

# Evaluating the Impact of Environmental Quality Indicators on the Degree of Humanization in Healing Environments

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## Abstract

During the last 2 decades, the effects of the physical and social environment on the healing process, recovery and well-being of patients, families and staff in hospitals have been proved. There is a growing recognition that healthcare architecture could do more by promoting overall wellness, and this requires expanding the focus to healing. The research on evidence-based design (EBD) has demonstrated the power of environmental design, but EDD most links between design and outcome such as safety and efficiency, while there is a difference between efficient environment and pleasing humanized environment. Humanization is the result of user-centered concept in design. The present study aimed to evaluate the perceived environmental quality indicators that affect the degree of humanization in hospital design. In this descriptive cross-sectional study, first, the user-centered level of the hospital environment (humanization) was determined in three selected hospitals in the city of Tehran by two hospital designing and planning experts, and then, with the data collected from patients, staff, and visitors (n=184) the relationship between the variables has been found. Analysis of the data was performed in SPSS V.19 software using standard tests. The results of the study showed that there was a significant relationship between the user-centered levels of hospitals and the users' comments on perceived environment quality of a hospital from various aspects. Out of 12 quality indicators, 10 were meaningfully related with the user-centered level of hospitals, and 4 had a significant relationship with the user type. The results indicated that the group of patients was more sensitive to the changes in environmental quality conditions than other groups of users.

**Keywords:** Environmental quality, Quality indicator, Healing environment, Supportive environment, Environmental assessment, User-centered design (Humanization).

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## 1. Introduction

Presence of human in hospitals has always been a unique experience and usually associated with fear, worry, and stress (Haltman, Coakley, Annese et al, 2012). So that, despite the considerable advances in medical sciences as well as application of modern treatment equipments, the hospital environments are still perceived as stressful environments (Ulrich, Gilpin, 2003), which has consequently led to the increased need for designing user-centered hospitals in the past two decades (Gifford, 2003). As a result of several years of studies on physical environment and approving its effects on users' behavior and spatial experience (Ulrich et al, 2008), the assumption that the hospitals are designed merely as a place for performing the treatment process has been challenged. Hence, the physical environment of hospitals is considered as a potential factor in facilitating the process of recovery and well-being and also reducing the users' environmental stress, and therefore, the focus is put on the concept of *healing environment* (Arneil, Devlin, 2002). The healing environment refers to a place where the environment promotes the patients' improvement process, increases the level of positive perception of the environment, and improves users' mental improvement

through physical and non-physical components. Discussions regarding the importance of the built environment for the patient's health and well-being go back at least to 400 BC with Hippocrates and the 19th century with Florence Nightingale (Huisman, Morales, Van Hoof, & Kort, 2012). Now, environmental psychology has maintained an interest in the study of healthcare environments and its implications for users (yusoff Abbas, Ghazali, 2010). Evidence-based design (EBD) uses scientific background to build the links between design and outcome, such as safety and efficiency, while there is a difference between efficient environment and pleasing healing environment. Many hospital designs have been based primarily on expert discourses that emphasize efficiency in terms of costs and clinical functionality; that is, only the visions of administrators and architects (Gesler et al., 2004). "User-Centered Design" aimed at planning and designing spaces that fit with the needs and preferences of end users (Gifford, 2003). It is important that architects and managers monitor users' perceptions of quality and levels of satisfaction in order to track quality improvements over time. Such data allow managers to compare their facilities

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to those of other health providers (when the same measures are used), and to recognize and resolve service problems in real-time (Lis, Rodeghier, & Gupta, 2011). The present article intends to recognize different aspects of physical and social quality indicators of hospitals and clarify the variables affecting humanization (healing environment) degree and user-centeredness and also discover the sensitivity of each user to environmental quality variations. In this context, a criterion that assesses users' perceptions of hospital environmental quality is of a high importance and greatly desired for architects and designers. The Perceived Hospital Environmental Quality Indicators (PHEQIs), which is a validated tool for measuring hospital environmental quality perception, has been used in the present study (Fornara et al., 2006).

