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Effective factors on the Hospital beds distribution: designing a model for Iran

Abstract

Hospital beds are one of the most important and most valuable resources of the healthcare system the heterogeneous and inappropriate allocation of these expensive resources around the world has caused to consumption of the resources. The purpose of this research is to design a distribution model of hospital beds in Iran to develop and distribute optimal and cost-effective hospital beds.

This research was descriptive-analytical that has been carried out in a quantitative-qualitative combination in 2020. The research population consisted of 345 persons of health managers and experts in the field of health that was selected through multistage sampling in 5 regions of the country (North, South, Center, West, and East). In total, 23 persons of university experts were selected from each university. A researcher-made questionnaire was used to collect data. To standardize and validate the questionnaire, a qualitative assessment was done using an expert panel and a quantitative assessment was done using content validity ratio (CVR) to assess the face and content validity. Reliability assessment was done by a test-retest method use of Cronbach's alpha and also the exploratory factor analysis with Varimax rotation and AMOS statistical software version 20 and SPSS version 20 was used to determine the validity of the items. Besides, Fit indexes were utilized to determine the fit of the model.

Based on the content validity ratio, 23 agents were confirmed by the experts from 51 effective identified factors in the questionnaire. The exploratory factor analysis identified five factors including organizational (with 7 parameters), economic (with 4 parameters), social (with 6 parameters), political (with 3 parameters), and geographic dimensions (with 3 parameters) as the main factors of hospital beds distribution, which covered 70.745 percentage of the variance of all variables. The organizational dimension had the highest effect (1.00) and the geographical dimension had the lowest effect (-0.16) on the distribution of hospital beds. Two parameters of social and economic characteristics with a factor load of 0.46 in the social dimension and efficiency and effectiveness of available centers with a factor load of 0.31 in the economic dimension were excluded from the model after conducting a confirmatory factor analysis.

This study confirmed the model of distribution of hospital beds with five organizational, social, economic, political, and geographical dimensions in which organization with high explanatory power has the greatest effect on the distribution of hospital beds. Therefore, using this model seems beneficial as a comprehensive and appropriate method in policy-making and decision-making regarding the development and distribution of hospital beds.

Keywords: *bed, hospital, bed distribution, policy-making, factor analysis*

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Introduction

One of the most important issues in social welfare is the proper, equitable, and fair provision of health services for different strata of society (1,2). In addition to its special importance and place, this category has a special complexity due to its plurality of dimensions and its effects, so that it made authorities and managers face large and complex decisions. One of the most important strategies in the way of achieving social justice and equality in health systems is the easy, fair, and continuous access of the community to their needs of health and treatment services.

In this regard, inequality in the geographical distribution of health and treatment resources will make individuals encounter problems in accessing health services (3). Therefore, increasing the number of treatable identified diseases, the expensive cost of equipment and technologies, and new therapies, as well as raising the community's expectations level on the one hand and restricting available resources, on the other hand, will make the necessity of accurate decision making undeniable in case of allocating of health system resources (4).

Several factors affect access to health services, including three categories of structural factors (organization, health service providers, transportation system), financial factors (level of insurance coverage and public support, government) as well as individual factors (cultures, incomes, education, and knowledge of the person), which have an important role in the access of individuals in a community to the provided services in health and treatment centers.

In developing countries, most resources are usually allocated unequally due to a shortage of information, skills, and expertise in the health care planning field (5,6). Hospital beds are one of the most important and most valuable sources of health care system the lack of equal and fair allocation among the provinces of our country may not only lead to irreparable complications but also a displacement of un-well patients (6). Thus, the distribution of hospital beds (as one of the sources of the health system) can be used as one of the indexes for the distribution of services (7,8). But, the results of the studies show that there are sufficient hospital beds in some parts of the country and the problem is relating to the distribution and referral mechanism and provision of healthcare services (6,9).

Therefore, this disorder may result from the available model which has not been able to estimate and locate accurately the priorities at the country's level according to the principles of the health economy. However, it is possible to promote the amount of utilization of these resources and access to health care services by identifying the effective parameters and factors in the distribution of hospital beds. Of course, the Ministry of Health, which is responsible for preserving, restoring, and promoting the health of all people and their families, has been making all its efforts to provide a fair and proper distribution of the bed and to set up a hospital, although such decisions need accurate evaluations and field-based studies. Hence, in this study, the researcher tried to extract important factors in the proper distribution of hospital beds using accurate and scientific evaluations and to design a proper model for our country.

