KID’S CANCER HOSPITAL

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Abstract
Cancer is not just a disease that affect the human bodies, but it affects the psychological state of the patient first and that is more painful than the physical affect itself. Therefore, this is necessary to create a place for children cancer patients that combined the rehabilitation, educational facilities and psychological care in addition to the medication treatment. The purpose of this study is to gather healthcare information, provide case studies and identify the global and local standards that will clarify the needs and requirements for the development of Kid’s Cancer Hospital. Three unique and luxurious hospitals from UAE, North Zealand and USA were considered for case study. This study covered the planning assumption and site selection as well as evaluation for the development of Kid’s Cancer Hospital. The site evaluation result suggested that the north side of Jedda, Ohur Al Janubia District, Saudi Arabia are suitable location to develop the Kid’s Cancer Hospital due to several privilege advantages such as beautiful scenery, high level of security and privacy, fresh air, good landscape for various activities.

Keywords – Kid’s Cancer, Hospital, Rehabilitation, Educational facilities, Psychological care

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INTRODUCTION
Cancer is a disease that poses enormous challenges to research, because every cancer is different and its course can vary immensely even from one patient to the other [1]. In 1898, Dr. Roswell Park established the Roswell Park Cancer Center and Institute was the first Cancer center in the world. Dr. Roswell Park was a professor of surgery at the University at Buffalo, School of Medicine [2, 3]. In 1898, Dr. Park claims that only through targeted and well-planned joint attacks from all directions can this kind of work be achieved and real progress can be achieved, and the relationship between laboratory work, clinical research and education must be closely linked [3].

The research was started in three rooms at the Buffalo School of Medicine, and these three rooms were quickly used up. Buffalo citizens realize the importance of cancer research and donate funds to purchase land and new buildings. Mrs. William Gatwick is the biggest contributor who donated $25,000 [2]. The Gatwick Research Laboratory of the University at Buffalo was constructed in 1901, and it was located on High and Elm Streets in Buffalo, New York [2].

A hospital is a medical facility that can provide inpatient care. It’s staffing and capabilities are sufficient to provide diagnostic and therapeutic services, as well as the necessary support services required to perform its assigned tasks and functions [4]. A hospital may discharge the functions of a clinic. Children cancer hospital is a special place dedicated to treating and curing children, adolescents and young adults with cancer [5]. The Hospital is designed to be focus on the themes of ‘nature’ and ‘play’ [6], which is the major two features that will help patient to heal fast. In the design approach will have a modern sample design that have the sense of nature and, always keep children in close contact with nature from the inside out and create a rehabilitation system for patients. Therefore, the architectural expression is based on organic, soft and humanized design [7]. The aim is making children less intimidated to hospitals and more willing to receive healing by creating a child-friendly environment with bright colours, and areas and opportunities to

play [8]. Therefore, this study proposed the idea and plan to develop the Kid’s Cancer Hospital is Saudi Arabia.

CASE STUDY OF THE HOSPITALS
There are three unique and luxurious hospital buildings are chosen for the case study. All the facilities and design of the hospital are very modern. The chosen hospitals for this study are:

a. The Cleveland Clinic Abu Dhabi Hospital (CCAD), UAE
b. New North Zealand Hospital, North Zealand
c. Nemours Children’s Hospital, USA

The Cleveland Clinic Abu Dhabi Hospital (Ccad)
The Cleveland Clinic Abu Dhabi Hospital (CCAD) located at Al Maryah Island, Abu Dhabi, UAE (Figure 1). CCAD completed in 2015 and the architects are Henningson, Durham and Richardson International (HDR). The Cleveland Clinic Abu Dhabi Hospital building is a combination of cutting-edge technology, evidence-based design, world-class care and Arabic culture with elegant architecture creating a facility that looks more like a seven star hotel than a hospital [9, 10]. The design of the hospital is overlapped with a set of cultural references that pound the project firmly in Abu Dhabi. The concept of the Cleveland Clinic is to integrate and provide care at all levels, so each area can be connected. The three largest blocks will accommodate outpatient clinics, diagnostic and treatment center as well as the patient towers. In addition, the hospital has an administrative department specifically designed to be converted into more wards in the future, as well as a department dedicated to the Intensive Care Unit (ICU). The patient tower stands above the ICU and the administrative building, and its orientation allows the sea and natural sunlight to be unobstructed and pierces the building.

