Children's Hospitals

The role of architecture in children's recuperation and development

Cláudia Sofia Fonseca Pinhão
claudiapinhao32@msn.com

Instituto Superior Técnico, Lisboa, Portugal

May 2016

Abstract

Children in hospitals have been disregarded for a long time. However, new concerns about the specific characteristics of this age group allied with new evidence that hospital design can contribute to the healing progress, attribute architects the duty to investigate and create the most appropriate healthcare environments. The main goal of this thesis is to adapt an actual, long lasting typology (Pediatric hospitals in relation with Academic Hospitals) to offer a good life quality environment, providing children the possibility of continuing normal daily routines, for a normal development, while enhancing their medical recuperation

The first part of the research, based on literature review, explores the Children's hospital historical evolution contextualised in the general typology, and debates the impact of built spaces on this age group. In a second stage, a set of guidelines was compiled addressing the factors that influence healing environments and relation hospital-city. The third chapter identified strategies to include final users in the design process.

Finally, two recent case studies, located in The Netherlands, were described and analysed in view of theory. A further post occupational qualitative research was carried, applying the studied methods and suggesting future developments.

This study compiles the design guidelines proposed in the most recent studies, in a unique combination cause-effect, enhancing better health outcomes and daily routine satisfaction. Furthermore, the need to include future users in the design process is underlined, in order to avoid unnecessary costs in future projects, and offer an effective user-friendly building. Lastly, from the analysis of the study cases and post occupational results it was possible to identify current disruption areas in the design practices, which propose future research themes.

Keywords: Children's Hospital Architecture, Patient Centred Design, Healing Environments, Evidence Based Design, Netherlands Hospital Design

1. Introduction

When architects design a building they have to deal with several requirements that sometimes are even contradictory. Economical, constructive and functional assumptions are among these requirements. However, what is the building objective, if it doesn't facilitate the users' life, or if it even constitutes an obstacle to everyday life? Several architects have been enrolled in this theme of humanizing architecture.

The fact is that architecture can play a fundamental role in shaping society values. This became even more important when the subject is children healthcare settings. Not only do children represent the future of society but also hospitals show how society treats their citizens when they fall victim of illness. A friendly and respectful built environment is required to give people some support.

The purpose of this study is to investigate the role of architecture in creating not only a therapeutic hospital environment for children, but also an environment that provides them, as much as possible, normal patterns of life.

For this purpose, this study concludes with an analysis of two recent paediatric hospitals, which are merged with academic hospitals. Both hospitals are located in The Netherlands, which is considered the country with the best overall child wellbeing when compared with other developed countries (UNICEF, 2007). This is believed to constitute an example for other countries and can also be used as a starting point for future advances

The thesis development can be divided in four stages:

1. Bibliographic review - The first goal was to approach the evolution of healthcare facilities, identifying progresses and design strategies. Furthermore, the children's hospital case was addressed and compared with the general hospitals, while the children relation with built spaces was discussed.
2. Evidence collection of new hospital paradigms – This stage consisted in collecting theories and evidence, through bibliographic review, regarding actual requirements and futuristic concepts. Finally, the most important influencing factors of life quality inside the hospital were identified and related with respective health impacts, design guidelines.
3. Methods for Participatory Design – Regarding future hospital designs, this stage aimed to alert architects for the actual need to include final users in the design process. Furthermore, processes of inclusion and child friendly methods are presented.
4. Case Studies – In the final stage, two case studies were analysed, relative to urban context, functional distribution and internal environments. In the end, a qualitative post-occupational study was held, based on 'the Mosaic Approach' methods and the results were presented and discussed.

2. History

2.1. Origins and Evolution

Although the hospital has always been used as a space to care and cure people, it has not always been housed in a healthcare setting, as we know nowadays.

Beginning in the Greek civilization (460-360 BC), the Asklepieion revealed a model of spiritual health allied with nature characteristics, such as natural light, ventilation and outside views, used to improve the healing process. Romans (27 BC – 410 AD) used the same methods, adding the termae, military hospital and sanitary systems. In the medieval times the Catholic Church assumed the Healthcare support. However, the chapels exhibited lack of illumination, ventilation and thermal comfort (Stephen Verderber 2010), with nature benefits ignored in relation to god's power. Even though the models represent different approaches, they all symbolize a form of social exclusion.

