Available online at www.CivileJournal.org

Civil Engineering Journal

Vol. 4, No. 9, September, 2018

A Systematic Review of Affective Factors on Locating Specialized Hospitals

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Received 29 March 2018; Accepted 01 September 2018

Abstract

Considering the importance of ways and accessibility in today's busy life, choosing the right place is one of the necessities of each project. It is worth saying that the sensitivity of the patient's condition and related issues has made the hospital locating more important and also it must be noted the different dimensions of health or disease affect each other and is influenced by each other. Indeed, data analysis suggests that the goal of designing a therapeutic centres should not only be included of physical therapy of individuals but in addition to the provision of health services, providing mental and psychological needs of users is one of the most basic design goals of such places. Therefore the hospital locating is taking place in Rasht led to a tree diagram for hospital locating factors based on a summary of scientists and researchers backgrounds which corresponding analysis was made by analysing the selected site and numbering matrixes based on tree diagram. The results of the matrix with an average of 1.31 out of 2 indicate that the selected field is suitable to construct a hospital from locating perspective.

Keywords: Hospital; Hospital Locating; Rasht; Architecture.

1. Introduction

Nowadays, due to the increase in street traffic, most health care centres are part of a community service whose access to them should not be delayed. Spatial and temporal access to such places is of major importance, because the lack of adequate access to medical resources for residents has dangerous consequences [1]. Access to health care is a complex and multidimensional phenomenon. Which refers to the ability of individuals to receive health care services needed [2]. In recent years, measurements of spatial access to health care has attracted more attention because of its ability to describe geographical variations in large areas, for example, within cities or provinces. Researchers with various specializations have always been interested in discovering solutions to various types of locational problems [4]. The number and variety of spatial and locating information has increased in recent years and has led to widespread debate about the quality and usability of such data [5-6]. Today, the development and application of multi-criteria decision-making models has become widespread in order to increase the accuracy of planning, because through them, according to quantitative and qualitative criteria, one can choose the best option [7]. Several studies have been carried out on the selection of appropriate healthcare centres using GIS. Some of these studies have focused on specific aspects of resource allocation, such as the availability of multiple studies on the selection of appropriate healthcare centres using GIS. Some of these studies have explored specific aspects of resource allocation such as accessibility [8]. Various factors have been identified for locating healthcare centres in various sources; a number of factors include pollution, distance to services, economic constraints, temporary barriers, and inconsistencies or social injuries [9]. Several researchers emphasize on general factors: 1. Desirability. 2. Compatibility. 3. Accessibility [10-16]. Among the researches carried out between

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http://dx.doi.org/10.28991/cej-03091151

the factors mentioned above, emphasis is on utility, Busief and Shouman in 2012 referred to desirable factors such as pollution, weather, site specific features, land cost [17], etc. as wellOppio in 2016 mentioned factors such as local quality, environmental quality, economic aspects, etc. and Vahidnia in 2009 and Moradian in 2017 reffer to pollution, land cost (economic conditions), relevant site and environment [19-20]. Among the researches, there have been some factors influencing the hospital locating, which according to review studies had have less importance such as quality and waiting time, urban and rural areas and the number of local competitors [21]. The purpose of this paper is to review the factors influencing locating of therapeutic use and factors prioritization based on researches and theories that have been carried out in recent years, in order to achieve an abstract of prioritization of effective factors in the hospitals locating, a diagram is drawn up to highlight more important and more emphatic issues in the research, and based on the diagram, a case study is carried out in city of Rasht

2. Specialized Hospital

Basically, according to World Health Organization (WHO) definition, the hospital is an institution that accepts patients for a short to long term stay and provides medical and nursing care services for sick or injured or suspected to illness, women who are ready to give birth or different titles. The main purpose of creating this valuable source is to meet the diverse needs of the people [22].

Hospitals specializing in a particular type of disease and a specific type of treatment are specialized hospitals. Generally, specialized hospitals are part of a general hospital. Types of specialized hospitals are described [22]. 1. Infectious Diseases Hospital 2. Psychiatric Hospital 3. Elderly Hospital 4. Women's Hospital 5. Children's Hospital.

3. Importance and Necessity of Hospital Locating Research

The goal of a locating is to find the optimal location according to predetermined criteria from candidate locations. Locating procedure consists of two steps: The first stage is the selection of candidate locations and the second stage is the assessment of candidate locations to find the best place [23]. Locating health-care applications (hospitals) in urban areas should be such that everyone could easily access them [24]. Health centres, especially hospitals, are among the most important centres that after being in critical condition, should be able to respond to the increased amount of the needs, in spite of encountering direct and indirect damages; the life giving role of these centres in a normal as well as in times of crisis is not covered to anybody, so paying attention to the specific role of hospital in supporting and preserving human lives and the high cost of hospitalization requires that special attention be paid to designing part in such infrastructure is necessary, therefore, empowerment of these centres have three levels of life survival, capital survival and functional survival at the highest levels [25].

