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Evidence-Based Design in Medical Centers and the Effects on Patient Satisfaction (Case Study: Kasra Hospital in Tehran, Iran)[1]

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ABSTRACT

Evidence-based design (EBD) is a design approach that emphasizes using valid data to examine its effect on the design process. This approach is an important and growing movement towards creating a safe environment to take care of patients.

The purpose of this study is to improve design principles in hospitals and medical centers based on the EBD and put patients at the center of this approach to achieve patient satisfaction.

The research method is based on the bibliography studies, field observations, and data collected through the Delphi technique and questions asked from five experts in the architecture of medical spaces of Kasra hospital in Tehran, Iran using ASPECT software.

According to the obtained results, threshold rate of 6, the average factors of views (3.646), nature and outdoors (3.472), comfort and control (3.913), Legibility of place (3.900), facilities (3.079) and staff (3.594) has a relatively higher average than the average, The average of privacy and participation (2.769) and interior design (2.896) is lower than average, indicating low satisfaction with the mentioned factors. Also, the average of architectural features, Interior design features, and Mental and social features are reported as 3.166, 3.309, 3.073, and 3.817, respectively, and the total average score of the number It is almost favorable, and in general, the patients' opinion about the condition of the hospital is less than satisfactory.

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[1] The present article is derived from the first author's doctoral dissertation entitled "A Conceptual Model for Improving the Architectural Quality of Evidence-Based General Hospital (EBD) with an Emphasis on Patient Satisfaction", which is being developed under the supervision of second and third author, and the advisor of the fourth author at the Islamic Azad University, Science and Research Branch, Tehran.

Introduction

Evidence-based research methods were founded in 1965 worldwide. These research methods were introduced to the architecture of hospitals in Britain in 1970. Few studies have been done on EBD since 1980. A health-based design center was founded in 1992 then more and better studies have been done on EBD since then. Huge research EBD projects began in 2000 to improve patients' outcomes and continued until 2004. Findings of around 1000 methods were analyzed up to 2008, and valuable results were obtained. These results indicated that we can improve patients' outcomes and safety by implementing some interventions (Labibzadeh and Sadeghi, 2021: 2).

EBD approach in medical centers is an important and growing movement towards the creation of a safe environment for taking care of patients. Compared to evidence-based medicine (EBM), EBD is a relatively new study field but numerous academic studies have established the foundations of this emerging major in the previous decade (Rashid, 2020).

As a modern approach to medical center design, EBD emphasizes the importance of using valid data to examine its effect on the design process. In therapeutic architecture, this approach is known as "an attempt to improve the well-being of patients and staff, the treatment process of patient, safety, and stress reduction." EBD is a relatively new research field that has adopted its terminology and ideas from various scopes, including environmental psychology, architecture, behavioral economics, and neurology (Tahouri and Sadeghi, 2021: 2).

EBD is defined as "the process of deciding on planning, designing, and constructing medical centers based on the valid evidence to achieve the best possible outcomes". EBD is influenced by the EBM. These two contexts are overlapped. This attitude provides design advice based on the causal relationships between characteristics of the designed medical environment and desired outcomes. Identification and application of psychological components and criteria in the interior design, including proper light and color, adaptable spaces, natural elements, and vegetation are effective in enhancing the quality of medical centers and designing a safer environment with more peace and less stress, which improves the medical performance (Hamzeloo and Sonboli, 2021: 1).

EBD Process

Rosalyn Cama defines the EBD as a process that can be used in the following cases: Design and construction of a new building or a renovation project Gathering a balanced group of employer representatives, investors, and design-related majors, including relevant researchers, design and analysis of a project based on an interdisciplinary method. Concentration on strategic guidelines that can improve outcomes through analysis of functional information of previous buildings and designs.

Confirming a tested design component or creating a creative idea to improve a certain outcome doing research projects after constructing a building to reveal the success or failure of the assumed outcome publication in a review and criticism journal (Figure 1) (Cama, 2009: 8).

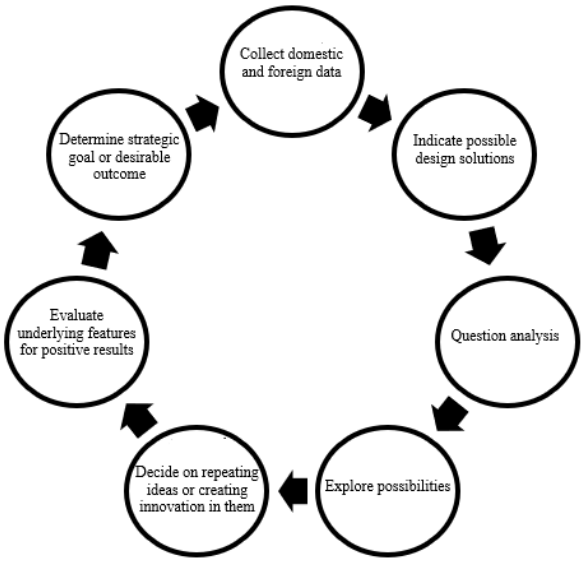


Figure 1. EBD process cycle (Cama, 2009: 9)