As a result of the progress of medicine and new understanding of the contagion process, the pavilion model appears, in the 18th century, as a 'ventilation machine'.

However, in the end of the 19th century, the therapeutic effects of hospital environment were disregarded, giving place to medical efficiency and technology. The 20th century is known by the discovery of bacteria and the x-ray machine. Consequently, the hospital shifted to a big compact representational building named 'block' typology, with reduced walking distances, limited plot size and land prices. (Cramer 1939).

After this technological boom, a counterculture emerged in order to return healthcare facilities to their users. Architectural quality became required not only to complement medicine, but also to offer psychological and emotional support to patients, improving their well being.

2.2. Paediatric Hospitals

Paediatric Hospitals are a quite recent typology with a lesser-known evolution.

Focusing on the Netherlands case, until 19th century, children were deprived of any security measure since they were not part of the working group and do not contribute to the country economy. Only in 1863, an epidemic of deadly diseases alerted the specialists for the special needs of children, and the first paediatric hospital was founded, in Rotterdam. Consequently, many others were founded in other cities. Different

from the general hospitals, the children's hospitals were forced to occupy residential houses because of financial problems.

During the early days, children's hospitals were purely charitable institutions, living from the money collected between the privileged classes and were specially aimed to treat poor children. Moreover, they frequently adopted the name of the regent Queen to be more likely to get support. Only in 1892, the Dutch Society of Paediatrics was founded, including all medical directors and the paediatric medical specialization was introduced (Offringa 2003).

Paediatrics, as the name indicates, focus on children, separating them from adults. The fact is that Children's diseases occur in different ways and children respond differently to medications due to their particular pathophysiology. Furthermore, children raise more ethical problems, and need special care and activities to help in their development. For this reason, children's hospitals became the first to develop a patient-centred environment, including new spaces as play areas, education rooms, etc.

Nowadays children play an unquestionable important role in society. They are not only the future of society, but they are also in a particular learning process of knowing themselves and relating with other people and the world around. The built space plays a specially important role because 'cognitions about the physical environment 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 behaviour and experience in the physical world' (Proshansky and Fabian 1987).

In the particular case of hospitalized children, who are struggling not only with their disease but also with the daily routine changes, a supportive environment would be more likely to produce good outcomes.

3. Architectural Design

3.1. Hospital, City and Society

Everyday hospitals house a great variety of users with different ages, jobs and objectives. However, this typology has been avoided for a long time, with negative connection with death and disposal. However, hospitals integrate cities and should have an active role in citizen's lives.

With this purpose in mind, several authors have been defending the hospital decentralization to reduce travel distances, provide earlier access to diagnosis and preventive therapies (Cole 2006), and to be easily integrated in the city (Wagennar 2006).

However, Verderber (2006) recognises that even if small-scaled care centres prevail, the large medical school hospitals will need to continue existing. This fact can be explained by their unique multidisciplinary approach, where the most specialized services are available, together with an advanced research and technology (Steven and Wartman 2007).

Even when centralized, there are more strategies to open the hospital to the city and society. More than looking for a place to cope with the disease, hospitals can be 'reconceptualized' to offer wellness, and some hospital amenities can even be opened for public use, such as gardens, supermarkets, restaurants, bookshops, cafes, travel agencies, etc.

Futuristic hospital concepts feature an increase of technological systems and a higher concern on users well being. Therefore, the Academic Hospitals is the central focus of this study, with the perspective of combining a high medical performance with human scale departments, which should offer a homely environment with the proper social and emotional support.

3.2. Hospital Environments

A movement towards patient in healthcare is increasing since the last decades. The patient is becoming to be seen as a client, promoting competition between healthcare facilities. The hospital environment is one factor that seems to contribute to elevate the hospital quality.

In Ulrich's work, he identifies the connection between design strategies and health outcomes through scientific evidence. In his article Evidence Based Healthcare Design (2006), Ulrich advocates that the design of hospital physical settings can avoid medical outcomes to be worsened by preventing and controlling infection; reducing medication errors; minimizing environmental stressors such as noise,

accesses, exposure to certain physical features and social situations; and increasing patients' safety by reducing staff fatigue and improving patients' observation.

Stress is seen as a depressor of good medical outcomes that can be easily reduced or eliminated through design. For this reason Ulrich formulated the Theory of Supportive Design, where he fosters the sense of control, social support and positive distractions.

