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# Can 'healing' architectural elements be incorporated into current and future hospitals to create environments that aid recovery and improve patient experience?

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## Abstract

The modern-day hospital are institutions experienced by the majority, yet, arguably, they often have a palpable absence of positive, meaningful and health-encouraging environments. This research project investigates the extent to which architecture and interiors can directly impact a hospital patient's recovery. It also considers the factors prohibiting relevant healing architectural features from being consistently implemented in the hospital design process.

When considering places devoted to healing the sick have a recorded historical presence dating back to ancient Greece, there is little exploration into 'healing' architectural features and the legitimate effectiveness of a health-enhancing built environment. The project, in investigating the historical progression and cultural interpretations of hospitals in addition to an exploration of scientific architectural studies, aided an understanding of the societal role of hospitals and analysis of recovery associated designs. Primary findings were collated from visiting three contrasting healthcare sites, hospital patient interviews and a public hospital experience survey.

With 48% of survey participants stating they felt worse within an environment that is intended to have the opposite effect, it highlights a concern for hospitals and patient experience. Largely, hospitals can provide healing spaces if they offer an environment that finds a balance between avoiding stress inducing features, such as poor wayfinding and lack of natural light, alongside the provision of spaces that are both rejuvenating and engaging. Despite the conjunction between the fields of neuroscience and architecture continuing to prove the impact of architectural features on the mind and body, the expense and potential impracticality of healing architecture often prevents them from being retrofitted in existing hospitals or involved in new builds. Notably, the understanding of the human perception of space and the power of patient experience are the neglected elements that need to be reintroduced during the concept phase of hospital projects.

**Keywords:** Hospitals; Architecture; Patients; Healing; Recovery; Experiential

## Introduction

“Childbirth to death, both joyful and traumatic moments we spend in hospitals rather than home – buildings devoid of culture, stripped of aesthetic and seemingly any architectural depth of symbolism. They are often our entrance and exit into this world, yet at these moments we are most in need of relief, meaning and spiritual uplift, and instead we find ourselves surrounded by the bleak expression of hygiene and efficiency which characterises the modern hospital” (Heathcote and Jencks, 2010, pp54).

For many the experience of using modern hospitals is a dismal one, with it often being found that the design of healthcare environments has been for practical purposes rather than tailoring it to the human experience (Farr, 2015). When comparing the first means of healthcare to the common medicinal megastructures often seen in modern society, it can be assumed that healing spaces once observed throughout history have been lost due to technological advancements and the inevitability of societal changes. It is evident, that without such advancements and knowledge, healthcare architecture was once entirely influenced by ‘the primacy of the bodily experience, the unbreakable link between body and mind’ (Jones and Meagher, 2015, pp204).

The World Health Organisation (WHO) defines health not as the absence of ill-health but as “a state of complete physical, mental and social well-being’ (Steemers, 2016), each contributing to healing. The idea that architecture has the ability to aid healing and assist with patient’s physical recovery remains in the early stages of being both scientifically and emotionally explored. Both a debate and an understanding has emerged that healing is not merely the process of correct provision of medicines and relieving symptoms, but that a more holistic approach of healing is needed. It can be argued that many examples of healthcare architecture today do not support the patient in this respect.

Leading the reintegration of comforting and health-encouraging spaces into the modern-day hospital is the field of neuroscience. The justification of healing environments is supported by measuring the correlation between architectural features and recovery rates with studies, such as UK patients being released from care 1.5 days prematurely when based in a refurbished NHS hospital in contrast to an unaltered site (Lawson, B., and Phiri. M., 2002, pp6). While it is becoming increasingly proven that the architectural experience of hospitals has the ability to aid recovery rates, and not merely alter patient satisfaction, it is important to consider that hospitals are highly operational buildings and therefore function is largely prioritised over form. For the architect, it is difficult to impose healing architectural features without the potential of compromising an environment that vitally needs to support ‘workflow optimization... and a more efficient infrastructure for optimal care delivery’ (GE Healthcare, 2012).

Undoubtedly, a successful hospital will be one that best and most thoroughly accommodates across factors of efficiency, cost-effectiveness, flexibility, future-proofing (Carr, R, F., 2017) and hosts features that provide both a physically and mentally supporting environment to thus sustain and enhance the healing process.

This research project will explore the centurial evolution of hospital architecture, to understand the shift from spiritual, cultural and holistic hospitals to the modern institutions often experienced today. Investigations into neuroscience and architecture will determine the architectural features and design motives that, if integrated appropriately in hospitals, could assist the healing and recovery process of patients and provide a more positive hospital experience. With the aid of interview and survey results in addition to the exploration of varying modern day healthcare institutions, findings will identify whether healing, therapeutic architecture can co-exist with medicinal and technological installations that hospitals ultimately depend on to heal patients. Further research will highlight the factors preventing healthcare institutions from consistently and effectively focusing on patient experience, avoiding stigma, and creating healing spaces.

## **Literature Review**

With hospital architecture and neuroscience studies being a small specialism within 'the general literature on the psychology of the architectural environment' (Lawson, B. and Phiri. M., pp5), a limitation with the quantity of developed and influencing literature poses a research boundary. Main contributors to the key themes within this project have included Roger Ulrich, publishing results of hospital architecture studies since the 1980's, in addition to Charles Jencks for his relating architectural and spiritual views presented in 'The Architecture of Hope', 2010. Another significant author contributing to the topic is health expert, Sternberg, particularly in 'Healing Spaces: The Science of Place and Well-being' 2009, for her insight into the historical progression of hospitals and the growing body of scientific studies in healing architecture. With this research project being patient experience and architecturally focused, literature discussing other considerable factors for hospital success and failures regarding healing, for example, the impact of poor staff facility design on efficiency and patient recovery, have not been extensively reviewed.

