The Effects of Local Factors on British Hospital Design in Colonial India: The Case of a European General Hospital

Intisar Ameen Tyne 1; Mahbub Rashid 2

ABSTRACT

Research aim: Using the spatial analysis techniques of space syntax, this study describes local influences on European hospital design in Colonial India.

Significance: This study sheds new light on how local factors related to healthcare might have impacted the British colonial hospital design in India.

Methods: Two plans of one European general hospital in Colonial India are compared – one was the competition winning project designed by architect H. St. Clair Wilkin; and the other project, marked second in the merit list, was designed by architect T. Roger Smith. For the study, the connectivity of various categories of spaces including doctor’s areas, custodian’s areas, wards or inpatient areas, surgery units, apothecary, corridors and toilets of these two design proposals are compared to find out if anyone of these two designs reflected local factors better than the other by controlling movement in and outside the hospital building.

Findings: Although Wilkins won the first prize, he did not consider local factors as our connectivity analysis indicates. In contrast, as indicated by our analysis, Smith’s design considered local factors and was later built. In Wilkin’s plan, direct connections to various spaces from outside were provided except pharmacists’ and custodians’ areas, which were connected to other areas using internal corridors. In Roger Smith’s plan, while internal corridors were avoided between pharmacists’ and custodians’ areas, direct connections to various spaces from outside were provided. As result, the internal connectivity of pharmacist’s and custodians’ areas decreased, while the overall connectivity of the hospital increased in Smith’s plan; indicating that this plan controlled internal movement within the hospital better than the other plan did. In Wilkin’s plan, inpatient units were distributed on the first and second floors. In Smith’s plan, inpatient units were placed on the first floor only. Consequently, the connectivity of the inpatient units in the plan increased, facilitating internal movement among these units while ensuring more privacy. In Smith’s plan, surgery unit was less connected than it was in Roger’s plan, improving safety and reducing harmful environmental concerns related to movement.

Conclusion: Although Wilkin’s design took the first place in the merit list it was not built. Smith’s design was responsive to factors such as reducing internal connectivity of spaces to ensure privacy for the European patients;
providing direct outdoor entrance for local customers using apothecary; not providing local custodians direct access to different internal spaces; and providing more protected surgery area.

KEYWORDS

Colonial India, hospital design, local influence, connectivity, accessibility

1. INTRODUCTION

In colonial India, the Europeans maintained their own separate institutions. (Chopra, 2011, p. 119) Therefore, it is not surprising that European and Indian patients were treated in different hospitals. European patients were treated in ‘European hospitals’ while Indian patients were treated in ‘Native hospitals’. This paper will study the influence of local factors on the design of one European general hospital in Bombay. This hospital was used for treating European patients only, who were staying in India. Although the patients and doctors were European, interestingly, the medical officers, custodians and hospital maintenance staff of the hospital were native people (William Robert Cornish, n.d., p. 51-55)

We should note that, the design of the general hospital we study here was selected from a set of competition entries. These entries, as it would in any design competition, were designed based on the same cost, design and functional requirements. As shown in Figure: 2 & 3, both hospital design proposals had a corridor-type plan; and had similar formal or stylistic expressions. Although Clair Wilkin’s design won the first prize in the competition, it was Roger Smith’s design which was eventually built. We should also note that, in addition to being placed first in the competition, Wilkins was also a more experienced designer than Smith. Therefore, one wonders, why was Smith’s design selected over Wilkin’s design?