Besides hospital medicinal purposes, hospitals also seem to incorporate social responsibilities to allow patients to be active citizens rather than simply sick ones. A will to bring important aspects of outside daily-life to the hospital can be noticed through the design of non-medical functions. Hospitalization should provide ways to allow children regular development and growth through the integration of a homely environment and access to educational, social and entertainment facilities.

The first study where design recommendations translated the new children's rights was The Nuffield Foundation's Children in Hospital (1959), in England. It represents an architectural companion of Platt Report (first document about children's rights in hospital), where notions of comfort, privacy, vigilance, parents' presence, lightning, acoustics and temperature are discussed (Kozlovsky 2013).

Not long after, in 1988, twelve voluntary associations for the welfare of children in hospital met together in Leiden for their First European conference where the EACH Charter (European document for children's rights in the hospital) was elaborated.

Even though further studies have been published, the main focus is on adults or general population. There is an increasing necessity to prove, through demanding studies, the relation between physical environments and children behaviour and well-being, i.e., discover if a certain spatial feature has indeed a positive impact on children, and if so, what type, and how can it be improved

3.2.2. Influencing factors and design implications

From the studied bibliography, the most recent studies were analysed and the results compiled in a series of design guidelines that can improve hospitalized children's well-being and health outcomes. They were separated in different areas respecting the following influencing factors:

Sense of control has an apparent deficiency in hospital facilities. When one is experiencing uncontrollable events and is dependent of others, the stress levels increase. The most effective way to combat it is to provide patients with choice.

- Way finding: the design of clear pathways, with areas distinguished by different materials, colours and specific landmarks, allows users to easily identify where they are, avoiding the sensation of confusion or being lost;
- Privacy: the design of single bedrooms and rooms for private activities, allows users to be alone or to have a private conversations without being heard;
- Personalization: the inclusion of picture boards, lockable storage and shelves, allow patients to keep their personal belongings and feel closer to the loved ones.

Social support is one of the most important elements for children. The deprivation of socialization, especially from parents, can lead to irreversible effects at an emotional level. For this reason it is important to allow parents to be with their children all the time, providing adequate bed and bathroom for them to overnight. Furthermore, family kitchen and laundry facilities are important to fulfil everyday needs. Other social rooms are important for children to establish connection with other children or adults.

Positive distractions, during the day, can provide distraction from negative thinking about patient's struggling and disease.

- Play: the design of different playrooms offers children the possibility to explore and interact with different things contributing to their knowledge and enjoyment;
- Education: the provision of fully equipped classrooms allows children to learn, even if they are medicated, without losing lecture contents;
- Art: does not have proven positive health outcomes in children yet;

- Nature: the provision of a natural space far from the institutional hospital image, can allow children to feel free and active. Gardens should be equipped for different activities and options.

Sensorial dimensions in hospitals are essentially visual and acoustic.

- Light: the building orientation and provision of windows became especially important since evidence proved that daylight increases melatonin levels and generates positive mood effects. Furthermore, artificial light should be also considered, since it is fully controllable and can be used as a distraction for children;
- Colour: stimulate different moods in each person. Moreover, studies have proved that children have a preference for mid blue-green tones:
- Acoustic dimensions: noise can increase stress and sleep disruption, elevating blood pressure. Providing single bedrooms, using high absorbing materials and eliminate noise sources seem to have effective results.

Age Appropriate Environments are required to correctly answer the different levels of cognition. Each age group demands different activities and spaces to improve socialization and integration. Furthermore, children tend to interact more with others in the same level of cognition.

Security increases the feeling of protection, which is very important for children and parents.

- Supervision: the reduction of visual barriers and creation of decentralized stations seems to increase supervision efficiency;
- Medical errors: the separation of dispensing rooms and distance of possible distractions, allows medical practitioners to be more focused and administer the right medication in the right dosages;
- Number of transfers: the provision of single bedrooms seem to reduce transfers due to lack of patient's incompatibilities, risk of infection and sleep disruption.
- Infection spread: the provision of single bedrooms and use of HEPA-filtered air seem to reduce airborne infection. In relation to infection by contact, well-located sinks and alcohol dispensers are suggested.

4. Engage users in the design process

The aim to design a paediatric hospital that fulfils users' requirements and expectations is evident. However, are designers' work experience and good intentions enough to achieve this end? Several authors are advocating the importance of integrating users in the design process and in post-occupation evaluations.

