HOSPITAL ROOFTOP GARDEN

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ABSTRACT

Public hospitals tend to be overcrowded, creating a higher need for patients to have access to a place where they can de-stress and heal their psyches. As hospitals around the world are increasingly adopting a patient-centred care model, they are also finding new ways to incorporate care into the built environment. One of the fastest growing trends is the installation of green roofs, or roof gardens, to create tranquil oases on otherwise barren rooftop spaces. In this research, with regard to benefits and advantages of roof gardens and healing gardens, the integration of these two gardens in the rooftop of the hospitals can contribute to the health problems of the patients as well as providing ecological profits and ecosistem services. In this research, with the analysis and survey of some hospital roof gardens, it has been attempted to discover the specific design qualities and features of these gardens.

Key Words: *Green roof/Roof - garden, Healing garden, Hospital rooftop garden, Well-being, Healing*

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ÖZET

Kamu hastaneleri aşırı kalabalık olma özelliği gösterir, dolayısıyla hastaların psikolojilerini iyileştirebilecekleri, streslerinin azaltabilecekleri mekanlara gereksinim duyarlar. Dünya genelinde hastanelerin giderek hasta merkezli bir bakım modelini benimsedikleri görülür. Aynı zaman da tedavinin, inşa edilmiş çevreye dahil edilmesi için yeni yollar aranmakta ve geliştirilmektedir. En hızlı büyüyen eğilimlerden biri, çorak çatı alanlarında sakin ortamların oluşturulması yani yeşil çatıların veya çatı bahçelerinin kurulmasıdır. Çatı ve iyileştirme bahçelerinin göz önünde bulundurulursa, bu iki bahçenin hastane çatıları ile birleşmesi hm hastaların iyileşmesi ve sağlık problemlerine yardımcı olması hem de çevre ve ekolojk açıdan katkısı büyüktür. Bu çalışmada dünya genelinde yapılan hastane çatı bahçelerinin incelenmesi, bu tür bahçelerin tasarım kriterleri ve özeliklerinin ortaya koyulması amaçlanmıştır.

Anahtar Kelimeler: *Yeşil çalı/Çatı bahçeleri, İyileştirme bahçesi, Hastane çatı bahçesi, İyileşme*

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1. INTRODUCTION

The Healing Garden and Its Inclusion in Healthcare Settings

Throughout the eighteenth and into the nineteenth centuries hospitals were placed at the edges of urban centers and designed with much open space between buildings, if not with gardens. Mental health facilities in particular were placed in less urban areas and gardens were thought to be especially effective in "curing" the mentally ill. By the late nineteenth century many of these mental health hospitals that had originally started as private institutions, came under state and government control. As these facilities became overcrowded, under-funded, and thus unsuccessful, the more institutional style of facility became the dominant model and gardens did not frequently appear as part of the design (Davis, 2002).

As the institutional style of mental hospitals led them to overcrowding and failure, the pavilion style hospital of the nineteenth century prevailed as a successful hospital model and with advances in medicine succeeded in becoming the predecessor of the modern hospital. The pavilion hospital benefited from the popular belief that "clean, airy, well-kept, sunlit hospitals, such as those being established for the military, should promise the least contagion and the lowest mortality." This proved to be true as medicine perfected the antiseptic practice and the level of patient care increased from treatment of symptoms to possible cures for some illnesses. After the acceptance of the germ theory the pavilion model of the hospital became even more prevalent. Because of the layout of the pavilion design it was easy to incorporate outdoor therapy into the patient's therapeutic program (Davis, 2002).

Today, healthcare has undergone a vast transformation from the holistic focus of the past and is now largely based on technology and hard science (Cooper Marcus & Barnes, 1999; Ulrich, 1991). The healthcare service industry has also transformed in terms of its massive financial standing, representing an estimated 17.7 % of the United States GDP in 2011 and 10 anticipated to continue growing through 2020. Researchers have recently been making the case for the expansive industry of healthcare to incorporate more green spaces in healthcare environments, not as an alternative to allopathic care, but as a vital augmentation to modern medicine (Gierlack-Spriggs et al., 1998). In their article promoting the greening of healthcare, Irvine and Warber (2002) stated that: The relationship among people, nature, and well-being has all but been lost. While health is the obvious goal of allopathic medicine, many healthcare settings are monolithic, surrounded by concrete, asphalt, and other structures, and cut off from the rest of the world, particularly the natural environment (Martin, 2013).