A research project by Ulrich and Zimring (2004) (2008) identified all common studies with improved outcomes and the physical environment of medical centers and hospitals. This study classified all environmental factors that can result in positive therapeutical outcomes if investment and studies are done for them. These factors are divided into four categories:

1. Stress reduction, improved quality of life and health for patients and their companions.
2. Decrease stress and pressure on the personnel, increase medical care and their effectiveness.
3. Improve safety and quality of treatment for patients.
4. Overall improvement in healthcare and reduced costs (Cama, 2009: 77 & 78).

Research Methodology

This descriptive-analytical study uses library studies and field surveys to gather data from patients hospitalized at the Kasra Hospital of Tehran; thus, data were analyzed to provide appropriate solutions to the problems. This study has been done based on the novel findings in environment psychology, behavioral sciences, and architectural design of medical environments.

Statistical Population

The statistical population of this study consists of patients at the Kasra hospital, who totaled 254 people.

Sample Volume

The Cochran formula was used to determine the sample volume.

Research Tools

The tool used in this study is an ASPECT-based questionnaire, as SPSS26 software is used to extract diagrams and descriptive data.

Research Limitations

Since the tool to gather data in this research was a questionnaire, this scale has problems, including subjects' shortage of time, boredom and consequently carelessness in answering some questions. Also, due to the inability of the elders and other illiterate people in filing on the scale, most questionnaires were asked in the form of an interview.

Data analysis method

Consistent with the nature of the research and its results, data analysis was performed via logical reasoning and inductive method. Descriptive statistics were used to analyze the data. In this study, 96 male and female hospitalized patients aged 15-80 years were surveyed face-to-face about "satisfaction with the hospital." The answers to the questions were entered in the ASPECT software. The results were weighted on a 6-point Likert scale ranging from 0-6, with 0 = unanswered, 1 = totally disagree, 2 = disagree, 3 = somewhat disagree, 4 = somewhat agree, 5 = agree, 6 = totally agree. The eight parts of the ASPECT software were privacy, company, dignity, views, nature and outdoors, comfort and control, place legibility, interior appearance, facilities and staff.

The questionnaire was again categorized based on the healing environment characteristic, and more results were elicited. The results were entered into the SPSS26 software, and the following figures were determined.

Research steps

Step 1: project description

The first step in the research process is the description of the project. This study measures the satisfaction rate of the expert panel with the quality of spaces in Kasra Hospital and uses the most appropriate idea and solution for designing and improving the quality of space based on the confirmed authenticated evidence.

Step 2: Evaluation of the current situation

Designed and planners would evaluate the current situation in this step of the process. Evaluation of the existing environment (current situation) is vital for finding opportunities for further development of the medical center.

The eight sections used for assessment through ASPECT software are as follows: privacy and company, view, nature and outdoor, comfort and control, legibility of place, interior design, facilities, and staff.

The results obtained from ASPECT software were analyzed based on these 8 sections. The results are reported here in.

Step 3: Find the ideal status

This part of the process determined the ideal status. The relevant standards, academic evidence, and published results must be reviewed to detect the distance between an existing medical center and its ideal status (Mardomi et al., 2013: 96 & 97). ASPECT software is a tool used to assess the ideal situation, which is based on the database results of 600 studies examining the effects of the medical environment on the satisfaction of patients and staff, medical outcomes of patients, and staff productivity. The results obtained from answers given to the ASPECT questions indicate the weaknesses and strengths of the design of available buildings (Table 1, & 2).

Table 1. Statistical indicators of satisfaction of patients in Kasra Hospital by the eight sections of ASPECT.

A Staff and Patient Environment Calibration Tool (ASPECT) NHS

Project details: Title

s

Workshop details: Location Date

Results summary:

C1:	▶ Privacy, company and dignity	2.7	5 of 5 scored
C2:	▶ Views	3.6	5 of 5 scored
C3:	▶ Nature and outdoors	3.4	3 of 3 scored
C4:	▶ Comfort and control	3.9	6 of 6 scored
C5:	▶ Legibility of place	3.9	6 of 6 scored
C6:	▶ Interior appearance	2.8	8 of 8 scored
C7:	▶ Facilities	3.0	8 of 8 scored
C8:	▶ Staff	3.5	6 of 6 scored

1 2 3 4 5 6

NOTE: A filled traffic light dot [●] in the table above indicates a valid average score, a hollow dot [○] indicates that one or more statements have been marked as 'unable to score'.