Lansdown (2001) differentiates participatory and consultative processes. In the first, children are involved in the research and decision-making during the design process. In the second, children have no control and adults preform all activities.

The participatory method has been gaining prominence because it can avoid problems and huge costs, instead of correcting them in the end. However, companies are not always prepared to take children's opinion seriously and give self-interpretations to the suggestions. A new perspective is giving children the right to express their own opinions and concerns, and allow them to actively participate in decision-making.

Post occupancy evaluations are also being used in a perspective of evaluating what was done, analysing patients' reflections and opinions, in order to proceed to possible solutions or avoid future errors.

The methods used to include children in these processes need to be different from adults, since they have different forms of expression that are not verbal or direct. Studies, as 'The Mosaic Approach', suggest the use of photography, drawing, walking tours and focus groups in order to better understand children's perspectives.

5. Case Studies in the Netherlands

5.1 Methodology

In order to complement the theoretical basis, two study cases were analysed using the current theories. The selection criterion was based on the construction date; use of the new concepts (child and family friendly environments); connection with academic hospitals; and, quality of information available.

From the selection resulted the choice of Wilhelmina Children's Hospital (1998), in Utrecht, designed by EGM Architecten, occupying a separate building from the general hospital, in a new construction; and, Emma Children's Hospital (2015) in Amsterdam,

designed by OD205 architectuur and OPERA, integrated in the Academic Medical Centre, in a renovated department.
The analysis was developed in the following steps:
- **Formal Study:** description and analysis of the architects' intentions and project materialization. The main themes discussed are the relation hospital-city, functional organization and internal environments (four selected spaces: entrance, garden, bedroom and family rooms);
- **Participatory Study:** introduction of users' perspective, especially children. The methods used were based on observations, verbal interviews, photographs and drawings. The children interviews included four activities:
- Walking Tour: a photographic selection of the hospital spaces was carried, in order to understand their recognition and emotions related with different spaces, without leaving their room;
- Photo Collection: cameras were distributed for them to photograph their favourite spaces, furniture, materials, etc.
- Rom Plan: consisted in giving a bedroom plan or picture, according to the child preference, to underline with coloured pencils the room elements: red – dislike; yellow – neutral; green – like.
- Mental Mapping: consisted in asking children to draw a plan of what they could remember of the paediatric department.

However, the study has some limitations, such as the limited universe of participants inquired and data collection; difficulties in gathering available participants; distance from the study object; lack of means to bring the method further; and, difference in the native language (Portuguese – Dutch). Because of hospital restrictions, Wilhelmina Children's Hospital was not evaluated in this section, with Emma Children's Hospital as the target of this study.
Despite the evident restrictions, the collected material can be worked and reflected towards the existent theoretical information, suggesting tendencies of the different user groups and generating conclusions. This study is a qualitative one, which means that the conclusions can only be applied in relation to the studied universe, and cannot be generalised. Further conclusions or generalised proof requires a wider range of participants, which goes beyond the scope of this work.

5.2. Wilhelmina Children's Hospital

The new Wilhelmina Children's Hospital (WZK) is located at the outskirts of the city, in the Uithof district. This area houses numerous universities and is close to two important highways.
In terms of plot area, the hospital is only predicted to expand to the east side.
Different volumes compose it:
- The boomerang: was designed as a sound barrier to the traffic noise. It mainly houses public spaces, the unit care, laboratories and the blood bank;
- The spine: gives a solid structure to the project. It houses important distribution halls, treatment areas and offices;
- The entrance building: is transparent volume that welcomes users with a smooth transition exterior-interior;
- The wings: are the most technological buildings, housing the majority of treatment areas, predictable of extension.

5.3. Emma Children's Hospital

The new Emma Children's Hospital (EZK) is a department of the Academic Medical Centre (AMC). It is located in the Bullewijk district, characterized by industrial and office buildings. Moreover, its location is close to two important highways and to the railway line.
The Emma Children's Hospital occupies the 8th and part of the 7th floors of AMC hospital. The new project unfolds around a central corridor that covers the length of the hospital, accommodating public spaces and connecting different wards, as if it was a truly street.

