Design Indicators Based on Nature and Social Interactions to Enhance Wellness for Patients in Healthcare Facilities

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Abstract

Healthcare facilities are complex and complicated structures that affect their inhabitants heavily. The effects may become both physical and psychological and address patients, users, and visitors. However, recent studies have shown that "coming back to nature" affects hospital stays significantly. Patients that are given access to nature and continuous connection to family, friends, and specialized social workers may eventually recover faster and become dismissed earlier. This research is based on an analytical overview of previous literature in relevance to the promotion of health and healing in healthcare facilities which have higher access to daylight and natural views. It accentuates previous research and emphasizes the importance of these factors as well as exterior connectivity for patients and their essentiality in accelerating the healing process. The research also presents the design indicators and criteria that future hospitals should follow to enhance the productivity of these institutions and promote wellness for patients. The results of this research came out as a group of indicators that address the effect of design factors on overall building and interior design of healthcare facilities.

Keywords

Hospital stay • Recovery • Stress factors • Design of healthcare facilities • Design indicators

1 Introduction

Patients in healthcare facilities often feel anxious and unsafe, leading to a delay in their overall healing and well-being. Previous research has confirmed that exposure, for long periods of time, to stress, can considerably reduce immune response in humans.

That is why hospitals should set a primary focus on the patient and develop standards and criteria to achieve an optimum healing environment, while taking into consideration, emotional, psychological, and physiological aspects in order to decrease the level of anxiety and stress as well as promote better healing, shorten the length of stay and support emotions through focusing on bringing nature, landscapes, and scenery to the patient for its adverse and positive effect on the nervous system; worn out and negative feelings decrease and feelings of enjoyment and pleasure increase. Studies have proven that watching pleasurable natural scenery affects physiological aspects like blood pressure and heart function (Ulrich, 1991). Recently, (Kuo, 2015) proposed a "central pathway" between nature and health which may inadvertently lead to enhanced immune function.

At the beginning of the early 1980s, medical research concluded that it was of utmost importance, to focus on patients' needs, not only from the medical service perspective but also from the physical, sensory, and psychological comfort. One of these points was set on improving way-finding systems in healthcare facilities and increasing the clarity of meanings communicated by space design (Totaforti, 2018).

With the beginning of the twenty-first century, the design of healthcare facilities took on a turn to include human aspects, in an attempt to support the productivity of these institutions. The length and capacity of stay of patients became an issue that was addressed to promote better health and living and enhance the quality of life of individuals undergoing hospitalization. With this idea in mind, healthcare facilities started taking on a more hospitable role and

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the emergence of hotel-like hospitals started to arise. This concept helped designers model a comfortable hospital environment that focused on patients' needs and overall well-being.

In the next section, a literature review of the theories formulated on human benefit from nature and social interactions will be addressed, a description of two case studies of children hospitals will then be analyzed, and the methodology undertaken for this research after that will be underlined. The section following the methodology will focus on the results and discussion reached and will end with concluding the design indicators compiled for the design of healthcare facilities in relation to social and nature interactions.

2 Literature Review

The association between health and physical surroundings has long been established, and the theories of "Kaplan and Kaplan's; Attention Restoration Theory (ART)" (Kaplan, 1995) and "Ulrich's, psycho-evolutionary model" (Ulrich et al., 1991) are only two of the theories that deal with the influences affecting recovery from stress and attention fatigue from exposure to natural elements. Both theories are built around the effects that nature has on the restoration of human emotions' attention. Roger Ulrich, in his well-known study, published in 1983 (Ulrich, 1983) discussed the influence of natural views from even a hospital window after surgery or urban nature (the setting for that study was a park with trees) and concluded that it was beneficial in aiding and influencing the boost of physical recovery following adverse health conditions or surgery. The study also focused on the social well-being of the patient, feelings of safety and security and a sense of adjustment as well as their state of mind and mental fatigue (Netherlands, 2004).

Visual exposure to actual or simulated natural views results in efficient recovery from stress, emotionally and psychologically, within a period of three to five minutes at most, or as quickly as 20 seconds, in some bodily systems, and physically, over subjection to longer periods of natural views (Ulrich et al., 2006) According to a study done in 1984, it was found that just looking at greenery and nature reduces hospitalization time by 8%. In times of fatigue and stress, nature acts as a mediator, which can provide a sense of familiarity and connection with the everyday challenges faced, and this is also particularly important in healthcare settings, where patients and staff are continuously confronted with life-changing and often challenging events. That is why it is important to subject patients to natural elements and views, including interior gardens, water elements, and urban scenery and landscapes.

Studies in the 1990s concluded that people, in general, when asked where they preferred going when upset, tired, or stressed, found that a majority chose to go to a place of nature, whether natural or designed (Cooper Marcus & Francis, 1998).

In 1997, McRae conducted several consumer surveys on former hospital patients, and these surveys chose a sample that differed by age, location of hospital, and medical problems of the patients, but still found that the one thing common between the majority surveyed was their preference to access to nature in the physical environment of the healthcare facility, gardens, views of nature, balconies, indoor plants, and landscape scenery and pictures (MacRae, 1997).