Method:

The present study was a descriptive-analytic study that was carried out through a quantitative-qualitative combination in four stages including reviewing the sources, validating identified factors, exploratory factor analysis, and confirmatory factor analysis, and providing a model for achieving a proper model for distributing hospital beds in Iran during the year of 2020. Before implementing the study, written consent to participate in the study was obtained from the individuals and they were assured that their information will be remained confidential to the researcher.

In the first stage, conducted studies in the distribution field of hospital beds and their effective factors in Iran and the world were evaluated by referring to reliable Persian information databases and libraries such as SID, Magiran, and foreign databases such as PubMed and Scopus. Based on the purpose of the study, a checklist of effective factors for the distribution of beds in Iran and the world was obtained. Then, the extracted items were primarily reviewed with the help of a group of experts, repeated cases were omitted and also similar items were moderated.

In the second stage, to calculate Content Validity Ratio (CVR), the identified items were accommodated for 15 certified experts to provide their opinions on 3 alternatives such as: “it is necessary", "it is useful but is unnecessary" and “it is not necessary". Considering the total number of 15 certified experts, the minimum score of the experts' agreement about the comprehensibility and presence of the index in the final questionnaire should be equal and more than 0.49 (10). The test-retest method was used to evaluate the reliability of the questionnaire. Besides, 30 qualified and expert persons were twice given the questionnaire during two weeks, and as a result, collected the reported reliability was 0.88.

Finally, in the third stage, to determine the dimensions and variables of each dimension, the participants were given a 23-component- questionnaire (which is arranged on 5-point Likert scales) based on the confirmed factors in the previous stage using the exploratory factor analysis method. The response scales use anchors such as very high (5), high (4), medium (3), low (2), and very low (1). Therefore, the fourth stage was conducted to confirm the identified factors to be in different dimensions and finally to present the final model and assess the fit model.

The statistical population of the present study is the first stage and included the current and available models in the distribution field of hospital beds. and also in the second stage, included professors of healthcare services management, economics, and health policy. Besides, in the third and fourth stages, the statistical population included university professors, Ph.D. students in the major of healthcare services management and health economics, managers, and experts who had scientific experiences about the health system, particularly, the distribution of treatment facilities and stratification of health services in all over the country.

The sample size was based on the number of variables multiplied by several 15, which means, that 300questionnaires were completed among 345 questionnaires which were obtained according to the number of 23 variables that were identified (the response rate was 87%). Afterward, 14 questionnaires were omitted due to incompleteness, and finally, 276 questionnaires were assessed. In this study based on multistage and quota sampling methods, the country (Iran) was divided into 5 geographical regions (north, south, center, west, and east) from one of them, and 3 medical science universities were selected.

Afterward, 23 university professors, Ph.D. students in the major of healthcare services management and health economics, managers, and experts who had scientific experiences about the health system, particularly, the distribution of treatment facilities and stratification of health services were selected from each university, completed the questionnaires. The researcher collected the completed questionnaires in the accessible provinces, moreover, a well-trained representative was sent from each of the medical science universities to collect the rest of the completed questionnaires in remote provinces.

Inclusion criteria include those who have a good command of related subjects, work experience in health system management are familiar with the stratification of health services in the country and have MS or higher education in the major of health care services management and the economy of health.

Ultimately, to analyze the data, the central limit and dispersion indexes such as mean, standard deviation, and frequency distribution tables were used. Also, to extract the dimensions and determine the effective factors in the distribution of

hospital beds, exploratory factor analysis, and confirmatory factor analysis methods were used. Moreover, fit indexes were used to fit the model. Consequently, all collected data were evaluated by using SPSS software version 20 and AMOS statistical software version 20.

Findings:

A total of 276 participants in the study were (75%) 208 men and (25%) 68 women. In terms of educational degree, (41%), 101 persons, (47%) 139 persons, and (12%) 36 persons had master's degrees, Ph.D. and were Ph.D. students, respectively. Also, (7%), 18 persons, (19%), 53 persons, (31%), 86 persons, (29%) 79 persons, (15%) 40 persons had work experience of fewer than 5 years, 5 to 10 years, 10 to 15 years, 15 to 20 years and more than 20 years. In terms of age (11%) 30 persons were less than 30 years old, (24%) 67 persons were between 30 and 35 years old, (31%) 86 persons were between 35 and 40 years old, (20%) 55 persons were 40 to 45 years old, and finally (14%) 38 persons were over 45 years old.

