Balanced and Imbalanced Performance Evaluation using Balanced Scorecard and Analytic Hierarchy Process

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A R T I C L E I N F O	A B S T R A C T
Article type:	**Introduction:** This study aimed to compare the performance evaluation of a selected hospital through weighting and not weighting the indices using a hybrid approach. **Materials and Methods:**
	This mixed-method study was conducted in a Specialized Hospital in Mashhad, Iran. In the group discussion sessions of the scorecard team, a list of performance indices was prepared in four perspectives using a balanced scorecard approach. The indices were selected using the Delphi method and measured in the hospital afterward. In the first method, the percentage of realization of each index was measured based on the expected value of the index in the hospital, and the overall performance score was obtained. In the second method, the weight of each perspective and index was calculated using the standard hierarchy analysis questionnaire, and the coefficient of the significance of each index and perspective was considered in hospital performance based on the expected quantity of the index. Eventually, the
	performance of the hospital was compared using these two methods. **Results:** Based on the results obtained from the application of the weighting method, the processes and customer perspectives obtained the highest and the lowest scores, respectively. The score of the hospital's performance in this method was obtained at 89.27%. However, in the method without weighting, the processes and financial perspectives obtained the highest and the lowest scores, respectively, and the score of the hospital's performance was estimated at 82.63%. **Conclusion:** The score of perspectives and indices will be different when the significance of perspectives and indices are ignored, which results in an incorrect (downgraded) estimation of the organization performance.

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Introduction

Today, public health services face many problems in response to the needs of a growing population and improving the efficiency and quality of services despite the high consumption of resources. Accordingly, the management control and traditional performance assessment systems do not have the efficiency to achieve multiple strategic goals. In recent years, health organizations tended to use more effective methods to identify deficiencies, make better use of resources, and improve the efficacy in order to select valuable and specific criteria for the performance evaluation (1-4). Functional indices were used to evaluate the efficiency and effectiveness of hospital activities, the performance of staff, and the proper use of resources. These also reformed the health system and improved the quality of health services. Hospital indices were to some extent indicative of the performance of hospitals and the status of the community covered by hospitals (5-7).

Studies showed that among different assessment methods, the balancing assessment model had the efficiency to evaluate the performance through the application of performance indices (8-12). The Balanced Scorecard (BSC) has been adopted from the business sector and has been used as a strategic management tool to survey subjects, such as operational efficiency and performance management, and manage health care resources more effectively (13). Perspective and appropriate indices are needed to reflect all of the organization's strategies and achieve a useful and balanced scorecard (14,15).

The BSC provides a simple tool to turn the organization's strategy into operational conditions, coordinate the organization's strategy with its structure, facilitate the development of a process through communication with the organization's strategy, and support the organization's perspective (16). These advantages will ultimately increase the responsiveness and motivation of the staff (17).

Based on the previous domestic and foreign studies, BSC can effectively measure organizational performance (18-21);

however, the increased use of BSC throughout the world has revealed its strengths and weaknesses. Some of the shortcomings of BSC include a lack of accuracy and an overall scale that suits all organizations. Moreover, BSC lacks mental and linguistic indices (5) and does not provide, neither relatively nor absolutely, any technique to estimate the significance of each perspective and even indices in one perspective (22). Many researchers use different measurement and research techniques, such as Analytical Hierarchy Process (AHP), Fuzzy Hierarchy Process (FAHP), Analytic Network Process (ANP), and Data Envelopment Analysis (DEA) to overcome the weaknesses and shortcomings of SSC in practice. This way they help organizations to maximize the efficiency of this tool, achieve a comprehensive and balanced assessment, and move toward their organizational perspective (5).

AHP was first introduced by Saaty in the 1970s and was later used to solve different types of multi-criteria problems through the prioritization of decision-making options (23). AHP is a multi-criteria decision-making technique that has been successfully accepted as a support tool for the BSC and has been used to prioritize BSC performance indices in a large number of studies (2, 24-25). The AHP allows various decision-makers and managers to express their judgments, and a hierarchy of indices can be defined from the same decision-making process afterward. Integration of the BSC and AHP allows interaction between different decision-making factors and a set of performance indices that are more consistent with the objectives of strategic management of the health care system (2).

