

Designing Performance Condition Indicator Tree of Gynecology and Obstetrics Ward Using Analytical Hierarchy Process, 2014

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Abstract: This study was aimed to design performance condition indicator tree using analytical hierarchy process (AHP) in gynecology and obstetrics ward. The study was applied in terms of the goals of the study and was conducted using cross-sectional method in 2014. The required information for designing performance condition indicator tree was gathered based on library studies and review of literature using views of the related Pundits and questionnaires. Delphi method was used to determine indicators. The indicators for designing Delphi questionnaire were obtained by performing three phases of 1-review of literature, 2-performing interview and receiving views of experts and 3- interview with patients. After performing three Delphi rounds, performance indicators were determined. Then, AHP was started by drawing trees. Indicators of each layer of the tree were designed as a questionnaire for paired comparisons and given to the experts. To analyze the data, the questionnaires were entered into Microsoft Excel and, finally, Expert Choice software was used to implement the technique. Results showed that: Among Second layer indicators, therapeutic results(0.62), satisfaction(0.38), clinical services(0.27), Manpower(0.20), Function of bed(0.17), safety(0.13) and Facilities(0.13) had maximum weights. Respectively, The second layer of each of the indicators, In the Third layer, indicators of ratio of cesarean section to total labors (0.42) and patients' satisfaction(0.55), Percent of executing clinical protocols and manuals(0.44), Ratio of obstetricians and gynecologists to inpatient bed(0.33), Inpatient bed occupancy ratio(0.43), Presence of fence for all ward beds(0.56), Oxygen output and central suction for each bed(0.43) gained the highest weights. In Conclusion: Among the main indicators, index of satisfaction, particularly patient satisfaction, received the highest weight. Patient satisfaction is one of the important quality indicators. Therefore, authorities of wards and managers of hospitals should pay enough attention to increase satisfaction.

Key words: Tree · Gynecology and Obstetrics Ward · Performance Indicators · Analytical Hierarchy Process Model

INTRODUCTION

Undoubtedly, success of each plan depends on the presence of an efficient and adequate evaluation and supervision system to protect health of the activities of a

plan and direct it forward [1]. Organizations have tried to utilize validation instruments in evaluation and assess performance of organizations based on definite goals at the end of each plan and in a time interval to specify access to them, judge about weaknesses and strengths

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and success or failure factors and utilize the results for planning to remove deficiencies and reinforce and develop organizations [2].

Among these organizations, hospitals as great national capitals have accommodated many elites of the country in addition to abundant facilities and resources. Elites are sources of abundant services for the society and suitable policymaking could orient and direct them toward major health goals. One of the most important tools of governance and behavior building at individual and organizational levels is use of suitable evaluation methods [3].

According to the reports of World Health Organization (WHO), share of organizations out of the current expenses of government in health section is between 50 and 80%, while share of hospital expenses out of health and therapy in governmental section does not exceed 40% in developed countries [4]. Therefore, performance of evaluation and execution of the obtained results can be highly important. Lack of evaluation in therapeutic institutes leads to increased therapeutic expenses; in addition, negligence in the provision of primary health care intensively endangers health of society, while its provision will result in full productivity of therapeutic institutes with suitable cost at the same time with guaranteeing health [5].

Today, information systems act as sensory members of management in organizations and centers and help organizations draw the present view and strategic perspective. Therefore, a suitable information system can give necessary evidence for decision making and performance of management in organizations. Result of a desirable information system is the indicator which can be regarded as the basis of decision making and planning and could measure and evaluate performance in different managerial, geographical, measurement and evaluation fields. Using this benchmark, a thing can be compared with another. Thus, all technical and managerial characteristics and components of services should be determined. Then, the thing at desirable or medium levels of each characteristic can be determined. Generally, this work is the most important part of hospital service evaluation [6]. Karter and Cahill conducted a research entitled *Developing performance evaluation indicators in James Hospital of Ireland* and, using the comparative study of 8 hospitals in some countries, concluded that there should be performance indicators for evaluating performance in each hospital and performance evaluation system could considerably help improve the performance and productivity of hospitals in the presence of performance indicators [7].

