

Hospital Garden Design for Cancer Patients: A Case of Malatya Oncology Hospital

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Abstract

Clinical findings have shown that gardens have a positive effect on the mental well-being of patients and also contribute to an improvement in the physical condition. However, cancer patients who have to stay in hospital for a period of time to complete their treatment usually do not have access to open areas with natural elements. Gardens with fresh air and a calm environment help cancer patients control their feelings of hopelessness and anxiety and improve their mental ability to cope with a difficult situation. This study aims to design a hospital garden with therapeutic value and to provide specific design strategies for the healing gardens of cancer patients. To achieve this goal, two balconies of İnönü University Oncology Hospital in Malatya, Turkey, were selected as design examples. The method consists of four consecutive steps: (1) a literature review to determine the design criteria of healing gardens, (2) analysing the case study, (3) identifying the needs and evaluations of cancer patients and experts, and finally (4) developing a list of design strategies based on the data obtained in the previous steps. As a result, specific design principles for the creation of an internal hospital garden were proposed, which can serve as a model for future hospital gardens and also provide practical guidance for architects and landscape architects.

Keywords: Cancer Patients, Environmental Design, Healing Landscape, Hospital Indoor Gardens.

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Received: 29.01.2026 - **Accepted:** 24.04.2026

Cite: Pouya, S., Sağlam, M., & Pouya Sönmez, S. (2026). Hospital garden design for cancer patients: A case of Malatya Oncology Hospital. DEPARCH Journal of Design Planning and Aesthetics Research, 5 (1), 35-52. <https://doi.org/10.63673/DepArch.2026.44>

INTRODUCTION

Health centers and medical clinics can be associated with extreme anxiety and tension for patients and their caregivers. One of the growing groups of hospital users is cancer patients who have to stay in hospital for a long treatment period. (Partanen et al., 2018). Cancer is a dreaded diagnosis and cancer patients need to keep their spirits high and not lose their motivation to fight the disease. Cancer patients are more likely to experience negative feelings such as depression and anxiety. These are both psychological and physiological disorders characterized by a number of physical, emotional and behavioral elements (Kaphle, et al., 2024). In most cases, it is difficult to control the stress and anxiety of cancer patients. Researchers have suggested that being in a more natural environment is relaxing and less stressful and therefore has a positive effect on hospitalization outcomes (Niebler-Walker et al., 2023). Natural environments have a positive effect on stress reduction (Andrade et al., 2012) and with deliberate design, these environments can increase their therapeutic effect on users (Cervinka et al., 2014). Nature can have several positive effects on human health: (1) reducing stress by lowering blood pressure and cortisol levels (Ward Thompson et al., 2016), (2) improving mental health by reducing depression and boosting mood and self-esteem (Gascon et al., 2015), (3) providing better cognitive and creative function by restoring the ability to think deeply and be creative, and (4) improving physical health by reducing obesity and diabetes and increasing cardiovascular health (Sanders et al., 2015; Niebler-Walker et al., 2023). Therefore, the creation of a dedicated healing garden in hospitals and healthcare settings seems to be a logical solution to this problem.

The term healing garden is often used to describe green open spaces that aim to improve health outcomes by reducing stress, providing positive distraction, and promoting overall well-being (Cooper Marcus & Barnes, 1999). Healing gardens in healthcare settings can provide users with access to nature while also providing opportunities for other activities such as play, rest, and socialization. Kaplan and Kaplan (1989) stated that access to a simply designed natural environment helps to reduce stress by neutralizing mental fatigue and cognitive chaos caused by the complexity and unfamiliarity of the hospital environment (Pasha, 2013). It can provide therapeutic and medical services such as horticultural therapy, creative arts therapy, acupuncture and infusion treatments for cancer patients in its private gardens. Therapeutic gardening and health goals can be linked. Therapeutic goals for people suffering from cancer often aim to give them a sense of hope, renewal and healing. Reflecting the diversity of cancer types and stages, each healing garden can feature a mix of natural and medical features, including hard and soft landscaping and aesthetic ambiance (Ulrich, 1992). Thus, healing gardens can serve a dual function — a platform for the provision of therapies and services as well as a place of physical sanctuary. In addition, research shows that healing gardens can directly or indirectly reduce healthcare costs by shortening the length of stay for patients. The need for an interdisciplinary approach in nature and health-related research has become clear in theory (Frumkin et al., 2017). But in practice, the related researches about the planning and designing of the healing garden in hospitals, seems insufficient and rudimentary.

In order to better understand how healing gardens are implemented in practice, several international case studies can be examined. These examples demonstrate the integration of healing gardens into hospital design. Marin General Hospital incorporates rooftop gardens and green terraces to enhance patient interaction with nature, while Kaiser Permanente Hospital integrates outdoor activity areas and sustainable landscape strategies to support physical

and psychological well-being (URL1; URL2). Similarly, projects such as Shenzhen Children's Hospital and Alder Hey Children's Hospital apply biophilic design principles through accessible green spaces, sensory landscapes, and strong visual connections to nature (URL3; URL4). These examples highlight the growing importance of nature-based design in healthcare environments. However, such comprehensive applications remain limited in Turkey, particularly in the context of indoor healing gardens for cancer patients. Therefore, this study aims to address this gap by proposing a context-specific design approach based on user needs and environmental analysis.

