

Holistic Healing Environment In Pediatric Hospital Settings

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ABSTRACT

Environment affects how we think, feel and behave. It shapes our habits, expectations of normality and values. Affect human physically and psychologically, it can support and nourish physical, mental and social development. In healthcare, Positive environmental stimulation can promote patient well-being by reducing stress or negative feelings. An increasing body of research shows that hospital interior design has an important impact on healthcare consequences, but there is a limited of research's on children's pediatrics hospitals, although research is often difficult for designers to understand and apply in decision making. While improving children's patient experience didn't receive the attention that it needs to make a thoughtful progress. The primary goal of this dissertation is to develop design requirements in pediatric hospitals as a holistic healing environment. This based on the principle of reducing patient stress by understanding children's experience in the hospital environment, also to investigate the role of the physical environment in the patient's feelings and well-being. This study is vital as it explains what the child healthcare environment should constitute to support them. To develop the healing environment in the pediatric setting, this research starts with an extensive literature review about interior space elements in pediatric, children's needs, indoor healing environment and the design requirements in pediatric settings. Following with an analysis for queen Rania hospital for children, using interviews, observations, and questionnaire conducted with patients, parents, and doctors to complement what was found in the literature.

The data found in the case study were used to conceptualize more richly a holistic healing environment for children's in pediatric settings and improve a future development recommendation for Queen Rania Hospital for children in Jordan. Therefore, the significance of this study is to organize design guideline in a pediatric hospital setting, by coming up with influence facture for design and research practices in the pediatric healthcare environment.

Keywords: Pediatric Settings, Children, Inpatient, Indoor Healing Environment, Child Friendly, Design, Wellbeing.

ÖZ

Yapılı çevre, düşünceleri, hisleri ve davranışları etkilemektedir. Çevre alışkanlıkları, normallik beklentilerini ve değerlerimizi de şekillendirir. Aynı zamanda insanları fiziksel ve psikolojik olarak etkileyebilir; fiziksel, zihinsel ve sosyal gelişimlerini destekleyip besleyebilir. Sağlıkta, ‘Pozitif çevresel uyarım’lar, gerilim ve olumsuzlukları azaltarak hastanın iyi hissetmesi yönünde etkisi olmaktadır. Bu yönde hızla artan araştırmalar, hastane iç mekan tasarımlarının önemini vurgulamakta; aynı zamanda sağlıkta olumlu sonuca ulaşmada etkileri olduğu yönünde çalışmalar yapılmaktadır. Ancak bu alanda yapılan çalışmalarda çocuklarla ilgili sınırlı sayıda araştırma yapılmış olduğu bilinmektedir. Pediatri hastanelerinde, araştırmacıların çalışması genellikle zor olsa da bu alanda ilerlemeler kaydedilmeye başlanmıştır. Bu tezin ana amacı, pediatrik hastanelerde tasarım gereksinimlerini bütüncül bir yaklaşımla ele alıp, iyileştirici ortam olarak geliştirmektir. Aynı zamanda, hastane ortamında çocuk varlığını ve deneyimini anlayarak, bu fiziki çevrede çocuk hastaların stresini, olumsuz hislerini azaltma; hastanın duygu ve refahındaki rolünü ortaya koyma yönünde araştırmalar yapmaktır. Bu çalışmada, çocukla ilgili sağlığı ortamının neleri içermesi gerektiği net olarak ortaya koymaktadır. Pediatrik yapıların iyileştirilmesi için bu araştırmada, iç mekân elemanları hakkında kapsamlı bir literatür taramasıyla yapılmıştır. Çocuk ihtiyaçları, iç mekan kalitesi ve tasarımla ilgili gereksinimler, ‘Queen Rania Hospital’ isimli hastahane üzerinden yapılan bir analiz örneklendirilmiştir. Literatür çalışması, kullanıcılar (hastalar, hasta ebeveynleri ve doktorlar) ile yapılan görüşmelerle desteklenmiştir. Vaka çalışmasında elde edilen veriler, bütüncül olarak ele alınmış ve kavramsallaştırılmıştır. Bununla birlikte, bahsi edilen Hastanelerde, yatılı çocuk hastalar için iç mekan önerileri geliştirilmiştir. Bu

alıřmanın nemi, pediatrik hastahaneler iin i mekan tasarımı kılavuzu dzenlenmeř
olmasıdır.

Anahtar Kelimeler: Pediatrik Mekanlar, ocuklar, Yatılı Hasta, Kapalı Tedavi
Mekanları, ocuk Dostu, Tasarım, İyi Hissetmek.

DEDICATION

This study is wholeheartedly dedicated to my beloved parents, who have been my source of inspiration and gave me strength, who continually provide their moral, spiritual and emotional support.

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LIST OF ABBREVIATIONS

CFH	Child friendly Healthcare
EBD	Evidence Based Design
NHS	National Health Service
NICUs	Neonatal Intensive Care Unit
OHE	Optimal Healing Environment
WHO	World Health Organization

Chapter 1

INTRODUCTION

1.1 Background Information

The interior of the spaces that surround us have an effect on our lives. This is particularly true in the case of children (Pol, 2002), who, according to Paula Lillard “Children’s use the environment to improve themselves; adults use themselves to improve the environment. Children work for sake of process while adults work to achieve an end results” (Day & Midbjer, 2007). Children and adults also experience places differently. Their perception is differentiated than adult’s perception. It is important for designers to take the needs of children into consideration since they are affected by their environment. Such considerations should be used to determine which design elements are best able to encourage children’s perception and their development.

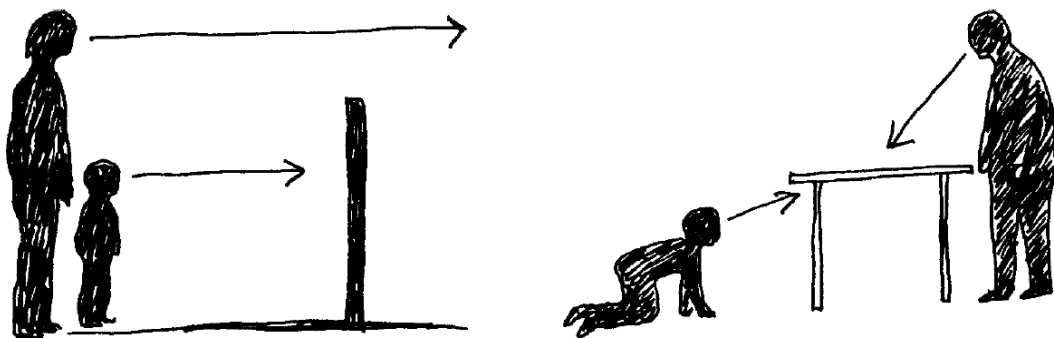


Figure 1: Children Perception Differ from Adults Perception (URL 1)

Healthcare services are not independent of the environment in which they are provided (Malkin, 2002). Both healthcare delivery and outcomes are affected by a number of environmental factors, including landscape, artwork, color, furniture, equipment, and buildings, which also collectively serve as a testament to the competence of the care provider (Berry & Bendapudi, 2003; Ulrich et al., 2008).

It is increasingly important that healthcare plans and facility designs are integrated, and also that the views of children, healthcare professionals, and designers are taken into consideration during decision-making. Any successful design requires that all possible effects the environment could have on healthcare professionals, families, and most importantly patients, are taken into account in the design and planning of healthcare spaces.

With its focus on the children's health, pediatrics tends to distinguish between this category of patients and adults. This distinction is important least of all because of the ethical concerns unique to children, which are a product of their relative immaturity and limited capacity to understand the world. As a result, modern pediatrics tends to also take into account the social and psychological needs of children in addition to the obvious medical concerns; pediatric hospitals have also evolved to become more than merely buildings to house clinical activities. They have now come to symbolize a complicated network of interconnected systems that help ensure the smooth operation of functional activities in a healthcare environment. Ensuring that modern facilities meet this standard requires designers to pay special attention to a wide range of issues early in the design process.

The needs of users should be reflected in any design choice. This is also true for their psychological needs, which are also important despite being largely ignored. Numerous environmental psychologists, nurses, doctors, psychiatrists, sociologists, interior designers, and architects have highlighted the importance of design for the therapeutic process.

This link between patient wellbeing and how it is affected by elements in the healthcare environment has also been empirically tested in a number of studies (Ulrich, 1984; Rubin, Owens & Golden, 1998). Few of these, however, have dealt specifically with how children cope with the changes they have to endure over the course of their hospitalization or how hospitals try to support children through these changes by trying to stabilize their routines as best as possible. Replicating everyday activities in the hospital environment is extremely important in the case of children patients, but unfortunately, very little is known about the effects on the change in environment on their health. Furthermore, there hasn't been a coordinated effort at identifying what aspects of the physical environment are most important for hospitalization from a holistic perspective, despite the fact that hospital environments have become increasingly focused on patients and their families.

A holistic perspective is useful to the extent that it focuses on how children's lives can be made to feel relatively normal during their hospitalization experience. Identifying the features of such a holistic healing environment on a conceptual level is necessary for the development of better healthcare environments that positively affect the healing process during and even after the patient's hospital experience. The image below, The Lady Cilento Children's Hospital is a children's hospital in Street, South, Queensland, Australia.



Figure 2: The Lady Cilento Children's Hospital in Australia (URL 2)

This study aims to identify how best to create a holistic healing environment for children. The design of such an environment is guided by information gotten from a review of the existing literature coupled with case-study research. The resulting design is intended to provide a fresh perspective for the pediatric department at the Queen Rania Hospital.

The final form of the design will be determined by which design criteria are given priority by the designer while recognizing the fact that every choice has to be made by logically prioritizing different arrangements based on the relevant policies and guidelines. This process is relatively more complicated when designing wards as it is necessary to satisfy the needs of different groups of young patients simultaneously. Partly because recognition of the fact that child-friendly hospital environments are a necessity is still relatively new, the design of many pediatric buildings remain largely similar to those of adult hospitals. The only minor differences concern the types of

non-medical activities they provide, the kinds of objects in the rooms, and sometimes the kind of care provided. As such, the evolution of pediatric hospitals has lacked a distinct space identity, mostly due to financial and implementation-related constraints. At the environmental level, however, such hospitals have been at the forefront of the effort to implement a patient-centered care model, motivated primarily by the special needs of children patients. This can be seen in the provision of education rooms, play areas, and other new spaces overtime.

Ensuring that all groups of patients have a positive healthcare experience is a general concern. It is therefore important this is taken into consideration when evaluating the quality of any healthcare provider, (Patient Experience Network 2013) cited in (Children environment of care reports 2015). Children's hospitals should provide a supportive healing environment capable of enhancing their well-being. However, because children patients are typically represented by adult proxies (most commonly parents), empirical evidence outlining how their experiences are affected by the physical environment is less common than expected.

A seminal study by Roger Ulrich (1984), found that a window view could positively affect the recovery of post-surgery patients. By discovering this link between healthcare outcomes (the use of medication, length of stay, etc.) and design strategies, Ulrich provided the motivation behind numerous subsequent studies and even concepts such as Evidence-Based Design and Healing Environments. Dealing specifically with children, a 1987 publication by Olds and Daniel titled 'Child Health Care Facilities: Design Guidelines and Literature Outline' marked a transition in the field to knowledge-based design from the previously dominant mode of photographic inspirational-based design, thus inspiring more scientific research in the field.

Other studies have emphasized the link between the body and the mind: patients in a more positive frame of mind tend to have lower levels of stress and an improved overall emotional state, which in turn improves their clinical outcomes.

Ulrich (1997) has identified the primary principles necessary to ensure positive psychological outcomes for all groups of patients. Designers and policymakers can also provide a supportive environment for children by accepting their needs and perspectives as users of a healthcare facility (Bishop, 2008).

The National Health Service (NHS) in UK Plan (2000) stipulates that it is imperative for patients to focus more on critical issues to improve the patient's experience in the hospital environment, NHS aims to provide a new and refurbished friendly and welcoming health environment, especially for children's hospitals.

1.2 Problem Statement

As White and Stoecklin (2008) put forward in their research "Adults see the environment as form, shape, structure and as a background, on the other hand, kids see the environment, not as a background, but interpret the environment holistically and evaluate it for all the ways they can interact with it", therefore the nonverbal communication between children and interior space is stronger than adults.

The environment has an emotional impact on the child's behavior by influencing kid's thoughts and feelings. There is a relationship between the quality of health care and the consequent anxiety felt by patients, due to the generated feelings by unfamiliar faces, sounds, smells, and sights (Norton Westwood 2012). When kids go in an inexperienced environment a feeling of fear and anxiety dominate them (Ekra and Gjengedal 2012). So kids shall be in an environment designed, furnished, and equipped

to meet their need of eliminating these feelings. (European Association for Children in Hospital 2014). Bishop (2008) notes the importance of identifying kid's perception in term of what role environment plays in their experience of healthcare. So design requirements can be beneficial for kid's reactions and interactions with the environment.

Compatible with the discussions above, the role of interior space for providing various experiences for children is significant. Providing positive physical experiences will increase the space aesthetic for children and improve their feelings. Since today children relatively spend long time periods in hospital, so having a positive physical environment in pediatric is an important part of their care. And this will be done by the specific elements and factors, which affect the character of the interior space.

The problem for the actualization of this research was defining the design requirements in identifying healing environment for children in hospital in order to create a positive space for children to provide their feelings and wellbeing. As there is a significant gap in the literature on the design guideline for children's hospital which meets their needs by understanding their experience. Its process requires comprehensive analysis and description of the different steps of involvement and methods to carry out the process.

1.3 Aim and Objective

Investigating the children's interest, requirements and needs should be the main attempt for designers who are responsible to design an environment for them. Categorizing the main items that should be considered in the design process will be a positive attempt to lead them. The purpose of this dissertation is to explore the role of the interior space in creating, not only a therapeutic hospital environment for children

but also an environment that provides their feelings and support their wellbeing, as much as possible.

The research purpose to investigate the design requirements and factors which affect the identity of interior space in healthcare to increase children's well-being. Accordingly, to define required design consideration for creating an identity in the interior space of pediatrics in order to support children's wellbeing and increase the interior space quality for children, this study also defines the objectives below:

- Explore the interior design elements which define the identity in general.
- Understand children's experience of a pediatric hospital environment.
- Highlight that researching with children leads into the evidence-based pediatric design
- Investigate the children's psychological needs.
- Define the main requirements which should be considered in designing the interior space of pediatric settings.

The research questions were developed from the patient's point of view as a direct response to their need for a holistic healing environment in the pediatric hospital environment and to explain the impact of the physical environment on patient's feelings and well-being in the hospital.

To answer these questions, it is important to clarify which domains in the child's experience affect his well-being in the hospital's environment.

1.4 Methodology

This study will adopt a mixed method, a qualitative method that provides a theoretical framework using document analysis. As well as providing this framework by using research sources such as professional written documents, visual documentation, completed research and analysis, official publications and reports. Generally, qualitative research has been provided the human involvement in use, by correlation individual domain into the public. By this, the qualitative research allows personal experience to contribute to knowledge in ways that exceed most individuals' abilities. This is especially true for children. The bibliographic review was used to identify the key consideration of healing environment, and to create a more supportive model of how the healthcare institutional environment can better achieve healing and well-being.

After extensive researches of literature related to children's needs and the healing environment for children, the articles and books found were analyzed for topics relevant to this study. Secondly, analyzing Queen Rania's children hospital using the founding's criteria to support these key consideration and suggest a future development for the hospital designs through different methods of questionnaire, interviews and observation with doctors, parents, and children. This stage aims to alert architects to the essence of understanding children's needs to practice in the designing process.

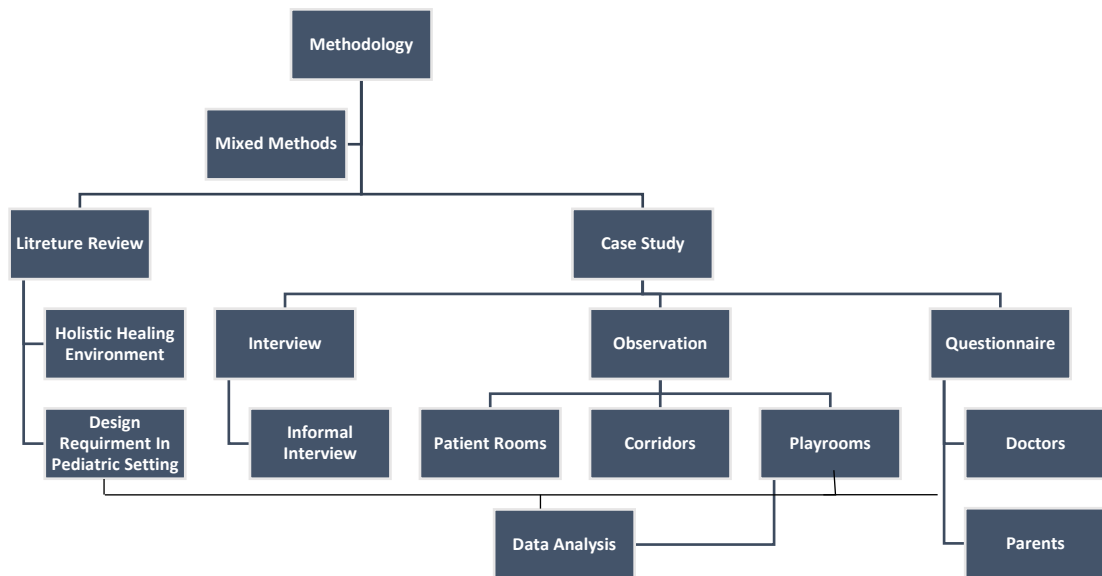


Figure 3: Methodology Process

1.5 Implication of Research

According to NHS Estates (2004), the design of the environment is a vital element that plays a part of kids understanding of their surroundings. Moreover, a high-quality environment can increase the morale of patients (Alder Hey Children’s NHS Foundation Trust 2012).

Additionally, kids psychological and physiological well-being have a significant contribution to the healing process (Eisen et al 2008), thus the physical environment can manipulate a reduction in stress and anxiety to reach a holistic healing procedure (Norton – Westwood 2012), Whereas Adverse physiological responses to the environment lead to higher blood pressure, heart rate, and muscle tension (Kreitzer 2013, Bird 2007), all of which impede the healing process.

1.6 Scope and Limitation

This research scope the Interior Space of the pediatric hospital. According to Poore, 1994, the interior design consists of manipulation of many different interrelated elements including space, form, structure, light, texture, and color.

This thesis will emphasis children psychological needs in the pediatric environment thus the design of hospitals should respond to the user needs, including their psychological needs, which are less often considered but are equally important.

Also, this research will consider the hospital ward design, thus wards occupy more floor area than any other individual department in a hospital. In a ward environment, patients are likely to be weak, stressed, and more importantly experiencing a limited amount of control over their environment. For these reasons, the impact of the physical environment on their well-being is amplified and they tend to be more sensitive to their requirements and preference. So this thesis will focus on the inpatient children, precisely for children aged between five to twelve years because communication with children of all ranges of age is difficult.

1.7 Structure of Thesis

INTRODUCTION					
Background Information	Problem Statement	Aim And Objective	Methodology	Study Implication	Scope And Limitation
↓					
THEORETICAL BACKGROUNDS					
Holistic Healing Environment			Design Requirement In Pediatric Hospital Settings		
Understanding the holistic healing environment An overview of healthcare environment research Implication for interior design in pediatric hospital settings			Children's needs Interior space design identity Design guideline for pediatric hospital settings		
↓					
EVALUATION OF CASE STUDY					
Overall design of the study Data analysis methods Data analysis Observations Questionnaire Development of case study					
↓					
CONCLUSION AND RECOMMENDATION					

The following chapter explains the theoretical dimension of the study by looking at related literature.

Chapter 2

HOLISTIC HEALING ENVIRONMENT

2.1 Understanding the Holistic Healing Environment

There is universal agreement that a healing environment is desirable for patients and for providers. What constitutes a healing environment is open to discussion and depends on individual perspectives.

The Samueli Institute coined the term Optimal Healing Environment (OHE) in 2004 to describe a healthcare system that is designed to stimulate and support the inherent healing capacity of patients, families, and their care providers. An OHE consists of people in relationships, their health-creating behaviors, and the surrounding physical environment. (Jonas WB et al, 2014)

As defined by World Health Organization (WHO), (1948), cited in Callahan, D. (1973), it is a “State of complete physical, mental, and social well-being, and not merely the absence of disease or infirmity”

The Samueli Institute is a US-based medical research organization whose focus is the healing process. They developed the concept of the “Optimal Healing Environment” (OHE), which they describe as “the social, psychological, physical, spiritual, and behavioral components of healthcare support and stimulate the body’s innate capacity to heal itself” (Ananth, 2008, p. 273).

The term 'healing environment' is used to describe the factors that positively affect both physically and psychologically, the community served by the healthcare facility, including the physical setting as well as the organizational culture (Ampt A et al 2008).

A number of researchers (e.g. Beauchemin and Hays, 1996; Devlin and Arneill, 2003;; Zeisel et al, 2003; Altimier, 2004; Dijkstra et al., 2006, Codinhoto et al., 2008; Nanda and Hathorn, 2012) have investigated the impact of various elements of the built environment on the health outcomes of patients. How the healing process is affected by the environment is an area of increasing concern among architects, consultants, environmental psychologists, and healthcare providers alike (Devlin and Arneill, 2003).

Malkin (2002) defines a healing environment as "a physical setting and organizational culture that is psychologically supportive, with the overall goal of reducing stress in order to help patients and families cope with illness, hospitalization and, sometimes, bereavement". Ghazali and Abbas (2010, 64) offer a similar understanding of the healing environment "simply as the overall environment (both physical and non-physical) created to aid the recovery process. In contrast to curing, healing is a psychological and spiritual concept of health. Since perception is also psychological, there is a likelihood of a relationship between healing and the physical environment".

There is little empirical evidence for various patient populations, including young people and children, to support theories on what exactly healthcare environments based on these care models should consist of. However, from the patient's point of view, it is possible to identify several significant considerations. These considerations may include physical, organizational, and social environment elements, which have an

influence either on the overall satisfaction of the patients with their hospitalization experience or on patient stress levels.

The primary factors that have been identified in regard to the social environment include: ensuring support for patients, privacy and control, and access to social contact with family, friends, and even other patients (Lawson et al., 2003; Ulrich & Zimring, 2004). Staying connected with others has important healing benefits. Social and parental support plays an important role in helping patients recover from illness. Evidence indicates that social interaction levels can be increased by providing lounges and waiting rooms with comfortable movable furniture arranged in small flexible groups (Ulrich & Zimring, 2004). Studies in psychiatric wards and nursing homes have found that appropriate arrangement of movable seating in dining areas enhances social interaction and improves eating behaviors (Melin & Gotestam, 1981). Research on day rooms and waiting areas has shown that arranging seating side-by-side along room walls inhibits social interaction (Holahan, 1972; Sommer & Ross, 1958).

For the organizational environment, primary considerations include: providing all necessary information; paying attention to tidiness, maintenance, and cleanliness; and access to supportive facilities and basic amenities (Harris et al., 2002; Lawson et al., 2003).

The healing process can be supported by the physical environment where it takes place (Quan and Joseph 2011, NHS Estates 2004), especially in the case of children, whose healing is affected by their physiological and psychological well-being (Eisen et al 2008). The healing process is one that should be considered as the sum total of various

factors; one such factor is minimizing the level of anxiety and stress, which is influenced by the environment (Norton– Westwood 2012).

Architectural principles can be applied in the design of healing environments to create intimate spaces reflective of the “human scale”, while they simultaneously perceiving small space in wider buildings (Bromley 2012). As form, color and light have also been found to physically affect the well-being of patients in a healthcare environment, especially when they are complemented by the use of appropriate artwork (Lankston et al, 2010).

The primary considerations in regard to the physical environment tend to be categorized by different authors (Harris et al., 2002; Ulrich & Zimring, 2004) ,Their study also divided the physical environment into three categories: interior design features, architectural features, and the ambient environment. Interior design features are the changeable characteristics of the environment, such as how legible the building through signage and maps, plants, artwork, texture, color, furniture, and other aesthetic qualities of the hospital (Fottler et al., 2000).

The architectural features of the hospital environment are its relatively more permanent characteristics, including access to outdoor areas, nature, and pleasant views; the kind and number of amenities and facilities, window placement and room size, the scale of the hospital, the configuration of its design (single or shared rooms), and the overall layout of the space (Cooper Marcus & Barnes, 1995; Lawson & Phiri, 2003).



