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Research paper

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Green spaces. A necessity for the health and well-being of hospitalized children – Case CHU Batna, Algeria

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Summary

This article tackles the topic of the health spaces and well-being of children hospitalized at the pediatric care in Chu Banta, Algeria, with a focus on the therapeutic garden based on the model of health architecture. In hospital therapeutic gardens, patient health and well-being are crucial, particularly in children's hospitals because children are often more vulnerable than adults. The aim of this research was to examine the opinions and preferences of children and therapists on the components that should be considered when designing a therapeutic garden for children in hospitals, taking into account factors such as age, disease, and mental health. To do this, 50 hospital therapists employed by the hospital and 200 sick children looked at 100 simulated images and answered questions. The results showed that there was no discernible difference between the therapists' and patients' preferences for a children's hospital environment. The children in the hospital preferred cartoon characters, animal motifs, and geometric designs. They also enjoyed crying trees and called for furniture in plant forms. The hospital garden has flower beds and water fountains installed. Outside the service, this study has demonstrated that therapists are capable of becoming experts in identifying children's preferences for wellbeing in the therapy garden. These results can also be applied to studies on children's preferences in situations where it is more difficult to assess the preferences of the subjects' directly. Therefore, these results may aid architects and designers to create more child-friendly hospital environments.

Keywords

children's hospital • green spaces • physical well-being • moral well-being • hospital architecture

1. Introduction

Child well-being is one of the main objectives of any health system. This field is influenced by a variety of issues, one of which is environmental health. Environmental health is especially importance for hospitalized children, as they may be more susceptible to the adverse effects of their environment due to their not fully developed yet immune system and increased vulnerability immune system and increased vulnerability. For hospitalized children, environmental health is not limited to physical aspects, but also includes psychosocial elements. Hospitals can be stressful for children, so creating a quiet, welcoming and safe environment can help reduce their stress levels [Özgüner and Kendle 2006, Van Meter 2019, Deng et al. 2020, Pálsdóttir et al. 2020], as well as improve their general mood, and prevent chronic diseases [Rugel 2015, Buck 2016, Vujcic et al. 2016, 2017, Sugiyama et al. 2018]. Since hospitals are considered to be stressful environments because of the poor health of the patients [Essa and Jabbari 2020], green spaces are necessary and beneficial to alleviate their difficult situation [Ulrich 1991]. Such green spaces are recognized as having a significant impact on patient health factors [Shah Hosseini 2013], for example, they can reduce stress and improve their physical and neuropsychological health [Allahyar and Kazemi 2020]. The influence of green spaces on human health and the treatment of patients in the natural environment are also historically recurring topics [Mazaheri 2010]. Several studies have shown that gardens can have psychological and physiological effects on humans [Sim 2015].

Even a short 3 to 5 minute encounter with a natural environment such as gardens and green spaces can improve the neuropsychological condition of patients [Ulrich 1984]. By focusing on the specific role of gardens in hospitals, such positive psychological effects have also been confirmed in sick children. The effect of green spaces on physical and neuropsychological health has been confirmed, it should be included in the design of hospitals [Gharib et al. 2017]. In this context, some design approaches have emerged. One of them is related to healthy design', which examines the design of the environment in the context of health and well-being [Karaca 2018, Souter-Brown 2020]. The therapeutic or healing garden' approach was also created in conjunction with the concept of 'healthy design'. Similarly, many well-designed gardens or green spaces can have 'therapeutic' and 'healing' effects. Souter-Brown [2020] recommended building sensory or therapeutic gardens in medical centres to promote health and well-being. Hussein [2010] found that sensory gardens are effective tools for improving educational development of children with special needs, as these spaces are preferred by these children [Hussein 2010]. Furthermore, Brown and Corry [2020] found that evidence-based landscapes directly and indirectly lead to improved human health and well-being, addressing the specific needs of patients. Today, in many Western countries, hospital therapeutic gardens are increasingly planted. In Switzerland, for example, no less than 400 greening projects of types of therapeutic gardens (rehabilitation garden, occupational garden, meditation garden and workshop garden... etc.) have been designed and implemented during last several years in order to create a healthy

and pleasant living environment, a place where they can play, learn and acquire respect for nature. For instance in Algeria, the law No. 07-06 on the management, protection and development of green spaces, only four executive decrees have taken place in chronological order: the nomenclature of urban trees and alignment trees; organization and modalities for awarding the national award of the green city, which was won by the city of Sétif, Tlemcen, and Médéa in October 2018 (first edition), 10 millions; the arrangements for the organization and functioning of the inter-ministerial commission on green spaces; the content and modalities for the development, adoption and implementation of the green space management plan. So the latter represents a new breath giving the authorities tools for better protection of green spaces, whether of existing ones or in the future public space planning projects. This law insists on making the introduction of green spaces in any construction project an obligation in all public and/or private urban and architectural projects. It's essential objectives are:

- Management, protection and development of green spaces in the context of sustainable development.
- Improvement of the urban living environment and existing urban green spaces.
- Promotion of new green spaces of all kinds.

Despite the existence of this law, nothing seems to be done in terms of protection, planning and even less the introduction of green spaces. This is all the more true in hospitals, where instead of green spaces there are always asphalt or concrete surfaces, without trees or any other type of vegetation. Equally the design and realization of the health infrastructure follows an outright standardization of the equipment intended of children: nursing rooms, prototype polyclinics deployed and adapted to all age groups across the entire Algerian territory without taking into account the specific contexts of the different regions.

The aim of this research on the health space and the well-being of hospitalized children this work is to grasp the state of pediatric service and the existing plant potential. In this sense, we are concerned with the state of children healthcare and the major importance of green spaces in hospitals in general. However, we will discuss the role of the green space or therapeutic garden at the pediatric service level in the satisfaction and well-being of sick children and therapists through the example of CHU Batna. This requires asking the following questions:

- Is the Algerian child satisfied with the current state of his sanitary area?
- Is it necessary to introduce vegetation in our hospitals (child service)?

In answering these questions, we make the following assumptions:

Hypothesis 1: the existence of plants can make major positive health changes to hospitalized children.

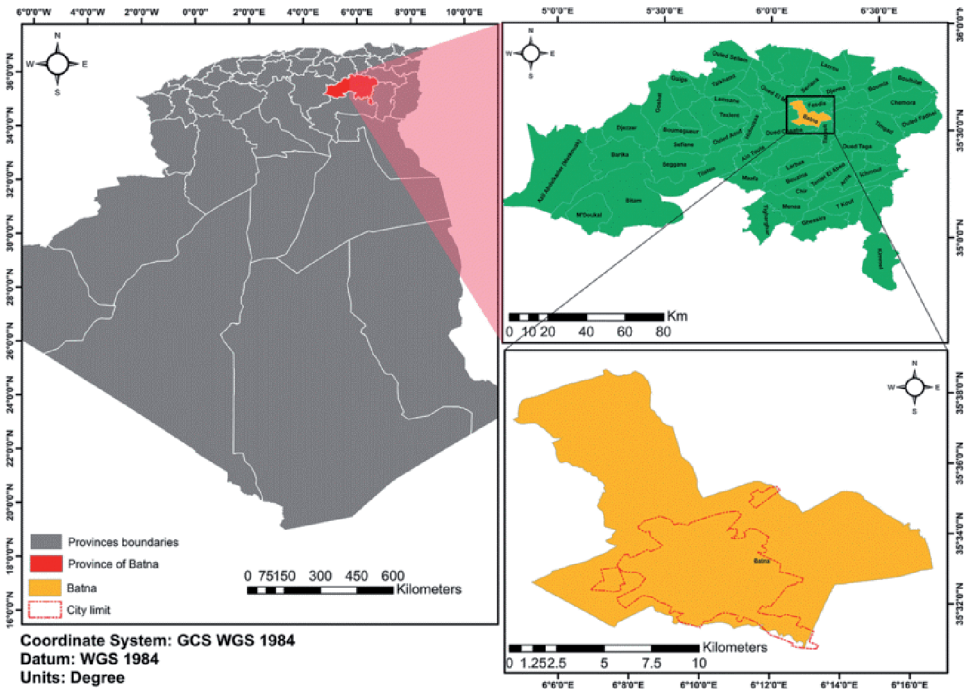
Hypothesis 2: The introduction of plants in the design of sanitary spaces and in particular of therapeutic gardens can contribute to the improvement of the quality of these spaces. The objective is to formulate concrete solutions and appropriate recommendations:

1. Improving mood and emotional well-being.
2. Improving mood and air quality.
3. Sedative and stress-reducing effects.
4. Connection with nature.
5. Encouragement of physical activity and play.
6. Positive distraction and sensory and cognitive stimulation.