There are different evaluation methods, each of which has different capabilities. Analytical hierarchy process (AHP) is one of the known multipurpose decision-making techniques based on paired comparison, in which a decision-maker performs evaluation process by designing indicators and providing analytical hierarchy process [8]. One of the cases which is important in the field of health is health of pregnant mothers. Mothers' health is regarded as not only a health indicator, but also one of the indicators of development and one of the main components of primary health care (PHC) [9]. It is known that hospital ward of gynecology and obstetrics as one of the main sections of general hospitals is the only ward, from which life of human starts and in which mother and fetal health is important. Designing indicators and evaluation of this ward by these indicators will be informative in terms of its performance; certainly, high performance of this ward is very effective in the performance of hospital and attitude of patients toward it. As a result, we decided to select this ward for performance evaluation by designing indicators and applying analytical hierarchy process (AHP).

MATERIALS AND METHODS

The present study was applied in terms of goals and was conducted using cross-sectional method in 2014.

The required information for designing performance indicators of gynecology and obstetrics ward was gathered based on library studies and review of literature, use of views of the related experts and specialists and questionnaires. In this research, Delphi method was applied to determine performance indicators. The required indicators for designing Delphi questionnaire were obtained by performing three phases of 1- review of literature, 2- performing interview and receiving views of the experts (obstetricians and gynecologists, validation experts, authorities of gynecology and obstetrics ward) and 3- interview with patients. After performing three Delphi rounds, performance indicators were determined. In the first phase, indicators were searched by library studies and journals and according to key words such as gynecology and obstetrics ward, performance indicator, analytical hierarchy process in different websites such as Iranmedex, Irandoc, SID, Magiran, DID and Civilica. In the second phase, the indicators obtained from review of literature were classified as a questionnaire in three input, output and process parts and given to 5 obstetricians and gynecologists as faculty members of Yazd University of Medical Sciences, 8 authorities of gynecology and obstetrics ward and 7 validation experts of Yazd hospitals

who were selected using convenience sampling method. The structural factors included goals of the ward, physical facilities, personnel, equipment, medicine and tools. Process factors included executive, therapeutic and clinical procedures, safety, reception and discharge. Output factors were improved patients, deceased patients and patients with hospital infection. In the third phase, views of 30 patients who were hospitalized in the selected gynecology and obstetrics ward of Yazd city were obtained using convenience sampling method from the intended hospitals with semi-structured questionnaire; this questionnaire contained 10 questions in the fields such as reason for the selection of this hospital ward, weaknesses, strengths and suggestions, etc. To analyze the data obtained from this phase, framework analysis was used. This method was used to analyze the qualitative data of studies in the field of policymaking with 5 phases as follows: familiarizing, identifying a thematic framework, indexing, charting and mapping and interpreting [10].

At the familiarizing stage, a communicative and content summary was designed for each of the interviews and a primary thematic framework was available based on the past studies in this field. Questions for the guidance of interviews and thematic guidance were designed. This framework was discussed in several sessions with members of the research group (two validation experts and one of the management group members). It was then revised by reviewing interviews and repeating the familiarization stage. Afterward, the researcher indexed the interviews primarily. These codes were revised and corrected by three members of the research group for many times and were finally discussed for the last time in a session in the presence of all members. Relationship between themes and sub-themes was also identified, analyzed and classified as three input, process and output groups. At the end, share of each one of the input, process and output indicators out of total indicators was drawn on the diagram.

Then, all the indicators obtained from the first to third phases were designed as a questionnaire for performing Delphi and receiving views of obstetricians and gynecologists using 5-point Likert scale (1=I fully agree to 5=I fully disagree) and given to 30 obstetricians and gynecologists (mean number of people required for Delphi method) in Iran by sending questionnaires through email. Delphi was performed in three rounds and means and standard deviations were used in each round to determine uniform confirmation or rejection of the indicators. In the first round, indicators with the mean of more than 4 and

standard deviation of less than 1 were confirmed and indicators with mean of less than 2 and standard deviation of more than 1 were rejected. Other indicators were included in the second round of Delphi. In this round, indicators with mean of more than 4 and standard deviation of less than 1 were confirmed and indicators with mean of less than 2 and standard deviation of more than 1 were rejected. Other remaining indicators were included in the third round of Delphi. In the third round, only items with mean of more than 4 and standard deviation of less than 1 were confirmed and other items were excluded.