In order to answer the question, we compare the connectivity patterns of the spaces of the two proposals. During the colonial period, it was common to design hospitals in India based on British hospital models. Therefore, this paper will study how a British general hospital model might have been modified differently in response to local factors in the two proposals we compare. We assume that Smith’s design was a better response to local factors than Wilkin’s plan design was. Therefore, Smith’s design was selected for construction, even though it was placed second as a competition entry, only behind Wilkin’s.
2. DATASETS AND METHODS:

2.1 CONTEXT

The Government of Bombay arranged a design competition for the European General Hospital, Bombay, in 1863. Seventeen designers from England and India took part in this competition. (Chopra, 2011) Among all the entries, British designer Captain H. St. Clair Wilkin won the competition and his design was marked as ‘Honor alitartes’. Although Wilkin’s design was first in the merit list, his project was never built. The second proposal on the merit list was designed by architect T. Roger Smith and was marked as ‘Koh-i-noor’. Later, the committee decided to use Smith’s design with some modifications for the construction of European General Hospital (“The builder: Illustrated weekly magazine,” 1864,p.809). In 1864, Smith came to India for the construction of this hospital. (“Smith, Thomas Roger (1830–1903), architect | Oxford Dictionary of National Biography,” n.d.) Even though Wilkin’s design was never built, this paper will examine his design to identify how the European architects perceived an ideal hospital model in India and compare his proposed design with the built project designed by Smith.

The first prize winner, Captain H. St. Clair Wilkin was an army officer in British army. He was also in charge of the Royal Engineers and worked in difficult terrains where high engineering skills were needed. In Colonial India, architect Wilkin was also employed by the ‘Public Works Department’ in architectural and engineering section. His designs were outstanding for their fitness and beauty. (“Wilkins, Henry St Clair (1828–1896), army officer | Oxford Dictionary of National Biography,” n.d.) Architect Wilkin was a gifted soldier as well as a talented draughtsman and artist. He designed the Government and Public Works Secretariats of Colonial India in 1868. (Maclean, 1875) On the other hand, Smith was a practicing architect and academician in University College, London. His built projects included college, church, hospital, school, warehouse and residence. In 1851, he became a member of the Architectural Association in London. He became the district surveyor under the Metropolitan Board of Works in 1899, and the chairman of Statutory Board of Examination in 1874. Architect Roger Smith was a researcher with many publications. His major work areas were architecture and acoustics, Gothic, Renaissance, Classic and early Christian architecture. (“Smith, Thomas Roger (1830–1903), architect | Oxford Dictionary of National Biography,” n.d.)
2.2 CASE STUDY:

St. Clair Wilkin’s proposed plan was a three storied building with two entry porches, on the east and west side. The ground floor of this building was mostly designed for administrative use, doctors, apothecary and for the accommodation of hospital staff. The inpatients’ areas were distributed among all three levels of this hospital. A small women’s ward marked as ‘Women with doubtful characters’, occupied the right wing of ground floor along with a private room and a receiving room. This ward was tucked between the receiving room and the matron’s room. To observe the female patients with doubtful character and to keep the area at a safe distance from the men’s zone, this ward was placed on the ground floor (Chopra, 2011,p.132) (Figure 02). First floor contained the ‘ward’ or inpatient’s areas for naval seamen, merchants and female patients in both left and right wings. Military patient’s units and poor patient’s units were on the second floor along with two private suits (Figure 02). Surgery unit was in the second floor at the right wing, beside the main stair. Custodians’ spaces were distributed as needed. The matron’s room was on the ground floor and two warrant officers were housed on the second-floor (Figure 02).

The hospital plan was simple with a central staircase and two projecting wings, one on each side of the stair case. The central staircase divided the hospital symmetrically. According to the plan, the hospital was a corridor type building. Toilets and staircases were placed at the end of each wing. In both wings, a single row of rooms was arranged with a corridor on one side and a semi covered verandah on the other side. Probably both the verandah and the corridor were intended to use as the main circulation spaces of the hospital.
T. Roger Smith’s hospital was a two storied building with a single centrally located entrance. Oriented in the east-west direction, the building had two wings, one on each side of the entrance. The ground floor of the building was designed as a public zone and the first floor as a private zone. The ground floor of this building contained rooms for administrative use, doctors, apothecary and hospital staff accommodation. Inpatients areas were located on the second floor of the hospital building. A small women’s ward marked as ‘Women with doubtful characters’ was located on the ground floor (Figure 03), next to the matron room. This provision allowed the matron
to easily observe the patients with doubtful character and also helped to keep these patients at a safe distance from the men’s wards (Chopra, 2011,p.132). All private wards or inpatients areas, private rooms for patients, and operating rooms were placed on the second floor of the hospital building. According to the plan, the built hospital was a corridor type building. Toilets and staircases were placed at the end of each wing. Although Wilkin’s and Roger’s designed hospitals had some similarities, their internal layouts were different.