The design of the hospital celebrates nature by its synchronization with nature on the rooftop of the diagnostic and treatment building and the Gallery. Patients, visitors and staff can easily travel to respite areas and healing gardens at every node. The introductions of blue and green space provide positive distractions to the five senses. The design celebrates the human...
emotion by providing a variety of different and delightful experiences. The work embraces variety through formal unity of the buildings and landscape. The selection of CCAD's site is preferred as it overlooks the seafront and surrounded by several famous and interesting places such as the Tourist Club. The interface of the seafront with the Cleveland Clinic Abu Dhabi site functions as an important transition from the hospital environment to a public waterfront space. Plazalevel café programming with outdoor seating provides useful access to the seafront for hospital patients, visitors and staff. Site furnishings such as café tables with shade umbrellas and movable seating encourage user friendliness and comfort.

New North Zealand Hospital

New North Zealand Hospital located at Hillerød city, North Zealand (Figure 2). This hospital completed in 2014 and the architect is C. F. Moller with the aims to create an attractive, green and compact hospital complex – a hospital where a sense of community and Mother Nature's healing properties will be combined with the functional requirements of the healthcare sector [11, 12]. The New North New Zealand Hospital provides a unique and warm urban environment where visitors and patients can enter the well-lit courtyard space, roof garden, reception and foyer areas. It creates an innovative typology that deviates from the basic procedures of the hospital; it is associated with patients, but places the hospital in public areas of the city, including convenience facilities such as cafes, movie theaters, barber shops and flower shops. The environments permeate into the core of the hospital, providing sensory experiences to enhance the healing effects of therapies and rehabilitation. By dividing the building into two slender curves, the size of the building is reduced. These curves mark the city of Hillerød in the north and the entrance to the new railway station and urban development in the southeast.

Internally, a unified central hall or internal street constitutes the focal point of the treatment floor, while the outpatient floor at the entrance is less dense. The basement has a more intensive treatment room to increase privacy. The interior integrates several plazas with children’s play spaces and amphitheater ramps, which can be used as cultural gathering places or research and teaching activities. The New North New Zealand Hospital’s concept is to create a landmark building-building and nature integrated hospital based on the nearby Frederiksborg Castle, providing patients with a safe environment, powerful and compelling work, the place as well as a green leisure paradise for all residents of the area. The hospital grows in the picturesque woodland and keeps people close to nature from the inside out, thus creating a patient-centered rehabilitation building.

Nemours Children’s Hospital

Nemours Children's Hospital located at Orlando, FL, USA (Figure 3). This hospital completed in 2012 and the architects are Stanley, Beaman and Sears. The hospital and grounds are a testament to the term “healing environment” evolving a life-affirming quality sure to reassure parents and delight children. The hospital's philosophy is one that embraces children “across the continuum” meaning from infancy to adulthood, Nemours cares for children with chronic conditions, as well as complex medical diagnoses and life-threatening illnesses [13, 14]. The children's hospital campus is designed to reassure and inspire, engage and delight. The investment in landscape in particular reflects Nemours’ understanding of the role nature plays in the life of a child. Nemours’ emphasis on healing gardens and landscape to the creation of a one-acre discovery garden with mature trees, terrace gardens and child-inspired outdoor areas with water play as one of the many feature designed to highlight the hospital’s connection to nature and also Wilmington campus. Nemours Children’s Hospital, situated in the Lake Nona Medical City mixed-use development in Orlando, Florida, has set a new design standard. Nemours chose a location with adjoining existing native wetlands and storm water retention pond.

Building Type Study

Standards of Inpatient Unit

The inpatient department is the basic nursing unit of the hospital. Its main function is to provide a suitable place for the diagnosis, care and treatment of patients. While promoting the provision of medical services to patients, the department must also provide facilities and conditions to meet the work needs of employees. Design Consideration in the Inpatient Unit:

Environment

The inpatient unit should be placed in a quiet place with a pleasant view and maximum environmental benefits. The location should avoid disturbing on-site and off-site sounds, such as traffic and mechanical equipment. The location should avoid interference with landscapes such as graveyards and burial sites.