After performing Delphi stages, performance indicators of performance of gynecology and obstetrics ward were obtained. After performing Delphi rounds and determining final performance indicators, analytical hierarchy process was started. The selected indicators should be drawn as a tree. In this part, the researcher identified, discovered and classified criteria, sub-criteria and alternatives by a person who was proficient in research method. The tree had three main levels of goal, criteria and options, out of which criteria can be divided into different sub-criteria. The main research question or problem which was intended to be solved was called goal. Criteria refer to the factor containing goals and constituent parts of that criterion. Criteria are the cornerstone of goal or the measurement tool. They are the second level of tree after goal and can be divided into sub-criteria; the sub-criteria can be divided into other sub-criteria. This condition can increase to n sub-criteria at vertical and horizontal levels, if necessary. Alternatives are the aim of the goal in trees and response of the goal is obtained among the drawn alternatives. Alternatives are the last level of tree [11]. In the present research, a tree with 4 layers was designed.

By designing the tree, an important part of the research work was performed. At the next stage, paired comparison was made and weight of indicators was determined. At this stage, all decision-makers should create a set of the matrices which numerically measure relative priority of the indicators over each other and any decision considering the indicators relative to other alternatives. This paired comparison was made by allocating numerical points which indicated priority or importance of two decision elements. To make paired comparison of the indicators, a questionnaire was designed and 9 obstetricians and gynecologists and validation experts were asked to validate the indicators according to Table 1.

Table 1: Validation of indicators in analytical hierarchy process

Importance coefficient	Equally preferred	Moderately preferred	Preferred	Strongly preferred	Very strongly preferred
Statement symbol	1	3	5	7	9

Finally, cross tables were designed to analyze data in Excel software. Then, the data were first entered into the table as upper triangle and lower triangle. The data obtained from the right hand scores of paired comparison had the same score and the opposite data (left side) obtained the reverse score. Finally, Expert Choice software was used for the final implementation of the technique.

RESULTS

In the first phase of the study (review of literature), 60 papers were investigated, among which 42 cases were complete papers and 18 were abstracts. 45 performance indicators were found to be related to obstetrics and gynecology ward.

Then, these indices were classified as three input, process and output parts and gathered as a questionnaire. In the second phase, they were given to 20 specialists in this field (5 obstetricians and gynecologists, 8 authorities of obstetrics and gynecology ward and 7 validation experts) so that 100% of the specialists were female, 40% were in age group of 36-46 years old and 30% had working experience of 25-30 years. Then, they were asked to mention if an indicator should be added and, then, 47 indicators were added.

At the third stage, an interview was conducted with 30 patients from the selected hospitals of Yazd who were being discharged and stayed in the hospital at least for one day. The interview questions were designed and data were analyzed using the framework analysis method in 5 steps. In the first step, the primary framework of questionnaire (the reason for selecting obstetrics and gynecology ward of this hospital, weaknesses and strengths, suggestions for improvement, etc.) was designed based on the previous studies. In the second step, interview with the research group was discussed for several times and the questions considered by them were added and the questions were finally confirmed. Response of the interviewees was implemented and then prepared as codes. The indicators were divided into the themes and sub-themes as input, process and output indicators. In the fifth step, the number of each one of the

Table 2: performance indicators of gynecology and obstetrics ward

Performance indicators of gynecology and obstetrics ward	the first round	Indicators
		1. Ratio of obstetricians and gynecologists to inpatient bed 2. Patient per capita for nurse 3. Average bed for each pain room 4. Ratio of fetal monitoring device to childbirth bed 5. Standard contents of childbirth pack 6. Presence of fence for all beds of the ward 7. Access to emergency trolley drugs in preeclampsia 8. Percent of observing breastfeeding instruction 9. Use of non-medicinal methods of pain alleviation 10. Patient satisfaction 11. Hospital infection 12. Neonatal death to total labor 13. Ratio of caesarian to total labor 14. Holding labor preparedness classes
	the second round	1. Ratio of midwife to the patient entering labor 2. Ratio of midwife to the patient who is in recovery after labor 3. Ratio of midwife to the patient who suffers from medical or midwifery complications 4. Mean record of management in the ward 5. Bed occupancy ratio 6. Number of postpartum beds for each labor bed 7. Percent of observing rooming in instruction 8. Average time of hospitalization for natural labor 9. Use of medicinal methods of pain alleviation 10. Presence of registration form or reporting system of medical errors
	the third round	1. Personnel satisfaction 2. Ratio of midwife to the patient who is in caesarian section 3. Oxygen output and central suction for each bed 4. Portable suction device in labor room 5. Number of hygienic service for each pain room 6. Average bed for each ward room 7. Average time of hospitalization for cesarean section