The incorporation of gardens in hospital settings has become a growing trend, with many hospitals today including a healing garden which refers to a green space in the campus of a health care facility designed with the goal of positively impacting individuals who visit the garden (Cooper Marcus & Barnes, 1999; Relf, 2005). With the goal of facilitating a connection with nature and creating a sense of restoration among visitors, healing gardens are intended to alleviate the negative emotions often related to the hospital environment (Whitehouse et al., 2001). For

hospital employees, gardens can serve as a place of relaxation and an escape from the stresses of their work (Cooper Marcus & Barnes, 1999; Whitehouse et al., 2001). Healing gardens may be located indoors or outdoors on a healthcare campus and should be composed of real nature content such as green plant life and water elements (Martin, 2013).

Benefits of Nature and Gardens in Healthcare Settings

Physical or visual access to nature can have positive influences on health outcomes (Hartig et al., 1991, 1993, 1996; Ulrich, 1981, 1984, 1992). Kaplan and Kaplan (1989) found that complexity and unfamiliarity of the hospital environment may cause mental fatigue and cognitive chaos. They suggested that access to a natural setting with little complexity would have a relaxing effect because of familiarity and lower information load. In 1984, Ulrich found that nature views from patient rooms aided their recovery from gall bladder surgery. Outdoor healing spaces also provide opportunities for social interactions (Pasha, 2011).

Visual 1.*Healing garden in hospital (URL 1)*

Research indicates that people with higher levels of social support are usually less stressed and have better health than those who are more isolated, and that stronger social support improves recovery and increases survival rates for a variety of medical conditions (Ulrich, 1999). Research in urban settings indicates that residents of urban areas with more vegetation have stronger social ties (Taylor et al., 1998).

Research has supported incorporation of outdoor spaces enriched by natural elements in hospitals. Among several effects of the outdoor gardens in hospitals, researchers have pointed out a variety of benefits. Achieving perspectives about life and death (Marcus & Barnes, 1999), stress reduction and fewer health-related complaints among patients (Ulrich, 1984), staff and patient satisfaction with hospital experience and facilitation of the healing process are the major findings in this area. Garden users have pointed out control retrieval and stress reduction as main reasons for garden use (Pasha, 2011; Pouya et. al., 2016).

It is important to emphasize that broadly parallel findings have been obtained when stressed patients in healthcare settings have been visually exposed to nature. A study by Heerwagen and Orians, for instance, found that anxious patients in a dental fears clinic were less stressed on

days when a large nature mural was hung on a wall of the waiting room in contrast to days when the wall was blank (Heerwagen, 1990). The restorative benefits of the nature scene were evident both in heart rate data and self reports of emotional states. In the case of hospitals and other healthcare facilities, there is mounting evidence that gardens function are especially effective and beneficial settings with respect to fostering restoration for stressed patients, family members, and staff (Ulrich, 1999).

Well-designed hospital gardens not only provide calming and pleasant nature views, but can also reduce stress and improve clinical outcomes through other mechanisms, for instance, fostering access to social support and privacy, and providing opportunities for escape from stressful clinical settings (Ulrich, 1999; Cooper-Marcus and Barnes, 1995).

In addition to ameliorating stress and improving mood, gardens and nature in hospitals can significantly heighten satisfaction with the healthcare provider and the overall quality of care. Evidence from studies of a number of different hospitals and diverse categories of patients (adults, children, and elderly patients; ambulatory or outpatient settings, inpatient acute care wards) strongly suggests that the presence of nature -- indoor and outdoor gardens, plants, window views of nature -- increases both patient and family satisfaction (Cooper-Marcus and Barnes, 1995; Whitehouse et al., 2001).

Benefits of Healthcare Gardens for Staff

Healthcare staffing problems are a critical issue in most European countries and North America. It has been known for decades that healthcare occupations such as nursing are stressful because they often involve overload from work demands, lack of control or authority over decisions, and stress from rotating shifts (Ulrich, 1991). Workloads and pressures have mounted further, however, as healthcare providers everywhere have been forced to control or cut costs (Ulrich, 2002). These conditions have in many locations lowered lower job satisfaction, increased absenteeism and turnover, contributed to shortages of qualified personnel, increased providers' operating costs, and eroded the quality of care that patients receive (Ulrich, 2002).