2. Presentation of the study area

2.1. Presentation of Batna city

Batna state is located 430 km from the capital in the Auras region, north east of Algeria. Its area is approximately 12038.76 km^2 for a total population of 1 377 000 people. The average population density of the state is 114 inhabitants for km^2 (31.12.2019). Batna is predominantly populated by Chawi Berbers, often trilingual speakers of Chawi, Algerian Arabic and French. Batna is border to the north by Mila, Oum El Bouaghi and Sétif city, to the east by Khenchela city, in the west by M'Sila, and to the south Biskra city. The climate of Batna city is semi-arid the winter is cold with temperatures ranging from 0°C to 5°C and summer is very hot with temperature ranging up to 46°C in the shadow.



Source: https://www.researchgate.net/figure/The-city-of-Batna-administrative-and-geographic-locations_fig1_340792283

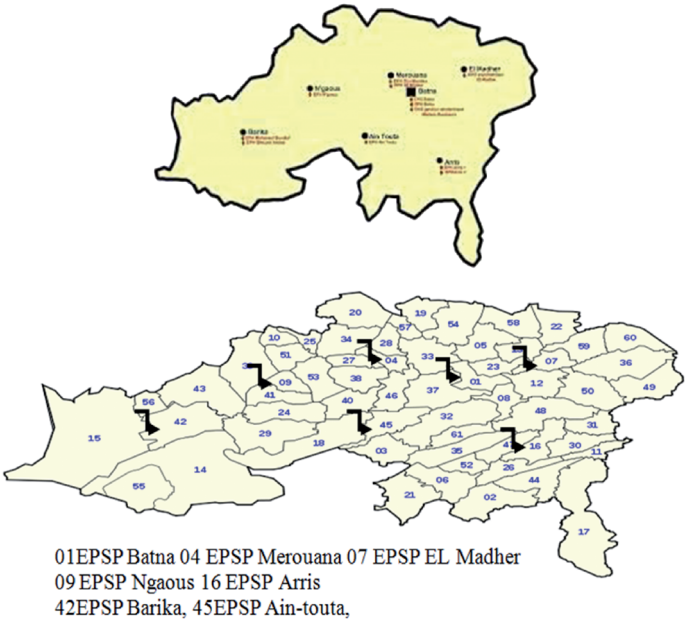
Fig. 1. The city of Batna: administrative and geographic locations

2.2. Sanitary map of Batna City

The city of Batna is organized according to a sanitary card by Executive Decree No. 07/146 of 19.05.2007, which stipulates: the establishment, organization and operation of public hospital and neighborhood health institutions: one university hospital centre CHU, three specialized hospital facilities, one anti-cancer center (Batna), one mere enfant 'Meriem Bouatoura' (Batna), one psychiatric hospital (El Madher), nine public hospitals (in the whole city), ten nearby public health institutions, national institute of paramedical higher education.

2.2.1. Study area

This research work was carried out at the hospital of Batna, which provides medical services to the south-east region of the country (Khenchela, Biskra, OUM El Bouaghi, Tebessa, M'sila and El Oued), in the Pediatric Specialized Service in the wilaya of Batna, in Algeria in 2023. The Pediatric Service is the largest and best equipped service in southeastern Algeria.



Source: https://www.researchgate.net/figure/Geographical-location-of-the-study-area-a-location-of-the-sanitary-of-Batna-b-study-area_fig1_348446589

Fig. 2. Distribution sanitary map of Batna hospitals

In Algeria 'all citizens have the right to the protection of their health; the State shall ensure the prevention and control of epidemic and endemic diseases.' This right derives from the fact that all citizens must have equal and free access to a well-developed health

system. According to the survey, 80 per cent of respondents the children were female and 20 per cent were male. Half of the respondents were between 5 and 14 years of age. Most respondents (30.7%) were hospitalized in the surgical ward, meanwhile, 70 per cent of the surveyed medical staff were female and 30 per cent were male. Approximately half of the respondents (45%) were between 30 and 50 years of age. The majority of respondents (40.7%) were nurses and more than 29.7% were spacialists.