## 2. Theoretical background of the research

### 2.1. Healing environment

“Healing is a holistic, transformative process of repair and recovery in mind, body, and spirit resulting in positive change, finding meaning, and movement towards self-realization of wholeness, regardless of the presence or absence of disease” (firth et al., 2015, p.12). Healing is facilitated by an optimal healing environment (OHE), where the individual is surrounded by elements that ease healing process (Sakallaris, Macallister, Voss, Smith, & jons, 2012). Physical environment is defined as ambient, architectural or interior design features that are purely stimulus objects (Dijkstra et al., 2006; Harris et al., 2002)

and that characterize the healthcare settings. Swan et al. (2003) found that patients recovering in appealing rooms rated their rooms considerably higher than did patients in typical rooms in the same hospital. The research literature has documented: 1) direct effects of the built environment on outcomes such as noise which interrupts sleep, and 2) indirect causation such as providing comfortable spaces for families, which increases social support. According to the Ulrich supportive environment theory, a hospital environment with effective spatial characteristics can reduce the users' stress, and consequently, increase satisfaction and humanization level of the environment (Andrade, Lima, Fornara, Bonaiuto, 2012). A major part of the patients' satisfaction is related to the physical environment. Furthermore, studies have proposed that the social support of other environmental factors can be rather effective in reducing the stress (Bolger, Amarel, 2007) and depression levels (Fornara, Andrade, 2015) among the patients. The environment itself cannot cause healing to occur, however it can facilitate engagement in behaviors and emotions that support healing: Physical and emotional responses such as happiness, joy, and relaxation can be induced and individual control and functionality can be enhanced as well. The built environment can facilitate healing through a variety of mechanisms. In some cases, architectural elements have direct impact on healing, but for the most part, architecture influences behaviors which they impact the healing experience (Figure 1).

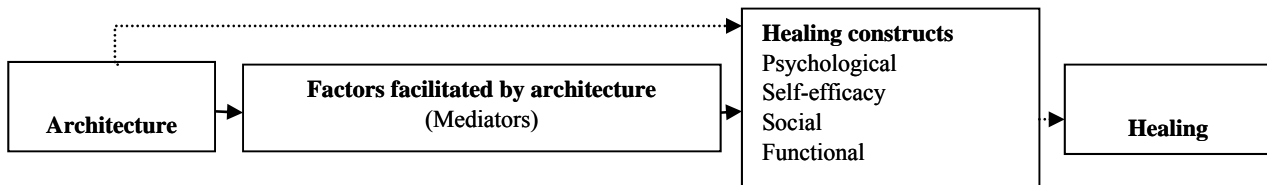


Fig. 1. Causal model for architectural impact on healing (Dubose, Macallister, Hadi, 2016)

Environmental support for managing emotions and reactions, especially the ability to diffuse aggression and avoid or mitigate anxiety and depression is psychological aspects of healing constructs. Self-efficacy is known as environmental facilitation of the sense of coherence and control and also the ability to accept and adapt to new situations. Moreover, social aspect is environmental support for developing and maintaining relationships and connections with others and functional aspect of healing constructs is considered as environmental support for safely performing the basic activities of daily living with minimal assistance.

### 2.2. User- Centered Design (humanization)

The effort to conceive hospitals as facilities that benefit their users can be seen as part of the broader context of implementing a model of patient-centered care. User-centered design is a highly iterative method for optimizing the user experience (Kuniavsky, Moed, Goodman, 2012). The term user-centered design is often

used interchangeably with human-centered design (ISO DIS, 2010). This framework rests on the idea that design is most likely to fulfill user needs. The degree of humanization in health care facilities depends on perception of the environmental quality and user satisfaction and this affects their perception of the care and treatment (Swan, Richardson, Hutton, 2003). The physical environment generates satisfaction with the service (Swan et al, 2003), as well as with the staff (Gotlieb, 2002), which are predictors to use the hospital again (Becker et al., 2008; Lee & Yom, 2007; Lis et al., 2011). The movement toward humanizing healthcare settings is also taking place in the world (Dilani, 2001; Gesler et al., 2004). Joint Commission on Accreditation of Healthcare Organizations (JCAHO) uses the patient's satisfaction as an indicator (index) for assessing the treatment quality of the institutes (Boudreaux, Mandry, Wood, 2003). Developed countries have codified plans for importing this issue in hospital design, so that, the recent Private Finance Initiative program of hospital building in the UK has been accompanied by a vigorous