Table 2. The mean and standard deviation of the eight sections of ASPECT of patients admitted to Kasra Hospital

Factors	Average	Standard deviation
C1: Privacy, company and dignity	2.769	1.030
C2: Views	3.646	1.001
C3: Nature and outdoors	3.472	0.939
C4: Comfort and control	3.913	0.928
C5: Legibility of place	3.900	0.646
C6: Interior appearance	2.896	0.689
C7: Facilities	3.079	0.695
C8: Staff	3.594	0.858
ASPECT overall score in Kasra hospital	**3.299**	**0.482**

The mean and standard deviation of the eight sections of ASPECT of patients admitted to Kasra Hospital are reported in (Table 1 & 2). It can be seen that the total average is 3.299, which is more than the theoretical average value of 3, which indicates a relatively better satisfaction with the eight factors of Kasra hospital. Also, the data shows that the average factors of views (3.646), nature and outdoors (3.472), comfort and control (3.913), Legibility of place (3.900), facilities (3.079) and staff (3.594) has a relatively higher average than the average, which means the relative satisfaction of the hospitalized patients with regard to the mentioned factors. The average of the components of Privacy, company and dignity participation (2.769) and interior appearance (2.896) is lower than average, indicating low satisfaction with the mentioned factors. The important point is that, in Kasra Hospital, the average answers of the patients in none of the eight ASPECT factors exceeded the number 4, and this office expresses a very high level of dissatisfaction with the mentioned factors. It is necessary to explain that the standard deviation of the answers given in the eight factors of ASPECT have small fluctuations with favorable numbers and indicate that the data is more focused on the average and are a seal of approval on the results.

Eight sections of assessment through ASPECT Software

- ***Privacy, company and dignity:*** Everybody's privacy is a feeling about their dignity, autonomy, and personal space (Heidari et al., 2011: 645).
- ***Views:*** The view of natural landscapes is seen in stress reduction and patients' recovery as a set of positive emotional, psychological, and physiological changes (Ulrich, 1984: 420).
- ***Nature and outdoors:*** The design and application of green spaces in hospitals do not cost as much as manufacturing hospital equipment. These spaces provide the following advantages: reducing the stress of patients, staff, and visitors, alleviating the pain of

patients, decreasing depression, enhancing the quality of life for permanent patients, improving routing ability, increasing the physical activity of patients, and strengthening their sense of autonomy (Mardomi et al., 2013: 64 & 65). The design of healing green space tends to create open space to meet the medical needs of patients. The garden is indeed the place and tool used to treat various patients; for instance, green space for rehabilitation, green space for patients suffering from Alzheimer's and other impaired senses, and green space for cancer patients (Tahouri and Sadeghi, 2021: 6).

- ***Comfort and control:*** The term "subjective comfort" is attributed to individuals' judgments about their situations. There is a high relationship between subjective comfort and enough knowledge about the disease, the close relationship between patient and physician, social support, and spiritual aspects that all are coping strategies (Siegrist, 2003).
- ***Legibility of place:*** Most clients of medical centers have fewer sensory, physical, and cognitive sources due to disease and stress, so it is difficult for them to find the route and be present in a complicated and stressful space (Mollerup, 2009). Legibility of place means creating a space in which, visual information is simply organized to create a coherent basis for the action and movement of individuals in the environment (Mardomi et al., 2011: 51).

- ***Interior design***
  - ***Light:*** natural and artificial illuminance must satisfy the following needs: occupational efficiency, comfort, psychological needs, aesthetics, visual well-being, human relationships, hygiene, and safety (Ministry of Health, 2013: 270). Available studies confirm that natural light can reduce depression in patients with seasonal disorder and bipolar depression (Benedetti et al., 2001), shorten the treatment period and improve sleep status (Joseph, 2006), alleviate emotion, and relieve pain (Lacgrace, 2002) (Hosseini et al., 2022: 30).
  - ***Color:*** color plays an underlying role in improving the environment, acquiring knowledge, and routing (Dalke et al., 2004: 3). Accurate application of color in medical centers not only fosters morality and makes the space happy but also can be effective in treating many diseases by influencing the body and soul of patients (Hosking & Haggard, 2003: 120).
  - ***Sound:*** sound pollution or noise in medical centers may cause negative effects, such as insomnia, anxiety, hypertension, and considerable need for reliving pain, disorder in processes and activities, and disturbing comfort of patients, companions, and staff (Ministry of Health, 2013: 283). "The noise that causes discomfort would hurt the patient. Too much noise is the cruelest kind of inattention," Florence Nightingale explained it for the first time in the book "Note on Nursing." (Nightingale, 1969: 47).
  - ***Positive Distraction:*** positive distraction is anything that can distract a person's attention creating a positive feeling response in them. When proper positive distractions are selected in the medical space, the stress of patients can be reduced and a sense of security is created for them (Kaiser, 2007: 8) (Ulrich, 1993: 7). Music can decrease stress and distract the patient's mind from paying attention to the adverse side of the disease. Music has an instant physiological effect due to the body's autonomous neural system (Kemper & Danhauer, 2005) (Mardomi et al., 2013: 48). Music can also leave a numbing sense (Malkin, 1992: 19).