It should be noted that AHP can explain the various dimensions of organizational performance and their significance in a comprehensive framework. However, in practice, perspective and indices are rarely similar in terms of importance. The AHP is a promising mechanism to help overcome the limitations of the BSC since it is a valuable tool for the prioritization and enhancement of performance measurement criteria based on multiple variables. Moreover, AHP has been used in many cases, as a method to

calculate the significance of a performance evaluation system (26-28).

Therefore, this study aimed to eliminate the shortcomings of BSC and increase its effectiveness through the integration of the BSC, the Delphi (selection of appropriate indices), and AHP (prioritizing and weighing the perspective and indices) techniques. A comparison is made between the performance score of the hospital and weighing indices and perspectives with the score of the hospital's performance without weighing indices and perspectives to show the effect of weighting the balanced scorecard indices and perspectives on the

improvement and performance of the hospital.

Materials and Methods

This mixed-method research (quantitative-qualitative) was conducted in 2016 at a specialized hospital located at the center of Mashhad city, Northeast of Iran, that works as the only specialized hospital in the east of Iran in terms of providing organ transplantation and stem cell separation. This small hospital had a strategic plan which made it manageable and suitable for the present study. The analytical structure of this research is presented in Figure 1.
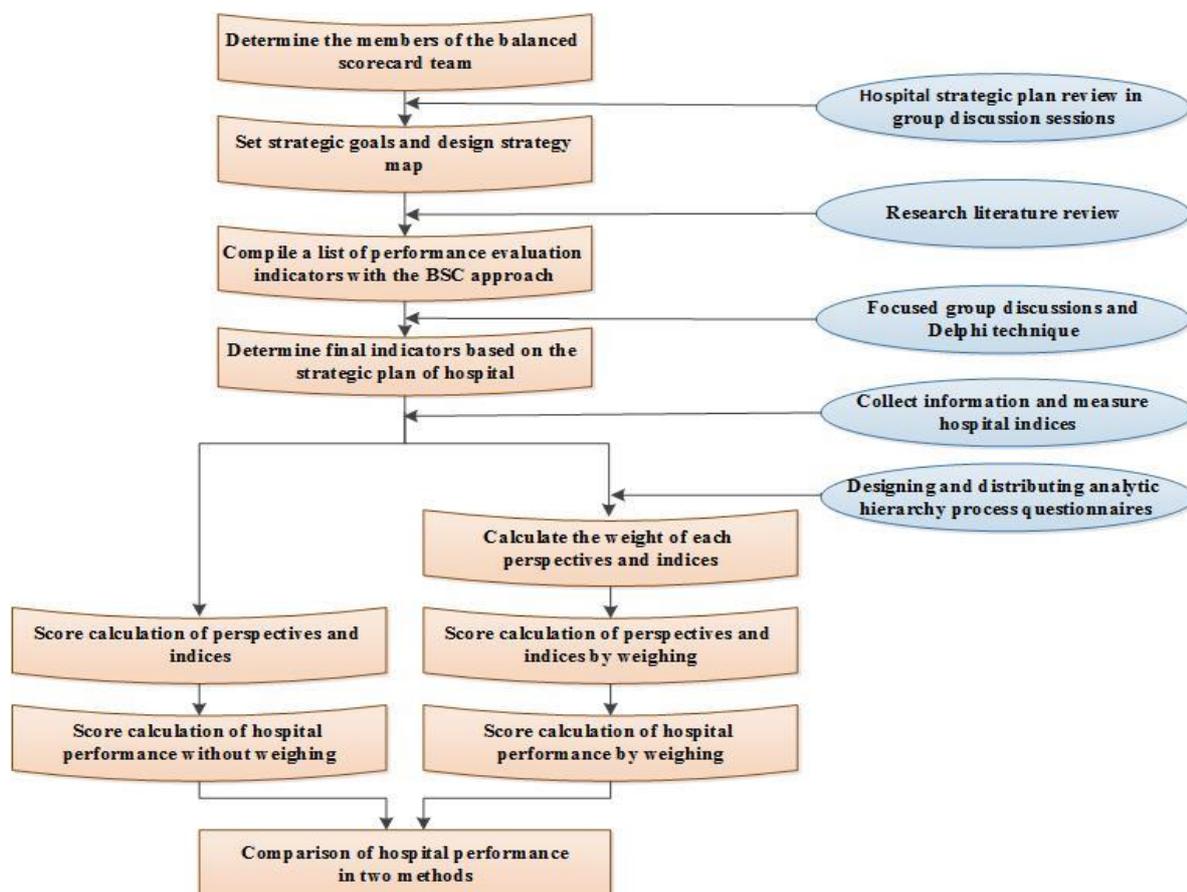

