ORIGINAL PAPER

Patients 'satisfaction with outdoor and indoor environments of a training hospital

Afsane Chavoshani[1], Asadollah Shams[2], Akbar Hassanzadeh[3], Majid Hashemi[4,✉]

1. Student Research Center, Department of Environmental Health Engineering, Faculty of Public Health, Isfahan University of Medical Sciences, Isfahan, Iran
2. Healthcare Services Management Group, Isfahan University of Medical Sciences, Management and Medical Informatic College
3. Department of Epidemiology and Biostatistics Health school, Isfahan University of Medical Sciences
4. Department of Environmental Health Engineering, Faculty of Public Health, Kerman University of Medical Sciences, Kerman, Iran

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ABSTRACT

Respect for the design guidelines of building environments is a complex subject that is associated with cultural and economic development of human societies. Therefore, accurately measuring users' favorites of environment design is an essential subject for optimizing the relationship between environmental and personal parameters. The purpose and aim of this study was to investigate patients 'satisfaction with outdoor and indoor environment dimensions, and it was performed in one of the hospitals in Isfahan City in Iran in 2015. Data were collected from all hospital wards by questionnaire and environmental health checklist. This questionnaire included questions about patients 'satisfaction with indoor and outdoor environment dimensions of the hospital. Statistical tests including the independent samples *t*-test, Pearson's Correlation test, Spearman correlation test, and paired sample *t*-test were applied by Statistical Package for the Social Sciences (SPSS). According to these results, the mean of total satisfactory scores from indoor and outdoor spaces were 62.3% and 80.5%, respectively. Paired sample *t*-test showed that the average satisfactory score of patients from outdoor view was significantly higher than for indoor view ($P<0.001$). Among outdoor-view items, the lowest and highest satisfactory scores were allocated to disruptive and constructive activities (31.7%) and green natural space (69.4%), respectively, while, among indoor view items, the lowest and highest satisfactory scores were allocated to access to sanitation/cleanliness of toilets (21%) and lighting (63.3%), respectively. Obtained results showed that the mean total scores of satisfaction from outdoor and indoor environments were at an acceptable level.

Keywords: Patients' satisfaction; training hospital; outdoor and indoor environments

Introduction

Nosocomial, or hospital-acquired infection, is an additional patient health issue affected by design of outdoor and indoor environments. Infections acquired during a hospital stay are harmful to patient treatment. Nosocomial infections often result in increased length of stay, readmissions, and decreased hospital efficiency.[1,2]

Respect for the design guidelines of building environments is a complex subject that is associated with cultural and economic development of human societies. Therefore, accurately measuring users' favorites for environment design guidelines is anessential subject for optimizing the relationship between environmental and personal parameters and to decrease incidence of nosocomial.[2-4] These guidelines include health of water supply (water quality, quantity, and accessibility), solid waste disposal, healthy building (including ventilation), food health (including preparation and storage), and control of phatogenic carriers.

✉ *Majid Hashemi*
Mhashemi120@gmail.com

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According to technology development in the world, it is necessary to formulate human satisfaction with outdoor and indoor environments then design and control the situation based on practical engineering methods.[2-5] In light of this, the hospital environment would be a dynamic setting and would be changed based on satisfaction of patients and staff.[6] In the view of engineering, the hospital environment is classified into outdoor and indoor environments, where both safety and health are necessary (Fig. 1).[7]