After extracting effective factors on the optimal distribution of hospital beds in the first stage (67 factors) and based on the opinions of the professors who have conducted the syllogism validity, the number of items was reduced to 51 factors. In the content validity evaluation, since the minimum acceptable amount of CVR based on the responsive number of 15 persons and the LASHE table is 0.49, 23 factors were finally selected as effective factors for the optimal distribution of hospital beds in Iran to determine the dimensions and to design the model (Table 1).

Table 1: Effective criteria for the optimal distribution of hospital beds and their content validity index

Acceptance or Rejection	Content Validity Index)CVR(	Criteria	Row	Acceptance or Rejection	Content Validity Index)CVR(	Criteria	Row
Rejection	47	The average length of stay by specialty	27	**Acceptance**	100	Population	1
Rejection	47	The existence of medical education centers	28	**Acceptance**	60	population density	2
Rejection	33	The amount of urgency and complexity of service delivery	29	**Rejection**	33	Culture, religion, and language of the region	3
Rejection	47	Human service provider	30	**Acceptance**	73	Distribution of age and gender of the population	4
Rejection	33	Communications network inter-hospital	31	**Acceptance**	87	Population growth rate	5
Rejection	20	Comprehensiveness and acceptability of providing health care services	32	**Acceptance**	60	The geographical location of the region	6
Rejection	33	Transportation facilities	33	**Acceptance**	100	Way of accessing referenced levels in terms of geographical	7
Acceptance	60	Index of hospital beds (per 1000 persons)	34	**Acceptance**	87	Number of cities, towns, and villages up to 60 km from the hospital location	8
Acceptance	73	Hospital Ownership	35	**Rejection**	33	Urban and rural traffic networks	9
Acceptance	100	High-level Documents and Policies	36	**Rejection**	47	The natural location of the region (mountainous, forest, coastal, weather conditions, etc.)	10

Acceptance	87	Bias and Political acceptance	37	**Acceptance**	100	Mortality rates and other vital indexes	11
Acceptance	87	authority pressure	38	**Rejection**	47	Illiteracy and literacy rate	12
Rejection	47	The direct and indirect cost of health care services	39	**Acceptance**	87	Socio-economic features	13
Rejection	33	Per capita income	40	**Acceptance**	73	Number of referrals by the specialized bed (based on retrospective study)	14
Rejection	33	Hospital size by beds	41	**Acceptance**	73	Patient rate of the region (number of hospitalized patients per thousand persons in one year)	15
Rejection	47	Size economics (Minimizing the costs of providing services by preventing the establishment of small or single medical units)	42	**Rejection**	47	Comparison of the volume of referrals per 1000 inhabitants of the city (acceptance of patient) with provincial acceptance of patient and then country acceptance of the patient	16
Rejection	33	Domain economics (maximizing the high-risk treated patients in a treatment unit to increase the expertise and experience and to improve the consequences for patients)	43	**Rejection**	33	Basic epidemiological data	17
Acceptance	60	Efficiency and effectiveness of provider centers of services	44	**Acceptance**	100	Outbreak and burden of disease	18
Acceptance	100	financial resources	45	**Acceptance**	73	Main causes of mortality (pregnant women, cardiovascular diseases, high accident rates, etc.)	19
Acceptance	100	physical space and facilities and proper equipment	46	**Rejection**	20	Vulnerable population size	20
Rejection	47	number of provider centers of services (including urban and rural health care centers and hospitals of regions)	47	**Rejection**	33	Vulnerability relating to common diseases in the region	21
Rejection	20	Number of industrial centers, factories and producers, agricultural regions, and business centers	48	**Rejection**	47	Life expectancy	22
Rejection	33	Employment rate	49	**Rejection**	47	The rates of hospitalized and outpatient patients	23
Rejection	47	inflation rate	50	**Acceptance**	100	Hospital Performance Indexes (bed occupancy amount, bed occupancy	24

						percentage, average residence time)	
Rejection	33	The interest rate for health insurance investment	51	**Rejection**	20	The desirable bed occupancy rate (70-85%)	25
				Acceptance	73	List and waiting times	26

According to calculating the initial matrix of factors, It was specified that five factors have more than 1 Eigenvalue so that they cover 70.745% of the variance of all variables (Table 2).

