Healing architecture: a study on the physical aspects of healing environment in hospital design

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ABSTRACT: The complexity of designing healthcare facilities functionally and psychologically is apparent. Apart from building services, various requirements of the Ministry of Health (MoH) are expected to be followed by healthcare designers.

This paper outlines the role and importance of physical built environment in the design of hospitals as a means to create a healing environment. Lighting (day and artificial lighting) will be one of the focus areas to be examined in the study of healing architecture. At the outset, the existing conditions in 100 to 150 bedded hospital buildings in Malaysia will be reviewed and further investigation will be carried out with particular attention to the design and implementation of lighting and its relationship to other environmental factors. The paper concludes with the discussion on the influence of lighting in hospital design as one of the physical aspects in creating a healing environment.

Conference theme: Daylighting and lighting
Keywords: Environment, Healing Architecture, Healthcare Facilities, Hospital Lighting.

INTRODUCTION
In hospital buildings where most patients seek medical treatment and staff provides continuous support, creating a healing environment is primarily important and relevant. Healing suggests redressing ills and establishing a process that leads towards health. The term ‘Healing Architecture’ which has been coined recently, is used to invoke a sense of a continuous process; in creating an environment physically healthy and psychologically appropriate. However, designing healthcare facilities is a very complex task: both functional and psychological. It is expected to conform to various requirements provided by the Ministry of Health (MoH). These include medical specialist requirements and equipment both for diagnostics and for treatment. Building services are also an integral part of this complexity. In the effort to comply with explicitly stated requirements, it seems that most designers pay less attention to the ultimate aim of creating a healing environment.

It has been known for a long time that the natural environment is closely related with health and its ambient environmental conditions affect human health. However, there is very little evidence to suggest that the physical aspects of built environment can affect human health. The relationship between natural environment and health is clearly explained in the Hippocratic treatise (i.e. Airs, Times, Waters and Places, one of the early classics of medical geography). The treatise basically emphasizes that climatic and geographical factors have strong influence on human health. It outlines what are the common diseases that occur in particular locations, seasons, winds and airs (Deuraseh 2003). Most physicians accept that illness emerges due to the action of the three factors: disposition (e.g. genetic), stress (e.g. exhaustion) and agent (e.g. pathogen). Whether or not we trace the causes of the illness materially, psychologically or spiritually, environment has a significant role in all parts of the process (Day 2002).

The World Health Organisation (WHO) defines health as a ‘state of complete physical mental and social well being and not merely the absence of disease or infirmity’ which means that the environment is free from major health hazards, satisfies the basic needs of healthy living and facilitates equitable social interaction (WHO 1997). Most people spend more than 90% of their lives within buildings (Evans & McCoy 1998). Thus, in the case of hospital buildings, architecture in its physical aspects should create a healing environment for patients, visitors and staff psychologically, mentally and physically.

These physical aspects of healing environment serve for all users of the healthcare facility: staff, clinicians, administrators, patients and families. Existing studies have shown that in a newer hospital environment better health outcomes can be achieved when the physical aspects such as access to outside view, patients’ privacy, lighting and other factors are appropriate. Nevertheless, negative experiences of the existing hospital environment were recorded from the visitors by the Commission for Architecture and the Built Environment (CABE) in the United Kingdom and from patients’ memories by Simini. Criticism included terms such as depressing, confusing, dull, shabby, windowless, stressful, little natural light, noisy, sleep deprivation, isolation, physical restraint, anxiety and want of information (Simini 1999; CABE 2004b). To a certain extent, in 1995, Chapman, president and CEO of United Health Corporation in Columbus had made an analogy that “Hospital as prison”. He described that both prisoners and patients are typically housed in buildings with “cold, hard floors and surroundings, lacking in colour, warmth, and variety” (Weber 1995).
This paper outlines the role and importance of physical built environment in the design of hospitals as a means to create a healing environment. Lighting (day and artificial lighting) will be one of the focus areas to be examined in the study of healing architecture and forms part of the broader study of physical aspects. At the outset, the existing conditions in 100 to 150 bedded hospital buildings in Malaysia will be reviewed and further investigation will be carried out with particular attention to the design and implementation of lighting and its relationship to other environmental factors. The paper concludes with the discussion of the influence of lighting in hospital design as one of the physical aspects in creating a healing environment.