Figure 3: Plan of European General Hospital, 1864. Source: *The builder: Illustrated weekly magazine*. (1864). York Street, Covent Garden, W.C.
2.3 RESEARCH QUESTION

This study will assess the reasons behind the selection process of the European General Hospital designed by Roger Smith and will also evaluate the reason for disregarding Wilkin’s design. In this regards the research asked the following questions:

1. Which design was modified according to the need of Indian context?
2. What were the main differences in the connectivity patterns of the spaces among these two designs?
3. What were the factors Roger Smith considered that Clair Wilkin eliminated?

2.4 METHODS

To understand the suitability of both designs in Indian context, it is necessary to explore the way spaces were used in Indian hospitals is necessary. Therefore firstly, the paper will compare both of the designs in terms of the allocation of space for various functions. Secondly, to understand the difference in the connectivity patterns of the spaces, spatial analysis will be helpful. In order to understand the spatial relations, space syntax techniques will be used to identify accessibility patterns based on the sequence of spaces, the linkage of spaces and space depth. These techniques will be discussed later in this paper.

2.5 UNDERSTANDING THE USE OF SPACES IN INDIAN CONTEXT:

Both case studies were designed as a European General Hospital in Bombay in 1864. This section will categorize spaces according to similar use pattern, will provide definition of these spaces, explain the use pattern of
different spaces and discuss about the users of those spaces in order to orient the readers about the use of spaces in Indian context.

2.5.1 DOCTORS’ AREA: For this paper, spaces allocated for surgeons and apprentices are grouped as doctors’ area. According to the practice of traditional medical systems like Unani and Ayurveda trainees were known as apprentices. Similar designations were found in Colonial India. (SUJATH & ABRAHAM, n.d., p.38) Both case studies, included multiple office spaces and bedrooms for surgeons and apprentices. The plans show that a few of doctors and their families might have lived inside the hospital. Additionally, we can assume that as the hospital was designed for the European patients, the selected doctors were also European doctors (William Robert Cornish, 1870, p.51-55).

2.5.2 CUSTODIANS’ AREA: In this paper, spaces for hospital stewards (attendant / organizer), matrons (a married woman, especially a dignified and sober middle-aged one / a female prison officer) and warrant officers are grouped as custodian’s area. All of the mentioned staffs were the caretakers or superintendents of the hospital; therefore, they are categorized as custodians. To provide the hospital services, native custodians needed to provide around the clock services and had access to European patients’ private spaces (BEATTIE, M., 2003, p.7). Among them, matrons were responsible for day-to-day administration and inspection of registered women in their hospitals if needed. (Hodges, 2005, p.384) Warrant officers were officers with arrest warrant and probably they were placed inside the hospital to look after the patients from military, navy or other governmental offices. Stewards were introduced as an authorized employ in England during 1776. Although at first, they had the responsibilities of collecting blankets, pillows, bed sheets, gardening etc., during the World Wars, stewards also worked as orderlies, attendants, ward masters, cooks, laundresses, matrons, guards and assistant of the surgeons. (William T., 2013) In Colonial India usually, native people occupied these custodian’s posts as they were not encouraged or allowed in the higher ranked government posts (Ernst, 2013, p.01). Therefore, it was impossible to avoid the presence of native custodians inside the hospital, because they cleaned the hospital, cooked for the patients, maintained patient wards, and attended many other chores around the clock. Since their presence might have negatively affected European patients’ privacy, it would become an interesting problem to solve in European hospitals in colonial India.