Figure 4: Garden in Hospital as a Therapeutic Environment (URL 3)

Lastly, the characteristics of the ambient environment include the smell, temperature, noise levels, and lighting of the environment. It has been found that patients with more control over these features have greater satisfaction levels (Harris et al., 2002), while patients with little to no control reported having higher stress levels (Topf, 2000; Ulrich & Zimring, 2004).

The aforementioned benefits of a patient-centered design for healing environments has led to that Verderber S. (2003) define as a pattern shift in the field to patient empowerment from the previously dominant focus on system empowerment. In regards to patient needs more specifically, the primary issue identified in the literature has been to reduce causes of stress in order to enhance the healing process. To improve the overall healthcare experiences of young patients, it is important to identify which

environmental stressors most commonly cause stress for children and to remove such stressors.

As a Psychological environment features, the design features of healing environments should be able to provide users with multisensory experience as well as positive healing effects. In addition, Altimier (2004), indicated that an outdoor view, natural sunlight, pastel colors, therapeutic sounds, and interaction with family members can facilitate healing. The hospital environments with visual art displays have been linked to patients with less anxiety, a higher tolerance for pain, and generally shorter hospital stays. (Langston et al, 2010).

Garden of hospitals have been famous for improving healing by reducing stress. Hospital gardens similarly allow patients (especially children) to interact with nature (Lambert et al 2014). “Healing features such as wooden chairs, nature photography, and indoor plants’ have been found to improve patient satisfaction and health outcomes” (Quan and Joseph, 2011, p.18). Puchalski (2006), noted that “spirituality includes religious practices; for others, it may include nature, art, music, family, or community”. Spirituality is the lifeline that sustains people through stress and challenging times, an essential aspect of one’s humanness. Today, however, health care providers are ill-equipped to care for the spiritual dimension in patients. Many patients complain about the increasingly impersonal approach they encounter in hospitals and other health care organizations. And, ironically, they often experience this sense of alienation at precisely the time when they most need human interaction and spiritual support.

Table 1: Holistic healing environment dimensions developed based on the literature review

Physical Environment			Psychological Environment	Social Environment	Spiritual Environment	Organizational Environment
Interior Design Features	Architectural Features	Ambient Environment	Art Noise Nature	Family support Privacy	Life line Art Nature	Tidiness Maintenance Cleanliness
Furniture Color Texture Artwork Plants Aesthetics Legibility	Spatial layout Design configuration Scale Hospital facilities Access to view	Lighting Noise level Temperature Odors	Outdoor view Natural sunlight Pastel colors Therapeutic sounds Family support	Control Social communication	Music Family Social communication	Basic amenities

2.2 An Overview of Healthcare Environment Research

Architects, researchers, planners, and healthcare providers are increasingly concerned with how the environment affects the healing process and health in general (Devlin & Arneill, 2003).

The increasing number of studies proving that patient's medical outcomes can be improved by making changes to their physical and social environments have motivated interest in the link between healthcare outcomes and the environment (Ulrich et al., 1992; Stichler, 2001). The previously dominant view of hospitals as huge institutions driven solely by their function and medical processes has been replaced by one of hospitals as patient-centered environments dedicated to satisfying their needs and ensuring their well-being (Verderber & Fine, 2000).

Hospitalization is increasingly being considered from the perspective of the patient. This has led to positive changes in the use of nature as a therapeutic tool, creating an uplifting environment, improving building attractiveness, and ensuring patient control and privacy. Designers have also paid more attention to making the interior space design feel homely using texture and color varieties, and local fabrics and furniture styles (Malkin, 1992; Verderber & Fine, 2000). Care models implementing these principles of respecting, comforting, and supporting patients while providing integrated and coordinated care (Beatrice, Thomas & Biles, 1998) have become more common, e.g. the Planetree Model. (Lindheim et al, 1972) Patients who have received care under these conditions have reported higher levels of satisfaction. (Martin et al., 1990) Such care models are founded on the understanding that the well-being of patients depends largely on emphasizing control, empowerment, and comfort. They also form the basis for the emphasis on holistic healing environments that emerged after the 1990s (Malkin, 1992).

2.2.1 Ulrich's Theory of Supportive Design

Ulrich (1991, 1992, 2000, 2001) is one of the foremost researchers in the field of healthcare design. The primary focus of his research is to identify how patients' clinical outcomes are directly or indirectly affected by the designs of healthcare facilities. "The theory of Supportive design in healthcare settings" is based on "supportive surroundings facilitate patient's coping with the major stress accompanying illness. The effects of supportive design are complementary to the healing effects of drugs and other medical technology, and foster the process of recovery" (Ulrich, 1991; p. 97).

The starting point of the theory is the assumption that there are two common causes of stress for patients in healthcare settings: their illness itself and the consequences, and

the physical environment that surrounds them. Ulrich believes that a number of negative physiological, psychological, and behavioral effects on patient wellness are caused by stress (Ulrich, 1991, 1992, 2000, 2001). As such, he argues that one way to directly support patient wellness is to minimize environmental stress. In his theory of supportive design, Ulrich (1991), suggests that integrating positive distractions in the environment, providing social support, and situational control are all linked to patient well-being.

It is well documented that patient wellness and stress levels are both positively affected by an increasing of the sense of control either on their physical or social environment. Patients can exercise control over two broad areas: the effects of their illness, and the elements of their socio-physical environment that are either unpleasant or unchangeable. Ulrich's research (Ulrich, 1991, 2000; Ulrich & Zimring, 2004) has also highlighted the importance of patient access to social support, as patients with more constant support from family and friends showed higher wellness and lower stress levels. The impact of positive distractions, however, is relatively more complicated and relates to the amount of positive sensory stimulants patients are exposed to as opposed to negative stimulation. Specifically, Ulrich (1991, 1992, 2000, 2001) has investigated the positive effects of exposing patients to nature, natural views, artwork, and entertainment on their stress levels.



Figure 5: The Supportive Design Developed Based on Ulrich's 1991

2.2.2 Child Friendly Environment

According to the Council of Europe Guidelines cited in S. Lenton (2014), "Child Friendly Healthcare-CFH" (2011) it is a framework that is: "Consistent with the rights of children and is informed by the core principles of dignity, participation, equitable access to healthcare and the best interests of the child" (Council of Europe, 2011).

In the point of view of this council, CFH requires a healthcare mechanism that provides the rights for children, includes:

- Development right (Article 6).
- Children expression should be taken parallel to their age and maturity (Article 12).
- Children's rights to have contact with their families (Articles 9).
- Privacy right (Article 16).
- Education rights (Articles 28).
- Playing right (Article 31).
- Access information right (Article 17).

- The right to manifest religious beliefs (Article 14).

According to the Guidelines on Child Friendly Healthcare, this guide has several rewards, which are; a) focusing on respecting the rights of children's in healthcare; b) presenting coordinated framework about how to deliver healthcare to children; and c) improving quality of healthcare experience.

In relation to above-mentioned, there are some evidences to suggest that this CFH improves child health outcomes. These evidences related to the child friendly advantages, are specifically including a reduction in children's anxiety to surgical procedures through therapeutic play (William LI et al. 2007).

However, their review on adolescent's participation in decision making identified some positive psychosocial outcomes such as improved self-esteem and positive self-regard. In summary, Child Friendly Healthcare is working to ensure better healthcare to children.

Depending on the literature, for a child, an attractive environment could make he\she become less anxious and scared of the hospital setting. Ulrich RS, (1993), cited in Lankston, L.(2010) "There is moreover increasing evidence that the display of visual art, especially in images of nature, can have positive effects on health outcomes, including shorter length of stay in hospital, increased pain tolerance and decreased anxiety". It may be possibly considered as a temporary distraction strategy, but creating a child-friendly environment which is more conducive for the patient is a good way on how children hospitals can achieve desirable results on patient's recovery process.



Figure 6: Nature Arts in Designing Children’s Hospital Spaces (URL 4)

Nonetheless, the quality of the space is another important impacts on inpatient children or those who share a multi-bed room. It occurs by incorporating home-attachments for patient’s rooms in hospital such as toys, and photographs. These requirements may influence children’s well-being.

2.3 Implication for Interior Design of Pediatric Settings

In healthcare environments, while research into the experiences of children is relatively less common, it has been discovered that there is a considerable amount of similar factors that affect the hospitalization experiences for both adult and children patients. Patient’s response to the hospital setting are consistently affected by the features of their physical, organizational, and social environments.

Another common factor that has been identified is personal control. Rivlin and Wolfe (1985), who showed an enduring revision of a “psychiatric hospital”, found that it was

necessary for young people to have personal control over the activities they participated in, time management, confidentiality, and privacy.

Furthermore, children need to be positively engaged and actively stimulated by their environment, feel comfortable, be able to move independently, and also be afforded the opportunity for competent action while in the hospital. Lindheim, Glaser and Coffin's (1972) have also recommended certain age-based strategies for pediatric design drawn from the concept of holistic human needs. These include individual control over confidentiality, privacy, and personal space, the opportunity for self-care management and social contact, access to both learning and recreational activities, and a suitable level of cognitive stimulation. In regards to the characteristics of the physical environment itself, it has been suggested that the needs of adult hospitals are somewhat different to those of pediatric environments, which require the provision of "age-appropriate" spaces and activities (Hutton, 2003; Tivorsak et al., 2004). Accommodating the needs of child patients and their families to allow them support the kids (Hall, 1990; Sheldon, 1997). And allowing the socialization opportunities among peers, especially with adolescent groups (Blumberg & Devlin, 2006).

Current studies with child and adolescent patients have found that the forward, mentioned environmental strategies can be used to enhance patient experiences, specifically for young people and children:

- The provision of interiors, spaces, and activities that are age-appropriate (Carney et al., 2003; Tivorsak et al., 2004; Hutton, 2005; Blumberg & Devlin, 2006).
- School accessibility and educational facilities in general (Liabo, Curtis, Jenkins, Roberts et al., 2002).

- Allowing them the opportunity to have personal property and to add a personal touch to their bed place. (Blumberg & Devlin, 2006)
- Decorating the environment with artwork and attractive colors (Sharma & Finlay, 2003).
- Keeping as much medical equipment and paraphernalia out of sight as can be managed (Tivorsak et al., 2004).
- Providing some form of escape by providing access to gardens and other activities (Whitehouse et al., 2001; Sherman et al. 2005).
- The needs of family supports taken in consideration (Hall, 1990; Hopia et al., 2005).
- The use of homely features in the design of the environment (Tivorsak et al., 2004).

For young people specifically, they:

- Typically desire to have a personal ward (Hutton, 2010; Blumberg & Devlin, 2006).
- Prefer locating their wards next to children (Sharma & Finlay, 2003).
- Prefer their wards to be decorated using bright colors, although they would rather avoid childhood emblems like cartoons (Blumberg & Devlin, 2006).
- Require access to age-appropriate social spaces (Blumberg & Devlin, 2006; Hutton, 2005).
- Need to have the choice of either shared or individual rooms in the adolescent ward (Blumberg & Devlin, 2006).
- Experiencing their daily life in private way (Hutton, 2005; Blumberg & Devlin, 2006).
- Require access to a telephone, music, and television (Blumberg & Devlin, 2006; Hutton, 2005).
- Tend to prefer access to non-medical activities in the hospital environment, such as kitchens, gyms, and game rooms (Blumberg & Devlin, 2006; Hutton, 2005).

Table 2: Summary of the literature review and data from formative research for children's

Design requirements	Related behavior In a children's Hospital	Design healing Relationships	Theme as defined in the literature	References
Control	Having control	Control over noise	Material that Absorbs noise	F. De vos, 2005
	Privacy	Exchange Information while Being protected from Others (visual, Acoustic etc)	Consulting Rooms, private Rooms	Picker institute, 1998; scher, 1997; winkel & Holahan, 1985
		Control over privacy While in room	Curtains, doors, Space	Kari, 1999; olds Et al., 1987; Wolfe, 1978
	Having access to Windows	Contact with outside World, feeling Connected and Knowing what is Going on/ day/ Weather	Access to Window for Orientation, Contact with Outside world	Horsburgh, 1995; verderber Et al., 1987; Yeaple et al., 1995
		Space cognition and Orientation	Human scale, Spatial design, Signs	Horsburgh, 1995; Nagasawa, 2000; scher, 1997; williams, 1988
	Keeping personal Possessions (identity)	Personalize Surroundings (display Books, games, Photos, cards, etc.)	Shelves, (lockable) Closets in Bedroom, teen Lounge	Shepley, 1998
Social support		Having parents be With you 24/7	Facilities for Parents	Olds et al., 1987; Picker institute, 1998,
Positive distraction		Meeting other Patients for support, To talk or play with	Age appropriate (play) rooms / Lounge / informal Meeting	Bearison 1994; Eiser, 1990; Hutton, 2003; Kari, 1999; Shepley, 1998; Winterberg, 2003
	Provide positive Distractions	Psychological, Physiological & Behavioral wellbeing, Reduce anxiety and Distress	Provide Appropriate Stimulation	Evans & mccooy, 1994; picker Institute, 1998; Ulrich, 1991a+b; Yeaple, 1998
	Having access to Nature	Visual access to Nature	Plants, pictures Of nature, Windows	Horsburgh, 1995; malkin, 1992; picker Institute, 1998; Ulrich, 1991b
	Child Friendly Environment	Qualities to improve Healing, use scale And world that Represents child	Make it less Institutional, all Levels of Stimulation	Evans & mccooy, 1994; Horsburgh, 1995; winkel & Holahan, 1985;

Sensorial dimension	Create comfort And beauty	Pleasing colors and Lighting	Make it less Institutional: child Friendly materials And finishes	Evans & mccooy, 1994; olds, 1981/ 1987; Picker institute, 1998; williams, 1988
Age appropriate environment	Range of Activities	Diversion, Availabilities of e.g. Games, toys, books, Video's, computers, Arts	Range of Facilities From Bed and at desks	Krol et al., 2003; Olds et al., 1987
	Staying in touch With school (education)	Schoolwork and Electronic learning Opportunities	Classroom/ Bedroom/ Teachers	Eiser, 1990; Kari, 1999; Krol Et al. 2003; Langeveld et al., 2003; Shepley,1998

A definition for the holistic healing environment had been given, the relationship between the setting of the environment and the healing process had described. The main issues of the healing process the impact of the environment on the healing process have been identified. An implication for interior design had described. Subsequently, in the following chapter discuss about the design requirement in pediatric hospital for providing a holistic healing environment which support children patient psychological needs.

Chapter 3

DESIGN REQUIREMENTS IN PEDIATRIC HOSPITAL SETTINGS

There is a difference between a good design and successful design. Successful design needs patterns according to the users and their needs so they feel successful in the environment. Designers can positively influence the performance of users if they consider both their psychological and psychical needs during the design process. In an effort to identify the tools that help designers project their unique identities onto an interior space, this chapter defined children's need within the hospital environment and clarify the design guidelines for pediatric hospital settings.

3.1 Children Needs

“Children are our future. What happens to children in their first days, months and years of life affects their development, the development of our society, and the development of our world” (Bernard van Leer Foundation 2004). The increasing amount of attention being paid to children and their widespread post-19th-century recognition as autonomous beings have led to the emergence of different children spaces in the socio-cultural context of Europe. The proliferation of sociological, psychological, and medical child-based studies, in conjunction with the public awareness of the benefits of a safe and healthy environment, is believed to be responsible for the development of such childcare spaces.

Childhood is a very important period in the life of any individual. This is not just because it is during this period that they mature and develop themselves as good citizens, but also because it is when they are in a continuous process of learning about themselves while relating with the world around them. A number of psychological and physical factors come into play over the course of a child's development. This study, however, focuses on the physical factors and how they affect children. Specifically, it focuses on the impact of the built environment during such a formative period when the place identities of children begin to take form. Proshansky and Fabian (1987) define place identity as a substructure of self-identity, which includes:

Cognitions about the physical environment that also serve to define who the person is (...) represented as thoughts, memories, beliefs, values, and meanings relating to all important settings of the person's daily life. Place-identity cognitions monitor the person's behavior and experience in the physical world.

A good physical environment is better positioned to create effective, rather than ineffective, outcomes. Hospitalization can be a very tiring experience for children, who not only have to endure their health problems but also have to deal with changes in their environment and routine.

Most children do not have the skills required to deal with such big changes and tend to react negatively, with feelings of anxiety, depression, fear, and anger as common responses (Deitch, 1990). Even the simple fact of being in a hospital environment makes children feel out of control and anxious. It is for this reason (Olds, 1979) suggested that hospital features and spaces should be modified such that they allow children to independently satisfy their basic needs. In fact, the hospital environment should prevent the emergence of negative responses as much as possible and should allow children to recuperate and grow in a conducive environment.

Providing spaces specifically tailored to the needs of children requires that we find out what their preferences are. In the past, however, designers have tended to rely not on the perspectives of children, but on those of their parents and healthcare professionals (Sommer et al. 2009). The rights of many hospitalized children have been ignored based on the belief that they are too young to properly express themselves (Nova et al., 2005). This is not really the case and many children are able to express their own opinions, which also provide an invaluable new source of perspective for healthcare facilities (Coad et al. 2008).

Thankfully, the decorations used and hospital spaces, in general, are becoming increasingly child-centric overtime. This proves the importance of listening to children's opinions concerning their hospital experiences to help reduce causes of stress in the hospital environment. Despite being an informative line of study, research into the design of healthcare facilities from the perspective of children has remained rather limited. One study by Lindheim, Glaser, and Coffin (1972) produced a list of recommendations for the child-centric design of hospital facilities, based on the patient-centered care model known as the "Planetree Model", the recommendations are intended to create a homely environment for young patients. They include the capacity for individual control, confidentiality, privacy, personal space and social contact, access to learning activities, and proper cognitive stimulation.

3.1.1 Children Perspective within the Hospital Environment

Policy makers and designers can make themselves better able to provide a supportive environment for children by understanding their particular needs as users of healthcare facilities (Bishop, 2008). The UK's National Health Service (NHS) Plan (2000) emphasizes the importance of taking issues that are critical to improving patient experiences in hospital environments into consideration when designing such environments. The NHS further aims to provide a new, friendly, welcoming, and refurbished hospital environment for its health service, particularly in children's hospitals (NHS Estate, 2003).

According to Matthews (1992) children's perceive interior space more than adults, so they perceive interior space through functions rather than aesthetics. A positive physical environment can improves their emotions and well-being. Regarding to children's experiences of healthcare environments, according to the literature, children's age could be categorize into three groups, which are "early year's children (0-5 years), middle childhood (5-11 years) and young people (12-18)" (Hubbuck, 2009).

Table 3: Children's experience within the hospital environment developed based on (Hubbuck, 2009)

User group	Positive environmental features	Negative environmental features
Early years (0-5 years)		Night time disturbances due to nursing activity and increased noise levels (Klausmeier et al 2014)
Primary-middle childhood (5-11 years)	<p>Can make children feel safe (NHS Estates 2004)</p> <p>Allows children to remain close to people they love, especially their parents (livesley and long 2013 , Ekra and Gjengedal 2012, NHS Estates 2004 provide nice areas to play (weil 2013, NHS Estates 2004)</p> <p>Want opportunities to do things while waiting for things to happen (Ekra and Gjengedal 2012, NHS estates 2004) Aquariums (Ekra and Gjengedal 2012)</p>	<p>Too much noise and light at night (Herbert et al 2014, Linder and Christian 2012, NHS Estates 2004)</p> <p>Feeling too hot, Unpleasant smells (NHS Estates 2004)</p> <p>Seeing and hearing other children who are sick (Ekra and Gjengedal 2012)</p> <p>Caught between early years and young people facilities (lambert et al 2013)</p> <p>Children perceive hospital spaces only meet the needs of younger children (Coyne and kirwan 2012)</p>
Young people (12-18 years)	<p>Dedicated adolescent facilities (Kovacs Silvis 2013, Farjou et al 2014, Norton-westwood 2012, NHS Estates 2004)</p> <p>Need for privacy (kennedy 2010)</p> <p>Feel something in common with other</p>	<p>Feeling embarrassed</p> <p>Being on a ward with much younger children or much older people (Kennedy 2010, NHS Estates 2004)</p> <p>Too much noise and light at night (Herbert et al 2014, Linder and Christian 2011)</p> <p>Multiple occupancy rooming (Farjou et al 2014)</p>

	<p>patients (Farjou et al 2014, NHS England 2004)</p> <p>Welcoming and peaceful (Farjou et al 2014)</p> <p>Comfort for family members (Farjou et al 2014)</p>	<p>Absence of windows or brightness (Farjou et al 2014)</p> <p>Rooms being too small (Farjou et al 2014 ,Coyne and kirwan 2012)</p> <p>Lack of entertainment (Farjou et al 2014)</p> <p>Hospital space only meet the needs of younger children's (McKenzie et al 2010)</p>
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3.1.2 Psychological Need of Children within the Hospital

Human behavior is one of the most difficult areas that can be interpreted or analyzed. It is the focus of attention of scientists and researchers in the psychological fields, and the specific part in the behavior of human. According to Maslow (1943) developed a Theory of Human Motivation, identifying a hierarchy of needs that worked on differing levels of 'relative potency' linked to motivational behavior. Maslow (1943, p.373), cited in NHS England (2015), that 'if all the needs are unsatisfied, and the organism is then dominated by the physiological needs, all other needs may become simply non-existent or be pushed into the background'. Once physiological needs are 'satisfied', other higher needs emerge, with the need for safety becoming the dominating potency.

Maslow (1943) identified illness as a threat to the child which would make them feel unsafe. Parents and the family play a crucial role in maintaining a child's sense of

safety, particularly in times of perceived threat. The child believes ‘he has all-powerful parents who protect and shield him from harm’ (Maslow 1943, p.378). Maintaining health and treating illness sometimes requires unpleasant and painful procedures and this may be seen as a betrayal by the child and the parents when they feel unable to offer their child their protection.

Regarding to Maslow (1970), Human's emotions are concentrated in a specific set of desires, and these desires derived from the need and the sense of safety to the sense of belonging, and these desires are arranged according to age, society and the surrounding environment:

- Vital living needs (food, drink, etc.)
- The need for security and safety (stability - privacy)
- Social needs (membership/ sense of belonging and participation)
- Satisfy self-confidence.

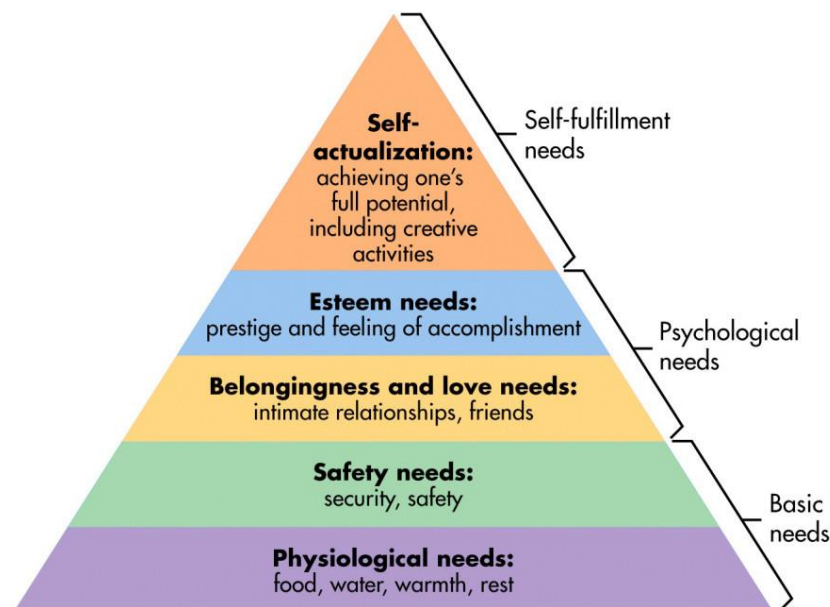


Figure 7: Human Needs Based on Maslow (1970) (URL 5)

Children have special treatment when designing their areas in the therapeutic facility. Where a natural environment is provided, and similar to the family environment so as not to be affected by feelings of deprivation and isolation. Which worsens their mental state and therefore their health and sense of psychological comfort inside the hospital. Which has a positive role in the success of the treatment process according to the medical views, which highlighted the importance of meeting the psychological needs of the patient to achieve comfort and reassurance, which has the greatest impact on the therapeutic results of these patients.

