CONTEMPORARY USE OF HOSPITAL EFFICIENCY INDICATORS TO EVALUATE HOSPITAL PERFORMANCE USING THE PABON LASSO MODEL

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ABSTRACT

Background: *Evaluating of the hospital performance using the hospital efficiency indicators can help to appropriate understanding of efficiency of pre-determined plans. This study used the Pabon Lasso model to evaluate the performance of hospitals and identify strategies to assist the hospitals in achieving to optimal level of performance.*

Materials & Methods*: This cross-sectional descriptive study was undertaken in 2013. The study involved all of the 14 hospitals in Ardebil province. Three performance indicators, namely Average Length of Stay, Bed Occupancy Rate and Bed Turnover, collected by questionnaire. The Excel software and Pabon Lasso model used to data analyze.*

Results*: The overall average of length of stay, bed occupancy and bed turnover rates were 2.44 days, %55.4 and 80.85 times / year respectively. Six hospitals were in Zone 1 of the model, five hospitals fell into Zone 3, indicating a satisfactory level of efficiency, and three hospitals placed in Zone 4. None of the studied hospitals fell in zone 2.*

Conclusion*: Hospital managers can use Pabon Lasso model to understanding the status of own hospital efficiency. This analysis can be useful guidance to planning for efficiency improvement.*

Keywords*: Hospital, Bed Occupancy, Bed Turnover, Pabon Lasso*

Background

Hospitals are the most essential and most costly component of health systems. They account for up to two-thirds of health spending. As a result, they greatly influence the overall quality of health care (1). Today, a huge number of hospital beds have been unused due to lack of proper planning. Even, in (many) most cases, despite the high demand for these resources and necessary need to them, we waste them due to poor management and failure to proper use lack of proper use (2). Absolutely, hospitals, like other organizations, need to continuous and regular monitoring and evaluation. With a glance on the main responsibility of such centers which is education, treatment, research and participation in health of community, this issue finds more importance. Since, through analyzing results of continuous monitoring and evaluations, it is possible to compare performance of hospitals with pre-determined plans and then to assess and specify their effectiveness and efficiency (3).

Performance evaluation is an effective method used by hospital management to evaluating and monitoring activities in the hospital (4). Evaluation which is employed as a process to judge the efficiency of pre-determined plans, needs using specific tools and models. Various models have been introduced in order to performance evaluation of healthcare organizations that each of them has its own features.

A used and conventional model according to necessity of principle of efficiency in the optimal use of resources is performance evaluation using hospital efficiency indicators (5).

Studies show there are different indicators to measure efficiency of hospital. Three indicators namely Bed Occupancy Rate (BOR), Bed Turnover Rate (BTO) and Average Length of Stay (ALS) are the most important and applied of them (6-8). Since evaluation of hospital efficiency using important performance indicators is one of the active methods of problem identification, their computing and comparison in the country have been the subject of various studies and researches. Some of such studies have compared performance of the centers by computing mentioned indicators. Some have compared these indicators with existing standards and the others have attempted to identify effective factors on increase and decrease of indicators. The common feature of mentioned researches is that they rarely have compared these indicators simultaneously. This is while employing a method which can use these indicators combinational and simultaneous mode makes it possible to have multiple conclusions in a comparison and evaluate performance of the hospital in different circumstances (9).

The Pabon Lasso model has proved to be one of the most useful for comparing the performance of different hospitals or different wards within the same hospital.

This graphical model was introduced in 1986 by Pabon Lasso for use in determining the relative performance of the hospitals. It uses three indicators to evaluate the overall performance of a hospital, namely: BOR, BTO and ALS (10). Interpretation of performance using this model is based on a chart which is divided into four parts by two crossing lines: the longitudinal axis (x) shows the mean for BOR and the transverse axis (y) shows the BTO. Regarding the quantity of these three indicators, each hospital assigns itself special features by being positioned in one of the four zones of the chart. This makes it easier to make decisions about hospitals and enables the planners to make appropriate and scientific decision about hospitals (2, 9).