2.5.3 WARD OR INPATIENTS’ UNIT: In England, a room in a hospital where patients with similar needs get care together under the hospital staff is called hospital ward. According to the British definition, a patient will be under the title of inpatient if he/she occupies the hospital bed for at least one night. In his proposal for the European General Hospital, Wilkins used gender and professional ranking as the basis of patients’ ward categorization. He provided separate wards for male and female patients as well as provided separate wards for seamen, merchants, navel seamen, military and paupers. In contrast, Smith categorized the hospital wards based on genders only. This study will use the word ‘ward’ as denoted by both the designers.

2.5.4 SURGERY UNITS: The way people perceived diseases and performed surgery changed over time. Along with the changes in perception, the practice and spatial model of surgery also changed. There was a time when surgery units were designed as theaters and were known as operation theaters. Surgery units were known as surgery
suites, when surgery units were a part of a larger collection of rooms. When the environment of a surgical unit became more controlled, they were named as operation rooms. (ADAMS & SCHLICH, 2006) Both Wilkins and Smith designated a room for operating patients and used the word surgery to denote that room. None of the plans show evidence of a theater or suite like space arrangement. According to the drawings the space was probably treated as single operation room.

2.5.5 SPACE FOR SELLING DRUGS: From the beginning of 17th century to the middle of 19th century the term apothecary was commonly used in Great Britain. Pharma was a space for the production and supply of drug prescribed by the physician. The space for apothecary was different than a pharmacy as apothecary needed room for the production and an area for a person who would provide treatment (Burnby, 1983). Moreover, apothecary was also allowed to provide treatment, health advices and suggest medicines to the patients. The middle and lower class of the society relied on the apothecary for treatment, as they provided low cost treatment, advice and medicines. As a result, apothecaries serving the native Indian population might have affected the privacy, cleanliness, and noise level of hospitals. Both Wilkins and Smith provided spaces for one pharmacist and one assistant in their proposals and marked the space as apothecary. According to their plans, the apothecary included bedrooms, and remained open at night. By following their way of demarcation, in this paper pharmacy will be addressed as apothecary.

2.6 ANALYSIS:

2.6.1 ACCESSIBILITY ANALYSIS USING INTEGRATION VALUES

For evaluating accessibility, both Wilkin’s and Roger Smith’s hospital plans were analyzed with the A-graph software. A-graph is a computer software that uses the technique of the justified- or j-graph of space syntax (also called the depth map), described in Hiller and Hanson (1984) and Hillier (1996). Readers may wish to consult Dovey (2014 [1999]), Markus (1993), and Steadman (2014) for some elaborate applications of this technique in the analysis of building layouts. This technique helps to understand, how many steps are needed to access a space from a selected space also known as the ‘root’ or, to put another way, the level of permeability of a space from the ‘root’. J-graph also shows the route to enter a space, the complexity of that route, and shows alternate routes to access a space (Hillier, Hanson, & Graham, 1987, p. 364).

J-graph starts with drawing a convex map from a building plan. In most cases, a convex space generally represents a well-defined room, or any other spatial unit within which every position can see every other position. Each convex space of the plan is defined as a node of the graph. The starting point of this graph is marked with a node that represents the root of the graph. These nodes are then connected using lines, known as edges. The j-graph of the convex map shows only the nodes and edges of the map, where nodes represent convex spaces/rooms and lines represent connection between the rooms. This graph is then organized in layer with the root node at the starting layer (or, ‘layer 0’). Any spaces directly connected to the root node then are placed in the next layer (or ‘layer 1’). Any spaces connected to ‘layer 1’ but were not already included in the graphs are then placed in ‘layer 2’, and so the
method continues until all the spaces are connected. In the J-graph the spaces of equivalent status and equivalent importance usually appear at the same depth and the members associated with that space usually appears at the next layer (Markus, 1987, p. 477). For example, general hospital wards should be in one layer and the private or individual patients’ wards should occupy the next layer (Markus, 1987, p. 477). The similarity between these spaces are the rules derived from trans-spatial medical practices (Markus, 1987, p. 470).