Table 3: Structure of performance indicator tree in obstetrics and gynecology ward

Target layer	First layer	Second layer	Third layer	Fourth layer		
General performance of the ward	Functional	Manpower	Ratio of obstetricians and gynecologists to inpatient bed	Ratio of midwife to the patient entering labor Ratio of midwife to the patient who is in recovery after labor Ratio of midwife to the patient who suffers from medical or midwifery complications Ratio of midwife to the patient who is in caesarian section		
			Patient per capita for nurse			
			Number of midwife per patient in the ward			
			Facilities		Mean record of management in the ward	
					Ratio of fetal monitoring device to childbirth bed	
					Oxygen output and central suction for each bed	
					Standard contents of childbirth pack	
			Bed function		Portable suction device in labor room	
					Number of hygienic service for each pain room	
					Bed occupancy ratio	
		Clinical services	Average bed for each ward room			
			Average bed for each pain room			
			Number of postpartum beds for each labor bed			
			Holding labor preparedness classes		Use of medicinal methods of pain alleviation Use of non-medicinal methods of pain alleviation Average time of hospitalization for natural labor Average time of hospitalization for cesarean section. Percent of observing breastfeeding instruction Percent of observing rooming in instruction	
			Access to emergency trolley drugs in preeclampsia			
			Application of pain reduction methods			
			Length of stay			
		Safety	Percent of executing clinical protocols and instructions			
			Presence of fence for all beds of the ward			
			Presence of registration form or reporting system of medical errors			
Results	Therapeutic results	Neonatal death to total labor				
		Ratio of caesarian to total labor				
Satisfaction	Satisfaction	Hospital infection				
		Patient satisfaction				
			Personnel satisfaction			

Table 4: Weighting combined indicators of the third layer and set of its indicators

Third layer indicators	Weight	Fourth layer indicators (sub-branches of the third layer)	Weight
Number of midwife per ward patient	0.19	Ratio of midwife to the patient entering labor	0.21
		Ratio of midwife to the patient who is in recovery after labor	0.21
		Ratio of midwife to the patient suffering from medical or midwifery complications	0.36
		Ratio of midwife to the patient who is in caesarian section	0.22
Application of pain reduction methods	0.20	Use of medicinal methods of pain alleviation	0.54
		Use of non-medicinal methods of pain alleviation	0.46
Length of stay	0.10	Average time of hospitalization for natural labor	0.55
		Average time of hospitalization for cesarean section	0.45
Percent of executing clinical protocols and instructions	0.40	Percent of observing breastfeeding instruction	0.5
		Percent of observing rooming in instruction	0.5

Table 5: Weighting combined indicators of the second layer and set of its indicators

Second layer indicators	Weight	Third layer indicators (sub-branches of the second layer)	Weight
Manpower	0.20	Ratio of obstetricians and gynecologists to inpatient bed	0.33
		Patient per capita of nurse	0.23
		Ratio of midwife to patient of the ward	0.19
		Mean record of management in the ward	0.25
Facilities	0.13	Ratio of fetal monitoring device to childbirth bed	0.13
		Oxygen output and central suction for each bed	0.40
		Standard contents of childbirth pack	0.25
		Portable suction device in labor room	0.12
Function of bed	0.17	Number of hygienic service for each pain room	0.10
		Inpatient bed occupancy ratio	0.43
		Average bed for each ward room	0.20
Clinical services	0.27	Average bed for each pain room	0.20
		Number of postpartum beds for each labor bed	0.17
		Holding labor preparedness classes	0.15
		Access to emergency trolley drugs in preeclampsia	0.15
		Application of pain reduction methods	0.20
Safety	0.13	Length of stay	0.10
		Percent of executing clinical protocols and manuals	0.40
		Presence of fence for all ward beds	0.56
Therapeutic results	0.62	Presence of registration form or reporting system of medical errors	0.44
		Neonatal death to total labor	0.20
Satisfaction	0.38	Ratio of cesarean section to total labors	0.42
		Hospital infection	0.38
		Patient satisfaction	0.55
		Personnel satisfaction	0.45

input, process and output indicators was drawn on a diagram and other 16 indicators were added to this section then, 14 indicators were confirmed in the first round, 10 indicators were confirmed in the second round and 7 indicators were confirmed in the third round (Table 2).