Fig 1: Performance evaluation framework of the research

Some indices of the hospital's strategic plan were extracted in a sub-category of four balanced scorecard perspectives for the complete implementation of a strategic plan and a better evaluation of performance (29). Afterward, the share and priority of each index were determined to allow the hospital to monitor its performance continuously. The statistical population of the study

consisted of 14 individuals, including 10 prominent hospital officials and four certified healthcare professors who were selected as the expert group of the BSC team through expert sampling.

In total, 68 indices in the four perspectives of BSC were determined based on discussions of a focused group with the BSC team. Eventually, 34 indices were

categorized and finalized by the BSC team using the classic Delphi method in two steps (30). From Kaplan and Norton's point of view, the four-sided perspective of the BSC includes customer, financial, internal processes, as well as growth and learning perspectives (31). These indices were presented as a checklist and their face validity and content validity were revised several times by the review team. Moreover, the criterion validity of these indices was confirmed by the categorization of these indices. Subsequently, hospital performance was assessed first without weighing the indices and perspectives and second by weighing them.

For the first method, data related to each index (34 indices) were collected from the departments and units of the specialized hospital. For each index, a small amount was determined based on the objectives of the strategic plan. In this step, the performance status of each perspective was determined by the realized percentage of each index (measured value of the index divided by the value of the expected goal multiplied by 100), and the percentage of the performance of each perspective (the sum of the realized percentage of all indices of that perspective divided by the number of indices of that perspective). The percentage of the performance of the perspectives was added and divided by the number of perspectives to obtain the total score of the hospital.

In the second method, the AHP hierarchy questionnaire was used to calculate the hospital performance score by weighing the perspectives and indices. In the process of forming a hierarchical structure, all decision-making elements were identified precisely, and the relationships between them were detected (23,32-33). For this purpose, the AHP questionnaire was first designed as a pairwise comparison and distributed among the members of the BSC team (14 individuals). The questionnaire information was entered into Expert Choice software after questionnaires were collected. Subsequently, all these comments were combined, and the final weight of each of the perspectives and indices was calculated according to the BSC team's opinion. The hierarchical structure of perspectives and indices obtained from the pairwise comparison is presented in Figure 2.
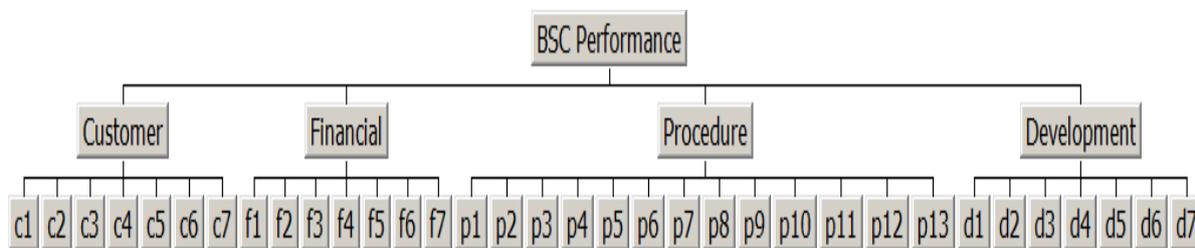

Fig 2: Hierarchical tree and conceptual model of balanced scorecard

After the weight of each perspective and index was calculated, the data for each index were collected from the sections and units of the hospital using the first method, as well as the expected target based on the objectives of the strategic plan. In this step, the performance of each perspective was determined first through the realized percentage of each index (measured value of the index divided by the value of the expected objective multiplied by 100), followed by the final weight of each index (multiplying the weight of each index by weight of its corresponding perspective).