Table 1: features of each of the zones of the Pabon Lasso Model

Zone 2	Zone 3
*Low bed occupancy *Inappropriate hospitalizations *Beds in these hospitals is often unused *Some beds are filled with patients who have little need to hospitalization *etc	*Relatively good performance *The low proportion of unused beds *Assured position and correct organizing of hospital beds *Favorable Geographic position and productivity *etc
Zone 1	**Zone 4**
*Surplus of beds *Low demand for inpatient services compared with hospital capacity *Inefficiency in use of hospital capacity *Lack of motivation in employees and especially physicians *People prefer to choose other hospitals *etc	*A high proportion of patients with severe diseases *The prevalence of chronic diseases *Unnecessary and long-term hospitalizations *Defects in the essential technology for timely diagnosis and treatment *Provision of some inappropriate services *etc

Although not all the features associated with each zone of the Pabon Lasso Model may be applicable to every hospital, this kind of analysis is useful for quick identification of the hospitals with weak performance and highlighting areas to direct rectification of their inefficiencies (2, 6, 10).

However, a limitation of the Pabon Lasso Model is that performance indicators may be affected by a number of factors that cannot be measured using this simplistic instrument, such as access to communication facilities, lack of availability of home- or community-care, geographic location, teaching hospital status, the number of employees and hospital policies (11).

The province of Ardebil is located in North-western Iran and is home to a population of over 1,242,956. There are 14 hospitals in the province, including 5 teaching and 9 non-teaching hospitals. It has 8 townships, with Ardebil Township at its centre.

This study used the Pabon Lasso model to evaluate performance of hospitals and identify strategies to help province hospitals in order to achieve a higher level of performance.

Materials and Methods

This is a descriptive cross-sectional study carried out in 2013. All of 14 hospitals in province were included in this research.

The statistical society included all of 14 hospitals in Ardabil province which were as follows: one private hospital (Arta), two hospitals belonged to Social Security Organization (Sabalan-e-Ardabil and Aras-e-Pars Abad), one hospital under governance of Martyr and Veterans Affairs Foundation (Isar Psychiatric Hospital), and such Medical Educational Centers as Dr. Fatemi, BouAli, Alavi and Emam Khomeini of Ardabil, Emam Khomeini of Khalkhal, Velayat of Germi, Vali-e-Asr of Meshginshahr, Emam Khomeini of BileSavar, Emam Khomeini of Namin, and Emam Khomeini of Pars Abad all affiliated to Ardabil University of Medical Sciences.

With the exception of Isar Psychiatric Hospital (Ardebil), the other hospitals all provide general medical care. Among the hospitals, Dr. Fatemi, BouAli, Alavi, Emam Khomeini of Ardabil and Emam Khomeini of Khalkhal hospitals were teaching and the others were non-teaching hospitals. Three performance indicators used in the study were Bed Occupancy Rate (BOR), Bed Turnover (BTO) and the Average Length of Stay (ALS) whose corresponding data for each hospital was provided by referring to health deputy of Ardabil University of Medical Sciences. Ultimately, data was analyzed using Excel statistical software and Pabon Lasso graph.

Results

The study results showed the average length of stay in province was 2.44 days. Bed occupancy and bed turnover rates were, 55.4% and 80.85 times/ year respectively. In calculating the average of three indicators, the figures related to the psychiatric hospital were not considered (Due to long-term hospitalizations and different types of services offered by the hospital that it could significantly distort the results). Table 2 illustrates the performance indicators of the hospitals.

Table 2: The performance indicators of the Ardebil Province hospitals

Hosp. Number	Hosp. Name	BOR	BTO	ALS
1	Alavi	66.63	97	2.49
2	Dr. Fatemi	78.29	60	4.86
3	BouAli	70.57	80	3.23
4	Emam Khomeini of Ardebil	66.31	81	3.01
5	Arta	32.53	78	1.52
6	Isar	93.22	8	44.52
7	Sabalan	86.95	108	2.95
8	Aras	83.39	151	2.02
9	Emam Khomeini of ParsAbad	46.19	73	2.10
10	Vali-e-Asr	65.19	111	2.14
11	Velayat	50.59	76	2.50
12	Emam Khomeini of Khalkhal	47.01	75	2.28
13	Emam Khomeini of Namin	3.64	13	0.99
14	Emam Khomeini of BileSavar	22.91	48	1.61

Excluding Isar Psychiatric Hospital (because of the different type of health care provided by this hospital), the highest ALS figure belonged to Dr. Fatemi Hospital. The maximum BOR and BTO figures belonged to Sabalan and Aras hospitals respectively. Emam-Khomeini hospital in Namin city has the lowest ALS, BOR and BTO figures. Fig. 1 illustrates the performance of the hospitals in a Pabon Lasso model. Among total of 14 hospitals subjected, Emam-Khomeini in Namin city, Emam-Khomeini in Bileh savar city, Emam-Khomeini in Pars abad city, Emam-Khomeini in Khalkhal city, Arta and Velayat hospitals were located in Zone 1 of the graph. - Indicating inefficiency in use of current resources-. Emam-Khomeini in Ardebil city, Alavi, Aras, Sabalan and Vali-e-Asr hospitals fell in Zone 3- indicating high levels of efficiency -. Also Dr. Fatemi, BouAli and Isar Psychiatric Hospitals were placed in zone 4. None of the hospitals fell in Zone 2. Excluding Isar Psychiatric Hospital did not change the position of the other hospitals on the Pabon Lasso graph, so we did not exclude it from our date.