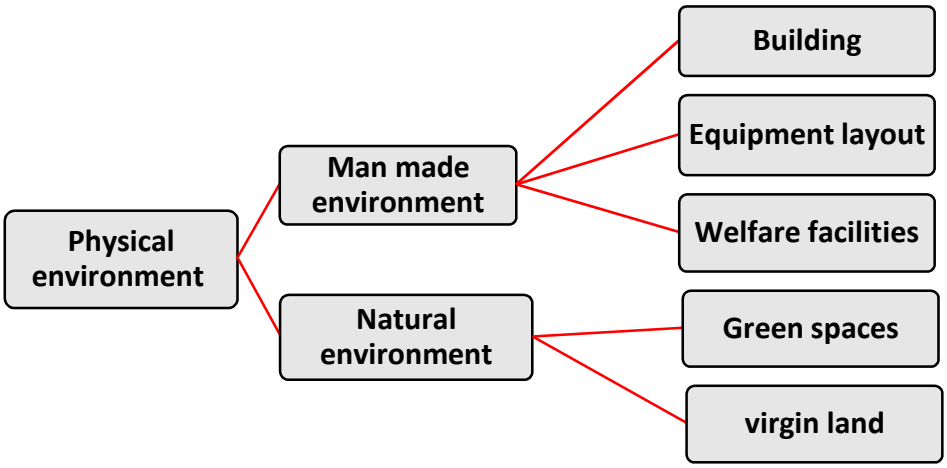

Fig. 1. The classification of the physical environment of a hospital[7]

Promotion of indoor and outdoor environments such as renovations and hospital construction, noise reduction strategies, providing attractive waiting rooms for visitors and families, improved patient room decoration, private rooms, and large and windows that can be opened result in improved patients 'satisfaction.[8,9]

Unfortunately, in Iran the study of the environmental health of indoor buildings is performed based only on a standard environmental health checklist, and in this checklist patient-centered care is ignored. But today, in new hospitals, patient-centered satisfaction standards have been used for hospital construction and renovation. In this manner, managements have preferred to design single-bed rooms with natural light and views like gardens, art works, digital entertainment and fountains to reduce transmission of infection ,enhance security and comfort of patients and visitors.[10-19]

Study of hospital leadership has shown that increasing and renovating equipment in a hospital are priority for improving patient satisfaction.[20] If renovation is based on the perception of staff, patients, and environmental health specialists, it can increase the value of existing buildings and provide more modern facilities.[8]

Consequently, the objectives of the present article were to study patients'satisfaction obtained from outdoor and indoor environments of a training hospital in Isfahan City, Iran.

Materials and Methods

The purpose of this study was to investigate patient satisfaction with indoor and outdoor environments of a hospital, and it was performed in one of the training hospitals of Isfahan City in Iran in 2015 (Fig. 2).

Geographical longitude and latitude of this hospital are 51.652628 and 32.609184, respectively. Permissions for the study were obtained from the relevant authorities. The line of activity of this hospital was treatment, education and training, and its date of establishment was 1993. Its land area, floor space and wards number were 25,000 m^2, 80,000m^2, and 20, respectively.

Required information for and data of this study were collected by the environmental health checklist (related to the Ministry of Health and Medical Education in Iran), and the validity and reliability of the questionnaire that was used was approved before hand.[21] For measurement of the patient satisfaction (completely dissatisfied, dissatisfied, satisfied,

completely satisfied, no idea), Likert scale was used. Data were related to all wards in the hospital. The questionnaire was completed by 170 patients in different wards during autumn of 2015. Patients were assured that their personal information would not be used. The questionnaire included questions about satisfactory experiences from indoor and outdoor environments of the hospital. The statistical tests, including Independent samples*t*-test, Pearson correlation test, Spearman correlation test, and paired sample *t*-test, were applied by SPSS.