1.0 OBJECTIVES
The aim of this research paper is to obtain an in-depth understanding of the physical aspects in hospital design and how these physical aspects play important roles in creating a healing environment. Other objectives of the present paper are:

- to acknowledge the critical experiences of patients, staff and visitors in hospital buildings,
- to outline the physical aspects in healing environment,
- to investigate the previous and current research available on the subject of health and environment, design for healing and the effect of daylighting on human beings,
- to examine the elements of physical aspects of existing project brief of public hospitals in Malaysia,
- to draw a preliminary conclusions on the subject of daylighting in healing environments.

2.0 METHODOLOGY
This paper is perceived as an extraction of the existing body of knowledge on healing environment and on-going research. It is at an early part of research and therefore the methodology employed to present the outcome is based upon literature review and desktop analysis.

2.1 Literature review
Aspects of healing environment in hospital design: the physical aspects, daylighting and the effect of daylight on human beings are critically reviewed. This is to establish understanding of the subject of healing architecture and provide substantial evidence for the later discussion. Negative experiences relating to the physical aspects of hospital building from patients, staff and visitors are explicitly noted. An examination of the project briefs (i.e. medical, architectural and mechanical and electrical briefs) of public hospitals in Malaysia is to critically analyse the provisions of physical factors in hospital design.

2.2 Desktop analysis
The information gathered from the literature review is thoroughly analysed. This is to form a clear understanding of the subject which leads to the formation of explicit answers to research questions. The desktop analysis is to provide clear directions and arguments which lead to the potential outcome of the research.

3.0 PRELIMINARY FINDINGS

3.1 The physical aspects in healing environment of hospital design

Ermengarde de la Houssaye describes three activities that play a most important role in the relationship between the patient and a caring nurse: First,” she writes, “to provide the correct environment for the patient; second, to mediate between patient and those aspects of life that are less accessible to the patient during her illness, such as family relationships, daily cultural life, and being in nature; and third, to accompany the patient on her path through the experience of illness.

(Coates & Siepl-coates 1998)

Some scientific literature confirms that the conventional ways that the hospitals are designed contribute to stress and danger to patients and staff, such as long circulation for medical staff, noise exceedingly high due to the density of patients and conversations among staff and visitors which could be disruptive to patients sleep and glare due to poor lighting (Malkin 1991). In the creation of a healing environment, among physical factors that have to be considered are noise control, air quality, thermal comfort, lighting, communication, colour, texture, privacy and view to nature (Malkin 1991). These factors have a more pronounced influence in hospitals than in other buildings, as the patients are bedridden or have limited freedom of reaction.

Research evidence suggests that newer hospital environments produce improved patients’ outcomes. The Length of Stay (LoS) of patients has been reduced by improving the physical aspects in a renovated hospital environment (Lawson 2002). The Commission for Architecture and the Built Environment (CABE) produced similar findings during the campaign for healthy hospitals in the United Kingdom in November 2003. They believe that well-designed healthcare buildings can lead to better health outcomes (CABE 2004b). They produced a report entitled ‘The role of hospital design in the recruitment, retention and performance of NHS nurses in England’, which provides clear evidence that well-designed hospitals (i.e. improved physical environment) have a significant influence on the nurses’ performance in their work and have positive impact on their recruitment and retention. Comments received from the visitors provide a clear outcome on aspects of physical environment to be considered for future hospitals: space was mentioned by 32%, light by 22%, fresh air by 16%, cleanliness by 16%, a warm and friendly atmosphere by 12%, colour by 11%, garden by 10%, privacy by 9%, technology by 5% and noise level by 5% of those interviewed (CABE 2004a).
3.2 A study of daylight in hospital design

Creating an appropriate environment in the design of hospitals is different from building up e.g. a garage workshop, where cars are sent for repairs before continuing their journey (Hosking & Haggard 1999). A hospital environment however, where “repair” of the body (healing) is the concern, requires the optimum level of comfort and care physically, socially and symbolically. For this, the luminous environment plays an important role and an integral part of the hospital’s healing environment.

Daylight is a crucial source of energy in our life. It has significant effects on human beings both physiological and psychological. The effect of light on our circadian rhythm (i.e. biological systems that repeat 24 hours) has been recognised for many years. Campbell et. al., (1988) as quoted by La Grace suggests that light is the most important environmental input in controlling bodily function after food (La Grace 2004). Several researchers agree that lighting has a profound effect on human’s hormonal and metabolic balance (Fellman 1985, Wurtman et. al. 1985, Klein 1986, Reiter 1986, Reiter and Karasak 1986, Brainard 1994, as quoted by La Grace, 2004).

