

Enhancing the Environmental Quality of the Interior Using Sustainability in the Jordanian Hospital Bedrooms

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Abstract—Since the last period, People's perception of wellness implies has to guide to an important carry on the design planning of the hospital's environmental, so the influence of the inevitable change finds its way into the health sector as well. Officials in hospitals whose main functions include providing adequate healthcare services to people should strive to provide facilities to meet a certain level of demand because it involves healing. The aim of this paper is to provide an outline of environmental strategies that can be used to support healing environments and to suggest a solution to improve the quality of the internal environment. This paper applies a qualitative research methodology. The original configuration of hospital buildings and the stream conditions in which the hospital environment was located were compared in a study. From the research's, the paper found that the design to be implemented for the hospital should take into consideration the needs of all of these and those that come in contact with a healthy environment or spend time in it. Besides, hospitals should be designed keeping in mind the climatic conditions of the region. According to scientists, hospitals in developed countries are typically built to be very spacious, with important environmental factors such as temperature, wind direction, and humidity taken into account. One bedroom has been shown to be ideal for patients because it provides needed privacy and significantly reduces disease spread. Hygienic practices should also be top notch considering circumstances. It can be complemented that the practices that involve the utilizing of sustainable designs are taken from hospitals in the developed nations of the scientist.

Keywords- *Interior design; Environmental; Healthcare; Healing; Hospital; Bedroom*

I. INTRODUCTION

The environment created in a hospital serve as different things and functions to different people. It is a derived social environment that offers value in health, structure, interrelationship and day to day interaction between people of different interests and goals. They ply their trade towards their diverse needs without necessarily limiting OT inhibiting that of others. While to staff of all class, be it doctors, nurses, gardeners or janitors, it serve at a work environment, to patients, it serve as a place where they can repair their ill-health and to the governing administration, it likely serve as a business center or an avenue to reach out to people.

According to (Elf et al., 2015), in the early days, the arrangement pattern of hospitals follows that which was stipulated by a then nurse, Florence Nightingale. Her plan involves aspects like good/adequate ventilation, balanced meal, landscape and cleanliness (Burpee, 2008). Through the elements of her input, she has touched the well-being of individuals and their social being. Stinger plan approach was used in the construction of hospital rooms, and also, the rooms receive adequate level of lighting and natural air.

When structures are put in place in the past for a proposed health institution, only the factors that will

assist the medicine and nursing staff are considered. Unlike today, priority is given to the well-being of patients and staff, patient, visitor and staff safety and stress reduction to ensure all possible components are phantom in when make important decisions. The results realized has suggested that the recent changes adopted has yielded positive impact as seen in the quality of services rendered to patients by staff (Alhmoud et al., 2020).

When the hospital environment is well-designed and managed, with enough space between structures and units, patients have a better experience, a better service is provided to the patient, visitors and hospital staff and operations and activities can be carried out without stress (Choi et al., 2012; Alhmoud et al., 2020).

The hospital is not just where someone goes to receive medical attention. It is a health institution that addresses various problems of man. With respect to this important role which it plays in our society, it has therefore become imperative on the governing body of such centers to pay critical attention to the various components of that affects the services which they render. Factors such as lighting, ventilation, daylight and views, acoustics and thermal comfort are critically discussed in this paper.

II. LITERATURE REVIEW

The problems that were identified in previous work were reviewed and in accordance with the current trend in building design, probable solutions were identified and the inferential conclusion was made.

III. HOSPITAL ENVIRONMENT

Initially, hospitals were not run as for-profit businesses. Before the responsibility shifted to communities, they were church-owned institutions and as the ownership of a building changes.

The horizontal forms are another option. Structures are built on the same foundation, ensuring that wards and other sections of the hospital are built next to one another. The main benefit of this type of design is that it eliminates the problems associated with sick people's upward/vertical movement, which can be too stressful for them to bear in their weakened state (Bachrach et al., 2012). It is not without a disadvantage in that there are varying floor heights in a different section of the hospital and there are also prolonged spaces to be covered due to the nature of the structures. The community transformed model is come about as-built houses within hospitals that metamorphosed into hospitals. It is never that the health institution has its own establishment, but rather resulted from the inclusion of buildings clustered within an area. A modern approach is called progress styled hospital structures. This model ails from existing styles while also incorporating modern systems of construction into its application.