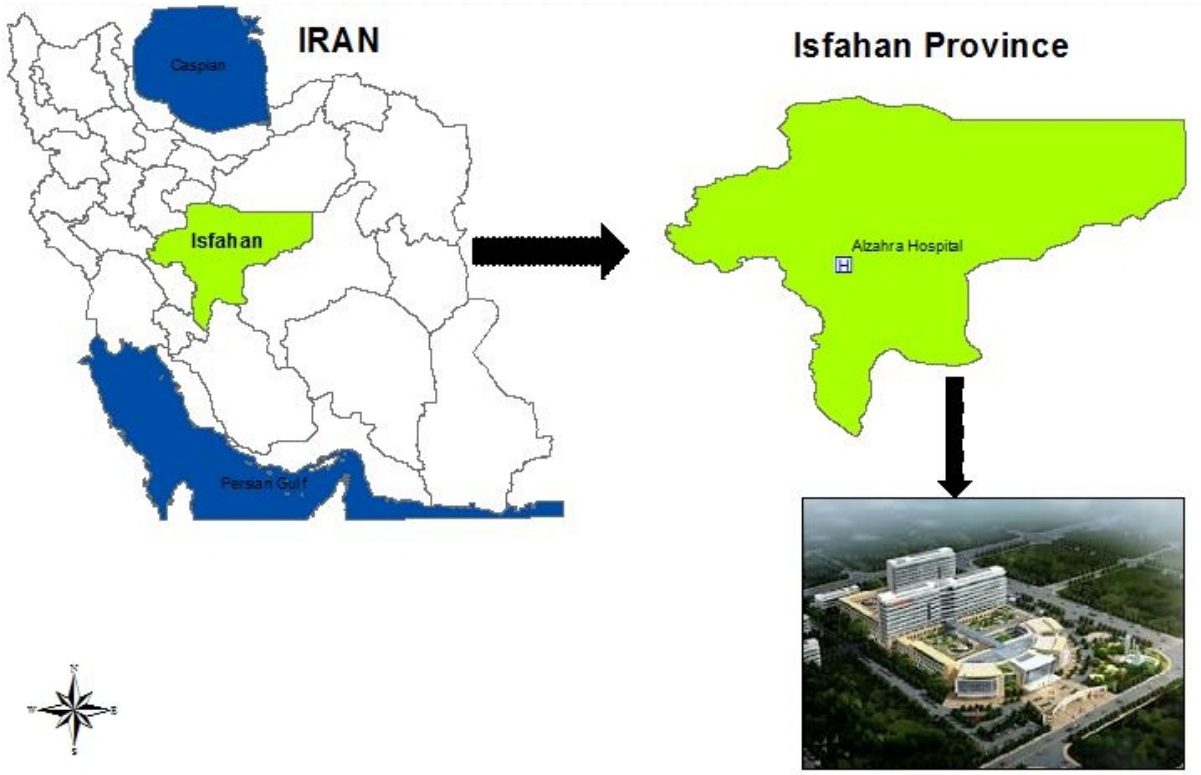

Fig. 2. Geographical location of hospital in Isfahan City in Iran

Results and Discussion

Patients' satisfactory experiences from outdoor environment

According to these results, the means of satisfaction scores from indoor and outdoor spaces were 62% and 80.5%, respectively (Fig. 3). Paired sample *t*-test showed that mean of patients' satisfaction score from outdoor view was significantly higher than for indoor view (P<0.001).

Specifically, 57.5%, 69.4%, 64.1%, 68.9%, 60%, and 31.7% of patients were satisfied with landscape beyond window, natural space, surrounding buildings' appearance, surrounding grounds of hospital, traffic situation, disruption, and construction activities, respectively. Among outdoor-view items, the lowest and highest satisfactory scores were allocated to disruption and construction activities (31.7%) and green natural space (69.4%), respectively (Table1).

Satisfactory comparison between outdoor and indoor views showed that mean of satisfactory score from outdoor space in hospital was higher than its indoor space. Obtained results were due to receiving sunlight, seeing sky and green natural space by windows, and resting family and friends in surrounding green space of hospital. Also, this hospital is located in near the Sofeh Mountain so that this geology has very the positive effects on the weathering situation and the green space of hospital. Cooper-Marcus and Barnes in their study evaluated the effects of garden on satisfaction of patients, visitors, and staff in four hospitals in the US. In their study, 95% of people who were interviewed experienced a positive change of mood in the garden.[14] Due to having a natural tendency toward natural landscapes rather than man-made environments, many people believed the natural space could make them feel better.[14-16,22]

In our study, 60% of patients had satisfactory responses from the situation of traffic and transportation, and this is due to the easy accessibility of the highway, public and private transportation. But in the study of Qadri et al., 84% of the participants identified accessibility to the hospital as the most common problem. Forty-five percent had to walk for 1–2 kms or wait for half an hour to one hour before getting any mode of transport to reach the hospital. Sixty-eight percent of them believed that the road connecting hospital to highway was also not suitable.[6]