Most researchers believe that daylight has a significant effect on work productivity in an office environment. A study of worker productivity level found that daylight may positively affect the work performance in an interior of windowed office environment during winter months (Figueiro et al. 2003). However, the quantitative relationship of daylight and productivity has not been established. Another study indicates scientifically that lighting systems (i.e. a combination of daylight and artificial light) appear to be important for both visual performance and biological stimulation i.e. circadian rhythm (Begemann et al. 1997). It also concludes that human alertness, work performance, sleep quality and degree of comfort and well being are adversely affected by inadequate light.

In a selected class of school environment, an interesting finding was made that a significant proportion of children choose to sit near the windows. The qualitative and quantitative analyses indicate that the reasons for choosing seats or working near windows are the view out, view content, nature, space and comfort both visual and thermal. The main factor is however, the amount of daylight (Stewart 1981). Another study by Kuller and Lindsten shows that in a classroom the absence of daylight may influence children’s performance and eventually have an impact on annual body growth and sick leave (Kuller & Lindsten 1992). These findings and others provide a significant insight on how daylight influences human behaviour, health and performance. These may help to improve daylight design, building fenestration and layout in a school environment.

Most areas in hospitals require natural daylight. Moreover, daylight is generally recognised as part of the healthy environment. In hospital design, daylight is utilised in many ways, such as the use of large windows and skylights, clerestory windows and large atria. Much literature describes how daylight has an effect on the well-being of human beings physically and psychologically. In addition, access to natural light and fresh air are crucial factors affecting patients and their recovery (CABE 2004b).

Healing by design (Horsburgh 1995) realised that the visual connection to nature is an important attribute of the healing environment. Interestingly, the window as physical connection to nature has a significant role to play. Many researchers quote the scientific study by Ulrich which has recorded the potential for nature to heal cholecystectomy (gall bladder surgery) patients in a suburban US hospital by providing a view through a window (Ulrich, RS 1984).

The study carried out by Ulrich has spurred similar further tests, reviews, research and qualitative findings by other disciplines involved with healing environments. Studies carried out by Lawson (2002), Jones (2002a and b) and (CABE 2004), arrived at similar findings that appropriate physical environment in the design of hospitals can provide health outcomes to patients, staff and visitors physically, mentally and psychologically.

Most physicians accept the fact that appropriate balance of daylight and artificial light may positively affect some illnesses in a ward environment. On this concern, there are growing numbers of studies on the effect of light for Alzheimer’s patients (Campbell et al. 1988; Noell-Waggoner 2002; La Grace 2004). These scientific observations and qualitative analyses agree that lighting strategies (i.e. daylight and artificial light) have a positive impact on managing behavioural disturbances of the Alzheimer’s type. Waggoner in his review entitled Light: An Essential Intervention for Alzheimer’s Disease, highlights issues to consider when determining the quality of lighting such as glare, flickering-free lighting, uniformity in ambient lighting, orientation of the light to the visual task, colour rendition and temperature, and balance between electric and daylight (Noell-Waggoner 2002). These are important factors to consider in creating a healing environment.

Conversely, psychiatrists generally agree that the absence of daylight (or shorter hours of exposure to daylight) may cause several health disorders (Morriss 2001; Evans 2003; Bower 2005). These are sadness, fatigue, mood disorders and seasonal affective disorder (SAD). Morriss clearly outlines that SAD: a psychiatric disorder with a clearly identifiable cause, the change of seasons and lack of exposure to daylight (Morriss 2001). The evidence of SAD is presented in great detail from clinical, methodological and basic science perspectives by Partonen et al. in their book entitled Seasonal Affective Disorder: Practice and Research. In addition, Wirz-Justice et al. (1986) as quoted by McColl discovered that the level and amount of illumination produces clinical improvement to SAD patients (McColl & Veitch 2001); either by one hour of daylight or half an hour of white light of 2800 lx.

Leslie outlines in general, the basic principles of daylighting design in order to achieve comfortable ambient lighting (Leslie 2003). In hospital design in the United States, Ulrich has made the recommendation through his study (The Role of Physical Environment in the Hospital of 21st Century: A Once-in-a-lifetime Opportunity) that a hospital design with single bedded wards should be implemented for all types of illnesses (Ulrich, R et al. 2004). The study claims that this would reduce rooms transfer and associated medical errors, greatly lessen noise, improve patient
confidentiality and privacy as well as increase patients’ overall satisfaction with health care. However, this recommendation seems almost impossible to be implemented physically in some other parts of the world including Malaysia. Thus, the research should respond positively, on how comfort and care can still be achieved in hospital design with 4 to 6 bed wards in the context of Malaysian public hospitals.