- ***Beauty:*** consideration of interior architecture components in medical centers based on the aesthetics approach and creating a healing space would improve the quality of medical spaces. Beauty can reduce stress, and increase the satisfaction of staff, patients, and companions (Mardomi et al., 2013: 41). There are specific features of spatial arrangement and environmental design in hospital spaces or workplaces that affect the outcomes, which must be considered in further studies (MacAllister & Zimring 2016, 1).
- ***Facilities:*** Single-bed hospital rooms, and replacing multiple-bed rooms with single-bed rooms have been a debatable issue in developed countries over recent decades. There is now a considerable willingness to use single-bed hospital rooms (Hosseini et al., 2022: 30). Two features of several beds and the landscape observable through the window are correlated with the hospitalization period of patients (Nikabadi et al., 2021: 87). Single-bed hospital rooms providing many confirmed advantages, such as reducing hospital infections, decreasing medical errors, physical injuries and possible falling, improving sleep, increasing patients' satisfaction, respecting privacy, and improving the relationship between staff, patients, and companions would improve safety of patients (Nikabadi et al., 2022: 98) (Hashemnejad et al., 2011: 41).
- ***Staff:*** Medical centers' staff are responsible for making patients familiar with doctors and nurses, access to physicians and members of medical groups, meeting the religious and educational needs of patients, and taking consent letters signed by the patient on medical, diagnostic, research, and risky therapeutical measures (Figure 2 & 3).
- ***Results assessment***

  Results assessment must be continuous and permanent. The most significant assessment or results is done by selecting a solution and after using a new medical center. To do the two phases mentioned above, some investigations such as patient satisfaction rating, measuring care quality, and clinical outcomes before and after hospitalization must be compared to find the effect of design solutions on the hospitals.

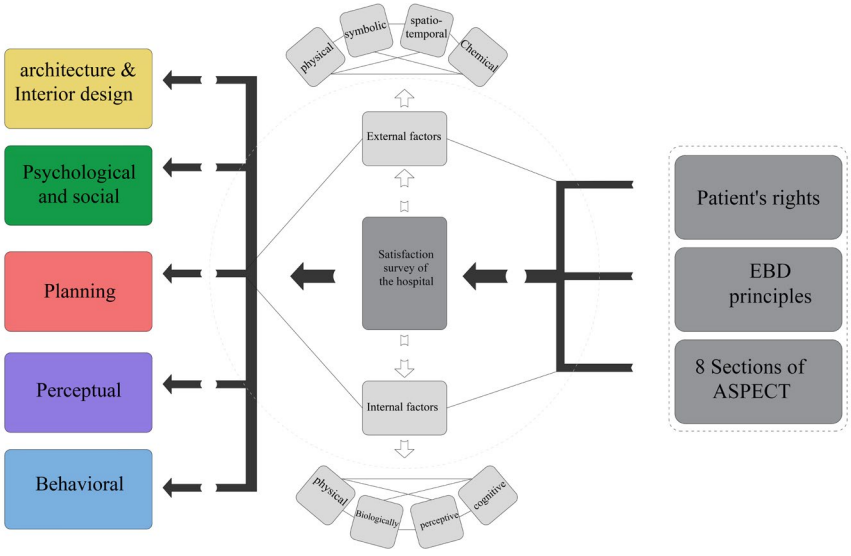


Figure 2. Model 1 of satisfaction.