IV. ENVIRONMENT FACTORS THAT INFLUENCE WELL-BEING HEALTH

The health sector receives a significant portion of any government's budget and allocation. This is supposed to show up in the quality of the facilities and equipment on the ground, as well as the staff's well-being and the delivery of high-quality health care. Unfortunately, many hospitals are now serving as a source of disease infections for both unsuspecting staff and patients (Frampton and Charmel, 2009; Alhmoud et al., 2020). This is due to a lack of focus on the built environment, which includes elements such as;

A. *Lighting*

Since light affects the psychology and physiology of people in their day-to-day existence, different degree of lighting is recommended for different wings of the hospital. For example, consultation offices, examination rooms and reception should be the brightest for surgery and other important operations, followed by the general ward and then the intensive care unit (ICU) due to sleep patterns.

B. *Indoor Air Quality and Ventilation Effectiveness*

To sustain life, there is the need to ensure continuous inflow and out glow of fresh air in a hospital environment, making it an important aspect of designing that one cannot undervalue. In addition to giving

way for natural lighting to fall into a building, fitting rooms with windows and adequate door spaces ensure that they receive good quality air and also allow stale smell to be expelled (Bachrach et al., 2012). In general wards those holds quite a number of patients, it is important to ensure constant movement of air/cross ventilation to prevent transmission of diseases among people (Verheyen, 2011). While any design plan to be implemented should carefully cater for exposure to natural ventilation, the use of artificial ventilation system also serve as supplement, and both should be properly incorporated in hospitals.

C. Acoustics

Sound, as perceived by our ears have varying effects on individuals. While some may have relieving effect, some others serve as form of disturbances. Some others may be therapeutic and others may be annoying. Noises, i. e unwanted sound usually present itself in an unorganized manner and can negatively affect the well-being of individuals in a hospital setting. Communication within and interaction between staff and patient can be in a way that allows one to grab the message in sounds with minimal level of stress (Vincent et al., 2010; Verderber et al., 2014).

D. Thermal Comfort

The temperature that is felt inside a building be it hotness or coldness can lead to decreased functionality in man also loss of performance capacity, and lowered production output has been attributed to extremely hot weather (Godbole, 2018). One's states of mind at this period of time cause inability to function ineffectively. As explained by Health and Safety Executive (HSE), the level of thermal discomfort felt in a building is at the minimum at 20% and not when higher.

E. Daylight and Views

When one can enjoy nature by just roaming within a beautiful garden, rocking on a well-crafted couch, pacifying pleasant odor's from flowers, lethargy as well as stress are shaken away from the body and the senses are also kept sharp (Mc. Collugh et al., 2010) . The criminal departments of some agencies do employ the torture strategy of exposing victims to plain walls of a confined enclosure. This will serve as forms of hypnosis that make such individual lose their senses and misbehave. When people experience this, with time they tend to lose track of their surroundings and maybe breakdown to reveal conceived secrets. The idea of designing hospitals should however make special provisions for gardening. As opposed to blank walls which patients see in wards, they get to experience nature close to them (Ulrich, 2008). In a nutshell, access to views and garden spaces are a vital aspect for hospital atmosphere have been shown to have a positive effect on stress/anxiety, pain medication use, pain tolerance and lengths of stay for patients in hospital wards.

V. HOSPITAL INTERIOR-ENVIRONMENT IMPROVEMENTS

In putting in place a building plan, it must go in hand with the nature of the environment in which it is to be sited. Attention should be paid to be relative climatic condition of the area to ensure that one achieve a naturally sustainable indoor condition. This is needed for there to be careful blend in the choice of architectural and environmental elements as this tells how well the previously discussed strategies are managed (Eckelman and Sherman, 2016; Castro et al., 2013).

VI. FUNCTIONS OF A HOSPITAL

Primarily, hospitals should provide healthcare services to in patients and out patients. And as noted by (Wagenaar, 2006), the hospital should allow patients to successfully and easily receive treatment and take time to recuperate and also obtain access to advices and attention from the medical staff, friends and families.