5.4. Analysis/Results/Discussion

5.4.1. Location and Spatial Organization

First, WZK (1998) and EZK (2015) cannot be extensively compared since they have different proportions, construction year and context. EZK should be analysed as a recent project, while WZK should be regarded as a pioneer project in the Netherlands, where issues such as single

rooms, family rooms or incorporation of electronic devices were raised for the first time.
In terms of location, both hospitals are located on the outskirts of the city and are connected with academic hospitals.
In relation to proportions and constructed area, the WZK is larger considering it is an entire hospital and the EZK is simply an AMC department. Thus, not only does the WZK offer a wider range of functions, but it also presents a more complex distribution. Both have in common, the spatial organization designed around a central distributor space.

5.4.2. Selected Spaces

Entrance/Lobby

The entrance area is particularly important since it contributes to the creation of the hospital's first impression. The NHS Estates (2004) published a study, in which the following design guidelines are suggested:
- Relation outside-inside: the entrance position should be intuitive and well signalised to prevent users from getting lost.
- Main Lobby: the entrance in the main lobby should offer a smooth transition in terms of light and temperature; avoid congestion; and, allow visual connections.
- Relation Lobby-other facilities: the main lobby should provide direct access to the main public facilities and easy identification of the other functions.

Considering the entrance area is the space that relates outside and inside, only the AMC and WZK entrances were considered.
From the outside, the first main difference between hospitals' entrances is visibility. In WZK the buildings' position already predicts the entrances location, while in AMC it is merely identified with a cover element.
In the relation to the main lobby, they are typologically different. WZK presents a glazed volume as a continuation of the outside garden, evoking a public building proportion without directly referring to a specific typology. On the other hand the AMC main hall is more enclosed and offers a shopping mall style on the ground floor. Independently of the purpose, both work as distraction and distributing areas.

Gardens

Outdoor areas are seen as an escape from the hospital interior facilities. Clare Marcus in her article *Healing Gardens in Hospitals* (2006) presents the main guidelines of this facility:
- Movement and exercise: provide different paths for varied activities intensities and settings for physical recuperation;
- Sense of control: provide users with choice such as, being alone or accompanied; sitting or lying; lay on shade or sun, etc;
- Socialization: provide moveable furniture and space to be in public or have private conversations;
- Contact with nature: provide a great variety of fauna and flora, with different colours, shapes and textures;
- Visibility: the garden's location should be easily recognisable;
- Accessibility: facilitate the entrance of all users even the ones with physical handicaps;
- Familiarity: provide a familiar and human scaled space;
- Quiet: the garden's location should be away from noise sources;
- Comfort: enable a sense of enclosure without feeling observed;
- Art: provide positive art elements referent to nature.

The garden facilities of both EZK and WZK cannot be compared since the EZK does not have a specific garden. The WKZ design includes this facility, but it is still far from the possibilities contemplated in theory. The garden offers an enclosed limited area surrounded by the building facades, as it was a cloister. Consequently, privacy, variety of activities and possibilities are limited.

Bedrooms

The patient room is one of the most important components in the hospital. It is in this space where patients spend most of their time during hospitalization, and consequently, attach major complaints or approvals. The following guidelines present the design provisions that are currently assumed as the most important:

- Provide medication locker stocked from the corridor and accessible from the room (UMCPP, 2005);
- Select sound absorbing materials in the corridor and patient rooms (UMCPP, 2005);
- Standardizing room layout, location of supplies and medical equipment (Henriksen et al., 2007);
- Include picture boards, shelves and lockable storage for personal belongings (Shepley et al., 1998);
- Provide appropriate bed and bathroom for parents to stay overnight (Olds and Daniel, 1987);
- Provide a curtain to improve privacy (UMCPP, 2005);
- Make available an art cart and paintings (Eisen et al., 2008);
- Provide outside window views (Ulrich, 1984);
- Provide temperature control (UMCPP, 2005);
- Provide a sink in the room entrance (Ulrich, 2004);
- Provide a close bathroom to the bed, supported by handrails in the way (UMCPP, 2005);
- Provide a presence light to lead the way to the bathroom (UMCPP, 2005).