debate over what constitutes good hospital design for different stakeholders (Gesler et al., 2004). The Planetree model is one of the pioneers in patient-centered approaches in hospitals. (Arneill & Frasca-Beaulieu, 2003). The Planetree philosophy encourages patients to become educated participants in choices regarding their care by fostering patients' access to information, promoting positive staff-patient interaction, and involving both patients and their families in the healing process (Schweitzer, Gilpin, & Frampton, 2004). An important component of this philosophy is the creation of an aesthetic, comfortable, soothing, and home-like environment conducive to well-being (Casparia, Erikssonb, & Naden, 2006). In order to achieve humanized environments, the personal perceptions of managers and designers from nature of the space are considered as the next priority, and conducting documented experimental studies to discover the users' actual preferences is regarded as the criterion (Zimring, Bosch, 2008). Studies have shown that the two groups of the staff and patients have different perceptions due to the level of their familiarity with the environment as well as their presence and role in the environment (Shumaker, Pequegnat, 1989). With regard to staff, a survey found that nurses based their decision to work at a hospital on a variety of factors, including the workspace inwards (CABE, 2004). However, these studies have neglected perception of the visitors and patients' companions from the environment; while, visitors might be caught by stress due to their unfamiliarity with the environment, encountering environmental problems such as illegibility and difficult navigation, exposure to inappropriate form and front design, as well as non-supportive interior space (Zimring, Reizenstein, Carpman, Michelson, 1987).

### 3. Materials and Methods

The construct of environmental quality perception (EQP) has strict connections with the cognitive psychological processes involved in the evaluation of environmental qualities (Bonnes & Secchiaroli, 1995), and represents a way to operationalize the relationship between the person and the environment (Horelli, 2006). EQP has also been applied to the hospital context, taking the form of the Perceived Hospital Environment Quality Indicators (PHEQIs) (Fornara et al., 2006). This assessment tool was based on the users' comments, development of the perceived environmental quality scales in urban areas (bonainto, fornara, bonnes, 2003), residential spaces for the elderly (moos, lemke, 1984) and this aimed at covering the primary design and social attributes that are expected to play a role in the assessment of healthcare environments. PHEQIs scales represent one of the few instruments created to measure users' EQP specifically in hospitals. This instrument has been used in research on healthcare environments in different types of Italian care units (Fornara & Cerina, 2011). In the present quantitative cross-sectional study, data collection was performed using questioning method. In order to assess the indicators which are affecting the user-centered level of hospital and the users' perception of quality, the internal admission

wards and their waiting spaces, the outpatient waiting spaces and the open spaces in three hospitals in Tehran were selected. We decided to select units whose differences in humanization were not extreme in order to verify the discriminating power of the tool even with small differences in spatial-physical quality. Two architects categorized hospitals into three high, medium and low levels in the highest focus on the degree of humanization with using the quality assessment instrument. The experts' instrument was designed for the primary assessment and determination of the user-centered level of the selected hospitals. This instrument included 140 questions on design features and physical-spatial aspects of the hospital outdoor space (32 items), patient hospitalization space (40 items), waiting rooms for patients and families in internal wards (33 items), as well as outpatient waiting room (35 items), which are consistent with the variables derived from review of the relevant literature. With regard to the questions of this instrument, the two experts weighted their judgments on the environmental quality based on five-point Likert scale ranging from insufficient to excellent for each item.

The study participants (N = 210) were sampled from the three main categories of hospital users (i.e. patients, staff and visitors/companions). Internal wards in three hospitals have 162 patients and 141 staff. In calculating of sample size, for each patient a companion is considered. According to Morgan table (S=465), the sample size was determined to include 210 subjects (d=0.05). Consent and privacy were considered as the basis for participation of the users in this study; therefore, 184 participants completed the given questionnaires. It was attempted to distribute the subjects in all the three hospitals equally; besides, only those patients in the admission wards were selected who had been hospitalized in the relevant ward for at least 2 days, because time is considered as an important factor in environmental perception (Fornara, bonaiuto, bonnes, 2006). The questionnaire was on paper and was answered by the users themselves or with the help of the research assistant. Regarding the perception of some of the components by all the users and in order to evaluate the users' comments, 12 environment quality indicators were considered in the form of four overall scales. Eventually, the required information was collected through 72 questions. The responses were scored based on the five-point Likert scale, in which the scores ranged from "strongly disagree" to "strongly agree". The Four evaluation scales in the present study included:

