Biophilic Design as Sustainable Approach for Interior Hospice Care

Yunida Sofiana, Yulia Yulia, Titi Indahyani
Interior Design Department, School of Design, Bina Nusantara University, Jakarta, Indonesia 11480

ysofiana@binus.edu

Abstract. In an interior design environment, the concept of natural care can give humans a sense of calm and comfort physically and mentally, since human inherently have a close relationship with nature. Based on the healing environment research, the natural approach to health facilities impacts the condition of the patient positively. In this study, hospice care facilities were designed to target pediatric patients seeking treatment for cancer. As part of a health therapy facility, the application of biophilic design aimed to apply hospice care to get the advantages of biophilic design. Therefore, it can improve patients’ physical and mental health when receiving cancer treatment. With the application of biophilic design in interior hospice care, it can be used as baseline data for hospice care design for pediatric patients.

1. Introduction.
About 300 000 children have been diagnosed with cancer every year worldwide. Approximately 80% of these children live in low-income countries, where more than 80% of them are killed by the diseases [1]. Today, Indonesia has nearly 700,000 chronically ill children, but less than one percent now have access to pain relief or hospice care [2]. The role of hospice care has been minimized by the limited number of palliative care in Indonesia. In Indonesia, the lack of the hospice or palliative care development will eventually contribute to a decline in the quality of life patients. Therefore, for patients (children) with cancer, hospice care design guidelines are needed, which are intended to become a guideline in the design of hospice care. In Indonesia, the lack of development and the presence of hospice care will contribute to a reduction in the quality of the healing process for children with cancer. A suitable hospice care design is needed for children with cancer, which is expected to be an inspiration in the future for the design of hospice care.

2. Literature Review
Based on comprehensive healing environment research studies, it was found that biophilic design have the beneficial effect on human health. Evidence shows that biophilic environments exert a healing effect on the human body, both natural and artificial [3]. As a service that offers a supportive feeling for the complaints felt by patients and their families, hospice care will then provide patients with a feeling of comfort with the biophilic design implemented in hospice care facilities. However, hospice care not only addresses the physical problem of the patient, but also addresses psychological, social and spiritual aspects.
This study is intended to be used as a contribution to the creation of evidence-based biophilic interior design approaches for sustainable health care environments such as hospice care. There are several different types of literature that will be used in this study, the selection of literature is based on the three main discussions in this study, which are: healing environment, biophilic design and hospice care.

2.1. Healing Environment.
The healing environment is a physical environment in health facilities that can accelerate patient recovery time or accelerate patient adaptation process from chronic and acute conditions by involving psychological effects in patients [4]. Other study has described it as a holistic environment that facilitates patient rehabilitation. In contrast to medical treatment, healing is a psychological concept of health [5]. The application of environmental healing methods in the care environment have an impact on patients’ final health condition, namely by reducing medical costs, reducing pain, reducing hospitalization time, reducing feelings of pressure, raising enthusiasm, providing a positive mood, and increasing environmental standards for patients.

2.1.1. Approach to the Healing Environment.
According to Murphy (2008) there are three approaches used in designing the healing environment, there are; natural, sensory and psychological[6].

a. Nature Approach.
Nature is a medium involving the five human senses that can be accessed. Nature has a great health restorative effect, such as reducing blood pressure, leading to a positive emotional state, reducing hormone levels of stress and increasing energy. Natural elements that are placed in the patient’s medication will help the patient relieve the pressure he is suffering from. The natural elements that are put into the patient’s treatment and care can help the patient to relieve the stress he feels.

b. Sensory Approach
The five senses possessed by humans include sight, hearing, smell, taste, and touch. Each of the five senses plays an important role in the process of healing the patient, there are:

i. The sense of sight can affect a person's feelings and mood when they see beautiful things which can make the eyes lighten the burden and become more relaxed.

ii. The sense of hearing can make humans hear pleasant and winning sounds which can reduce blood pressure and heart rate, thereby creating an atmosphere that can affect the patient’s nervous system.

iii. The sense of touch is the sense that becomes the basic mechanism in childhood discovery of the world, with their sense of touch, the form of touch emphasizes what they see, smell, taste, and hear.