This remark was not only true of patients, but of staff as well, nurses and members of staff claimed that they preferred being surrounded by natural open settings (Huisman, 2012), whether it was through bringing nature into the building, or through designing hospitals around open outdoor space or combining both aspects together through integrated hospital design that promotes physical activity and social interaction (Ulrich, 1984).

Nowadays, the evidence is even more clear as to the effect of nature on people's well-being, one study held in 2018 showed that spending just 120 min a week in natural settings may help boost immunity and relieve stress (White, 2019), while another one, published this year, 2020, discussed the benefits of visiting nature more than once a week helped promote health and well-being (Martin, 2020).

2.1 Designing for Patient Wellness: The Concept of Health Care Facilities Design and Development According to Patient Wellbeing

The term "Biophilia," coined by Edward O. Wilson in 1984, was defined as the need of incorporating natural elements to human needs, and it emphasized that humans need connections to the natural environment in order to survive and excel. This term, in turn, led to the coining of a new term that focuses on aspects of the natural world and its contribution to human health and productivity: biophilic design. Biophilic design is based on the idea that humans need constant connections to nature, even in modern settings, to improve their mental and physical well-being, through everyday common techniques such as opening up views to natural landscapes or placing planters at workstations. This conclusion led, in turn, to experimenting with biophilic design in healthcare settings to evaluate its impact on the hospital environment, as well as, its users. The principles of biophilic design include incorporating natural materials,

natural light, views of nature and plants, and vegetation into the overall design setting.

Integrating biophilic design and access to nature in the design of healthcare facilities aims at improving patient health and satisfaction, while combining sustainability and human health goals (Silvis, 2013).

Given all the above, the current research sheds light on two of the principles of biophilic design; (a) natural light and its effect on patients and hospitalization rate and (b) views of nature, plants, and vegetation in the hospital setting (whether through using them inside the hospital itself and incorporated in the design setting of the healthcare facility, or by designing gardens embedded in the healthcare environment), and this research also examines the effect of social interactions on patient's well-being and state.

2.2 Natural Daylighting and Healing Process

2.2.1 Natural Lighting

In an attempt to better explain the importance of daylight and views of nature to healthcare personnel, architects and design experts at Green Build 2012 explained that subjection to natural daylight has been recorded to improve alertness, focus, and function, as well as alleviate depression. Natural daylight, which helps promote production of vitamin D (one of the main vitamins responsible for heart health, bone growth, and other biological effects), thus has a direct and positive impact on health. Natural daylight also helps regulate and modulate patients' heart rhythm, while maximizing user comfort, as well as providing an ambient and more relaxing indoor environment, with a better performance and higher productivity yield.

The presence of access to natural lighting in healthcare facilities is also advantageous to patients who have been admitted for long hospital stays; through offering them the ability to see the time of the day, through window watching as well as observing the weather and natural landscape along with natural light. This connection helps them feel that they are not isolated. A study, recently done, at the University of Texas in the United States of America, portrayed that comforting colors and natural views helped in promoting the healing process of patients. Daylighting not only reduced the length of stay and admission, but also helped in alleviating the feelings of isolation felt on hospital premises (Iyendo & Alibaba, 2014) This can be achieved through efficient placement of windows in the initial design, to incorporate windows with a view of the outside, in every space in the building, where possible. This design allows natural daylighting, through the design of windows, to become the main source of lighting for most of the spaces inside hospital buildings and create an interconnected link between the inside and the outside as well. This will ultimately lead to considering optimizing window placement to efficiently utilize exposure to daylight in patient rooms while designing hospital layouts. Design settings may also include outdoor decks, courtyards, and a rooftop track, which can be seen and observed from the inside and help in engagement with nature in the wellness setting.

The orientation of the building acts as a major factor in the aid of healing of healthcare facility patients. Optimum orientation utilizes airflow and sunlight into the building, helping the designer make better decisions as to the width and dimensions of windows and relevant openings (Aripin, 2006, 2007). Optimum orientation also helps admit natural light without glare and distortion through placing the building on the east–west axis and having the large elevation facing the north (Iyendo & Alibaba, 2014). It is also worth mentioning that most components of healthcare facilities need natural light that may be provided through skylights, large atria, or clerestory windows.

One of the main physical attributes, of hospital rooms design and layout, to patients, both physiologically and psychologically, is the presence of exterior viewing windows; however, the design and placement of efficient and effective windows depend on elements other than the view itself but rather on orientation, environmental considerations, and specific building considerations. The importance of windows to patients lies in the fact that most hospitalized patients have limited movement and thus depend on windows to provide them with daylight and other natural aspects. Internally, lighting should be focused and directed toward the patients' bed, in a manner as to not provide discomfort to the patient. Table 3 discusses the size of windows in accordance with the UK criteria for hospitals (Department of Health, 2013).

