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'Thoughtful' Design and Healthcare- Comparative Case Studies of Medical Facilities built 146 years apart

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Abstract: Health and well-being have a very direct relationship. The purpose of this research is to understand the impact of design of the healthcare facility to the recovery of those inside it. The most apparent differences between healthcare facilities built with human-centric approaches and those built with a broader or more 'number-centric' approach, is found when the exemplar facilities being compared, belong to different eras. For this research, the first facility chosen is one built during war- a promptly designed and promptly set-up hospital where patients were mostly nameless, faceless soldiers considered most important for numbers in the army- and the second, a hospital of the twenty-first century, one built involving residents, psychology, nature and aesthetics. This research compares the buildings on various architectural as well as general factors, including ideology, humanity of approach, design, materials, construction techniques, context and setting, aesthetics, socio-cultural parameters, morals and overall medical treatment merits. It concludes with an analysis of the similarities and differences of the two approaches, the changing requirements of a post-pandemic world, and what the latest definition of "future-ready" means for healthcare infrastructure.

Keywords: healthcare architecture; thoughtful design; hospitals of the past; future-ready healthcare; wellbeing design

1. Introduction

The purpose of this paper is to analyse the similarities and differences of exemplar buildings of healthcare infrastructure from two extremely different time periods. The first facility is the British Barracks Hospital at Renkioi, Turkey, the world's first prefabricated hospital made of wooden units built in 1855 by engineer Isambard Brunel. The second is the 300-bedded Katta Public General Hospital in Miyagi, Japan, a designated disaster response centre built in 2002 through a participatory planning process involving local residents, incorporating nature, and complementing the mountainous context. The stakeholders, time periods, treatment approaches, and even patient bases of both the buildings vary, but their primary purpose is the same- to impart healthcare to the sick and to bring them back to health. While the hospital at Renkioi was built especially as a military hospital to treat the British troops during the Crimean war and as a response to the spectacular failures of army hospitals such as the converted British Barracks in Scutari, the Katta Public General Hospital is an open-for-all public hospital built to serve the masses. The first belongs to the Nightingale Period and the second belongs to the Postmodern Period. The major references used in the essay shall be *Innovations in Hospital Architecture* (Stephen Verderber); *The Pavilion Hospital: A Designed Plan*, A History of Hospital Ward Design (Thompson Goldinn); *Florence Nightingale: Statistics to Save Lives*, International Journal of Statistics and Probability, (Lynn McDonald); *Renkioi: Brunel's Forgotten Crimean*

War Hospital, (Christopher Silver) and *Sustainable Healthcare Architecture*, John Wiley and Sons (Guenther, Robin, Vittori, Gail)

2. Theories and Methods

The paper weighs the buildings equally on various architectural as well as general factors, including ideology, humanity of approach, design, materials, construction techniques, context and setting, aesthetics, socio-cultural parameters, morals, and overall medical treatment merits.

3. Historical Overview

The field of healthcare has seen many advancements throughout the centuries, and healthcare architecture has evolved with it. The concept of hospitals was once unknown and the sick stayed either in the physician's house or the temple while they recovered or, in most cases, left for their eternal abode. Until the 6th and 5th centuries BC, healing was rooted mostly in religion and magic, and Asclepius, around the 7th or 6th century BC, became the representation of the new generation of medicine. The cult of Asclepius and the Temples of Healing were the ancestors of the modern hospital. "According to Pliny...Hippocrates was himself an Asclepiad, a member of the hereditary priesthood, and, Hippocrates was said to have been 'the first to separate medicine from philosophy', thereby creating rational medicine at Cos." (Loudon, 2005) Healing temples soon turned into dedicated hospitals, and by the ninth century, patients had their own small rooms or lived in general sick wards. However, the conditions of the hospitals were far from ideal. Eighteenth century Paris hospitals, for example, were associated with unhygienic conditions, poor sanitation facilities and high mortality rates. Hotel Dieu, the largest of Parisian hospitals and the only hospital to exist in the city until the Renaissance period, had 1200 beds and housed over 3500 patients with multiple patients on single beds, pregnant women giving birth on shared beds, and a mortality rate of approximately 25%. In military hospitals, the injured soldiers who took respite in the cold and unattended barns often recovered while the ones who went to the army hospitals could hardly make it out of there alive. At the British Barracks at Scutari, converted into a hospital during the Crimean war, "The building was dilapidated and filthy, walls running with water, a central courtyard a sea of mud, cavalry horses kept in the same building as the men." ("Scutari" 2020)

4. Comparison

When Florence Nightingale reached the makeshift British Barracks hospital at Scutari, she was shocked to see the filthy and unhygienic conditions of the hospital. With a death rate of around 42%, more patients died in the hospital because of infections such as cholera, dysentery, typhoid, and malaria, contracted after being admitted to the hospital, than injuries or their original illnesses. The building was highly inadequate and failed to cope with the needs of the sick and injured soldiers who were admitted there in thousands. Florence Nightingale reached there in 1854, and the deplorable condition of the hospital inspired her to strive for the betterment of healthcare infrastructure. Her plea to The Times newspaper prompted the development of this offsite, prefabricated hospital, headed by Isambard Brunel.