Afterward, the weighted percentage of each index was obtained by multiplying the realized percent of each index in the final weight of each index.

Eventually, the score of a perspective was calculated through the addition of the weighted percentage of all the indices of a perspective. Subsequently, the performance of four perspectives was added together to calculate the total score of the hospital performance. The collected data on indices were analyzed based on descriptive statistics, including frequency, percentage, and mean using the Excel software.

Results

Perspectives, objectives, and performance evaluation indices were extracted based on the strategic plan of the hospital in four perspectives of a balanced scorecard after numerous interviews, and various meetings of group discussion by the BSC team (Table 1). In the perspective of processes, 13 indices were selected. In addition, seven separate indices were selected for customer, financial, growth and learning perspective, and positive and negative indices were identified as well. In the positive index (such as the index of income increase) the highest value, and in the negative index (such as the index of death rate) the lowest value was more favorable.

Table 1: Perspectives, goals and performance evaluation indicators

Perspectives	Goals	Index	Target Tendency	Value measurement
Customer	-Increase responsibility -Increasing customer and employee satisfaction -Hoteling promotion	Percent of response to patients	Increase	Percentage
		Hoteling	Increase	Percentage
		Percentage of employee satisfaction	Increase	Percentage
		Willingness to return to hospital	Increase	Percentage
		The job complications of personnel	Decrement	Percentage
		The ratio of patients introduced to the entire surgical team before surgery to the total operated patients	Increase	Ratio
		The ratio of Specialized hospital's kidney transplant to the entire kidney transplant operations of country	Increase	Ratio
Financial	- Creating a balance between incomes and costs -Attracting credits - Optimal use of facilities and resources (resource management).	The percent of Hospitals increase in revenue over the previous year	Increase	Percentage
		Unused potential in hospitals	Decrement	Percentage
		Medical deductions	Decrement	Percentage
		Increase revenue percentage to cost ratio	Increase	Ratio
		Per capita income for each patient	Increase	Million rials
		The ratio of personnel expense of rewards and rights to total expenses	Increase	Ratio
		Medical tourism income	Increase	Percentage
processes	- Improve the safety and quality of services - Full implementation of accreditation standards -Development of services	Nosocomial infections percent	Decrement	Percentage
		Average length of patient stay more than six hours in emergency	Decrement	Hours
		The number of unplanned re-admissions	Decrement	Percentage
		The ratio of canceled surgeries	Decrement	Ratio
		The net mortality (hospital)	Decrement	Percentage
		The percentage of successful transplants	Increase	Percentage
		Falling off a bed for every 100 days of patient	Decrement	Percentage
		Average waiting time from the first triage to the first doctor visit in the emergency room	Decrement	Minute
		Pharmaceutical accidents per thousand of distributed doses	Increase	Percentage
		Organ procurement function units (the rate of consents in a million)	Increase	percentage
		The implementation of the standards of accreditation of sectors and units	Increase	Percentage
		Percent of approved processes that have been developed	Increase	Percentage
		The success rate of the internal departments and units in achieving the total audit score of the same departments and units	Increase	Percentage
Growth and learning	- Enhance group work -Improve the capabilities needed - Excellence in individual knowledge and group development -Effective communications	The number of nursing staffing requirements based on standards	Increase	Percentage
		Training hours per capita (comers and in-service) employees	Increase	Hour
		Percent of formed Committees at hospital	Increase	Percentage
		Innovation or number of research-based innovations	Increase	Numeric
		Average response time tests	Decrement	Minute
		Per capita implemented suggestions	Increase	Numeric
		The percentage of implemented decisions of the executive committees of hospital	Increase	Percentage

Based on the data analysis presented in Table 2, in the first method (i.e. the method without weighting indices), the processes perspective and financial perspective obtained the highest (93.78%) and the lowest (65.97%) scores in the evaluation of hospital's performance, respectively. The scores of growth and learning and customer perspectives were 90.72 and 80.07, respectively. In evaluating the indices in the first method, the "implemented proposals per capita" index, as one of the indices of

growth and learning with the realized percentage of 200% (due to double realization) had the highest share and "the ratio of the percentage of increase income to expenses" as a financial perspective index

had the lowest (86.5%) share among the indices (due to failure to realize the expected quantitative value). Finally, the overall hospital performance was estimated at 82.63% (Table 2).