The A-graph software produces graphs from building plans imported as background images, and then computes different accessibility values for individual spaces using space syntax techniques (Manum, Rusten, & Benze, 2005). Firstly, each enclosed room (example: patients’ ward, doctor’s room, operating rooms, toilets, etc.) and semi enclosed area (example: corridors, verandah, lobby, porch, etc.) are denoted as nodes of a graph. Secondly, with the help of a drawing tool connections are drawn among these nodes. After running an analysis, the software colors each node of the graph based on its accessibility. In a colored graph, the color red denotes high accessibility, whereas dark blue denotes low accessibility. With decreasing accessibility, color gradually shifts from red to blue.

For this study, the A-graph software was used to calculate the integration value of each space in hospital layouts. Describing accessibility, the integration value of a space measures the relative depth of a space by comparing its depth with the depth of all the other spaces of the graph. Put simply, it describes how accessible a space is taking into accounts all the connections among the nodes of a graph (Hillier and Hanson, 1984). More accessible spaces have higher integration values and less accessible spaces have lower integration values. Using the integration value of spaces in a layout, it is possible to understand cultural and social relationships expressed through these spaces. When the integration values of spaces show a consistent order across the sample of building layouts, we can assume a cultural pattern exists in these layouts (Hillier et al., 1987, p. 364). In this study, therefore, the accessibility of doctors’ areas, custodians’ areas, wards or inpatients’ area, surgery units, apothecary and corridors of the two design proposals were compared using the mean of the integration values of all the spaces in each of these categories to identify the differences of the proposed plan of Wilkin and the built plan of Smith.

While comparing the connectivity of these two designs, Wilkin’s design contains more red nodes than Smith’s design. In the proposed plan (Wilkin’s design) ground floor does not contain any blue nodes, then again, first floor contains one light blue node (Figure 05). Whereas the built plan (Smith’s design) contains more green and yellow nodes and less red nodes than the proposed plan. The built plan contains five blue nodes in the ground floor and a single red node in the first floor (Figure 06). From the holistic perspective, the proposed plan was more connected than the built plan.

The overall integration value of corridor in the proposed plan is 11.89 which is less than the integration value of the built plan 15.19. Because in the built plan both the east and west side corridor of ground floor were
directly connected to the outdoor area through multiple points and were the most connected nodes marked with red color (Fig 06: Nodes 28 and 29).  

Doctors’ areas in the proposed plan (Fig 05: Nodes 10, 11, and 12), were less connected with the layout as marked in yellow. This is also supported by its integration value, which is less than that of a comparable space in the built plan. (12.052 in proposed plan vs. 15.99 in built plan) In the built plan doctors’ areas are directly connected with the internal corridor and are marked with orange (Fig 06: Nodes 3, 5, and 63).

Custodians’ area in the proposed plan (Fig 05: Nodes 8 and 9) marked with orange color, with an integration value of 11.24. Apothecary and the custodians’ areas in the built hospital, are treated as individual blocks and are somewhat disconnected from the rest of the hospital. They are marked with green, yellow and blue showing less connectedness (Fig 06: Nodes 8, 9, 10, 11, 12, and 38) with an integration value of 13.43.

In the proposed plan patient’s wards were less connected. This is also supported by its integration value, which is less than that of a comparable space in the built plan. (10.74 in proposed plan vs. 11.80 in built plan)

Surgery unit in the proposed plan was well connected with the rest of the hospital (Fig 05: Node 54) with an integration value of 13.28. In the built plan integration value of surgery unit was 11.37, marked with green, placed in the second floor and less connected with the adjacent rooms (Fig 06: Nodes 82 and 73).

In the proposed plan apothecary was well connected with the rest of the hospital (Fig 05: Nodes 28 and 30), marked orange and red. This is also supported by its integration value, which is higher than that of a comparable space in the built plan. (13.06 in proposed plan vs. 12.59 in built plan) In the built plan apothecary was treated as individual blocks and are somewhat disconnected from the rest of the hospital. They are marked with yellow and blue showing less connectedness (Fig 06: Nodes 8, 9, 10, and 11).