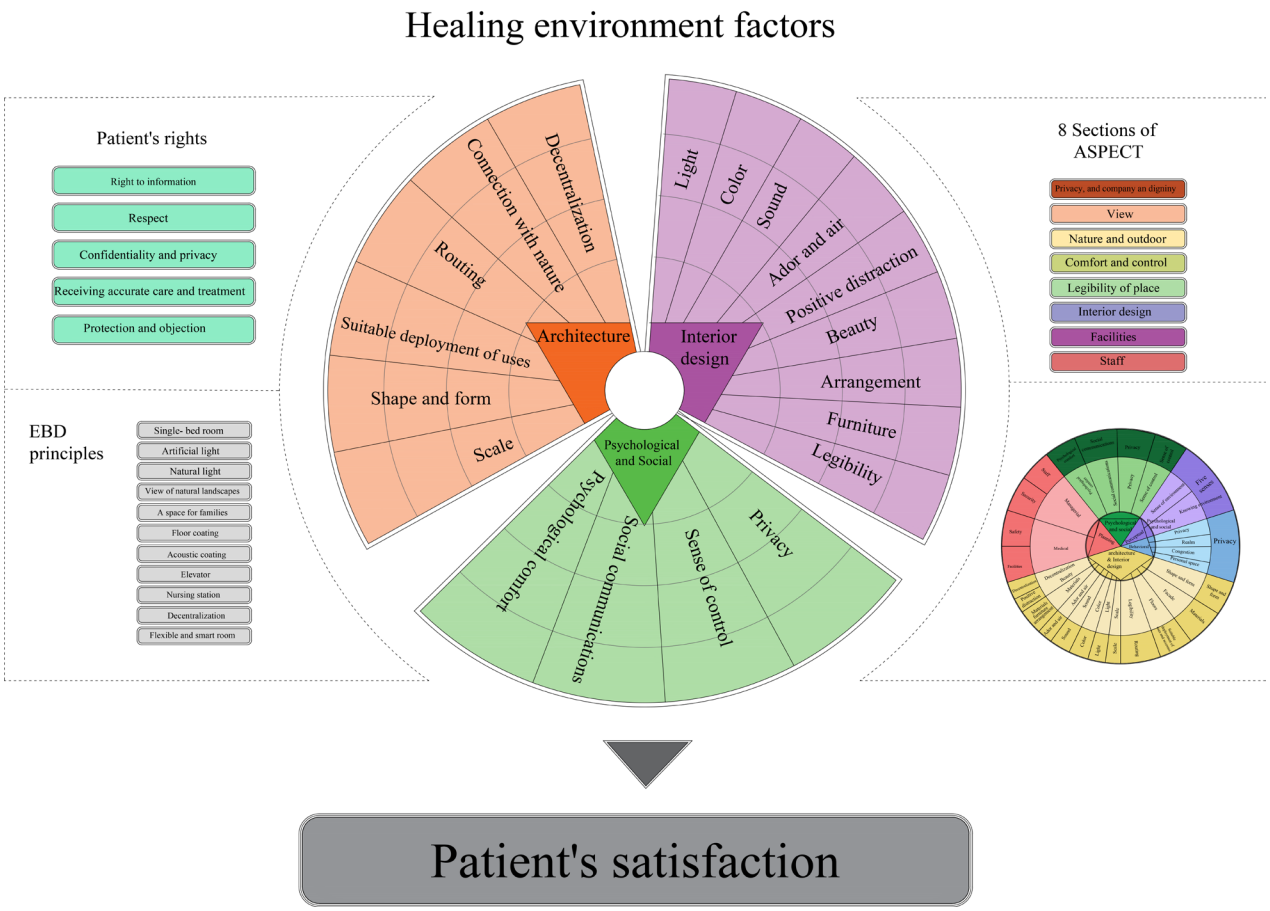


Figure 3. Model 2 of satisfaction.

In the descriptive part, the mean, standard deviation, minimum and maximum responses of the research participants in each of the research variables, including architectural features, interior design features, psychological and social features, as well as eight ASPECT criteria, are reported. In the section related to inferential analysis, research hypotheses have been investigated using correlation coefficient and multivariate regression model using structural equations.

Table 3. Statistical indicators of the level of satisfaction of patients hospitalized in Kasra Hospital by the factors of the healing environment.

Category	Factors of the Healing Environment	Average	Standard Deviation
Architectural features	Shape and form	4.715	0.944
	Suitable deployment of uses	3.328	1.202
	Routing	2.908	1.354
	Connection with nature	3.508	0.821
	Decentralization	2.077	0.862
	Total score of architectural features	**3.309**	**0.510**
Interior design features	light	4.415	0.868
	Color	2.338	1.019
	Sound	2.80	1.148
	Temperature, air and adore	2.423	0.977
	Positive Distraction	3.20	1.134
	Beauty	2.261	1.278
	Arrangement	3.215	1.256
	Textiles, materials and furniture	3.001	0.929
	Legibility	3.862	1.014
	Home-like space	3.210	0.761
	Total score of interior design features	**3.073**	**0.562**
Mental and social features	sense of control	3.261	0.940
	Privacy	2.823	1.049
	Social communication	3.085	1.084
	Psychological comfort	2.761	0.923
	Facilities and safety	3.031	0.980
	Staff	3.670	0.802
	Total score of Mental and social features	**3.817**	**0.574**
The score of components of the healing environment of Kasra hospital		**3.166**	**0.459**

The average indicators and standard deviation of the healing environment components of Kasra Hospital are shown in Table 3. It can be seen that the total average, the average of architectural features, the average interior design features, and the average of mental and social features are reported as 3.166, 3.309, 3.073, and 3.817, respectively, and the total average score of the number It is almost favorable, and in general, the patients' opinion about the condition of the hospital is less than satisfactory. Also, the dimensions of architectural features, interior design features, and mental and social features are higher than the theoretical average, and it shows relative satisfaction with the mentioned factors. With a closer look at each component, we see that the average level of satisfaction of patients in the factors of shape and form (4.715) and light (4.415) is relatively high and higher than the score of 4 out of 6, which shows they have higher than average level of satisfaction with these components. After that, the average level of satisfaction of the patients in the dimensions of Suitable deployment of uses (3.328), connection

with nature (3.508), positive Distraction (3.20), arrangement (3.215), Textiles, materials and furniture (3/001), routing (3/862), home-like atmosphere (3/210), sense of control (3/261), social communication (3/085), facilities and safety (3/031) and staff (3/670). It was on a Likert scale of 6, which is more than the theoretical average, which means that it leads to their relative satisfaction in these areas. Although these numbers do not give the desired satisfaction, it indicates that the design of Kasra hospital has been relatively successful in these indicators. It can also be seen that the average level of satisfaction of patients in other areas (routing, decentralization, color, sound, temperature, air and adore, beauty, privacy and psychological comfort) is lower than the average, which shows the level of satisfaction. It is necessary to explain that the standard deviation of the answers given in the categories and their factors have favorable numbers due to small fluctuations and indicate the concentration of the data on the average and are a seal of approval on the results.