iv. The sense of smell is a sensation that can make humans perceive different types of smells, ranging from pleasant and pleasant smells to lowering blood pressure and heart rate, while pungent and unpleasant odors can increase the heart rate and affect the breathing of the patient.

v. The sense of taste begins to be disturbed when the patient is experiencing pain or is undergoing medication. Typically, this is indicated by a change in the taste of food or drink when consumed by the patient. Therefore, the quality of food and beverages offered in health services need more attention when given to patients.

c. Psychological Approach.
Psychologically, the healing environment can help the patient's recovery or healing process to also be faster, can reduce pain, and reduce pressure in the patient. The care given to patients takes into account the choices, needs, and values that guide their clinical decisions.
2.1.2. Impact of the Healing Environment on Health.

The healing environment method applied to a health facility has a big impact on patients, managers and visitors. Positive impacts that can arise from the application of the healing environment method [7]:

i. Reducing the stress and anxiety experienced by patients and their families;
ii. Reduce pain;
iii. Reducing the incidence of infection;
iv. Improve sleep and recovery time;
v. Increase patient excitement;

2.2. Biophilic Design

The positive effects on the health and performance of human being in response to biophilic design of the build environment have been verified by extensive scientific studies in different settings; health care facilities, work places, children places, community spaces, etc. The meaning of biophilic according to Kellert (2005) is the inherent human predisposition to be associated with natural systems and processes, particularly the non-human or natural environment's life-like features. The other meaning of biophilic design itselfis the attempt to incorporate an awareness of the inherent human predisposition to interact with natural structures and processes – known as Biophilia – into the development of a built environment[7].

Humans have an inherent desire to dominate and understand the natural world by classification, categories, and labels that describe the environment. Through observation, understanding, and immersion in the natural world, humans derive physical and mental benefit as cognitive development and learning are nurtured fostering an increased sense of well-being. This relationship can foster a spiritual response as humans ponder the purpose and meaning of life and its unity to creation. Recognition of unity and order is perceived in the beauty of the natural world eliciting spiritual, metaphorical, emotional, and sensory understanding. These responses contribute to the value applied to natural systems and the creation of a sense of place within the natural world [7].

Finally, the theory of biophilia, which is simply described as the inherent affinity of people and their desire for nature and natural systems. It needs to be further explored in the sense of interior design and how it integrates environmental psychology and relationships between people and plants [7].

2.3. Hospice care

There are several definition of hospice care, one of them are an approach that improves the quality of life of patients and their families facing the problem associated with life-threatening illness, through the prevention and relief of suffering by means of early identification and impeccable assessment and treatment of pain and other problems, physical, psychosocial and spiritual [2]. Hospice care is a special kind of care which focuses on the quality of life for people and their caregivers who is experiencing an advanced, life-limiting disease. In the last stages of incurable disease, hospice care provides compassionate care for people so that they can live as fully and comfortably as possible [4]. However, hospice care for children with cancer is a place where pediatrics patients with early stage cancer who cannot be treated at home but do not take the necessary actions in the hospital. The treatment facilities provided by hospice care are treatments that can relieve patients from their suffering, both physical (for example pain, nausea, vomiting) and psychological (sad, angry, worried) related to their illness, as well as providing moral, spiritual, and psychological support and practical training in patient care for patient families and carers.

Hospice care is used when an illness, such as advanced cancer, hits the point where medication cannot prevent or control it any longer. Hospice treatment should usually be used when a person is expected to live for around 6 months or less if the disease runs its normal course. Patients with advanced cancer will have a conversation with family members and doctor to determine when hospice
treatment should be taken together [4]. Hospice care for children represents a special, albeit closely related field to adult palliative care, and is defined by the WHO as follows [2]:

- Palliative care for children is the active total care of the child’s body, mind and spirit, and also involves giving support to the family.
- It begins when illness is diagnosed, and continues regardless of whether or not a child receives treatment directed at the disease.
- Health providers must evaluate and alleviate a child’s physical, psychological, and social distress.
- Effective palliative care requires a broad multidisciplinary approach that includes the family and makes use of available community resources; it can be successfully implemented even if resources are limited.
- It can be provided in tertiary care facilities, in community health centres and even in children’s homes.