Table 2: The value of the total variance covered by the five factors before and after the periods

N	Sum of squares of factor loads before the periods			Sum of squares of factor loads after the periods		
	Eigenvalue	Variance Percentage	The cumulative percentage	Eigenvalue	Variance Percentage	The cumulative percentage
First factor	7.705	33.5	33.5	5.643	24.535	24.535
Second factor	3.231	14.049	47.549	3.521	15.31	39.845
Third factor	2.246	9.765	57.314	2.717	11.814	51.659
Fourth factor	1.747	7.597	64.911	2.395	10.413	62.072
Fifth factor	1.342	5.834	70.745	1.995	8.674	70.745

Table 3 shows the matrix of components in which the factor loads of variables are presented after Varimax rotation.

Table 3: Factor loads of each of the variables affecting the optimal distribution of hospital beds

variable	factors				
	organizational	social	economic	political	Geographical
High-level Documents and Policies				0.848	
Population		0.661			
Number of cities, towns, and villages up to 60 km from the hospital location					0.817
Bias and Political acceptance				0.826	
Distribution of age and gender of the population		0.819			
Number of referrals by the specialized bed (based on retrospective study)	0.845				
Index of hospital beds (per 1000 persons)	0.648				
Hospital Performance Indexes (bed occupancy amount, bed occupancy percentage, average residence time)	0.627				
Outbreak and burden of disease	0.845				
Main causes of mortality (pregnant women, cardiovascular diseases, high accident rates, etc.)	0.920				

authority pressure				0.903	
Efficiency and effectiveness of provider centers of services			0.520		
List and waiting times	0.931				
Hospital Ownership			0.895		
The geographical location of the region					0.712
Patient rate of the region (number of hospitalized patients per thousand persons in one year)	0.926				
population density		0.742			
Way of accessing referenced levels in terms of geographical					0.867
Population growth rate		0.671			
Mortality rates and other vital indexes		0.525			
physical space and facilities and proper equipment			0.781		
financial resources			0.892		
Socio-economic features		0.722			

A Box plot was used to identify the Outliers. First, a box plot relating to economic, socio-cultural, organizational, geographic, and political dimensions was drawn and outliers were identified for each dimension. To manage the outliers relating to each dimension, some procedures were considered as follows: if an outlier was wrongly typed, it was replaced with the right form of the number. Also, if an outlier was wrongly reported by the population sample, unrealistic numbers were replaced by the median. the Standard deviation was used to remove different samples. In the present study, the standard deviation of all samples was≥ 0.3, so that sample was not removed.

Skewness relating to each question of the questionnaire was between (3 and -3) and their elongation was between 5 and -5, hence all questions of the questionnaire had a normal distribution.

Regarding the critical ratio and the significance level of 0.01, all of the questions were significant in the probability of 99%. Therefore, they had the first condition to stay in the model. According to the standard table, if the factor load of the question is more than the minimum acceptable standard (0.5), it will not be removed from the model. Therefore, the factor load of all questions except the 5th Question of Social Dimension (Socio-economic features) and the first Question of Economic Dimension (the efficiency and effectiveness of service providers' centers) was more than 0.5, consequently, it remained in the model.

