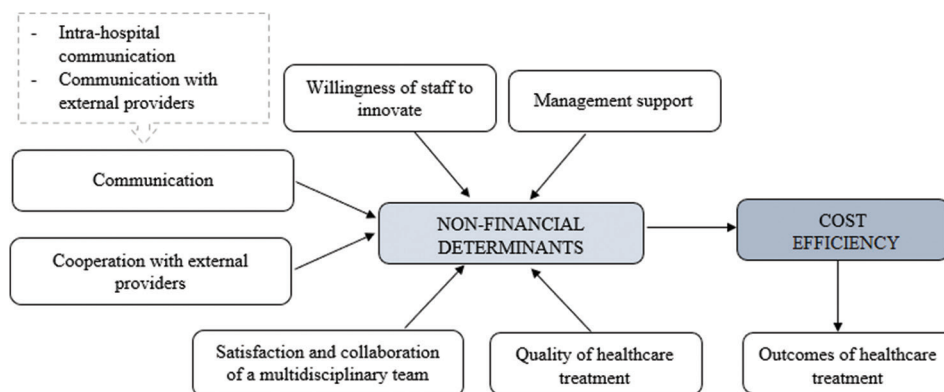

Figure 1: Model

experiences with health-care professionals, the patients will choose a different hospital in the future, which will deter potential customers, and consequently reduce hospital revenues [10].

The results of the conducted research show that satisfaction with communication with the management is rather poor compared to other stakeholders and that the impact on cost-efficiency is the lowest, therefore, there is still much to be improved in this area in the hospital in question.

Which are the factors that influence health-care professionals' satisfaction with communication with the management? The results show that listening of the management to the team's suggestions has the greatest influence on satisfaction with communication, followed by the resolution of communication problems. The adequacy of communication has proved to be a statistically insignificant factor. Because health-care professionals feel that the management does not listen to them and that conflicts are not resolved with adequate communication on average, it is incumbent upon the management to improve their communication and become more open and accessible to employees. Solving problems, listening, and accepting suggestions, all contribute to employees' satisfaction, willingness to innovate, higher performance, and consequently higher cost-efficiency. In this context, we may also assume that cost-efficiency suggestions coming from the employees who are at the front line of patient care and know the work best would also be much easier to implement in practice and more likely to be accepted by the employees.

This study has some limitations, however. Perhaps, the most important one is that we conducted the study in one Slovenian hospital only. Although this is a typical Slovenian general hospital, we cannot generalize the results to all general hospitals in Slovenia and beyond. Another limitation is that the study is based on a self-assessment of the impact of various non-financial factors on hospital cost-efficiency. An important limitation is due to the situation related to the COVID-19 pandemic, due to which the work, communication, and collaboration were different from that before the pandemic.

Conclusion

Self-assessment of cost-efficiency is influenced by communication in a hospital, satisfaction and cooperation of the multidisciplinary team, willingness of employees to innovate, cooperation with external providers, and evaluation of the quality of health care. Communication with the patient has the greatest impact, followed by communication with external providers and communication with the management.

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