The administration of treatment may be the first set of responsibility which must be performed by any functioning hospital; they also perform some other functions which include teaching and research. As a result of the collaborative efforts and method of operation of some hospitals, research unit of the institutions

provide learning services that are usually ongoing there in.

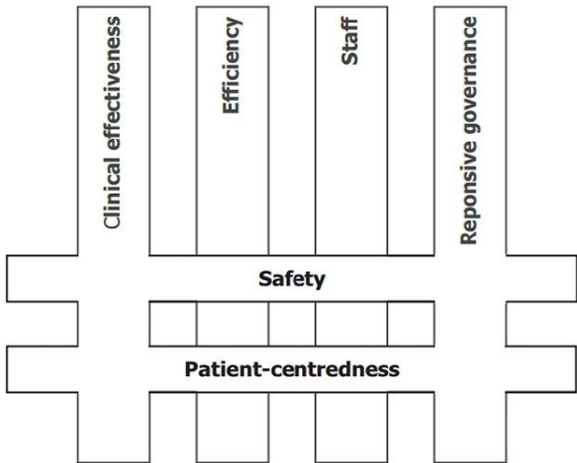


Figure 1: Theoretical model for hospital performance (Seitio-Kgokgwe, 2014)

VII. EVIDENCE BASED DESIGN

Evidence-Based Design is a method of making decisions that involves carefully considering previous work and findings on a specific model of design for each and every specialized project (Rechel et al., 2009).

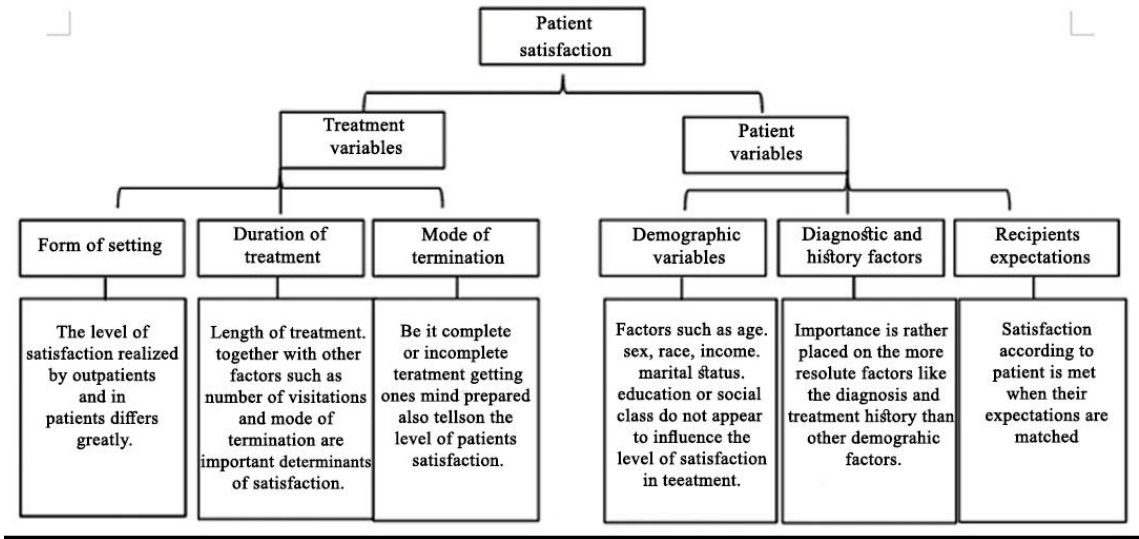


Figure 2: Factors determining level of satisfaction in hospital patients

VIII. ANALYSIS OF JORDANIAN HOSPITALS

For a comprehensive analysis of the bedroom space distribution in Jordan, a total of two (2) hospital bedrooms were randomly selected from wide district region of the city to fully analyze the space distribution of the hospitals in the cities. Typically, a hospital is expected to be made up of several forms of rooms with ranging category of consulting room, ER room, ICU room, maternity room, surgery.

The study focuses on the analysis of the forms of hospital bedrooms with respects to key factors such as; site, location, landscape, units plan and bedroom plan of the hospital. Table 1 below shows the various requirements that are expected of a hospital and shows the standard which is employed by hospitals as rolled out.