Children are not small adults but on the contrary, they live in a fantasy world governed by their own sense and needs and no one can easily acquire the art of taking care of children. Jain Malkin (1992) described the needs of children within the hospital such as:

Family Support The sick child may feel sad not only because s\he is sick, but also because s\he is away from family environment, and also s\he may turn inward and the reaction show variety according to age group.

The child development officials are aware that having one or both parents with young children is the most important factor in helping children and parents together to cope with the crisis of admission to the hospital because attendance of parents helps to facilitate the routine of the hospital and even parents feel welcomed.

I am convinced that the movement towards patient and family-centered care is permanent. Healthcare facilities of the future will be explicitly designed for a positive patient experience and will strive to sensitively accommodate the needs of families and the important social support systems of patients. (Hamilton 2006, 278)



Figure 8: Provide Comfortable Furniture for Parents to Encourage Them to Stay Next to their Children (URL 6)



Figure 9: Family Room in Children Hospital (URL 7)

Social Communication Jain Malkin (1992), note that child needs social interaction, by providing the climate that offers communication with others and interacting and not ending up in isolation and self-isolation.



Figure 10: Design of Waiting Area Effect Children's Communication (URL 8)



Figure 11: Communication in Children's Room (URL 9)

Legible and Comfortable Environment A good interior organization will provide readable paths and appropriate amount of empty spaces, which will support legibility (Weinstein & David, 1987). Generally curvilinear lines increase the legibility (Ching & Bingeli, 2007). Using different colors and textures on the floor, using forms and objects such as landmarks, partitions and visual access to lead children's movement and perception in interior space will increase legibility for them (Trancik & Evans, 1995). This is because the patient has no energy to adapt to the environment or fight it. This energy can be used to enable the patient to focus on healing.



Figure 12: Using Legible Elements in Children Hospital (URL 10)

We can achieve comfort after meeting basic needs (food, sleep, medical care) through an aesthetically harmonious environment. When the child's comfort is available, this helps him to relax, thus improving the chances of healing (Malkin, 1992).



Figure 13: A Model of a Child's Bedroom in a Hospital, which Provides for the Convenience of the Patient and the Accompanying (URL 11)

Access to Outdoors As Malkin (1992) illuminated that, reaching the backyard, or indoor sunny areas, enables patients to enjoy the benefits of sunlight, monitor activities outside the hospital, and Imagination.



Figure 14: Green Roof to Increase Patient Healing Process (URL 12)

Imagination is an important part of a child's life. It provides an opportunity to escape from reality and to appear strongly in front of adults. Imagination is a safe way to maintain psychological health for the child's and reduces mental tension (Malkin,1992).



Figure 15: The Radiology Room is Fantastically Designed to Attract the Child's Attention Away from Examine Procedures (URL 13)



Figure 16: Using Nature Simulation Elements in the Hospital to Provide Children Perception (URL 14)

Privacy is a basic human feeling that a person needs at the personal level. Ruga, W. (1989) noted that there are communities that believe that privacy can be achieved only through high walls and large walls, while others only achieve privacy by determining the scope of ownership even if symbolically. The audio privacy is meant to address the place so as to ensure that the sound does not move from the inside to the outside or vice versa, in order to block what others can't hear.

Security and Safety Is considered as one of the most important humanitarian needs that must be provided to the patients in the hospital, which helps them to feel comfortable because they cannot bear more pressures resulting from the environment in addition to the condition of their illness that they are facing. According to NHS Estate, the process of developing the child psychologically and physically is a continuous process for the children and the vast majority of children acquire new different skills daily. Therefore, security and safety are fundamental considerations that must be taken into account while designing pediatric Hospital.

Control The child needs to have a sense of control over the surrounding environment and is not overwhelmed by his or her fear of something. So the child should be given the opportunity to explore his surroundings and experience his skills which generates the feelings of competition. In order to achieve this, (Huisman et al.,2012) suggest that designer must make the Surrounding environment understandable and clear for the child, through the use of colors and understandable signs and provide easy ways to find things in the space through the elements close to the child is related to his life experiences and the things he has dealt with before.

Scale According to Malkin Jain (1992), the basins, toilets, mirrors and wardrobes should be suitable for children scales to give them a sense of controlling the environment and enhancing their sense of their self-esteem.



Figure 17: Taking Into Account the Child Scale (URL 15)

Play According to Senda (1992), the Impact of the play on children psychological needs on the design process arranged in the following points:

- Through playing children release physical and emotional tension.
- Allows expressing his needs that are not expressed enough expression in his real life.
- Give an opportunity to use his senses and mind and increase his ability to understand.
- Provides an Opportunity to change which is a basic need in human life.
- Satisfying the child's motivations and psychological needs such as freedom, sense of organization, safety, ordering, and leadership.
- Helps the child to receive and learn (as language), also attracts the child's attention to education and enthusiasm to learn more.

- A play is a delightful activity and is a way to overcome frustrating situations in life.



Figure 18: Translucent Wood and Light Installation Brightens at Children’s Hospital in Australia to Help Children Interact with the Environment (URL 16)

3.2 Interior Space Design Elements

Designers are influenced by a number of different elements during the design process, which also affect the overall identity of the interior space based on its intended functions and users. The key factors that can influence environmental experiences used by architects and designers can be manipulated to generate different effects, according to differing needs (Kreitzer 2013).

These factors come under two broad categories: The elements of design: Space, Form, Texture, Light, Color, Lines, and Point. The principles of design: Rhythm, Proportion, Balance, Emphasis, Variety, Unity, Repetition, and Human Scale’ (Kreitzer 2013).

3.2.1 Color

Most objects, times, and events are often linked to the memory of a specific color: fire with red, yellow for the sun, black for night, and red for blood. Our perception of a color is affected by how it is represented. This perception is also affected by the

association of a color with particular things. For example, the association of the color yellow with the sun gives it a certain warmth, as does the association of fire with the color red (Gage, 2000).

While most humans perceive color as a distinguishing feature of the objects and the environment surrounding them, the diversity of colors in the collective human experience make it impossible to develop a general psychology of colors and preferences (Meerwein, et al. 2007). However, this does not take away from the fact that color is an important factor in how users perceive a space. The color green causes the feeling of relaxation and generates energy, while deep blue is associated with pure calmness (Mahnke, 1996). Therefore, a room decorated with the color blue will cause its users to relax, while green would cause users to feel more energetic in carrying out their tasks. This shows that the choice of colors for interior space should be used by designers to reinforce the quality of the space and should be considered along with other design elements and functions. “Like all other elements of interior design, color communicates, carrying messages about design intent from the designer to the users (Abercrombie, 1990, p.113)”.

Color is not an independent element and needs to be attached to any kind of thing, such as furniture, flowers, a wall, etc. Taylor & Preston, (2006) while remaining a characteristic of the environment as a whole. Colors also affect the perception of a space by emphasizing specific objects, either as the color of the object itself or of the background (Miller, 1997).



Figure 19: The Characteristics of Color in Providing Positive Distractions.(URL 17)

Pediatric Hospitals uses a lot of colors to help users identify and categorize the space. In the hospital environments, despite the use of a number of different colors, there are positive impacts rather than disturbing the children. The color choices provide a positive distraction and speed up the healing process by improving the children's mood. The interior design of a hospital environment is successful to the extent that the design choices and aesthetics of the environment support the intended function of the space by promoting healing.

In terms of color, options were divided between the use of a single color throughout the ward, to multiple colors used in combination: 'Preferred single colors were blue, accent and pastel yellow and pastel orange while color combinations were shades of blue, orange, pink, neutral and yellows' (Coad and Coad 2008, p.43).

Color is associated with the child-friendly atmospheres and was extensively used in children's hospitals to create colorful environments. Birmingham Children's Hospital describes its color usage as "predominantly white walls and ceilings which are

complemented by occasional bold, bright colors, supporting and reinforcing the atmosphere of cheerfulness encountered throughout the hospital” NHS Estates, NHS Design Portfolio.



Figure 20: Color in Birmingham Children Hospital (URL 18)

One of the solutions to provide the colorful interior space with appropriate level of complexity for children is to consider the color harmonies. Marberry & Zagon (1995, p.12) cited in Shirin Izadpanah (2011), divided color harmonies in 4 categories: “1) Analogues harmony: colors next to each other on the color wheel. 2) Complementary harmony: color opposite of each other in color wheel. 3) Split harmony: two directly opposite colors along with one or two more colors that are analogues to one or another. 4) Full spectrum: all colors use in various proportion with changes in their value and chroma”.

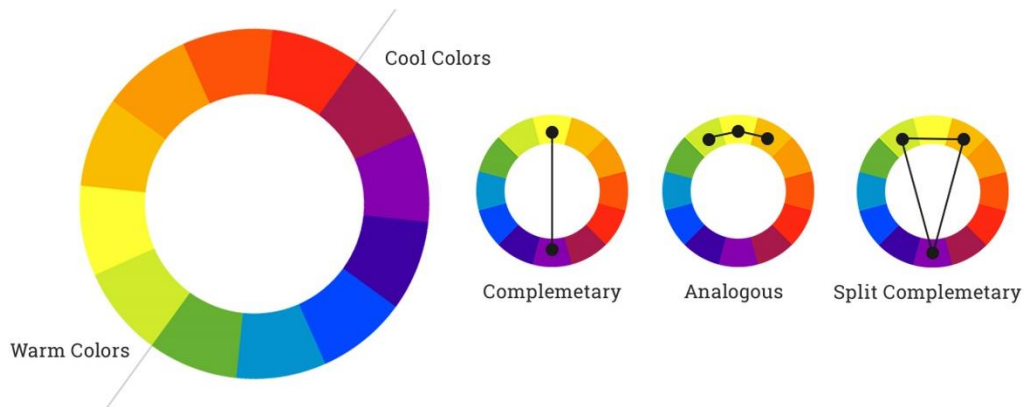


Figure 21: Color Harmonies Category for Children Based on Marberry & Zagon (1995, P.12)

3.2.2 Space and Form

The mutual dependence between a space and its form means that they cannot be separated from one another. The form of a space can either be irregular or curvy, two or three dimensional, and is one of its positive characteristics (Kubba, 2003). Forms can sometimes be a purely decorative way to improve the aesthetic quality of a space, they can serve the more symbolic function of defining a concept. Regardless of the particular function it performs, a function is always the characteristic of a space. Three types of forms can be identified in an interior space: the form of space, furniture, and fixture. The form of the space itself can be irregular, cubic, curvilinear, etc. As John N. Hazar put it, “the furniture arrangement will tell you at a glance who has what authority (Abercrombie, 1990, p.13)”. Furniture is an important defining element for any interior space.



Figure 22: Furniture is the Main Element in Identifying the Interior (URL 19)

Mark Kingwell argues that Furniture structure the space, what makes sense to be undifferentiated into something have more meaning (Taylor & Preston, 2006). All furniture, whether fixed or moveable, decorative or functional, has a meaning and form. Most people prefer to reorganize furniture to create the particular atmosphere and look they desire. It is interesting that creating a whole new atmosphere for an environment does not require entirely new furniture; just the rearrangement of the old ones can change the characteristics of the same space. Furthermore, as Shirely Andener has pointed out, changing the arrangement, form, and the number of tables in a space can also affect the mobility and actions of users in an environment, as well as the overall identity of the space (Taylor & Preston, 2006).



Figure 23: Furniture Has Been Arranged According To Child Scale in the Royal Children's Hospital (URL 20)

In figure 23, in the Royal Park Hospital and Shriners Hospital for Children, the scale of the furniture has been arranged according to child scale and they can use the space easily.

Visual barriers like furniture, partitions, and other objects can be used to create private spaces, and landscape features can be used as visual barriers and provide feelings of refreshment among users. Curtains and cubbies can also be used to provide temporary private spaces when necessary and are a great way to conserve space.

In the figure 24, below the fixtures and furniture create a successful combination to present the void and solid in the interior of this hospital. To create smaller and more private spaces by using the semi-close elements.



Figure 24: Beneficial Element for Providing Private Spaces for Children (URL 21)

3.2.3 Lighting

Light allows users to see and distinguish the features of an interior space. There is no identity in the absence of light since the inside of a space depends on light (Taylor & Preston, 2006). “People may have a different perception of the same space by changing the lighting in that space. Lighting in the interior space not only visually shows the design, but also supports the designer's message and emphasizes the characteristics (Abercrombie, 1990). Kubba (2003) argues that lighting serves two primary functions: “illumination” and “establishing a mood” (p. 140).

The illumination produced by lighting allows people to recognize, perceive, and experience the environment and its character. This lighting could either be artificial or

natural and while sunlight is the preferred option for a healthy ecological environment, alternative lighting needs to be provided at night. As such, it is important that the quality of artificial lighting is able to capture the interior environment in the same way as natural daylight.

The benefits of daylight are well known in modern science and many experts recommend that architects maximize the amount of natural light allowed in interior spaces. This is especially true in hospital environments where daylight can be used to create a healthy and pleasant environment.

Lighting should be taken into consideration along with texture and color to avoid creating an unsuccessful and disturbing environment. The following (figure 25), show the use of daylight in Randall children's hospital in the USA, the hospital main aim was to create a healing environment. The hospital provides a plenty of daylight, and a relaxing light blue to provide the more homely environment.



Figure 25: The Positive Effect of Natural Lighting (URL 22)

3.2.4 Texture

By creating variety and contrast, texture plays an important role in the design of an interior space (Kubba, 2003). Different materials naturally have different textures, which can also be artificially applied to a surface by the designer. Textures can be used to create a special mood or convey a particular message in an environment. Variations in texture help users determine the smoothness, roughness, coldness, and softness of materials using their sense of touch. Texture also affects the color and light of an object (Miller & Schiltt, 1985).

Rough surfaces reflect colors heavier and darker, and can also reduce the perceived height of the object. They also create the feeling of a warm environment, as opposed to that of a cold environment portrayed by smooth surfaces. Smooth and shiny surfaces, however, are more preferred for spaces where surfaces need to be kept constantly clean (Kubba, 2003). The use of different textures helps define the characteristics of a space. Because of the effect, it has on users' physical and visual experience in an interior space, texture also affects the mood of its users and the identity of the space.



Figure 26: Texture Beneficial for Children Perception (URL 23)

Texture can be used to outline spaces and paths for children by distinguishing one area from another in the same space (Clark, 2010). Texture choices should be made very carefully in hospital interior spaces, as should the choice of colors, in order to avoid over-stimulating and negatively affecting the comfort of patients (Meerwein, et al. 2007).

3.3 Design Requirements for Pediatric Hospital Settings

A 1995 study by Trancik and Evans titled “Spaces Fit for Children” found that one of the most important factors to be considered in the interior spaces of daycare centers concerns their capacity to facilitate positive children-environment interactions. This “competency”, as they termed it, is believed to be both realized and improved in preschool children through certain physical characteristics, including “control, privacy, complexity, exploration, restoration, place identity, legibility, and safety” (p. 44). In the case of healthcare:

Improving patient experience for children and young people is a subject which is close to many people’s hearts and which has not always received the attention and investment that it needs to make serious progress. Ensuring a positive patient experience for all groups is a strategic, commissioning and financial imperative for all. Patient experience is a fundamental component of how we should think about the quality of healthcare. (Patient Experience Network 2013, p.7)

As such, it is important that children’s hospitals provide a physical environment capable of adequately supporting their well-being in a proper healing environment. Unfortunately, however, very little research has been conducted in the area of how a child’s overall healthcare experience is affected by her\him environment. This is especially true in the case of younger children, whose interests are represented by adult proxies.

As the primary focal point of healthcare delivery, it is important that the hospital environment is used as a tool for positive engagement and empowerment (European Healthcare Design, 2015). While the hospital itself will continue to perform the function of delivering specialized medical services, both the delivery of said services and the overall design of the hospital itself would need to be patient-centered with prominence given to community-based, local services (Department of Health, 2013). Such a focus is especially beneficial for children, whose caregivers should aspire to bring said care ‘closer to home’, especially by improving the community nursing teams catering to children (Royal College of Nursing, 2014).

In 2007 the University Of Sheffield School of Architecture undertook a Research and Development project that was disseminated by the Department of Health, which had been commissioned by the NHS Estates in 2004. The project produced prototypes of two tools intended for use in the assessment of the environmental aspects of healthcare buildings: “ASPECT and AEDET Evolution”. ‘A Staff and Patient Environment Calibration Tool’, “ASPECT” was developed on the basis of over 600 datasets and is used to determine the manner in which satisfaction levels and healthcare results are impacted by the healthcare environment from the perspectives of both patients and healthcare providers (NHS Estates and Facilities, 2008).

An Economic and Social Research Council (ESRC)-funded study by James et al. (2007) provides a much clearer perspective of an even improved version of the ASPECT tool known as ACE ASPECT: Environments to Children (Curtis et al., 2007). By increasing the number of categories to 10 from the 8 in the original ASPECT tool, it can be used to assess the character of the hospital environment considered to be important for children specifically. In the improved ACE tool, dignity, privacy, and

company are redefined and expanded to personal space, privacy, social space, and age-related factors.

Furthermore, hospital decorations and the environment, in general, have increasingly been seen to be more child-friendly than has historically been the case. Lindheim and Coffin (1972) compiled a list of recommended children hospital design specifications based on the Planetree Model (a patient-centered care model with the aim of creating a home-like environment for the patient).

Their recommendations are intended to stimulate cognitive activity, improve access to learning facilities, personal space, and opportunities for social contact, individual control, confidentiality, and privacy. The adequate understanding of a child's needs and vision as a healthcare facility user is necessary if designers and policymakers alike are to provide supportive environments (Bishop, 2008).

The UK's NHS Plan (2000) specifies the importance of patients' focus on issues critical to improving their experience in the hospital environment. The goal of this is to ensure the provision of a new and refurbished friendly health environment, particularly for children's hospitals (NHS Real Estate, 2003). This study problematizes how the needs of children are defined when designing the physical environment of a children's hospital in such a manner that allows it to aid the healing process. Such an undertaking necessitates an all-inclusive description and analysis of the different methods and steps involved in the process. Practically speaking, current children's participation models are essentially based on abstract principles, which highlights a pressing need for more specific theories and models.

With the intention of determining the most efficient environment possible, many authors have published an even greater number of recommendations in articles and books. These can be used as design guidelines to create better results.

Based on the studied literature, the influencing factors that seem to have the most refund repercussions in children’s lives in the hospital, and which can be manipulated through design, were selected and summarized in the following chart:

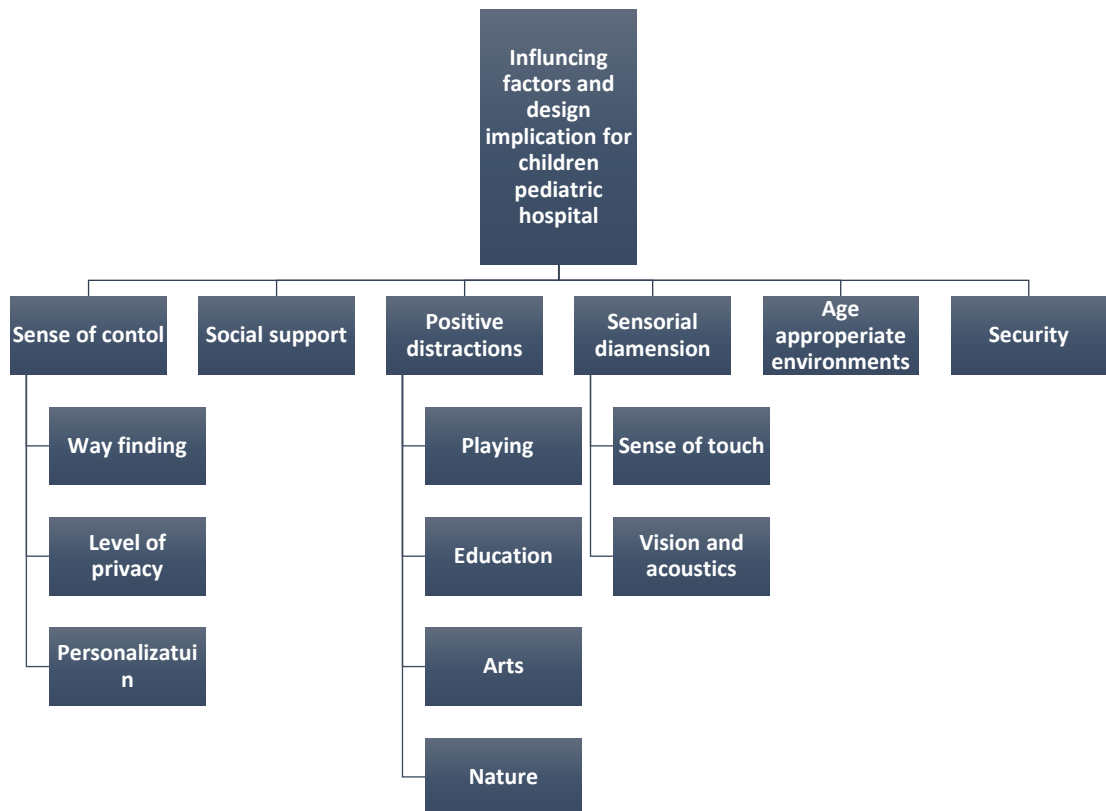


Figure 27: The Influencing Factors and Design Implication for Children Pediatric Hospital Developed Based on Literature Reviews

3.3.1 Sense of Control

A perceived lack of control can be aggravated by a number of factors, including poor communication, physical barriers, poor way-finding, and a lack of privacy. This perceived feeling has also been linked to increases in depression, passivity, and blood pressure, as well as weakened immune systems (Ulrich, 1991). One effective remedy is providing patients with options, however unideal they may be. The capacity for choice on the part of the patient increases the patient's sense of independence (Shepley and Hamilton, 2010). This is particularly important as the loss of control is a recurring downside of hospital life.

Huisman et al. (2012) suggest a 'self-supporting systems' approach, which uses the physical design of the environment to increase the capacity for control. Under this approach lie different factors, including the capacity to adjust the room arrangement, degree of light, sound (music, television), and bed position.

3.3.1.1 Way finding

As one of the factors that influences the sense of control, way-finding is considered to be the capacity for 'spatial problem solving' and can be defined as "the process of reaching a destination, whether in a familiar or unfamiliar environment" (Arthur and Passini, 1992).

A mental image of the physical layout is necessary for spatial orientation. The problem-solving process requires an understanding of the actual location, the destination, preferred route, how to follow it, and determining when the destination has been arrived at (Huelat, 2007).



Figure 28: Way Finding In Hospital Design by Improving the Spatial Orientation (URL 24)

Carpman's (1986) work in the area of healthcare has found that way-finding exerts an effect on stress and can be enhanced through visibility, placement, context, density (number of signs), and nomenclature. As such, architects are instrumental, not only in the image and placement of signs but also in the design of spaces. For example, the patient's position within the building can be clarified through the placement of windows in corridors, designating clear pathways, visible elevators, a visible entrance, and strategically-placed landmarks (Huelat, 2007).

The perception and navigational capacities of children differ from adults, thus requiring that children's hospitals are able to provide solutions for a wide variety of ages. Furthermore, since clinical terminology is not easily understood by children, the use of colors could be used as a means to differentiate between areas. Color is also

ideal because it can be applied to a variety of materials and can be used to incite specific physical and emotional responses (Mahnke, 1996). Other examples include the use of artwork as landmarks, floor markers, and mosaics, which can be used as reference points (Bayliss-Robbins, 2012). The use of graphics work, such as wall illustrations, plays an important role in the provision of a calming distraction and aiding navigation. Regardless, care should be taken when particular color schemes and themes are attributed to different departments as consistency should also be an important consideration.



Figure 29: Graphic Work to Provide a Calming Distraction, and Also Act as Navigational Landmarks (URL 25)

3.3.1.2 Privacy

Closely related to control is the issue of privacy, which is understood here as “an interpersonal boundary process in which a person or group regulates interaction with others” (Altman 1975, p. 6). This regulative capacity is perhaps even more important than the act of social interaction itself (Shepley, 2001) as it allows for access to personal space or groups to be controlled. Moreover, privacy also needs to be balanced

with socialization since the latter is also an important factor; the efficient combination of both will result in a better hospital environment.