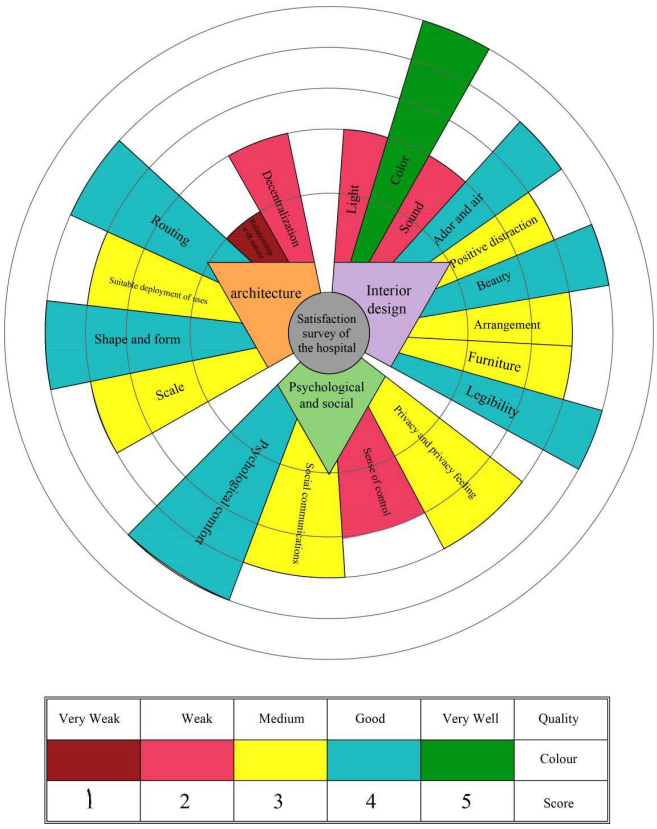


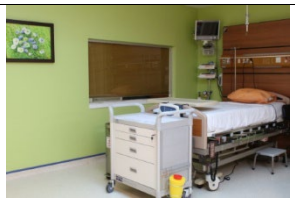
Figure 4. Outcome of 8 elements of ASPECT and healing environment factors and patient rights in Kasra Hospital.

Table 4. Mean satisfaction of hospitalized patients by the healing environment factors.

Category	Healing environment factors	Item/mean	Mean scores given out of 6 by the items of the questionnaire based on the healing environment factors				Average	Mean classification of factors
Mental and social features	Sense of control	Item	Sound/noise control	Light control	Temperature control	Ventilation control	2.50	3.817
		Mean	2.03	2.4	2.6	2.67		
	Intimacy and preservation of privacy	Item	Privacy	Private conversations	Loneliness	Personal items	3.54	
		Mean	4.02	3.98	2.55	3.63		
	Social communications	Item	Collective space	Place for the patients' companion	Religious deeds	Daylight room	3.92	
		Mean	4.93	3.19	4.78	3.80		
	Subjective well-being	Item	Household sense	Comfort	Access to physician and nurse	Respect by physical and nurse	3.23	
		Mean	3.16	2.15	5.50	5.14		
Interior design features	Light	Item	Window	Natural light	Diversity of light sources	Artificial light	3.24	3.073
		Mean	3.64	2.78	2.64	3.93		
	Color	Item	Comfort	Attraction	Legibility	Aesthetics	4.30	
		Mean	4.54	4.61	3.52	4.53		
	Noise	Item	Sound control	Music	Noise	Pitching	1.63	
		Mean	2.04	1.07	2.06	1.37		
	Ventilation and fresh air	Item	Ventilation control	Fragrance	Appropriate ventilation	Window	3.14	
		Mean	3.91	2.16	2.35	4.16		
	Positive distraction	Item	Artistic works	Entertainment	Attractive scenery	View of landscape	3.47	
		Mean	3.34	2.38	4.00	4.17		
	Aesthetics	Item	Diversity	Order	Attraction	Cleanliness	3.69	
		Mean	2.02	3.02	4.65	5.08		
	Textiles, materials and furniture	Item	Joinery	Furniture	Suitable flooring	Suitable curtain	4.38	
		Mean	4.07	4.23	5.09	4.13		
Architectural features	Forms	Item	Index input	Index output	Invitation form	Appropriate spatial distinction	3.88	3.309
		Mean	3.91	3.85	3.78	3.92		

	Path-finding	Item	Pathfinding	Hierarchy	Coloring	Index acceptance	4.30	
		Mean	4.30	4.60	4.88	3.42		
	Communication with nature	Item	View of landscape	View of green space	Comforting landscape	Access to green space	1.77	
		Mean	2.16	1.93	1.33	1.66		
	Decentralization	Item	One-bedroom	Private space	Multi-use room	Distinct facilities	4.20	
		Mean	4.70	4.28	3.63	4.20		

Table 5. Factors of ASPECT in Kasra Hospital of Tehran.