Healing Garden Design

Extensive research associated with the history of healing gardens has encouraged modern hospitals to use some of their space for healing gardens, courtyards, and playgrounds (Pasha, 2013). For a garden to have a healing effect, it should have certain characteristics of the natural environment so that patients can achieve a sense of relaxation, tranquility, and mental recovery. These areas should be rich in plant species, accessible to all users, and consistent and safe (Cervinka et al., 2014). It is important to create opportunities for people to spend time, socialize, walk, and exercise in the environment, and to provide an attractive space for patients and staff (Van den Berg & Custers, 2011). Therefore, to create a specifically beneficial environment for patients staying or using the hospitals, designers need to consider diverse issues (Cooper Marcus & Barnes, 1999). Well-designed medicinal hospital gardens create a social atmosphere by saving patients from the monotony of the clinical environment and positively affect patients' clinical outcomes by reducing stress, thus making patients feel good psychologically and physiologically (Ulrich, 2020). Diverse criteria and issues for designing hospital gardens have been determined in different research. Table 1 provides a list of the important items and points that should be addressed in designing a hospital garden.

When designing a healing garden, it is important to understand the physical and psychological effects of cancer. Cancer treatment (chemotherapy, radiation, surgery) can lead to fatigue, dizziness, loss of strength and stamina, reduced mobility and a feeling of loss of control (Eckerling et al., 2020). These changes may be temporary or permanent during treatment. Equally important, the psychosocial impact of cancer can include a sense of loss, anxiety, limited independence, social stigma and being labeled as a person with cancer. The challenge in designing healing gardens for cancer patients is to take into account the needs of patients, especially those related to their physical illnesses (Fleming & Figueiredo, 2013).



Table 1. Important criteria in designing the hospital gardens mentioned by different resources. (Authors).

Researcher	Healing Garden Design Criteria	Researcher	Healing Garden Design Criteria
Robert Paine (1990)	<ul style="list-style-type: none"> • Space planning and location • Physical access • Outdoor view • Awareness of outdoors • Plant diversity • Area furniture • Storage and equipped areas • Control of area 	Scott Scarfone (1996)	<ul style="list-style-type: none"> • Visual and physical access • Attractive feature of nature • Interdependency of people • Provision of public, private, and semi-private spaces • Increased emotional awareness • Personalized space
James Burnett (1997)	<ul style="list-style-type: none"> • Spirit of the area • Maximum exposure to the external environment • Sensory stimulation • Horticultural therapy 	David Kamp (1996)	<ul style="list-style-type: none"> • Field analysis • Diversity in space design • Ease of use and accessibility • Diversity of plant material • Increase healthcare quality
Clare Cooper Marcus and Marni Barnes (1995)	<ul style="list-style-type: none"> • Location, space planning, and wayfinding • Planting, seating, and aesthetic details • Policy on the provision and maintenance of gardens 	Christopher Delaney and Burnett, (1990)	<ul style="list-style-type: none"> • A safe haven • Closed connecting rooms • Order in the area • Water use • Interaction of nature and biodiversity
Susan Ghose (1996)	<ul style="list-style-type: none"> • Accessibility and visibility diversity of emotional input • Design diversity • Difference from interior design 	Cheryl Ware (1994)	<ul style="list-style-type: none"> • Physical and emotional safety • Attractive entrance • Seasonality • Beauty • Places of interest
Mara Eckerling (1996)	<ul style="list-style-type: none"> • Sense of place • Garden location as to interior spaces • Garden arrangement • Involvement of the senses 	Renata Valente, & Clare Cooper Marcus (2015).	<ul style="list-style-type: none"> • Plenty of shade and the lack of glare • Private and semi-private spaces • Soothing sounds and avoiding noise • Paths with a smooth surface • Rooms with views to the garden for patients with weak immune system

In Turkey, there are only a limited number of healthcare facilities and centers with dedicated open spaces or gardens for patients and other users. They usually have an open entrance area that is often busy with people, cars, cafés and parking lots. The entrance areas of the health centers cannot meet patients' needs for a green and quiet garden with a therapeutic effect. Therefore, patients, especially those suffering from cancer, have no place where they can escape the frustrating feelings of helplessness and hopelessness during their difficult illness experience. The present work aims to create a model of garden design for İnönü University Oncology Hospital, In Turkey, the process and approach to the design of hospitals, including their indoor and outdoor spaces, follow the guidelines used in many other countries. The current standards for the open spaces of the hospitals are limited to the "Turkish Health Buildings Minimum Design Standards 2010 Guide" published by the "Ministry of Health Construction and Repair Department" (Özgen & Onaran, 2023). The design criteria of indoor balconies, terraces and outdoor areas of the health centers are not yet included in detail in this guide. This research provides specifically designed guidelines for the healing garden aimed at cancer patients and their caregivers who are coping with cancer. Several aspects were considered in the design of the garden to reduce user stress, create a balanced sensory environment, increase

motivation and ensure a higher level of comfort for patients, medical staff and other users.

Although previous studies have highlighted the benefits of healing gardens in healthcare environments, there is a lack of comprehensive research focusing specifically on indoor healing garden design for cancer patients, particularly within the context of Turkish healthcare facilities. This study aims to address this gap by proposing a design model based on both user needs and environmental analysis. In addition, this study aims to raise awareness of the need to consider indoor gardens (or healing gardens) and to contribute to the theoretical and practical aspects of the subject.

STUDY AREA

The present work aims to design an indoor hospital garden where patients can receive psychological and physical therapies. It also introduces a garden design approach to promote patients' medical recovery and improve the quality of the hospital environment by ensuring an optimal level of comfort for patients and medical staff. The İnönü University Oncology Hospital (IUOH) on the university campus in the Battalgazi district of Malatya/Turkey was selected as the study site (Figure 1).