A patient's privacy can be said to have been neglected when they are left on the corridors in gurneys; triage is done in public; financial information is released; they share rooms with strangers (Shepley, 1998); or simply when they have not been provided the opportunity to be alone or talk to a particular individual. A number of studies have tackled the issue of allowing patients 'spaces to be alone'. This is especially true in the case of children, for whom it has been found that a strong correlation exists between the type of room and privacy, a single-room provides the highest degree of control (Lambert et al, 2014).



Figure 30: Single Room for Patient and Place for Their Personalization to Provide More Privacy for Children (URL 26)

3.3.1.3 Personalization

Personalization refers to the ability of children to manipulate their surroundings favorably and is integral to their overall degree of control. It is also an important dimension of a hospital's overall ability to adapt and be flexible.

Although the literature regarding the degree of personalization afforded by pediatric hospitals is scant, Blumberg and Devlin (2006) argue that the ability to convey in personalization and customize the bed-place is vital for teenagers as it afforded the opportunity to portray their identity and preferred comfort level. They even found that such self-expression through environmental manipulation surpassed the importance of the appearance of the ward and even its age-appropriateness.

In a similar vein, Shepley et al. (1998) emphasized the importance of personalization based on the various dimensions of the built environment that could be modified to improve it, including: picture boards, shelves, and storage lockers. The capacity to customize one's environment as desired allows patients to surround themselves with valuable personal items, which at least allows them to feel emotionally attached to their loved ones. This is particularly true in the case of patients who are hospitalized for long periods of time, for whom the capacity for personalization is all the more important.

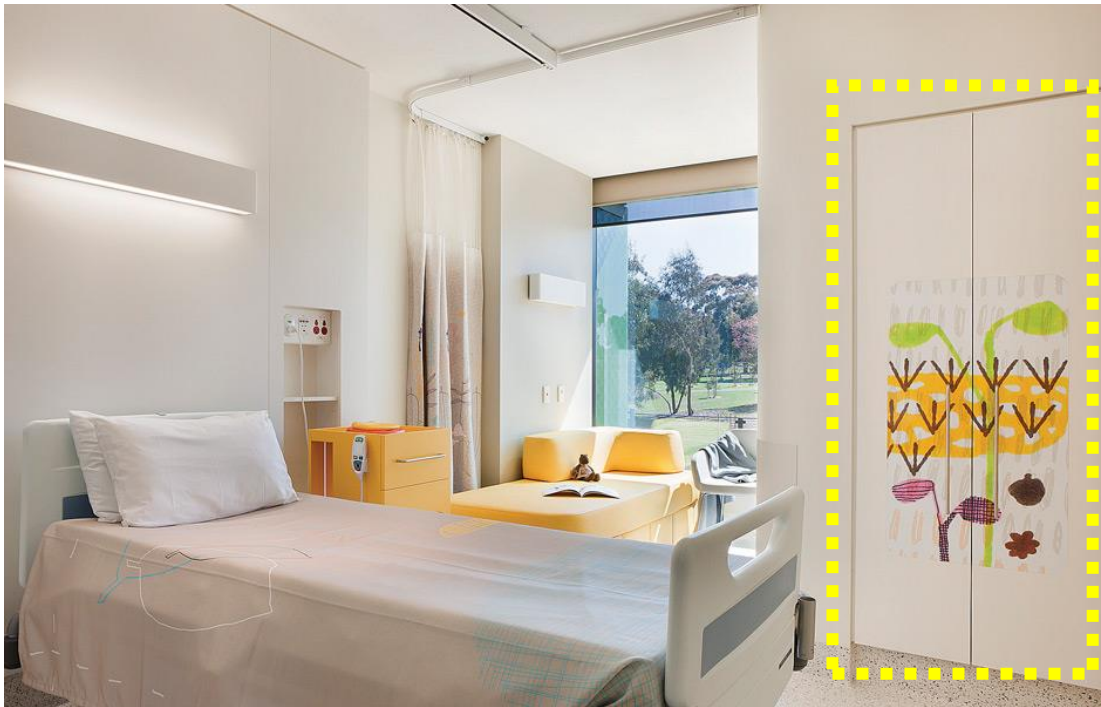


Figure 31: Closet for Children Personalizing to Enable Patient by Familiar Things (URL 27)

3.3.2 Social Support

As is to be expected, children are much affected by parental care and social support due to their early age. The fact that they know little about the world leads them to have expectations of the people that surround them, who they expect to be available, provide social support, and assist them in solving any problems that may arise. Additionally, this support could help develop the child's competence and capacity for problem-solving; that is, self-confidence (Aken, 1994).

In addition to their interactions with those upon whom they are dependent, children also need to interact with other adults and children. Their interaction with other children helps hone their social skills. The importance of such positive relationships during a child's formative years and even later in life has been stressed by a number of researchers (Ladd, 1999) and in cases of child hospitalization, it is important for development that rejection and isolation are avoided.

It has been discovered that social support reduces stress in different categories of individuals (Ulrich, 1991). Consequently, the space for this goal should be made available to provide socialization opportunities for each age group. (Coyne and Kirwan, 2012), although this has received little attention in the area of hospital design and how it could be used to aid or prevent access to social support.



Figure 32: Waiting Room in Hospital with Central Area for Social Communication (URL 28)

The figure above is an example of how physical spaces could be to the detriment of the socialization process. The organization of these rooms is typically such that older children sit with their accompanying adults in chairs that encircle the central area where playing activities for the smaller children are concentrated (James, Curtis and Birch, 2007). Since the goal is to ensure that the physical space does not itself constitute a barrier to socialization, the evidence is growing which suggests that the

provision of waiting rooms, day rooms, and lounged with moveable furniture would be beneficial (Ulrich et al., 2004).

In terms of parental support, familial relations appear to be an all too important means of social support, particularly in cases of hospitalization. For the parents of a hospitalized child, the process can be extremely overwhelming as it requires significant changes to their routine in addition to the emotional burden. To help families deal with the disruptions to their daily life resulting from the hospitalization of a child, there has been a recent switch to family-centered care in the field. This involves including them in medical decisions, closer interaction with medical staff, system evaluation, engaging them in healthcare policies, and adequate facility designs (American Academy of Pediatrics, 2015).

The following recommendations have been made in terms of physical dimensions. It is important that parents are offered:

- The capacity to satisfy the most basic of their needs by providing bathrooms in the rooms or on each floor (Olds and Daniel 1987).
- Beds to allow them rest and even sleep when necessary (Olds and Daniel 1987).
- A consulting room, chapel, or family room to provide privacy (Olds and Daniel 1987).
- A storage room to safely store personal effects and allow them, personalize the space (De Vos 2005).
- Laundry and kitchen facilities to facilitate daily tasks like laundry and meal preparation (Olds and Daniel 1995).

Other facilities may equally be provided to enable the family to have a more pleasurable experience since the parents also require a sense of control, information, positive distraction, and socialization.

3.3.3 Positive Distractions

3.3.3.1 Playing

‘Play can be an important factor in diminishing the harmful effects of stress in hospitalized children.’ (MacCarthy 1979).

Playing is particularly important for children – not just because it is a source of enjoyment, but also because it allows them to interact with and explore their surrounding environment (Armstrong and Aitken, 2000). Such positive activities help cultivate emotional, physical intellectual, and social growth. They also help in decreasing anxiety and stress (Peterson, 1989), as well as making the hospital admission process easier to cope with (Delpo and Frick, 1988). The adjustment from the calm and familiar home environment to the hospital environment with large, strange spaces, noises, machines, faces, and smells can be a difficult one for a child. Playing at this level helps the child understand and interpret the sounds, sights, and language of the hospital (Haiat, bar-Mor and Shochat, 2003).

Hospitals need to provide spaces conducive for children, as well as toys and activities so as to encourage play. Individual patient rooms could also be equipped with games and other play items so as to attract other children visitors and thus enhance the overall play experience.



Figure 33: Toys and Activates For Providing Child Friendly Environment (URL 29)

3.3.3.2 Education

Education is extremely important in the development of any child. Since children with chronic illnesses are subjected to long hospital stays, education programs have been developed specifically to allow them to continue learning at the same pace as their peers. While there are adjustments that have to be made in regards to content due to the effect of illness on the child's learning capacity (Thompson and Gustafson, 1996), educational activities remain extremely vital for the psychosocial well-being of the child (Sanger, Copeland and Davidson, 1991) as well as an all-too-needed distraction. Research into this area remains somewhat limited, particularly in the case of the physical support provided by hospital schools. Regardless, it is evident that pediatric hospitals need to offer wheelchair/stretchers-accessible classrooms and accommodate the need to take medication even while learning.



Figure 34: Learning Room in Children's Hospital (URL 30)

3.3.3.3 Art

Art is known to be a beneficial distraction in healthcare environments and has been proven to reduce stress and improve moods in adult patients (Ulrich, 1991 & Simons et al. 1991). Research into the effects of art on the health of child patients, however, is a still-developing field of study. One possible explanation offered for this difference between adult and child patients is that pediatric units better facilitate social activities, as opposed to the general hospitals with higher isolation levels for adults. Consequently, it has been recommended that children's feeling of control be enhanced through the provision of art carts composed primarily of nature-based images (Eisen et al, 2008).



Figure 35: Arts as a Positive Distraction for Children in Hospital Corridor (URL 31)

3.3.3.4 Nature

In addition to its long-recognized health benefits, nature is also a positive distraction. Several studies have found that within the context of healthcare, there have been reductions in the number of health-related complaints and stress levels (Ulrich, 1984), with adult patients reporting that their visits to natural settings helped them conquer feelings of depression and stress (Cooper-Marcus, 1995). Additionally, patient access to appealing landscapes, as opposed to a brick wall, has been found to reduce the length of hospitalization, surgical complications, and analgesic doses (Ulrich, 1984). Children are especially affected by their contact with nature, such as through hospital gardens when available (Horsburgh, 1995). The stresses of hospitalization can be mitigated through the provision of simple natural settings, with a familiar and relaxing atmosphere (Whitehouse et al. 2001).

Whitehouse et al. (2001) found that outpatients and inpatients' siblings were the primary users of the garden, as opposed to the hospitalized children as would be expected. The importance of this observation lies in the fact that it reveals the necessity of understanding how more fragile children could benefit from contact with nature. Possible ways to ensure users take full advantage of the garden include: raising awareness about the garden; ensuring accessibility for physically-handicapped children; giving the garden a sense of purpose by offering recuperating physical activities, educational, and other playing activities.



Figure 36: Healing Garden in Children Hospital (URL 32)

3.3.4 Sensorial Dimensions

As systems that actively facilitate perception, human senses function either jointly or independently to help the individual interact with and extract information from his surroundings (Gibson, 1996). The sense triggered by this interaction include sound, vision, taste, smell, and touch.

The sense of touch is particularly sensitive amongst children, primarily because it is the first sense to develop in an embryo (White, 2014). This sense enables children to determine the closeness of objects, perceive movement, and better understand their environment in general by allowing them to explore items like food (Hall, 1969). Different textures can be used when designing facilities for this age group to better enhance tactile exploration. The different textures that could possibly be employed range from surfaces like low-level walls, outdoor paths, the floor, moveable objects, and barriers, using different materials, including silk, cotton, mirrors, metal, rubber, plastic, and wood (Post, Hohmann, and Epstein, 2011).

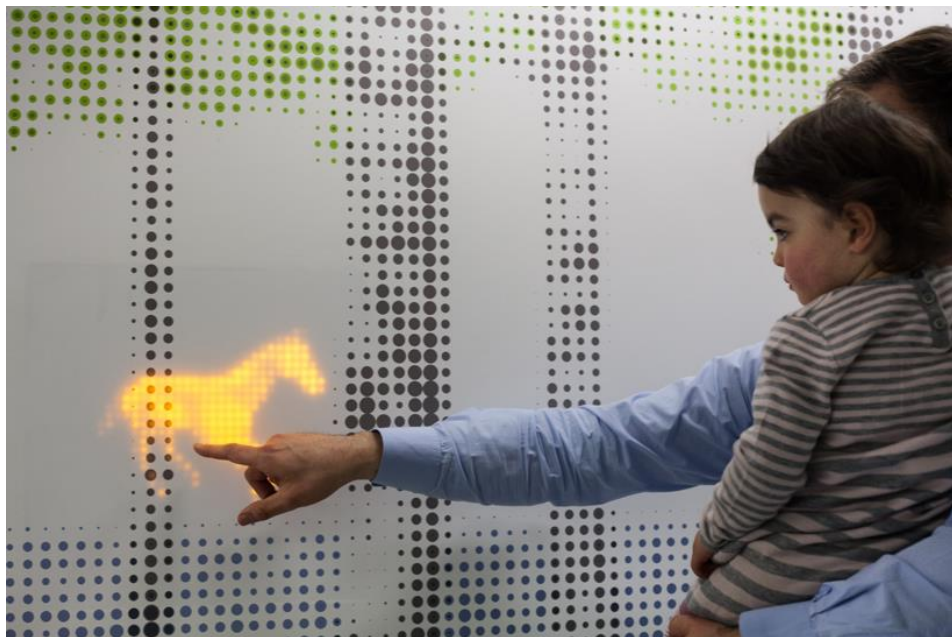


Figure 37: Children Interact with the Environment through Playing (URL 32)

Acoustics and lines of sight are especially important in healthcare environments and although very few studies concentrate exclusively on young age groups, daylight has been recognized as being equally important for hospitalized patients. Sunlight has been found to improve melatonin levels (which regulate biorhythms) in the brain (Olds and Daniels, 1987) and reduce the need for pain medication post-surgery (Walch et al., 2005). It has also been found that patients staying in adequately sunlit rooms stayed in the hospital for shorter periods of time and both artificial and natural light positively affect the moods of both depressed and healthy patients (Beauchemin and Hays, 1996).

The effects of sunlight on patient recovery is an important consideration for healthcare administrators and architects when deciding on new projects as well as choosing the orientation of the building (Ulrich, et al. 2006). It is a widely known fact that site plans with buildings that obstruct access to daylight and rooms lacking any windows are to be completely avoided. Despite this, however, daylight is not the sole source of lighting used in healthcare settings. In fact, it is often combined with artificial lighting. The two types of light are different in a number of ways, including: luminance level, diffusion, UV radiation level, color, uniformity, and variation depending on the time. On the one hand, daylight produces a full spectrum of colors, which differs depending on the season, meteorological conditions, and latitude (Boyce, Hunter and Howlett, 2003), and one of its advantages is that it helps minimize electricity costs by mitigating the need for artificial lighting.



Figure 38: Day Light in Children Hospital (URL 33)

Conversely, *artificial light* is fully controllable and can be chosen to serve specific functions. Intense lights, for example, are needed for examination rooms as opposed to the comfort of a homely environment. There are even electric lights that have been developed to replicate daylight's natural full-spectrum. This has led some sources to claim that the distinction between natural and artificial lighting is moot as they could equally be used for most visual tasks (Boyce, Hunter, and Howlett, 2003). Additionally, artificial light is useful in pediatric settings where its ceiling placement allows it to function as a way to distract young patients (Dutro, 2007). Overall, and regardless of the lighting source, patient control over the window blinds, type, and intensity of lighting gives better results.

Another source of visual stimulation is *color*, whose impact in healthcare settings have been considerably documented as improving the overall satisfaction of children and their families (Park, 2009). Various studies have also attempted to identify the most suitable colors for hospital environments, although a number of contradictions have emerged in the literature as a result (Tofle et al., 2004). Regardless, Tofle et al. (2004) have suggested that certain colors can indeed be associated with certain moods, although these associations can vary between individuals as not everyone can be expected to link the same color to the same specific emotion. Coad and Coad (2008) also performed a study on children's preference for thematic design and color in hospitals. Contrary to what would be expected, children did not prefer bright colors. The most preferred ones were mid-blue-green colors. Single color preferences tended to be blue accent, pastel yellow and pastel orange.

Noise is a relatively frequent topic of discussion in the field of acoustics. Defined as 'unwanted sound', noise could potentially and negatively affect the health of patients and staff alike. Noise isn't, however, equally perceived as individuals analyze it based on their own personally selected factors (Kam, 1994). Kam (1994) have found that intermittent sounds are generally less preferable to continuous, background noise. The problem of noise has been extensively researched in healthcare settings due to the acknowledgment that high levels of noise are to be expected. According to the World Health Organization (WHO), acceptable noise levels lie at a maximum of 35 and 30 dB for day and night, respectively, and 40dB at nighttime peaks (Berglund et al., 1981). Studies investigating noise levels in hospitals have found that there recommended levels are exceeded quite substantially as background noises typically ranged between 45-68 dB with peaks of 80 dB and above (Ulrich, 2006). The main

sources of this noise are the various hospital equipment, voices, and environmental surfaces.

Additionally, noise has also been found to negatively affect patient health by inducing a loss of sleep, fragmentation, high blood pressure (Yinnon et al, 1992), stress, and longer recuperating periods (Bailey and Timmons, 2005). In the specific case of children, Neonatal Intensive Care Unit (NICU) studies have found that loud noises worsen sleep patterns, increase the respiration and heart rate, decrease oxygen saturation, and elevate blood pressure in infants (Slevin et al., 2000; Zahr and de Traversay, 1995).

The sound conditions in hospitals can be improved through the implementation of suitable design strategies, especially as attempts at changing organizational and staff behavior have proven futile. Providing single rooms for patients; eliminating sources of noise, such as by using silent machines in place of noise ones; and installing sound-absorbent ceiling tiles are a few strategies known to be effective (Ulrich 2006).

3.3.5 Age Appropriate Environments

A common design strategy used in healthcare settings is to divide children based on their age groups. In so doing, administrators hope to ensure that children in the same ward would have the same capacity for socialization and can easily relate with one another (Platt, 1959). Furthermore, a cognitive development study conducted by Piaget (1983) found that children develop various capacities during childhood, which represent their different social, emotional, physical, and cognitive competencies.

It is generally accepted that wishes, dependencies, preferences, and needs change relatively frequently during childhood. The complete dependence of infants on their

parents begins to fade over time as social activity expands to include new people and areas for group and personal socialization are needed to accommodate this development. Privacy becomes particularly important in adolescence as the necessity of near-constant monitoring is replaced by a need for privacy. In terms of playtime, older children prefer social activities like competitive sports and games to the individual activities favored by young children. It is, therefore, necessary that both kinds of activity are supported with suitable spaces. Children also interact with spaces differently at different stages: younger children are more responsive to special features (colors and textures) than adolescents, who desire more control over their environment and the opportunity to personalize. Lastly, the issue of scale also arises in pediatric hospitals as they have to accommodate older children down to newborn babies. The use of different dimensions for objects and spaces can be both helpful and comfortable. For example, lower toilets and sinks would allow little children to visit the bathroom alone and cater for themselves. Additionally, larger spaces with longer heights can be a little intimidating to young children in contrast to well-scaled spaces, which can be more comfortable by allowing them a more enhanced view of the environment. It does remain necessary, however, that all spaces are also accessible to adults who will need to supervise and monitor children, as well as ensure they are up to date on their medication.

3.3.6 Security and Safety

Feeling protected is a natural result of being in a homely environment. Abnormal hospital environments can be the source of more insecurity, vulnerability, and anxiety. It was mentioned earlier that the presence of parents is a very important factor in making hospitalized children feel more supported and accompanied. This is equally beneficial for the parents, who can feel secure about the supervision of their children.

It was also mentioned earlier that security could further be enhanced by the availability of storage spaces to stow personal belongings. A sense of control could also improve feelings of security and cards, photographs, books, drawings, friendly messages, and blankets could all be used in personalizing the space to both reinforce the patient's identity and sense of control.

Inappropriately placed nurse stations are one design factor that could negatively affect staff effectiveness and patient safety. Space layouts with central nurse stations and supply storage increase the distance nurses need to walk, causing fatigue and claiming 30-40% of their shift time, which could otherwise have been used for patient care. In contrast, decentralized nurse stations and storage in close proximity to patient room increase efficiency by reducing the amount of walking needed and increasing patient observation and care (Institute of Medicine, 2004).

Longer patient monitoring times are particularly necessary for pediatric hospitals as children are less predictable and more prone to unintentionally harming themselves. Fewer visual barriers and transparent doors can be used to increase patient safety and facilitate their monitoring, in addition to being much appreciated by parents. Also, simply knowing that they're being monitored by medical professionals can help mitigate anxiety (Yeaple et al., 1995). Supervision is important for the scale and openness of the hospital as a larger area means fire regulations can be better satisfied with more entrances and exits.

Allowing space for patient vigilance would reduce anxiety among parents who have to leave their children unsupervised (Olds and Daniel, 1987). A possible solution to the issue of dispensing errors, therefore, is the use of dispensing spaces separate from

the central nurse station, adjustable lighting, and the reduction of noise and other distractions (Ulrich, 2004).

Lastly, the prevention of infection is also a security issue due to the continued death of patients as a result of infections acquired in the hospital. Not all patients can simply be cured by using medicine and so the spread of disease ought to be prevented using appropriate design guidelines.

These guidelines are proving increasingly necessary as 5% of hospitalized patients are infected in the hospital, of which 10% die while infected and 1% die as a result of the infection (Walenkamp, 2009). The quality of the air and ventilation systems in hospitals are also important in relation to airborne infections as they could transport concentrations of bacteria, fungi and other contagious pathogens (Ulrich et al., 2004). One of the recommendations outlined by Passweg et al. (1998) for effectively preventing and controlling infections is the use of single-patient rooms fitted with laminar airflow or HEPA-filtered air. Conversely, contact-transmitted infections are spread primarily by contaminated surfaces and direct human contact (Bauer et al., 1990). Such infections are spread primarily due to a lack of proper hand-washing practices and so a number of properly-placed alcohol gel dispensers and sinks are necessary to increase hand-washing and consequently mitigate the spread of infection (Ulrich, 2004).

Safety, a very important factor to be considered especially when involving the pediatric patients should be one of the outcomes of the ergonomically-designed pediatric setting. France, et. al. (2005) opined that the creation of a Patient-centered setting facilitated safe and efficient care and as such human factors expertise were

needed to be involved early in the design process. Croasmun (2004) argued that often products or services might have been designed without sufficient knowledge of the end users. As such, improved ergonomics by designing out potential flaws before the occurrence would make a safer setting for the pediatric patients and better environment for the medical cares. In addition, Miller and Zhan (2004) revealed that the prevalence of patient safety events frequently involved the very young with substantial increase in duration of stay. Similarly, Woods, et. al. (2013) cautioned that patient-specific setting increased vulnerabilities and as such patient safety risks must be accounted for in the design and improvement interventions.

The design healing guidelines for safety:

- Having (visual) connections to staff. Feeling connected and seen reduces anxiety. Visual connection between bed/room and nursing station. (Picker Institute,1998; Yeaple et al.,1995)
- Knowing the place is being watched. Knowing there is control over entrances & surveillance e.g. controlled access security, cameras, and visual openness. (Picker Institute,1998; Yeaple et al.,1995)
- Keeping personal valuables. Having a safe place e.g. lockable storage in patient room. (Picker Institute,1998; Yeaple et al.,1995)

Conclusion

Consistent with the discussion in this chapter the design requirements identifying identity in pediatric hospital settings are represented in the table below:

Table 4: Relationship between interior space elements and design requirements in pediatric hospital settings

Interior Space Design Elements	Design Requirements In Pediatric Hospital Settings						
	Sense Of Control	Social Support	Positive Distractions	Sensorial Dimension	Age Appropriate Environment	Security And Safety	
Color							
Form							
Lighting							
Texture							

Interior Space Design Elements are defined according to children’s psychological needs within pediatric hospital environment in order to create positive environment due to support children’s wellbeing and to identify the most significance element. Form has the most important role in defining the six requirements, light is the second significance characteristics then color and texture.

To achieve a holistic healing environment in children hospital spaces all the design guidelines mentioned above: sense of control, social support, positive distractions, sensorial dimension, age appropriate environment, security and safety, should be taken into consideration as they all have a large impact on children psychology and effect positively on their wellbeing.

The social support need to design, comfortable chairs to sit on, sleeping rooms, living rooms and meditation rooms where family can rest. There should be a family lounge

to relax, to provide a kind of family atmosphere and access to privacy at the same time, to allow social interaction with parents and other opportunities for mutual support. Facilities need a seat that opens out to a bed, allowing parents to stay with the sick child at all times. With playrooms, study rooms, and lounges are specially designed to facilitate communication and interaction between them.

Although, the environment of pediatric should be readable to children with the use of colors and understandable banners. And it must contain elements of imagination to provide children with a way to overcome their fears and encourage them to dream to conquer their illness.