## **History of Hospital Architecture**

It can be argued that healing spaces have existed since 800 to 500 BC (Heathcote and Jencks, 2010, pp56). Considering this, both an understanding and recording of what is integral to hospitals, as healing environments, is lacking. Architecture critic, Charles Jencks, writes of a loss of tradition once historically evident in the 'seamless continuity between health and architecture' which he claims is 'verified by picking up the standard textbook on hospital building today; it shows little record of past interplay between culture and health' (Heathcote and Jencks, 2010, pp16).

## **Ancient Greece**

Early civilisation hospitals were a 'fusion of religion and healing' (Haggard and Hosking, 1999, Foreword pp1), and it can be assumed that their reliance on religious faith as a tool for healing was due to the absence of scientific capabilities that emerged since the discovery of infection (Heathcote and Jencks, 2010, pp71). Ancient Greeks cared for the sick in temples, and were known to be 'equipped and manned to assuage both the flesh and spirit' (Kairis, 1938). The first health institution, surfacing a 'hybrid of healing and culture' (Heathcote and Jencks, 2010 pp18), was Epidaurus, a temple dedicated to God of healing, Asclepius (Sternberg, 2009, pp220). Adopting a holistic approach

(Heathcote and Jencks, 2010, pp56), and offering powerful views of nature, Epidaurus signifies humankind once largely relied on the environment to help mind, body and spirit assist healing (Prasad, 2014).

### **The Medieval Hospital**

A landmark in early medieval healthcare architecture is the Hotel Dieu, Paris (651 AD), translating to Hostel of God (Science Museum, N/A). It is questionable whether the healing temples were a source of architectural inspiration, however similarities arise in the primarily religious orientation and multi-function healthcare approach (Heathcote and Jencks, 2010, pp57). The hospital is adjacent to the Notre-Dame Cathedral (Vallois, 2003), likely acting as precedent for city centre hospitals. After a fire in 1817, it began to 'shed its reputation as a disease trap' and its revised design adopted a central courtyard and spaces with vaulted ceilings (Vallois, 2003). It can be questioned whether its gradual closure of its medical facilities is due to its diminishing architectural suitability, or as a result of changing societal needs of the modern hospital.

### **12<sup>th</sup> Century Islamic Hospitals**

At the forefront of Islamic hospital design were Islamic intellectuals, including religious successors, scholars and medical practitioners (Tschanz, 2017). With intentions of continually improving the ways in which hospitals healed the sick, they used their combined specialisms to create the Bimaristan; 'a centre of treatment, a convalescent home..., a psychological asylum and a retirement home...' (Tschanz, D, W. 2017). It is presumed that these intellectuals used ancient precedent and knowledge, extending on that of the Ancient Greeks. Inspiring hospitals like the Nur Al-din Bimaristan, Syria (1154); operating over several centuries and being a medical school and hospital (Demeter, 2014), it is 'closer to anything we have today than anything that came for centuries after' (Heathcote and Jencks, 2010, pp57) regarding healing architecture. Strongly suggesting this application of precedential knowledge is noting that, largely, Bimaristan locations prioritised hill or riverside plots (Al-Ghazal, 2007, pp3). This signifies Islamic architects understood the health benefits of natural ventilation; as supported by the design of wards with windows facing the street (Tabbaa, 2003, pp106).

A pivotal moment in hospital architecture surfaced in the 14<sup>th</sup> Century. An increasing number of hospitals were under the instruction of the city rather than the church. It can be questioned whether this initiated the collapse of the influential relationship of religion, culture and hospitals, distancing from the charitable, spiritual institutions they had been for centuries.

### **14<sup>th</sup> Century and the Renaissance**

The Renaissance's 'first major building was a hospital' (Heathcote and Jencks, 2010, pp59). The Ospedale degli Innocenti (1419), Florence, designed by Brunelleschi (Prasad, 2014), was an orphanage. Similarly to other institutions at the time, a generous donation was made after the decision to 'deliberately select the civic guild instead of a church or religious order' (Hornik, 2007, pp65). A design based upon Brunelleschi's influence of 'Classical Roman, Italian Romanesque and

late Gothic architecture' (Istgalilei, 2009), the calculated geometric structure and presence of the loggia provides a medium of shelter and enclosure.

## 18<sup>th</sup> Century

At the end of the 18<sup>th</sup> Century hospitals began to develop the role they have within society today: decreasing their association with the Church, simultaneous to their increasing demand (Nickl and Nickl-Weller, 2007, Foreword pp1). German hospitals initiated the pavilion style, spanning a larger land surface area with the composition of separate buildings (Nickl and Nickl-Weller, 2007, Foreword pp2). Unintentionally, this revised layout proved to be healthier; isolating patients by illness and reducing spread of infection (Nickl and Nickl-Weller, 2007, Foreword pp2).