Hospice care is a special kind of care which focuses on the quality of life for people and their caregivers who experience an advanced, life-limiting disease. In the last stages of incurable disease, hospice care provides compassionate care for people so that they can live as fully and comfortably as possible. Hospice care is a place where patients who have chronic or dangerous illnesses who cannot be treated at home but do not take the necessary actions in the hospital [8]. The services provided by hospice care are not like those in hospitals, but are able to control the symptoms and effects suffered by patients from their illness, with the space and environment conditions like being at home. The treatment at hospice care aims to be able to alleviate the suffering and discomfort of the illness that patients suffer from, based on the physical and psychological aspect. The objectives of the implementation of hospice care services are:

a. Relieve the patient from his suffering;
b. Provide moral, spiritual and practical training in patient care for the patient's family and caring behavior;
c. Provide moral support for the patient's family during the grief period.

Cancer palliative care is an urgent humanitarian need throughout the world, including Indonesia, for cancer patients, especially in advanced stages. Ideally, palliative care services should be provided to cancer patients and their families from the time the cancer diagnosis is made until the disease progresses to a terminal phase.

The increasing growth of cancer in children in Indonesia can be overcome by the presence of hospice care. With the existence of hospice care, the community and parents can have knowledge about early handling of chronic diseases such as cancer. Hospice care must also be a place that can fulfill the activities of the patients in it. Hospice care is here as a solution for child cancer patients who have early stage cancer and have been detected early, as well as patients living in remote areas. However, the image of hospice care in general still tends towards patients who cannot be cured.

3. Method

This study conducted systematic literature review and case study to determine the hospice care characteristics for children based on the six biophilic design elements by Stephen R. Kellert (2005). The research method and scope are described. Firstly, we described the definition of a healing environment, biophilic design, and hospice care based on a literature review. Then, for the case study, we analysed the study case of hospices care to find the characteristics of hospice care facilities and how far the characteristic of the six biophilic design elements can be applied on interior design facilities. As a study case, the two locations of children's hospice care will be selected and analysed, there are Hummingbird hospice care in Perth Australia and George Mark Children’s House in California. This study will be focused on the selected area related to children activities such as, private area (bedroom) and semi-private area (art and music room) as communal facilities in hospice care. Finally, the data from the study cases will be used to develop a new design concept and facilities in hospice care based on the biophilic design approach.
4. Results and Discussions

4.1. Analysing the hospice care design

a. Hummingbird Hospice care.

This hospice care is designed by ThomsonAdsett and the only one of its kind in Queensland and the third in Australia. The Hummingbird House designed concept is to create the feeling of a house in scale and layout, with loose furniture elements, flexible shared spaces and ample connection to the outdoors. Hummingbird House has a range of accommodation options including eight ‘Guests In-Care’ bedrooms, and three two-bedroom adaptable apartments. They provided thoughtful and flexible spaces for families with terminally ill children, Hummingbird House also delivers humanity through design. Hummingbird House supported several facilities such as, eight bed facility with five family accommodation suites, therapy rooms, multi-sensory room, all-abilities accessible bathroom, pool, large outdoor spaces and play centre, teenagers retreat, and a specifically designed space for care after death [12].

Figure 1. Hummingbird Facilities (bedroom, therapy room)
(images: http://hummingbirdhouse.org.au/home/explore-hummingbird-house/)

Figure 2. Hummingbird Facilities (play centre, music room)
(images: http://hummingbirdhouse.org.au/home/explore-hummingbird-house/)

b. George Mark Children’s House

George Mark Children’s House is located in San Leandro, California. They focuses on quality of life and continuity of care for children with illnesses that modern healthcare cannot yet cure, or for those who have chronic medical conditions. They provided and supported several facilities such as, bedrooms, hydrotherapy spa, sensory room, living room, game room, art room and kitchen. They also have eight children’s bedrooms, each with their own theme which are sea breeze, good night moon and jungle safari with all bedroom has access to the gardens. Rooms are designed to support the needs of children and they all have a daybed where a relative or friends can stay [13].
4.2. The concept of Biophilic Design