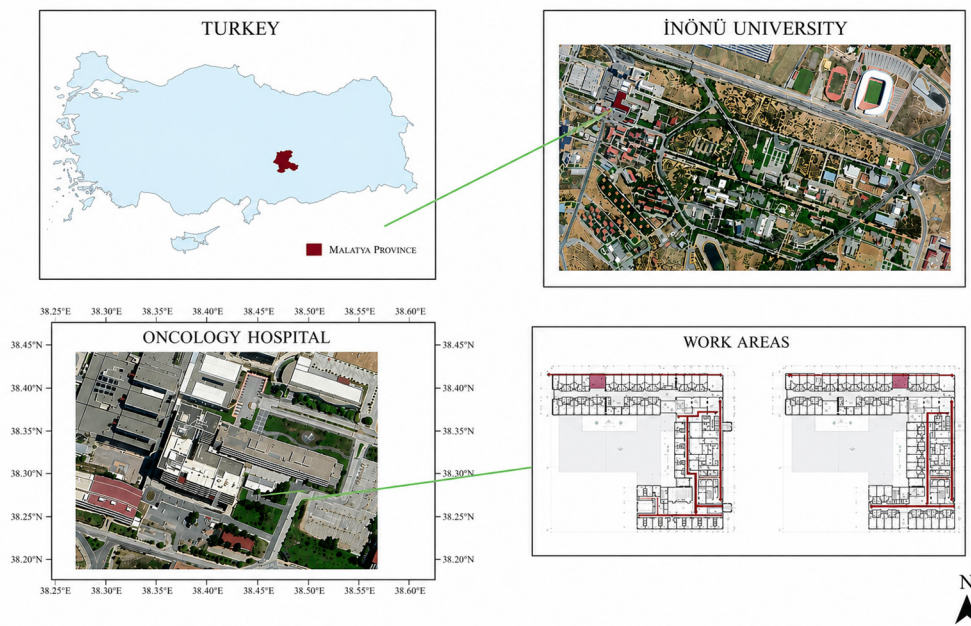


Figure 1. Location of Malatya İnönü University Oncology Hospital (IUOH) (Arkiv, 2023).

IUOH has an enclosed area of 31,590 m² and is the largest oncology hospital in Turkey. It has been providing services to Turgut Özal Medical Center since 2020. The building has 176 oncology-hematology patient rooms, 20 treatment rooms for bone marrow patients, 16 intensive care rooms and 5 iodine treatment rooms. It also includes a chemotherapy room for 84 people and 16 outpatient clinics reserved for daily use by patients (Arkiv, 2023).

Malatya province is located in the upper Euphrates basin in the Eastern Anatolia region of Turkey. Data from the meteorological station of Malatya show that the average annual temperature is 13.7 degrees (7-8 degrees in winter and 26-28 degrees in summer) (Sunkar et al.2013). The temperature difference between the seasons is too great in the province, so that the temperature drops to -30°C in winter and rises to 42°C in summer. The rainiest season in Malatya is spring and the average rainfall over the last ten years was 359.9 mm. It rains very little in

Malatya in the summer months. The prevailing wind in Malatya blows from the southwest. Although the wind direction varies in summer, the winter winds come from the southwest, south, north and northwest. The province has been under the influence of a significant drought in recent years (Ateş & Sabaz, 2013), which has led to a massive decline in fruit production in some areas. Due to the severe summer drought in Malatya, humidity remains at a very low level (Hatun, 2010).

METHODOLOGY

This study consists of three basic phases. The method consists of four consecutive steps: (1) a literature review to determine the design criteria of healing gardens, (2) analysing the case study, (3) identifying the evaluations and needs of cancer patients and experts, and finally (4) developing a list of design strategies based on the data obtained in the previous steps.

Site Survey and analysis

There are several balconies and terraces on the main building of the IUOH. Two balconies are located on the south side, and two are located on the north side of the building. The existing balconies in the building were closed to users and had no active function at the time of the study. For this study, two balconies on the south side of the building were selected as a suitable area to create the garden (Figure 3). The reason for choosing the balconies was their location, as they receive suitable southern sunlight. In addition, both balconies were primarily planned as dedicated areas for patients on the floors on which they are located. In this way:

- Balcony 1 (B1) with an area of 55.41 m² is located on the second floor. The second floor belongs to the Department of Pediatric Hematology and Oncology and 1 accommodates young patients aged 3-18 years.
- Balcony 2 (B2) on the fourth floor belongs to the Medical Oncology Department and is used by adult cancer patients aged 18-54 years suffering from one of the following cancers: lung cancer, head and neck cancer, breast cancer, prostate cancer, esophageal cancer, stomach cancer, colon cancer, ovarian cancer and cervical and uterine cancer. The area is also 55.41 m².

Prior to the design, environmental analyses of the selected balconies were carried out. Traffic, sun exposure, wind, and noise analyses of the areas were carried out as part of the study. Once all the analyses had been carried out on site, a SWOT analysis was conducted to identify the internal strengths and



Figure 3. Inonu University Oncology Hospital Area Analysis. (Arkiv, 2023).

weaknesses as well as the opportunities and threats of the area. During the field inspection and on-site analysis, some photos were also taken in the study area for later evaluation.