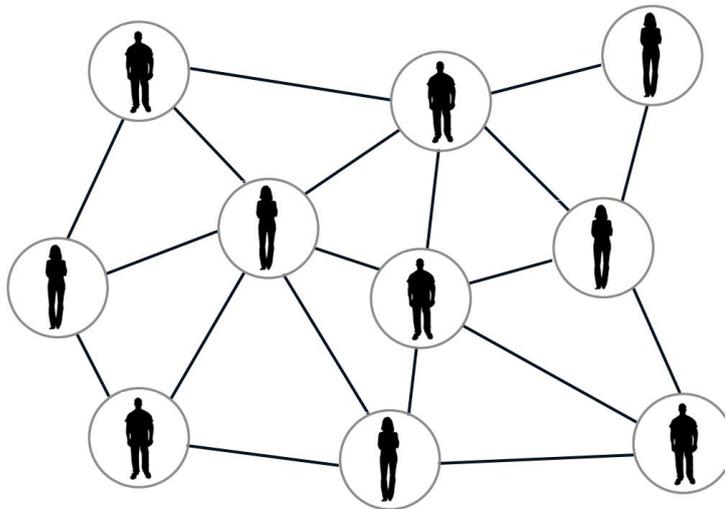


Figure 1: Infection Concept Diagram

## 19<sup>th</sup> Century

The various 19<sup>th</sup> C approaches to hospitals were influenced greatly by the industrial revolution. With a significant rise in factory buildings, the UK became notorious for poor living and working conditions: the detrimental effect this had on citizens' health increased the number of hospitals built (Heathcote and Jencks, 2010, pp67). 'Hospitals became a feared presence, evidence of decay and death' (Heathcote and Jencks, 2010, pp67) and debatably, this instigated the stigma hospitals often have today.

Renowned nurse, Florence Nightingale impacted 19<sup>th</sup> century hospital architecture; advocating her belief that conditions of the built environment are central to healing, her writings informed that natural light and fresh air are vital in hospitals (Prasad, 2014). The value of her teachings was certified in her influence over the re-location and design of St Thomas's Hospital, London (Godfrey and Roberts, 1951, pp79). Comprised of individual buildings with river views: three of the classical buildings remain operating today (Godfrey and Roberts, 1951, pp80), highlighting its success. Later in the 19<sup>th</sup> century a scientific paper informing that sunlight destroys bacteria was released to the Royal Society in

London (Sternberg, 2009, pp4). Consequently the emergence of large windows and skylights (Sternberg, 2009, pp4) exploiting maximum levels of sunlight, began to direct hospital architecture into an era of hygiene.

## **Modernism**

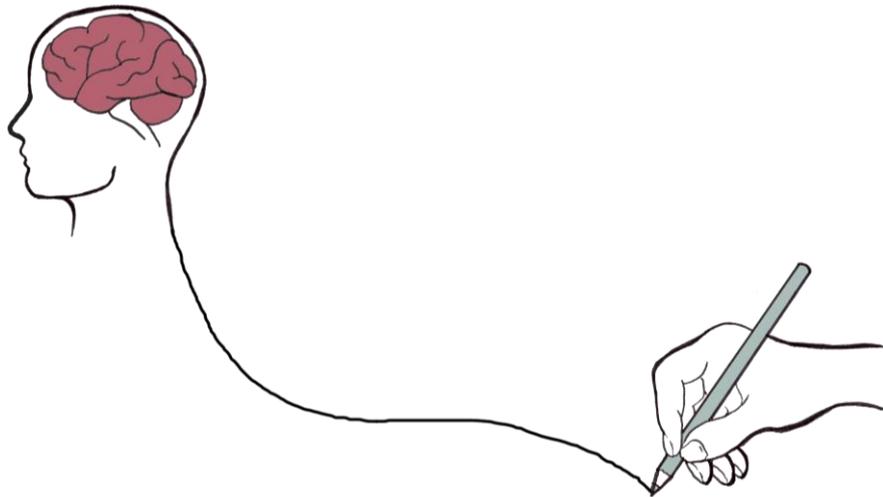
Arguably the most respected 20<sup>th</sup> century hospital is Alvar Aalto's Paimio Sanatorium, Finland, 1933, aiming to 'provide complete peace' for its residing tuberculosis patients. (MacCarthy, 2007). Its south facing wards and pine forest views were supposedly inspired by the 19<sup>th</sup> Century focus on the benefits of sunlight and natural ventilation (Sternberg, 2009, pp5). Conflicting its natural context with its strictly modernist 'articulated structure' (Mindel, 2013), the sanatoriums vital connection to its woodland surrounding cannot be denied as a successful 'instrument for healing' (Mindel, 2013). Despite its widespread admiration, the post WWII continuance of 'the hygienic, puritanical language of international modernism' becoming 'the universal language of hospital architecture' (Heathcote and Jencks, 2010, pp77) has since received criticism. The functional nature signature to modernism becoming the designated hospital design has been described as 'a vehicle to express mankind's faith in technology as a cure for all ills' (Heathcote and Jencks, 2010, pp77). The gradual realisation of hospitals being too solely focused on homing technological advancements and consequently 'leaving man behind' (Heathcote and Jencks, 2010, pp80), began with the late 20<sup>th</sup> century associations between neuroscience and architecture.

## **Neuroscience and Architecture**

In an age where hospital architecture has largely detached from cultural, religious and spiritual influence and is based on its ability to accommodate increasing medical demand and technological advancements, it is becoming evident that the human response to our surroundings is vital at critical times in our health. Scientifically, and disputably whether it was of priority and interest, the notion that 'emotional responses to architecture affect health' (Sternberg, 2009, pp7) could not be measured prior to scientific advancements introduced in the late 20<sup>th</sup> century (Sternberg, 2009, pp10). A landmark advancement being neuro-imaging (Campbell-Dollaghan, 2012); enabling scientists to record the human response of spaces through scans and mapping of the brain.