2.2.2 Design Example Adopted to Optimize Access to Daylight and Views of Nature

Hospitals in most European countries are required to have narrower building configurations and operable windows, and this enables them to have widespread access to daylight as well as utilize natural ventilation, when exterior weather conditions permit, and interior needs can be met without mechanical conditioning. Hospitals in these countries are typically laid out with narrow wings and/or contain courtyards and atria to provide occupants with

- Almost universal access to daylight,
- Views to nature and
- Natural ventilation.

Typical hospital typologies such as the street typology, terrace typology, perforated block, or the campus plan promoting these connections in patient care, work spaces, and public areas are based on narrow building footprints or

articulated and penetrated plan forms. In some countries in Europe, for instance in Germany, the connection to the outside and providing a view of nature, in primary staff working areas, is mandatory by law due to its necessity for a safe and healthy environment (Behringer, 2011).

Research also concluded that patients who stayed in lucidly lit rooms were discharged earlier in comparison with those who stayed in dimly lit or duller rooms. It was found that patients hospitalized for severe depression and whose rooms were poorly lit or overlooking spaces in shadow had an average increase in the length of their stays by around 3.67 days more than those who were admitted to sunny rooms or with a better outside view. This study also found that patients exposed to more intense sunlight suffered from less perceived stress, complained of less pain, and were given 22% less painkiller medications during the course of an hour (resulting in an overall cost reduction of 20% for pain medications) (Ulrich et al., 2004). It also found that natural light helped improve sleep, decrease agitation, and aid in the treatment of hyperbilirubinemia in infants (Ulrich et al., 2004).

2.3 Gardens in Healthcare Environment

As mentioned before, evidence-based studies have found that gardens and places of nature are often getaways where people go when they are feeling upset, stressed, or tired. Gardens, in general, provide a relief to most pressing matters and bestow a calming and relaxing effect on visitors. Psychological research shows that green as a color has a calming, soothing, and healing effect as it symbolizes nature.

Gardens, in healthcare facilities, have been proven to, not only, reduce stress and improve patient outcomes, but also supply healthful and regenerative calming natural views, through:

- Fostering access to social support (enabling meeting with family and friends in other contexts other than the patients' room or ward)
- Enabling patients with a sense of control regarding stressful settings as well as providing positive chances of escape (Cooper Marcus & Francis, 1998; Ulrich, 2001).

After assessment of post-occupancy data evaluations of hospital gardens in the state of California, USA, researchers found that patients were not the only ones who used these gardens to promote healing; nurses, healthcare workers as well as other staff members also used these gardens as a much needed escape to recuperate from everyday stress (Cooper Marcus & Barnes, 1999). Results from other post departure research found that admitted patients and family members, who used hospital gardens, reported reduced stress levels and positive mood changes (Whitehouse, 2001), leading to heightened satisfaction with overall quality of care from both patients and family members (Ulrich et al., 2004). "Healing gardens," as they were termed, offered a way for patients and healthcare workers and personnel to step back, relax, recover, and revive. Patients and staff, alike, reported that using these hospital gardens helped them to better focus and calm down, while families of patients claimed that the time spent in these gardens allowed them to better cope and help loved ones.

In a healthcare therapeutic garden, based on several studies, acknowledgeable positive results of hospital recovery and discharge are related to the patient's leisure time with outdoor open nature, as well as, the patient's presence in green open spaces and landscapes. These gardens may either be shared or private; however, the private ones are considered to be the best type of meditation gardens, leading to positive healing impact, due to the fact that the user has his own space and utilizes his own time to access the most healing benefits of the garden (Momtaz, 2017).

Strategies for the design of "healing and therapeutic gardens" vary from simple garden layouts to gardens that feature a home to diverse systems and habitats. This diminishes the "sterile" sensation of a hospital, which may in itself act as a stressor to patients. This "sterility" can be mitigated, creating something more pleasing to the senses through seeing lush green surroundings, listening to the sound of flowing water, and rustling leaves or even through the natural smell of plants (Pouya & Demirel, 2015).

As a whole, the design of healthcare gardens prevails with green materials; hardscaping is minimized to only one-third of the space occupied and plant materials dominate the garden. With the spread of greenery, the minimization of hardscapes, and the softening of landscapes, patients may be encouraged to exercise; walking has been found to lower severity of depression. The different opportunities present in the garden, aiding in elevated mobility and accentuated exercise, may support different choices and facilitate useful distraction through direct connections with nature (views, scenery, shade, or sunlight) or indirect connections (rustle of leaves, soft breeze, sound of water or birds) (Momtaz, 2017).

Thus, "therapeutic gardens":

- Aid activity, mobility, and movement
- Aid in the decrease of stress
- Aid in the building of convivial and emotional bonds
- Accentuate sensory benefits from natural elements (sun, wind, rain, breeze, smell of soil, trees, shrubs, and flowers, the sound of birdsong, the rustle of leaves, trees and water and the sight of scenery, butterflies, moonlight, and more (Pouya & Demirel, 2015).