#### ***Scale-1: Physical-spatial aspects in hospital outdoor space (15 questions)***

This scale included four general indicators, namely upkeep & care, orientation, building aesthetics (frontage), and green space. The first indicator dealt with issues such as appropriate status of the routes and proper care of the sidewalks, the building entrance's sense of invitation, and cleanness of the building frontage. While the second indicator focused on issues such as ease of finding the hospital entrance, hospitalization wards, diagnostic services, presence of signs, and legibility of the spaces. The third indicator emphasized on aesthetics including

beauty of the building form and frontage design, painting, and materials; while, the fourth indicator examined the amount and type of the green space as well as its use in the treatment spaces. The Cronbach's alpha coefficient was obtained for the four above-mentioned indicators equal to 0.62, 0.72, 0.78, and 0.72, respectively.

**Scale-2: Physical-spatial aspects of internal wards (18 questions)**

In this scale, three qualitative indicators namely physical-spatial comfort, orientation, and quietness were considered. The first indicator examined issues such as optimal painting of walls and ceilings, flexibility of the hospitalization room for various diseases, appropriate lighting conditions, types of furniture, quality of sanitary services, and environmental health. The second indicator focused on issues that were directly related to legibility of the hospitalization ward, ease of finding the routes, ease of detecting the entrances of the wards, etc. Since tranquility in treatment spaces is one of the most important factors in mental health of the staff and patients, the third indicator investigated the factors affecting tranquility as well as the causes of abnormal sounds within the hospitalization wards. The Cronbach's alpha coefficient for the three above-mentioned factors was equal to 0.83, 0.84, and 0.86, respectively.

**Scale-3: Waiting spaces in inpatient and outpatient wards (21 questions)**

This scale investigated two indicators, namely physical-spatial comfort, and view & lighting in waiting spaces. The first indicator examined issues such as arrangement and quality of furniture, environment cleaning, and painting. The use of large windows, adequate ventilation, green space view, and environment's adaptability to artificial lighting were among the cases evaluated in the second indicator. The Cronbach's alpha coefficient for the

indicators of this scale was equal to 0.9 and 0.8, respectively.

**Scale-4: Functional-social aspects in internal wards (18 questions)**

This scale examined three indicators, namely social and organizational relationship, privacy and additional services. The staff's friendly behaviors, satisfaction from medical appointments, and the information that must be provided by medical staff are the cases that were evaluated in the first indicator. In measurement of the cases related to the second indicator, the factors that were associated with privacy, tranquility, and personal spaces in the environment were assessed. The third indicator dealt with the cases, the presence of which would significantly reduce the feeling of isolation among the users. The issues such as newspaper distribution, books, and internet access are among these services. The Cronbach's alpha coefficient in the questions of this scale was equal to 0.8, 0.78, and 0.68, respectively.

**4. Findings**

The present study was conducted on 184 users in three groups of patients, staff, and visitors and families in three hospitals. Out of these subjects, 64 (34.7%) belonged to a hospital with high humanization level, 55 (30%) were from a hospital with medium humanization level, and 65 (35.3%) were from a hospital with low humanization level. Furthermore, 110 subjects (59.7%) answered the research questions in the inpatient wards, while 74 participants (40.3%) answered the questions in the waiting spaces of the outpatient and admission wards. Among the subjects, 29 (15.8%) had junior high school degree and lower, 68 (37%) had high school diploma, and 87 (47.2%) had academic degrees. Table (1) represents the demographic characteristics of the subjects in the study.