The connection between neuroscience and architecture strives to be evidential to the effectiveness of design that improves patient experience and healing process. John. P. Eberhard, founding President of the Academy of Neuroscience for Architecture (ANFA), San Diego, believes that 'the key to understanding how our brains enable our minds to experience architectural settings is consciousness' (Eberhard, 2009). This suggests if one is consciously aware of the ways in which our minds respond to our built environment, these can structure the basis for assigning measurement, research and scientific proof that informs how our buildings are designed (Nasser, 2015). Such investigations continue to not only attempt to measure the *extent* to which architecture causes emotional responses, but to identify *how* these responses can impact health. When these factors are determined, healing spaces can be better integrated into hospitals (Sternberg, 2009, pp7). The body provides scientists with indicators such as nerve chemicals in the brain, hormones and even 'immune system molecules

and stress-related chemicals in sweat' (Sternberg, 2009, pp251), explaining the signals that define our senses and perception of space (Sternberg, 2009, pp13).



**Figure 1:** Neuroscience and Architecture Collaboration

The first scientifically measured studies occurred in the 1980's when Roger Ulrich, Professor of Architecture at Chalmers University of Technology, explored how hospital architecture impacts patients (Maddox, 2014). Studying gallbladder surgery patients, he revealed average post-operation stays reduced by 18 hours when subjected to views of nature in comparison to those with views of walls (Ulrich, 1992, pp24). Similar results highlighted fewer health complications and need for pain reducing drugs (Ulrich, 1992, pp20). Ulrich advises against poor wayfinding, poor lighting, sensory deprivation and spaces void of facilitating social support due to their impact on stress, increased blood pressure and extended hospital stays (Ulrich, 1992, pp20). Expanding on research, Associate Chair of Psychiatry at Stanford University, David Spiegel, conducted a study whereby breast cancer patients participating in group therapy lived up to eighteen months longer than those who did not attend (Heathcote and Jencks, 2010, pp39). Whilst not being a comment on architectural impact, spaces for human interaction support, such as recreational zones, could act as a secondary form of healthcare alongside medicine.

The degree that architecture can directly influence patient healing is disputed; with hospital design being largely influenced by economic efficiency factors. Of 2000 articles submitted between 1999 to 2002 on health and architecture only 35 'stood up to scientific scrutiny' (From and Lundin, 2009, pp260-261). Referring to primary research results, 91 out of 93 survey participants stated that architecture and the design of spaces can support patient health and well-being, suggesting design is an important element of hospital planning.

Evidence-based design (EVB) is the most substantial research element between neuroscience and architecture. Originating from the USA during the 1980's, it continues 'to prove that stress-reducing factors, such as a reduced sound level and access to natural surroundings, aid the healing process' (From and Lundin, 2009, pp251). EVB provides architects with the knowledge to create healing

spaces that simultaneously accommodate high quality healthcare. EVB is not entirely patient focused; an increasing value is set on providing a positive workplace for staff to allow for efficient patient support (Bauer, 2014).

Hospitals are generally known to harbour stress. 'A stressor knocks you out of homeostatic balance, and the stress response is what your body does to re-establish homeostasis' (Sapolsky, 2004, pp7). The experience of waiting, busy staff schedules and noisy medical equipment are examples of common hospital stressors. With research revealing that stress affects our health thus slowing the physical healing process (Sternberg, 2009, pp226-227), reducing stress inducing factors has the potential to speed up rates of patient recovery. For instance, experiencing an unfamiliar environment can determine stress responses (Sternberg, 2009, pp99) and poses the idea that the stress of hospitals can be reduced from inception. In addition to providing a welcoming entrance, survey participants prioritised making hospitals easy to navigate, access to nature and control over their surroundings as methods of reducing stress.

### **Healing Architectural Features**

While scientific studies and EBD are still in relative early exploration, there are elements of the way a space is designed that is effective in having calming and restorative effects. Einstein stated that "there is nothing in the understanding which did not previously exist in the feeling" (From and Lundin, 2009, pp234), demonstrating that adopting a greater 'spiritual aesthetic which engenders hope, contentment and peace' (Haggard and Hosking, 1999, pp169), could form healing environments.

### **Hospital Entrances and Waiting Rooms**

Hospital entrances are the first impression the patient receives of the hospital experience. In web article, *Can Architecture Heal*, Mathiesen discusses 'crossing the harsh line that typically defines a hospital entrance' (Mathiesen, 2013). Due to our perception of spaces having the ability to produce nerve chemicals that negatively impact the immune system, and thus prevent us to heal efficiently (Sternberg, 2009, pp13), it is important that entrances are unthreatening. Commenting on Nord Architect's Centre for Cancer and Recovery, Mathiesen describes the glass entrance as a 'central hub' whereby other spaces are clearly visible (2013), forming a comforting aesthetic.

Hospitals typically provide waiting rooms for patients prior to appointment or treatment. As spaces with high use, where patients often spend a considerable duration of time waiting for a healthcare professional, it is identified as important to alter the potentially negative perception of care quality within the waiting room environment (Arneill and Devlin, 2002). In addition to aesthetics such as comfortable seating and the presence of artwork as visual distraction (Arneill and Devlin, 2002), a sense of flexibility and adaptability in the waiting room has the ability to allow the patient to divert attention away from the health concern (Arneill and Devlin, 2002).