Fig. 1: Locations of studied hospitals based on Pabon Lasso model
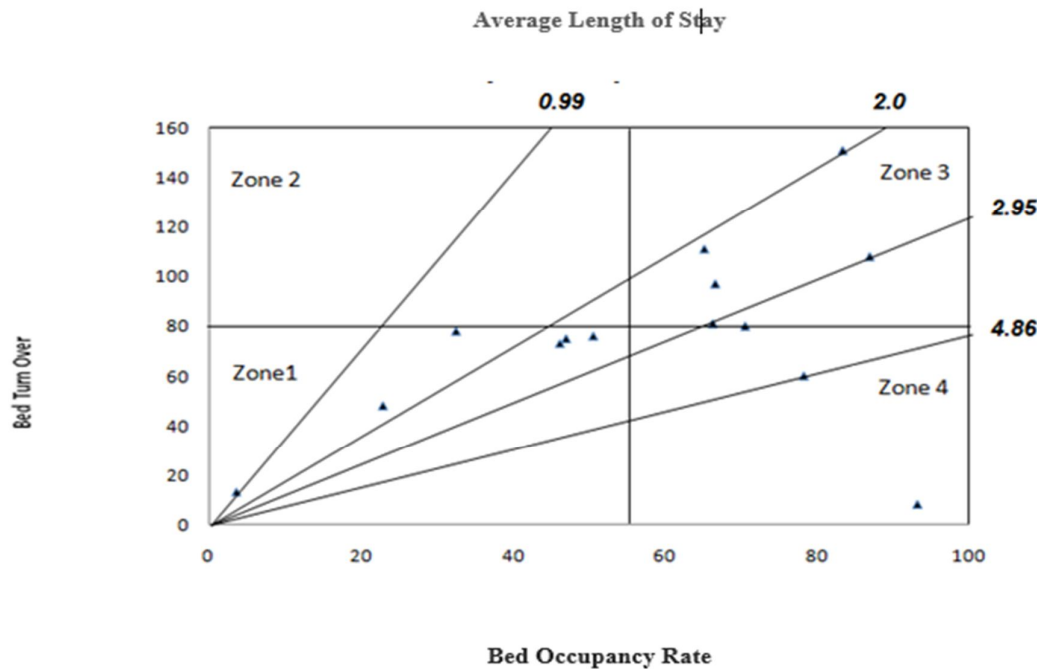
Discussion

Many indicators exist in the literature for measuring hospital performance. This study used multiple indicators for performance evaluating of province hospitals.

In the absence of an analytical model incorporating all of the three indicators, using a single performance indicator could result in misleading conclusions about the overall performance of a hospital. For instance, high BOR can result from either high ALS- indicating efficient performance- or the existence of unnecessary hospitalizations - indicating low efficiency in use of resources-. Use of an analytical model comprising the three indicators would be an appropriate way to avoid such confusions (12).

Overall, the averages of length of stay, bed occupancy rate and bed turnover rate in the province hospitals were 2.44 days, 55.4% and 80.85 times/year respectively.

If, based on available information, minimum bed occupancy rate be considered 55 percent (6) and desired goal to achieve be taken as 75 percent (13), then a comparison between bed occupancy rates of studied hospitals with reasonable standards will show that status of the hospitals in this indicator is not desired.

While attempts to improve productivity and efficiency are of current preferences of health care sector and specifically treatment centers, it is required to plan in order to improve this indicator by identifying the most important reasons of low BOR.

In comparison with available standards, if minimum desired bed turnover be 35 times/year, then bed turnover rates of the hospitals will show desired status of the hospitals from this perspective.

Also, the comparison between ALS with the standard- which do not recommend more than 3 days- shows that this indicator is suitable in this study.