Healing gardens have many benefits and when they cannot be incorporated into a design, plants, water, and other natural elements with restorative qualities can take their place. Hospitals are often disorienting and confining. Patients are often under a constant reminder of their illness with various protocols and equipment. Plants (especially entire gardens) reduce the feeling of isolation. The gardens encourage patients to feel part of a larger group and offer an opportunity to focus on living plants that represent hope, growth, and renewal (Beggs, 2015).

With the above design decisions in mind, it is recommended that the leading landscape to the healthcare facility itself and the entrance be equipped with plants and water elements that act as a mini-oasis to help calm the various nervous thoughts and feelings that arise before entering the facility and allow for a more relaxed waiting period before being admitted to the physician or hospitalized (Beggs, 2015), and this recommended design criteria result from the evidence that nature extends beyond visually aesthetic pleasure, but also encompass a range of psychological well-being benefits as well (Ulrich, 1984). Some of these features may be

- A garden that is soothing to patients, family, and staff and that is easily accessible
- Aquaria in waiting areas (often distinguished with high levels of stress and anxiety)
- Atria with green elements and details
- Fountains or the sound of waterfalls to intensify the soft sound of water, and
- Calming art that is accessibly mounted for access to bedridden patients (Ulrich, 2003).

Well-designed hospital gardens emphasize the importance and essentiality of social interaction and its benefits which through providing pleasant views, which aims at decreasing stress and improving therapeutic results. Designing a hospital garden should focus on location, accessibility, patients' needs, and priorities.

2.4 Integrate Nature in Interior Design

The above design parts are all subject to availability of an element which may contribute to the healing process, whether through availability of a space allocated for the design of a garden inside the facility, through which an integrated design can be implemented. However, present functioning healthcare facilities may not have the leisure of a space that may be converted into a garden. That is when the use of indirect scenery may be of use. This can be achieved through imagery of nature. The same aspect of gardens arises in this indirect layout, just as gardens aimed at engaging the senses, so does indirect subjection to nature aim. Color, smell, touch, and sound of nature as perceived may be incorporated into the facility's setting. Horticultural therapy emphasizes the positive impact that close contact and care for plants have on health and healing outcomes. The addition of fragrant plants, variations in color and texture, and opportunities to become closer to elements of nature enhance patients' sense of calm, act as a positive distraction to his current state, and bring back experience-based memories of nature (Ulrich et al., 2004).

These elements may be, for example,

- Green walls, green roofs, plants in rooms (Totaforti, 2018)
- Images of nature, videos, pictures, or slides
- Virtual connection with nature, represented through use of modern technology, whether augmented or virtual reality
- Accentuating the senses, through the sound of leaves or that of birds or the smell of flowers in the air.

2.5 Social Support and Positive Social Interaction

2.5.1 Social Contacts

It is without doubt that social relationships and interactions are essential for health and prosperity, and that the absence of strong connections is directly related to development and progression of several diseases as well as adverse health-threatening conducts such as smoking, drinking, substance abuse, and even gang involvement (Beggs, 2015).

Approximately, 49% of all family-related visits to patients in healthcare facilities took place in the patients' room, and family members and loved ones spend most of the hospitalization time at the patient's bedside, up to several hours a day. "Close" family members' visits had a significant effect on patients' well-being and their mental status. Although it cannot be stated that all patients improved after visits from family members, some experienced a decline in their mental status, it can be stated that those who improved had access to public areas that contained simple green common spaces with trees or grass (Netherlands, 2004) and had access to appropriate facilities which encouraged social interactions and a chance for social support, this included, provision of appropriate and comfortable seating in patient rooms, overnight accommodations, for close family members, or next of kin, inpatient rooms and even a place to accommodate small groups that wish to visit (Huisman et al., 2012). Design interventions also include comfortable, pleasant waiting areas; convenient access to food, drink, telephones, and restrooms; and accessible areas for sitting and socialization.

2.5.2 Social Support

The importance of social support lies in the caring and tangible assistance and emotional endorsement received by the person (White et al., 2019). It has been concluded, from an occupational research, that those who receive higher social support often feel less stress and better health. On the other hand, introverts and those who are socially isolated experience higher rates of illness and reduced recovery. This is evident in cardiac patients whom received a higher level of social support and was noticed to recover quicker from heart attacks and better survival rates. It has also been witnessed that patients recovering from myocardial infarction had better recovery outcomes when receiving social support. The same was concluded for patients recovering from metastatic cancer. Evidence-based benefits of social support across health-relevant contexts suggest that focusing on a design that promotes social support will in turn reduce stress and improve outcomes. (Ulrich et al., 1991) This can arise from the intersection between public spaces and a homely environment with both the comfort and amiability provided by each space (Mogensen, 2011).