These provisions were mainly used in the WKZ and EKZ projects, which predominantly applied single bedrooms. In this way, privacy and sense of control are increased, while noise, infection spread and transfers are reduced. However, the hospitals' bedrooms do not present the same layout.
For one, the EZK room layout is clearly divided per user zones, through the use of different floor colours, ceiling heights and provision of a curtain. Also the position of the bathroom in the inboard footwall allows cleaning and disinfection without disturbing family socialization. On the other hand, the WKZ room layout occupies less area and places the bathroom closer to patient and family. However, the division per user zones is only suggested by the different ceiling heights that do not offer a high degree of privacy.
In terms of available room facilities, EZK essentially evolved in terms of technology, offering electronic devices to entertain patients and families.

Family Rooms
The importance of family rooms is increasing due to their connection with the home environment, where families can be together playing, cooking, watching TV, reading or even working. The Ronald McDonald House Charities, suggest from their practice and research the following provisions:
- Provide an equipped kitchen;
- Provide laundry facilities (washing machine, dryer and ironing utensils);
- Enable Internet access;
- Provide shelves to place reference books;
- Design a seating area with television;
- Provide a quiet room.

In both projects it was possible to identify that family living rooms are one of the most recent advances in hospital design. In WZK first plan it is already possible to see the inclusion of bedrooms' amenities for parents to stay overnight and more rooms for them to cook or relax. However, in EZK, the family rooms became the central concept of the hospital, which housed in the main corridor, offer a great variety of activities, such as restaurants, entertainment and relaxation areas. Furthermore, these spaces have colours, materials and furniture that simulate the home environment. This progress can also be seen in WZK (2011) with the creation of the Ronald McDonald room, that already incorporates the same homely style.
Both offer all the suggested guidelines with the exception of the laundry facilities.

5.4.3. Post-Occupancy Evaluation
This qualitative study was divided in two days for observations and interviews. The interviews counted with the participation of 18 users (6 children, 4 parents, 4 nurses, 2 doctors and 2 administrative).
The following items relate each method with results and conclusions:

Walking tour – Children seemed to be happy and confortable with the hospital design, feeling welcomed in the offered spaces. The majority of children recognise their ward's rooms, but only the chronic patients with mobility can recognise

the majority of the other spaces. Also, inside the wards, children seem to be more confortable to walk alone than outside, where they go accompanied by adults.

Photo collection – The majority of photos were taken inside the room since this space is the most frequented by hospitalized children. Outside views, medical equipments, electric plugs, electronic devices, personal belongings, table games and kitchen facilities are among the top preferences.

Room plan – Inside the room, the preferences focus on bed, sofa, ceiling lights, toilet, chair, electric plugs and electronic devices. This can be divided into two main areas of interest: entertainment and company. Independently of the disease, age or medical state, all children enjoy having the possibility to socialise and be comforted, while having different activities to spend the day on.
In general, children's satisfaction with their rooms was dependent of their hospitalization term, i.e., children hospitalized for few days revealed to need fewer amenities than long-term patients. For this reason standardized rooms do not seem an effective solution.
Moreover, one child showed his discontentment with the automatic systems, which frightened him in the middle of the night. This brings along the theme of sense of control. Patients should have full control inside their rooms.

Mental Mapping – The mental image of the hospital was not present in all children's minds. Children that were in the hospital for a long time seem to recognise the space better.
From the ones who could draw the mental map, all drew the ward's door. This element seems to have a similar connection with the home's door. They feel free to walk alone inside the ward, while outside they normally go accompanied.

From the interviews collected, the design strategies seem to be effective in attributing a homely and family centred environment. However, there are still some areas that need further studies to be confirmed and conclude the best way to design, such as:

- School facilities;
- Ward's division;
- Room diversity or standardization;
- Family rooms dimensions and variety;
- Bedroom activities and comfort;
- Semi-public spaces;
- Automated systems.

In relation to adults, the interview revealed that parents prefer to go to completely different spaces to relax, rather than staying inside the children's department. Professionals referred the preference for rooms with daylight, and doctor highlighted the increased walking distances caused by the wards division per age.