### **Wayfinding and Navigation**

Poor wayfinding has been known to prohibit efficient application of staff hours, and incidentally the time attributed to patient healing. In one USA based study, '4,500 hours of clinical time a year' was

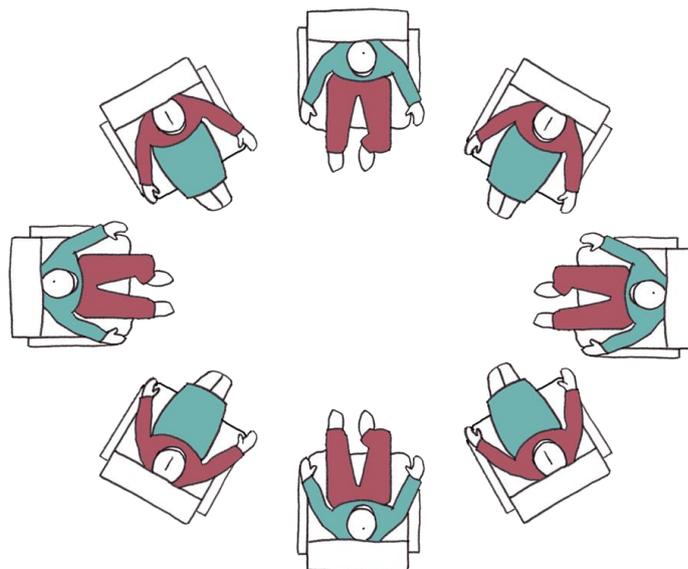
wasted (Maddox, 2014) as a result of staff giving directions. Represented commonly through signage, wayfinding can be attractively integrated in floor prints, colour injection and the manipulated form of space to channel users (Farr, 2015). Whilst vital that navigation permits ease of use, if hospitals can seek a balance between a diverse interior for exploration that maintains mental stimulation, with uncomplicated spaces that prioritise patient comfort, then the space will be more therapeutic (Maddox, 2014).

### Structure and Form

The structure and form of a space impacts both how we use it and our emotional interpretation. Regarding spatial typology, lower ceiling heights or in-wall 'niches' infer intimate spaces in contrast to large, open voids whose volume indicates a public purpose (From and Lundin, 2009, pp52). Breaking linear spaces by including curved forms, in walls or seating, has been linked to 'comfort and beauty' (Steemers, 2016). Exemplifying this aesthetic is Aberdeen's Maggie Centre for cancer patients, featuring a cutaway egg shaped exterior, described by Jencks as 'enveloping, comforting and cuddling' (Jencks, 2014). In consideration, form and structure is subjective therefore varying spatial form can be interpreted differently by each patient, and not necessarily have a positive impact.

### Social, Recreational and Group Therapy

The introduction of recreational and social zones for supporting both physical and mental health needed for recovery could appear as yoga and meditation spaces, gardens and art therapy rooms (Farr, 2015). These spaces are known to promote 'self-confidence which can lead to restorative effects' (Ivarsson, 2010, pp152-153). Jencks exemplifies this in his neologism, 'kitchenism' (Jencks, 2014), to term the centrally located kitchens native to Maggie Centres that become relatable, sociable and comforting. Delivering a similar impact are homely aesthetics, emerging architecturally as ceilings imitating the roof peaks or the exposure of roof trusses, evoking a sense of normality and avoiding 'institutionalisation' (From and Lundin, 2009, pp45).



**Figure 3** Group Therapy Concept

## **Views and Access to Nature**

The natural environment supports well-being of patients, with outdoor views providing 'stabilising points of reference' (Sternberg, 2009, pp128). The inclusion of courtyards and gardens, or large windows are methods of increasing the connection between indoor and outdoor environments, providing escapism. Professor of Landscape Architecture at the University of California, Clare Marcus, emphasises "Spending time interacting with nature in a well-designed garden won't cure your cancer or heal a badly burned leg. But there is good evidence it can reduce your levels of pain and stress—and, by doing that, boost your immune system in ways that allow your own body and other treatments to help you heal" (Franklin, 2012).

## **Materials**

Introducing outdoor elements through natural materials such as solid wood flooring and stone (From and Lundin, 2009, pp51) relates to the positive impact of nature on patients. Light diffusing materials, glass partitions and windows benefit hospitals by being hygienic materials that additionally provide a balance between seclusion and openness (From and Lundin, 2009, pp48). In further regards to materials, literal healthy and non-toxic options exist, such as 'carpets and paints that clean the air by collecting dust particles in their fabric structure' (Nickl and Nickl-Weller, 2013, pp157).

## **Art**

It is advised that hospital artwork be selected or commissioned with care (Heathcote and Jencks, 2010, pp29); art is subjective and emotional response varies depending on the viewer (Ulrich, 1992, pp25). Ulrich conducted several art based studies, finding that artwork theming 'therapeutic landscapes' (Evans, et al., 2009, pp716) left patients feeling happier and with increased concentration (Ulrich, 1992, pp25).

## **Colour**

The application of colour in hospitals is subjective and being significantly linked to mood and emotion (Lehman, N/D), colour sub-consciously influences how people use space and address stress. An experiment conducted at the Architectural Digest Home Design Show, NYC (2006), consisted of hosting a social event in three equal rooms (Sternberg, 2009, pp42). Each room adopted either red, blue or yellow paint; and attendees were monitored on variables such as heartrate and behaviour (Sternberg, 2009, pp42). Blue was perceived as the most soothing, whilst red and yellow were stimulating (Sternberg, 2009, pp42). The introduction of appropriate colour to hospital design could avoid the often clinical, neutral hospital aesthetic, and promote the sought after normality (From and Lundin, 2009, pp191).

## **The Indoor Environment**

Despite not being architectural factors, indoor environmental parameters influence the hospital experience. The most habitable spaces must provide patients with access to a sufficient amount of daylight (Steemers, 2016). Natural light has the power to 'banish claustrophobia and lighten mood' (Haggard and Hosking, 1999, pp98) and variable conditions should be available such as 'light that is

from above, the side, direct, diffused, adjustable by shutters, louvres and blinds' (Steemers, 2016). Poor, glaring or florescent artificial lighting, and over which the patient might have no control, has been identified as a stressor (Smith and Watkins, 2016).