2.5.3 Social Interaction

Social interaction is essential to health and well-being, and community interaction zones where individuals can bond and get inspiration and support from others can, in turn, achieve a social bond between those who share similar views. This is an environment where people gather with a mission to alleviate the overall wellness of the community through positive social interaction. Support, whether parental, familial, or social, plays an important role in helping patients recover from illness. Evidence-based research shows that increasing of social interaction levels can be achieved by providing lounges and waiting rooms with comfortable movable furniture arranged in small flexible groups (Hilal, 2006).

Variety of Spaces

A variety of spaces while designing healthcare facilities may better promote the healing process, where the patient is given different choices, ranging from different outdoor spaces in which to explore or indoor spaces with natural views and works of art. This, in turn, results in an increased sense of control, which leads to lower stress levels. Areas of solitary occupancy may allow the patient to "get away in a controlled area" from the sterilized environments of the hospital. Adjunct areas for family members or support staff to congregate may also help provide social and emotional support to the patient (Pouya & Demirel, 2015).

It is also worth establishing that single-bed inpatient rooms also make it easier for visits from family and friends and helps promote intimate and serious conversations without disturbing others. With this in mind, the social support needed by the families of hospitalized patients is often forgotten, the feelings of anxiety, worry, and stress that arises from not knowing what is wrong with a loved one is sometimes overlooked, and the stress from the patient from suffering from serious and life-threatening illnesses is transferred to families who often also require social support in order to adapt. This may be derived from other family members and intimate friends but may also be highly advantageous from social interaction with families of patients with similar experiences (Ulrich, 2003).

2.5.4 Orientation

Research shows that the design of seating arrangements and patterns played a powerful hold over the amount of social interaction between patients in a patient dayroom area setting. Chairs, which had been positioned shoulder-to-shoulder along the walls, strongly suppressed social interaction, while those that were arranged around small tables in the middle of the room increased interaction, especially among socially inclined patients (Huisman et al., 2012).

The above can also be applied to the design of "healing gardens" that encourages conversations and social networks between groups of patients and visitors (Cooper Marcus & Barnes, 1999). These design features may also be made use of in waiting areas and dayrooms; this can be achieved through creating transparency in public spaces by designing floor to ceiling windows or by engaging patients and visitors in artwork and graphics.

2.6 Examples of Hospitals Accommodating Nature and Social Interaction

The following two examples are of hospitals that adopted design criteria to promote healing through providing daylight, natural scenery, and social interaction and support. The first one "The Dell Children's Hospital" is located in Austin, Texas, USA, and is the first hospital to achieve the Platinum LEED. The design of the hospital embraces the concepts of sustainability and utilizes these concepts in creating a healing environment through design features like natural lighting, evident in over 80% of the hospital's interiors, while natural ventilation and monitoring systems are embedded in the design to ensure high indoor air quality. The hospital is also designed with natural wood materials, bricks, and stone, giving it a natural look. There is also an onsite garden, with most of the hospital having its view on it. The interiors also feature over 700 original pieces of art (Table 1).

The other hospital is in Melbourne, Australia, "The Royal Children's Hospital." The hospital building's formal

Table 1 Dell Children's Medical Center

1. Example (1) DELL CHILDREN'S HOSPITAL

"Dell Children's hospital" utilizes natural and aesthetic factors in order to promote healing both psychologically and physiologically to the children they care for, as well as, to the families through providing an environment to help people get well.

The hospital has an articulated building footprint and incorporates several courtyards to increase the perimeter wall. As a result, 36 percent of the building space is located within the daylight zone. (Aripin, 2007)

Artwork and sculptures, are carefully placed throughout the hospital, along the walls and reception areas. Design specialists have described the healing garden at the Dell Children's grounds as "breathtaking".

The design of the hospital aims to optimize access to daylight, views to nature and social interaction (Central, 2019) as shown in Figure 36.1.

1	A hub and spoke design incorporates seven interior courtyards that bring natural light throughout the building	**Dell Children's Medical Center of Central Texas** (https://www.architecturalrecord.com/articles/12178-dell-childrens-medical-center-of-central-texas, 2019), (https://segd.org/dell-childrens-medical-center, 2019).
2	The courtyards represent the ecosystems found in the hospital's	
3	A multi-level "Healing Garden" with an embedded labyrinth, a reflecting pond and bridge.	
4	"Sensory Garden" that uses plants and other elements with unique textures, colors, smells and tastes to stimulate the senses to promote rapid recovery.	
5	"Butterfly Gardens" planted with vibrant florals that attract butterflies to better awaken the senses with the sound of fluttering and vivid colors.	
6	Global and Local art, with pieces chosen as much for the collection's clinical healing power as they are for their beauty.	
7	A natural palette of indigenous plants, in line with the overarching theme of our "green" building to complement the landscaping of the gardens	
8	Family Lounges are located directly outside each patient unit on 2nd, 3rd & 4th floors. They're available 24 hours a day.	
9	The Family Resource Center is located near the main entrance on the 3rd floor. The Center offers resources ranging from computers to books and DVDs, and a medical librarian is available during daytime hours.	