6. Conclusion

Hospitals are complex building typologies that not only cure disease but also promote health and extend life. They have many different age, gender and job users going in and out, every day. Even though this study was specially focused on children, adults could not be totally disregarded. The fact is that users inside the hospital create a symbiotic flow. Parents, medical practitioners and other users also need good experiences because they will all have repercussions on children wellbeing.
Nowadays, there is an increasing demand for stress reduction. Therefore, healthcare settings are progressing towards patient and family centred care, offering a homely environment and facilities that reduce the hospitalization impact on daily routine. For this reason, the family living rooms concept has evolved a lot during the last years, trying to create a communal space for family activities, as if they were at home. Overall, children's hospitals seem to progress from a pure technical public building to a 'second home', where medical care is provided.
This new awareness for emotional and psychological support revolutionized hospital facilities. Hospitals try to offer spaces and activities for patients to forget, even for a second, their medical condition, and feel like 'real children'. Children, who need to live inside the hospital, should be able to have similar routines and same life opportunities as 'regular' children. Scientific evidence is required not only to relate spatial characteristics with patients'

healing progress, but also with their development patterns and satisfaction levels.
Furthermore, children's hospitals have the particularity of involving a lot of emotions. The dependable character of children leaves adults powerless. So, hospital design should be friendly and supportive on such a difficult period. It can even create situations where people experience good emotions.
A pleasant, friendly and welcome environment cannot heal diseases by itself, but can be an important factor in improving the user experience, influence life expectancies and consequently may aid recovery.

References

[1] Cramer (1939), 'Eenige beschouwingen over ziekenhuisbouw in hoogbouw'. In: Handboek voor het ziekenhuiswezen.

[2] Eisen S., Ulrich R., Shepley M., Varni J. and Sherman S. (2008), The stress-reducing effects of art in pediatric health care: art preferences of healthy children and hospitalized children. London: SAGE Publications, Journal of Child Health Care.

[3] Henriksen K, Isaacson S, Sadler BL, et al. The role of the physical environment in crossing the quality chasm. Jt Comm J Qual Patient Safety. 2007;33(11 Suppl), pp:68–80.

[4] Kozlovsky, R. (2013), The Architectures of Childhood: Children, Modern Architecture and Reconstruction in Postwar England. UK: Eamonn Canniffe, Manchester School of Architecture, Manchester Metropolitan University.

[5] Lansdown, G. (2001). Promoting Children's Participation in Democratic Decision-Making. UNICEF International Child Development Centre: Florence, Italy.

[6] Marcus, C. and Hartig, T. (2006) Healing Gardens-places for nature in helth care, Lancet, v. 368, pp. 536-537.

[7] NHS Estates (2004), Improving the patient experience: Welcoming entrances and reception areas. London: TSO.

[8] Offringa, M. (2003), Meten en Wegen. Amsterdam: Amsterdam University Press.

[9] Olds, A. and Daniel, P. (1987), Child Health Care Facilities: Design Guidelines and Literature Outline. Bethesda: Association for the Care of Children's Health.

[10] Proshansky, H., Fabian, A. (1987). The development of place identity in the child. In: Weinstein & David, (Eds.), Spaces for children: The built environment and child development (pp.21-40). New York: Plenum Press.

[11] Shepley, M., Fournier, M. and McDougal K. (1998), Healthcare Environments for Children and their Families. Dubuque, IA: Kendall/Hunt Pub.

[12] Steven, A. and Wartman, A (2007), The Academic Centre: Evolving Organizational Models. Washington: Association of Academic Health Centres.

[13] Ulrich, R. (1984), View through a window may influence recovery from surgery. Science, 224, pp. 420-421.

[14] Ulrich, R., Zimring, C., Quan, X., Joseph, A. and Choudhary, R. (2004), Role of the Physical Environment in the Hospital of the 21st Century. Published by the Centre for Health Design.

[15] Ulrich, R. (2006), Evidence Based Healthcare Design. In: Wagenaar, C. (Ed.), The architecture of hospitals. Rotterdam: NAi publ. pp.281-289.

[16] UMCPP (2005), Patient Rooms at UMCPP. In: http://www.princetonhcs.org/phcs-home/what-we-do/university-medical-center-of-princeton-at-plainsboro/who-we-serve/patient-resources/patient-rooms.aspx

[17] UNICEF (2007), Child poverty in perspective: An Overview of child well being in rich countries, Innocenti Report Card 7. UNICEF Innocenti Research Centre: Florence.

[18] Verderber, S. (2006), Hospital Futures – Humanism Versus The Machine. In: Wagenaar, C. (Ed.), The architecture of hospitals. Rotterdam: NAi publ. pp. 76-87.

[19] Verderber, S. (2010), Innovations in Hospital Architecture, New York: Routledge.

[20] Wagennar, C. (2006), The Architecture of Hospitals. Rotterdam: NAi Publishers.