Table 2: Hospital Performance Results in Balanced Scorecard without Weighting Perspectives and Indicators

Perspectives	Index	Index quantitative objective	Index performance	Index realization percentage	Vision performance	Hospital performance
Customer	Percent of response to patients	90	69.4	77	80.07	82.63
	Hoteling	70	85.7	122		
	Percentage of employee satisfaction	76	75.6	99		
	willingness to return to hospital	80	86.0	108		
	The job complications of personnel	3.2	4.0	80		
	The ratio of patients introduced to the entire surgical team before surgery to the total operated patients	50	0.0	0		
	The ratio of Specialized hospital's kidney transplant to the entire kidney transplant operations of country	10	7.4	74		
Financial	The percent of Hospitals increase in revenue over the previous year	50	75.4	150.8	65.97	
	unused potential in hospitals	0	0	100		
	Medical deductions	0	0.6	99.94		
	Increase revenue percentage to cost ratio	20	-66.5	86.50		
	Per capita income for each patient	40	31.33	78.3		
	The ratio of personnel expense of rewards and rights to total expenses	37	37	100		
	medical tourism income	10	1.92	19.2		
Processes	nosocomial infections percent	3.5	4.5	77.78	93.78	
	average length of patient stay more than six hours in emergency	0	0	100		
	The number of unplanned re-admissions	50	53	94.34		
	The ratio of canceled surgeries	10	13	76.92		
	The net mortality (hospital)	0.5	0.5	100		
	The percentage of successful transplants	90	94.5	105.00		
	Falling off a bed for every 100 days of patient	0	0	100		
	Average waiting time from the first triage to the first doctor visit in the emergency room	8	8.5	94.12		
	Pharmaceutical accidents per thousand of distributed doses	0	0	100		
	Organ procurement function units (the rate of consents in a million)	10	10.8	108.00		
	The implementation of the standards of accreditation of sectors and units	70	60	85.71		
	Percent of approved processes that have been developed	90	80	88.89		
	The success rate of the internal departments and units in achieving the total audit score of the same departments and units	60	53	88.33		
Growth and learning	The number of nursing staffing requirements based on standards	3	3	100	90.72	
	Training hours per capita (comers and in-service) employees	157	157	100		
	percent of formed committees at hospital	100	70	70		
	Innovation or number of research-based innovations	1	0	0		
	Average response time to tests	45	52.3	86.04		
	Per capita implemented suggestions	50	100	200		
	The percentage of implemented decisions of the executive committees of hospital	100	79	79		

In the second method (i.e., the method weighing the perspectives and indices) the weights of each perspective and indices were obtained through pairwise comparison (Table 3). Therefore, it was found that among the BSC perspective in the studied hospital, the customer's perspective and the perspective of growth and learning with the

coefficients of 0.657 and 0.056 are the most important and the least important perspectives, respectively. Among the indices, the "response" index belonging to the customer's perspective was the most critical factor with the coefficient of 0.39, and the index of "percentage of non-implemented committees of the hospital"

belonging to the growth and learning perspective was the least important factor among the other indices. Furthermore, the indices were arranged from the highest to the lowest in each perspective in terms of importance (Table 3). It should be noted that two indices of "The percentage of responding to patients" (25.6%) and "the ratio of income increase to the expenses"

(-1.8%) had the highest and the lowest share in the score of the hospital's performance, respectively. In the second method, the perspectives of processes (91.54%) and the growth and learning (88.67%) had the highest and the lowest scores, respectively, and the overall hospital performance was estimated at 89.27% (Table 3).