Based on the above review, daylight plays a significant role as one of the physical aspects in creating a healing environment. It has a profound effect physiologically, mentally and psychologically on the human being. On the other hand, experimental studies on the role of daylighting design in the healing environment are few and far between. Many studies on the subject of daylight focus on schools, offices and commercial buildings but few on hospitals.

3.3 The physical development of public hospitals in Malaysia

Malaysia gained independence in 1957. Since then, the health vision of the country is not static. It has dynamically progressed and sets in place a framework to ensure that the health system could develop and adapt to the changing environment and needs. All strategies and developments for improvement are aimed to meet the Malaysian health vision formulated by the Ministry of Health (MoH) which is:

**Ministry of Health, Malaysia**

Malaysia is to be a nation of healthy individuals, families, and communities, through a health system that is equitable, affordable, efficient, technologically appropriate, environmentally adaptable and consumer friendly, with emphasis on quality, innovation, health promotion and respect for human dignity, and which promotes individual responsibility and community participation towards an enhanced quality of life.

The health vision is being implemented through health development planning which is aimed to improve the mix and quality of services, and to increase efficiency and effectiveness. A bottom-up planning approach has been adopted which is set in the context of the National Economic Development Plan (i.e. the Five-Year Malaysia Plan). This is to ensure that the plans for health development cope up with the needs of the community (Suleiman & Jegathesan c2000).

The nation’s health status is believed to be strongly dependent on the physical development of public hospitals in Malaysia. This is demonstrated in the Malaysian healthcare referral system which encompasses primary, secondary and tertiary level of care (see Figure 1). These are then being refined to promotive, preventative, curative and rehabilitative care. The referral system is a concept defined by WHO as a channel of filtering and referring patients to appropriate care. Patients approach the first level of the system and then they may be referred upwards to levels of increasing complexity and specialisation. This would suggest much higher complexity of hospital design.

![Figure 1: Malaysian National Healthcare Referral System](image)

3.3.1. Pre-independence

During British occupation since 1874, the development of hospitals in Malaysia (formerly known as Federated Malay States) was driven by the tin industries. It was provided for Chinese tin miners, the armies, the government servants and the labourers in the estates. There were 10 major general hospitals and 56 district hospitals in Malaysia by the time of independence in 1957 (Suleiman & Jegathesan c2000). Some of these hospitals are found to be still in use till present. Their built forms were either single stories with pavilion type arrangement in rural areas or medium rise in urban areas. Most spaces of these hospitals utilised natural ventilation and daylight as they command a fine view of seaside or a good location on the hillsides. Figure 2 Tanglin Hospital, Kuala Lumpur shows a typical single
storey colonial hospital. Timber, steel, concrete with clay roof tiles are the choice of local materials used for the building. The British successfully employed climatic considerations in the design. Such considerations included openable wall cum door panels, louvred doors and windows, low eaves, washable floors of durable material, hot air ventilated pitched roofing system with wide overhang, high ceiling, perimeter drainage system, open and airy connecting corridors and appropriate use of local materials to assimilate with nature. Manually operated bamboo blinds were added to openings for prevention of rain and became a common element for the whole building.

Figure 2: Typical colonial single storey Hospital (Tanglin Hospital, Kuala Lumpur)

3.3.2. Post-independence
The Affordable Health Services for All policy was established by the Ministry of Health (MoH) in the early days of independence and it was adopted by the newly formed government. This had brought about the expansion of Rural Health Services which required provisions of new hospital buildings in all states in the 1960’s. The replacement of old hospitals with the new designs was based on standard drawings of one to two stories buildings with pavilion type planning layout. Each block of the pavilion building with pitch roof and flat ceilings represents different disciplines and departments. Natural ventilation using adjustable louvred glass windows with some mechanical fans was used as a significant element of the physical aspects in the design of each pavilion building (exception to operating departments and clinical areas). Curtains for shades were provided for patients’ control over the environment. Shaded and open corridors through landscaped gardens were used as a connection from one building to another. This early pavilion type layout was implemented in two districts hospitals: Jerih and Kuala Berang. Since then the standard template is referred as ‘Jerih and Kuala Berang Type Plans’ and being replicated to suit other district hospitals of 50 to 150 beds.