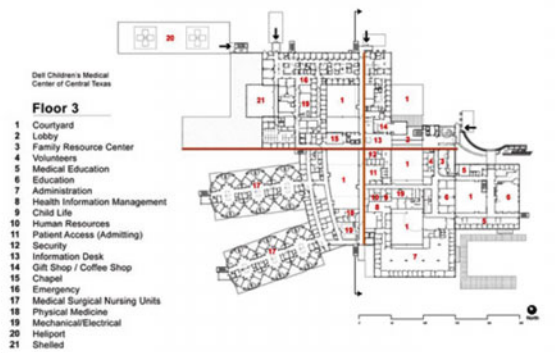


Figure 36.1: Plan of Dell's Children Hospital showing number of courtyards

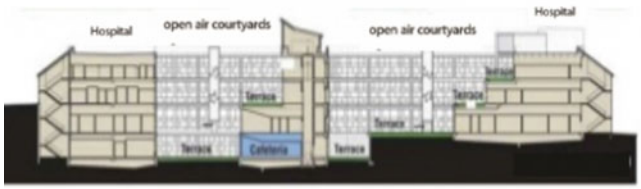
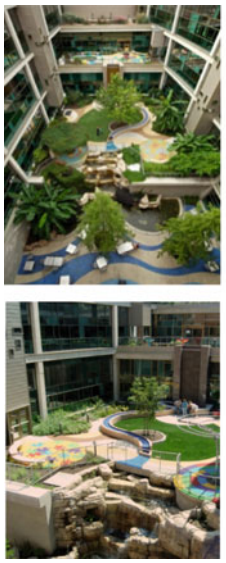


Figure 36.2: Section of Dell's Children Hospital

Figure 3: Total area: 180,962 SF, Daylit area: 65,374 = 36% (13)

10	Circular eight-room pods have a nursing station just outside the doors of every patient room.
11	Family Sleeping Accommodations are part of every child's room.
12	Playrooms for kids and siblings 10 and under are located on the 2nd, 3rd and 4th floors.
Dell Children's Medical Center	

Figures 36.4 & 36.5: Interior Courtyard providing play area for children and views for rooms facing the courtyard (Chaudhury, et al., 2003).



Figures 36.6 & 36.7: Healing Garden

arrangement, along with the internal and external spatial distribution, was assembled to promote a regenerative and restorative healing environment for children and their families. The hospital is built around a large park and is coined to be a "park in a hospital, and a hospital in a park" (Bensalem, 2002) (Table 2).

3 Methodology

3.1 Data Collection

This research is based on an analytical overview of several theories that people in general are affected directly by their interaction with both nature and social interacommunications, which has led to a focus that patients in healthcare facilities would heal better when subjected to nature, daylight, social support, and interactions.

3.2 Methodology Used

The methods used are reviews of eminent published research, evident in the literature review, and analysis of pre-established and designed healthcare facilities that follow the above literature. This is carried out through deductive and analytical methodology. It also aims to emphasize the benefits of this material to analyze the indicators needed for the design of these facilities to empower better functioning and aid in rapid healing and recovery of patients through decreasing stress and anxiety and increasing relaxation and positive social interaction.

4 Results and Discussion

4.1 Design Indicators Based on Nature and Social Interaction

After a thorough look at the above research, a set of design indicators may be discussed. Table 3 shows the indicators concluded that the indicators were grouped to address the effect of design factors on overall building and interior design of healthcare facilities.

5 Conclusion

This research contributes to the promotion of the aspects needed to improve patients' overall well-being, based on results from previous psychological studies, through developing design indicators and solutions to be able to incorporate them in the process of architectural design through two important elements, namely the connection to nature and social interaction. The research is targeted to help introduce indicators that may be embedded in the code of hospital design to promote healing, well-being, and faster discharge rates.

The research concludes that efficient design of the building and its structure, to aid in interaction with nature,

Table 2 The Royal Children's Hospital in Melbourne

2. Example (2) THE ROYAL CHILDREN'S HOSPITAL IN MELBOURNE

The inpatient building of the royal children's hospital in melbourne is designed in a star shape, connecting the rooms to the park. Around 20% of the rooms look out onto the courtyards, while remaining 80 percent have park views (Bensalem, 2002)

The star shape has these wedge-shaped fingers resulting in a more spacious corridor, ideally a place for parents and kids to come out and socialize. An open space lounge is placed at the end of one of the wedges for families to spend time and has access to an open view of the park.

The use of narrow footprints for the clinical buildings of the hospital, sheds ample light and makes natural sunlight accessible to all areas of the hospital.

The exterior glass of the hospital is specially designed to allow the activities on the ground floors to be witnessed from the patient's bed. 85% of all patient in rooms are of single occupancy, designed to be calming and comforting. Procedures involving the medical practice is typically conducted far away from the in patient room, whenever possible, so that the room remains a place of rest and family time. Optimized design to access to daylight, views to nature and social interaction: Figures 36.9-36.13.