These serious staff related problems imply major importance for the aforementioned finding that healthcare staff heavily uses gardens for positive escape from workplace pressures and to recuperate from stress. Additionally, it should be emphasized that evidence has begun to appear showing that hospital gardens increase staff satisfaction with the workplace, and may help hospital administrators in hiring and retaining qualified personnel (Whitehouse et al., 2001; Sadler, 2001; Ulrich, 2002).

Why rooftop hospital garden

Historically green roofs have been used as a medium for providing insulation and protection in cold climates, mainly in northern parts of Europe, while in hot dry climate they have been used to cool the indoor air and increase its moisture content through evaporative processes. Nowadays, green roofs are being implemented not only due to thier thermal insulation properties,

but also because they are considered as way of recovering the benefits provided by the lost green space of cities. Various studies which have analysed the effects of green roofs have focused on a number of key benefits, including reduction in energy consumption, reduction in greenhouse gas emissions, reduction in heat island effect, improvement in air quality, reduction of urban noise, storm water management, and various social and recreational opportunities (Visual 2) (Martens et al. 2008).

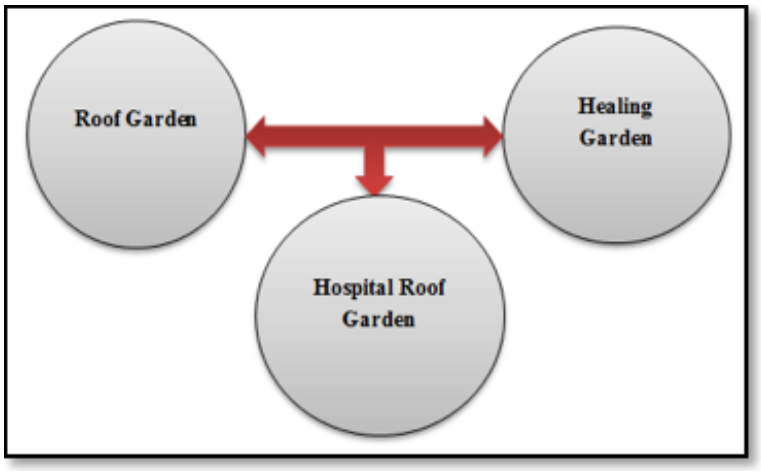
Visual 2.*Rooftop garden (Parkroyal Hotel, Singapore, Mill Valley Cabins, California, USA)*

Green roof systems have been proven to be beneficial to the urban environment in several ways. They constitute valuable elements in ecological networking (Ignatieva et al. 2011), and provide wildlife habitats within the urban infrastructure (Osmundson 1999; Ignatieva et al. 2011). The philosophy of a roof garden relies on the fact that the plant material destroyed during the construction phase will be restored on the roof of the building and will reduce the adverse effects of urbanization and deforestation (Nektarios, 2014). Rooftop gardens use in urban areas has been due their ability to decrease water runoff from the roof area. The primary intent of the living roof application is to filter the storm water and minimize the storm water runoff from reaching the underground infrastructure. This is of particular importance in areas with older infrastructures because the capacity of the runoff could exceed the capabilities of aging sewer systems. The depth of the planting medium determines the amount of water runoff. The general rule of (green) thumb is that the thicker the medium the higher the potential decrease of water runoff. The vegetation further impacts groundwater by absorbing all of the pollutants from the rainwater prior to runoff. Studies have indicated that more than 95 percent of cadmium, copper, lead and a portion of zinc can be taken out of the rainwater, which prevents their distribution into groundwater. The vegetation also contributes to clean air by fi ltering and binding dust particles as well as naturally fi ltering airborne toxins. The other significant environmental advantages of living roofs are that they can help to reduce urban heat island effect, and they provide habitat for diverse of wildlife (Beyhan, & Erbas, 2013).

Public hospitals tend to be overcrowded, creating a higher need for patients to have access to a place where they can de-stress and heal their psyches (Marx 2012). As hospitals around the world are increasingly adopting a patient-centered care model, they are also finding new ways to incorporate care into the built environment. One of the fastest growing trends is the installation of Green Roofs, or roof gardens, to create tranquil oases on otherwise barren rooftop spaces.