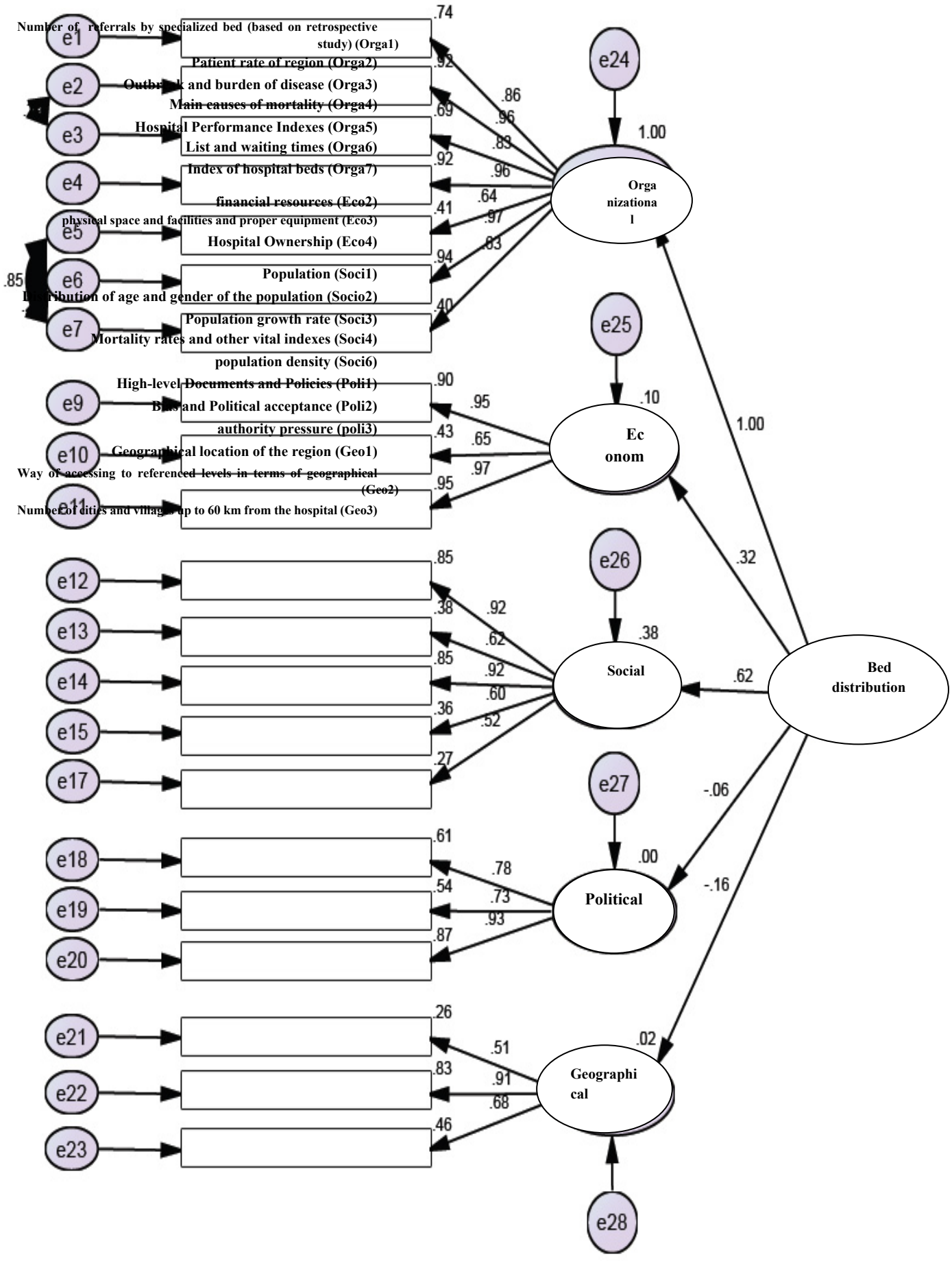
Number of referrals by specialized bed (based on retrospective study) (Orga1)
Patient rate of region (Orga2)
Outbreak and burden of disease (Orga3)
Main causes of mortality (Orga4)
Hospital Performance Indexes (Orga5)
List and waiting times (Orga6)
Index of hospital beds (Orga7)
financial resources (Eco2)
physical space and facilities and proper equipment (Eco3)
Hospital Ownership (Eco4)
Population (Soci1)
Distribution of age and gender of the population (Socio2)
Population growth rate (Soci3)
Mortality rates and other vital indexes (Soci4)
population density (Soci6)
High-level Documents and Policies (Poli1)
Bias and Political acceptance (Poli2)
authority pressure (poli3)
Geographical location of the region (Geo1)
Way of accessing to referenced levels in terms of geographical (Geo2)
Number of cities and villages up to 60 km from the hospital (Geo3)
Orga nizationa l
Ec onom
Social
Political
Geographi cal
Bed distribution
1.00
.10
.38
.00
.02
.32
.62
-.06
-.16
.74
.92
.86
.96
.69
.83
.92
.96
.64
.41
.97
.83
.94
.40
.90
.95
.43
.65
.97
.95
.85
.92
.38
.62
.85
.92
.60
.36
.52
.27
.61
.78
.54
.73
.93
.87
.26
.51
.83
.91
.68
.46