1	The hospital is surrounded by the parkland of Royal Park, with views of trees and lots of natural light.
2	The hospital is family-centered with improved facilities and places for accommodation and rest for parents
3	It includes a fun, interactive, child-friendly zone, both indoors and outdoors.
4	The place making and wayfinding techniques used is ideally situated to make it easier for caregivers, and visitors to find their way around the premises without the stress of losing their way
5	The building is of northern orientation to be able to make optimum use of natural light, while more than seventy five percent of all the inpatient rooms have a view of the park located on the grounds.
6	Open access to the garden courtyards as well as to Royal Park.
7	Maximizes access to daylight, gardens and views throughout.
8	Single rooms with en-suite bathrooms, allowing children and families extra space and privacy.
9	Children's playgrounds have been included, some set in central courtyards that flood rooms with daylight.
10	The hospital's central hub is called Main Street, with direct links to all areas of the hospital, it encompasses a two-floor aquarium, and large-scaled works of art and sculptures.
11	A central 'street' allows intuitive way-finding and creates a social heart for the hospital.
12	The hospital's central hub is called Main Street

Royal Children's Hospital, Melbourne

The Royal Children's Hospital in Melbourne Australia

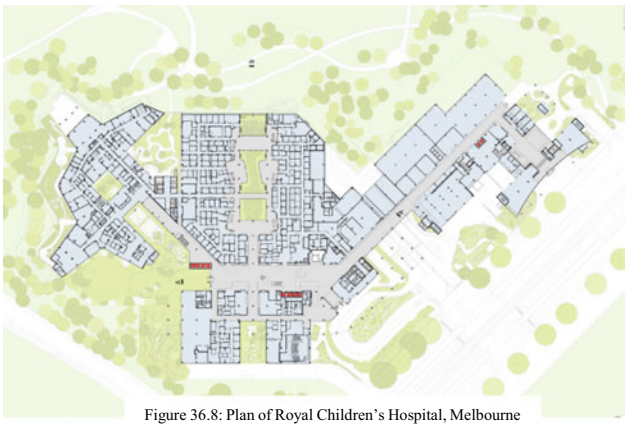
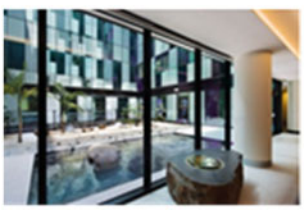


Figure 36.8: Plan of Royal Children's Hospital, Melbourne

Figures 36.9 & 36.10: The outpatient courtyard featuring the aquariam and other activities



Figures 36.11& 36.12: The multi –faith courtyard

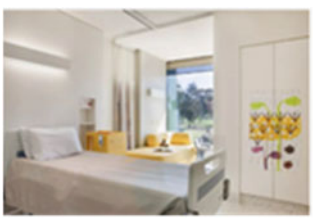
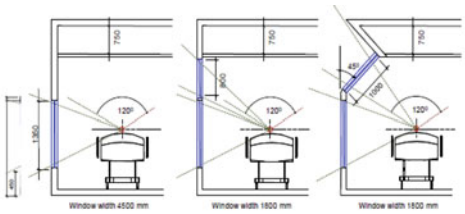
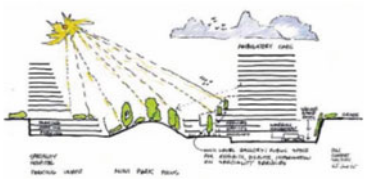
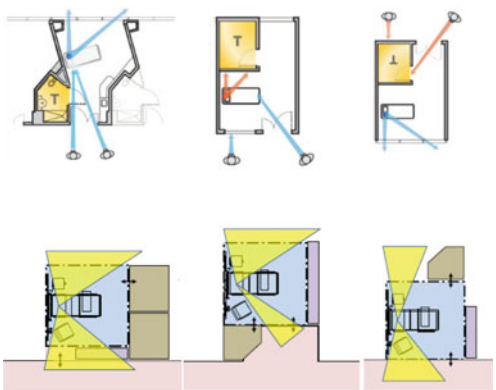