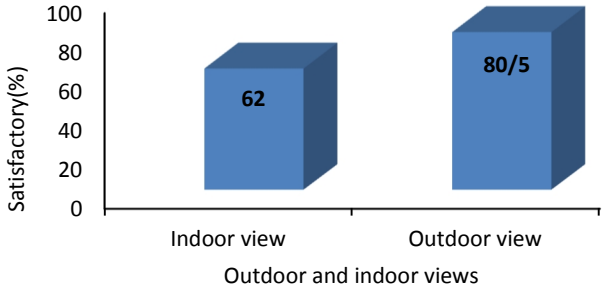

Fig. 3. The mean of satisfaction score based on outdoor and indoor views

Table1. The patients' satisfactory experiences from outdoor environmental dimensions in the chosen hospital

	Environmental dimensions	Completely dissatisfied (%)	Dissatisfied (%)	Satisfied (%)	Completely satisfied (%)	No idea (%)
Satisfaction from outdoor view of hospital	Landscape behind the window	4 Total=9	5	14.9 Total =57.5	42.6	34.5
	Natural space	5.4 Total =9.7	4.3	23.2 Total =69.4	46.2	29.1
	Surrounding buildings appearance	4.3 Total =13.1	8.8	15.2 Total =64.1	48.9	22.8
	Surrouding grounds of hospital	4.4 Total =6.6	2.2	18.9 Total =68.9	50	24.5
	Traffic situation	5.2 Total =11.4	6.2	11.3 Total =60	47.7	28.6
	Disruption and construction activities	8.2 Total =19.5	11.3	20.4 Total =31.7	29.6	28.6

Patients 'satisfaction with indoor environment

Nevertheless, 50%, 52.9%, 53%, 63.3%, 57.9%, 51.5%,21%, 24.8%, 24.8%, and 60%, respectively, of patients were satisfied with room size, number of a patient roommates, belonging security, lighting, windows, ventilation system/air quality, sanitation/cleanliness of toilet and bathroom, refrigerator and cooling water, entertainment, wall and surface color (Table 2). In this part, the lowest and highest satisfactory experiences were allocated to sanitation/cleanliness of toilet and bathroom,and lighting, respectively. The most annoying sound in the indoor environment of the hospital was given to staff noise, and 30.2% of patients were dissatisfied with staff noise.

Most of the respondents (63.3%) were satisfied with lighting in the room and 50% of them were satisfied with room size. In a similar study assessing parameters such as lighting, fans, seating facilities and general cleanliness showed that the level of satisfaction varied (92%, 78.5%, 86.5%, 94%, and 74.5% , respectively).[6]

Comforting room size and natural light provide psychological and physiological benefits for patients as well as save energy for hospital managers.[23] It should be respected that natural light is sufficient during the day and other forms of lighting should be available for night-time and emergency conditions.[24] Measuring patients 'satisfaction with lighting, room size, wall and surface color, the number of windows, and layout of the bedridden are important measurements to help inform managers about quality and safety of indoor environmental aspects of the hospital. In this study, 43.3% patients were bedridden in the two-bed rooms. The relationship between the number of roommates and satisfaction with the indoor environment was a negative relationship.

Ittelson et al. observed that, in a small room (single-bed room), the patient had wide freedom for what he/she did, while in the large room (multi-occupancy room), the patient freedom was limited and he/she was forced into passive behavior.[10] During several studies it was found that the amount of patient activity decreased as room residence numbers increased.[9] In a small room and without a window, patients became disorientated and depressed, which may lead to increased anxiety levels and sleep deprivation.[12] Single-bed rooms offered patients the comforts of privacy, quiet time, personal space, and control over their environment.

