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Emergency Department Performance Evaluation Indicators in Pre and Post-Health Care Reform in Kermanshah Public Hospitals

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Abstract: Performance of the hospital's emergency department can be evaluated by means of key quantitative and qualitative indicators. Important quantitative indicator, including percent of failed CPR, waiting time duration, percent of released emergency patients with personal responsibility, percent of released emergency patients in specific times, etc. Present study aims to survey emergency department's performance by means of mentioned indicators during pre and post-health care reform. This was a descriptive and cross-sectional study, implemented during 2013 and 2014, pre and post-health care reform in the public hospitals of Kermanshah province. Data gathered by means of performance indicators in the emergency department were evaluated. Then indicators of these 2 periods were compared by means of the paired independent t-test while $p<0.05$ was considered to be at a significant level. Among measured indicators, failed CPR ($p = 0.025$) waiting time duration in level 4 triage ($p = 0.012$) emergency patient who were settled in 6 h ($p = 0.00$) patients who moved out of the department in 12 h ($p = 0.00$) decreased after the implement of health care reform in surveyed hospitals and other indicators didn't change. Hospitals' indicators including indicators of emergency department are the most important hospital performance indicators considering various fields. So comprehensive attention to these indicators is necessary because hospital indicators show clearly hospital performance and also hospital's weaknesses and strengths which are explicit with more thought on these indicators. What's more its performance has a direct impact on hospital activity, health network and health care system activities.

Key words: Evaluation, emergency department, indicator, quality improvement, health care reform

INTRODUCTION

No hospital could be considered as an ideal health and medical center without an active emergency room with proper performance and in case such short coming happens, other hospital services will suffer due to this great problem (Bahadori *et al*., 2007). This study is responsible to present the best healthcare and treatment in the shortest time period possible (Rahmati *et al*., 2013). What's more, receiving healthcare services in order to move the society toward a healthier version of it is one of the basic human needs and in such case, sections such as emergency room are units responsible for presenting professional services and medical care to patients. These services have special characteristics and its quality is considered by different points of view such as availability, safety, acceptability, efficiency and performance effectiveness and service continuance. Since, healthcare quality is the level that healthcare services are in accordance with professional knowledge of the day and it increases the possibility of satisfactory health results for individuals and the population and healthcare quality is increasingly known as a product of systems and not individuals, therefor, an expanded agreement based on the necessity and need for systematic measurement, creates permanency and performance, report the significant progresses on improving quality.

One of significant and helping characteristics of evaluating performance is that it has a quantitative aspect and turns results and consequences of the evaluation to calculable amounts and is in fact a process that evaluates

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and measures the valuation and judgment about the performance in a certain time period and is usually equal to activities profitable in organizational dimension. Profitability means the level of achieving goals and plans with the efficient characteristic of activities. Performance evaluation is presented based on efficiency indexes format in relation to dimension of resource usage type and performance evaluation system evaluates the level of efficiency in management decision-making in relation to resource and equipment's usage and compares the existing condition with the satisfactory or ideal condition based on pre-determined indexes which have certain characteristics themselves.

Five important index are presented by the Ministry of Healthcare and Medical Education as national indexes to evaluate emergency rooms which were developed by aid of professionals and scholars which are:

Patients settled in <6 h index: This index shows that how many patients that weren't out patient and needed immediate temporary hospitalization were settled in <6 h and their release from emergency room was recorded in their document.

Temporary hospitalized patients exiting the emergency room in <12 h index: That evaluates therate of patients' exiting the emergency room. This index shows that what percent of temporarily hospitalized patients that were settled in <6 h and their release order was recorded in their documents, left the emergency room in 12 h and emergency's personnel and equipment's were ready again for new patients and unnecessary crowed didn't occupy the emergency room.

Unsuccessful CPR percent index: It shows that what percent of CPRs failed. By analyzing this index we can identify the probable reasons of cardiopulmonary failure and perform necessary planning to lower the level of such index. Based on definition, a CPR activity is successful when the patient finds a voluntary blood circulation after that and doesn't require a CPR I 20 min after that.