Figure 36.13:Patient Bedroom and family zone

Table 3 Wellness design elements based on nature and social interactions

Wellness Design Elements Based on Nature and Social Interactions			
Design Indicators Scale	***Design Factor/issues***	***Design Indicators***	
Building Design	***-Visual access to nature:*** Viewing nature in indoor and outdoor (external view) settings like a meditation garden, greenery, flowers, or water. - Being able to get fresh air/ go outside. **- Optimize access to sunlight** - Ensure spaces for patients are filled with daylight through orientation and shape of a building which dictates the potential availability for daylighting. (Behringer, 2011) - The orientation decisions made require unique skin and apertures design for eastern, southern, northern and western exposures such as exterior shading systems including vertical or horizontal blinds, sliding shutters and low-emission glazing. - Openings allow the exchange of light and air and provide visual connections to the outside. -Location of hospital beds near to windows, ensures provision of maximum access to daylight without the feeling of discomfort, while supplying an outdoor view for patients lying on the bed. (Joarder, 2011)	***SITE LOCATION:*** Visual access to nature &direct views of nature	Location with External views: green space and good natural views. Optimize the surrounding scenery.
		FORMING MASS: Narrow building footprints or articulated and penetrated plan forms (Behringer, 2011) courtyards and atria, configurations and operable windows that enable them to have widespread access to daylight and utilize natural ventilation.	Master plan: Narrow plan design: maximizing patient's exposure to fresh air and daylight (Behringer, 2011)  Figure 36.14: Typical hospital typologies used in Europe: street typology, perforated building block and campus plan.
		ORIENTATION PLAN: The design of a daylight hospital (Behringer, 2011) must address local climate conditions. The orientation and shape of the inpatient units are designed to maximize rooms facing daylight with no direct sun. The majority of the reviewed hospital orient their inpatient units along the east/west axis such as the Dell Children's Hospital in Texas and the KIZ Children's Clinic in Austria.	 Figure 36.15: Dell Children's Hospital, Texas Latitude 30°18'8.93"N Longitude 97°42'24.29"W[17]  Figure 36.16: Orientation of inpatient rooms
		Building Height:	Horizontal solutions offer better connection with the surrounding environment.
		The building skin: ***Window Design:*** The building skin creates a filter between the interior and exterior. It also must control sunlight penetration to minimize unwanted heat gain, lighting and glare. (Joarder, 2011)[j]	 Figure 36.17: "Sky window configurations performed better than traditional typical standard hospital window configurations" (Joarder, 2011)[j]
		Urban Areas, building cluster healing spaces: Garden, balcony, Open window, Courtyard or atrium containing interior landscape and fountains.	 Figure 36.18: Courtyards and, Gardens were arranged to catch the sun's rays.

Interior design	***Social support &interaction*** - Physical access to Nature to help recovery through accessible gardens. - Contact with other people: friendly, personal spaces and invite to walk or other forms of physical activity.	***- Access to Nature :*** accessible gardens with sitting areas - pleasant waiting areas - building cluster social interaction spaces: the layout of the nursing unit: Nurses and patients are grouped closer together. (Central nurses' station).	  Figures 36.19 & 36.20: Outdoor seating & walking areas  Figure 36.21: Nursing unit layout [29]
	Visual access to nature: -Provide the illusion of nature and help patients, family and friends relax in a stressful situation. -Mimic natural surfaces and textures.	***Accommodation in patient spaces or waiting and treatment areas:*** Green walls, plants in rooms. **The artificial connection with nature.** Biophilic design : - Views of nature and plants and vegetation into the overall design setting - Virtual connection with nature(VR) and virtual skylight - The nature feature pictures.	  Figures 36.22 – 36.25: The Northfield Hospital Radiology Suite in Minnesota features a virtual skylight (https://medium.com/the-healthy-city/mother-nature-takes-a-peek-into-medical-facilities-f62d4b76c6c, 2018)  
	Social support &interaction - social interaction in smaller rooms -Staying in touch with friends/relatives/ work. -Access to therapeutic help, being able to talk freely to someone (Social worker/volunteer, etc.) - Visual relationship between room and staff -Continuation of daily activities (Home, work, friends and family and celebrate birthdays).	***social interaction spaces:*** -Single bedrooms: -Family zone in patient room /Family lounges/ dayrooms / waiting rooms with comfortable movable furniture arranged. -Nurse station closed patient rooms: patient and team interactions and satisfaction. -Counseling room, Quiet room. - Phone/ email/TV/radio. - The different design solutions and decisions offers better views to the outside by the patients, it also aids nurses in being able to see the patient and better connect with them.	Figures 36. 26 – 36.28: Miami Valley Hospital conventional room (http://www.nbbj.com/work/miami-valley-hospital-heart-and-orthopedic-center/, 2019)[] Excellent visibility and optimal connection to daylight.  Figure 36.29: Layout in terms of viewing and daylighting potentiality. (Joarder, 2011)

should be carried out in the mass forming stage through optimum orientation and placement of efficient and effective windows. The urban design and coordination of elements should permeate the blocks and interact with them, as well as provide spaces to achieve daily social interaction and support. During the design process, a transparent setting should be in place, to enable monitoring of patients, whether in their rooms or in intensive care units and central care units. A special focus should be given to the design of individual inpatient rooms with an appropriate accommodating surface that allows for interviews with family while providing a suitable natural or stimulated environment. The necessary technology to enable social communication with family and friends during a patients hospital stay should be provided and taken into consideration during the initial design to make for the appropriate wiring and cables, while at the same time, designing physical social spaces in general for social interaction with families, friends or other patients, and medical staff. It is also concluded that in areas where natural views are not possible, designing artificial connection with nature in places of accommodation and patient spaces or waiting and treatment areas should be present. Nursing units and doctors' rooms are advised to be integrated within inpatient areas to achieve the desired social interaction, whether with the patients or with their families.

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