Figure 1: Hospital beds Distribution model in Iran

Among questions relating to organizational dimension, the 6th question (list and waiting time of patients) had the highest correlation coefficient (0.97) and the 7th question (bed ratio index to population) had the lowest correlation coefficient (0.63). In the economic dimension, the 4th question (hospital ownership) had the highest correlation coefficient (0.97) and the third question (physical space and equipment) had the lowest correlation coefficient (0.65). In the socio-cultural dimension, the 1st and 3rd questions (population number and population growth rate) had the highest correlation coefficient (0.92) and the 6th question (population density) had the lowest correlation coefficient (0.52). In the political dimension, question 3rd (authority pressure) had the highest correlation coefficient (0.93) and the 2nd question (political bias and acceptability) had the lowest correlation coefficient (0.73). Finally, among questions relating to geographic dimension, the 2nd Question (how to access geographic reference levels) had the highest correlation coefficient (0.91) and the 1st question (geographical location of the area) had the lowest correlation coefficient (0.51) with the political dimension (Figure. 1).
to validate the model, at least 3 indexes should be placed within acceptable limits, so that the model was confirmed (Table 4).

Table 4: Fit indexes of confirmed factor analysis model affecting factors on optimal distribution of hospital beds

Index type	Fit indexes	allowed Limit	primary model	Modified model
Absolute	(χ2/DF) CMIN/DF	0<3	4.417	2.308
	RMSEA	<0.08	0.111	0.069
	GFI	>0.8	0.784	0.878
	AGFI	>0.8	0.729	0.840
Parsimony	PNFI	>0.5	0.709	0.770
Comparative	NFI	>0.9	0.816	0.919
	RFI	>0.9	0.788	0.903
	IFI	>0.9	0.851	0.952
	TLI	>0.9	0.828	0.943
	CFI	>0.9	0.850	0.952

Since CR of all dimensions is larger than 0.7, the construct reliability is established. Meanwhile, CR is larger than AVE and AVE is larger than 0.5. Therefore, convergent validity is established for all dimensions. In the end, given that AVE is larger than USA and MSV, discriminated validity is also established for all dimensions affecting the optimal distribution of hospital beds (Table 5).

Table 5: construct reliability **and validity of factors influencing the optimal distribution of hospital beds**

	CR	AVE	MSV	ASV	Geographical	Organizational	Economic	Socio-cultural	Political

Geographical	0.859	0.671	0.074	0.026	0.819				
Organizational	0.945	0.716	0.381	0.128	-0.063	0.846			
Economic	0.902	0.760	0.104	0.058	0.272	0.323	0.872		
Socio-cultural	0.847	0.540	0.381	0.112	0.088	0.617	0.210	0.735	
Political	0.752	0.514	0.025	0.017	0.135	-0.158	0.095	-0.131	0.717

Discussion

The model of hospital bed distribution in Iran, including 5 dimensions and 21 variables, has provided an instrument by which policymakers and health care managers can plan the development of hospital beds. One of the most effective dimensions of bed distribution in this research is an organizational dimension in which the list and waiting time of patients is one of the most important components of this dimension. In the research conducted by Ataolahi et al., the average waiting time for using the bed has been considered an essential factor in the allocation of hospital admissions (11). The findings result from the research conducted by Cardoso et al., showed that 326 clinical referral cases were not accepted due to a lack of beds. And also, the waiting time for a clinical admission was too long (12). In the research conducted by Ravaghi et al, it is important to consider alternative approaches to planning hospital capacity like care pathways to fix the limitations of "bed numbers" (13).

One of the other influential components in this dimension was the Patient rate of the region or in other words, utilizing population from the beds. The results of Goodarzi et al.'s research, entitled "Modeling hospital bed prediction in Iran", showed that the development of hospital beds without taking the Patient rate of the region can lead to a decline in the health equity index (9). Moreover, they introduced the bed-to-population ratio index as an effective criterion for predicting the required bed (9), which according to the results of the present study; however, was introduced as one of the lowest effective indexes in the proposed model. It is necessary to first measure the volume of referring to different specialties, before distributing and allocating beds to the districts of the country. Ataolahi et al., in their research conducted in Shahid Mohammadi Hospital of Bandar Abbas, found that there was a shortage of beds in the ICU, CCU, orthopedic and internal wards, and there were surplus beds in the emergency, neurology, neurosurgery wards, and burn units (11).