Beyond the direct medical and mental health benefits for patients and their families and the cost benefits for the hospital from lower medical treatment, green roofs also provide many environmental and economic benefits that ultimately serve both patients and entire communities. Environmental and economic benefits include, amongst other things, decreased storm water runoff. It is estimated that a green roof will retain 70 to 90 percent of the precipitation that falls on it during summer, and 35 to 40 percent during winter. Green Roofs also save on heating and cooling costs, reducing in turn greenhouse gas emissions and pollutants. A roof garden will not only absorb heat, but also improves local air quality by filtering the air moving across it and exchanging carbon dioxide for oxygen through the process of photosynthesis. In addition to cutting energy costs, green roofs also protect the roof membrane, resulting in a longer roof lifespan. Hospitals constantly struggle to balance ever-tightening financial budgets with quality medical services. Green roofs are gaining more recognition as an innovative solution to managing costs and serving patients. Better access to the outdoors, reduced impact on the environment, and economic savings all add up to better patient care (IGRA, 2016).

In this research, with regard to advantages of each garden (roof garden and hewaling garden) mentioned above, the integration of these two garden in the rooftop of the hospital, can contribute to the health problems of the patients as well as providing ecological profits and ecosistem services (Visual 3).



Visual 3. *Integration of two garden in hospital roof garden*

In this research, with the analysis and survey of some hospital roof gardens, it has been attempt to discover the specific design qualities and features of these gardens. Considering the extensive importance of these kinds of gardens in today's modern time, this reaserch can provide some effective instructions and strategies to the urban planners and landscape designers.

The Study on hospital rooftop garden through Examples applied in the World

Case 1. The Therapy Park At Fort Sanders Regional Medical Center, Knoxville, Tennessee

The park is approximately thirteen thousand square feet. It is bordered on the east, south, and west by hospital buildings; only the north end of the park is somewhat open to the surrounding environment. The hospital is surrounded by a mix of residential and commercial use, with the campus of the University of Tennessee only two blocks to the east. The park is visible from many parts of the hospital, and is officially available for use by anyone at the hospital; however, the park is designed for use by patients and staff of the Patricia Neal Rehabilitation Center. The park is only accessible through the Rehabilitation Center, which is located on the third and fourth floors of the East wing of the hospital. In order to enter the park, users must take an elevator from the fourth floor of the hospital down to the second floor entrance into the Rooftop Therapy Park (Davis, 2001) (Visual 4).

Visual 4. *Rooftop Therapy Park (Davis, 2001)*

Upon exiting the elevator, the user is invited to stroll, or roll, along curving concrete paths that circulate throughout the park. In addition to concrete paths, various surface textures are used in the park as part of the rehabilitation of patients recovering from physical disability as a result of stroke or other trauma. Surfaces include mulched areas, gravel, rubber, brush-finish concrete, and also Astroturf. Notice the small fountain on the right of the brick path, next to the vine covered gazebo.

Many activities are programmed into the park as part of the therapeutic regime. Most elements of the park serve multiple purposes in order to maximize use of the limited amount of space. A basketball court and putting green are designed for patients in wheelchairs. The basketball court surface is designed with two colours of rubber and serves as a figure-ground field for patients to practice their visual perception. The putting green also doubles as a bocce court. The curving concrete path is designed as a therapy walk. One path of the garden is designed with

two, four, and six-inch curb heights for patients to practice negotiating curb changes. Multicoloured play structures are handicap accessible. A wrought iron arbor/gazebo serves as a place to congregate and rest, while also providing steps and a ramp for patients to practice on. There is a worktable and sink at wheel chair height for patients to participate in horticulture therapy (Davis, 2001).

Case 2. Alta Bates Medical Center, Ashby Campus, Berkeley, CA, USA

The roof garden is located on the south side of the hospital complex, three floors above the ground. On the north side, it is bounded by a four-story wing containing patient rooms and offices in the maternity department. On the other three sides, the garden looks out onto expansive views: to the east, the wooded and partly residential Berkeley Hills; to the south, Berkeley residential neighbourhoods of single- family houses; to the west, a panoramic view of San Francisco Bay, the city of San Francisco, the Golden Gate Bridge, and the hills of Marin County. The garden consists of several distinct subareas. Upon emerging from the elevator, one walks out onto a square, brick-paved plaza bounded by flowered planters with seat-height concrete edges, and eight small carob trees in concrete boxes. In the middle of the plaza is a square flower bed with a small fountain at its center. On a wall bounding the eastern edge of this plaza, two ornate columns and a crest that formed the entrance to the hospital in 1928 were saved and placed here after the building was demolished in 1983. The feeling of this sub-area is of an urban plaza, with users sitting around the edge, exposed to each other.