TABLE 1. CRITERIA FOR PHYSICAL CONDITIONS OF A STANDARD HOSPITAL (PIERDAIT, 2006)

Parameters	Recommendations
Layout	<i>Can be designed to have central space and rays or wings for specialized sectors. Main section of the institution should be differentiating from annexes and circulatory passages. To Layout should prevent excessive distances between the outs and in patients should be easily differentiated from out patients. A garden park should be provided for sound isolation and control in norms.</i>
Plot Orientation	<i>Stores and treatment areas should be sited at the North, North West or North East direction in patient rooms should be at the south or South East some can be places on the north so they can have as limited as possible access to direct sun light.</i>
Dimensioning	<i>Squared area to be occupied by a bed 70m²-100m² for 1 bed units.</i>
Entrances	<i>The hospital should have one main entrance. A Hall should be sited at the entrance to serve as waiting room for visitors and the size is usually determined by the number of the body. Passage path for patient, staff and visitors should be differentiated. Reception should have an area of 12m² to allow for a supervision desk and clear circulation of air. Another entrance should be made available also through the reception with a slop entrance for admission.</i>
Lightning	<i>Operating rooms should have illuminating at about 1000 lx and a luminosity of 500 lx in annexes.</i>
Ventilation	<i>Provisions should be made for made for filtering, dilution and extension of air renewal should be about 15-20 volume changing for 1 hour.</i>
Examination Room	<i>36 Inch (91,44m) minimum room clear space to be provided along the full length of both sides of the bed, the examination tables, procedure tables, gurneys and lounge chairs</i>
Treatment Room	<i>If the examination rooms provided separately the floor area should be out 120sq ft. with minimum of dimension is 10sq ft. Rides of the bed and other and other statuaries should be about 3sq ft. empty space for using. Also to prevent are exam light, counter for places expand, hardworking fixture, cabinets for strong medium. Cubicle should be used to separate beds in multiple bed wards.</i>

A. Case Study 1: Islamic Hospital (Private Hospital)

1) *Choice of site:* The hospital is located in moderately populated vicinity. There are clusters of houses but the ways in which they are built gives way for the proper exchange of air and prevailing wind is not disturbed. An artificial garden exists close to the site that consists of greens that allows for view through the entrances and corridors in the eastern and western direction with easy access to the building where the

general patient ward is. Even with the presence of garden, there is not much trees and shrubs with the garden consisting predominantly of grasses.

2) *Location (Orientation)*: A major flaw that exists in the construction of building is that the long sides of the buildings face the east west direction. This way, direct rays of sunlight find their way into the rooms and this leads to increased ambient temperature. This is not to say some others that adopt the North South orientation do not experience heating up but it's usually reduced.

3) *Landscape*: Green grasses are present at the hospital in gardens that allows patients to enjoy natural views that will aid the healing process. Close to the main entrance a few meters away from the doors are large trees that rarely dry up. They provide a clean bill of fresh air and ensure clean breezes after the sun goes down.

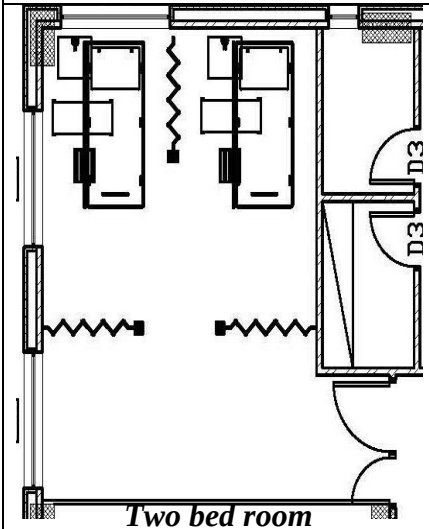
4) *Courtyard*: Courtyards are not present at the Islamic Hospital because the building stands on their own with a serrated rectangular shape. There is no form of interaction between buildings creating no form of garden or natural sight for positive distraction.

5) *Unit and floor plan*: The section of the hospital building that does not hold patients is designed in such a way that rooms are placed parallel to each other and the central position acts as the waiting area. This sort of design is simple and not cumbersome. Therefore, adequate lighting is ensured in the day and cross ventilation is not inhibited either.