Comparison the position of the hospitals in the four zones of Pabon Lasso graph demonstrated that 6 hospitals (42.86%) were placed in zone 1. In similar studies within the country, the percentage of hospitals that placed in this zone, in Shiraz, Kerman and Semnan was nil, in Kohkeluye-va-BuyerAhmad it was 50%, in West Azerbaijan it was 26.09% and in Mazandaran it was 36% (14-17). Also, in comparison with results of similar studies in foreign countries, such percentages for district and regional medical centers have been obtained 20% and 32%, respectively (18).

Among studied hospitals, 5 hospitals (35.71%) fell in zone 3. These percentages in domestic studies were 90%, nil, 33%, 34.78% and 9% (Respectively for Shiraz and Kerman, Semnan, Kohkeluye-va-BuyerAhmad, and West Azerbaijan) and in similar foreign study were 40% and 28% for district and regional hospitals, respectively (14-18).

One of the reasons which can be count for good efficiency of hospitals in this zone might be delivering specific type (or types) of health care services, having reputation, having experienced medical, paramedical and administrative staffs, the use of advanced medical equipment and technology, taking advantage of modern methods and practices of management and easy access, attracting more customers, etc.

It's necessary to say that merely being placed in zone 3 does not mean we stop attempts towards more productivity; because efficiency improvement is the process for which no extremity can be imagined, hence continuing to enhance the efficiency of hospitals must be considered in working priority of hospitals managers (9).

And ultimately, 3 hospitals (21.43%) possessed zone 4 of the graph. The percentages of hospitals located in this zone were as follows: Shiraz and Kerman (25%), Semnan (100%), Kohkeluye-va-BuyerAhmad (17%), West Azerbaijan (30.43%), Mazandaran (55%), foreign district hospitals (33%) and foreign regional hospitals (34%) (14-18). Zone 4 includes hospitals with high BOR, low BTO, low utilization of facilities and high costs (Characteristics of long-term inpatient facilities such as psychiatric and geriatric medicine centers). Though, due to nature of these centers activity, we cannot have change expectation of zone, but efficiency improvement in this zone and thereby position change (Shifting towards zone 3 of the graph) are not unexpected and must be taken into consideration by managers and corresponding authorities.

None of studied hospitals were included in zone 2 which is allocated to the hospitals which have high BTO due to their specific activities (e.g. Short-term inpatient and/or Maternity centers). So if any hospital can be included in this zone by having above mentioned conditions, it can be argued as an efficient hospital. The percentages of hospitals located in this zone were as follows: Shiraz and Kerman (50%), Semnan and Kohkeluye-va-BuyerAhmad (nil), Mazandaran (9), West Azerbaijan (8.7%), foreign district hospitals (40%) and foreign regional hospitals (28%) (14-18).

In a study in Isfahan from a total of 31 hospitals in 2005, 3 hospitals (10%) were in zone 1, 12 hospitals (39%) were in zone 2, 14 hospitals (45%) were in zone 3, and 2 hospitals (6%) were in zone 4; and in 2006, 2 hospitals (6%) were in zone 1, 14 hospitals (45%) were in zone 2, 13 hospitals (43%) were in zone 3, and 2 hospitals (6%) were in zone 4 of Pabon Lasso graph (9).

Also, results of present study is compatible with results in which low relative performance has been reported for Iranian hospitals. As an example, in 2000 Shahrestani and colleagues conducted a study regarding evaluation of Iranian hospitals' performance by Pabon Lasso graph and concluded that 14 provinces were located in zone 1, 10 provinces in zone 2, only one province in zone 3 of the graph. In that study, ALS, BOR, and BTO indicators for Ardebil Province hospitals were 5.10 days, 42.92 percent, and 57.28 days / year, respectively. While these statistics for the country as a whole were as follows: Average Stay Length: 5.8 days, Bed Occupancy Rate: 49.37 percent and Bed Turnover rate: 30.6 times/ year. These statistics inserted Ardebil Province in zone 2 of Pabon Lasso graph (2).

The improvement in hospital performance that seems to have occurred between the two studies could in part be due to a change in age distribution and prevalent diseases and, perhaps more importantly, to different data collection, index calculation and analysis methods.

Conclusion

This study applied the Pabon Lasso Model for evaluating hospitals performance which provided us with a quick evaluation about the overall performance of the hospital by charting three indicators (BOR, BTO and ALS). These indicators show how close a hospital has come to using its maximum performance capacity. Therefore, they provide a basis for reviewing and revisal current resource allocation practices and devising strategies for implementation of the required changes.

Being located in zone 1 indicates poor performance and inefficiency. Therefore, appropriate strategy for these zone hospitals could include a halt to hospital expansion for the time being. At the same time, every effort should be made to identify and correct factors contributing to the present state of poor efficiency.