The social dimension was identified as the second effective dimension in the proposed model and its effective components were introduced as a number, growth rate, age, sex distribution, and density of population. Jamali et al., and Ahadnejad et al ., introduced the population of the area as one of the important factors in locating the hospital and allocating health and medical facilities. Also, the results of this research showed that there is no balance and proportional between population density and the number of hospitals in Tabriz (14,15). The age structure and population of an area are primary factors in allocating hospital beds in the structural program of Australian hospitals (16). Aghamohamadi et al. suggested that shifts in the disease patterns toward chronic diseases as well as shifts in the population age and gender structure toward aging in Iran would have a great influence on the future demands for hospital beds (17). According to Schofield and Earnest's study, aging would increase the demand for beds up to 70-130 percent by2050 (18). In the present research, the above-mentioned criteria are important factors in the distribution model of the hospital beds which are consistent with the results of the mentioned research.

The economic dimension was the third most effective dimension in the present model and also the hospital ownership index, financial resources, and the availability of facilities and equipment were placed in this dimension. It should be considered whether the owner of the hospital is consistent with the financial ability of the people of that area at the time of establishing a hospital in an area. Furthermore, the cost of investment and the physical and environmental characteristics are important factors in locating the hospital and allocating health and medical facilities (14). Low-income households pay about 40 percent of their trivial income for healthcare services while affluent households approximately spend 9 percent of their income on healthcare costs (19). For instance, six private hospitals of ten existing hospitals in the 11th district of Tehran have mainly been established with the motivation of making profits (15). The geographic and political dimensions were, with the weighted least square regression, the fourth and fifth dimensions of the proposed model of the study. Authority Pressure and high-level documents and policies were among the most effective indexes in the political dimension. According to the findings resulting from Zahedi Asl's research, more than 45 percent of the hospital beds belonged to the private section in Tehran, while the share of Ilam, Bushehr, Chaharmahal and Bakhtiari, Zanjan, Semnan, Sistan, and Baluchestan, Kurdistan and Boyer Ahmad provinces was zero in 1996 (20). The results of this study indicate that there are problems either in macro policy making or in implementing the related policies. It seems that the facilities of Tehran, as the capital of the country, and provincial centers are more than the facilities of the other cities concerning authority pressure.

Geographic location and ways of accessing referral levels were effective variables in the geographic dimension. The results of the study of Shafie et al. showed that there are 34 third-level women & infants hospitals (Referral) in 22 geographical

districts in Tehran and six out of 34 above-mentioned hospitals are located at a distance of 500m from each other (21). Chavehpour found that The high inequalities in hospital and hospital bed distributions in our study imply an overlooked but growing concern for geographical access to healthcare in rapidly urbanizing metropolitan cities in Iran (22).

In their research, Khabiri et al. found that the highest frequency of childbirths on roads (33.3%) occurred in Tehran province. Even though most hospitals and hospital beds are concentrated in Tehran province, the disproportionate distribution of hospital beds in different regions along with the heavy traffic has led to the occurrence of such childbirths (23). Farrokhyar et al. found that among the influential components, the demographic factor component plays a very important role in the distribution of intensive care beds (24). The results of the study of Mosadeghrad et al. showed that The geographic distribution of hospital beds in Tehran city is not equitable and The Gini coefficient was 0.619 for hospital bed distribution among Tehran districts. Districts 6, 12, and 3 have had the highest hospital beds per 1000 people. District 6 had 23% of the total hospitals and 24% of the hospital beds (25). Hospitals located on downtown, narrow and crowded streets cause problems such as lack of prompt and timely access and noise pollution posed by traffic congestion, resulting in discomfort for patients (26). It is recommended that hospitals that are far away from other hospitals and individuals covered by the hospital are far away from other hospitals offer a variety of services to meet a greater number of needs for the covered ones (27).

Conclusion

As the lack of hospital beds in a region can greatly decrease health accessibility and health equity indexes, hospital bed development and distribution, regardless of effective factors, may downgrade equity in access to health services through imposing costs of inefficiency. According to the results of the current research, it could be concluded that the model proposed in this research has provided a means for policymakers in the health system to improve hospital bed distribution even though further accurate information over different periods is required for this model. This model would help the Ministry of Health and Medical Education to gain a thorough understanding of the issues with a greater impact on hospital bed development and distribution to plan, implement and manage the issue. Hospitals should also increase their efficiency not only to improve the quality of their services but also to promote satisfaction among their clients. The Ministry of Health and Medical Education is thus recommended to consider the effective dimensions and factors detected in this model and to include them in Iran's health development document that is being compiled. To implement the model, a comprehensive information system in the healthcare sector should be set up to record effective indexes such as the percentage of service benefits, patient immigration, and others to plan and approve future macro policies of the health system through using such information.

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