3. Materials and methods

3.1. Methodological approach

In order to address this problem, we present our analysis of this phenomenon on the basis of the participatory design approach (quantitative/qualitative) and two investigations which are:

A. **Theoretical:** focuses on the role of the green elements, the layout of the courtyard, the impact of the school green spaces on the students, and new trends in the world.
B. **Operational:** four tools were used in the fieldwork: interviews, drawings, satellite images processed with the SPESS software, and photographs, observations and questionnaires. The questionnaire was distributed by post to sick children (from 6 to 14 years old) during their hospitalization and to the medical and paramedical staff during the fieldwork. It is presented in Arabic. A fun questionnaire was created using three modules: colors, image and game. Indeed, these three techniques avoided complicated scientific jargon and made it easier to reach to each of the sick children interviewed, which is not obvious with a more traditional questionnaire.
C. **Observation in situ**: This is an important tool for our study. It is about observing the children hospitalized in the service. The purpose of the questionnaire and the interview is to prove how architecture helps to acquire feelings of hospitalized children, and how it makes parents understand the affective impact of architecture on their families and children: guarantee that the staff makes sure the architecture and equipment are suitable for the child's development.

The criteria for the choice of garden spaces have been developed based on the variables of confusion considered by the literature. According to the previous studies, the main obstacles to visiting gardens are: unawareness of the existence of gardens [Whitehouse et al. 2001], closed doors of the premises [Cooper Marcus 1999] and unsuitable sidewalks and paths for wheelchairs and walkers [Cooper Marcus 1999, Davis 2002]. Descriptive analysis of survey data and garden designs was carried out to rank the therapeutic gardens based on the duration and frequency of visits by staff and visitors, and also their design characteristics. The statistical principal component analysis (CAP) method was used. The ACP is useful to describe the variance-covariance relationship. Situational observation is a valuable tool for studying hospitalized children, as it enables an in-depth understanding of their experience and needs during their hospital care. According to Priya et al. [2020)], the result of such approach can

broaden the understanding of designers about user preferences, opinions, requirements, ideas and solutions in the design process. Thus, participatory design enables architects and designers to conceive spaces that better meet the needs, preferences and aspirations of users. Using images to understand the overall design preferences of its users is a participatory design method [Loyola et al. 2019]. In reality, researchers often use multiple photographs to illustrate different landscape designs and ask respondents to select their favorite designs [for example Zheng et al. 2011, Ozkan 2014, Chen et al. 2016a, 2016b]. This allows researchers or designers to better understanding the needs and preferences of users [Titman 1994]. User preferences in public green spaces have been studied extensively. For example, in a research by Jorgensen et al. [2002] on individuals' preferences for wooded spaces and edges and their influence on the perception of safety in Sheffield, UK, it was found that individuals have a preference for denser planted areas and edges. Similarly, according to Todorova et al. [2004], there is limited research into the preferences of specific users (e.g. patients and children) in concrete contexts, such as hospitals, including the children's hospital landscapes. Sick children are among the most vulnerable individuals in terms of psychological indicators. Sick children can be affected by behavioral disorders, fear and anxiety due to poorly designed hospital environments [Hojjat and Ibn al-Shahidi 2011]. In addition, many open spaces are neglected due to poor design [Brown and Corry 2020]. Therefore, when designing spaces that are more appropriate for sick children, it is essential to consider children's perspectives, needs and preferences with regard to the hospital environment. When these needs and preferences are not met, users may feel frustrated or even threatened, thereby reinforcing their fears and concerns [Hussein 2010]. This last element could help to address the central question of this paper. Its aim is to assist landscape architects working in pediatric hospitals to create environments that are more appropriate for these significant user groups.

4. Results and discussions

The national health system can be defined as 'the totality of activities and material and financial human resources intended to ensure: improvement, evaluation, monitoring, maintenance and restoration of the health of the population' [Sanitary law 85.05 art. 4]. Since the independence, Algeria has invested considerable resources into the health infrastructure, equipment, and training.

4.1. The Algerian Health Policy

The health sector development strategy is focused on accessibility for all citizens and improving the quality of care. By 2028, the needs of our population, which would have reached 38 million inhabitants, would change both quantitatively and qualitatively. The epidemiological situation will be considerably improved and the pathologies to be monitored will be prioritized. The coordination between health and other sectors, such as the environment, will be strengthened to address environmental health risk factors.