Table 3: Hospital Performance Results in Balanced Scorecard by Weighting Perspectives and Indicators

Perspectives & Weight	Index	Index quantitative objective	Index performance	Index realization percentage	Index relative Weight	Index final weight	Weighed realization percentage	Vision performance	Hospital performance
Customer 0.657	Percent of response to patients	90	69.4	77	**0.39**	0.2562	19.76	58.26	
	Hoteling	70	85.7	122	**0.18**	0.1183	14.48		
	Percentage of employee satisfaction	76	75.6	99	**0.151**	0.0992	9.87		
	willingness to return to hospital	80	86.0	108	**0.117**	0.0769	8.26		
	The job complications of personnel	3.2	4.0	80	**0.075**	0.0493	3.94		
	The ratio of patients introduced to the entire surgical team before surgery to the total operated patients	50	0.0	0	**0.047**	0.0302	0.00		
	The ratio of Specialized hospital's kidney transplant to the entire kidney transplant operations of country	10	7.4	74	**0.04**	0.0263	1.94		
Financial 0.197	The percent of Hospitals increase in revenue over the previous year	50	75.4	150.8	**0.325**	0.064	9.655	17.71	
	unused potential in hospitals	**0**	**0**	100	**0.175**	0.0345	3.448		
	Medical deductions	0	0.6	99.94	**0.173**	0.0341	3.406		
	Increase revenue percentage to cost ratio	20	-66.5	86.50	**0.11**	0.0217	-1.874		
	Per capita income for each patient	40	31.33	78.3	**0.094**	0.0185	1.450		
	The ratio of personnel expense of rewards and rights to total expenses	37	37	100	**0.073**	0.0144	1.438		
	medical tourism income	10	1.92	19.2	**0.05**	0.0099	0.189		
Processes 0.09	nosocomial infections percent	3.5	4.5	77.78	**0.211**	0.019	1.477	8.24	**89.27**
	average length of patient stay more than six hours in emergency	**0**	**0**	100	**0.119**	0.0107	1.071		
	The number of unplanned re-admissions	50	53	94.34	**0.115**	0.0104	0.976		
	The ratio of canceled surgeries	10	13	76.92	**0.11**	0.0099	0.762		
	The net mortality (hospital)	0.5	0.5	100	**0.094**	0.0085	0.846		
	The percentage of successful transplants	90	94.5	105.00	**0.081**	0.0073	0.765		
	Falling off a bed for every 100 days of patient	**0**	**0**	100	**0.072**	0.0065	0.648		
	Average waiting time from the first triage to the first doctor visit in the emergency room	8	8.5	94.12	**0.049**	0.0044	0.4151		
	Pharmaceutical accidents per thousand of distributed doses	**0**	**0**	100	**0.039**	0.0035	0.351		
	Organ procurement function units (the rate of consents in a million)	10	10.8	108.00	**0.033**	0.003	0.321		
	The implementation of the standards of accreditation of sectors and units	70	60	85.71	**0.03**	0.0027	0.231		
	Percent of approved processes that have been developed	90	80	88.89	**0.025**	0.0023	0.2		
	The success rate of the internal departments and units in achieving the total audit score of the same departments and units	60	53	88.33	**0.022**	0.002	0.175		
Growth and learning 0.056	The number of nursing staffing requirements based on standards	3	3	100	**0.416**	0.0233	2.330	5.06	
	Training hours per capita (comers and in-service) employees	157	157	100	**0.228**	0.0128	1.277		
	percent of formed committees at hospital	100	70	70	**0.141**	0.0079	0.553		
	Innovation or number of research-based innovations	1	0	0	**0.082**	0.0045	0.000		
	Average response time to tests	45	52.3	86.04	**0.059**	0.0033	0.284		
	Per capita implemented suggestions	50	100	200	**0.043**	0.0024	0.482		
	The percentage of implemented decisions of the executive committees of hospital	100	79	79	**0.031**	0.0017	0.137		