Interview and questionnaire

Two types of interviews were conducted in this study to determine the users' preferences and needs as well as users' evaluations of the site. First, a face-to-face interview was conducted with the patients, the officials and the patients' companions. In cases where an interview was not possible due to the patient's health condition, the questionnaire method was conducted with the patients or their companions. The questions consisted of two parts. In both the interviews and the questionnaires, the first part of the questions related to socio-demographic characteristics and the second part contained questions about the research topic and the hospital environment. For example, participants were asked what problems they have in the hospital garden, whether they spend time outdoors in the hospital, how often they spend time there and what outdoor activities they do there, etc. The indoor and outdoor conditions of the hospital building were also evaluated by the participants in terms of design, user-friendliness and landscape. The questions were answered by 50 people who were cancer patients or their companions who were treated in this hospital.

The survey was also conducted with the participation of doctors, nurses and administrative staff. The interviews with the medical staff were conducted with 10 experts. The aim of this survey was to propose and design a suitable indoor space as a healing garden in the hospital building for cancer patients who are being treated in the hospital for a certain period of time and also for other hospital users, who are dealing with the cancer of their relatives.

Design proposal for the hospital garden

In the final phase of the study, a proposal for the design of an indoor garden specifically for people with cancer was developed based on the findings from the literature review, the field analysis and the assessments of patients and users of the hospital. In this phase, computer software such as AutoCAD 2021, Adobe Photoshop 2021, Sketchup 2021 and Lumion were used to create the design layout and transfer it to the digital environment.

RESULTS

Site Analysis

The results of the location analysis have shown that:

- The hospital is easily accessible by public transport. The buses, which are the main transportation system to almost any point in the city, pick up passengers from the main entrance of the university campus to the hospital and back. The main entrance to the hospital is located in the southwest of the building. There is also a research entrance in the northern part of the building and another entrance is located to the west of the medical school building to the north of the hospital.
 - There are plenty of places for staff, students, patients, and their companions to meet their food, drink, and shopping needs. However, there is no accommodation on campus for the carers of patients undergoing long-term treatment. As a result, the patients' companions are accommodated in their vehicles or in the recreational areas in the hospital's garden.
 - The hospital building consists of 6 floors and the total area is 30,000 m². The problems with daylight on the first floor and basement and their intensive daily use were overcome with the help of recessed courtyards. The spatial system with recessed courtyards has provided all rooms on the first floor and in the
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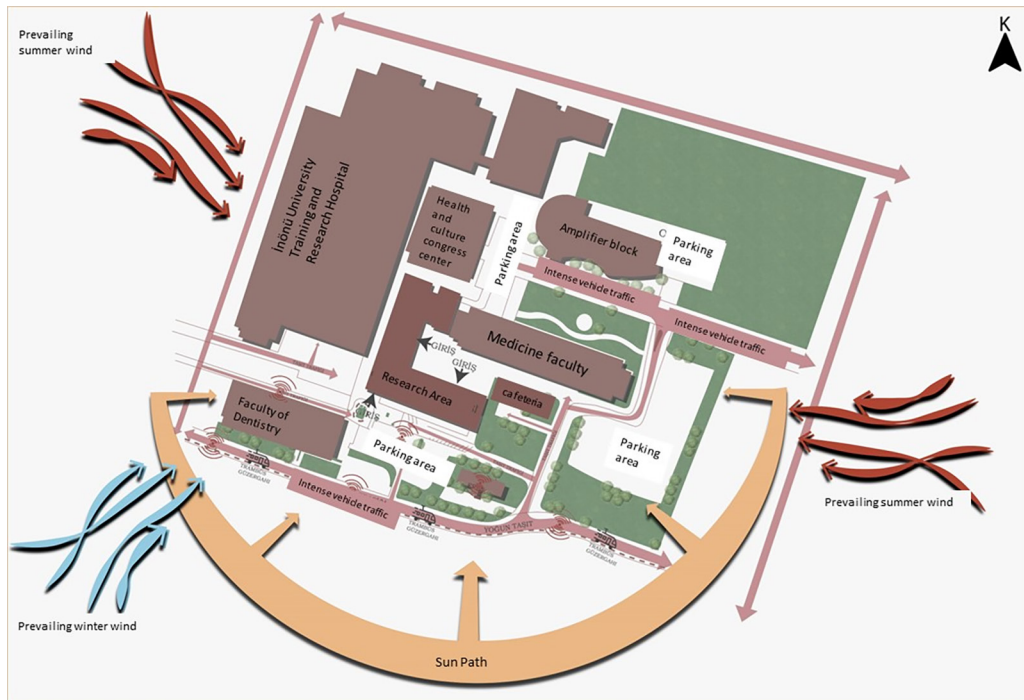


Figure 3. Floor Analysis of Balcony 2 (reproduced by authors).

- The sun's rays complete their orbit at an oblique angle with a short range in winter and at a right angle with a long range in summer. Therefore, the sun's rays are more noticeable in the summer months, especially between 11.00 and 15.00. As both balconies are on the south side, they receive direct sunlight. It has been shown that the shadow length changes as the angle of the sun decreases in winter and increases in summer.
- As for the balconies, balcony 1 is located on the second floor where the pediatric hematology inpatients are located, so it is easier for the young patients to reach balcony 1 without having to go to another floor. It has a drainage problem. Balcony 2 on the Medical Hematology floor (floor 4) is easier for adult patients to reach without having to go to another floor. Burnt granite was used for the floor and composite panels for the walls.