An English civil engineer, Isambard Kingdom Brunel was invited In February 1855 by the Permanent Under Secretary at the War Office, also Brunel's brother in law, Sir Benjamin Hawes, to design a pre-fabricated hospital for use in the Crimean war, that could be manufactured in Britain and dispatched for prompt assembly a site that hadn't been chosen by the time. Brunel took six days to complete the design of a 1,000 patient hospital complete with sanitation, ventilation, drainage and even a heating system. The structure was shipped in a timber kit format. It was on-site in May 1856 and ready to intake patients by July of the same year.

Brunel originally planned a unit ward to house 50 patients, 90 feet long by 40 feet wide, split into two hospital wards. The plan incorporated provisions for hygiene, sanitation, ventilation, drainage, and basic temperature adjustments. These were then integrated within a 1,000-patient hospital layout, using 60 of the planned unit wards. It served exclusively as a military hospital and its socio-politico-cultural context was the Crimean War. Each patient in the hospital was a crucial soldier for the army, and more emphasis was laid on the wellness of the numbers, the faceless soldiers, than on any individual admitted there.

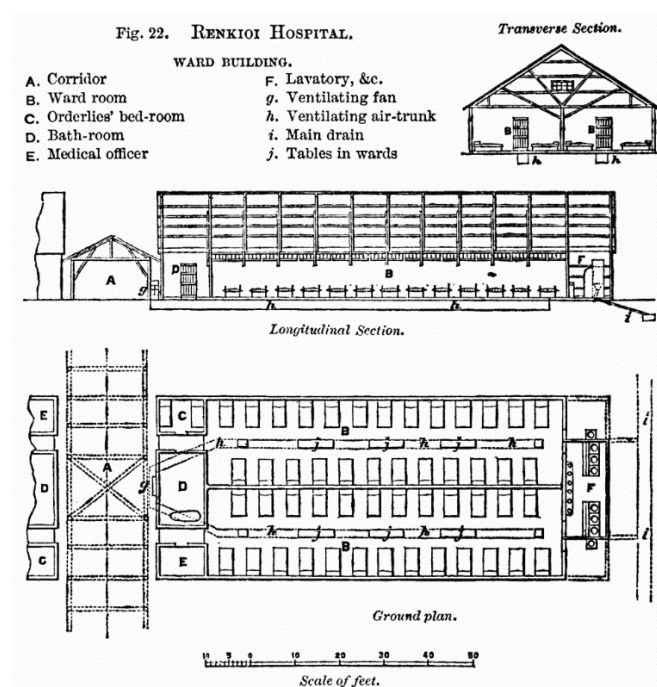


Figure 1 Plan and Sections of the Renkioi Hospital; Source: <http://www.modularize.co.uk/so-you-think-youre-innovative/>

In contrast, Katta Public General Hospital, built by Taro Ashihara Architects and completed in 2002, has a capacity of 300 inpatient beds and is built over 22 acres. It was built in three levels with a rectangular configuration measuring 120 metres by 160 metres in plan. A general hospital's socio-cultural setting is that of a hospital open to the public, based in a small city with a little over 33,000 residents, built with extreme emphasis on the overall health and wellness of each patient.