Location

Inpatient services are the core of every hospital and are supported by a wide range of services. Functional relationships should be determined to enhance the delivery of these services. Principal relationships with other Units include:
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a. Easy access from the Main Entrance of a facility.
b. Inpatient Units must not be located so that access to one Unit is via another
c. Ready access to diagnostic facilities such as Medical Imaging and Pathology.
d. Ready access to Emergency and Critical Care Units.
e. Surgical Units require ready access to Operating / Day Procedures Suites.
f. Ready access to staff amenities.

Optimum Internal Relationships
a. Patient occupied areas form the core of the unit.
b. Staff Station and associated areas need direct access and observation of Patient Area.
c. Utility and storage areas need ready access to both patient and staff work areas.
d. Public Areas should be on the outer edge of the Unit.
e. Shared Areas should be easily accessible from the Units served.

Standards of Clinic
If it is an independent building, it should comply with the requirements of development control rules, building area index, local regulations, etc. If located as a part of another building then minimum area should be adequate to accommodate Doctors table, consultation chair, two stools/ chairs, examination bed of the size 6 ft X 2.5 ft., privacy screen around examination area while having free mobility. The minimum area of each clinic must be 150 square feet, and there are temporary partitions to wait for patients.

PLANNING ASSUMPTION
The building zones for this project are divided into six zones namely In-Patient Zone, Medical Zone, Admin Zone, Amenities & Recreational Zone, Learning Center & Research Center and Services Zone. The planning assumption of the building zone is tabulated in Table 1.

| ZONE          | %  | GFA/m² | NFA/m² | Foot Print | # Floor |
|---------------|----|--------|--------|------------|---------|
| A In-Patient Zone | 40 | 13440  | 8736m² | 4480       | 3       |
| B Medical Zone  | 30 | 10080  | 6552m² | 4200       | 2       |
| C Admin Zone    | 4  | 1344m² | 874m²  | 1344       | 1       |
| D Amenities & Recreational Zone | 8  | 2688m² | 1747m² | 2352       | 1       |
| E Learning Center & Research Center | 6  | 2016m² | 1310m² | 1008       | 2       |
| F Services Zone | 12 | 4032m² | 2621m² | 1344       | 2       |
| Tot            | 100% | 33,600 | 21,840 | 14,7        | 9       |

SITE AREA CALCULATIONS
Assumed number of beds: 280
Basic building ratio: 120
Site area: 14728x100/40 = 36,820m²
Parking Space: 240 x 20 = 6,720 m²
Final site area (Adding parking area to the site) = 36,820 + 6,720 = 43,540 m²

SITE CRITERIA FROM CASE STUDIES
The site criteria will be used in the process of selecting proper site for the kid’s cancer hospital. This criterion includes the following:

Shape/ Proportional (WF=2)
Sites with shapes almost rectangular in form are usually easiest to plan. As a very general rule-of-thumb, an efficient plan can be achieved on a rectangular site with dimensions in a ratio of approximately 3:5.

Access and Traffic (WF=3)
Access to the site from minor arterial and collectors is more compatible than access from high speed or high volume road corridor or a law neighbourhood residential street. Considering traffic speed and intensity at the point of driveway access is highly important.

Noise Level (WF=3)
Noise should not be serious enough to cause interference with communication. The site should be far enough from air traffic and high speed vehicular traffic (especially trucks and buses) and noisy industrial or commercial enterprises.

Security and Safety (WF=2)
Site should be convenient to a fire station, police station, hospital. The side should provide adequate site lighting to discourage vandalism. Avoid the location near social hazards neighbourhood, such as areas with high incidence of crime or drug. The site should away from industrial and manufacturing areas to avoid bad air quality problems, such as odour, dust and noise.

Visibility (WF=2)
Prominent location is required to attract a large number of people. A highly visible site long a major street with easy accessibility is ideal. If the site involves other buildings, it should be oriented in the portion of the site with highest visibility.

Future Development (WF=3)
This is a measure of potential level of future developments in areas adjacent to a candidate site, which would have impact on the site. Therefore, the value of the site could be increased or decreased.

Surrounding (WF=3)
The surrounding of the site should have a relation with the main function of the project. Thus, the project will blend with the surrounding and assist in achieving the objective of the project.

Views (WF=2)
The aesthetics view from the inside of the site to the surrounding environment.

SELECTED SITES
There are three sides were considered to locate the kid’s cancer hospital. Figure 4 shows site number one, this site is located in the north side of Jeddah, Obhur Al Janubia District, Saudi Arabia.