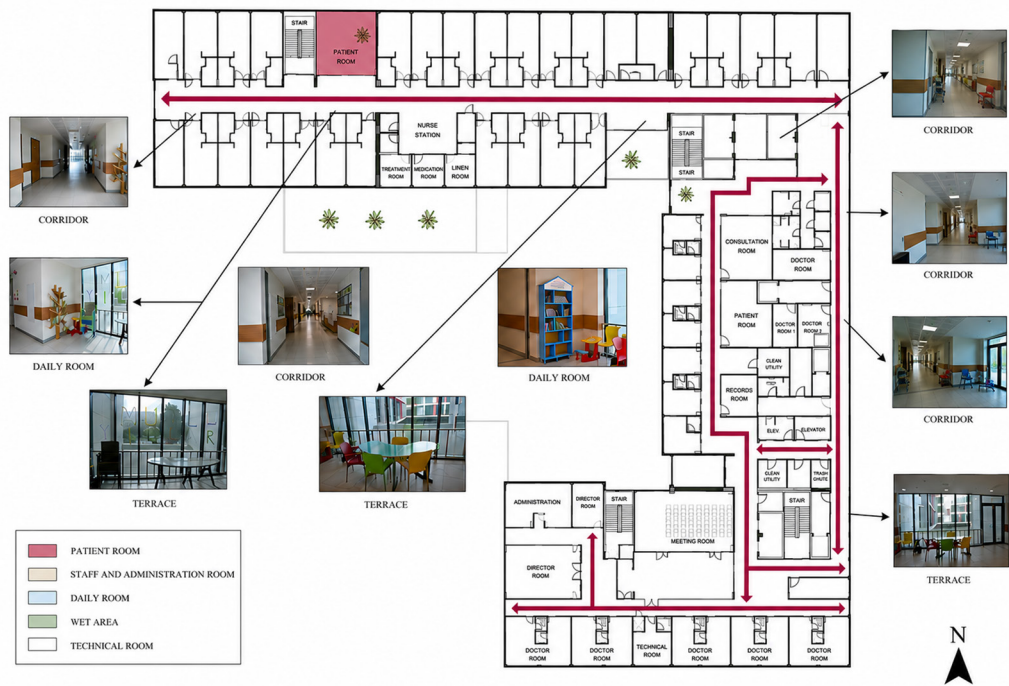


Figure 4. Floor Analysis of Balcony-1 (reproduced by authors).



Figure 5. Floor Analysis of Balcony-2 (reproduced by authors).

SWOT Analysis

The SWOT method was used to identify parameters such as strengths, weaknesses, opportunities and threats in relation to the study areas (Table 2).

Strength	
S1	The hospital was built using new and modern technology.
S2	There are many balconies in the building, and the corridors are wide, spacious, and sunny.
S3	It has easy access from the city center to the university where it is located.
S4	There are no problems with navigation and movement within the hospital.
S5	Sufficient car parks are available for the hospital.
Weakness	
W1	There is no garden in the area;
W2	There is no space for gardening near the hospital building;
W3	The number of medical staff is not enough in the hospital;
W4	The silhouettes seen from the balconies do not have beautiful views;
Threats	
T1	The proximity of the oncology hospital to the Inonu University research hospital and the presence of common corridors through the building to the research building will negatively affect the use of the gardens designed for cancer patients.
T2	User profiles will vary, and the space will be insufficient. Since the front parts of the balcony areas are open, there is a danger of excessive sun or wind exposure for these balconies.
Opportunities	
O1	If access to the hospital and directions in the building are provided well, the hospital gardens will be easy to access.

Table 2. SWOT analysis of study areas (source: authors).

Users' Evaluations Patients and their caregivers

- When patients and their caregivers were asked to rate and rank the physical conditions of the hospital, they cited lack of open space (38%), lack of sun (22%), airlessness and dust (14%), and overcrowding (8%), as well as problems with cleanliness (8%), transportation, and accessibility (5%) as the most critical aspects of the hospital. In addition, 85% of patient rooms have windows, while 55% of rooms receive no sunlight. According to the responses, the main problems at the hospital are the length of treatment (53%) and the long stay at the hospital (45%).

- In terms of patients' physical abilities, almost all patients and accompanying persons (caregivers) stated that they were unable to go out. 37% of the participating patients stated that being outdoors has a physical effect, 35% stated that it has a psychological effect, and 28% stated that the social effect of open spaces has a healing effect.
- Regarding a new hospital garden, 42% of participants stated that they do not want noise and sound, 30% of them do not want scented plants and 28% do not want wobbly furniture elements. It is clear from the participants' responses that they expect a hospital garden to be primarily a quiet area (32%) and secondarily a green and recreational area (30%). Then, an educational area (10%), a meeting area (7%), a place to follow part of their treatment in the garden (7%), and an area for walking and sports (6%) were the preferences for the hospital garden.
- 81% of participants did not want the hospital garden to be far away from the hospital. According to the responses, the main problems of cancer patients in the hospital garden could be the sun (42%), the temperature (23%), the soil (21%) and the plants (14%). 75% of patients stated that they were treated as inpatients and 25% stated that they were treated as outpatients.
- As cancer patients are isolated in hospital and spend long periods of treatment in hospital, it has become very important that patients' rooms have open green spaces or even a window to nature. The survey of nursing staff revealed that when patients are placed in a room without a window, they refuse and demand a room with a window. It was found that fresh air and the countryside are very important for cancer patients to feel well and make the most of the day.