Being placed in zone 2 (excluding short-term inpatient centers) and zone 4 (excluding long-term inpatient centers) implies relative efficiency and guides management to follow up efficiency improvement measures. Hence, for zone 2 hospitals some provisions are recommended to rationalize hospitalizations and for enhancing the performance of zone 4 hospitals a shift towards outpatient services and efforts to overcome shortages and improve management is advised.

Zone 3 is related to the hospitals which have good degree of efficiency to handle affairs and management shall permanently try to shift from other zones to this zone. Hospitals located in this zone should follow up their strategy to insure about having continuity in delivering efficient services with optimal number of used beds. Absolutely, according to efficiency improvement and direction of the graph, in all four zones shifting towards zone 3 is reasonable and shows success in efficiency and performance improvement plans in hospitals (9, 16). There are clearly differences between the performances of studied hospitals. However, a better understanding of such differences should be based on objective evidences. Undoubtedly, future researches should focus on identifying factors that lead to low efficiency in hospitals and also to find ways to overcome these factors. As governments search for the best ways to monitor and evaluate hospital performance, policy-makers must identify the best ways to maximize hospital outcomes, patient satisfaction, and operational efficiency.

Conflict of interest
None declared.

References

1- A. NA. Manager's Performance Appraisal of Health Networks in Semnan and Mazandaran Province and Provision a Suitable Model. Journal of Ghazvin University of Medical Sciences. 1998;2(8):55-63.

2- Anonymous. Allocation and technical efficiency in health financing and expenditure in post-apartheid South Africa. South African National Health Reports, 2001.

3- Asefzade S. Health Economics Principles. Ghazvin: Hadise emrouz Publications; 2003.

4- Asefzadeh S. Hospital's Management and Research. Ghazvin: Hadise emrouz Publications; 2007.

5- Bahadori M, Hamouzadeh P, Hakimzadeh M, Nejati M. Combining multiple indicators to assess hospital performance in Iran using the Pabon Lasso Model. Australasian Medical Journal AMJ. 2011;4(4):175-9.

6- Barnum H, Kutzin J; Public Hospitals in Developing Countries: Resource use, cost, financing. Baltimore: The John Hopkins University Press. 1993:99-100.

7- Farzandipour M, Rangraz Jeddi F, Mousavi G. How often do the managers use the statistics for hospital management? feyz. 2003;27:92-8.

8- Ghasemi A. series evaluation in hospitals. Journal of Iranian Scientific Hospital Association. 2001;2. Kamale danesh, Tehran.

9- Goshtasebi A VM, Gorgipour R, Samanpour A ,Maftoon F, Farzadi F, et al. . Assessing Hospital Performance by the Pabon Lasso Model. Iranian Journal of Public Health. 2009;38(2):119-24.

10- Health NDo. Use of the Indicators to Assess Hospital Efficiency. The Epidemiology Unit, Kwazulu-Natal Department of Health; 2004; Available from: http://www.kznhealth.gov.za/epibulletin7.pdf.

11- Mazhari S. Structural resources allocation system of Inpatient services in Iran during during the fourth 5-year development program. Tehran: Arvij Publications; 2005.

12- Medici A , and Murray R. Hospital Performance and Health Quality Improvements in São Paulo (Brazil) and Maryland (USA). June 2010, Number 156, www.worldbank.org/enbreve.

13- Pabon Lasso H. Evaluating hospital performance through simultaneous application of several indicators. 1986;4(20):341-57. Bulletin of the Pan American Health Organization.

14- Roholamin A PH. The Comparison of Hospitals's Performance of Kerman and Shiraz Universities of Medical Sciences through Poben Lasso Graph. Tabriz: Tabriz University of Medical Sciences. 2007.

15- Sadaghiyani E. Evaluation of Healthcare and Hospital's Standards. Tehran: Moein Publications; 1997.

16- Sajadi H SZ, Hadi M. Is There any Method to Compare Key Indicators of Hospital Performance Simultaneity? Health Information Management. 2011;8(1):71-81.

17- Taleb shahrestani M. Using three major indicators (bed occupancy rate, bed turnover rate, and average length of stay) to assess the performance of Iranian hospitals in a Pabon Lasso model. Tehran: Iran University of medical sciences; 2000.

18- Thomas S NC, Smith S. Social health insurance: further options for Ireland. 2008:1-48. Report prepared by TCD and published by the Adelaide Hospital Society.