Legislative aspect	Promote necessary programmers' for the realization of health equipment for children
Training aspect	Force to study pediatric diseases
Administrative aspect	Follow the health field by specialist architects Develop a flexible workload in coordination with different sectors and areas
Architectural aspect	Artistic use at the service level to reduce stress and improve mood
	Combine many attractive elements on walls or floors
	The use of color graphics in the panels to make the way easier to the interior
	Give importance to reception and designing
	Provide single rooms for sick children

Source: Author's own study

Fig. 3. Health structure in Algeria

4.2. Health services

Health services include all diagnostic and treatment services provided by a medical team to members of the community. Several studies and surveys indicate that the access to health care depends on the availability of health facilities, medical personnel, medical devices, and the quality of health services. They also reveal that the availability of a service offer and the frequency with which these services are provided are the key elements that promote the use of these services by patients. It should be added that diagnostic deficiencies are hindering the identification of the symptoms of certain child diseases such as cancer. Often, a caregiver treats the most obvious symptoms without carrying out a comprehensive assessment of the child's health. This approach ignores the underlying causes of the diseases or other existing health problems, as in the case of the mentioned cancer. The analysis in Batna has revealed that the care for children is only provided in adult healthcare facilities. This confirms the lack of medical equipment for children and medical personnel shortage.

A suitable environment	Offering physical and psychological comfort
Psychological care	Maintaining stability and continuity of psychic life A positive effect on physical abilities
Therapeutic workshops	Are based on active and voluntary participation of the patient, they allow better control of psycho-behavioral disorders Ex: art and music therapy, therapeutic gardens
Cognitive stimulation	Has a positive effect on physical abilities and decreases psycho-behavioral of sick children

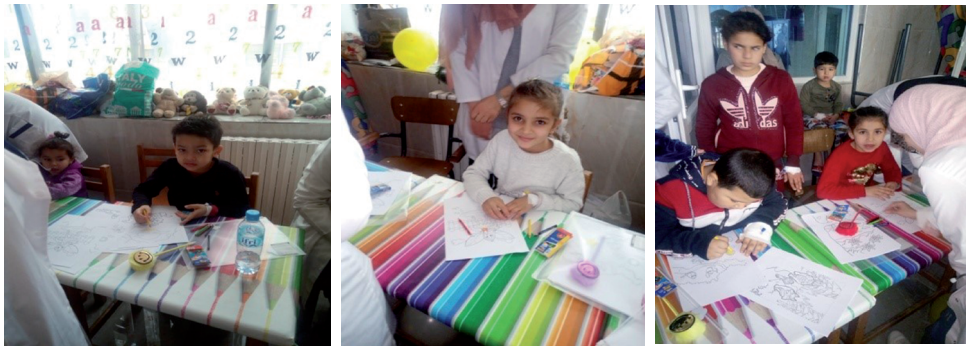
Source: Author's own study

Fig. 4. Therapeutically aspects for hospitalized children non-medical

4.3. The hospital environment and its influence on the psychosocial needs of the child

Modern medical trends have highlighted the importance of the patient's psychological needs as well as his comfort and calm, which have a great impact on treatment outcomes. As Florence Natingel, an expert in health, explains, the medical care of sick children requires specific training, because children are not small-sized adults but, on the contrary, different kind of human beings who live in different psychic realm with special needs, and not everyone can acquire the art of communication to understand and take care for them. So a child in hospital has a lot of needs and it is up to the architect to satisfy them when designing this environment, such as a positive distraction. Children need social interaction, so it creates a climate that will push them to communicate with others, otherwise they will turn to isolation, and this has a negative impact on the psychic of children, their relationship with doctors and nurses during the treatment. To allow interaction with other children of their age it is necessary to design play spaces for daily activities.

Therapeutic effect. Green spaces provide a calming natural environment that can help reduce stress and anxiety in sick children. Contact with nature is known to have beneficial effects on mood and mental well-being, which is crucial for sick children, who often face challenging medical treatments. Green elements can play a role in creating a therapeutic environment for hospitalized children. Therapeutic gardens, green courtyards and other natural spaces can provide places for relaxation, reflection and healing.