Index of patients leaving the emergency room with their personal responsibility: Since, the hospital is responsible for ensuring the patient's health and hospital services' quality is evaluated based on patients' needs and satisfaction, usually when the hospital and specially the emergency room create a proper relation with the patient and his/ her companion and presents satisfactory and qualitative services based on their need, the patient and his/her companion usually desire to stay in the medical center till the end of medical process and release but one of the problems happening in hospitals and specially emergency rooms is patient leaving and refusing to continue the treatment despite its not being complete and based on personal responsibility.

The triage time duration evaluation index: Triage time at any level of it is also very important because the main duty of emergency room is to deal with sever condition patients that are at an emergency condition and triage process is considered to be a critical stage in the patient's circulation in the emergency room and an important point to ensure patients' satisfaction from qualitative aspect and resources profitability. Since, all the people seeking medical advice in various hours of the day and night are in different medical and emergency levels and emergency resources are limited, there is no possibility to deal with all of them as soon as they enter and therefore we face the issue of prioritizing patients to be visited by the doctor and being taken care of. The familiar term of triage which means categorizing in terminology is used to reach such goal. In fact triage is the process of prioritizing patients based on their treatment and medical care emergency and is one of the basic and main elements in managing emergency rooms. This index includes five levels based on various triage methods such as Manchester, ESI and ... and other methods, now a day used worldwide. (Gilboy *et al*., 2011). The formula to calculate these indexes are presented in Table 1.

Present research aims to study the effect of executing healthcare transformation plan on performance indexes

Table 1: The definition of emergency performance indexes

Index name	Index formula
Percent of patients settled in <6 h index	Patients settled in <6 h index in a certain time period 100 Number of total temporarily hospitalized patients in the emergency room during the same time period
Percent of temporary hospitalized patients exiting the emergency room in <12 h index	Number of temporary hospitalized patients exiting the emergency room in <12 h in a time period index100 Number of total temporarily hospitalized patients in the emergency room during the same time period
Unsuccessful CPR percent	The number of unsuccessful CPRs in a certain time period100 Number all CPRs in emergency room during the same time period
Percent of release with personal responsibility	Number of cases leaving the emergency with their personal responsibility Number of total temporarily hospitalized patients in emergency room during the same time period
Median of triage time in each triage level	Total time required for a patients' triage in each level Total number of al patients in same triage level

of the hospitals' emergency room. The healthcare transformation plan in Iran is a plan emphasizing on following basics based on justified coverage of services: decreasing the level of payment by hospitalized patients in hospitals dependent to Ministry of Health; supporting physicians' dwelling in deprived areas; expert physicist dwelling and presence in hospitals dependent to Ministry of Health; improving visit services' quality in hospitals dependent on Ministry of Health; improve hoteling qualities in hospitals dependent on Ministry of Health financial protection of special cases, incurable and poor patients; natural child birth expansion (series guidelines for health system reform plan). Finally, we should mention that since the hospitals' emergency room is never static and protected from outside and inside organization changes and epidemiologic, economic changes, changes in medical rules andregulations, insurance coverage, changes in rivals' condition and similar issues and service quality procedure have a great effect on it. Therefor, ensuring of satisfactory emergency services and improving levels in each quality dimension requires continuous measurement and permanency.

MATERIALS AND METHODS

Present research is a descriptive and cross sectional research executed during the years 2013 and 2014, pre and post-executing health transformation plan in state and public hospitals of Kermanshah City. Required data were gathered by means of patients' entrance and exit table and timing form for triage time duration. Then, emergency room performance indexes were calculated by means of related formula's (Table 1). Studied indexes in present research include the following items: percent of settled patients in <6% of patients existing the emergency room in 12% of unsuccessful cardiopulmonary restoration and percent of patients leaving the emergency room with their personal responsibility and median of triage time duration in each triage level. What's more, the study is divided into two periods of pre-executing healthcare transformation plan and post-executing healthcare transformation. Data were entered in the SPSS22 Software based on this. Data were presented for standard deviation and the difference between these two time period was evaluated by means of binary statistical t-test and $p<0.05$ was considered at the significance level.