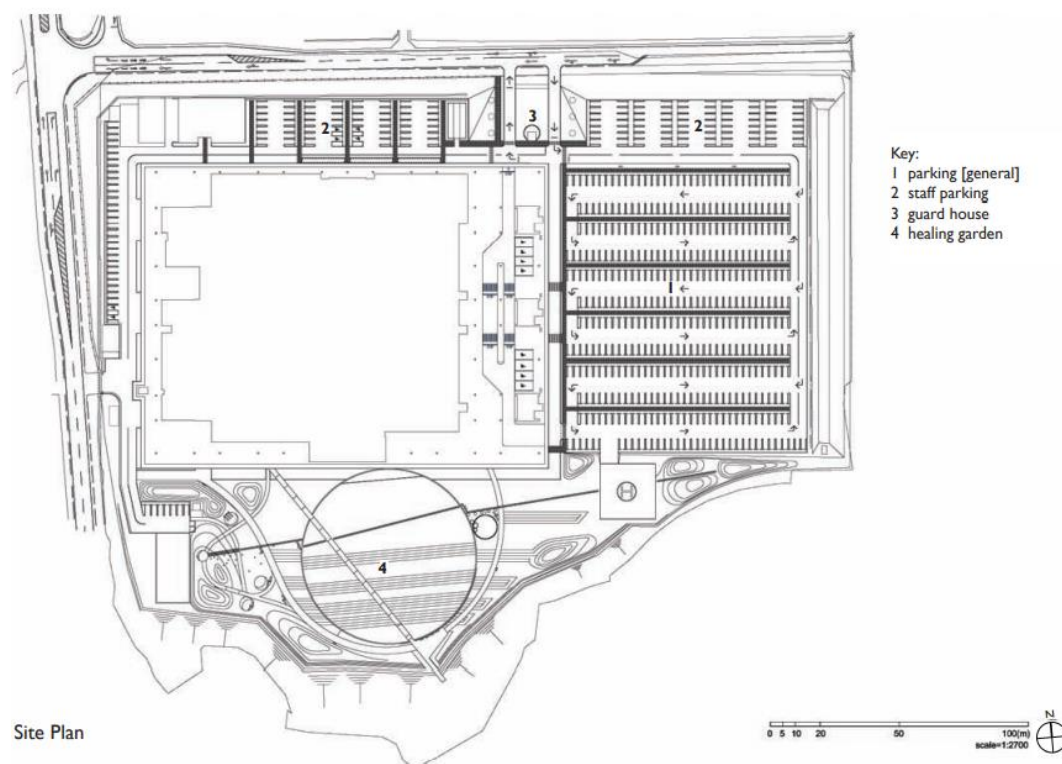


Figure 2 Plan of Katta Public General Hospital, Miyagi, Japan

Though Renkioi Hospital tried to incorporate fresh air and natural light by allowing them in through high windows, it being a primarily wooden complex, is beaten in transparency and lightness by Katta Public General Hospital, which incorporates traditional Japanese concepts *Shakei* and *Kiritori* to maximise the occupants' views of the nearby mountains and the pristine landscape.

Due to the extraordinary pressure to serve cheaply and efficiently, the design of the Renkioi Hospital had to be economical, efficient, easy to construct and supervise, and able to treat a large number of patients in hygienic conditions. The site of the hospital at Renkioi was chosen for its gradual seaward slope, closeness to the sea for transport and sewage disposal facilities, and sandy and porous soil, and each part, made of the lightest and cheapest wood, required only two men to carry it. The nearby springs ensured that pumping water was not required, and segregated barracks ensured the isolation of different kinds of diseases. Aesthetics were not a priority for the self-sufficient military hospital that arrived from England to Turkey in parts, and the wood was covered with very thin polished tin for heat insulation.

On the other hand, Katta Hospital, built in the mountainous context of Shairoshi City, had the luxury of using an earthquake-resistant foundation system with underground shock-absorbent piers, outward cantilevered second and third levels, steel structural systems, and materials of good quality, including stainless steel, aluminium, stone, glazing on exterior walls, and laminated interior finishes. Functional as well as aesthetic features such as skylights, double-heighted areas, floor graphics for wayfinding, roof gardens, courtyards, and outdoor seating areas with views of the mountains have been generously provided.



Figure 3- Renkioi Hospital 1856; Source: https://www.ssgreatbritain.org/sites/default/files/getty_museum_british_hospital_at_renkioi_1856.jpg



Figure 4: A view of the Katta Public General Hospital, Japan; Stephen Verderber, *Innovations in Hospital Architecture* (New York: Routledge, 2010), pp. 190

4. Results

While one similarity between the two hospitals is the horizontality of their forms, the strictly need-based structures of the huts at Renkioi is starkly contrasted by the contemporary structures of the Katta Hospital. On one hand, the Renkioi Hospital housed only the non-negotiable and important areas, including patient wards, nurses' homes, laundry areas, pharmacies, kitchen, officer's quarters and a mortuary, the Katta Hospital additionally houses, among other areas, recreation areas, meditation centers, gift shops and landscaped gardens.



Figure 5 Inside ward no. 5 at Renkioi Hospital; Source: https://www.ssgreatbritain.org/sites/default/files/getty_museum_ward_no_5_at_renkioi_1855.jpg

Natural elements are more abundantly used in Katta Hospital, and it also has an upper hand in the aspect of privacy, with individual rooms and shared semi-private terraces for recreation and interaction with other patients, as contrasted to the common general patient ward at Renkioi. Its rectangular plan also allows for grid planning, and multiple levels provide for better segregation of spaces, including the isolation of outpatients, inpatients, staff, visitors, and specialized areas such as surgical suites. Both hospitals were built to efficiently utilise the resources naturally abundant in their areas, and both feature various elements of passive heating and cooling. While Renkioi Hospital has the advantage of low environmental impact due to its time, Katta Hospital features a multitude of green areas and provisions for capturing and recycling rainwater for an on-site irrigation system.

5. Conclusions

The two hospitals, with their similar primary objective of imparting healthcare to the sick, differ greatly due to their specific requirements, their contexts, and their basic purposes of existence. Even with their differences, including their placements in what can be called completely opposite environments, both are highly successful in providing medical care to the sick and injured. The evolution of healthcare architecture makes itself evident while comparing the two buildings, and a highly holistic approach paired with technological advancements makes the hospitals of the post-modern era unlike any other in history.

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