Table 1  
demographic characteristics of the users for each hospital unit

Degree of humanization	Users				Gender			Age				
	patients	staff	visitors	total	female	male	total	29≤	39-30	40-49	50≥	total
High	25	20	19	64	35	29	64	14	8	16	26	64
Medium	25	17	13	55	30	25	55	11	6	12	26	55
Low	30	20	15	65	36	29	65	12	5	18	30	65
Total	80	57	47	184	101	83	184	37	19	46	82	184

The results of assessment of the architecture experts as well as the results of the users' questionnaires were analyzed in SPSS v.19. Prior to the research, validity of the questionnaire was examined using the expert' opinions; furthermore, the Cronbach's alpha coefficient was used to examine reliability and homogeneity of the questions of the users' questionnaires in each scale, the results of which were specified in each scale and each indicator, representing acceptable reliability of the questions of each indicator. In data analysis, the environmental quality indicators were considered as dependent variables, the user-centered levels (high, medium, and low) and type of users (patients, companions, visitors, and staff) were considered as independent variables and functional area (in-patient area

vs. outpatient waiting area) as covariate. Analysis of the principal components was performed based on the data obtained from the users' questionnaire. Data of the questionnaire were analyzed using statistical methods of ANOVA and Duncan's post hoc test ( $\alpha$ : 0.05). In order to assess the simultaneous effects of the type of hospital and type of users on the above-mentioned 4 scales and 12 indicators, the factorial ANOVA was used. The experts' assessment to determine the low, medium, and high levels for observing the user-centered scales in the health care spaces exhibited differences in various aspects. The position of each part of the assessment is specified in Figure (2) with regard to the scoring. The mean score of the experts' judgments on the hospital design quality ranged from zero (insufficient) to four (excellent).

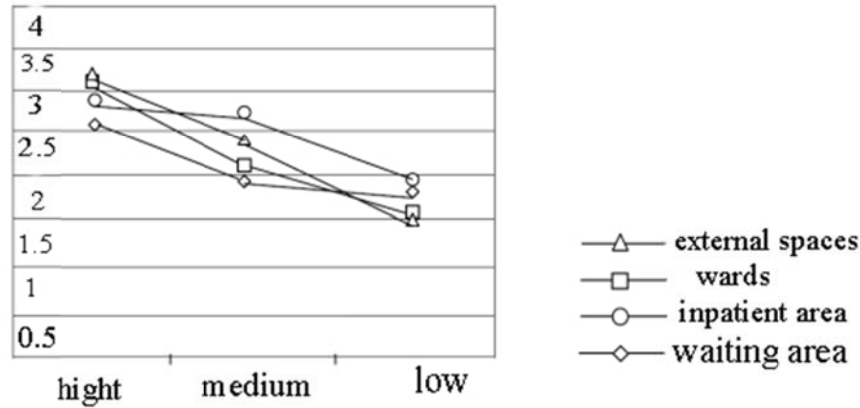


Fig. 2. Mean scores of designers' judgment of hospital sub places design quality. Range: from 0: insufficient to 4: excellent.

Table 2

Indicators means, SDs (in parentheses) and post hoc comparisons (Duncan test,  $\alpha$ : 05) in relation to the degree of user- centered environment

Quality indicator	Low H	Medium H	High H	F	P
Upkeep & Care	2.48 (0.84) N=65	2.83 (0.64) N=55	2.82 (1.01) N=64	3.297	0.039
Orientation(external spaces)	2.58 (0.61) N=65	3.01 (0.76) N=55	2.86 (1.2) N=64	3.573	0.03
Building Aesthetics	2.32 (0.59) N=65	3.39 (0.65) N=55	3.09 (1.03) N=64	17.149	0.001
Green Spaces	2.48 (0.61) N=65	2.60 (0.64) N=55	3.30 (1.06) N=64	12.439	0.001
Orientation(wards)	2.65 (1.15) N=65	3.06 (0.82) N=55	3.09 (0.77) N=64	2.343	0.04
Spatial-physical Comfort (wards)	2.53 (.61) N=65	2.99 (.64) N=55	3.16 (1.06) N=64	9.174	0.001
Spatial-physical Comfort(waiting area)	2.94 (0.75) N=65	3.70 (0.57) N=55	3.53(1.08) N=64	13.958	0.001
Views & Lighting.	2.76 (1.48) N=64	3.29 (0.87) N=55	3.48 (0.92) N=64	6.851	0.001
Social and Organizational Relationship	2.89 (0.9) N=64	3.14 (0.71) N=55	3.22(0.85) N=64	3.177	0.001
Additional Services	2.03 (1.13) N=65	2.20 (0.97) N=55	2.91 (0.92) N=64	14.280	0.001

Range: from 0 = lack of quality to 4 = presence of quality; in post hoc comparisons different letters refer to significantly different means.