4. Hospital Locating Criteria

4.1. Principle of Neighbourhood (Compatibility)

The purpose compatibility is to place compatible applications together and to isolate maladaptive applications from each other. Some inappropriate application such as pollutants industrial centres in neighbourhood of therapeutic centres reduce the efficiency of these centres in terms of maintaining patient comfort and presence of some applications, such as neighbourhood to green space and proximity to the fire stations will have such consequences [26].

4.1.1. Compatible Neighbourhoods

When locating a hospital and health centres, neighbouring a number of suitable and consistent applications are considered. These applications include neighbourhood to the green space and the park, neighbourhood to the fire station and neighbourhood to the fast access network.

4.1.2. No Compatible Neighbourhood

When locating a hospital and therapeutic centres, neighbouring a series of inappropriate and incompatible applications are considered [27]. These applications are included as:

1) Neighbourhood with Industrial application: Industries can be incompatible with therapeutic centres for causing problems such as atmospheric and acoustic pollution.

2) Neighbourhood with Cultural Centre.

3) Neighbourhood with Educational Centres.

4) Neighbourhood with Military Centres: Military centres come along with high voltage due to making loud noises which disrupts patients relaxation, through a circular, drainage plan for all military areas, mainly in the form of Educational and military barracks levels has been approved by the city [28].

5)Neighbourhood with business centres: Commercial districts have had an undesirable influence on access to health care centres due to overcrowding and traffic congestion [28].

6)Neighbourhood with transportation centres: Due to the growing urban population, the role of urban terminals is of great importance which cause regional traffic.

7) Neighbourhood with the cemetery: When constructing the cemetery, their location should be considered in the context of the city's expansion. Considering this point, the cemetery should be constructed so as not to expose the wind to the city, and the location of the facilities should not be neighboured to the cemetery of disposed covert.

4.2. Population Density Criterion

This index is one of the most important indicators for the construction or expansion of medical centres [29]. Capacity of these centres is a function of population size and distribution of population at the city level. In general, the density of the city is divided into three categories of densely populated areas, regions with moderate populations and low density areas [27].

4.3. Principle of Access Radius

The effect of the distance on the patient's visit to medical centres indicates that physical access to medical centres is one of the main factors influencing the choice of patient to select the medical centre [15]. Based on numerous studies in the field of behaviour assessment, the proximity to medical centre and the effect of the distance on the patient's visit to medical centres indicate that physical access to medical centres is one of the most commonly used factors that affects the patient selection for the medical centre [15].

4.4. Utility

Means trying to preserve natural factors, creating open and pleasant spaces, how to form roads, buildings, and urban space [26].

5. Neighbourhood Standards with the Hospital

In general, the standard means a level of implementation that is specified by certain criteria, in other words, in determining the minimum amount of land needed for each urbanite, factor such as climate, in determining population density, density of buildings, urban texture, number of building floors, City size, price, and other social and economic factors interfere. There are usually different standards and sizes for different cities in the world that vary in many respects [30]. Proposed land will not be neighbour to the following applications and, if necessary, minimum noticeable distance must be observed: industrial workshops (at least 200 meters distance). Military barracks (with the exception of military-therapy centres) (at least 1000 meters). Airport (at least 2000 meters from the runway and the route). Train terminals, buses and trucks (minimum distance 500 meters). Police stations (at least 200 meters). Telecommunications, radio and television stations and towers (minimum distance 300 meters). Schools and unrelated educational spaces (at least 100 meters distance). Stadiums (at least 200 m distance). The main side and entrance of the hospital neighbouring to the residential tissue. Other intruder application is detected by visiting experts from the site [31].

6. Definitions of Matrices

One of the qualitative assessment methods is compatibility matrix, which in fact considers the compatibility of each application to the surrounding applications. The assessment in this type is partially divided into five categories:

- Fully compatible: perfectly compatible with each other; in the sense that they both have the same characteristics, or their work is consistent.
- Moderately Compatible: In these situations, the degree of compatibility between the two applications is more than its incompatibility.
- Indifferent: in the sense that two types of applications are indifferent to each other for compatibility.
- Moderately incompatible: In these situations, the degree of incompatibility between the two applications is more than its compatibility.
- Fully incompatible: Which means the characteristics of the two applications do not correspond to each other and are in opposition to each other [12].
- In Table 1, the degree of hospital adaptation is differentiated according to different conditions as with other applications
- Utility Matrix: This matrix assesses the compatibility between applications and their deployment location, and a variety of characteristics such as type of soil, facilities, sound, and gradient can be used as a standard for this

assessment [12].