The quality of the acoustic environment is cited as a significant factor by children when asked about their experiences of healthcare (van Staa et al 2011, Curtis 2007, NHS Estates 2004), with elevated levels of noise being a major dislike, particularly at night time (Herbert et al 2004, Linder and Christian 2011). The use of ceiling tiles can be used to absorb sound, particularly in long, wide corridors that traditionally have 'hard hygienic floors and wall coverings', which can help to control the buildup of noise (Anonymous 2011). Ceilings can also help to reduce transmission of noise between rooms, thereby promoting privacy, confidentiality and levels of concentration (Anonymous 2011).

A sense of security can be enhanced by placing rooms or directing furniture for the baby way whether leaning to the wall, instead of the middle of the room, when people enter the room they see the child directly from the front better than to come from behind, as well as playrooms, have to put this fact under consideration.

Table 5: Summarize of the design requirement in pediatric hospital settings

	Conditioning factors	Prevention measures	Design guidelines
Sense of control	Way finding Level of privacy Personalization	Provide patient with choice	
Social support	Family Friends and peers	Provide space for meeting moments Allow parents full time stay	Design different social spaces Rooms, lounges and day rooms Provide movable furniture Incorporate an adequate bed, bathroom and locker for parents overnight. Provide a family kitchen and laundry room to fulfill parents basic needs
Positive distraction	Playing Education Art Nature	Enhance interaction with environment Improve children understanding of the hospital Distraction from illness Keep patients acquainted with school subject Absence of therapeutic effects	Design playrooms with toys and games Provide classrooms fully equipped Provide rooms with an art cart Viewing gardens through window Raised bed gardening
Sensorial dimension	Light Noise	Reduce pain and stress	Building orientation Extensive use of windows Avoid visual barriers Provide single rooms Choices for high absorbing ceiling tiles Eliminate noise source
Age appropriate environment		Divide children based on their age	Design Low Ceiling Heights In Alcoves And High Ceiling For Adults Areas Lower Windows And Mirrors To A

			Position Where Children Can See Provide A Place For Own Personalization Include A Place For Studying, Entertainment And Storage Near Each Bed
Security and safety	Parents presence Possibility to keep personal belongings		Decentralize nurse station Reduce visual barriers Design well located sinks Provide Adjustable Light Design Indoor Room Windows Provide Control Over Entrances And Exits Provide Single Rooms

The previous chapters outline the theoretical framework for the study based on the existing literature. It dealt with the literature on pediatric design requirement, interior space identity, conceptualizing the needs of children and the holistic healing environment dimension. In the next chapter, the thesis will attempt to test the aforementioned theories on the link between children's needs and the healing environment at Queen Rania`s children`s hospital. the goal is to discover a more comprehensive account of factors to be taken into consideration in relation to the hospitalization experiences of children and to develop consideration relevant to the present case study.

Chapter 4

EVALUATION OF SELECTED CASE STUDY

This chapter presents the research case study, which is used in this study in detail. The first section presents an overall view of what is done in this research. The second section shows the contexts of this study. The third section illustrates the data sources that are used in this study. The fourth section defines the data collection instruments and data analysis procedures. Finally, the results are given.

4.1 Overall Design of the Study

The main aim of this case study is to evaluate three parts in Queen Rania Hospital (inpatient rooms, corridors, play areas).

As a research design, a mixed methods approach is used, where both qualitative and quantitative approaches are incorporated. The study integrates two different ways of collecting data in order to provide a more complete understanding of the research problem. These are data collected from on-site observation done by the researcher (qualitative), and information gathered from doctors and parents obtained through a structured questionnaire survey (quantitative).

Prior to the collecting forms of data, the researcher scanned relevant documents in literature. This process helped the researcher identify the key-issues needed to evaluate hospital environment case through the design requirements and children's needs as

covered in the literature. The figure below shows a schematic explanation of the research design:

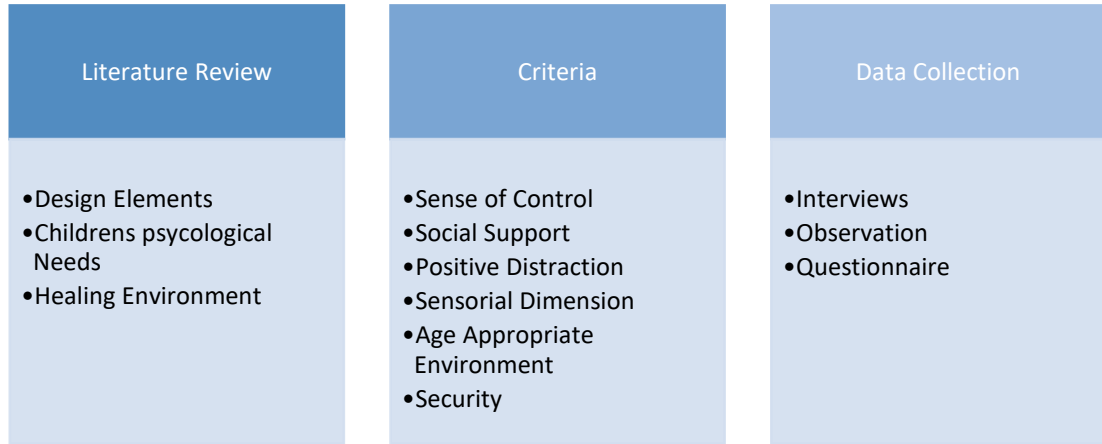


Figure 39: Case Study Process

4.2 Background of Queen Rania Hospital

The Queen Rania Al Abdullah Children's hospital situated in Amman, Jordan. It is the first specialized medical center for children in Jordan. It is characterized by the construction of modern world-class standards as well as renowned medical technology and medical staff, which are of the highest scientific excellence and efficiency.



Figure 40: Queen Rania Hospital for Children (URL 34)

The establishment of the Queen Rania Hospital was an urgent necessity to raise the medical services for the children of Jordan.



Figure 41: Entrance of Queen Rania Hospital (URL 35)

The hospital was constructed to improve the quality of medical care provided to children by creating their own hospital and to be an educational and referral center for difficult cases in pediatric medicine and surgery in the armed forces in particular and the Kingdom in general.

- The establishment of operating rooms and beds for children's intensive care, which reduces the pressure on the operations of the hospital and the waiting lists of operations in it.
- Providing a distinctive and advanced medical service for bone marrow Transplantation, liver, cochlea, kidney, eye surgery and endoscopic surgery.

There is no special place for cancer patients and chemotherapy because their immunity is low.

- The number of reviewers (the number of child clinic auditors increased from 90,000 annually).

- Meet the basic requirements of workers, sick children, companions and visitors and provide them with the necessary facilities.

Queen Rania Children's Hospital was built on an area of 43000 m² including the hospital building and accompanying foreign works. Hospital capacity 200 beds distributed as follows: 168 beds spread over three floors and 6 sections. 18 beds for intensive care 14 Incubator Taking into account the privacy of the child and the facility where every 28 beds are considered a department and the family is organized within each section as follows: 2 Insulation 4 Special 6 beds divided into three rooms 16 beds spread over four rooms.

The hospital has different medical service departments:

1. Neurology department
2. Psychological and social recovery department
3. Supply divisionary
4. Nutrition Department
5. Gastrointestinal department
6. Audiology Department
7. Chest section
8. Intensive care department
9. Ophthalmology department
10. Glands department
11. Immunology, arthritis and allergies department
12. Metabolic disease department
13. Hematology and oncology department
14. Nephrology Department



Figure 42: Queen Rania Hospital (URL 36)

The colors of the walls on the hospital floors are taken from the colors of nature so that the leveling floor takes the color of the land, the ground floor the color of the sea and the first floor the life of the animal, the second floor the life of the plant and the third floor the color of the sky .There are murals on the three floors inspired by the life of nature and coordinated in color.

4.3 Data Analysis Method

After collecting data from the literature, this study has created its own criteria for the evaluation of the hospital environment. Based on these criteria, on-site observation, interviews, and questionnaire were done by the researcher by visiting the Neurology and immunology department at Queen Rania hospital.

Firstly, informal interviews with children patients were done inside the playrooms to facilitate communication between the researcher and children. They were asked a number of questions. The questions are:

- What do you feel when you stay at hospital?
- Do you prefer single or multiple occupancy rooms?
- If you have a chance to add and eliminate an element from this hospital, what you will add and eliminate?

After the interviews, the researcher collected the data in two visits during July 2017, the observation were grouped according to the implication of the design which had been found in the literature. The first visit involved an informal approach, including exclusive observation. The visit was guided by the head of the immunology department, where it was possible to take the impression of the quality of the wards. The second visit allowed a general understanding of the space quality. Firstly the observation results are presented and following this the questionnaire results are given.

Regarding a more profound analysis, three relevant spaces in the hospital were selected, to provide further investigations about their functions. The selection was based on the importance of these spaces for the children perception. The first selected place which has a connection to the home environment is provided by the space where the patient most frequently stay (Rooms), which considered the space where they should have more control, personalization, and family support. Moreover, hallways connect the patient with other spaces (rooms, exam rooms, outside, playroom, etc.) so it has an impact on children's feeling. Finally, the last space selected was the play area, which represents a specific characteristic of pediatric hospitals and at the same time present a strong connection with the social areas.

The data which obtained from hospital ward observation and children experiences were analyzed, with respect to the main aim of this study. The children’s interviews results were used to shape the conceptual framework for the observation.

Although, differently structured questionnaire with 14-17 questions (close-ended and open-ended), was distributed to the doctors and the parents of the inpatient children, 30 questionnaires for doctors and 20 for parents. The type of questions focused on personal experience but also on adult’s perspective of what children’s perceive and feel about the space. The main idea of these questionnaires was to confront adults and children’s opinion, but at the same time evaluate the hospital quality in serving the users. Their answers have an important contribution to this research.

Table 6: The questionnaire distribution number

	Doctors	Parents
Immunology department	15	10
Neurology department	15	10
	30	20

In general there were 26 females and 24 males, who participate in this research.

Their ages between 27 to 50 years. After collecting the data through the questionnaire the results were put in tables and graphs in Microsoft excel program to provide a better presentation.



Figure 43: Queen Rania Hospital Second Floor Plan

4.4 Data Analysis

4.4.1 Observations of Patients Rooms

The patient rooms are one of the most important parts in the hospital. In this space, patients spend most of their time during hospitalization. Previously, the different influencing factors for example the use of single bedrooms as a design guideline. It was considered to be an advantage in improving privacy, providing better family accommodation, reducing noise, lowering the risk of infection spread and reducing the number of transfers and relative medication errors.

However, there is no agreement regarding the choice between single or shared bedrooms. Van Aken (1994) pointed out as potential disadvantages of single bedrooms, the increase of construction costs; extensive space requirements; decreased ability for nurses to visually monitor multiple patients at the same time; reduce social interaction between patients and staff; and, the increased distance between patients, which results in longer walking distances and reduced nursing efficiency. However, the majority of these statements are being refuted, and single rooms are the actual trend in the hospital design. Van Aken (1994) in the conclusion of his research suggested that the big initial investment in construction was likely to produce a positive return,

over the hospital lifespan, since single rooms would reduce the operational costs of infection reduction. Moreover, Ploeg (1988) suggested that the predicted better social support provided in multi-bed rooms does not occur, since roommates are frequently linked with loss of privacy, noise, worsened sleep, unfriendliness or serious illness. Lastly, research has proved that single rooms do not require higher nursing staff number or an increase in nurse-patient ratios (Hendrich, Fay and Sorrels 2004), and even, health care professionals seem to have more private and focused consultations in this model (Ulrich 2003).

More research and evidence in this topic is required to draw a clear conclusion of whether single or shared-bedrooms are the most adequate. Meanwhile, the combination of both single rooms and multiple is being discussed. The idea of 'one room does not fit all' reveals the individual user characteristics, proclaiming an empowerment of the patient, who can choose the model that suits him/her better. Along with the power of choice and the provision of an adequate environment in the bedroom, independently of its typology, came the design guidelines and important room elements.

The design guideline for patient room:

1. Select sound absorbing materials in the patient rooms.
2. Include picture boards, shelves and lockable storage for personal belongings (Shepley Et Al.,1998).
3. Provide appropriate bed and bathroom for parents stay overnight (olds And Daniel, 1987).
4. Provide a curtain to improve privacy (Ulrich`s, 2000).
5. Make available an art cart and painting (Eisen Et Al., 2008).
6. Provide outside window view (Ulrich`s, 1984).
7. Provide control over temperature and provide a presence light.

Overall, a hospital room should gather safety, control, positive distraction, sensorial dimension, age appropriate and security. It's extremely important to offer a great quality in the inpatient room space where they are going to spend the majority of their time.

Observation results

In queen Rania hospital, the patient rooms are mainly divided by age. Even though there is a large number of single room's layout, the number of common bedrooms increases with age, as parental dependence decreases. One of the important characteristics that wards have is the strategic placement of the nurse station in the center of the ward so children will have a safety and security sense.

The following show the selected rooms for observation process from both departments (Immunology, Neurology), room number 1 from the neurology department and 2 from the immunology department. Consequentially room 1 is a single room, room 2 is

multiple occupancy rooms. Although, it should be mentioned that the rooms are occupied by children between (5-11) years old. To evaluate these rooms the researcher focused on essential dimension such as sense of control, social support, positive distraction, sensorial dimension, age appropriate and security.

In order to do so each room has an observation table, which present the initial data collection such as number of children in room, their gender, the existing elements and some photos. Then through the knowledge and findings within literature review an evaluation table prepared to examine the quality of inpatient children's rooms in term of design requirements.

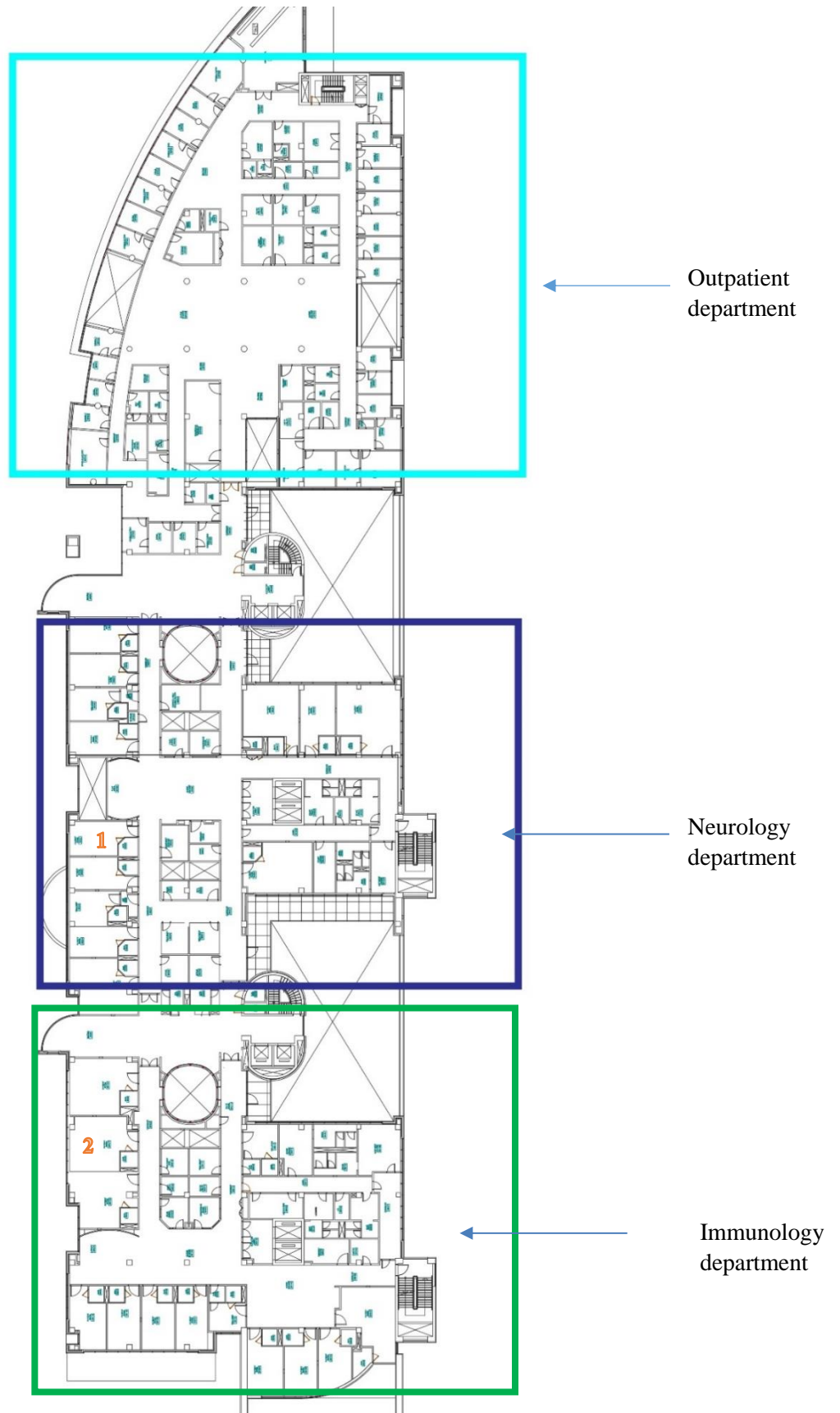
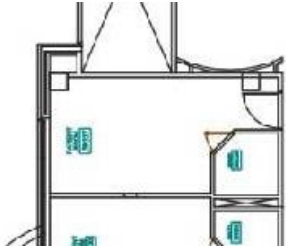


Figure 44: Second Floor Plan of Queen Rania Hospital with Pointing to the Two Selected Departments

Observation No #1

Table 7: Observation of room No: 1

<i>Room NO</i>	<i>1</i>	<i>Room plan</i>
<i>Department</i>	Neurology	
<i>Number of patient</i>	1	
<i>Number of beds</i>	1	
<i>Gender of children</i>	Boy	
<i>Note</i>	Room number one is a single room occupancy.	
<i>Furniture</i>	1 bed 1 sofa 1 chair 1 table 1 closet	

Room photos taken by Author



Evaluation and analysis of observation No 1

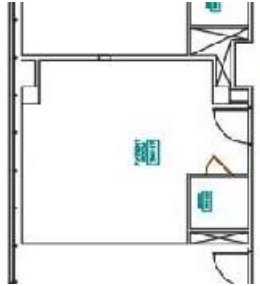
Analyzing of evaluation table based on six key dimensions:

Table 8: Evaluation of room No: 1 (√ exist, × not exist)

<i>Interior space elements</i>	Design requirements	Indicators	Options		
<i>Form & Light</i>	Sense Of Control	Privacy	Provide curtains	√	
			Single rooms	√	
			Provide Adjustable Light	√	
		Personalization	Include pictures boards	×	
			Provide lockable storage and shelves for personal belongings	√	
<i>Form & Light</i>	Social Support	Social Spaces	Provide Movable Furniture	√	
			Incorporate An Adequate Bed, Bathrooms, And Locker For Parents Overnight	×	
			Provide A Family Kitchen And Laundry Room To Fulfill Parents Basic Needs	×	
<i>Form, color, texture and lighting</i>	Positive Distractions	Playing	Provide A Space For Play In Bedrooms	×	
		Education	Provide a space for study in bedrooms	×	
		Arts	Provide Rooms With An Art paintings	√	
		Nature	View Garden Through Window	√	
			Raised Bed Gardening	×	
<i>Form, color, texture and lighting</i>	Sensorial Dimensions	Sense Of Touch		Provide different texture	×
		Vision	Day Light	Extensive Use Of Windows	√
			Artificial Light	Avoid Visual Barriers	√
		Acoustics		Provide Single Rooms	√
				Eliminate Noise Sources	√
<i>Form, texture and color</i>	Age Appropriate Environment			Design Low Ceiling Heights In Alcoves And High Ceiling For Adults Areas	×
				Lower Windows And Mirrors To A Position Where Children Can See	×
				Provide A Place For Own Personalization	×
				Include A Place For Studying, Entertainment And Storage Near Each Bed	×
<i>Form & lighting</i>	Security & safety			Provide Adjustable Light	√
				Design Indoor Room Windows	×
				Provide Control Over Entrances And Exits	√
				Provide Single Rooms	√

Observation No #2

Table 9: Observation of room No: 2

<i>Room NO</i>	<i>2</i>	<i>Room plan</i>
<i>Department</i>	Immunology	
<i>Number of patient</i>	2	
<i>Number of beds</i>	2	
<i>Gender of children</i>	Two girls	
<i>Note</i>	Room number two is a multiple occupancy room.	
<i>Furniture</i>	2 beds 1 Chairs 1 table 2 closets	

Room photos taken by Author



Evaluation and analysis of observation No# 2

Analyzing of evaluation table based on six key dimensions:

Table 10: Evaluation of room No: 2 (√ exist, × not exist)

<i>Interior space elements</i>	Design requirements	Indicators	Options		
<i>Form & Light</i>	Sense Of Control	Privacy	Provide curtains	√	
			Single rooms	×	
			Provide Adjustable Light	√	
		Personalization	Include pictures boards	×	
			Provide lockable storage and shelves for personal belongings	√	
<i>Form & Light</i>	Social Support	Social Spaces	Provide Movable Furniture	√	
			Incorporate An Adequate Bed, Bathrooms, And Locker For Parents Overnight	×	
			Provide A Family Kitchen And Laundry Room To Fulfill Parents Basic Needs	×	
<i>Form, color, texture and lighting</i>	Positive Distractions	Playing	Provide A Space For Play In Bedrooms	×	
		Education	Provide a space for study in bedrooms	×	
		Arts	Provide Rooms With An Art paintings	×	
		Nature	View Garden Through Window	√	
			Raised Bed Gardening	×	
<i>Form, color, texture and lighting</i>	Sensorial Dimensions	Sense Of Touch		Provide different texture	×
		Vision	Day Light	Extensive Use Of Windows	√
			Artificial Light	Avoid Visual Barriers	√
		Acoustics	Provide Single Rooms	×	
			Eliminate Noise Sources	√	
<i>Form, texture and color</i>	Age Appropriate Environment		Design Low Ceiling Heights In Alcoves And High Ceiling For Adults Areas	×	
			Lower Windows And Mirrors To A Position Where Children Can See	×	
			Provide A Place For Own Personalization	√	
			Include A Place For Studying, Entertainment And Storage Near Each Bed	×	
<i>Form & lighting</i>	Security & Safety		Provide Adjustable Light	√	
			Design Indoor Room Windows	×	
			Provide Control Over Entrances And Exits	√	
			Provide Single Rooms	×	

4.4.2 Observation of Corridors

It is essential to provide patients through a friendly space, offering spaces for waiting, meeting and socialization, and provide easy way findings (NHS Estates 2004). The design of the corridors area is particularly important since it contributes the connection between different areas. Additionally, users can judge the quality of clinical care based on hospital's appearance (NHS Estates 2004).

Nevertheless, the corridors as well on rooms has effects on patient's perception Coad and Coad (2008) said that "Preference appears to be for warm, welcoming and inviting colors, such as warm blue, pastel green and pale to mid yellow or pale orange" (Curtis 2007; Coad and Coad 2008). Nevertheless, children use corridors as a means of socialization, especially, if there is not appropriate facilities (Curtis 2007). Visual arts is important to enhance feelings of well-being and to support the healing environment (Paintings in Hospitals 2015).

As a design guideline for corridors in pediatric hospital setting:

1. Select sound absorbing materials in corridors.
2. Make available an art cart and painting.
3. Visual access to nature.
4. Using plants and picture of nature
5. Using windows in corridors.

Overall, a corridor of hospital should gather safety, control, positive distraction, sensorial dimension, age appropriate and security.

Observation results

In queen Rania hospital, every floor has three different departments. The plan of the hospital near the courtyard plan type which provides good patient observation when they transfer from space to another using the corridors. The success of this type depends on the amount of daylight available and the degree of privacy obtainable. All rooms have a large windows so they have a beneficial daylight. One of the important characteristics that wards have is the strategic placement of the nurse station in the center of the ward.

In order to evaluate the selected corridors spaces, the researcher prepared observation table for corridors in both departments, the immunology department, and neurology department. To evaluate the corridors the researcher focused on essential dimensions such as the sense of control, social support, positive distraction, sensorial dimension, age-appropriate, and security. Through the knowledge and findings within literature review, an evaluation table prepared to examine the quality of corridor in term of design requirements.