It overlooks a bay that is connected to the Red Sea and surrounded by several recreational and entertainment activities. Figure 5 shows site number two, this site is also located in the north side of Jeddah, Al Nahdah District, Saudi Arabia.

It overlooks the main king Abdulaziz Road and surrounded by residential and some commercial facilities. Figure 6 shows site number three, this site is located in the north side of Jeddah, Al Shati District, Saudi Arabia. It overlooks Al Cornish Road and surrounded by residential and some commercial facilities.
SITE EVALUATION
According to the results of sites evaluation in Table 2, site 1 is considered to be the preferable site to locate the kid’s Cancer Hospital. This site can be accessed from king Road and Al kurnish road. It is located in Obhur Al Janubia in Jeddah. This site has a view to the bay in the west side. On the south side it has a vacant land. The site is surrounded by a residential area, sport area & educational area. The noise levels in the site vary according to the surroundings of the site. The site has unique shape that will play an interesting role in the design of the project. The advantages of the site include excellent views, high level of security, fresh air & tranquillity, opportunities for good landscape, provide possibilities to create activities & maintain privacy also it is surrounded by an active mixed use area. Figure 7 and Figure 8 shows the zoning of the project within the site and main perspective of the building respectively.

**Table 2. Result of site selection**

| No. | Site Criteria                      | Site1 | Site2 | Site3 |
|-----|------------------------------------|-------|-------|-------|
| 1.  | Shape/ Proportional, (WF=2)        | 8     | 10    | 6     |
| 2.  | Access / Traffic, (WF=3)           | 15    | 12    | 9     |
| 3.  | Noise Levels, (WF=3)               | 12    | 12    | 6     |
| 4.  | Security and safety, (WF=2)        | 10    | 6     | 10    |
| 5.  | Visibility, (WF=2)                 | 10    | 10    | 8     |
| 6.  | Future Development Plans, (WF=3)   | 12    | 9     | 9     |
| 7.  | Surrounding, (WF=3)                | 15    | 9     | 6     |
| 8.  | Views, (WF=2)                      | 10    | 6     | 10    |
|     | Total                              | 92    | 74    | 66    |

**Location analysis**
After conducting the site evaluation on the three options, the first site marks the highest score and has been chosen to be the project site. It is located in the north side of Jeddah, Obhur Al Janubia District, which is considered one of the most important areas in Jeddah’s. The site has an un regularly shape with a total area of approximately 50,000 m².

**Environmental analysis**
The high levels of humidity and hot temperature are the two main is usesin Jeddah’s climate during summer, while the temperature becomes warm and sometime scold in winter. The rainfall is very light most of the year. The prevailing wind is coming from the North-West side as it is located on the Red Sea Shore and they are usually adequate winds. The undesired wind is coming from the South-East side and sometimes they carry dust causing sandstorms and heavy rain.
Accessibility from the major road in Jeddah
The site is located in Obhur Al Janubia district. It is located on King road which is connected directly to the city and the easiest way to reach the site. In the new master plan of Jeddah, King Abdul Aziz Road will be extended over the water bay through a bridge that will link Obhur Al Shmaily to Obhur Al Janubia of the city.

Noise Level
The south west part of the site very quiet, since the adjacent area are residential unit and vacant land, the high level of noise comes from the east part of site, due to the main street King road.

View
The selected site is surrounded by different iconic and new buildings that attract the attention, some currently exist and some are part of the future plan of Obhur. The existing buildings have different functions as there are recreational resorts, the sport city, King Sultan City, and the Red Sea Marine.

CONCLUSION
This study have proposed a plan to achieve a standard of excellence for care of children health by leading a national, regional and state-wide child healthcare system. The idea of Kid’s Cancer Hospital brings the impact towards health and wellbeing of children and adolescents through leadership in healthcare, research, education and awareness. The Kid’s Cancer Hospital also combined the cutting-edge technologies, medical equipment’s, and significant design, which will include big recreation areas for patients and their siblings and accommodation for families and family resource lounges. In addition the Kid’s Cancer Hospital designed to have educational and professional services focus on raising the awareness of the parents for better parenting experience. The site evaluation result suggested that the north side of Jeddah, Obhur Al Janubia District, Saudi Arabia are suitable location to develop the Kid’s Cancer Hospital due to several privilege advantages such as beautiful scenery, high level of security and privacy, fresh air & tranquility, good landscape for various activities.

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