A major concern is in the fact that there is a great chance that the transmission of airborne disease will be swift and rapid since the wards share a common waiting area.

6) *Bedroom plans (Ward)*: The sort of bedroom design adopted here is such that allows the structures to be closely knitted to each other. This thus interferes with the flow of air and natural lighting, even though this has made possible the proper utilization and management of the little spaces. The mode of construction has made different sectors and units compact and as a result generating noises due to the activities of human going on in there.

TABLE 2. WARD SPACES IN ISLAMIC HOSPITAL

Ward	Photo	Remarks
 Two bed room		- The ward is designed to hold 2 patients (beds), while thick clothing is used as curtain to afford some level of privacy. - There is controlled lighting system and ventilation is allowed through the window. The high level of artificial light provided to act as support at night. - Placement of state main in the hospital treatment room should be specific especially.

B. Case Study 2: Princess Basma Hospital (State Hospital)

1) *Choice of site*: The hospital is sited in the very busy surrounding of Irbid. This health center is placed in this region by the government to provide first hand medical services to people of Irbid and its neighboring cities. The hospital in which the hospital is located is previously heir marked for the construction of market. A new administration came on board and decided that part of the land mass be made available for the construction of a school. The school operates on Monday. This means that majority of the noises generated is within the hours of 8 am in the morning and 4 pm in the evening when their learning activity is on.

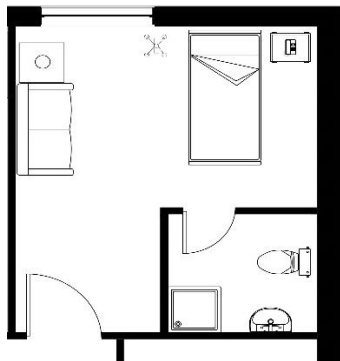
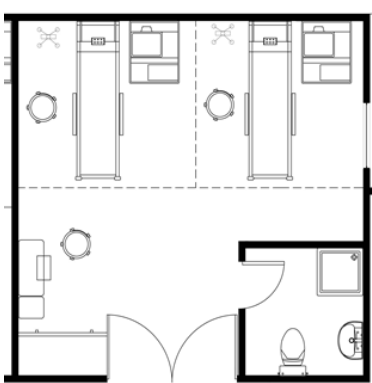
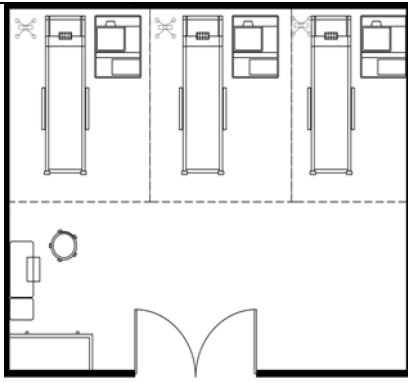
2) *Location (Orientation)*: The inpatient and outpatient wards are facing the North South direction. But because of the proximity of the institution to a welding workshop, the fume if gases generated from their machines tends to flow easily through the hospital buildings. Also, the limited flows of air do enhance the spread of air borne infections. The entire building is a 2 story structure and therefore the nearby buildings have tended to obstruct the smooth flow of fresh air.

3) *Courtyard*: Even though the land is limited in size, provision is made for a lofty courtyard which is centrally placed with low rising grasses. This space does not provide any sort of hindrances to sounds from conversations. Together with clear hearing, the view from this site aids quick healing and recovery processes.

4) *Unit and floor plan*: The general land mass is not fertile which accounts for the sparsely populated gardens that are present in the hospital surroundings. Deciduous trees are present in pairs. These trees serve as wind breakers and also reduce the intensity of sunlight that falls on the structures.

5) *Bedroom plans (Ward)*: The wards are placed not adjacent to each other but at diagonal in that distance of about 10m exist between each ward on the same row and a spacing of the same distance from doors across hallways. The center spaces are equipped with sitting materials arranged to line the walls of the wards.