The analysis of users' comments designated that out of 12 indicators presented in four defined scales, eight indicators, including upkeep & care, orientation (external spaces), building aesthetics, green spaces, orientation (wards), physical-spatial comfort in wards and waiting spaces, views & lighting, social and organizational relationship and additional services had a significant relationship with the user-centered level of a hospital (humanization). Two indicators of quietness as well as the feeling of privacy were considerably related to the type of user (patient, family, and staff). Two indicators of physical-spatial comfort in the wards and favorable services exhibited a substantial connection with the user-centered level of hospital and type of user. Tables (2) and (3) represent the mean of the significant qualitative indicators in relation to effects of the type of hospital and type of user. The questions were presented in the four

above-mentioned scales and then the assessment results were analyzed as follows: in scale (1), which dealt with the hospital outdoor space, the indicators of care and attention to environment(Upkeep & Care) ( $F_{(2,181)}=3.297$ ,  $P<0.05$ ), Orientation ( $F_{(2,181)}=3.573$ ,  $P<0.05$ ), aesthetics ( $F_{(2,181)}= 17.149$ ,  $P<0.001$ ) and green space ( $F_{(2,181)}= 12.439$ ,  $P<0.001$ ) were meaningfully related to the effect of the type of hospital (human-centered level), while these indicators had no significant relationship with the independent variable of user type. Reviewing the qualitative indicators of the hospitalization ward (Scale-II), the significant relationship of the effect of hospital type with qualitative indicators was observed in the indicators of physical-spatial comfort ( $F_{(2,179)}=9.174$ ,  $P<0.001$ ) and Orientation ( $F_{(2,181)}= 4.432$ ,  $p<0.05$ ). The qualitative indicators of physical-spatial comfort ( $F_{(2,179)}= 1.679$ ,  $P<0.05$ ) and the dominant tranquility and silence in

the hospitalization ward ( $F_{(2,181)} = 2.343$ ,  $P < 0.05$ ) also exhibited a considerable relationship with the effect of user type. As it is evident, the navigation indicator had no significant relationship with the effect of the user type. Analysis of the results obtained from questionnaires of the third scale (waiting spaces of the hospitalization and outpatient wards) pointed out that the indicators of physical-spatial comfort, view and landscape, and lightning had no significant relationship with the user type; while as it can be seen in Table (2), the indicators of physical comfort ( $F_{(2,181)} = 13.958$ ,  $P < 0.001$ ), view, landscape, and lighting were significantly related to effect

of the type of hospital. In the fourth scale, which is focused on investigating the social-functional content in the hospitalization ward, the obtained results showed that the indicator of attention to organization and functional relationships was significantly related to the effect of the type of hospital ( $F_{(2,181)} = 3.177$ ,  $P < 0.05$ ), indicator of feeling of privacy was meaningfully related to the effect of the user type ( $F_{(2,181)} = 3.135$ ,  $P < 0.05$ ), and indicator of desired services was considerably related to the effect of the type of hospital ( $F_{(2,179)} = 14.280$ ,  $P < 0.001$ ) as well as effect of the user type ( $F_{(4,179)} = 3.010$ ,  $P < 0.05$ ).

Table 3  
Indicators means, SDs (in parentheses) and post hoc comparisons (Duncan test,  $\alpha: 05$ ) in relation to Type of User

Quality indicator	Patients	staff	visitors	F	P
Spatial-physical Comfort (wards)	2.98 (0.79) N=80	2.93 (0.81) N=57	2.75 (0.94) N=47	13.958	0.001
Quietness	3.09 (1.15) N=65	3.06 (0.82) N=55	2.65 (0.77) N=64	2.343	0.04
privacy	3.89 (1.25) N=80	3.46 (1.52) N=57	3.30 (1.41) N=47	3.135	0.046
Additional Services	2.56(0.98) N=80	2.25 (1.21) N=57	2.26 (1.05) N=47	2.961	0.04

Range: from 0 = lack of quality to 4 = presence of quality; in post hoc comparisons different letters refer to significantly different means.