Evaluation and analysis of observation No# 3

Analyzing of evaluation table based on six key dimensions:

Table 11: Observation of corridor No: 1

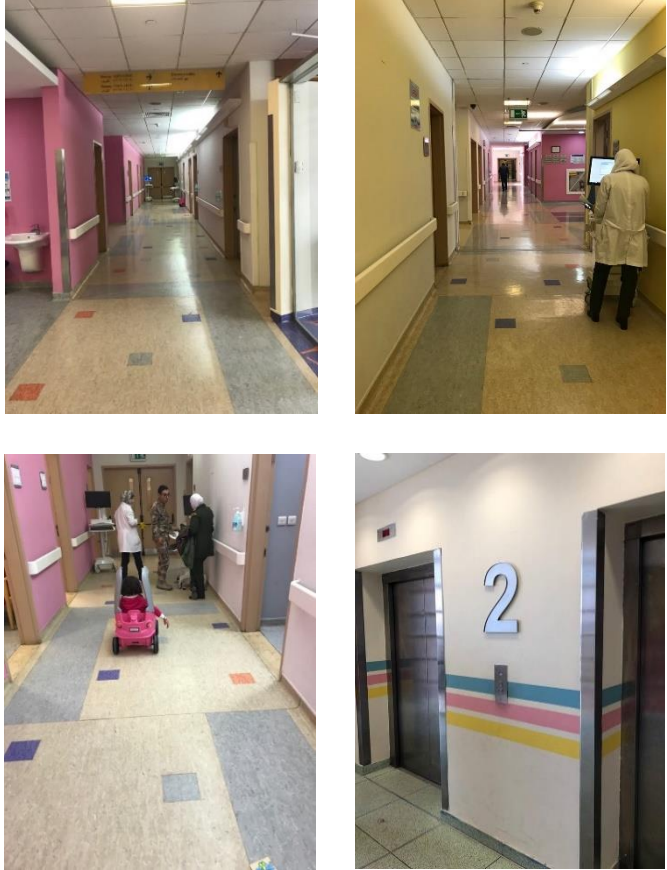
<i>Corridor Observation 1</i>	
<i>No</i>	
<i>Department</i>	Neurology
<i>Photos by Author</i>	

Table 12: Observation of corridor No: 1 (√ exist, × not exist)

<i>Interior space elements</i>	<i>Design requirements</i>	<i>Indicators</i>	<i>Options</i>	
<i>Form & Light</i>	<i>Sense Of Control</i>	Way Finding	Design Clear Pathway	√
			Provide Elevator With Visibility	√
			Locate Landmarks In Strategic Places	√
			Create Differentiated Ward-Themes For Artwork	×
			Used Different Graphics And Color For Sign	×
	Privacy	Closed Ward Corridor	√	
	<i>Social Support</i>	Social Spaces	Provide Movable Furniture	×
			Waiting Rooms, Lounges, Dayrooms	√
	<i>Positive Distractions</i>	Arts	Provide Art Paintings	×
		Nature	View Garden Through Window	×
Natural Elements			×	
<i>Sensorial Dimensions</i>	Sense Of Touch	Provide Different Texture	×	
	Vision	Day Light	Extensive Use Of Windows	×
		Artificial Light	Avoid Visual Barriers	√
	Acoustics	Carpets For Reducing Foot Sounds	×	
		Eliminate Noise Sources	√	
<i>Age Appropriate Environment</i>		Design Low Ceiling Heights In Alcoves And High Ceiling For Adults Areas	×	
		Lower Windows And Mirrors To A Position Where Children Can See	√	
		Include A Place For Entertainment	√	
<i>Security and Safety</i>		Provide Adjustable Light	√	
		Centralize Nurse Station	√	

Evaluation and analysis of observation No# 4

Analyzing of evaluation table based on six key dimensions:

Table 13: Observation of corridor No: 2


<i>Corridor</i>	<i>Observation</i>
<i>No</i>	
<i>Department</i>	<i>Immunology</i>
<i>Photos by Author</i>	

Table 14: Evaluation of corridor No: 2 (√ exist, × not exist)

<i>Interior space elements</i>	Design requirements	Indicators	Options		
<i>Form & Light</i>	<i>Sense Of Control</i>	Way Finding	Design Clear Pathway	√	
			Provide Elevator With Visibility	√	
			Locate Landmarks In Strategic Places	√	
			Create Differentiated Ward-Themes For Artwork	√	
			Used Different Graphics And Color For Sign	×	
	Privacy	Closed Ward Corridor	√		
<i>Form & Light</i>	<i>Social Support</i>	Social Spaces	Provide Movable Furniture	×	
			Waiting Rooms, Lounges, Dayrooms	√	
<i>Form, color, texture and lighting</i>	<i>Positive Distractions</i>	Arts	Provide Art Paintings	×	
		Nature	View Garden Through Window	×	
			Natural Elements	×	
<i>Form, color, texture and lighting</i>	<i>Sensorial Dimensions</i>	Sense Of Touch	Provide Different Texture	×	
		Vision	Day Light	Extensive Use Of Windows	×
			Artificial Light	Avoid Visual Barriers	√
		Acoustics	Carpets For Reducing Foot Sounds	×	
			Eliminate Noise Sources	√	
<i>Form, texture and color</i>	<i>Age Appropriate Environment</i>		Design Low Ceiling Heights In Alcoves And High Ceiling For Adults Areas	×	
			Lower Windows And Mirrors To A Position Where Children Can See	√	
			Include A Place For Entertainment	√	
<i>Form & lighting</i>	<i>Security & safety</i>		Provide Adjustable Light	√	
			Centralize Nurse Station	√	

4.4.3 Observation of Play Rooms

The play room space is a special characteristic of the pediatric hospitals and it has a strong connection to the social interaction which helps children to be in positive interrelation during their exists in hospital. (Bishop 2014)

Children will try and find “commonality in the hospital to their home environment” (Coad and Coad 2008). To achieve this, children try to incorporate home activities into hospital. (Jensen et al 2012). Children in different age groups want to have such activities as computers, movies, games, and music, in the hospitals rooms (Coyne and Kirwan 2012).

“Second to the continuing presence of the mother or another supporting figure, play can be an important factor in diminishing the harmful effects of stress in hospitalized children” (MacCarthy, 1979)

Evaluation and Analysis of Observation No# 5

Analyzing of evaluation table based on six key dimensions:

Table 15: Observation of playroom No: 1


<i>Playroom Observation 1</i>	
<i>No</i>	
<i>Department</i>	<i>Neurology</i>
<i>Photos by Author</i>	

Table 16: Evaluation of playroom No: 1 (√ exist, × not exist)

<i>Interior space elements</i>	Design requirements	Indicators	Options		
<i>Form & Light</i>	<i>Sense Of Control</i>	Way Finding	Design Clear Pathway	√	
			Create Differentiated Themes Of Artwork	√	
		Privacy	Semi-Close Play Areas	√	
<i>Form & Light</i>	<i>Social Support</i>	Social Spaces	Provide Movable Furniture	√	
			Waiting Rooms, Lounges, Dayrooms	√	
<i>Form, color, texture and lighting</i>	<i>Positive Distractions</i>	Arts	Provide Art Paintings	√	
		Nature	View Garden Through Window	√	
			Natural Elements	×	
<i>Form, color, texture and lighting</i>	<i>Sensorial Dimensions</i>	Sense Of Touch		Provide Different Texture	×
		Vision	Day Light	Extensive Use Of Windows	√
			Artificial Light	Avoid Visual Barriers	√
		Acoustics		Carpets For Reducing Foot Sounds	×
<i>Form, texture and color</i>	<i>Age Appropriate Environment</i>	Eliminate Noise Sources		√	
		Design Low Ceiling Heights In Alcoves And High Ceiling For Adults Areas		×	
		Lower Windows And Mirrors To A Position Where Children Can See		√	
		Include A Place For Entertainment		√	
<i>Form & lighting</i>	<i>Security & security</i>	Provide A Place For Own Personalization		√	
		Provide Adjustable Light		√	

Evaluation and analysis of observation No #6

Analyzing of evaluation table based on six key dimensions:

Table 17: Observation of playroom No: 2

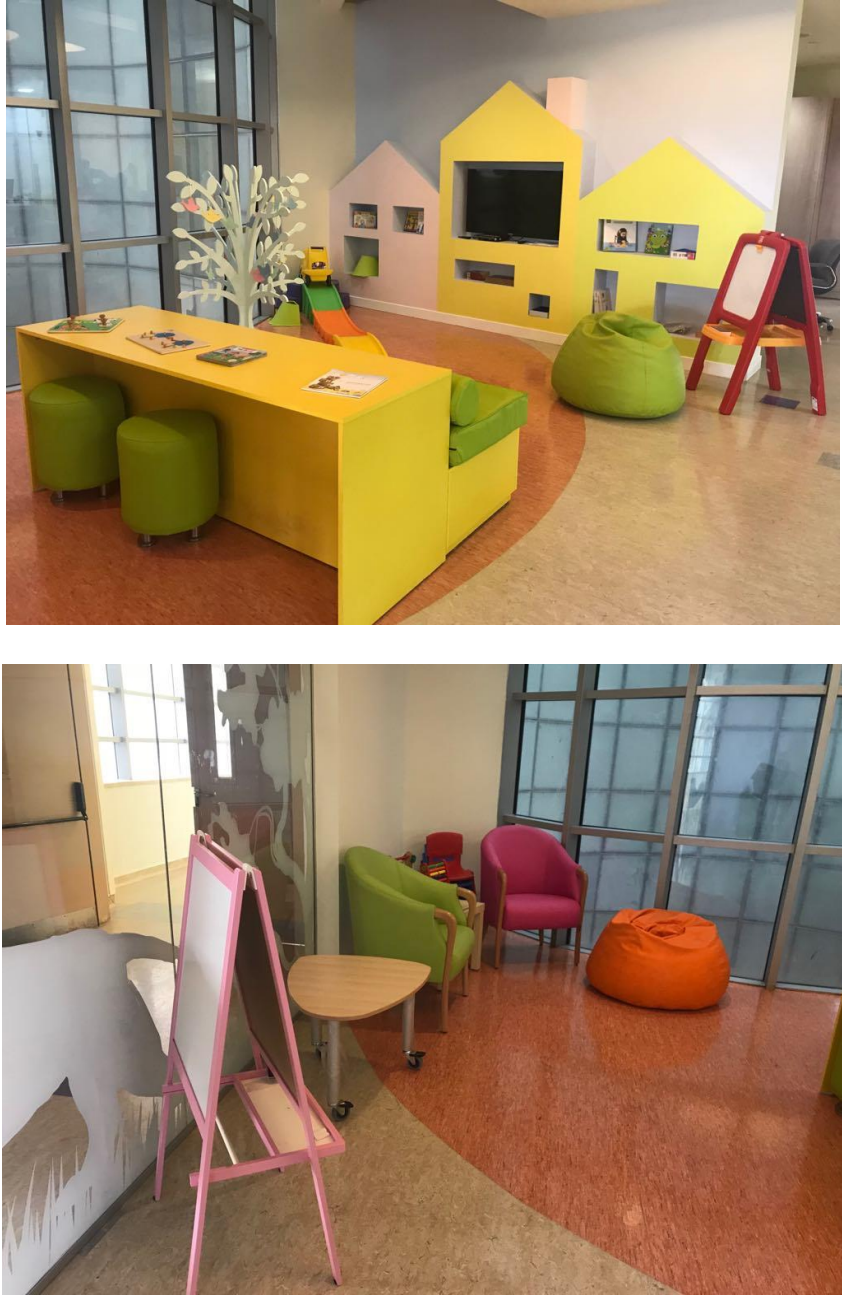
<i>Playroom</i>	2
<i>Observation No</i>	
<i>Department</i>	<i>Immunology</i>
<i>Photos by Author</i>	

Table 18: Evaluation of playroom No: 2 (√ exist, × not exist)

<i>Interior space elements</i>	<i>Design requirements</i>	<i>Indicators</i>	<i>Options</i>		
<i>Form & Light</i>	<i>Sense Of Control</i>	Way Finding	Design Clear Pathway	√	
			Create Differentiated Themes Of Artwork	√	
		Privacy	Semi-Close Play Areas	√	
<i>Form & Light</i>	<i>Social Support</i>	Social Spaces	Provide Movable Furniture	√	
			Waiting Rooms, Lounges, Dayrooms	√	
<i>Form, color, texture and lighting</i>	<i>Positive Distractions</i>	Arts	Provide Art Paintings	√	
		Nature	View Garden Through Window	√	
			Natural Elements	×	
<i>Form, color, texture and lighting</i>	<i>Sensorial Dimensions</i>	Sense Of Touch		Provide Different Texture	√
		Vision	Day Light Artificial Light	Extensive Use Of Windows	√
				Avoid Visual Barriers	√
		Acoustics		Carpets For Reducing Foot Sounds	×
				Eliminate Noise Sources	√
<i>Form, texture and color</i>	<i>Age Appropriate Environment</i>	Design Low Ceiling Heights In Alcoves And High Ceiling For Adults Areas		×	
		Lower Windows And Mirrors To A Position Where Children Can See		√	
		Include A Place For Entertainment		√	
		Provide A Place For Own Personalization		√	
<i>Form & lighting</i>	<i>Security & Safety</i>		Provide Adjustable Light	√	

It is vital to provide patient children with a child-friendly space, offering spaces designed with the six requirements: Sense of Control, Social Support, Positive Distractions, Playing, Education, Art, and Nature, Sensorial Dimension, Age Appropriate Environment, Security and safety. According to the observations in the selected spaces, the both single and multiple occupancy inpatient rooms in queen Rania hospital provide a sense of control, such as the room contain certain to offer privacy for children's ,also they provide adjustable light through large windows . On the other hand, there was absence for some design requirement like social support, positive distraction, and age appropriate environment.

Queen Rania hospital corridors didn't offer all the design requirement. Thus one of the important points for designing the corridor in children hospital is providing readable signs for children aimed to support them with the way findings. And absence of the positive distractions (arts and nature). Conversely, the corridors contain playing features like a bike for helping children in their healing process.

In the observations of the play area the researcher found that it is the most essential part inside queen Rania hospital because it helps children's express their needs and its cover almost all the design requirements.

4.4.4 Questionnaire

Doctor's questionnaire

In order to test the validity of these observation, some question were asked to the doctors. Overall, there were 18 questions addressed to the doctors, in order to understand children experience in hospital environment. These were:

1. Do you agree that children have difficulty with hospital environment?
2. Do you agree that the hospital environment has impact on children's behavior?
3. Do you agree that the child patient experience is an essential element of designing hospital spaces?
4. Do you agree that there is a relationship between the hospital design and consequent anxiety felt by patients?
5. Do you think that kids prefer single or multiple occupancy room in the hospital?
6. Do you agree that playground space and other kid's activity spaces can improve kid's experience in the hospital environment?
7. Do you agree that Color play a part in the healing process and add a sense of well-being?
8. Do you agree that the quality of natural or non-natural light has an essential impact on patients healing processes?
9. What do you think about the natural light in this hospital building?
10. In terms of walking distance, do you feel that you have to walk too much between your services' spaces in the hospital?
11. Do you feel able to keep your eyes on the patients all the time?
12. Do you think that children's have enough space in their rooms?
13. Do parents have enough Conditions to sleep in the hospital?
14. What kind of spaces and activities this hospital have to distract children from their illness?
15. In your opinion, which space in this hospital is the most child-friendly? Why do you think so?
16. What kids prefer to have in their rooms?

17. From your experience, order (from the most to the least) the following elements which leads to a healing environment for kids in hospital environment.

Sense of Control, Social Support, Positive Distractions (Playing, Education, Art, Nature), Sensorial Dimension, Age Appropriate Environment, Security.

All the results to these questions are presented below, one by one, in graphic forms.

1. Do you agree that children have difficulty with hospital environment?

According to the results, out of 30 doctors, 4 doctors mentioned that they are strongly agree children difficulty in hospital environment, 18 doctors agree, and 8 doctors disagree. Consequently, 60% of doctors agreed that children face difficulties in hospital environment.

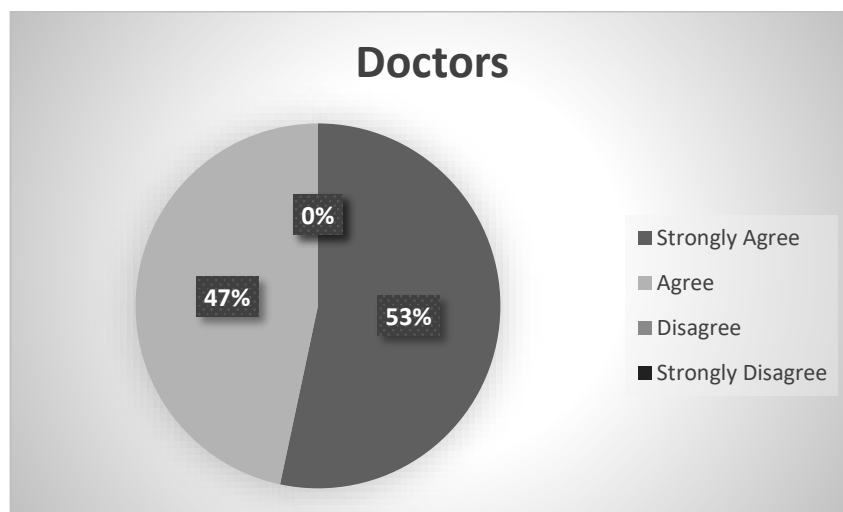


Figure 45: Doctors Answers about Children Difficulty in Hospital Environment

2. Do you agree that the hospital environment has impact on children’s behavior?

According to the results, out of 30 doctors, 16 doctors mentioned that they are strongly agree that hospital environment has impact on children’s behavior , and 14 doctors agree. As a result, 53% of doctors strongly agreed that the hospital environment has impact on children’s behavior.

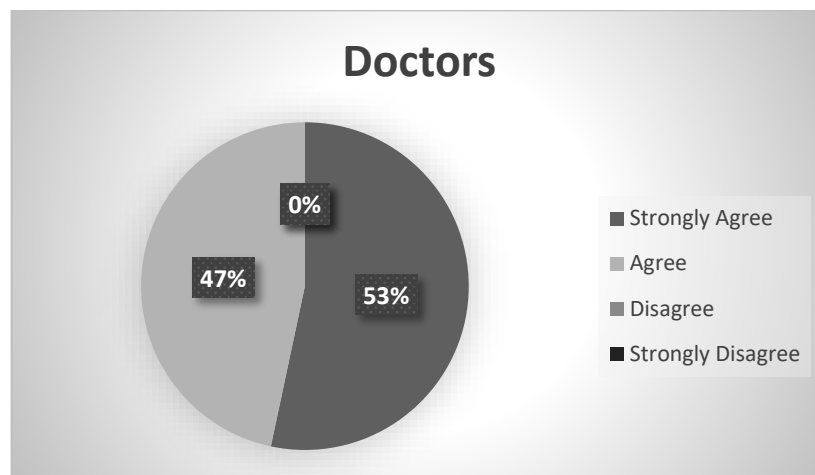


Figure 46: Doctor’s Answers about the Impact of Hospital Environment on Children Behavior

1. Do you agree that the child patient experience is an essential element of designing hospital spaces?

As a results, out of 30 doctors, 9 doctors mentioned that they are strongly agree that the child patient experience is an essential element of designing hospital spaces, and 21 doctors agree. As a result, 70% of doctors agreed that children experience is an essential elements for designing the hospital spaces.

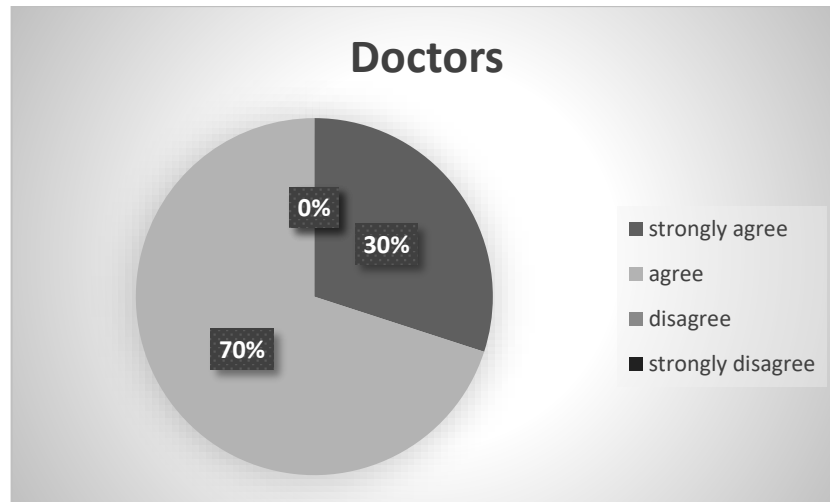


Figure 47: Doctors Answers about the Children Experience as an Essential Element for Designing Hospital

2. Do you agree that there is a relationship between the hospital design and consequent anxiety felt by patients?

As a results, out of 30 doctors, 18 doctors mentioned that they are strongly agree the relationship between the hospital design and consequent anxiety felt by patients, 12 doctors agree, and 2 doctors disagree . As a result, 56% of doctors strongly agree that there is a relationship between the hospital design and consequent anxiety felt by patients.

3. Do you think that kids prefer single or multiple occupancy room in the hospital?

According to the results, out of 30 doctors, 26 doctors mentioned that kids prefer multiple room, on the other hand, 4 doctors mentioned that children prefer single room. So, 87% of the doctors think children prefer multiple room for this group age.

4. Do you agree that playground space and other kid's activity spaces can improve kid's experience in the hospital environment?

According to the results, the half number of doctors agree and the other half strongly agree that the playground space improve children perception in the hospital environment.

5. Do you agree that Color play a part in the healing process and add a sense of well-being?

As a results, 16 doctors agree that color have impact on children's well-being and 14 doctors strongly agree that. So 53% of doctors agree that color play part in the healing process.

6. Do you agree that the quality of natural or non-natural light has an essential impact on patients healing processes?

As a results, out of 30 doctors, 17 doctors mentioned that they are agree that the quality of natural or non-natural has impacts on patients' healing processes, 8 doctors strongly agree, but 4 of them disagree and 1 doctor strongly disagree. As a result, 57% of doctors agree that there is an impact of natural or non-natural light on patients' healing processes.

7. What do you think about the natural light in this hospital building?

According to the results, out of 30 doctors, 13 doctors rated that natural light in hospital are very good, 13 doctors rate good, however, 2 of them was rated ordinary and 2

doctors rated bad. So, 87% of the doctors rated good and very good about the natural light in Queen Rania hospital.

8. In terms of walking distance, do you feel that you have to walk too much between your services' spaces in the hospital?

As a results, out of 30 doctors, 18 doctors answered No, and 12 of them answered yes, it shows that 60% of doctors felt that they do not walk too much between services spaces in hospital.

9. Do you feel able to keep your eyes on the patients all the time?

According to the results, out of 30 doctors, 18 doctors answered No, 8 of them answered Yes and 4 of doctors they mentioned that most of the times. So, it shows that 60% of doctors would not able to keep their eyes on the patients all the time.

10. Do you think that children's have enough space in their rooms?

As a results, out of 30 doctors, 26 doctors answered Yes, and 4 of them answered No, it shows that 87% of doctors think that children have enough space in their room.

11. Do parents have enough Conditions to sleep in the hospital?

As a results, out of 30 doctors, 24 doctors answered No, and 6 of them answered YES , it shows that 80% of doctors agree that parents don't have enough conditions to sleep in the hospital.

12. What kind of spaces and activities this hospital have to distract children from their illness?

According to this question the doctors demonstrated mostly on (playing area, social support, Television and cinema) as a positive distraction in hospital.

13. What kids prefer to have in their rooms?

As a results, out of 30 doctors, 17of them answered T.V, 7 doctors answered toys for children, 2 of them answered music, 3 doctors answered PlayStation and only 1 doctors answered art crafts. In this question the result show that most of the doctors demonstrate on the importance of having T.V in kid's room.

16. From your experience, order (from the most to the least) the following elements which leads to a healing environment for kids in hospital environment.

Sense of Control, Social Support, Positive Distractions (Playing, Education, Art, Nature), Sensorial Dimension, Age Appropriate Environment, Security.

In this question the result show that most of the doctors demonstrate on the importance of social support for children.

Parent's questionnaire

Also the researcher collected some information from parents about their child's needs and how he/she interact with hospital environment to understand their experience and working in the design through family and children participate.