Natural materials have a heavy impact on how we feel and interpret our space. Natural materials possess visual and tactile qualities that few if any artificial materials can replicate [4]. Use materials such as cotton, wool, linen, wood, and stone. Natural materials reveal the properties of maturation, aging and change in adaptive response to the challenges of survival over time. By contrast, artificial materials often lack dynamic features; instead they seem fixed in lifeless space and time [4]. These materials also are what creates visual and physical texture through the items themselves or strategic placement. Texture can also refer to light, sound and colour. Most people prefer natural finishes and textures to synthetic because it triggers instinctual parts of our brain.

The hospice care interior design takes the concept of sustainable design that combines the natural environment and non-toxic natural materials in the interior space. Permata Husada Loka is the theme raised in the design of this hospice care and can be displayed through the design concept which is dominated by the use of natural materials, earth tone and soft color combinations along with their derivatives that symbolize calm, cool, positive influence from nature, comfort, and fun in the healing process of child patients with cancer. The design of hospice care is intended as a comfortable and safe treatment for children with cancer and their families. Therefore, the concept of Permata Husada Loka is expected to be able to create a space that can provide positive and healing effects for its users through a combination of design elements used. The use of this form of inspiration from the winning lavender flowers and commonly grown in therapeutic gardens located in health care facilities. Lavender flower is very closely related to aromatherapy, because its aroma can soothe and relieve pressure on someone who is doing care and healing.

4.3. The Concept Design of Hospice Care

Permata Husada Loka also means that children do healing and healing in the natural environment, because in this hospice care applies the environmental healing method. A place for treatment, learning and play, as well as other healing and development activities by presenting a green space that can provide a positive atmosphere and reconnect humans with the natural environment, as well as give a touch of children to the interior of the room to make it more pleasant when doing treatment in this hospice care.

The impression of a space that can be displayed on the application of the design results in it can affect all user activities in the room. Therefore, a good design needs to be considered the activity needs of its users in the existing space, so that it can create an image of the space that is expected. In this interior design, the image of the space that the author wants to display is a natural, cool, and pleasant image that can provide a calm, comfortable, positive effect, and make space users more creative and feel close to nature. This is applied by using materials that are not hazardous, and implementing natural and soft colors.
Natural and fun interior elements that you want to apply also follow the functions of these spaces. In public space, it uses design elements that show the dynamism of the combination of patterns and shapes, while in semi-public spaces it uses design elements that tend to be simpler, in order to match the function of the space, namely to rest and relax.

![Figure 4. Layout Music Therapy Room and Art Therapy Room (drawing by Yulia)](image)

The layout of this music therapy room is dominated by purple on the floor which gives a calming impression of the lavender color, and the use of a touch of wood can give the room a natural impression. The floor pattern used also tends towards dynamic organic shapes, inspired by the active and unruly nature of children. The layout of this art therapy room is not much different from the music therapy room which is dominated by purple on the floor which gives a calming impression of the lavender color, and the use of wood and white touches can give the room a natural and neutral impression. The floor pattern used also tends towards dynamic organic shapes, inspired by the active and unruly nature of children.

![Figure 5. Layout VIP Patient Room (drawing by Yulia)](image)

The layout of this pediatric patient room is also in line and is not much different from the music therapy and art therapy rooms which are dominated by purple on the floor which gives a calming impression of the lavender color, and the use of wood and white touches can give the room a natural and neutral impression. The floor pattern used also tends towards dynamic organic shapes, inspired by the active and unruly nature of children.
The interior of the music therapy room at this hospice care gives a natural, positive, and fun impression for child cancer patients undergoing music therapy sessions. This impression is due to the fact that the interior of this music therapy room is dominated by natural-colored materials with a touch of soothing purple lavender flowers. Besides that, there is also a game ceiling shape inspired by the shape of the lavender flower.