In the selected hospital, for security of personal belongings a bedside cabinet with several drawers was used,and patients had 53% satisfaction with this question. This satisfaction was due to the medium security of personal belongings. Also, for more adaptation and comfort with in hospital, patients' desire to have a sense of control over their actions, facilitated by good design to enable them to move around the ward area, open and close curtains, control lights and temperature, and access external areas of the building, can be facilitated by good design.[13]

Based on patients'satisfaction, the quality of the ventilation system in the chosen hospital was desirable. O'Connell and Humphreys recommended that air conditioning be adjustable from 16 to 27 ºC, humidity from 30%–60%, and ventilation pressure from positive to negative. The ventilation system should also be adjustable from six to 15 air exchanges per hour, and the filtration should be equipped to eliminate all particles over five µm.[25]

Our results show that most noise belonged to staff and disruption/construction, respectively. Today, researchers have found that even low noise levels of 40 dB–58 dB can worsen health outcomes.[20] The US Environmental Protection Agency (EPA) in 1974 recommended that hospital noise levels do not exceed 45 dB during the day and 35 dB at night.[26] The International Noise Council has suggested a maximum of 45 dB, on average, in acute-care areas during daytime, 40 dB in evening, and 20 dB (a soft whisper) at night.[27]

Also, in this study, 71.8%, 70%, and 60% patients complained that entertainment (for example television), cleanliness/sanitation of toilet/ bathroom and refrigerator/ cooling water in rooms and wards, are not respected.

Managers of this hospital should remember that entertainment, music, and art works can have positive effects on the healing environment. Patients with nature images have less anxiety and require fewer doses of strong pain medication. The use of music programs timed to the surgical procedure (e.g., central nerve block) was associated with a significant reduction in the amount of perceived pain and a decrease in level of stress hormones in the blood. There are the strong evidences for the benefits of music in promoting weight gain and reducing stress, resulting in a shorter length of hospital stay.[2]

In Isfahan Hospital, due to shared toilets of males and females in most of the wards, patients were dissatisfied with the cleaning and situation of toilets. Review of several studies has confirmed our results about cleanliness/sanitation of toilet/ bathroom.[6,17,18] For example, in Pakistan, 35.5% of patients were dissatisfied with hospital toilets.[6] But satisfaction with toilets in the studies of Srilata[19] and Persak et al.[17] showed the lowest level of dissatisfaction (3.52%). Another study by Aleena et al.[18] reported a higher level of dissatisfaction (80%). Regard for toilet health is very necessary because human excreta and faeces are very dangerous to human health. One gram of fresh faeces from an infected person can contain around 10^6 viral pathogens, 10^6–10^8 bacterial pathogens, 10^4 protozoan cysts or oocysts, and 10–10^4 helminth eggs.[4] To prevent transmission of infection, piped water and water from showers and toilets should ideally be maintained below 20 ºC or above 50 ºC. Separate showers may be needed for staff and patients, and for both sexes, to ensure that all groups have adequate privacy and safety.[24]

In choosing a hospital, the reasons for patients' dissatisfaction with refrigerator/ cooling water was due to the insufficient quantity of these facilities in rooms or wards, but in Pakistan Hospital, 32.5% complained that water coolers were not working and the areas with facilities for drinking water were not clean.[6]

Table 2. The patients'satisfaction with indoor environmental dimensions in the chosen hospital

	Environmental dimensions	Completely dissatisfied (%)	Dessatisfied (%)	Satisfied (%)	Completely satisfied (%)	No idea (%)
Satisfaction from indoor view of hospital	Room size	8.5 Total = 25.5	17	3.8 Total = 50	46.2	24.5
	The number of a patient roommate	5.8 Total =25	19.2	4.8 Total = 52.9	48.1	22.1
	Belonging security	6.7 Total =23	16.3	8.7 Total =53	44.3	24
	Lighting	1 Total =4.1	3.1	4.1 Total =63.3	59.2	32.6
	Windows	1 Total =5.9	4.9	11.8 Total =57.9	46.1	36.2
	Ventilation system/air quality	12.9 Total =31.7	16.8	1 Total =51.5	50.5	16.8
	Sanitation / cleanliness of toilet and bathroom	30.7 Total =70	39.3	10 Total =21	11	8
	Refrigerator and cooling water	33.3 Total =60	26.7	26 Total =36	10	4
	Entertainment	44.3 Total =71.8	26.8	9.3 Total =24.8	15.5	4.1
	Wall and surface color	6.1 Total =16.3	10.2	11.2 Total =60	48	23.7