Experts (doctors, nurses, administrative staff)

- The staff survey revealed that 32% of participants would like a green space and recreation area, 22% a place to read, 11% a quiet place, 8% to use the garden as a place to learn, 7% an area to walk and 3% the opportunity to carry out some of their treatments in the garden.
- When staff were asked about the negative physical conditions of the hospital, lack of open space (34%), lack of sunlight (25%) and stuffy air (25%) were the most critical. The least critical issues were overcrowding (12%) and problems with cleanliness.
- 45% of participants stated that they go to the canteen during their break, 19% of them go outside to get some fresh air, 17% rest in their room and 9% smoke.
- According to the surveys, 74% of employees' rooms have no window, while 26% of rooms have a window. 65% of staff do not receive sunlight in their rooms. The main problems cited by healthcare staff were the impatience and restlessness of people accompanying patients who were worried about the patient's situation (52%) and, in second place, the psychology of the patients themselves (41%).
- Similar to patient responses, 73% of staff stated that the hospital garden should not be outside the hospital building. Healthcare staff indicated that sun (38%), temperature (29%), soil (18%) and the presence of plants (15%) in hospital oncology gardens could have a negative impact on patients. Staff also stated that the negative aspect of being in open areas for cancer patients is the large number of people (63%) and sensitivity to allergies (35%).
- According to staff responses, 38% of cancer patients should wear a mask, 33% should wear gloves (33%) and 29% should avoid being in crowded open areas (29%). They stated that it is psychologically beneficial for cancer patients to stay and spend time in the garden of the hospital during treatment.

- 75% of healthcare staff stay in hospital for 12 hours a day and 25% of them for 8 hours. Regarding the length of hospitalization of cancer patients, 64% of the staff stated that they stay in the hospital for 1-2 months and 36% stated that they stay for 21 days. The staff stated that the side effects of treatment in cancer patients are 41% weight loss, 32% hair loss and 27% sores on the corners of the mouth.

Indoor Garden Design

As a result of this study, a design proposal was developed for two balconies of the hospital building. Based on the literature study, the field analysis and survey as well as the interviews, some important criteria and design guidelines were developed.

According to the literature studies, a hospital healing garden:

- Should create a sense of place and a stress-free environment through a unique and original design;
- Should have a vision for the outdoor spaces of the hospital;
- Should include a variety of private, semi-private and shared spaces to cater for the different user groups with their varying needs;
- Should be accessible to disabled and wheelchair users. Walkways should be wide enough for wheelchairs and doorways should be wide enough to allow easy maneuvering;
- Should have minimal height differences in the surrounding area to be easily negotiable;
- Should have non-slip surfaces with handrails and seating at short intervals for users with reduced mobility.
- Should be designed in such a way that the senses of sight, hearing, smell, touch and taste are incorporated into the garden.

The analysis and survey results of the area showed that:

- Sunlight is strongest in areas at midday, so it is important to take precautions when designing the area to protect users from sunlight.
- The prevailing winter wind from a south-westerly direction can particularly affect the use of the work areas.
- Since the winter months in Malatya are cold and snowy, it is very important to close the front of the balconies in winter.
- Since the areas of the balconies are small, the features of the garden should be carefully planned and placed according to their importance.
- The maximum weight of the balconies in the hospital, which is 9800 kg, should be considered.
- Hospital managers should actively participate in the design of these outdoor spaces by giving hospital staff the opportunity to learn about the healing effects of the gardens and promoting the use of the outdoor spaces.

The results of the interviews and questionnaire showed that:

- Children with cancer want a place to relax away from the hospital environment.
 - A comfortable environment can be created where hospital staff can sit and have a drink in the hospital garden.
 - Giving patients the opportunity to continue their social roles was one of the patients' wishes.
 - Increasing the feeling of independence and freedom was one of the patients' wishes.
 - It was recommended by expert doctors to use healthier materials, away
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from carcinogenic substances, in the field.

- Sight is one of the most important senses. There should be a view of the natural areas from the patient rooms.
- The garden should use a variety of textures, colors and shapes to attract users' attention and make them linger.
- The representation of the seasons is extremely important for understanding the passage of time and the life force to which we are all connected. This can be accomplished through the blooming of seasonal plants in the spring and the changing foliage of trees in the fall.
- Color is another aspect of visual sense. Color evokes a variety of emotions in different people, such as excitement, alarm, calm and positive feelings.
- Unpleasant sounds should be avoided by utilizing the pleasant sounds of nature in the environment. The chirping of birds and the movement of leaves in the wind provide a positive stimulation of nature.
- Depending on the condition of the outdoor space, wind chimes can be used to create a lively sound that does not reflect the hospital environment.
- An organized, legible and attractive space reduces stress, enhances the enjoyment of being in the garden and reduces cancer patients' fear of getting lost.
- Plants and flowers should reflect the seasonal changes, and the variety of texture, form and fragrance of plants should be considered to avoid uniformity.
- Different sunny and shady areas should be created in the garden to provide protection from wind and rain.
- Some unique art objects and esthetic landscapes can attract the attention of patients.
- Clear signs should be placed near the main entrance of the gardens to guide visitors.

The information leaflets for patients should also include a map of the garden with all the facilities and options that can be offered in the garden.

Functional plan

In this study, the proposed functions and their relationships were drawn using bubble diagrams. The functions proposed for the Healing Garden for Children with Cancer in Balcony 1 are divided into three types of areas: the rest or sitting space, the green space, the play or activity area, and the green wall. There are sculptural objects, sound objects, areas where groups can sit alone, colorful artistic walls, a vertical garden, planter boxes, an ornamental pool in the middle and quiet green areas also in the garden for children. The activity area, located on the right side of the balcony from the front door, was created to bring a small number of children with cancer together where they can play games at an active-passive table. The plan is for this area to allow children, their family members or doctors and even people who use wheelchairs to sit comfortably and spend time together.