Discussion

As previously mentioned one of the most critical shortcomings of the BSC model is that perspectives and indices have the same or balanced coefficients (Table 1). However, all the perspectives and indices that are obtained in a balanced scorecard in the specialized hospital in this study did not have the same importance. For a better comparison of the obtained scores in both methods of performance measurement, the scores of perspectives and indices were compared separately on a scale of 100 and have been presented in Figure 3 and Figure 4, respectively.
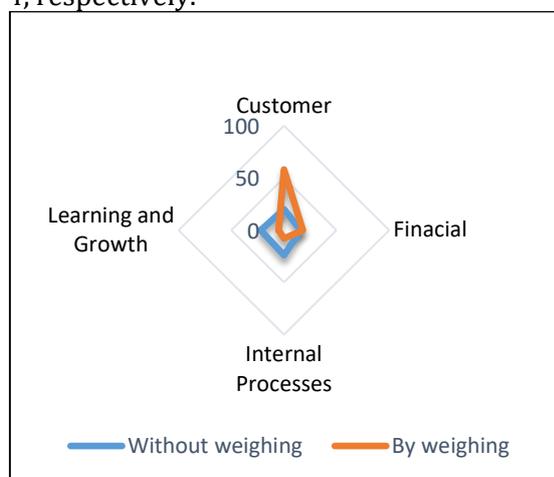
Fig 3: Perspectives score radar graph in both method of performance measurement

In the weightless method, respectively; Process, customer, growth and learning, and financial. The score divided between the perspectives and there was a slight difference between the perspectives. (Figure 3). There was a small difference between perspectives in this study; however, after the application of their weights, the perspectives were prioritized in the order of the customer, financial, process, growth and learning, respectively. It should be noted that the perspective score of the customer had much difference from other perspectives, which is common in healthcare organizations, such as hospitals. This is due to the importance of customer perspective since the provision of effective services to customers is the main goal of hospitals. Moreover, the financial perspective is the second priority after the customer perspective indicating the importance of

acquiring the consent of suppliers who provide required financial resources to hospitals.

As indicated by the column of hospital indices relative weight in Table 3, the perspective indices of the customer, such as "responding to patients" is more important than growth and learning perspective indices, such as "Implemented approval of hospital committees".. There is a difference in the distribution of score between the indicators in two ways. It should be noted that except for some indices that have zero scores due to failure to achieve the target, score distribution between indices was almost in the same range in the method without weighing indices, and only "implemented suggestions" index had an abnormal point, which was due to the double realization of the expected target – not the importance of index itself (Figure 2).. Achieving an indicator can easily raise or lower the performance score, indicating the need for weighting.

Therefore, after calculating the weight of perspectives and indices and applying it in their score, the score of perspectives and indices was different from its previous score, and eventually, the performance score of the hospital has also changed accordingly.

Based on the previous findings and theoretical foundations of the AHP method, the process of performance evaluation can be easily modeled hierarchically.

In this study, BSC method was combined with Delphi technique. Parallel comparisons were performed by drawing a hierarchical framework of perspectives and indicators. By quantifying the BSC team's qualitative judgments, a more accurate calculation of the contribution of each BSC perspective to performance evaluation was obtained.

In the study conducted by Ghandehari et al. in Nour and Ali Asghar Hospitals in Isfahan, Iran, two methods of BSC and MACBETH (the technique of measuring attractions by a randomized evaluation) were combined. Furthermore, it was found that if performance evaluation is carried out considering the priority of BSC method perspectives, the hospital decision-makers would be able to focus on perspectives with higher importance factors and avoid spending valuable resources on