### 5. Discussion

The main objective of the present research was to determine the relationship between the physical and social environment and quality perception by the users as well as the relationship of this quality with the degree of humanization level. All the environmental components introduced in the study scales, as declared by the earlier studies, had significant relationship with the users' needs and the quality which is perceived from the treatment environment (Andrade, Lima, Fornara, Bonaiuto, 2013). Taking into account the proof of the significant relationship of the environmental quality indicators with the user-centered level of the treatment space that was obtained from the results of this research, it would be possible to find out the exact weakness of any given environment and quality indicator. The obtained results are consistent with the theoretical framework of Davidson's theory (Davidson, 1994), but they are not perfectly matched with the experimental studies of Fornara in 2006. The meaningful relationship of the scales with different independent components of the research varied depending on the type of component (Fornara, bonaiuto, bonnes, 2006); hence, the organizational culture, cultural and native features, design and maintenance level, and service providing would affect the final outcome. The obtained results indicated that the components should be prioritized to achieve the user-centered space and which users were more sensitive to the environmental changes. As shown in the tables of findings, out of twelve qualitative indicators, 10 were significantly related to the effect of the hospital type (user-centered level). Apparently, all three hospitals were weaker in qualitative aspects including additional services, orientation in wards, maintenance and attention

to the environment than other indicators, and therefore, further measures are required in this regard. Four indicators had a significant relationship with the effect of the user type. What can be inferred from the results in Table (3) is that, among the users, the patients were more sensitive to the environment and its changes. Consequently, it is evident that paying upkeep & care to the needs of this group should be prioritized in the hospitals in order to achieve a higher user-centered level. However, the mean obtained from the staff assessment yielded the results that were almost similar to those of the patients, which indicated that in contrast to the earlier studies the staffs were more sensitive to the issues within their working environment. The findings of the present study also implied that the hospitals, which had more successful performance in physical-spatial scales, also exhibited more favorable performance in the users' assessment. It is plain that the results obtained from the assessment of the users' comments on treatment environments were consistent with the experts' investigations, and according to the users' opinions, the favorable hospitals are those that pay more attention to the qualitative indicators of the environment. Nevertheless, it is noticeable that the assessment factors of the experts group had merely spatial function, but the present study indicated the importance of social environment and additional services; while, perception of care and treatment is tied with an individual's perception in a social environment (Siddiqui, Zuccarelli, Durkin, Wu, Brotman, 2014; Kaplan, 1995). On the whole, the PHEQIs emerging from the analyses show they cover the main design attributes which represent distinct features characterizing the sphere of hospital humanization, in both spatial-physical and social-functional terms. Since

one of the objectives of the present study was to validate the factors intended by the expert and programmer groups, it can be inferred that such evaluations on the environmental quality of a hospital will be perfect when the social-functional aspect is also taken into consideration. It should be noted that paying attention to the given arrays in each of the indicators also specifies, by itself, a wide series of major aspects in the environment quality. For example, the physical-spatial comfort indicator includes wide arrays of furniture, color, temperature, humidity, ventilation, and lighting, representing the organized features of the users' experiences and needs, which plays an important role in formation of these design fundamentals and should be reflected in the treatment spaces appropriately (Bonaiuto, Fornara, Bonnes, 2003).

## 6. Conclusion

The research presented in this paper prefaces the need for engaging with the humanization concept in the early stages of planning, design, construction and administration of hospitals as a means to achieve higher performing designs with an increased certainty for end-user satisfaction. The results of the study showed that presenting mere generalities on the quality or lack of quality of environment would not provide considerable assistance to the service management in medical centers. Since as much as quality of medical services affects the users' satisfaction, quality of the treatment environment would also affect the sense of confidence on treatment and even the decisions for future references to the same center. The setting up of an instrument measuring indicators of perceived environmental quality of hospital places was the principal aim of this research project, in order to allow comparisons between hospital settings which differ in degree of humanization. Despite the positive results of this study, PHEQIs must be applied and validated in more cultural contexts in order to further confirm its reliability. Replications of this study are needed, by comparing other hospital care units, in order to generalize results across units themselves. Despite the difficulties of sample collection (questionnaire) in the hospitals, the larger statistical samples (more participants) in future studies can improve the validity of the obtained results. In future studies, this study can also provide the ground for conducting further studies on medical centers with a range of special diseases (e.g., psychiatric) or special audiences (e.g., infants).

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