RESULTS AND DISCUSSION

The present study shows that the median for percent of patients exiting the emergency in 6 h is 4.519 (before executing healthcare transformation plan) which was reduced to 1.0525 (after executing healthcare transformation plan) and this reduction is significant ($p = 0.00$). What's more, the median of patients exiting the emergency room in 12 h index was reduced from 4.5639-1.1615 with ($p = 0.00$). The median of unsuccessful cardiopulmonary restoration was decreased from 62.1765 in 2013-68.1176 in 2014 ($p = 0.02$) and index of median fortriage time duration in level 4 triage (min) also increased from 8.8882-12.5294 and ($p = 0.012$) that shows the reduction of these two indexes. Other indexes of leaving with personal responsibility percent and median of triage time duration in levels 1, 2, 3 and 5 didn'tchange. The highest reduction (no improvement) was related to the index of unsuccessful cardiopulmonary and the lowest reduction was related to the index of patients settled in 12 h. Median of triage time duration in level 4 triage (min) and index of settled patients in 6 h were placed in next levels and what's more (Table 2) shows that none of these indexes improve (Table 2-4).

Findings of present research showed that executing healthcare transformation plan in public hospitals which were studied didn't cause any improvements in most performance indexes. But among these, we could mention to unsuccessful cardiopulmonary index which faced a significant improvement. Decreasing this index shows good performance of the emergency room and ability of team work and emergency personnel knowledge in managing most sever patient's condition coming into emergency that are among the most important reasons for existence of the emergency room. Baratloo in a study aiming to evaluate performance indexes ofthe emergency room showed that after the intervention and executing

Table 2: The median and standard deviation of studied hospitals' emergency room performance indexes

	Year 2014		Year 2013		
Index	Deviation	Deviation median	Standard	Median	p-values
Patients' settled in <6 h	1.0764	1.0525	2.6176	4.5192	0
Patients exiting the hospital in 12 h	1001.1	1615.1	4.5639	2.6517	0
Unsuccessful cardiopulmonary restoration	2378.106	1176.68	102.9394	62.1765	25
Leaving with personal responsibility	4743.2	9624.1	2.8822	2.2544	438
Level one triage time duration (min)	10925.0	6741.0	0.09832	0.6941	829
Level two triage time duration (min)	80942.0	6467.1	0.89267	1.6600	967
Level three triage time duration (min)	52162.4	9912.4	4.02693	4.9353	935
Level four triage time duration (min)	28266.7	5294.12	5.64955	8.8882	12
Level five triage time duration (min)	28266.7	5294.12	7.69667	11.9271	678

Table 3: Studied hospitals' emergence room performance indexes in year 2014

Hospitals	Percent of settled in 6 h	Percent of patients leaving the emergency room in 12 h	Percent of unsuccessful CPR	Percent of leaving with personal responsibility	Median of triage time in each triage level				
					Level 1	Level 2	Level 3	Level 4	Level 5
Imam Reza	87.38	87.63	76.68	9.38	0.70	2.20	4.25	8.90	8.90
Imam Khomeini	99.75	99.72	72.29	18.29	1.00	3.30	4.80	10.20	10.20
Ayatollah Taleghani	99.49	99.29	30.58	4.44	0.20	0.50	1.00	4.50	4.50
Imam Ali	94.50	98.83	50.50	8.66	0.70	2.80	7.20	12.80	12.80
Farabi	98.43	90.75	71.50	15.80	1.96	6.60	6.80	10.90	10.90
Motazedi	100.00	100.00	0.00	1.23	0.00	1.10	1.80	2.90	2.90
Mohammad Kermanshahi	100.00	84.46	70.21	1.15	1.00	1.30	6.90	15.30	15.30
Imam Khomeini (eslam aabad)	99.95	99.20	61.99	3.10	0.30	0.80	3.70	10.20	10.20
Shohada (sarpoul zahab)	99.56	99.17	79.16	3.48	0.60	0.90	1.30	11.30	11.30
Hazrat Abolfazl (qar shirin)	99.63	99.84	64.58	0.63	0.30	1.40	4.60	20.00	20.00
Alzahra (gilanqarb)	100.00	100.00	74.53	1.06	0.70	1.40	2.70	9.00	9.00
Imam Khomeini (sonqour)	99.85	99.73	77.14	1.57	0.30	0.80	1.70	7.50	7.50
Dr. Chamran (kangavar)	100.00	93.30	41.01	2.70	0.50	2.30	6.10	17.80	17.80
Moaven (sahne)	100.00	99.82	85.18	1.98	1.00	2.05	3.10	26.00	26.00
Shohada (harsin)	100.00	100.00	78.94	1.74	0.50	1.60	4.60	9.20	9.20
Ghods (paveh)	99.58	98.85	55.28	0.72	0.70	8.20	20.80	30.00	30.00
Hazrat Rasoul (javanaroud)	99.97	100.00	71.16	0.46	1.00	2.25	3.50	6.50	6.50