Privacy and Company	**View**	**Nature and outdoor**	**Comfort and Control**
			
Providing waiting halls with flexible chairs Waiting space with flowing daylight A space for the presence of families	Outdoor view for patients, staff, and using daylight with an approximate suitable method	Using green space inside the building Access to outdoor green space is limited.	A kind of design that considers individuals' privacy has a higher effect in terms of disease recovery. Protecting the privacy of patients by using curtains
Legibility	**Interior design**	**Facilities**	**Staff**
			
			
Prominent entrance Proper indoor routing	Pleasant interior design Using diverse colors	Available facilities Proper medical equipment	Rapid access to nurses that are outside, so they can have access to patients rapidly

In Iran, the patient rights charter was enacted in 2002 and submitted to the subordinate centers by the Health Deputy of the Ministry of Health, Treatment and Medical Education. This charter has been designed within five general contexts and 37 paragraphs. The five contexts have been formulated in 9, 7, 4, 14, and 3 paragraphs (Mosadegh Rad, Asna Ashari, 2003).

1. **Right to information, 2. Respect, 3. Confidentiality and privacy, 4. Receiving accurate care and treatment, 5. Protection and objection**

Hypothesis Test

In the current research, the variables of the healing components, which include architectural features, interior design features, and psychological and social features, are known as independent variables, and the design of the treatment center is known as dependent. Before testing the hypotheses, the presuppositions of structural equations, including normality (Kolmogorov–Smirnov test), non-collinearity of independent variables (variance inflation factor test (VIF)) and independence of observations (Durbin-Watson test) were examined. It is assumed that all the mentioned assumptions have been confirmed. According to Figure 4, it can be seen that the architectural features with a rate of 0.486 have the greatest impact on the design of the treatment center, and the psychological and social features with a rate of 0.333 have the second priority, and at the end, the interior design features with a rate of 19 0/ has had the least role. The coefficient of determination for the hospital is calculated as 0.344, which means that the contribution of the variables of the components of the patient's healing environment, i.e. the three factors of architectural features, interior design features, and psychological and social features, in the satisfaction of patients admitted to the hospital is 4.4 It is 34% and the share of other unidentified factors is equal to 65.6%, which should be identified and their impact coefficients should be measured.