The second major section of the roof garden is four steps below the plaza and has more of a garden feel to it (Visual 5). A small brick- and concrete-paved plaza accessed from a door in the maternity wing is bounded by seat-height concrete planters and a large raised lawn. Three maple trees offer some shade on hot days, and a lush expanse of red and purple climbing bougainvillaea has grown to the third floor of the adjacent building. A third, small and hidden section of the garden consists of a walkway behind the planters on the west and south sides of the roof. Movable garden chairs have been carried here for a very private sitting, viewing, and conversation setting (Visual 6) (Marcus & Barnes,1995).

Visual 5. *Alta Bates Medical Center, roof garden (Marcus & Barnes,1995)*

A fourth sub-area is under a building overhang by the elevators where a drink and a snack machine are located. As discussed in a later section, this small "anteroom" to the garden proper is well used because it is near the elevators and near snack machines; on hot days it is sheltered from the sun's glare; on frequent windy days it is screened from the breeze.

Visual 6. *Movable chairs allow this staff person to create a private setting for a lunch break (Marcus* & *Barnes,1995).*

The background hum of a large air-conditioning/ heating unit is ever-present as one enters the garden, though it is not unduly intrusive everywhere, depending on where one sits. One is aware of bird-song, and in the large plaza area, of the sounds of the fountain. On a breezy day, the rustle of trees and vines is a soothing backdrop for garden-users. The garden is high enough off the ground so that traffic cannot be heard. Apart from the sounds of an occasional plane or helicopter, the roof garden is very quiet and peaceful. When seated in most parts of the garden, the views over the city are screened by planting, and one has the sense of being in a secluded city garden.

A design factor that may inhibit use is the lack of elements to ameliorate the wind or bright sun. For perhaps half of the year, it is warm enough to sit outside, and, depending on the time of day, many would prefer to sit in the shade. The choice of planting in the main plaza — short, squat carob trees — was a poor one; they create very little shade. The roof tends to be more windy than the adjacent streets. A screened area offering shelter from the prevailing winds would have been a welcome addition (Marcus & Barnes,1995).

Case 3. Healing Garden, Good Samaritan Regional Medical Center, Phoenix, Arizona

In 1996 a healing garden was incorporated into the medical center in Phoenix, Arizona. The garden is a rooftop courtyard "bounded on three sides by two-story buildings, and on the fourth

side by a twelve-story tower, with porthole windows, that looms up in one corner of the garden." (Cooper Marcus and Barnes, 1999) A water feature is the main focus throughout this garden. The water feature symbolizes "The Cycle of Life." The different phases of life from birth to death are symbolized in various ways by means of quiet pools, as well as flowing streambeds. Throughout the site water is not only audible and visual but also touchable throughout the garden. Seating in the garden varies from movable chairs and tables to a curvilinear seat-wall, allowing for different levels of comfort and positions in sun and shade. Raised beds contain plants that have low water and maintenance requirements. Another major element featured in this garden is art. A tile artist was brought into the project to design colourful tiled columns that actively engage users of the site. The site is handicap accessible and also has capacity for walkers, gurneys, and wagons. A small coffee bar is a part of the garden that provides a social aspect for the garden users (Visual 7).

Visual 7. *Banner Good Samaritan healing garden (URL 2)*

"The garden-courtyard is well used: by visitors and inpatients who come together to enjoy a coffee or stroll; by visitors waiting for an outpatient who is at an appointment or undergoing a test; by staff, for breaks, lunch, or small group meetings; by physicians and hospital chaplains meeting with family members. A fairly large expanse of flat concrete allows beds to be wheeled out on occasions. Another, less direct form of use, is visual access. Outpatients attending a cardiac care unit can exercise on the StairMasters while looking out onto the garden via floor-to-ceiling glass windows. An intriguing monitoring device secreted in the tree canopies permits telemetry cardiac patients to continue to be monitored in the garden when exercising outdoors." (Table 2) (Cooper Marcus and Barnes, 1999).