TABLE 3. WARD SPACES IN PRINCESS BASMA HOSPITAL

Ward	Photo	Remarks
 One bed room		- <i>The single or private wards are designed to operate in a way that can allow for total conditioning of daytime temperature and lighting conditions.</i>
 Two bed room		- <i>The 2 bed wards are not really much in number but well equipped.</i> - <i>The windows are wide enough and at night, lighting is provided with the use of the convectional fluorescent bulbs.</i>
 Three bed room		- <i>This is a typical 3 bed ward for inpatients at the hospital.</i> - <i>The beds are arranged parallel to each other with no demarcation between any two.</i>

IX. DISCUSSION: 3D SOLUTIONS AND EXAMPLES FROM OTHER NATIONS

A general wave of change is sweeping through all the important sectors of an economy and is

subsequently entering into the health sector as well. The need for the use of sustainable materials in a healing center is bore of the fact that what do improve the health of patients goes beyond the services that they receive from the health practitioners. Some little components of the economy which are ordinarily over looked are usually beneficial on the long run.

The discussion focuses on the existing models of use in various health institutions of repute around the world. Some examples were selected and renovation work has taken place in the hospital over time were examined and how they tackled the problems using sustainable materials and comprehensive interior design and planning was evaluated.

After the initial plan of a hospital building has been put in place, as time passes the increased acceptance of the use in sustainable materials in building construction and there superior advantages has always necessitated that some major or minor improvements be carried out in these buildings. Looking into how some major leading hospital in Europe has gone about these will give a good insight into how the hospitals in Jordan can warm towards. Some prominent examples are;

A. *Cleveland clinic, Ohio*

The hospital carried out a study to assess the level of noise reaching 7 bedrooms including patient rooms. With different number of beds, balconies and staff sections. From the conducted research, it was found out that the highest forms of noise that are generated are from alarms for notification, slamming of entrance doors and movement of carriages.

The designing and renovating company charged with the improvement recommended the following; addition of improved ceiling covers or tiles to absorb sound, installation of silicon coverings on windows and doors and also using quite types of shutters to replace the lousy ones. They recommended that the volume on telephones and pagers in the while building should be put off and vibration mode is recommended.

Sensitization of the extended staff on noise reduction, cancellation of late night deliveries, gathering & loitering and not keeping televisions and radio on when they are not in use.

TABLE 4. DESIGN IMAGES OF CLEVELAND CLINIC, OHIO

Cleveland clinic, Ohio	Remarks
 South Elevation	- <i>The main campus of the clinic has 41 buildings in total sited on more than 170 acres of land.</i> - <i>It is regarded as one of the leading health institutions in the country and has staff strength of about 52,000.</i>

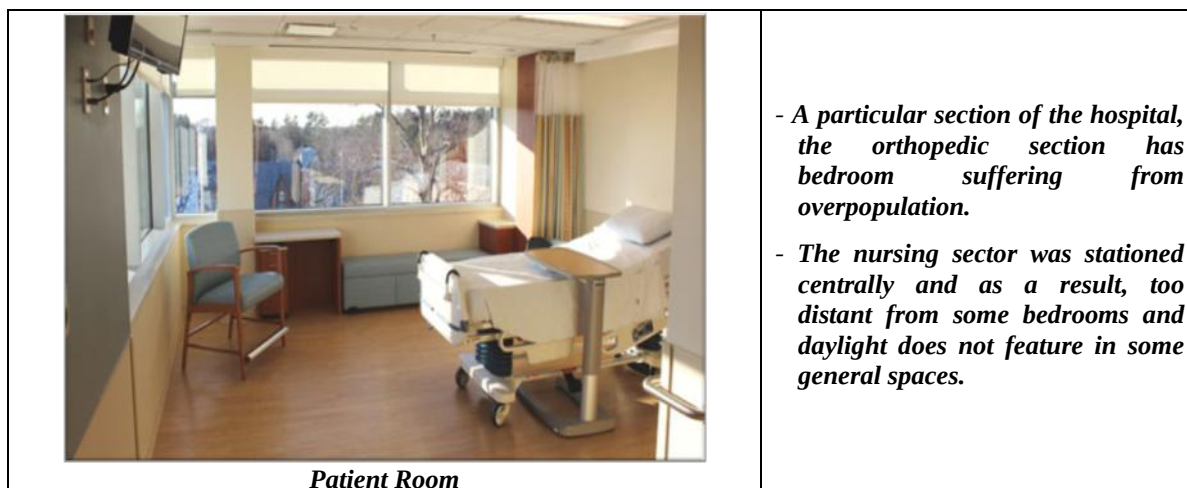
	- The hospital has a total of 1,200 beds as at 2016 and was concerned about limiting the impact of the noise reaching patient wards
	- This is an educational medical center located in Cleveland. - Together with this clinic, 10 other regional hospitals and 19 other clinics are located in areas across the city of Ohio as well as other states. - They are all under the stewardship of the Cleveland clinic foundation.