Table 4: Studied hospitals' emergence room performance indexes in year 2013

Hospital	Percent of settled patients in 6 years	Percent of patients leaving emergency in 12 h	Percent of unsuccessful CPR	Percent of leaving patients with personal responsibility	Triage time duration during each triage level				
					Level 1	Level 2	Level 3	Level 4	Level 5
Imam Reza	79.66	91	69.28	12.46	1	1.9	4.5	6.68	9.218
Imam Khomeini	98.96	99.54	67.80	18.94	0.8	1.9	4	5.2	5.8
Ayatollah Taleghani	95.73	93	30.73	9.12	0.2	0.7	1.1	3	4
Imam Ali	95	95	45	9	0.4	0.8	3.4	7.2	11.2
Farabi	99.98	91	73.90	13.62	1.3	4.2	5.7	6.65	7.75
Motazedi	100	100	0	1	0	1.5	2.1	2.06	2.35
Mohammad Kermanshahi	92	85	58	2	0.9	1.6	4.3	9.4	17
Imam Khomeini (eslam aabad)	99.98	100	56	3	0.4	0.8	3.4	7.2	11.2
Shohada (sarpoul zahab)	95	95	78	11	0.8	1	1.8	9.63	13.83
Hazrat Abolfazl (qar shirin)	99.96	100	62	1	1.4	4.4	5.5	6.58	7.05
Alzahra (gilanqarb)	100	100	69	1	0.6	1.5	2.3	6.1	7.8
Imam Khomeini (sonqour)	89	95	67	4	0.7	2.5	11	19.2	24.38
Dr. Chamran (kangavar)	100	99	48	1	0.1	1.7	5.3	9.1	10.8
Moaven (sahne)	100	100	70	2	1.1	1.9	4.3	16.3	27.3
Shohada (harsin)	98	99	81	4	0.4	0.8	2.8	5.8	8.075
Ghods (paveh)	95	97	73	1	0.7	7.4	18	23.5	27.25
Hazrat Rasoul (javanaroud)	99	100	57	1	1	2.1	4.4	7.5	7.75

emergency improvement plan, percent of successful restoration reached from 64.9% in the first 6 m to 74.4% and increased to 88% in the last 3 m of the year and they also claim that due to changes in hospitalized patients' pattern and changes toward increasing patients' in a very poor condition, increase in patients stay time duration due to their need to special and longer treatment, increase indealing with patients by pre-hospital services and increase in percent of hospital bed occupation, other indexes didn't improve significantly.