### **Acoustics and Noise Reduction**

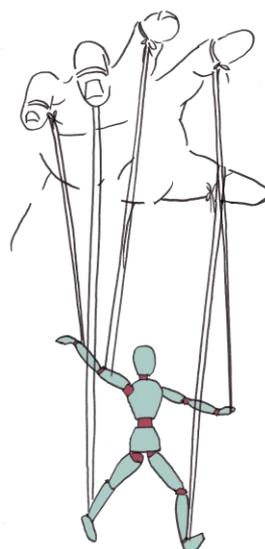
Acoustically, human traffic and medical equipment in a hospital environment contribute to loud noise levels. The WHO studied five UK intensive care units, discovering noise levels consistently exceeded the average of 35 dB (Darbyshire and Young, 2013). Excessive noise has a negative impact on stress levels and sleep needed to recover. Noise reduction approaches include acoustical treatment of walls and inclusion of materials such as soft furnishings and flooring in addition to adequate separation of patient and staff orientated zones (Smith and Watkins, 2016).

### **Ventilation and Temperature**

The optimisation of natural ventilation is a necessity in creating healthy buildings. Louvre instalments and ventilation techniques such as 'stack and cross' exemplify methods to exploit and sustain natural ventilation (Steemers, 2016). Material considerations could help retain warmth of certain spaces, such as social and familial zones, for instance heavyweight cushioning on seating areas for thermal absorption (Steemers, 2016).

### **Control and Independence**

A sense of control over indoor conditions, such as being able to adjust lighting, temperature, have outdoor access and involvement in social or recreational therapy seemingly offers a sense of importance to the patient and instils a caring environment. Lena Walther, Director of Planning at the Sahlgrenska University Hospital, claims a 'lack of independent control has proved to entail many negative effects, including depression, helplessness and impaired cognitive achievement capacity' (From and Lundin, 2009, p25), suggesting its potential to reduce patient recovery rates. While patient independence is beneficial, it is questionable as to the extent of control given.



**Figure 4:** Patient Control and Independence

## Problems and Prevention

It can be analysed that hospitals have evolved historically: being inspired by historical, religious and cultural precedents or as a result of centurial trends and societal transformation. Questionably, it suggests that hospital architecture has either failed to reach its optimum or the requirements of hospital architecture change too frequently for one architectural style to be sustained.

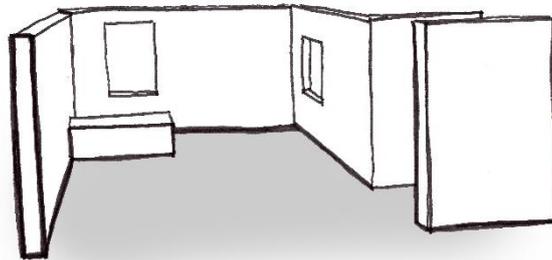
Post-opening, the cost of hospitals are more expensive than initial expenses (Nickl and Nickl-Weller, 2013, pp184). There is potential that provision and maintenance of healing features such as gardens and recreational spaces are viewed as an unnecessary investment, second to the proven capabilities of medicine alone. Regarding existing hospitals, the addition of healing features would be expensive and require departmental closure.

With the capabilities of medicinal advancement, practices aim to have the patient healed in the fastest possible time to accommodate new patients (Heathcote and Jencks, 2010, pp90). Due to the fact that 'change in the medical sector takes place at a particularly fast pace' (Nickl and Nickl-Weller, 2007, Foreword pp2) and the extensive timescale of hospital planning, it is possible that the design will need updating prior to physical completion. Despite now having greater knowledge on designing spaces that can assist healing, it is viewed as a time consuming and economical risk to build a hospital for an 'experiment simply to measure its effectiveness on health' (Sternberg, 2009, pp238). The modern hospital timescale is often 'five to ten years' (Maddox, 2014) and it is surfacing that hospitals ideally need to last three decades before demolition and re-design to suit societal needs (Nickl and Nickl-Weller, 2013, pp184).

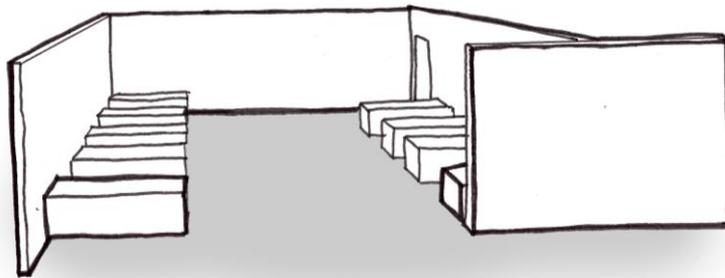
A problem surfaces when debating 'location and cultural constraints' of hospitals. Since the relationship between neuroscience and architecture there has been an increasing number of culturally sensitive and 'architecturally inventive, innovative, and elegant health buildings' globally, however they tend to be smaller, privatised organisations (Heathcote and Jencks, 2010, pp83). This poses the idea that the designs of such organisations is unlikely to transfer to a modern city hospital (Heathcote and Jencks, 2010, pp83), being more largely populated and consequently having a higher demands. It is challenging for healthcare architects to meet the needs of a variety of users, not only for staff, patients and visitors but on a personal, cultural, religious and health related level. In terms of the facilities provided, it is equally complex to 'consider design, art, medical science, logistics, technical equipment and building technology' (Nickl and Nickl-Weller, 2013, pp184).