Source: Authors' own study

Fig. 5. Activities preferred by children

Stress and pain reduction. Vegetation, trees, and gardens can help decrease pain perception and accelerate healing. Studies have shown that hospitalized patients with green spaces are healed faster than those without them. For children, being able to relax in a green space or simply seeing it from a window can make a big difference in their experience of the disease.

Source: Authors' own study

Fig. 6. Children's paintings inside hospitals

Source: Authors' own study

Fig. 7. The hospital throught the eyses of children

Nature. Nature is not only a source of distraction, but also a positive influence on health that has been recognized for centuries. In this area, several studies have shown a decrease in the level of stress and disease, when there is a view of a natural landscape, rather than a view on a brick wall. Nature also reduces the length of hospitalization, and the doses of analgesics and post-surgical complications. Children are affected by contact with nature – in hospitals that have gardens, the stress of hospitalization can be reduced by offering a less complex space than the hospital, with a more family-friendly and relaxing atmosphere, acting as a refuge.

Vegetation plays a key role in improving the quality of healthcare facilities and in the rehabilitation of hospitalized children, thereby contributing to better care. Plants and vegetation can have a significant impact on physical and psychological well-being of children during their stay in the hospital. Here are some ways in which vegetation can positively influence these aspects:

Source: https://www.site-design.com/projects/ucmc-comer-childrens-hospital-playground

Fig. 8. The therapeutic hospital green spaces

A. **Improved mood and morale.** The cons sight of nature can have a positive effect on the mood of hospitalized children, helping them to feel happier and more positive despite the challenges they face during their hospital stay.
B. **Physical and cognitive stimulation.** Green spaces encourage physical activity, even if it is light, which is beneficial for sick children who may suffer from muscle weakness or lack of energy. These environments also stimulate children's curiosity and creativity, which can be an asset in their cognitive development, even during illness. For children who spend a lot of time indoors, especially in the hospital, green elements can serve as a link with the outdoor world. This can help improve their mood and reduce feelings of isolation or confinement.

Source: Authors' own study

Fig. 9. Outdoor green spaces in CHU Batna

C. **Inclusion in holistic care**. More and more hospitals and pediatric care centres are adopting green spaces into their architecture, recognizing the importance of a holistic approach to healthcare. This shows that healthcare is not limited to medical treatments, but also includes the environment and the emotions of patients.

Source: Authors' own study

Fig. 10. Activities preferred by children

These results clearly indicate that the design and layout of the healthcare architecture for children hospitalized in Algeria does not give sufficient weight to the spaces that can complement the therapeutic spaces, even though the composition of these spaces is more or less explicit in the regulation. It should be taken into account that each child is unique and reacts differently to illness and childhood. Health experts, such as doctors, nurses and social workers, also parents' caregivers' have an important role to help hospitalized children with their situation. So it is essential that the design of the healthcare architecture for hospitalized

So it is essential that the design of the healthcare architecture for hospitalized children focuses on the support of healing, the promotion of well-being and comfort, and the specific needs of young patients and their families. Hospital spaces need to be designed with children's specific needs, their size, development stage and preferences in mind. This can include things like furniture appropriate for their size, bright and attractive colors, and play and relaxation areas. It is essential that the therapeutic environment is adaptable to different forms of treatment interventions, whether individual sessions, group therapy or entertainment activities. It is important that the environment is safe for children and easily accessible for those with reduced mobility, with age-appropriate equipment, anti-slip surfaces, and access ramps.

5. Conclusion

In general, green spaces are not only soothing places for sick children but also effective means of improving their well-being and speeding-up their recovery. Their integration into the care environment is necessary to promote a holistic healing framework in which nature actively contributes to the healing process. In children's hospitals, green spaces are an essential part of a holistic approach to improving children's well-being and care. Healthcare professionals and architects can better the quality of life and hospitalized children's experience by incorporating plants into their design. This can also support the rehabilitation and general care of the patients. The overall result of this study is that the soothing colors, the wailing trees, and the connections between the use of

animal shapes, the relationships between the plants and the lawns on the plateaus, the water fountains and the plants, the furniture linked to the plants, the cartoon characters and child-friendly features in contemporary styles, as well as playground design, were given additional weight in the children's hospital environment. Children in hospitals can be quite sensitive to green spaces, and having green spaces can be very beneficial to their physical, mental, and emotional health during their stay. Incorporating natural elements into the hospital design can be a useful tactic to improve the patient experience and aid recovery.

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