The authors who observed this healing garden for the most part praised the design of this space. They did express that a couple elements about the site needed to be reworked. The extensive amounts of concrete not only took away from the garden appeal of the space but it also produced high amounts of glare. The suggestion for decreasing the amount of glare is the use of earth-toned tint to be added to the concrete. Otherwise the garden was mostly successful, providing the sound and touch of water, native plants many of which had medicinal uses and reflected the changing season as well as encouraged wildlife. Seating was varied according to

type, material and location in sun or shade. The garden is open twenty-four hours a day which is great in a hot climate like Arizona where many garden users may be more inclined to use it when it is cooler at night and early morning hours. The addition of colourful art engages the garden visitor and the entry and navigation in the garden are straightforward. Patient rooms include 10 views down onto the healing garden. One of the best things about this garden is the fact that it is strongly supported by the hospital administration (Vapaa, 2002; Yang, 2010).

A water feature	The water can be touched. The water feature is composed of three parts: "The Source" fountain, "The Water Course" stream bed and "The Return" fountain. It represents a metaphor of "The Cycle of Life," starting from the source fountain to the water course and completing at the return pool. The entire water feature is surrounded by a connected winding seat-wall providing more seating areas and opportunities to get close to the running water.
Terraced planters	The terraced planters bordered by concrete walls display a similar pattern as the water feature throughout the courtyard. The lowest level of planters services as a seating area for gathering, accommodating more people in the site.
Seating areas	The seating walls are distributed throughout the garden, inviting patients, families and employees to stay.
Elevation change	The stairs and ramps serve as exercise equipment for cardiac rehabilitation patients participating in an exercise therapy program.
Plant material	Native plants with historical medicinal characteristics. The characters of the plant materials are low water-use, low maintenance and desert adaptation, producing colour, flowers and scent all year round and attracting wildlife into the site.
Art	The decoration of the columns along the site. Each of them is decorated in a different style presenting the concept of the garden— "the Cycles of Life".
Access	Allowing disabilities, gurneys and wagons move around the site.
A coffee cart facility with tables and chairs	The coffee cart is isolated in the corner, providing a quiet space for people with different needs.

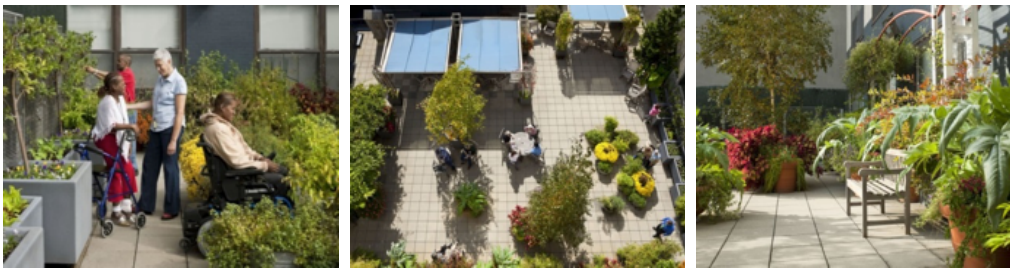
Table 1. *Advantages of Good Samaritan healing garden (Yang, 2010)*

Case 4. Joel Schnaper Memorial Garden, Terence Cardinal Cooke Health Care Center- New York City, NY

The Terence Cardinal Cooke Health Care Center, a long-term care facility located in East Harlem, provides services for the elderly and individuals with developmental disabilities and HIV/AIDS. Built in 1995 on a barren rooftop, the garden now welcomes all residents, visitors, and staff and provides a specialized therapeutic environment for the adjacent AIDS care wing. This early and influential project shows the effectiveness of gardens to enhance the quality of the health care environment.

The design focuses on the specific needs of individuals with HIV, including strength and stamina, varying sensory abilities, sunlight sensitivity, awareness, orientation, and the need for activity, interaction, privacy, and independence. The garden also hosts a horticultural therapy program linked to the Center's physical and occupational therapy programs. Dirtworks provided complete professional services on a pro-bono basis. The firm has stayed involved in the project since its inception, providing a unique opportunity for long-term post-occupancy research with particular design observations regarding issues of safety and security (URL 2). The garden also serves as a convenient location for social activities, ranging from parties to exercise classes to small gatherings. This project shows the effectiveness of gardens to influence and enhance the quality of the health care environment. It advances the idea that properly planned and operated gardens can reduce stress and encourage a sense of well-being for long-term health care patients (Visual 8) (URL 3).

Materials were chosen to extend the life of the garden for decades of enjoyment. Ms Fierle, Director of therapeutic recreation at Terence Cardinal Cooke Health Care Center, describes the Schnaper Garden as a "... healing garden, which has truly been a source of joy, delight, and inspiration for our residents and their families."