Overall, there were 14 questions addressed to the parents, in order to understand children experience in hospital environment. The result of these questions are presented in the following table.

Table 19: Parent's answers for the questionnaire.

	Strongly Agree	Agree	Disagree	strongly Disagree
Do you agree that children have difficulty within the hospital environment?	12	8	0	0
Do you agree that the hospital wards environment has an emotional impact in child's behavior?	6	14	0	0
Do you agree that the child's patient experience is an essential element of improving the quality of space?	7	11	2	1
Do you agree that there is a connection between hospital design and children anxiety?	5	13	2	0
Do you agree that playground space and other child's activity area can	9	11	0	0

improve your child experience in hospital?				
Do you agree that color play a part in the healing process and add a sense of well-being?	7	9	4	0
What your child prefer single or multiple occupancy room in the hospital?	Single		Multiple	
	17		3	
What do you think about the natural light in the hospital building?	Very Good	Good	Ordinary	Bad
	0	4	13	3
What helps your child to stay calm during medical procedures? (For example: Distraction, music, lights, sounds and or touch....)?	Most of the parent's answers conclude a positive distractions (drawings, colors, play objects.....)			
In terms of walking distance, do you feel that you have to walk too much between your child room and others spaces in the hospital building?	78 % of parents answered yes			
Do you think that your child room in the hospital is convenient / suitable for your staying at night?	53 % of parents answered no			
Do you think that your child have enough space in his/her room?	64 % of parents answered yes			
In your opinion, which space is the most child-friendly in the hospital?	Most of the parent's answered play area			

<p>From your experience, order (from the most to the least) the following elements which leads to a healing environment for kids in hospital environment.</p> <p><i>Sense of Control, Social Support, Positive Distractions (Playing, Education, Art, Nature), Sensorial Dimension, Age Appropriate Environment, Security.</i></p>	<p>90% of the parent's ordered Social support as the most important requirements for children following with positive distraction , sensorial dimension, Age appropriate environment , Sense of control , Security</p>
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Through the doctors and parents answers, it was possible to identify which design requirement established in the queen Rania hospital design and which doesn't.

In the following table, from the results of the questionnaire the influencing factors was summarized in queen Rania hospital.

Table 20: The influencing factors in queen Rania hospital analysis through the questionnaire inside the selected spaces (√ exist, × not exist)

Selected spaces	Dimension of Indicators analysis		
Patient rooms	Sense Of Control	Way finding	√
		Privacy	√
	Social Support	Social Spaces	×
	Positive Distractions	Arts	×
		Nature	×
	Sensorial Dimensions	Day Light	√
Artificial Light		√	

	Age Appropriate Environment		×
	Security & safety		√
corridors	Sense Control	Of Way finding	×
		Privacy	√
	Social Support	Social Spaces	×
	Positive Distractions	Arts	×
		Nature	×
	Sensorial Dimensions	Day Light	√
		Artificial Light	
	Age Appropriate Environment		×
Security & safety		√	
playrooms	Sense Control	Of Way finding	√
		Privacy	√
	Social Support	Social Spaces	√
	Positive Distractions	Arts	×
		Nature	×
	Sensorial Dimensions	Day Light	√
		Artificial Light	
	Age Appropriate Environment		√
Security & Safety		√	

4.5 Development of Queen Rania Hospital

All the findings derived from the observation of the selected spaces were presented. Following the relevant questions that were asked of the doctors and patient parents through the questionnaire were given, with their results. This part consist of a development recommendation for Queen Rania children hospital.

The current study covers the fact that queen Rania hospital needs to be a more child-friendly environment to better patient out comings. As a development accommodation, Queen Rania hospital should add more elements to support the design requirement for children healing the environment. Clarifying that, a space for the family in every room should be enhanced like a suitable bed for their staying at night and a family kitchenette for patient whom staying for a longer time. Education facilities, (classroom, desk, technology, .etc) to provide the children with positive distractions. Also, the corridors in the hospital should have natural elements and paintings craft. Color of hospital environment ought to contain large amounts of primarily bright colors, which should have some variation in the environment.

Chapter 5

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

The main aim of this thesis was to maximize understanding of the children perception in pediatric hospital environment and classify the key considerations that support the pediatric environment and the contribution of these factors in children's perspective within their staying in pediatric hospital.

The research resided in revealing design decisions that could contribute both to help medicine in its role to cure disease, and offering the necessary psychological support for children perception. The design of pediatric hospital should respond to children's needs including the psychological needs. As an initial points, the children's needs was studied, in order to adapt to new requirements in designing children's hospital. Moreover, the specific case of children hospital Queen Rania hospital was pointed out.

Particularly, spaces seem to affect children in a different way. From the evidences collected, it was concluded that in fact design strategies do not only directly influence the disease through an improvement in hygiene, isolating contagious sick patients, but also indirectly through stress reduction. Stress seems to affect life quality and medical outcomes, which can be reduced by offering a homely, child-friendly and family-centered environment.

In the concept of holistic healing environment this study found six design requirements for the pediatric settings, these considerations should be noted: Control, social support, positive distraction, sensory dimension, age appropriateness, and security were analyzed as factors that had the greatest impact on the quality of hospital admission, thus highlighting relevant health impacts and design guidelines.

The personal experiences of all patients are connected to the organizational, physical, and social domains, which cumulatively comprise the socio-physical environmental components patients interact with. A patient's need for support, and interaction with, friends, and especially family are all included in social considerations. While most patients see the members of their family as their primary source of support. In terms of the physical environment, the important considerations include brightness, artwork, color, and aesthetics in general. Research shows that artwork, and color influence patients in their comfort and feeling, as well as their general perception of the environment as child-friendly.

A secondary consideration concerns patients' access to outdoor environments and contacts with nature, which is generally important for all patients. Also important is the age appropriate environment. Such factors include the age-appropriateness and volume of activities, the colorfulness and brightness of the environment, and friendly hospital personnel.

Findings reveal that some considerations relating to the physical environment also affect the children's comfort, such as being able to control light and noise levels. Ambient light and noise are known to be primary irritants for patients, especially those

sharing rooms. The ability to have greater control over these attributes has commonly been cited by patients as a reason for wanting a single room.

Being able to customize their bed space with items from home is also linked to patient comfort. Having some control over the aesthetics of the environment and surrounding themselves with personal objects and familiar faces from home makes the hospital environment itself feel homelier, which in turn makes the patients more relaxed and comfortable.

Patient comfort in the hospital environment is another factor that affects whether or not patients feel welcome in the environment. This can be improved through the use of brightness, color, and artwork. The influence of these factors depends on the patients' ability to maintain a positive mindset, which is another consideration in managing hospital time. Patients typically link their environment with their particular mood and evolving emotional needs.

A third strategy entails the ability to physically and socially 'escape' the ward environment. Playroom spaces are typically the most preferred escape destination due to their attractiveness, peacefulness, and their ability to increase feelings of imagination.

The physical environment also engages patients through the provision of visual interest. This visual interest varies with changes in the hospital's wall artwork. Patients suggest that this minimizes the repetitiveness of the environment and provides an imaginative distraction. Patients' ability to appreciate the variation in the artwork can be a helpful distraction and engage them overtime.

Overall, findings show that patient comfort, positivity, and engagement are influenced by their interaction with the physical environment, consequently affecting their general feeling of wellbeing.

5.2 Recommendation for further study

Therefore, this project can serve as an inspiration and a base for future investigations, namely:

1. Universal design of safety in pediatric hospital settings.
2. Study the actual need for school facilities in children's hospital settings and
3. Compare the impact of wards' division per age and per medical specialization.
4. Compare the room diversity according to hospitalization duration, with room standardization.
5. Focusing more in the social environment aspects in pediatric hospital settings for special needs children's.

REFERENCES

- Abbas, M. Y., & Ghazali, R. (2010). Healing environment of pediatric wards. *Procedia-Social and Behavioral Sciences*, 5, 948-957.
- Abercrombie, S. (1990). *A philosophy of interior design*. Routledge.
- Alder Hey Children's NHS Foundation Trust (2012) Alder Hey Strategic Plan: 2012/13 to 2-15/16. Alder Hey Children's NHS Foundation Trust.
- Altimier, L. B. (2004). Healing environments: for patients and providers. *Newborn and Infant Nursing Reviews*, 4(2), 89-92.
- Altman, I. (1975). *The Environment and Social Behavior: Privacy, Personal Space, Territory, and Crowding*.
- American Academy of Pediatrics, & American Academy of Pediatrics. (2015). *Media and children*. Elk Grove Village, IL: American Academy of Pediatrics.
- Ampt A, Harris P and Maxwell M. The health impacts of the design of hospital facilities on patient recovery and wellbeing: A review of the literature. 2008 Centre for Primary Healthcare and Equity, University of New South Wales, Sydney
- Ananth, S. (2008). Building healing spaces. *EXPLORE: The Journal of Science and Healing*, 4(6), 392-393.

- Anon, (2018). [online] Available at: https://www.hfmmagazine.com/articles/418-all-access?dcrPath=%2Ftemplatedata%2FHFH_Common%2FNewsArticle%2Fdata%2FHFHM%2FMagazine%2F2013%2FMar%2F0313HFH_FEA_design [Accessed 16 Jan. 2018].
- Armstrong, T. S. H., & Aitken, H. L. (2000). The developing role of play preparation in paediatric anaesthesia. *Paediatric anaesthesia*, 10(1), 1-4.
- Arthur, P., & Passini, R. (1992). *Wayfinding: People, Signs, and Architecture*. McGraw-Hill.
- Bailey, E., & Timmons, S. (2005). Noise levels in PICU: an evaluative study. *Paediatric nursing*, 17(10).
- Bauer, T. M., Ofner, E., Just, H. M., Just, H., & Daschner, F. D. (1990). An epidemiological study assessing the relative importance of airborne and direct contact transmission of microorganisms in a medical intensive care unit. *Journal of Hospital Infection*, 15(4), 301-309.
- Baykoç, N. (2006). *Hastanede Çocuk ve Genç*. Ankara: Gazi Kitabevi.
- Beatrice, D. F., Thomas, C. P., & Biles, B. (1998). Essay: Grant Making With An Impact: The Picker/Commonwealth Patient-Centered Care Program: A successful multimillion-dollar program offers lessons to grantmakers about how a foundation can advance a field. *Health Affairs*, 17(1), 236-244.

- Beauchemin, K. M., & Hays, P. (1996). Sunny hospital rooms expedite recovery from severe and refractory depressions. *Journal of affective disorders*, 40(1-2), 49-51.
- Beauchemin, K., & Hays, P. (1998). Sunny Hospital Rooms Expedite Recovery From Severe and Refractory Depressions. *Year Book of Psychiatry and Applied Mental Health*, 1998(7), 214-215.
- Berglund, B., Berglund, U., Goldstein, M., & Lindvall, T. (1981). Loudness (or annoyance) summation of combined community noises. *The Journal of the Acoustical Society of America*, 70(6), 1628-1634.
- Bernard van Leer Foundation Projects. (1979). *The Aboriginal Child at School*, 7(02), pp.45-50.
- Berry, L. L., & Bendapudi, N. (2003). Clueing in customers. *Harvard Business Review*, 81(2), 100–106.
- Berry, L. L., & Seltman, K. D. (2008). *Management lessons from Mayo Clinic*. New York, NY: McGraw-Hill.
- Birch, J., Curtis, P., & James, A. (2007). Sense and sensibilities: In search of the child-friendly hospital. *Built Environment*, 33(4), 405-416.

- Bird, W. (2007). *Natural thinking: Investigating the links between the natural environment, biodiversity and mental health*. Royal Society for the Protection of Birds.
- Bishop, K. (2014). Challenging research: Completing participatory social research with children and adolescents in a hospital setting. *HERD: Health Environments Research & Design Journal*, 7(2), 76-91.
- Bishop, K. G. (2008). From their perspectives: children and young people's experience of a paediatric hospital environment and its relationship to their feeling of well-being.
- Blumberg, R., & Devlin, A. S. (2006). Design issues in hospitals: The adolescent client. *Environment and Behavior*, 38(3), 293-317.
- Boyce, P., Hunter, C., & Howlett, O. (2003). *The benefits of daylight through windows*. Troy, New York: Rensselaer Polytechnic Institute.
- Bromley, E. (2012). Building patient-centeredness: Hospital design as an interpretive act. *Social Science & Medicine*, 75(6), 1057-1066.
- Callahan, D. (1973). The WHO definition of 'health'. *Hastings Center Studies*, 77-87.
- Carney, T., Murphy, S., McClure, J., Bishop, E., Kerr, C., Parker, J., ... & Wilson, L. (2003). Children's views of hospitalization: an exploratory study of data collection. *Journal of Child Health Care*, 7(1), 27-40.

- Carpman, J. R., & Grant, M. A., & Simmons, D.(1986). Design that cares.
- Clark, A. (2010). Transforming children's spaces: children's and adults' participation in designing learning environments. UK: Taylor & Francis.
- Coad, J., & Coad, N. (2008). Children and young people's preference of thematic design and colour for their hospital environment. *Journal of Child Health Care*, 12(1), 33-48.
- Codinhoto, R., Tzortzopoulos, P., Kagioglou, M., Aouad, G., & Cooper, R. (2008). The effects of the built environment on health outcomes. University of Salford.
- Cooper-Marcus, C., & Barnes, M. (1995). Gardens in Health Care Facilities: Uses. Therapeutic Benefits and Design Recommendations, The Centre for Health Design, Martinez, CA.
- Council, U. G. B. (2011). Leadership in energy and environmental design. US Green Building Council, Washington, DC.
- Coyne, I., & Kirwan, L. (2012). Ascertaining children's wishes and feelings about hospital life. *Journal of Child Health Care*, 16(3), 293-304.
- Curtis, P., James, A., & Birch, J. (2007). Space to care: children's perceptions of spatial aspects of hospitals. Swindon: ESRC End of Award Report, 1-25.

- Day, C. & Midbjer, A. (2007). *Environment and children: passive lessons from the everyday environment*. USA: Architectural Press.
- De Vos, F. (2005). Building a model of holistic healing environments for children's hospitals with implications for the design and management of children's hospitals.
- Deitch, E. A. (1990). The management of burns. *New England Journal of Medicine*, 323(18), 1249-1253.
- DelPo, E. G., & Frick, S. B. (1988). Directed and nondirected play as therapeutic modalities. *Children's Health Care*, 16(4), 261-267.
- Department of Health: Health Building Note 00-01 (2014) UK; *General design guidance for healthcare buildings*.
- Department of Health: Health Building Note 00-03 (2014) UK; *Clinical and clinical support spaces*.
- Department of Health: Health Building Note 23 (2014) UK; *Hospital accommodation for children and young people*.
- Devlin, A. S., & Arneill, A. B. (2003). Health care environments and patient outcomes: A review of the literature. *Environment and behavior*, 35(5), 665-694.

- Dijkstra, K., Pieterse, M., & Pruyn, A. (2006). Physical environmental stimuli that turn healthcare facilities into healing environments through psychologically mediated effects: systematic review. *Journal of advanced nursing*, 56(2), 166-181.
- Dutro, A. R. (2007). Light Image Therapy in the Health Care Environment.
- Eisen, S. L., Ulrich, R. S., Shepley, M. M., Varni, J. W., & Sherman, S. (2008). The stress-reducing effects of art in pediatric health care: art preferences of healthy children and hospitalized children. *Journal of Child Health Care*, 12(3), 173-190.
- Ekra, E. M. R., Blaaka, G., Korsvold, T., & Gjengedal, E. (2012). Children in an adult world: A phenomenological study of adults and their childhood experiences of being hospitalised with newly diagnosed type 1 diabetes. *Journal of Child Health Care*, 16(4), 395-405.
- England, N. H. S. (2015). Commissioning for quality and innovation (CQUIN) Guidance for 2015/16. Leeds: Department of Health.
- Estates, D. H. (2008). Facilities (2008), A Staff and Patient Environment Calibration Toolkit (ASPECT): Summary, NHS, UK. Retrieved January, 15.
- Estates, N. H. S. (2004). Friendly healthcare environments for children and young people. Stationery Office.

European Association for Children in Hospital (2014) EACH Charter / The 10 articles of the EACH Charter. Online. <http://www.each-for-sick-children.org/eachcharter/the-10-articles-of-the-eachcharter.html> Accessed: 18 January 2015.

European Healthcare Design (2015) Call for Papers; Empowering Patients: Transforming the Health Economy by Design. European Healthcare Design.

Evans, G. W. (1994). Psychosocial factors and the physical environment: Interrelations in the workplace. *International review of industrial and organizational psychology*.

Farjou, G., Sinha, R., Dix, D., Shahbaz, A., Klaassen, R. J., & Klassen, A. F. (2014). Understanding the healthcare experiences of teenaged cancer patients and survivors. *Child: care, health and development*, 40(5), 723-730.

Fottler, M. D., Ford, R. C., Roberts, V., & Ford, E. W. (2000). Creating a Healing Environment: The Importance of the Service Setting in the New Consumer-Oriented Healthcare System. *Journal of Healthcare Management*, 45(2), 91-106.

Gage, J. (2000). Color and meaning; art, science and symbolism. California: University of California Press.

Gibson, J. J. (1996). The senses considered as perceptual systems.

- Guideline, A. S. H. R. A. E. (2011). Interactions affecting the achievement of acceptable indoor environments. *Atlanta, GA: ASHRAE*.
- Haiat, H., Bar-Mor, G., & Shochat, M. (2003). The world of the child: a world of play even in the hospital. *Journal of Pediatric Nursing*, 18(3), 209-214.
- Hall, E. T. (1969). *The hidden dimension: Man's use of space in public and private*. Bodley Head.
- Hall, J. A., & Dornan, M. C. (1990). Patient sociodemographic characteristics as predictors of satisfaction with medical care: a meta-analysis. *Social science & medicine*, 30(7), 811-818.
- Hamilton, D. (2006), Evidence Based Design and the Art of Healing. In: Wagenaar, C. (Ed.), *The architecture of hospitals*. Rotterdam: NAI publ. pp.271-280.
- Hargreaves, D. S., & Viner, R. M. (2011). Children's and young people's experience of the National Health Service in England: a review of national surveys 2001–2011. *Archives of Disease in Childhood*, archdischild-2011.
- Harris, P. B., McBride, G., Ross, C., & Curtis, L. (2002). A place to heal: Environmental sources of satisfaction among hospital patients. *Journal of Applied Social Psychology*, 32(6), 1276-1299.

- Hendrich, A. L., Fay, J., & Sorrells, A. K. (2004). Effects of acuity-adaptable rooms on flow of patients and delivery of care. *American Journal of Critical Care*, 13(1), 35-45.
- Herbert, A., De Lima, J., Fitzgerald, D., Seton, C., Waters, K. and Collins, J, (2014) Exploratory study of sleeping patterns in children admitted to hospital. *Journal of Paediatrics and Child Health*, 50, p.632–638
- Holahan, C. (1972). Seating patterns and patient behavior in an experimental dayroom. *Journal of Abnormal Psychology*, 80(2), 115.
- Hopia, H., Tomlinson, P. S., Paavilainen, E., & Åstedt-Kurki, P. (2005). Child in hospital: family experiences and expectations of how nurses can promote family health. *Journal of clinical nursing*, 14(2), 212-222.
- Hpset.org.uk.(2018).[online]Availableat:
https://www.hpset.org.uk/downloads/research_development/HPSET_CEC%20Report.pdf
- Hubbuck, C. (2009). *Play for sick children: Play specialists in hospitals and beyond*. Jessica Kingsley Publishers.
- Huelat, B. J. (2007). *Wayfinding: Design for understanding*. The Center for Health Design: Concord, CA, USA.

- Huisman, E. R., Morales, E., van Hoof, J., & Kort, H. S. M. (2012). Healing environment: A review of the impact of physical environmental factors on users. *Building and environment*, 58, 70-80.
- Huisman, E. R., Morales, E., van Hoof, J., & Kort, H. S. M. (2012). Healing environment: A review of the impact of physical environmental factors on users. *Building and environment*, 58, 70-80.
- Hutton, A. (2003). Activities in the adolescent ward environment. *Contemporary nurse*, 14(3), 312-319.
- Hutton, A. (2005). Consumer perspectives in adolescent ward design. *Journal of Clinical Nursing*, 14(5), 537-545.
- Hutton, A. (2010). How adolescent patients use ward space. *Journal of advanced nursing*, 66(8), 1802-1809.
- Izadpanah, S. (2011). Investigation of Identity in Interior Space of Kindergarten: A review on an example of High/Scope Kindergarten (Doctoral dissertation, Eastern Mediterranean University (EMU)).
- Jonas, W. B., Chez, R. A., Smith, K., & Sakallaris, B. (2014). Salutogenesis: the defining concept for a new healthcare system. *Global advances in health and medicine*, 3(3), 82-91.
- Kam, P. C. A., Kam, A. C., & Thompson, J. F. (1994). Noise pollution in the anaesthetic and intensive care environment. *Anaesthesia*, 49(11), 982-986.

Kennedy, I. (2010) Getting it right for children and young people. Overcoming cultural barriers in the NHS so as to meet their needs. London: Department of Health.

Klausmeier, H. J., & Allen, P. S. (2014). Cognitive development of children and youth: A longitudinal study. Academic Press.

Kovacs Silvis, J. (2013) 5 Design Strategies To Create Competitive Children's Facilities. Online. <http://www.healthcaredesignmagazine.com/blogs/jennifer-kovacs-silvis/5-design-strategies-createcompetitive-children-s-facilities>
Accessed: 18 January 2015.

Kreitzer, M. J. (2013). Integrative health: pathway to health reform and a healthier nation. Policy and Politics in Nursing and Healthcare-Revised Reprint-E-Book, 225.

Kreitzer, M. J., & Zborowsky, T. (2013). Creating optimal healing environments. Complementary and Alternative Therapies in Nursing, 55-70.

Kubba, S. (2003). Space planning for commercial and residential interiors. McGraw Hill

Ladd, G. W., Birch, S. H., & Buhs, E. S. (1999). Children's social and scholastic lives in kindergarten: Related spheres of influence?. Child development, 70(6), 1373-1400.

- Lambert, M. J. (Ed.). (2013). Bergin and Garfield's handbook of psychotherapy and behavior change (p. 864). New York, NY: John Wiley & Sons.
- Lambert, V., & Keogh, D. (2014). Health literacy and its importance for effective communication. Part 1. *Nursing Children and Young People* (2014+), 26(3), 31.
- Lambert, V., Coad, J., Hicks, P., & Glacken, M. (2014). Young children's perspectives of ideal physical design features for hospital-built environments. *Journal of Child Health Care*, 18(1), 57-71.
- Langston, L., Cusack, P., Fremantle, C., & Isles, C. (2010). Visual art in hospitals: case studies and review of the evidence. *Journal of the Royal Society of Medicine*, 103(12), 490-499.
- Lawson, B., Bassanino, M., Phiri, M., & Worthington, J. (2003). Intentions, practices and aspirations: Understanding learning in design. *Design Studies*, 24(4), 327-339.
- Lawson, H. A., Anderson-Butcher, D., Petersen, N., & Barkdull, C. (2003). Design teams as learning systems for complex systems change: Evaluation data and implications for higher education. *Journal of Human Behavior in the Social Environment*, 7(1-2), 159-179.
- Lenton, S., Lie, S. O., & Expert Committee. (2014). Council of Europe guidelines for child friendly health care. *Europarat-Leitlinien für kinderfreundliche Gesundheitsversorgung. Pädiatrie & Pädologie*, 49(1), 9-18.

- Liabo, K., Curtis, K., Jenkins, N., Roberts, H., Jaguz, S., & McNeish, D. (2002). Healthy futures: A consultation with children and young people in Camden and Islington about their health services.
- Lillard, P. P. (1980). *Children Learning: A Teacher's Classroom Diary*. Schocken Books, 200 Madison Avenue, New York, NY 10016.
- Linder, L. A., & Christian, B. J. (2011). Characteristics of the nighttime hospital bedside care environment (sound, light, and temperature) for children with cancer. *Cancer nursing*, 34(3), 176.
- Linder, L. A., & Christian, B. J. (2012, November). Nighttime sleep disruptions, the hospital care environment, and symptoms in elementary school-age children with cancer. In *Oncology nursing forum* (Vol. 39, No. 6, p. 553). NIH Public Access.
- Lindheim, R., Glaser, H. H., & Coffin, C. (1972). *Changing hospital environments for children*. Harvard University Press.
- Livesley, J., & Long, T. (2013). Children's experiences as hospital in-patients: Voice, competence and work. Messages for nursing from a critical ethnographic study. *International journal of nursing studies*, 50(10), 1292-1303.
- Mahnke, F. H. (1996). *Color, environment, and human response: an interdisciplinary understanding of color and its use as a beneficial element in the design of the architectural environment*. John Wiley & Sons.