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1 In the proposed design the central staircase, landing areas adjacent to the staircase were the most connected areas marked with red color (Fig 05: Nodes 3, 4, 5, 47 and 87) while in the built plan central staircase and the immediate outdoor lobby area are the second most connected areas marked with orange color (Fig 06: Nodes 33,34,and 71). In the proposed plan, east corridor was directly connected with the outdoor area through multiple stairs, and these corridor spaces were the second most connected spaces marked with orange (Fig 05: Nodes 31, 32, 35, 42, 21, and 17) in contrast, the west corridor was connected to the outdoor area with a single connecting point the porch. Therefore, the spaces along the west corridor were less connected to other spaces when compared with the spaces of the east corridor, marked with orange and yellow (Fig 05: Nodes 27,23,29,22, 34, and 19).

2 In this case the relationship of color code and value are not reciprocal because in the built design six rooms were allocated for the custodians whereas in the proposed one only two rooms were allocated for the custodians. In the built hospital each custodian’s room was accompanied with separate bedroom space and private verandah with a direct connection to the outdoor area.

3 In the proposed plan patient’s wards were less connected due to their placement on the third floor (Fig 05: Nodes 99, 102, 105, 115, 118, and 121). This is also supported by its integration value, which is less than that of a comparable space in the built plan. (10.74 in proposed plan vs. 11.80 in built plan) In the built hospital patients wards were all in the second floor marked with green color (Fig 06: Nodes 72, 74, 79, 83). In the built hospital female wards became less connected with the rest of the hospital (Fig: 06: Nodes 13 and 19). Detached entrance and stairs provided to maintain this separation (Fig: 06: Nodes 61 and 62). The built hospital contained two private rooms attached with the nurses’ room (Fig: 06: Nodes 89 and 90). These rooms were least connected with the rest of the hospital. But in the proposed hospital one private rooms (Fig 05: Node 39) was connected with the female ward. In the built plan the connectivity increased due to the placement of patient wards in first floor.
Figure 5: Connectivity pattern of Wilkin's proposed plan

0. entry 39. Stewards 76. Seaman
1. Porch 40. Corridor 77. Corridor
2. Entry 41. Corridor 78. Corridor
3. Main stair 42. Corridor 79. Female Ward
4. Corridor 43. Corridor 80. Corridor
5. Corridor 44. Stair 81. Corridor
6. Receiving room 45. Toilet 82. Corridor
7. Dispensary 46. Central stair 83. Corridor
8. Apprentice (trainee) 47. Corridor 84. Open area
9. Apprentice (trainee) 48. Open Passage 85. Stair
10. Surgeon 49. Bath and urinal 86. Toilets
11. Asst surgeon 50. Corridor 87. Central stair
12. Matron room 51. Corridor 88. Corridor
13. Corridor 52. Merchant Seaman
14. Women with doubtful character 53. Surgery
15. Private room 54. Corridor
16. Receiving room 55. Corridor
17. Secondary entry 56. Naval seaman
18. Surgeon 57. Corridor
19. Corridor 58. Corridor
20. Open area 59. Naval seaman
21. Toilets 60. Corridor
22. Stair 61. Corridor
23. Secondary entry 62. Corridor
24. Corridor 63. Corridor
25. Corridor 64. Stair
26. Corridor 65. Open area
27. Corridor 66. Toilets
28. Corridor 67. Corridor
29. Corridor 68. Chapel
30. Corridor 69. Verandah
31. Porch 70. Corridor
32. Space beside the porch 71. Corridor
33. Corridor 72. Merchant
34. Asst Apothecary 73. Corridor
35. Corridor 74. Corridor
36. Apothecary 75. Corridor
37. Corridor 76. Corridor
38. Corridor 77. Corridor
Figure 6: Connectivity graph of Roger Smith's built plan