Regarding the design layout of treatment areas, it is preferred that hospitals provide private patient rooms rather than wards, as indicated in primary research interviews with Kent based hospital patients. An interview with a Tunbridge Wells hospital patient highlighted that the use of a private room with bathroom facilities was more convenient in comparison to the ward layout the patient experienced at East Grinstead hospital. Multi-patient wards can contribute to increased stress, as exemplified with one patient of Maidstone hospital stating the experience of a 12 bed ward disturbed her rest due to increased noise. Due to many hospitals having high patient accommodation demands,

such as NHS hospitals, wards offer space and expense saving solutions, hindering the provision of private, therapeutic recovery spaces.



**Figure 5:** Single Patient Ward



**Figure 6:** Multi-patient Ward

## **Case Studies**

With an understanding of the historical progression of hospital architecture and how neuroscience is currently impacting the development of architectural features considered to assist healing, visits were made to three UK medical and health based sites. For their differing approach to healthcare, the sites analysed were Queens Medical Centre, Nottingham which is a large NHS hospital; Burrswood Christian Hospital, Tunbridge Wells, which provides holistic care to its patients; and West London's Maggie Centre adjacent to Charing Cross Hospital, offering cancer patients with palliative care and emotional support. Comparisons were made on sense of place, architecture, interior and spatial experience, in order to evaluate their effectiveness as environments for healing.

### **Queens Medical Centre – Nottingham NHS**

Open to the public in 1977, Queens Medical Centre (QMC) is one of the biggest hospital complexes in the UK (Swift, N/D). Due to its large scale, the site was complicated to navigate: wayfinding signage is misleading and the car parks and sub-roads necessary to access different departments provide a negative setting.

The interior adopts a dated aesthetic; users were standing waiting in clusters near the reception desk due to lack of seating, and the lino flooring reflected harsh lighting. Colour injection as wayfinding is applied to the floor and walls, however it did not brighten the atmosphere and the warm temperature gave the impression of poor air quality. Patients waiting in beds were positioned against corridor walls; overcrowding circulation spaces.



**Figure 7:** QMC Interior



**Figure 8:** QMC Exterior

In contrast the Nottingham NHS Treatment Centre on site, also providing surgical procedures and treatment, offers an opposing experience. Natural materials and plants are dispersed throughout the large central atrium, which reveals alternative spaces to sit and treatment rooms. Despite its openness, noise levels were significantly less than in QMC and users appeared less stressed, presumably due to the absence of narrow corridors and impression that spaces were not restricted. The ceiling features large wooden beams and diffused glass, exploiting the natural light. This modern building exemplifies that hospitals can provide architectural features that form a therapeutic environment, despite the stressful nature of treatment.



**Figure 9:** NHS Treatment Centre Interior



**Figure 10:** NHS Treatment Centre Exterior

## **Burrswood Christian Hospital – Tunbridge Wells, Kent**

Burrswood Hospital provides patients with 'intensive rehabilitation, respite care and post-operative care' in addition to a variety of therapy services. The approach to care is holistic, focusing on the unity of the 'mind, body and spirit' (Burrswood Hospital, N/D). Built in 1834 as a country house (Bowden-Pickstock, 2009, pp111), it was improved in the mid-20<sup>th</sup> century by 'modern-day Christian saint', Dorothy Kerin and turned into a healing centre (Burrswood Hospital, N/D). Burrswood is a charity and Anglican organisation (Bowden-Pickstock, 2009, pp112), evident in architecture through the main hospital being flanked by the original chapel and a church.

A long drive surrounded by trees and a lake to one side forms the approach to Burrswood, which in itself is therapeutic. The reception visualises its original country house function rather than that of a typical institutional hospital, and patients are greeted by a receptionist waiting behind a wooden desk. Burrswood employee, Angie Yeoman, states that 'it is like working in one big home', describing its design as homely and unique. In this sense, it is similar to the design motives of Maggie's West London, however its antiquated aesthetic is likely to be better suited to older generations. Patient's admiration for the hospital is largely due to its natural setting; with one patient stating that the glass façade separating the hydrotherapy pool from the countryside grounds had calming and rehabilitative impact.



**Figure 11:** Burrswood Building and Landscape



**Figure 12:** Burrswood Interior

## **Maggie's West London – Charing Cross Hospital, London**

Maggie's West London is described as 'by far the most urban of centres' (Heathcote and Jencks, 2010, pp136). The approach through Fulham Palace Road is a busy commercial and residential road, however the site, which is situated to the left of Charing Cross Hospital's entrance, is semi-concealed by trees. The metallic roof hovers over the bright orange building and has protective, comforting connotations.

Signature to Maggie Centres, the building revolves around a central kitchen as a social hub and familiar point of reference. Patients and family openly used the large wooden kitchen table and

facilities surrounding it, giving the space a friendly and comforting ambience. The domesticated aesthetic is further instilled through the use of natural materials of light washed wood and stone, partnered with warm, patterned furnishings and varied comforting textures. The spaces are undoubtedly modern, but avoid the clinical aesthetic known to many late 20<sup>th</sup> and early 21<sup>st</sup> Century establishments.

It is noticeable that spaces seamlessly flow and are an open sequence of private and public space, with light-filled open voids leading into smaller and private niches. Compensating for its stressful city location, the use of glass planes sectioning off planted courtyards and a calming roof garden allows the rehabilitative impact of nature to reach the users; an element absent in QMC.