- Malkin, J. (1992). *Hospital Interior Architecture: Creating Healing Environmental for Special Patient Populations*. Van Nostrand Reinhold.
- Malkin, J. (2002). *Medical and dental space planning: A comprehensive guide to design, equipment, and clinical procedures*. John Wiley & Sons.
- Marcus, C. C., & Barnes, M. (Eds.). (1999). *Healing gardens: Therapeutic benefits and design recommendations* (Vol. 4). John Wiley & Sons.
- Marcus, C. C., & Sachs, N. A. (2013). *Therapeutic landscapes: An evidence-based approach to designing healing gardens and restorative outdoor spaces*. John Wiley & Sons.
- Martin, D. P., Hunt, J. R., Hughes-Stone, M., & Conrad, D. A. (1990). The Planetree Model Hospital Project: an example of the patient as partner. *Hospital & health services administration, 35*(4), 591-601.
- Maslow, A. H. (1943). A theory of human motivation. *Psychological review, 50*(4), 370.
- Maslow, A. H., & Mintz, N. L. (1956). Effects of esthetic surroundings: I. Initial effects of three esthetic conditions upon perceiving “energy” and “well-being” in faces. *The Journal of Psychology, 41*(2), 247-254.
- Maslow, A. H., Frager, R., Fadiman, J., McReynolds, C., & Cox, R. (1970). *Motivation and personality* (Vol. 2).

Matthews, M. H. (1992). Making sense of place: Children's understanding of large-scale environments. Barnes & Noble Books.

McKenzie, S., Norrish, S., Parker, L. and Frampton, I. (2010) Young people and healthcare. Part I: Experience of the hospital environment. *Pediatric health*, 4 (2) p.157–166.

Meerwein, G., Rodeck, B., & Mahnke, F. H. (2007). Color-communication in architectural space. Walter de Gruyter.

Melin, L., & Götestam, K. G. (1981). The effects of rearranging ward routines on communication and eating behaviors of psychogeriatric patients. *Journal of applied behavior analysis*, 14(1), 47-51.

Miller, C.M. (1997). Color for interior architecture, Canada: John Wiley and Sons.

Miller, S. & Schiltt, J.K. (1985). Philosophy of interior space: design concept for personal needs. New York: Praeger Publisher

NHS Estates (2004) Improving the patient experience: Friendly healthcare environments for children and young people. London: The Stationery Office.

NHS Estates, NHS Design Portfolio. Available online:
<http://www.nhsdesignportfolio.nhsestates.gov.uk>

- Norton-Westwood, D. (2012) The health-care environment through the eyes of a child—Does it soothe or provoke anxiety? *International Journal of Nursing Practice*, 18 p.7–11.
- Nova, C., Vegni, E., & Moja, E. A. (2005). The physician–patient–parent communication: a qualitative perspective on the child's contribution. *Patient education and counseling*, 58(3), 327-333.
- Olds, A. R. (1979). Designing developmentally optimal classrooms for children with special needs. *Special education and development*, 91-138.
- Olds, A. R., Hall, J. H., & Daniel, P. A. (1987). *Child health care facilities*. Assn for the Care of Childrens.
- Park, J. G. (2009). Color perception in pediatric patient room design: Healthy children vs. pediatric patients. *HERD: Health Environments Research & Design Journal*, 2(3), 6-28.
- Passweg, J. R., Rowlings, P. A., Atkinson, K. A., Barrett, A. J., Gale, R. P., Gratwohl, A., ... & Schaefer, U. W. (1998). Influence of protective isolation on outcome of allogeneic bone marrow transplantation for leukemia. *Bone marrow transplantation*, 21(12), 1231.
- Pati, D., Harvey Jr, T. E., & Barach, P. (2008). Relationships between exterior views and nurse stress: An exploratory examination. *HERD: Health Environments Research & Design Journal*, 1(2), 27-38.

Patient Experience Network (2013) Improving Patient Experience for Children and Young People. NHS England.

Platt, H. (1959). The welfare of children in hospital. *British Medical Journal*, 1(5115), 166-169.

Pol, E. (2002). Environment and behavior: the theoretical background of the city-identity-sustainability. *Environment and Behavior*, 34(8), 8-25.

Poore, J. (1994). *Interior Color By Design: A Design Tool for Architects, Interior Designer, and Homeowners*. Massachusetts.

Post, J., Hohmann, M., & Epstein, (2011), A. S. Teacher's Corner.

Proshansky, H. M., & Fabian, A. K. (1987). The development of place identity in the child. In *Spaces for children* (pp. 21-40). Springer, Boston, MA.

Puchalski, C. M., & McSkimming, S. (2006). Creating healing environments. *Health Progress*, 87(3), 30.

Quan, X., Joseph, A., Malone, E., & Pati, D. (2011). Healthcare environmental terms and outcome measures: an evidence-based design glossary. The Center for Health Design Phase I [Internet].

Rivlin, L. G., & Wolfe, M. (1985). *Institutional settings in children's lives*. Wiley-Interscience.

- Rollins, J. H., Bolig, R., & Mahan, C. C. (2005). Meeting children's psychosocial needs across the health-care continuum (pp. 119-174). Austin, TX: Pro-ed.
- Royal College of Nursing (2014) The future for community children's nursing: challenges and opportunities: RCN guidance. London: Royal College of Nursing.
- Rubin, H. R., Owens, A. J., & Golden, G. (1998). *Status report (1998): An investigation to determine whether the built environment affects patients' medical outcomes*. Martinez, CA: Center for Health Design.
- Ruga, W. (1989). Designing for the six senses. In *Journal of health care interior design: proceedings from the... Annual National Symposium on Health Care Interior Design. National Symposium on Health Care Interior Design (US)* (Vol. 1, p. 29).
- Salonen, W. (1997). *Designing for the senses*, Healthcare Design, John Wiley&Sons.
- Sanger, M. S., Copeland, D. R., & Davidson, E. R. (1991). Psychosocial adjustment among pediatric cancer patients: A multidimensional assessment. *Journal of Pediatric Psychology*, 16(4), 463-474.
- Senda, M. (1992). *Design of children's play environments*. McGraw-Hill.
- Sharma, S., & Finlay, F. (2003). Adolescent facilities: The potential... *Paediatric Nursing*, 15(7), 25.

- Shepley, K. J. (1998). U.S. Patent No. 5,841,115. Washington, DC: U.S. Patent and Trademark Office.
- Shepley, M. M. (2001). Research on healthcare environments for children and their families. *Design & health—The therapeutic benefits of design*, 25-29.
- Shepley, M. M., & Hamilton, D. K. (2010). *Design for critical care: An evidence-based approach*. Routledge.
- Sherman, S. A., Varni, J. W., Ulrich, R. S., & Malcarne, V. L. (2005). Post-occupancy evaluation of healing gardens in a pediatric cancer center. *Landscape and Urban Planning*, 73(2-3), 167-183.
- Slevin, M., Farrington, N., Duffy, G., Daly, L., & Murphy, J. F. A. (2000). Altering the NICU and measuring infants' responses. *Acta Paediatrica*, 89(5), 577-581.
- Sommer, D., Samuelsson, I. P., & Hundeide, K. (2009). *Child perspectives and children's perspectives in theory and practice (Vol. 2)*. Springer Science & Business Media.
- Sommer, R., & Ross, H. (1958). Social interaction on a geriatrics ward. *International Journal of Social Psychiatry*, 4(2), 128-133.
- Springer, T. (2007). *Ergonomics for healthcare environments*. Knoll, New York.

- Stichler, J. F. (2001). Creating healing environments in critical care units. *Critical Care Nursing Quarterly*, 24(3), 1-20.
- Taylor, M, & Preston, J. (Ed.). (2006). *INTIMUS: interior design theory reader*. Great Britain: Wiley Academy.
- Taylor, M, & Preston, J. (Ed.). (2006). *INTIMUS: interior design theory reader*. Great Britain: Wiley Academy.
- The Ministry of Health NSW; guideline wayfinding for healthcare facilities, (2014) available online at <http://www.health.nsw.gov.au/policies/>
- Thompson Jr, R. J., & Gustafson, K. E. (1996). Psychological adjustment of parents and siblings.
- Tivorsak, T. L., Britto, M. T., Klostermann, B. K., Nebrig, D. M., & Slap, G. B. (2004). Are pediatric practice settings adolescent friendly? An exploration of attitudes and preferences. *Clinical Pediatrics*, 43(1), 55-61.
- Tofle, R. B., Schwarz, B., Yoon, S. Y., Max-Royale, A., & Des, M. E. (2004). *Color In Healthcare Environments-A Research Report*.
- Topf, M. (2000). Hospital noise pollution: an environmental stress model to guide research and clinical interventions. *Journal of advanced nursing*, 31(3), 520-528.

- Trancik, A. M., & Evans, G. W. (1995). Spaces fit for children: Competency in the design of daycare center environments. *Children's Environments*, 311-319.
- Ulrich, D. J., Wagener, M. E., Patel, S., Schmid, J. J., & Jennings, R. J. (2004). U.S. Patent No. 6,825,763. Washington, DC: U.S. Patent and Trademark Office.
- Ulrich, R. S. (1984). View through a window may influence recovery from surgery. *Science*, 224(4647), 420-421.
- Ulrich, R. S. (1991). Effects of interior design on wellness: Theory and recent scientific research. *Journal of health care interior design*, 3(1), 97-109.
- Ulrich, R. S. (1992). How design impacts wellness. In *The Healthcare Forum Journal* (Vol. 35, No. 5, p. 20).
- Ulrich, R. S. (1997). A theory of supportive design for healthcare facilities. In *Journal of healthcare design: proceedings from the... Symposium on Healthcare Design. Symposium on Healthcare Design* (Vol. 9, p. 3).
- Ulrich, R. S. (1999). Effects of gardens on health outcomes: Theory and research. *Healing gardens: therapeutic benefits and design recommendation*.
- Ulrich, R. S. (2000, September). Evidence based environmental design for improving medical outcomes. In *Proceedings of the Healing by Design: Building for Health Care in the 21st Century Conference, Montreal, Quebec, Canada*.

- Ulrich, R. S. (2001). Effects of healthcare environmental design on medical outcomes. In *Design and Health: Proceedings of the Second International Conference on Health and Design*. Stockholm, Sweden: Svensk Byggtjänst(pp. 49-59).
- Ulrich, R. S. (2006). Essay: Evidence-based health-care architecture. *The Lancet*, 368, S38-S39.
- Ulrich, R. S. (2008). Biophilic design of healthcare environments. In S. Kellert, J. Heerwagen, and M. Mador (Eds.), *Biophilic design for better buildings and communities* (pp. 87–106). New York, NY: Wiley.
- Ulrich, R. S., & Wilson, P. (2006). Evidence-based design for reducing infection. *Public Service Review: Health (UK)*, 8, 24-25.
- Ulrich, R. S., Berry, L. L., Quan, X., & Parish, J. T. (2010). A conceptual framework for the domain of evidence-based design. *HERD: Health Environments Research & Design Journal*, 4(1), 95-114.
- Ulrich, R. S., Simons, R. F., Losito, B. D., Fiorito, E., Miles, M. A., & Zelson, M. (1991). Stress recovery during exposure to natural and urban environments. *Journal of environmental psychology*, 11(3), 201-230.
- Ulrich, R. S., Zimring, C., Zhu, X., DuBose, J., Seo, H. B., Choi, Y. S., ... & Joseph, A. (2008). A review of the research literature on evidence-based healthcare design. *HERD: Health Environments Research & Design Journal*, 1(3), 61-125.

- Ulrich, R., Zimring, C., Quan, X., Joseph, A., & Choudhary, R. (2004). The role of the physical environment in the hospital of the 21st century. The Center for Health Design.
- van Aken, M. A. (1994). The transactional relation between social support and children's competence. In *Social networks and social support in childhood and adolescence* (pp. 131-148). de Gruyter.
- van Staa, A., Jedeloo, S., van Meeteren, J., & Latour, J. M. (2011). Crossing the transition chasm: experiences and recommendations for improving transitional care of young adults, parents and providers. *Child: care, health and development*, 37(6), 821-832.
- Verderber, S. (2003). Architecture for health-2050: An international perspective. *The Journal of Architecture*, 8(3), 281-302.
- Verderber, S., & Fine, D. J. (2000). *Healthcare architecture in an era of radical transformation*. yale university Press.
- Verderber, S., Grice, S., & Gutentag, P. (1987). Wellness health care and the architectural environment. *Journal of community health*, 12(2-3), 163-175.
- Walch, J. M., Rabin, B. S., Day, R., Williams, J. N., Choi, K., & Kang, J. D. (2005). The effect of sunlight on postoperative analgesic medication use: a prospective study of patients undergoing spinal surgery. *Psychosomatic medicine*, 67(1), 156-163.

- Walenkamp, G. H. (2009). Joint prosthetic infections: a success story or a continuous concern?. *Acta orthopaedica*, 80(6), 629-632.
- Weil, L. G., Fleming, S. M., Dumontheil, I., Kilford, E. J., Weil, R. S., Rees, G., ... & Blakemore, S. J. (2013). The development of metacognitive ability in adolescence. *Consciousness and Cognition*, 22(1), 264-271.
- White, R., & Stoecklin, V. L. (2008). Nurturing children's biophilia: developmentally appropriate environmental education for young children. White Hutchinson Leisure & Learning Group.
- Whitehouse, S., Varni, J. W., Seid, M., Cooper-Marcus, C., Ensberg, M. J., Jacobs, J. R., & Mehlenbeck, R. S. (2001). Evaluating a children's hospital garden environment: Utilization and consumer satisfaction. *Journal of environmental psychology*, 21(3), 301-314.
- William Li, H. C., Lopez, V., & Lee, T. L. I. (2007). Effects of preoperative therapeutic play on outcomes of school-age children undergoing day surgery. *Research in nursing & health*, 30(3), 320-332.
- Woo, J. C., & Lin, Y. L. (2016). Kids' Perceptions toward Children's Ward Healing Environments: A Case Study of Taiwan University Children's Hospital. *Journal of healthcare engineering*, 2016.
- World Health Organization. (2013). WHO guidance note: comprehensive cervical cancer prevention and control: a healthier future for girls and women.

Yeaple, W., Iltus, S., De Vos, F. and Sabo, K. (1995). Hasbro Children's Hospital: A Post-Occupancy Evaluation. Unpublished report.

Yinnon, A. M., Ilan, Y., Tadmor, B., Altarescu, G., & Hershko, C. (1992). Quality of sleep in the medical department. *The British journal of clinical practice*, 46(2), 88-91.

Zeisel, J., Silverstein, N. M., Hyde, J., Levkoff, S., Lawton, M. P., & Holmes, W. (2003). Environmental correlates to behavioral health outcomes in Alzheimer's special care units. *The Gerontologist*, 43(5), 697-711.

Zimring, C., Joseph, A., & Choudhary, R. (2004). The role of the physical environment in the hospital of the 21st century: A once-in-a-lifetime opportunity. Concord, CA: The Center for Health Design.

URL 1: Kraftl, P. (2008). Environment for children: passive lessons from the everyday environment.

URL 2: A. Frearson, "Children's hospital has vibrant facade and tree-inspired layout", *Dezeen*, 2018. [Online]. Available: <https://www.dezeen.com/2015/01/03/lyons-conrad-gargett-childrens-hospital-brisbane-glass-facades/>. [Accessed: 20- Aug- 2018]

URL 3: Simpson Gumpertz & Heger. (2018). Nemours Children's Hospital. [online] Available at: <http://www.sgh.com/projects/nemours-childrens-hospital> [Accessed 27 Sep. 2018].

- URL 4: Norton CFI. (2018). Gallery. [online] Available at: <http://www.nortoncfi.com.au/gallery.html> [Accessed 27 Sep. 2018].
- URL 5: Simply Psychology. (2018). Maslow's Hierarchy of Needs. [online] Available at: <https://www.simplypsychology.org/maslow.html> [Accessed 27 Sep. 2018].
- URL 6: S. Dawood, "Morag Myerscough transforms rooms in Sheffield Children's Hospital - Design Week", Design Week, 2018. [Online]. Available: <https://www.designweek.co.uk/issues/30-january-5-february-2017/morag-myerscough-transforms-rooms-sheffield-childrens-hospital/>. [Accessed: 20-Aug- 2018]
- URL 7: "PHOTO TOUR: Nicklaus Children's Hospital Advanced Pediatric Care Pavilion | HCD Magazine", HCD Magazine, 2018. [Online]. Available: <https://www.healthcaredesignmagazine.com/projects/pediatrics/photo-tour-nicklaus-childrens-hospital-advanced-pediatric-care-pavilion/#slide-4>. [Accessed: 20- Aug- 2018]
- URL 8: R. Barker, "International Interior Design Award, The Royal Children's Hospital, Melbourne - Adelto", Adelto, 2018. [Online]. Available: <https://www.adelto.co.uk/international-interior-design-award-the-royal-childrens-hospital-melbourne/>. [Accessed: 20- Aug- 2018]
- URL 9: TCT ward at Birmingham Children's Hospital wins design award - DesignCurial", Designcurial.com, 2018. [Online]. Available:

<http://www.designcurial.com/news/tct-ward-at-birmingham-children-s-hospital-wins-design-award>. [Accessed: 20- Aug- 2018]

URL 10: "Randall Children's Hospital / ZGF Architects", ArchDaily, 2018. [Online]. Available: <https://www.archdaily.com/347370/randall-children%25c2%25b4s-hospital-zgf-architects-llp>. [Accessed: 20- Aug- 2018]

URL 11: "Randall Children's Hospital / ZGF Architects", ArchDaily, 2018. [Online]. Available: <https://www.archdaily.com/347370/randall-children%25c2%25b4s-hospital-zgf-architects-llp>. [Accessed: 20- Aug- 2018]

URL 12: "PHOTO TOUR: Park Nicollet | HCD Magazine", HCD Magazine, 2018. [Online]. Available: <https://www.healthcaredesignmagazine.com/trends/architecture/photo-tour-park-nicollet/>. [Accessed: 20- Aug- 2018]

URL 13: Pinterest. (2018). The Royal Children's Hospital | Inspiration - Espace attente | Pinterest | Interior architecture, Spaces and Modern. [online] Available at: <https://www.pinterest.com/pin/121949102384682986/> [Accessed 22 Aug. 2018].

URL 14: ArchDaily. (2018). Nemours Children's Hospital / Stanley Beaman & Sears. [online] Available at: https://www.archdaily.com/439396/nemours-children-s-hospital-stanley-beaman-and-sears?ad_medium=gallery [Accessed 22 Aug. 2018].

URL 15: ArchDaily. (2018). Nelson Mandela Children's Hospital / Sheppard Robson + John Cooper Architecture + GAPP + Ruben. [online] Available at: <https://www.archdaily.com/870774/nelson-mandela-childrens-hospital-sheppard-robson-plus-john-cooper-architecture-plus-gapp-plus-ruben> [Accessed 22 Aug. 2018].

URL 16: Interior Design. (2018). Power Players in Healthcare Design: ZGF Architects. [online] Available at: <http://www.interiordesign.net/slideshows/detail/7822-healthcare-power-players-zgf-architects/> [Accessed 22 Aug. 2018].

URL 17: Mha-online.org. (2018). 10 Most Colorfully Inspiring Children's Hospitals in the World. [online] Available at: <http://www.mha-online.org/10-most-colorfully-inspiring-childrens-hospitals-in-the-world/> [Accessed 22 Aug. 2018].

URL 18: ArchDaily. (2018). Gallery of Kindergarden between Palms in Los Alcazares / Cor & Asociados - 29. [online] Available at: <https://www.archdaily.com/405440/kindergarden-between-palms-in-los-alcazares-cor-and-asociados/51ed3b3be8e44e67170000eb-kindergarden-between-palms-in-los-alcazares-cor-and-asociados-photo> [Accessed 22 Aug. 2018].

URL 19: Hharp.org. (2018). Gallery. [online] Available at: <http://www.hharp.org/library/evelina/gallery/> [Accessed 22 Aug. 2018].

URL 20: Mike Bink fotografie | fotograaf Zaandam. (2018). emma kinderziekenhuis | amc - Mike Bink fotografie | fotograaf Zaandam. [online] Available at: <https://www.mikebinkfotografie.nl/photocrati/emma-kinderziekenhuis-amc-2/> [Accessed 22 Aug. 2018]

URL 21: hello@pixelplay.co.uk, P. (2018). Art in Site - Variety Children's Hospital, King's College Hospital. [online] Artinsite.co.uk. Available at: <http://www.artinsite.co.uk/projects/variety-childrens-hospital> [Accessed 22 Aug. 2018].

URL 22: Wikoff Design Studio. (2018). *Promote a Quieter, More Restful Healing Environment* / Wikoff Design Studio. [online] Available at: <http://wikoffdesignstudio.com/promote-a-quieter-more-restful-healing-environment/> [Accessed 22 Aug. 2018].

URL 23: Ucsf.edu, 2018.[Online].Available: https://www.ucsf.edu/sites/default/files/legacy_files/documents/16intchildren27s20patient20room-20new2c2010-25-10.jpg. [Accessed: 23- Aug- 2018]

URL 24: 19 Waiting Room Design Images - Doctors Office Waiting Room Design, Waiting Room Interior Design and Dental Office Waiting Room / Newdesignfile.com", Newdesignfile.com, 2018. [Online]. Available: http://www.newdesignfile.com/post_waiting-room-design_9912/. [Accessed: 23- Aug- 2018]

URL 25: "Playing with the toys in the waiting room of his pediatrician's office | jaddie.com", Jaddie.com, 2018. [Online]. Available: [http://jaddie.com/2011/10/images-monkey-joes-home-school/max_3-yr_checkup_waiting_room_8591/#prettyPhoto\[2361\]/0/](http://jaddie.com/2011/10/images-monkey-joes-home-school/max_3-yr_checkup_waiting_room_8591/#prettyPhoto[2361]/0/). [Accessed: 23- Aug- 2018]

URL 26: 2018. [Online]. Available: http://www.childrenshospital.org/centers-and-services/programs/a-_e/boston-childrens-hospital-neighborhood-partnerships-program. [Accessed: 23- Aug- 2018]

URL 27: "15 Artists Collaborate To Make London Children's Hospital Cozier For Kids", Bored Panda, 2018. [Online]. Available: https://www.boredpanda.com/artists-mural-design-royal-london-children-hospital-vital-arts/?utm_source=google&utm_medium=organic&utm_campaign=organic. [Accessed: 23- Aug- 2018]

URL 28: D. Texas, "Home - Dell Children's Medical Center of Central Texas", Dell Children's Medical Center of Central Texas, 2018. [Online]. Available: <https://www.dellchildrens.net/>. [Accessed: 23- Aug- 2018]

URL 29: "Alder Hey Children's Hospital by BDP", Architects Journal, 2018. [Online]. Available: <https://www.architectsjournal.co.uk/buildings/alder-hey-childrens-hospital-by-bdp/8689754.article>. [Accessed: 23- Aug- 2018]

URL 32: designboom | architecture & design magazine. (2018). *interactive installation at children's hospital by jason bruges studio*. [online] Available at: <https://www.designboom.com/design/interactive-installation-at-childrens-hospital-by-jason-bruges/> [Accessed 27 Sep. 2018].

URL 33: Pinterest. (2018). Lobby, Randall Children's Hospital at Legacy Emanuel, Portland, OR. | Patient-Centered Design | Pinterest | Lobbies, Lobby design and Interiors. [online] Available at: <https://www.pinterest.com/pin/126874914478851625/?lp=true> [Accessed 27 Sep. 2018].

URL 34: Anon, (2018). [online] Available at: <http://www.mid-contracting.com/node/593> [Accessed 27 Sep. 2018].

URL 35: Anon, (2018). [online] Available at: <http://www.mid-contracting.com/node/593> [Accessed 27 Sep. 2018].

URL 36: Anon, (2018). [online] Available at: <http://www.mid-contracting.com/node/593> [Accessed 27 Sep. 2018].