In the early 1980’s, the health development plans had adopted and incorporated the objectives of WHO’s Health for All strategy, which were congruent with the goals of national policies. This had resulted in an equitable distribution of resources and greater accessibility to healthcare services for rural communities. Accordingly, the existing healthcare facilities were renovated and refurbished. Until late 1980’s, a turnkey system of procurement for hospital buildings was adopted by the federal government through a pact with the British government. UK nucleus hospitals design concept was introduced as a template for 12 district hospitals in all states in Malaysia. The UK temperate hospital design was modified to suit the local tropical climate. Perimeter corridors, roof overhangs, covered and shaded skylights with added mechanical ventilation systems (fans and exhaust fans) in the wards’ interior, were additional elements to the design. Two types of hospital design were built: a single storey for 90 to 108 beds and two stories for 300 beds. Both types adopted a pavilion type layout planning. However, the design intention was questionable with the justification that the original design was intended to be energy efficient in temperate climates instead of natural ventilation and daylight considerations in the tropics.

On the other hand, the engagement to design general hospitals in late 1970s in some states was given to the Public Works Department (PWD) locally known as Jabatan Kerja Raya (JKR). Six general hospitals were constructed in various states with Seremban Hospital as a prototype to replace the old and dilapidated hospitals. Podium and tower configuration as built form was adopted in consideration of the land constraints in urban areas. The design allows the wards to be in the medium rise tower of 10 to 11 stories height to take advantage of natural ventilation and orientation for daylight and view (Mohd Nawawi & Aripin 2005).

Another development for large district general hospitals in the early 1990s is referred as ‘one-off’ design. This design development is favoured for the replacement of state general hospitals, establishment of referral medical specialist centres or hospitals for teaching institutions and also serves as the second general hospitals. With the capacity of 300 to 500 beds, the ‘one-off’ design hospitals have different outlooks of either corporate, resort or vernacular image. Perhaps, the main factor is the calls to be ecologically sustainable and environmentally friendly driving the ‘one-off’ design concept to be implemented at that time. As a result, the current development of public healthcare facilities in Malaysia since the year 2000 witnesses a variety of design aesthetics and considerations. This applies also to the primary level of healthcare centres (Mohd Nawawi & Aripin 2005).
Conversely, the sophisticated structures of new hospital designs in Malaysia with different outlooks and mechanical aids do not mean that the ultimate aim of creating healing environment for staff, patients and visitors has been achieved physically, mentally and psychologically. These may lead to energy waste, confusion and other negative aspects in the functioning of the hospital. To establish this concern, it is relevant to investigate the provisions of the physical aspects of hospital design in Malaysia which is part of the objectives of the paper. Revisit the project brief of completed buildings is an initial step of the investigation in the subject of healing environment of hospital design.

3.3.3. The emphasis of physical aspects in the project briefs of public hospitals

The design process of a hospital project from inception to completion is generally similar to other type of building projects. However, the complexity of designing a hospital building is to conform to various project brief requirements. In the 1970s, there was no proper documentation of project briefs for hospitals development in Malaysia.

The statement of needs for hospital projects was discussed at meetings of Hospital Division of Department of Health, MoH. The health situational analysis prepared by the state hospitals and state directors was thoroughly discussed in the meeting. Standard requirements in terms of service level provided at different level of hospitals were mainly decided by the Hospital Division of MoH. At present, the statement of needs remains relevant and is evolved from a similar approach. It illustrates the background, situation analysis, population, the health facilities and status, scope of the project, location plan and numbers of beds distribution according to the departments.

On the other hand, the specific medical requirements were previously drawn from the recommendations of respective medical specialists. For example, Obstetric and gynaecological (O&G) requirements are derived from the association of O&G specialists and similarly for other medical specialities. This is referred as ‘Operational Policies’ which describes the complete procedure of the service undertaken at Primary up to Secondary and Tertiary levels of care until the patients are discharged. Numerous guidelines which are provided by various divisions of hospital (i.e. pharmacy and pathology divisions) are added to the operational policies to form the medical brief. Currently, based on a similar approach, the medical brief is compiled on to cover the role of the proposed hospital, medical needs and facilities of every department, distribution of beds of patients wards accordingly, public amenities and facilities, support services and administrative requirements.