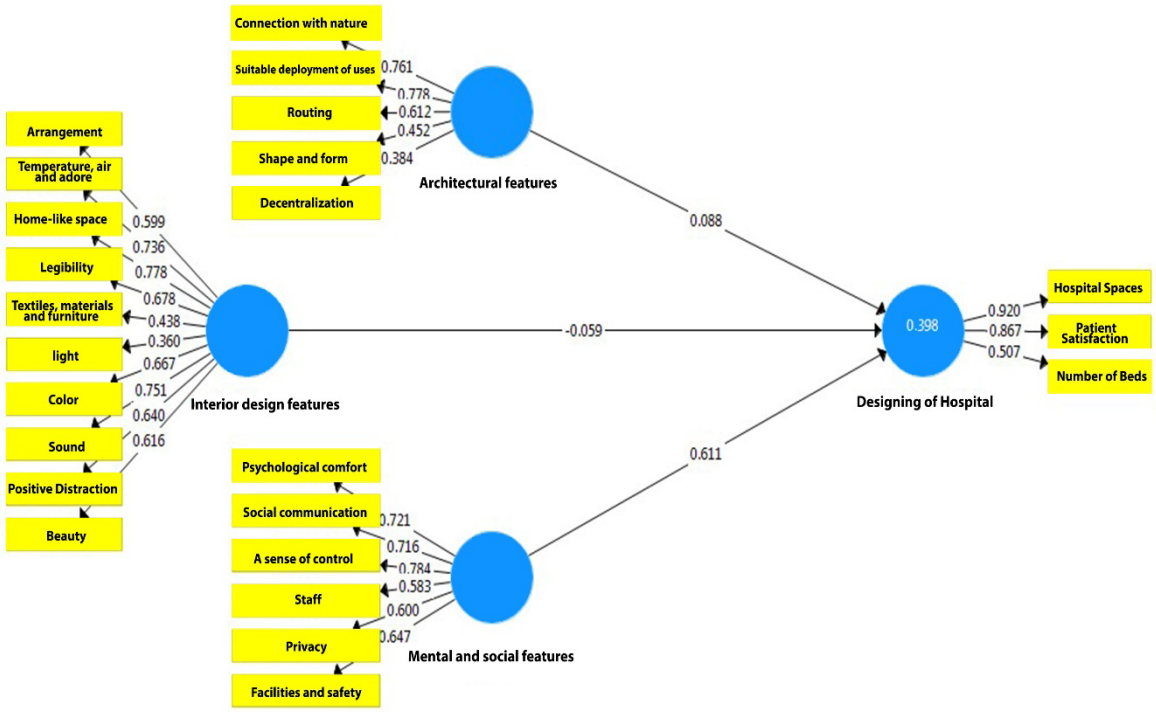


Figure 5. Standardized path coefficients of the conceptual model in Kasra Hospital.

Conclusion and provide solution

The main advice of EBD in comparative evaluation can be mentioned for the design of medical buildings based on the results obtained from the Table and Figures shown above.

Table 6. Design solutions and recommendations.

Factor	Suggestions and design solutions
Privacy and Company	Social support is increased when a suitable and comfortable place is considered for the family in the patient's room
View	Patients must have access to and a view of relaxing natural landscapes. The spaces where patients spend most of their time should have windows.
Nature and outdoor	It is recommended to create a garden with an emphasis on green space presence in the environment and using interior design elements such as comfortable furniture with the proper layout to increase communication.
Comfort and control	One of the significant factors in a healing environment is its similarity with the house's space to break the imagination of patients that they are in hospital spaces allowing them to feel comfortable. Some amenities must be created for illumination control, room temperature, TV control, music, ability to use personal items specific scales for children, and privacy for patients.
Legibility	Visible and understandable signs should be used, and a common language must be applied to design signs and the number of rooms.

Interior design	Light	It is recommended to use indirect and gentle lights in all, hospital spaces to avoid sudden light changes in the spaces. The ceiling is the place that patients see in communicational spaces, corridors, and elevators when patients are on a bed or stretcher, so these spaces must be designed in a way that wall or ceiling lamps do not shine directly into the patient's eyes.
	Color	The color of wards must be chosen from bright colors that provide comfort and peace, so dark colors should not be used in wards. The colors should be selected in all hospitalization wards in a way that the medical group's perception is not disturbed and patients have psychological comfort at the same time.
	Sound	If the fan is used, they must be installed inside the walls or on the ceiling to reduce the sound. The floor and ceiling coverings with a high sound reduction rate can help to decrease noise.
	Positive distraction	Music therapy is suggested for patients with hypertension or those who suffer from migraine headaches. Positive distractors can be a fireplace, a game table, or even access to the outside landscape through a patio or large window.
	Beauty	Accurate planning is required for sufficient storage of portable equipment and extra beds. Strange tools or medical gas outlets must be used rarely.
Facilities		The rooms must be designed uniformly. The uniform rooms provide similar and repetitive arrangements; it means that patient beds, technology, and nurses' places are the same in all rooms. Private rooms should be prepared for all patients. Private rooms can reduce the pollution and stress of patients. The size of hospitalization rooms should be increased.
Staff		A station should be considered for nurses next to the patient room with a window towards the nurse station. Decentralized nurse stations must be designed.

Conclusion

The evidence-based design studies promise a better healthcare sector and better medical buildings. Faster development is required in this field. It is necessary to have cooperation and coordination with evidence-based research centers to complete more accurate methodologies and share information. A collaborative research plan can provide the field for coordination and enhance the research funds.

EBD has become popular in the architecture of medical centers over the years trying to improve various factors. This approach insists on using robust evidence and authentic information resulting from deterministic methods and studies to influence the design process and its results. Hence, EBD is used to create an environment that can treat and support the presence of families, be effective and efficient for staff's performance, and recover the ability of staff that are under stress. In the last phase of analysis, an evidence-based medical design must lead to

confirmed improvements in clinical results, economic performance, job yield, and patient satisfaction.

Since the design and construction of medical centers cannot be postponed until the valid evidence and required knowledge (through studies) are created; therefore, designers and executors of the project must create a balance between available knowledge and evidence obtained from studies to make flexible decisions that are adaptable with future studies and evidence.

Many studies must be done and academic references should be generated to achieve efficient medical centers regarding the country's goals at the macro level describing medical centers based on international standards. Application of the EBD approach in planning, designing, and constructing medical centers can lead to the best results. The presence of a multidisciplinary team and the EBD process ensures achieving these goals.

Author Contributions

All authors contributed equally to the conceptualization of the article and writing of the original and subsequent drafts.

Data Availability Statement

Not applicable

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Ethical considerations

The study was approved by the Ethics Committee of the Islamic Azad University, SR.C. The authors avoided data fabrication, falsification, plagiarism, and misconduct.

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Conflict of interest

The authors declare no conflict of interest.

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