unimportant perspectives (3). In the study conducted by Azar and Mohammadi three methods of FANP, Simple Additive Weighting (SAW), and LINMAP were integrated with BSC. It can be calculated that the weights of indices should be considered necessary for the performance evaluation when systematic and scientific methods are used given the objectives of governmental hospitals (5). Ali Mohammadian et al. used the fuzzy multi-criteria decision-making approach to rank and improve the gap between educational hospitals affiliated with the Shiraz University of Medical Sciences based on a balanced scorecard, and suggested that regarding the limitations of resources and their condition, hospitals should consider the weight and priority of each of the perspectives and indices for planning and future decisions (34). In another study, Wu et al. combined BSC and ANP. Moreover, they found that perspectives and indices are different and that the customer's perspective and its subset indices are most important in evaluating the hospital's performance (35). Santos et al. evaluated the public health system using the combination of BSC and ANP and suggested that the AHP method should be used in the performance evaluations (36). Wang et al., in their study, integrated fuzzy and BSC methods to evaluate the performance of a technology company which led to a more accurate and effective performance evaluation (37). Kucukaltan et al., in their assessment of the logistics industry, combined the BSC and ANP and found a new method for the application of key performance indicators. They found that this way performance evaluation would be carried out more accurately (38). The results of this study were in line with those of Chan (25), Santos (36) and, Wu (39). The results indicated that weighing all perspectives and indices allows for the prioritization of objectives, and defining proper improvement projects will lead to practical steps toward better performance.

Conclusion

Concerning the raised issues, the hospital performance was evaluated by weighing and without weighting the respective indices and perspectives, which score is 82% in the first

method and 89% in the second method. At first, only the realization of the expected goals can be seen.. However, after the importance weight of each index and perspective was considered in realizing the indices, it was observed that the score of perspectives and percentage of realization of the indices were different. This in turn can change the overall score of the organization. In other words, if the importance of each perspective and index is not considered, the score of perspectives and indices will be different despite the realization of the objectives, and the performance of the organization will be downgraded accordingly.

The impact of a weighted balanced scorecard on the improvement of performance evaluation and hospital performance can be explained by the fact that although BSC assesses the organization from different perspectives, the perspectives and indices are considered equal in terms of importance, which is not valid for all organizations, especially those in the realm of healthcare. It should be noted that financial success is not the primary goal of many hospitals. These hospitals have a pervasive goal (e.g., improvement of health conditions) that is placed on top of the balanced evaluation model and represents their long-term goals. Therefore, they adjust other goals in order to realize this main objective.

Based on the findings of this study, such objectives as the improvement of the safety level of hospital staff and patients and/or service quality are more critical than the growth of personal knowledge or fulfillment of staff's capabilities (indices measure objectives) when evaluating the hospital performance. Therefore, these two objectives should not be considered equally important in the calculation of the overall performance of a hospital. Moreover, a manager might focus on accessible objectives which might not be very important in order to show the organization's functional status. In this study, the effect of an index was shown on the score of performance and perspective. The comparison of the performance score of a hospital with weighing and without weighing the given indices showed that

when the overall performance of an organization is calculated all indices should not be considered the same since indices and perspectives have different weights. This indicates the substantial importance of weighing the incises and perspectives in BSC. The use of AHP also reduces the effect of each person on weighting the indicators and perspectives. Therefore, for a more appropriate implementation of BSC, other techniques (e.g., weighing components and indices) can be used given the nature of an organization to have a more accurate performance evaluation.

Regarding the limitations of the present study, it should be noted that the indices examined in this study belonged to a specialized hospital in Mashhad, Iran, and were selected based on the strategic plan and goals of this organization.

Therefore, the generalization of the results of the study to other hospitals should be made cautiously.

The findings of this study indicated that the level of strategic mapping can be revised. Moreover, it is suggested that other methods, such as regression and correlation analysis, ISM model, or DEMATEL technique should be used to establish a better causal relationship between objectives in designing the strategic map of an organization.

This way the perspectives (primarily financial) and leveling that do not suit the healthcare organizations will be eliminated with the appearance of the first problem in BSC. Moreover, in another method for the implementation of BSC, the objectives rather than indices can be weighed in a way that the first suitable objectives in each perspective are selected and the indices for each objective can be considered afterward. Subsequently, each perspective and objective can be assigned with an importance factor (weight) using the AHP method (paired comparison).

The performance of each perspective will be calculated by the multiplication of realized percentage of each index by its targeted weight and summing the products. Eventually, the hospital performance score will be obtained by multiplying the obtained performance of each paradigm by the weight of that perspective and summing the products. In this method, it is easier to report hospital performance based on the achieved objectives (selected from the strategic plan).

Acknowledgments

Conflict of Interests

The authors declare that they have no conflict of interest regarding the publication of the present study.

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