In the 1980s, when the turnkey procurement system was first adopted for the Teluk Intan Hospital project (in Perak) with 300 beds, the statement of needs and medical briefs were prepared by MoH and was referred as a ‘functional brief’. The architecture and engineering brief are provided by Public Works Department (PWD) complementing the above briefs. In later years of hospital development projects, the government had given autonomy to each ministry to appoint a Project Management Consultant (PMC) for the coordination of government projects. As a result, several turnkey contractors employ their own healthcare consultants to bid for hospital projects. To a certain extent and theoretically, this would encourage a variety of hospital designs but would not suffice to ensure the quality of the hospital projects.

Two completed district hospital projects with 108 beds are reviewed: Pekan Hospital (in Pahang) and Jempol Hospital, (in Negeri Sembilan). The projects are currently at the stage of testing and commissioning for the purpose of handing over to the MoH. Turnkey procurement system has been adopted for both hospital projects. Statements of needs, medical, architectural and engineering briefs are the documents made available for the review. Both locations are in suburbs with open green sites and the outcome of the designs is ‘one off’ type, with different concepts and approaches.

Based on the cross examination on the project briefs, it can be deduced that the requirements on physical environmental aspects are obviously minimal with lack of emphasis on luminous environment of the wards. Any explicit statement for building orientation to daylight, window sizes and view is absent. It is merely a derivation of hospital standard requirements from other international standards such as British Standard (BS) and The Illuminating Engineering Society (IES) code of practice. It is also noticed that the outdated measures are still in use (such as \(25^\circ\) instead of \(27^\circ\)). The project brief of hospital design lacks any description on how daylighting design should be considered and integrated. It is assumed that for the healthcare designers or consultants to conform to daylighting requirements of hospital design is by means of complying with the uniform building by laws (UBBL) and the standard of IES code of practice. This would be insufficient as for example glare could possibly occur in the wards environment. In addition, one would expect provisions in the project briefs for the overall hospital environment and other critical spaces (wards and treatment areas) to be experimented with and tested by means of 3D visualisation. This would probably allow some rectification and modification at design stage to balance the internal and external environment which is a crucial factor in a healing environment. Another important aspect which is clearly missed in the project brief is patients’ statement of need. This could be derived from post occupancy evaluation (POE) of the previous public hospital projects which would be the best way to ensure continuous improvement. The assumption made by the healthcare provider that the consultants would be sensitive to the patients needs is not necessary correct. There are evidences in the existing design of public hospital in Malaysia to possibly suggest that daylight has been compromised by the other requirements such as circulation and services.

4.0 DISCUSSION

A review on the study of daylight in hospital design as discussed in 3.2, provides unequivocal evidence to suggest that the physical aspects play an important role in the subject of healing environment in hospital design. Poor considerations may have an effect indirectly on the health outcomes of patients. On the contrary, creating a healing environment would contribute to eliminate the stress factor for patients and subsequently reduce the length of stay (LoS). This would also reduce the cost of treatment on patients. Therefore, the study of daylight in hospital buildings
is pertinent and significant to enhance the body of knowledge in the field of architectural building science. On the other hand, the subject of healing environment requires a multidisciplinary approach and in-depth understanding of various disciplines. Architecturally, critical analyses on the conflicting issues: physical to physical (e.g. daylight versus solar heat gain) and physical to psychological (daylight vs. undesirable glare) aspects are important and within the scope of the study. Achieving the balance and compromise on these aspects would satisfy the appropriate ambient environment of healing.

The insight into hospital procurement systems and the evolution of hospital project briefs in Malaysia are also seen as a primary factor to achieve appropriate physical aspects of healing environment. It largely depends on how critical and to what extent the project briefs are being reviewed by the healthcare providers for healthcare designers as this would be the first crucial step of creating healing environment. A preliminary finding suggests that the healthcare designers ought to consider issues beyond the project brief and requirements provided by healthcare provider. Engagement with specialists such as lighting consultants for hospital buildings could further enhance the design outcome.

In conclusion, with reference to public hospitals in Malaysia, a coordinated effort is required to achieve the ultimate aim of creating a healing environment in hospital design. This would suggest more stringent requirements in the project brief by the Ministry of Health (MoH), highlighting the negative experiences raised by patients, staff and visitors to healthcare designers for design considerations and inclusion, encourage research of hospital design with particular attention to healing environment and initiative made by healthcare designers to explore the project briefs beyond what is required. On these grounds, the study embarked upon the physical aspects of healing environment in hospital design could significantly reinforce the project briefs provided by MoH. It is also hoped that the outcome of the study would achieve an environment responding for the patients' needs.

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