Intervention factors on patients' satisfaction

Human intervention factors that had negative effects on patients'satisfaction were hospitalization time and number of patient roommates. Based on the results of this study, age and hospitalization time of patients were 44 ± 21.43 years and 7.35 ± 5.3 days, respectively. The number of participants was 170 persons and 56% and 44% of them were male and female, respectively. The duration of hospitalization time had a negative effect on total patients 'satisfaction with hospital ($r = -0.198$, $p = 0.029$) and their satisfaction with room space ($r = -0.179$, $p = 0.039$), respectively (Fig.4). Also, these results showed that the number of patient roommates had a negative effect on satisfaction with room space ($r = -0.157$, $p = 0.04$). Spearman correlation coefficient showed that there was not any significant relationship between patients 'satisfaction and their ages and gender ($r = 0$, $p = 0.256$). Differences in study population and hence in patients' expectations could affect satisfaction levels. Also, socio-cultural differences and variations in levels of literacy could be affected. In addition, variation in methodology and timing of the study could explain some of the differences.[6]

For example, Makarem et al. during their study found that increasing age and duration of hospitalization were related to decreasing satisfaction.[28] The lowest satisfaction was obtained among patients with age older than 70 years.[29]

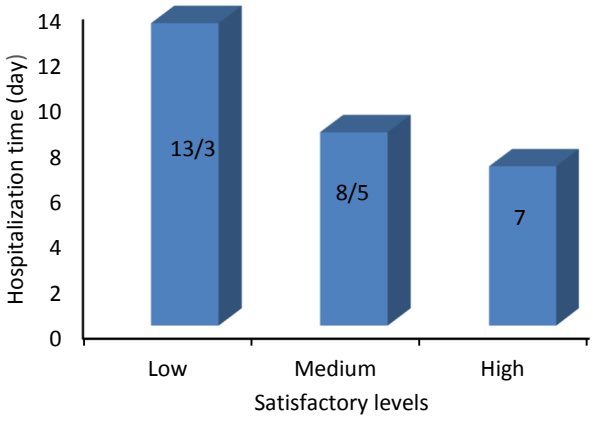

Fig. 4. The mean of hospitalization time effect on satisfaction levels

Indoor environment score according to environmental health checklist

During monitoring of environmental health specialists in this hospital, indoor environmental elements were monitored based on an environmental health checklist and scores below were obtained (Table 3). According to a statement of the environmental health expert, daily solid waste production in hospital is 3.5–4

tons, of which its 1.2 tons is infected solid waste and disinfected by autoclave then disposed by other solid wastes. Monitoring environmental health specialists in this hospital showed that all

Table 3. Indoor environment score (%) according to environmental health checklist

Environmental element	The number of questions	The standard score for each elements	Obtained score from each element	Obtained score(%)
Solid waste management	20	50	46	92%
Ward cleaning	29	96	91	95
Ventilation	5	20	19	95
Isolated room	7	18	15	83
Sheet collection	6	13	11	84
Isolation of hazardous materials	5	10	7	70

environmental health elementsare desirable. Based on checklist, treatment processes and environmental health elements are not dynamic, while today hospital not only is a treatment place, but also is a resident place for patients and their families and it is necessary to obtain their satisfaction. In a dynamic process, a hospital needs to renovate and improve with time passing and new checklist.

This work provides information on the beneficial effects of outdoor and indoor environment designon patients satisfaction in one of the hospitals in Isfahan as well as information on the relevant guidelines and standards that play key roles in environmental aspects. The most important outdoor environmental elements for increasing patients'satisfaction are exposure and access to green nature. But in the indoor environment, the most important elements for improving patients'satisfaction are room size, the number of a patient roommates, belonging security, lighting, windows, ventilation system/air quality, sanitation/cleanliness of toilet and bathroom, refrigerator, cooling water, entertainment, and wall and surface color. This knowledge can be used to maximize the aspects of outdoor and indoor design that enhance patients'satisfaction, while minimizing or eliminating undesirable environmental design. The satisfaction of patients depends upon their socio-economic profile, personality, and their perceptions; some may be satisfied with average services, while others may be dissatisfied even with the best services. The present study was only performed in a public hospital, while further studies are recommended in several other hospitals.

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