Similarly, the functions for adult cancer patients on Balcony 2 on the fourth floor are planned in the form of seating areas, semi-covered seating and green areas where people can sit alone or in groups. This area is separated by barriers. In this garden there is also a vertical garden, plant boxes and an ornamental pool (Figure 7). The artificial vertical green wall in the garden was built at the request of the patients who took part in the surveys. The presence of landscaping and green spaces can be beneficial in terms of their healing effect.

In the hospital garden, the ratio of greenery to paving should be around 7 to 3 to make the area feel more like a garden than a square. In this garden, this ratio is achieved through vertical landscaping. As the area is too limited, the most optimal use of space including important functions was preferred

Design strategies

- Taking into account the physical and health situation of cancer patients, some specific design strategies were considered. For example, according to specialists, patients taking certain cancer drugs should avoid the sun, so shade umbrellas should be placed in the garden during the summer months. Some patients may lose muscle mass, so the presence of cushions makes sitting more comfortable for them. Some patients feel weak or may be elderly. For them, benches with backrests and armrests should be considered to make it easier for them to get up from a sitting position.
- There is a wide range of seating and furniture available in both children's and adult patients' gardens, all made from wood. Not only is the design of the seating and furniture important, but also how it is placed. Some people prefer to sit alone or with a friend in a private place. Some have just started treatment and feel weak and need to rest before going home. Low walls that divide the room into multiple areas can easily turn a space into a semi-private alcove. Also, some hospital staff may want to hold an informal meeting with patients outside or have lunch together in the gardens.
- Garden patches for cancer patients should be chosen carefully. Patients taking certain medications may be bothered by the glare of the materials. The suggested paving materials to reduce or eliminate the glare problem are light-colored concrete, such as the light gray-brown paving stones. It is also suggested that all furniture in the two gardens be made of wood, which has a lower reflective potential. Designers should stay away from tables made of steel or aluminum, which are highly reflective. In addition, soft flooring must be used in the nursery so that young patients do not injure themselves if they fall due to their treatment effect.
- To take advantage of the healing effect of water, both in terms of sight and sound, an ornamental pool was planned in the middle of the two gardens. The water basin in balcony 1 should be high up so that the water cannot be touched, as there is a risk of germs or microbes accumulating in the water.
- Discussions with doctors have shown that cancer patients receiving chemotherapy and radiotherapy should not be directly exposed to the sun, as this has a negative effect on them. For this reason, parasols and umbrellas have occasionally been used to avoid the harmful effects of the sun.
- According to surveys of patients and staff, the greatest wish for the inner garden was that it should be a quiet and green place. However, in some parts of the garden, artificial plants are preferred to avoid the risk of mold, fungi and infections which could be transmitted to patients through the soil. To give the impression that the patients on balcony 1 are in a green area, vertical green walls were used. The vertical green wall consists entirely of artificial plants, and the plant species chosen in this location are visually aesthetic, provided that the materials used do not contain carcinogenic substances.

DISCUSSION

The aim of this study was to create the hospital healing garden for cancer patients within the IUOH and to develop a corresponding design proposal. The healing properties of nature for cancer patients were discussed and suggestions for the design of the hospital garden were developed. This research has sought to define the healing role of hospital designed gardens, particularly for cancer

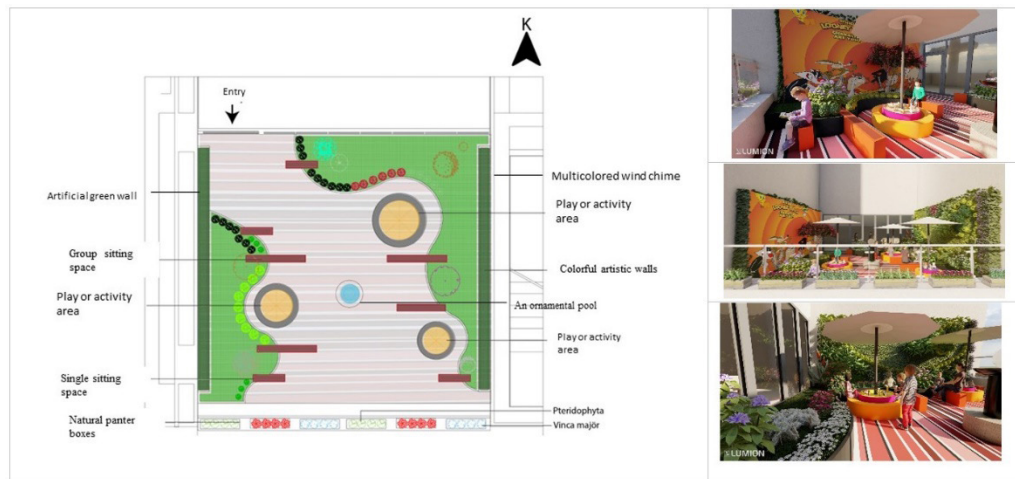


Figure 6. Indoor Garden Design Proposal in Balcony 1 (produced by authors).