From the other hand, present research shows that the leaving with personal responsibility percent index didn't show any significant change in pre and post-periods while this plan decreased medical expenses and it is expected to decrease this index too but this didn't happen and this issue shows that financial issues are one of the important reasons that determines if patients continue their treatment or not and there are also other issues that should be considered and require more research. This tendency to leave the emergency could be a result of patient's dissatisfaction from presented services, equipment, the hospital being an educational hospital, lack of patients as a result of the long waiting in emergency section and the sense that physicians don't take their condition seriously. A study by Curtis and Wiseman titled essential nursing care in the ED considers the following issues, the most important factors at increasing emergency section patients' satisfaction: communication (as one of the healthcare basis in emergency), creating a section and special place for patients that need a longer time in emergency room,

paying attention to the culture and psychological-social condition of patient, pain relief and controlling the disinfection (Kate and Taneal, 2008).

What's more, present research shows that the indexes related to percent of settled patients in 6 h and percent of patients exiting the emergency room in 12 h, decreased after executing the mentioned plan. A reason for such incident might be the fact that this plan was executed without considering the existing substructures and a proper information system wasn't considered for it while employees workload and number of patients going to mentioned hospitals increased but no solution was provided for facing the new condition. It's clear that increasing level of indexes belonging to percent of patients settled in 6 h, shows the ability of the emergency room in determining patients' condition, using resources of the wing for existing patients and good work circulation in the emergency room. And to increase the level of indexes related to percent of patients settled in 12 h is also facing many challenges similar to the previous index that we could mention to lack of cooperation of expert sections, lack of empty beds in special and expert wings, problems in emergency bureaucratic procedures and as a result long wait for patients... among them. A study by salifard titled "improving emergency room performance by applying simulation" shows that the main factor of disorder in performance and creating a crowed in an emergency room is longer time duration that patients stay in this study in a manner that approximately 72% of temporary inpatients spend >6 h there and as a result patients expectation for hospitalizing is high (36 m) and the bed occupation rate also has a high percentage (86%). Still, it seems that the main reason for patients long hospitalizing as a temporary inpatient is related to emergency room's intercommunication with other wings of the hospital. Delay in laboratory and radiology response, delay in presence of specialist from other wings, lack of special treatment beds and surgery room are among the most important factors (Keshtkar and Moradi, 2014).

In the present research, the median of triage time duration in levels 1, 2, 3 and 5 didn't show any change while level 4 triage showed an increase in its median. What's more, in comparison to international standards, the triage time duration, median in levels 1, 2 and 3 triage was based on international standards (5 m or less) and this amount had a great difference in levels 4 and 5 in regard to international standards and it shows that as the illness severity decreases, the response will also decrease. Among the reasons for such issue we could mention to factors such as patients going to the emergency room with no urgent condition and too much crowd in this wing. Too much crowed leads to long waiting time and delay in receiving services. Indexes used for showing too much crowd are: value demand, bed ratio, provider ratio and emergency department work index (Jones *et al*., 2006). Therefor, emergency departments that face increasing demand and limited capacity leads to increase in patients waiting time and decreasing their safety and we should try to find a way to increase the efficiency and improve patients care quality. In a study by Safavi titled "Comparative Study of Theteriah System in Comparison to International Standards in Educational-medical Hospitals of Tehran University", we realize that in comparison to these standards, the maximum percent of patients (89.4%) have a longer triage time duration than the standard (5 m or less). Calculated amounts show that as the patients' condition severity decreases (levels 3, 4 and 5) the level of response increases in a manner that the level of patients' percentage which were visited by the physician in standard triage time duration in level one was zero percent and the fifth level was 100%. In fact, patients with a more severe condition spent a longer time period for their triage in comparison to standard level. These results show the differences in waiting time.

CONCLUSION

Finally, we should say that hospital indexes such as emergency department indexes are the most important factors in showing hospital performance in various areas. Therefor a general attention to these items are essential due to the fact that by a look to hospital indexes, hospital performance becomes clear and by a deeper introspection on these index, we could identify healthcare transformation weak and strength points. What's more the emergency department as the main entrance of the hospital, the closest place to the heart of society and population, the most available place to reach healthcare with >50% of the hospital addition in many centers and almost 30 million annual patient in the country has a special value. Therefor, this section's performance has a direct effect on the whole activities of hospital healthcare and treatment network and country's healthcare system activities.

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