B. South Shore Hospital, South Weymouth, Massachusetts

In a new renovation that was executed in 2012, the 5th floor of the building which is the other poetic wing in question now have its nursing sections at the two ends of the floor. This way, nurses can shift ends with respect to their set of patients. They also can now monitor their patients better, hence improved patient satisfaction is ensured.

TABLE 5. DESIGN IMAGES OF SOUTH SHORE HOSPITAL, WEYMOUTH

South Shore Hospital, Weymouth, Massachusetts	Remarks
	- At the south shore hospital, there are about 370 - beds. - The administration was concerned about the state of the hospital that was previously built in 1978.



Patient Room

- *A particular section of the hospital, the orthopedic section has bedroom suffering from overpopulation.*
- *The nursing sector was stationed centrally and as a result, too distant from some bedrooms and daylight does not feature in some general spaces.*

This new design also features single rooms with bed lined on a side and equipment which are installed in multiple locations within a ward and tend to hinder smooth staff - patient interaction are not stationed at a single position. The extra space afforded also prevents unnecessary stress in nurses, patients and attendants. Considering the fact that most of the patients in this wing of the hospital are usually aged and do require help a lot, they benefit from having friends and families close by always. Whenever the visitors decide to stay overnight, new couches are fitted in the rooms that are easily folded into beds for relaxation and sleep.

Finally, more lighting finds its way into the hospital since the previously fitted windows of 3sq ft. length are now modified to cover the whole length of the wall.

Some people have well-argued that hospitals may be the most sophisticated forms of buildings. Moreover, since the hospital houses within itself several forms of sectors and while a lot of services are rendered theirs in. These services may range from scanning/imaging and laboratory clinical to surgery among others. This goes along with the primary function of establishment which is attending/provision of basic medical assistance to in and out patients. The diverse form of services which are offered here account for the constant need for change and upgrading in the set of buildings, design and orientation in each sections. This upgrading and renovations could be associated to their mechanical, electrical or telecommunication systems.

In a normal setting, the administration of a hospital will consist of a board of members, owners inclusive and some key members do oversee important decision making. The same applies when a decision is to be taken on adjustment and improvement on the design of rooms in a hospital, only that it is even better and effective when there is a representative from the staff, inpatients, outpatients and visitors at such meetings.

X. CONCLUSION AND RECOMMENDATIONS

The idea of sustainability is now being married with the concept of Evidence Based Design when renovating old buildings and erecting new ones. The health sector is picking the right to associate with the use of sustainable materials in its structures and physical environment. The impact of nurses in achieving a befitting hospital design in any form of hospital administrative setup should not be underrated. It serve all well if they are involved in the planning, testing and evaluation of wards and also in the use of new technological installations to ensure adequate usage and that the desired result is obtained in terms of rapid healing in patients.

In few years to come, hospitals are expected to adopt to the changes in the use of materials and adoption of different interior design models when they are to meet with the changing market demand. When the administration of an hospital subscribe to the idea of going 'green' in design and renovation plans, a glaring outcome will be noticed in patient satisfaction and healing in general.

This study found that controlling the spread of diseases and improved patient care, a 1 - bed room is superior to other forms and also when it comes to increased privacy and eliminating stress in the nursing

staff. Sleep patterns in wards especially the ICU's are disrupted by abject electricity. Families and friends have always expressed some level of satisfaction when their patients are admitted into 1 bed room. They do respect privacy and a high level of comfort is usually felt, together with the additional attention they receive from the nursing staff and other members of the hospital management. For child bearing patients, a 1 bed room is also recommended. When single bed models are adopted, it is advisable to properly manage the cross ventilation with other wards or pathways so that infectious diseases can be contained and this can only be ensured if the room is usually tightly sealed.