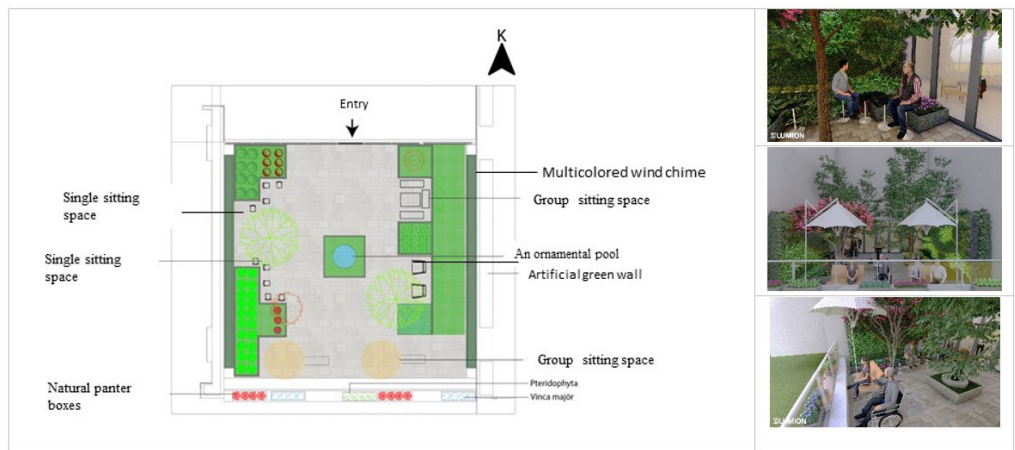


Figure 7. Indoor Garden Design Proposal in Balcony 2 (produced by authors).

patients, and to determine the dimension of enhancement. It is anticipated that designers and architects will benefit from the results of this research in their new design projects for people with illness and cancer.

In the design of this hospital garden for cancer patients, some strategies were considered that take into account the health condition and physical situation of the patients, which was explained in the results of the article. The functions recommended for the balconies inside the hospital were selected according to the needs and wishes of the cancer patients and the doctors' comments: Seating area, activity area, areas for sitting alone and in groups, an artificial green wall, plant boxes and a central pool. An effort was made to create a space different from the hospital environment to reduce patient stress by creating a calm and open area that utilizes the therapeutic values of natural elements.

The acceptance of the healing role of gardens in Turkey, not only for patients but also in general, is a phenomenon that needs to be developed institutionally. Some of the reasons for the lack of development in this regard are related to the educational and cultural structure as well as the financial situation of the country. However, the topic of "Hospital Garden" can be included in the framework of the "country's health system" and developed in a broader and more specific area from a scientific point of view. Therefore, non-governmental organizations, associations and foundations, local governments, state and social institutions, military institutions, volunteer organizations and universities in Turkey are encouraged to work on this issue. Significant improvements can be achieved in both economic and health terms.

In Turkey, there are only a few health institutions that have an oncology department and IUOH is one of the most well-known oncology centers in the country. Therefore, the establishment of such an indoor garden can be a good model for other health centers. However, the planning criteria cannot be met with a single design case. Depending on the economic potential of the hospital, the available open spaces, the needs of the patients and other aspects, the optimal design should be considered. The healing gardens of a hospital require a comprehensive approach to planning and design in order to take into account all economic, physical and social aspects.

There are various aspects of the design that need to be studied with regard to the needs of the patients and the site conditions. Different types of patients of different ages, with cancer or other diseases, may have specific needs for staying in open spaces. In outdoor gardens, where the available space is large, designers plan different ideas and functions, but in indoor gardens the space is small and functions are carefully prioritized. As this study shows, in some parts of the garden, artificial planting was preferred because it was not possible to use natural plants. Or the sound of water, nature and birds. From this study, it appears that a green and quiet garden is something that cancer patients need the most. Therefore, one should try to eliminate the noise in this place and create a green place with natural elements such as plants and water.

The challenge in creating these gardens is to address the physical and health issues of the patients in the area. Considering the specific medical and health needs of the patients, designing them in practice becomes an arduous task. However, providing a place where an average portion of the users' needs are met can be acceptable as a first step. The management and care of the garden is another issue that should be investigated, as the enormous amount of maintenance can lead to a place that no longer has its original quality, form, beauty and healing properties.

Another issue that should be investigated is the evaluation after use. The patients' comments and their mental and physical behavior can be observed and studied after a few months of using the place to verify the positive effects of the garden on the patients and the achievement of the project's objectives. This is very important as these results will provide valuable information to improve the design approach and other physical aspects of the garden to enhance its healing effects.

CONCLUSION

In fact, the health center is expected to address patients' psychological needs as well as their other physical health needs. As studies have shown, nature plays an important role in alleviating stress and panic through its healing effect on the human psyche and mind. The hospital's green and open spaces inside and outside the building are crucial in this regard. However, given the physical situation and health problems of patients, especially cancer patients, it is not practical in most cases to use the outdoor green spaces, which are usually overcrowded. In addition, due to the sensitivity of their immune system during chemotherapy treatment, they mostly live in the hospital environment. The idea of creating indoor gardens in the hospitals is one possible solution to the problem. Hospital balconies or terraces or even places on the roof can be considered for creating such a green and peaceful place. As easy as it looks to design these small areas, there are several aspects related to the patients' health needs that make designing the garden a difficult task. They should be created based on the health and physical conditions of the patients, otherwise

the created garden cannot be used by all patients of the hospital. All plants, materials and physical elements such as benches and furniture should be carefully selected according to the needs of the patients during the treatment period. However, there are other aspects that will be examined later after the space use, by frequent monitoring, and objective and subjective evaluation. Social and economic aspects of this garden should also be considered in future surveys. Although there are no specific guidelines and design guidelines for the design of these indoor gardens, with more experience, a complete list of regulations and design principles can be achieved through an integrated and multidisciplinary approach.

Conflict of Interest:

No conflict of interest was declared by the authors.

Financial Disclosure:

The authors declared that this study has received financial support of Scientific Research Projects Unit of İnönü University Scientific Research Project (BAP) (Project no: 2487)

Ethics Committee Approval:

Ethics committee approval has been obtained from the Scientific Research and Publication Ethics Committee of İnönü University on 25 April 2023 (1/1).

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