- Dependency Matrix: This matrix indicates that these types of applications can be interconnected in a chain wise manner, contrary to the type of incompatibility that can be opposed and their alignment, may cause damage to one another. In this matrix, the emphasis is on that applications are interconnected in a chain wise manner [32].
- Capacity matrix: Each application has a scale and different levels of city structure also have a certain capacity. If the two measures are in line with each other, on the one hand, the performance of the activity is well done and, on the other hand, the specific level of the city structure will effectively benefits from its services. But if these two levels cannot be adapted to each other, there will be many problems for both of them. [28].

Table 1. The degree of compatibility of neighbouring applications with the hospital [12]

Components	Applications
Fully Compatible	Offices, arid lands, vacant lands, telecommunications, gardens, forests, open spaces, public green spaces, parking lots, fire station
Moderately Compatible	Offices, healthcare, catering, abandoned
Indifferent	Higher education, market, agricultural land, hairdressing salon, Vegetable market
Moderately incompatible	Historical centre, Religious, Cultural, Residential Complex, Ruins, Water Resources, Sports
Fully incompatible	Educational, Urban Facilities, Water Centres, Repair shop, River, Industrial, Airport, Livestock, Residential, Old Townhouses, Riverside, warehouse, Transportation, Terminal, Military, Exhibition

7. Research Methodology

Different approaches are also used to measure the values of the Delphi processor marker, estimating the ratio of logistic regression and the hierarchical analysis process. AHP is one of the most efficient decision making techniques [33]. One of the most useful ways which plays an important role in choosing optimal suggestions. The first classic writings about AHP was written by SAATY in 1980. The most important advantage of this method is its relative ease and the application of multiple criteria [34]. AHP is a decision-making technique that can be used to analyse and support decisions that have multiple and mutual goals. This analysis is one of the most comprehensive systems designed for decision making with multiple criteria. Because it allows the formulation of issues in a hierarchical manner. A robust and flexible method for quantitative and qualitative examination of multi-criteria issues, whose main feature is based on a paired scale [35]. AHP is based on three principles: analysis, decision making based on comparison and composition of priorities. In each stage, the criteria are compared in pairs according to their importance in the decision which is considered. After forming the comparing matrices, relative weights are derived for different elements. Then the weight of the composition is determined by the total weight in all hierarchies. The result of this community is the normalized vector of the sum of weights of the choices [36]. Since the 1970s, the use of quantitative methods for locating urban services has increased, and each of these methods has been used in addition to its own disadvantages and advantages. But in this research, the AHP technique has more advantages than other locating techniques [36]. In this paper, firstly, studies on the latest patterns and factors in locating hospital from scientists and researchers perspective have been reviewed. According to the number of replicates and prioritization of factors, a tree chart has been arranged through them, and the opinion of 3 specialist in order to examine the relevant area, it is used in the context of a case study, and determined how matrices and their scoring are done.

8. Case Study

An example is used for locating hospital in the city of Rasht. The land is located in the Khorramshahr beltway near Farzaneh Square in Rasht. This land is located along roads outside the city, including the Lahijan road (500 meters from the Janbaazaan Square), Anzali road (Farzaneh Square) and on the proper road of Tehran. In Figure 1, the site mapping is indicated.