And finally, analytical hierarchy tree was drawn according to Table 3 using these final performance indicators.

After data were analyzed in Excel, weight of each of the indicators of each layer was measured and shown in Tables 4 and 5.

DISCUSSION AND CONCLUSION

In this research, attempts were made to determine performance indicators using views of specialists about obstetrics and gynecology ward to study condition of this ward. For this purpose, the performance indicators effective for obstetrics and gynecology ward was drawn in a tree and then weight of each indicator was calculated to calculate the performance of the designed indicators in the tree using analytical hierarchy process (AHP). After weighting indicators by analytical hierarchy process (AHP), the results showed that branch (sub-branch) ratio

of obstetricians and gynecologists to inpatient bed gained the highest score among the manpower indicators. The main goal of any organization is to achieve productivity. Several factors affect rate of productivity of organizations and, in a general conclusion, dominant role of human factor can be pointed out among others[12].

As a result, observing proportion of obstetricians and gynecologists to inpatient bed as one of the most important factors of this ward was selected as one of the performance indicators. Among the performance indicators of the bed, inpatient bed occupancy ratio gained the highest weight. The mentioned indicator is the most applicable one among other hospital performance indicators as a general guidance for consuming resources of hospitalization wards. Considering the attempts for promoting productivity and improving efficiency as one of the present priorities in health field, it is necessary to plan to increase this indicator[13]. Khayat Moghadam Saeed *et al.* [14] in Research, performance indicators of “Average length of patient’s stay”, “days’ occupied bed”, were measured.

Among indicators of clinical services, percent of executing clinical protocols and instructions gained the highest weight. Ministry of Health emphasizes the

observance of techniques in the ward according to different circulars and different instructions. Therefore, application of clinical instructions in obstetrics and gynecology ward which is necessary as one of the performance indicators was studied. Considering that the use of fence beside bed is necessary to prevent collapse of patient, it should be observed for safety. Among the safety indicators, the presence of fence was selected for all beds of the ward as the performance indicator.

Percent of cesarean to total labors gained the highest weight among the indicators of therapeutic results. Nowadays cesarean rate in Iran has been exceeding from recommended rate by World Health Organization (WHO) [15]. One of the major issues was the increasing use of cesarean section for performing labor. Considering that one of the main missions of obstetrics and gynecology ward is giving birth to a child, childbirth is a natural case and labor can be performed in cesarean section, ratio of cesarean section to total labor can be one of the performance indicators of the ward.

Among the satisfaction indicators, indicator of patient satisfaction gained the highest weight. Patient satisfaction is a concept, which is receiving increasing attention in medical care [16]. Patient satisfaction should be on the agenda in order to improve accreditation programs [17].

In the research by Masoumeh Alidoosti *et al.* for investigating the post-surgery satisfaction of women with services and equipment of Hajar Maternity Hospital of Shahrekord, people's satisfaction with human services was less. They mentioned that high working volume of personnel in the ward might reduce their focus on providing better services and some measures should be taken in this field[18].

In this research, some obstetricians and gynecologists did not have the required cooperation in responding emails for completing the questionnaire; we removed this limitation due to use of three Delphi rounds for several times of emailing.

Finally, last performance of the ward can be measured by measuring indicators of the designed tree. Strengths and weaknesses can be identified and planning can be made for improving and reinforcing these factors in the ward. With the focus of hospital management and authorities on some indicators such as inpatient bed occupancy ratio, provision of enough manpower, requirement for executing clinical protocols and instructions, reduction of the number of cesarean section

and more importantly, all performance indicators, patient satisfaction will improve performance of the ward with more effort for its increase.

Finally, general performance of an organization results from performance of all of its units. Therefore, any ward should have an evaluation model to assess the organization with gained scores for each unit. Generally, one can take steps for improving performance of other wards and finally promoting total performance of hospital by designing such a tree.

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