The interior of the art therapy room at this hospice care gives a calming, positive, and creative impression to child cancer patients undergoing art therapy sessions. The use of natural materials that are non-toxic, which are varied but still continuous with one another, makes the atmosphere of the room not boring. Using a modular form of furniture that can be moved according to the needs of the therapy session.

The interior of the VIP patient room at this hospice care gives a natural and comforting impression for child cancer patients who want to rest or relax in their room as a place of their privacy. This impression is due to the fact that the interior of this VIP patient room is dominated by natural-colored materials with a touch of purple and soothing lavender flowers.
5. Conclusion
The aim of this paper is to be seen as a contribution to the advancement of evidence-based biophilic interior design solutions for health care environments such as hospice care. Interdisciplinary research and the guidelines proposed are hypotheses as to how to further design for human well-being with nature. They provide support and design considerations for normal psychological responses in the healthcare environment. Because of the interdisciplinary complexity of biophilic interior healthcare architecture, one significant consequence for future work that stems from that interdisciplinarity can be emphasized here. Such features are also particularly relevant to consider in the sense of an indoor health environment, since they can answer many of the patients' physical and psychological responses to well-being.

The interior design of hospice care aims to provide a safe and pleasant place for care, but can facilitate children's development needs such as music and art activities, apply comfortable interior elements that affect children's activity and development, and design hospice care interior design by providing green space in the interior by applying healing environment method. The concept of Permata HusadaLoka is the theme raised in this design. This design concept is dominated by the use of sustainable and safe materials for pediatric patients, and combines natural and soft colour that can make users feel close to nature and the dynamic character of children. With this hospice care, it is hoped that it can improve the survival of children with cancer, facilitate the activities and development of children with cancer, and provide a platform to gain knowledge and information about early detection of cancer in children. Spaces are designed to support healing through biophilic responses and the connection to natural elements and systems using biophilic design concepts to guide decisions for the built environment.

References
[1] International Children’s Palliative Care Network. (2018). The role of palliative care when caring for children with cancer. Retrieved 10 June 2020 from: <http://www.icpcn.org/role-palliative-care-caring-children-cancer/ >.
[2] Rachel House. What is Palliative Care?. Retrieved 10 June 2020 from: <https://rachel-house.org/what-is-palliative-care/>.
[3] Salingaros, Nicos A. (2015). Biophilia & Healing Environment: Healthy Principles for Designing the Built World. New York. Terrapin Bright Green. LLC.
[4] Dijkstra, K. (2009). Understanding Healing Environments: Effects of Physical Environmental Stimuli on Patients’ Health and Well-being. University of Twente. Faculty of Science and Technology. Enschede. <https://doi.org/10.3990/1.9789036527958>
[5] Kardan, O. et al. (2015). Neighbourhood green space and health in a large urban center. Scientific Reports, Vol.5, Article No. 11610. Retrieved 10 June 2020 from: <http://www.nature.com/articles/srep11610#abstract>.
[6] Murphy, Jenna. (2008). The Healing Environment. <http://www.arc.ttu.edu>
[7] Kellert, Stephen R.(2005). Building for Life: Designing and Understanding the Human-Nature Connection. Washington DC. Island Press.
[8] Kazmierczak, L. (2018). Nature’s cure: How Biophilic Design can enhance Healing. Retrieved 10 July 2020 from medical construction & design: <https://mcdmag.com/2018/04/natures-cure-how-biophilic-design-can-enhance-healing/#.Xz_i7ZMzZxg>.
[9] Kellert, Stephen R. Heerwagen, Judith H., Mador, Martin L.(2008). Biophilic Design: The Theory, Science, and Practice of Bringing Buildings to Life. New Jersey. John Wiley.
[10] Salingaros, Nicos A. (2015). Biophilia and Healing Environment: Healthy Principles for Designing the Built World. New York. Terrapin Bright Green. LLC.
[11] Kellert, S., Calabrese, E. (2015). The practice of Biophilic Design. Retrieved 10 July 2020 from: <www.biophilic-design.com>. 

9
[12] Retrieved 11 June 2020 from: http://hummingbirdhouse.org.au/home/explore-hummingbird-house/
[13] Retrieved 11 June 2020 from: https://georgemark.org/about-us/life-at-the-house/