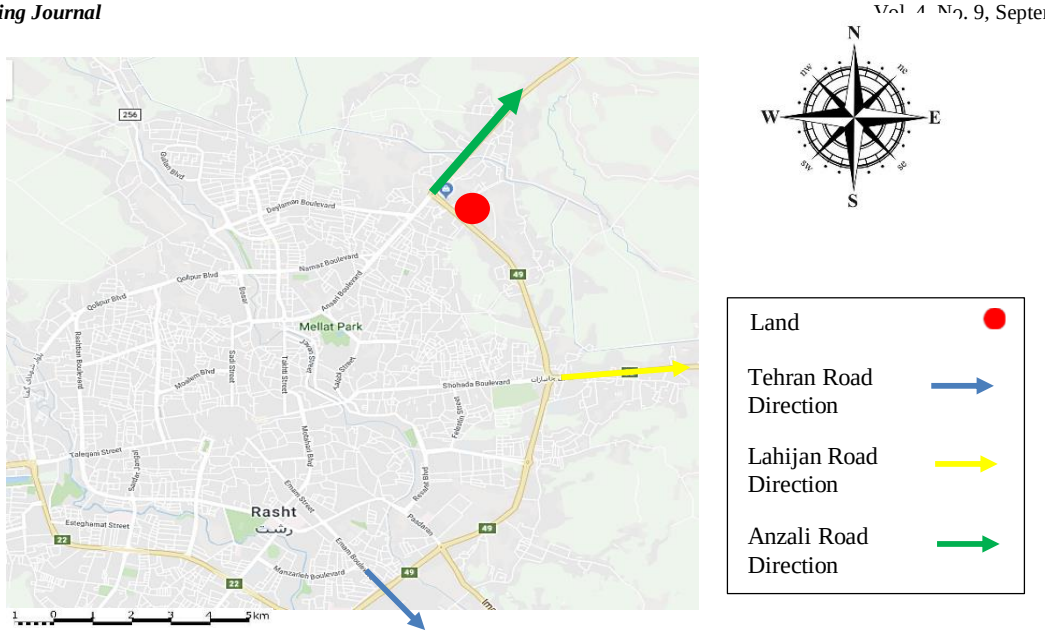

Figure 1. The position of the considered land

In the map below the density of hospitals and medical centres in Rasht city has been specified in the Rasht detailed map, major city hospitals are indicated by larger red dots and smaller red dots indicate clinics and smaller infirmaries. The green dot is the land to be studied in this research. Figure 2.

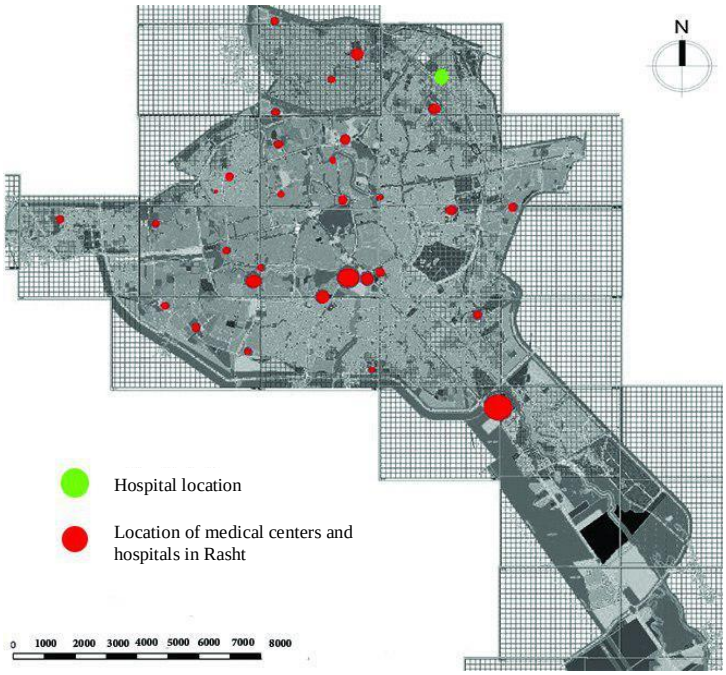

Figure 2. Distribution Map of Medical facilities in the City of Rasht

This land is located along the urban arterial pathway (beltway), with limited and acceptable urban traffic. It also has a logical distance to urban centers and places of residence. In the following map, the application of land users have been identified Figure 3.