The following are the basic components of a hospital:

- The design is patient-centered.
- The use of only one bedroom was strictly adhered to.
- Visitors, such as family and friends, should be able to comfortably fit into the rooms.
- Within the hospital, to limit the spread of communicable diseases, the HVAC system should be up and running, and maximum control should be exercised over it, as well as the use of non-absorbent surfaces.

REFERENCES

- [1] S. H. Alhmoud, Ç. Çağnan , and E. F. Arcan, "Improving Interior Environmental Quality Using Sustainable Design in Jordanian Hospital Bedrooms," *European Journal of Sustainable Development*, 2020, 9(3), 443-443.
- [2] Bachrach, D., Braslow, L., & Karl, A. (2012). Toward a high performance health care system for vulnerable populations: funding for safety-net hospitals. The Commonwealth Fund.
- [3] Burpee, H. (2008). History of Healthcare Architecture: Integrated Design Lab Puget Sound.
- [4] Choi, J. H., Beltran, L. O., & Kim, H. S. (2012). Impacts of indoor daylight environments on patient average length of stay (ALOS) in a healthcare facility. *Building and Environment*, (50) 65-75.
- [5] Castro, M. D. F., Mateus, R., & Bragança, L. (2013). Improving sustainability in healthcare with better space design quality. *Green Design, Materials and Manufacturing Processes*, 101-106.
- [6] Eckelman, M. J., & Sherman, J. (2016). Environmental impacts of the US health care system and effects on public health. *PloS one*, 11(6), e0157014.
- [7] Elf, M., Fröst, P., Lindahl, G., & Wijk, H. (2015). Shared decision making in designing new healthcare environments—time to begin improving quality. *BMC health services research*, 15(1), 114.
- [8] Frampton, S. B., & Charmel, P. A. (Eds.). (2009). *Putting patients first: best practices in patient-centered care* (38). John Wiley & Sons.
- [9] Godbole, S. (2018). Investigating The Relationship Between Mean Radiant Temperature (MRT) And Predicted Mean Vote (PMV): A case study in a University building.
- [10] Mc. Collugh, J., & Humphreys, M. (2010). Adaptive thermal comfort and sustainable thermal standards for buildings. *Energy and Buildings*, 34 (60), 563-572.
- [11] Pierdait, A. (2006). Handbook to Build a Hospital. French Red cross Society.
- [12] Rechel, B., Buchan, J., & McKee, M. (2009). The impact of health facilities on healthcare workers' well-being and performance. *International Journal of Nursing Studies*, 46(7), 1025-1034.
- [13] Seitio-Kgokgwe, O., Gauld, R. D., Hill, P. C., & Barnett, P. (2014). Assessing performance of Botswana's public hospital system: the use of the World Health Organization Health System Performance Assessment Framework. *International journal of health policy and management*, 3(4),

179.

- [14] Ulrich, R. S., & Gilpin, L. (2008). Healing arts: Nutrition for the soul. In S. B. Frampton, L. Gilpin & P. Charmel (Eds.), *Putting patients first: Designing and practicing patient-centered care* (pp. 117-146). San Francisco: Jossey-Bass.
- [15] Verheyen, J., Theys, N., Allonsius, L., & Descamps, F. (2011). Thermal comfort of patients: Objective and subjective measurements in patient rooms of a Belgian healthcare facility. *Building and Environment*, 46(5), 1195-1204.
- [16] Verderber, S., Jiang, S., Hughes, G., & Xiao, Y. (2014). The evolving role of evidence-based research in healthcare facility design competitions. *Frontiers of Architectural Research*, 3(3), 238-249.
- [17] Vincent, E., Battisto, D., Grimes, L., & Mc. Cubbin, J. (2010). The effects of nature images on pain in a simulated hospital patient room. *HERD: Health Environments Research & Design Journal*, 3(3), 42-55.
- [18] Wagenaar C (2006). The architecture of hospitals. In: Wagenaar C, ed. *The architecture of hospitals*. Rotterdam, *NAi Publishers*, 10–19.