Visual 8. *Joel Schnaper Memorial Garden (URL 3)*

Case 5. Cancer Lifeline's O'Brien Center Gardens, Seattle, Washington

Three rooftop gardens, each with a distinct focus, are part of Cancer Lifeline's Dorothy O'Brien Center. The Earth and Sky Garden with its overhead sky opening is used for therapeutic sessions and ceremonies, and has space that can be reconfigured to accommodate groups of all sizes. The Asian-influenced Reflection Garden is designed for use by one or two people and offers privacy screens and rock and water garden elements appropriate for contemplation. The Celebration Garden, with input from a horticultural therapist, was planted with herbs as the basis for client and staff involvement. Designed and built in 1999 by University of Washington landscape architect students, the gardens seek to "restore a sense of order, safety and privacy for those dealing with the chaos induced by" cancer (Cancer Lifeline O'Brien Center, 2013). Programs, workshops and classes on relaxation, healing arts for creative expression, therapeutic horticulture, nutrition, and meditation are conducted at the rooftop gardens - all reflecting the therapeutic garden characteristic of "scheduled programming activity" (Visual 9) (Fleming, 2013).

Visual 9. *Cancer Lifeline's O'Brien Center Gardens, Seattle, Washington (URL 4)*

Case 10. Mesa Hospital Ankara, Turkey

Stepping out of a door into a healing garden is probably not possible due to illness, but in Turkey's Mesa Hospital in Ankara a Green Roof courtyard has been created so that patients can at least have a green view, even if they're not able to physically Access the garden. The 1,000 m^2 intensive Green Roof was established on the top of the underground garage.

The design of the Green Roof includes different flower beds, walkways and benches. The Green Roof area is visible and accessible to mobile patients and thus provides a healing atmosphere (IGRA, 2016).

Visual 10. *Mesa Hospital Building (Beyhan & Erbas, 2013)*

CONCLUSION

Design Criteria for Roof Gardens at Medical Facilities

Nowadays almost any building can be landscaped with modern green roof technology. The fields of application range from extensive green roofs that serve as ecological compensation areas for plants and animals to roof gardens with integrated paths, seats, play areas and ponds. While extensive green roofs only need to meet normal technical standards, roof gardens on medical facilities require comprehensive planning processes and the involvement of medical professionals (IGRA, 2012). Special features include barrier-free access, handrails along the pathways and a simple routing within the gardens as well as the perfect blend of retreat areas and places for community activities. Some parts of the garden must offer protection from sun and wind throughout the year. The plant selection should provide a varied mix of colours, shapes and scents that stimulate all the senses. The gardens should create a motivating environment that encourages the self healing powers of the patients and also allows them to focus on something other than their illness. When direct contact with nature leads to lower medical treatment costs, the additional investment for the installation and maintenance of roof gardens will pay off quickly. Other advantages include reduced building operating costs through the insulating and heat absorbing effects and the protection of the roof membrane by the vegetation layer. And we mustn't forget the environmental benefits of the new habitat for plants and animals and the positive impact of green areas on the urban climate. A classic win-win situation for all involved.

According to Marcus & Barnes (1999), it is important to remember that activities in healthcare outdoor space can range all the way from completely passive to very active, for example:

Potential activities in a healing garden range from passive to active

- Viewing garden through window
- Sitting outside
- Dozing/napping/meditation/prayer
- Gentle rehabilitation exercises
- Walking to preferred spot
- Eating/reading/doing paper work outside
- Taking a stroll
- Child playing in garden
- Raised bed gardening
- Vigorous walking
- Sports

To start to build a set of design guidelines for hospital outdoor space, one must begin with Roger Ulrich's Theory of Supportive Garden Design. In brief, this framework is based on the premise that gardens help to mitigate stress to the extent that they:

- Create opportunities for physical movement and exercise
- Provide opportunities to make choices, seek privacy and experience a sense of control
- Provide settings which encourage people to gather together and experience social
- Support
- Provide access to nature and other positive distractions

In addition to these four basic guidelines, this author's observation of more than one hundred hospital gardens in four countries (US, UK, Canada, Australia) suggests the need for consideration of the following, if the garden is to be used and reach its full potential:

- Visibility
- Accessibility
- Familiarity
- Quiet
- Comfort
- Unambiguously positive art

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