**Figure 13:** Maggie's West London Interior



**Figure 14:** Maggie's West London Exterior

## **Patient Experience Survey and Interview Analysis**

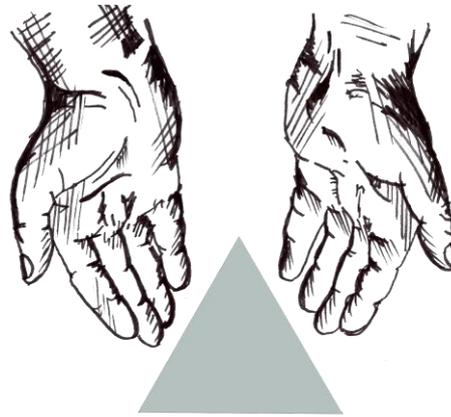
With the majority of people having directly used or visited a hospital, questions as to the relevance of hospital architecture on patient recovery can be drawn from opinion and emotional experience, without need to consistently refer to scientific justification. In conducting a public survey of 93 participants in addition to 6 interviews with hospital patients, an overview of the conditions and reasons for architectural and environmental failures and improvements can be analysed.

While it is understood that not all participants have an applicable understanding of architecture and design, and therefore impacting the nature of in-depth results, only 2 participants claimed that architecture and design could not support patient well-being and 40% of participants claim it was vital to recovery. With the opportunity for critical comment and descriptive responses, the four most common requirements for hospitals to improve patient experience was to: provide a welcoming entrance; make the space easy to navigate; provide easy access to and views of the outdoors and to allow users to have more control over their surroundings.

Contrastingly, referring to hospital patient interviews, 2 patients stated that their surroundings had little impact on their emotional state or recovery, adding the wards were 'basic and minimal' (Finch, K., 2017). In indicating that a hospital environment can provide a neutral experience which neither accelerates nor hinders a patient's recovery, this poses a question whether an improvement of these spaces is necessary to be made.

## Conclusion

'Medical care cannot be separated from the buildings in which it is delivered. The quality of space in such buildings affects the outcome of medical care, and architectural design is thus an important part of the healing process' (Boubekri, 2008, pp6).



**Figure 15:** Holistic 'Mind, Body and Spirit' Triangle

Referring to the insufficient documentation of past hospitals as healing environments and the majority being unsuitable for modern societies, the historical approach that can be applied to modern hospitals is holistic healthcare: aiding the mind, body and spirit through a positive and health-encouraging built environment.

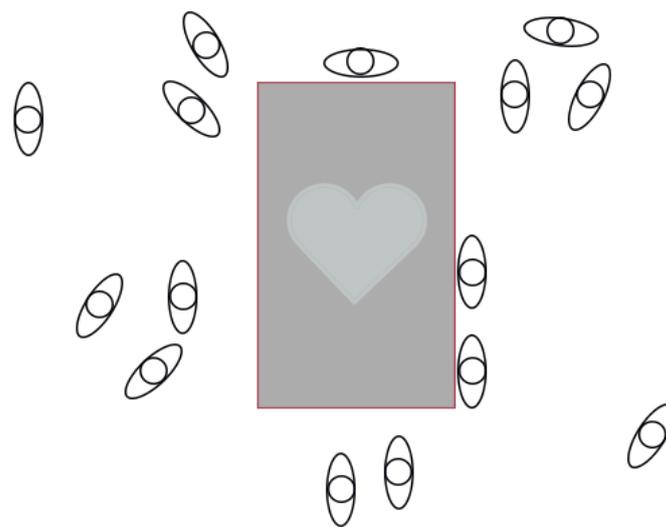
With 48% of survey participants stating they felt worse within an environment that is intended to have the opposite effect, it highlights a concern for hospital architecture and patient experience. The neuroscience and architecture unification is gradually improving the understanding of how architecture can form healing environments by justifying the long term benefits of healing architectural features during the planning phase, over initial expenses. As exemplified in the contrast between QMC and smaller establishments such as the Burrswood Hospital, it is possible for hospitals to be 'poised between pragmatic and artistic architecture' (Nickl and Nickl-Weller, 2013, pp161) and to 'embrace the patient, family, and caregivers in a psycho-socially supportive therapeutic environment' (Smith and Watkins, 2016). However, challenges arise in implementing healing spaces in existing hospitals, due to expenses and implications of facility closure and phased works.

A hospital environment, where one goes to recover from illness or injury, can, ironically, become an environmental stressor. Understanding that stress can have negative impacts on the stability of our immune system, slowing healing, it is important that hospitals reduce stress. Eradicating hospital stigma and stress can begin with a welcoming landscape and entrance, along with easy, innovative wayfinding to contribute to a therapeutic experience. Supporting Ulrich's studies on the rehabilitative

impact of nature, it was emphasised within primary research investigations with 80% of survey participants stating both views and access to nature would aid recovery and reduce stress.

The most important architectural elements for future healthcare architects and investors to consider are 'adding features that enhance comfort and take into account the spiritual and social aspects of the patient's life' (Sternberg, 2009, pp239). Homeliness as an aesthetic deinstitutionalises hospital interiors and reduces environmental stressors through the fostering of normality and familiarity. Furthermore, the provision of a central, communal 'heart' acting as a core for social, familial and recreational activities, combined with access to smaller private spaces, would more easily accommodate spiritual and emotional uplift and the support necessary to recover. Referring to the ideology of designing hospitals that are not impersonal, it has been confirmed that a level of control over ones surroundings, such as lighting, ventilation and temperature, would assist healing.

Fundamentally, the adaptability of hospitals is becoming a necessity, however it can be argued that there is a subsequent loss of characterful, healing spaces in the process. Whilst it is accepted that architecture and design is subjective, the reintroduction of consideration of the patient experience can provide modern hospitals that 'breaks with past typology', such as modernist hospital institutions, and thus 'form its own individual picture' (Nickl and Nickl-Weller, 2007, Foreword pp3).



**Figure 16:** Maggie's Kitchen 'Heart' Concept

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