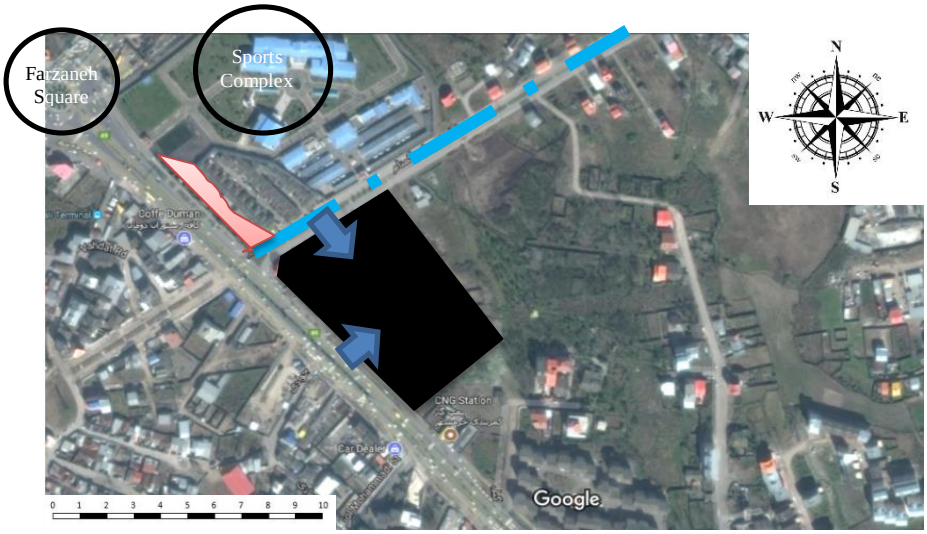

Figure 3. Land Map and Neighborhood

8.1. Compatibility Matrix

In the following, using the scoring system, we will examine the environments' application. Criteria and scores are shown in Table 2. This scoring method allows to obtain appropriate results in locating hospital by analyzing and getting average .In order to achieve hospital compatibility with other applications, all applications that are highly compatible are beside highly incompatible applications, according to the studies conducted in the present essay, investigating compatible and incompatible locations with the hospital to the degree of application compatibility dealt with neighboring applications. In order to determine the degree of compatibility and incompatibility between the two applications, it is necessary to determine the different specifications and needs of each one for its normal activity, and then, by comparing these specifications, we can determine the agreement and disagreement items. In Table 3, which is divided into two sections of compatible and incompatible in general, in compatible section, fully compatible and compatible applications and in other section, incompatible and fully incompatible applications are wrote, and based on library and field studies and interviews with a number of experts specializing in this field, the rating will be done. Table 3 describes the compatibility and incompatibility of the hospital is determined and rated based on the form and opinions of neighboring experts.

Table 2. Compatible matrix of the respective hospital

Compatibilities	**Offices**	**Parking lot**	**Fire Station**	**Public green spaces**	**Offices**	**Wasteland**	**Urban access**	**Fire station**	**Forrest**	**Entertainment**
Hospital	compatible	compatible	compatible	compatible	compatible	compatible	compatible	compatible	compatible	compatible
score	2	1	2	-2	2	2	1	2	2	2
Incompatibilities	Historical and Cultural Center	Cemetery	Residential	athletic	Gas Station	Animal husbandry	Exhibition	Military Base	Urban Facilities	Water centers
Hospital	compatible	compatible	compatible	compatible	compatible	compatible	compatible	compatible	compatible	compatible
Score	2	1	-1	1	-2	2	-2	-1	2	2
Total Compatibility Score	-9									

8.2. Utility Matrix

Desirability and palatability in planning the application of urban land in order to try to preserve natural factors, create open and pleasant environment, how to form roads, buildings and urban spaces [37]. This matrix assesses the compatibility between applications and their deployment location, a variety of characteristics such as type of soil, installation, sound, and gradient can be considered as a criteria for this kind of assessment. [12] In Table 3, the desirability criteria are specified and the scoring is based on specialists.

Table 3. Desirability Matrix

Desirability	Land size	Facilities and equipment	Sound	Air	Smell	Accessibility	Topography
Medical Center	Fully Desirable	Fully Desirable	Desirable	Desirable	Fully Desirable	Desirable	Fully Desirable
Score	2	1	2	2	1	2	2
Total Score of Desirability	1.71						

8.3. Results of Findings

By examining the tables and all the studies and findings obtained in this project and analysing them, we will examine the results and status of the proposed site in terms of being suitable or not. Using the tables and matrices we examined, and by getting average from total sum of result, we come to the numbers of 1 and 31 which according to the conventional numbers in this study, it is concluded that the location is suitable and there will be no problem and it also helps growth in this region. Table 4 shows the result of two compatibility and desirability matrices

Table 4. Summary and Average Matrices

Elements	Average
Compatibility	0.9
Desirability	1.71
Suitable	0.9+1.71=2.61 1
	2.61/2=1.31

9. Conclusion

Hospitals are one of the most important urban utilities that are of considerable importance due to their performance in relation to other urban services. In recent years, due to the rapid growth of urbanization and mutual lack of comprehensive planning and management in our country's urban system, these spaces are encountered many problems like other urban services which are mostly due to lack of, dispersed and disproportionate distributions, lack of optimal locating and lack of prediction of suitable spaces for these applications in cities, given that the choosing an optimal location for the construction of health care centres contains a lot of parameters Therefore, traditional locating theories cannot combine all of these parameters in the locating process, and it is concluded that the functionality and capabilities of the matrices can be used in locating urban services.

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