1. Hospital sergeants room
2. Hospital store
3. Surgeon’s room
4. Passage
5. Apprentice (trainee)
6. Dispensing room
7. Receiving room
8. Assistant apothecary’s room (sells drug)
9. Bed room
10. Apothecary room
11. Steward’s room (attendant / organizer)
12. Matron’s room
13. Female ward
14. Verandah
15. Baths
16. WC & lavatories
17. Waiting room
18. Accident ward
19. Female ward
20. Open area
21. Porch
22. Trainee
23. Stair
24. Open area
25. Open area
26. Corridor
27. Open area
28. Corridor
29. Corridor
30. Private verandah
31. Private verandah
32. WC
33. Stair
34. Corridor
35. Corridor
36. Bath
37. Bath
38. Bedroom
39. Bedroom
40. Private verandah
41. Private verandah
42. Private verandah
43. Private verandah
44. Private verandah
45. Bath
46. Bed room
47. Private verandah
48. Private verandah
49. Bath
50. Passage
51. WC
52. Corridor
53. Stair
54. Open Area
55. Toilet
56. Stair
57. WC/lavatories
58. Stair
59. Toilet
60. Corridor
61. Lift
62. stair
63. Apprentice (trainee)
64. WC
65. Corridor
66. Lobby
67. WC
68. Corridor
69. Corridor
70. Corridor
71. Central stair
72. Ward
73. Surgery
74. Ward
75. Corridor
76. Corridor
77. Corridor
78. Corridor
79. Ward
80. Corridor
81. Corridor
82. Surgery
83. Ward
84. Lift
85. Lobby
86. Stair
87. Nurse
88. Operating room
89. Unknown room (Private Room)
90. Unknown (private room)
91. Chapel
92. WC
93. Corridor
94. Corridor
95. Stair
96. Toilet
97. Corridor
98. WC
99. Corridor
100. Corridor
101. Toilet
102. Unknown room
103. Stair
104. Unknown
105. Corridor
106. Corridor
107. WC
108. WC
109. Corridor
110. Stair
111. Corridor
112. Unknown
113. Unknown
114. Stair
115. Unknown
116. WC/Lavatories
117. WC/Lavatories
118. WC/Lavatories
119. WC/Lavatories
120. Outdoor
121. outdoor
In the built hospital female wards became less connected with the rest of the hospital (Fig: 06: Nodes 13 and 19). Detached entrance and stairs provided to maintain this separation (Fig: 06: Nodes 61 and 62). The built hospital contained two private rooms attached with the nurses’ room (Fig: 06: Nodes 89 and 90).

The most connected space of Wilkin’s design is the surgery with the integration value of 13.28 and apothecary with the value of 13.06. On the contrary, Roger Smith designed the surgery unit as least connected space with the value of 11.37 and apothecary contained the value of 12.59.

### 2.6.2 ACCESSIBILITY ANALYSES USING JUSTIFIED GRAPHS

In this section both the proposed and the built hospital is analyzed with the j-graph method described above. In this paper for both Wilkin’s and Rogers’ plans, the base point or zero layer refers to the outdoor area. J-graph represents the minimum number of connections one must use to reach any other specific space. Given its standardized form, J-graph has been used to study space hierarchy, space structure, permeability and accessibility in space syntax studies. (Lee, Ostwald, & Gu, 2018)

Figure 7: Justified Plan Graph of Clair Wilkin’s EGH proposal (The numbers used in the figure are labeled in figure 05)
In the proposed plan in total 12 steps were needed to reach the most private space of the hospital (Fig: 07). Whereas, to reach the most private space of the built hospital, in total only 8 steps were needed (Fig: 08). Compared to the proposed hospital the built hospital was easily accessible from outside.

In the proposed plan, all the spaces allocated for doctors were only 2 steps away from the outside (Fig: 07 Nodes 8, 9, 10, and 11), that proves doctors had an easy access and permeability inside the hospital. All the spaces allocated for doctors were only 2 steps away from the outside (Fig: 08 Nodes 3, 5, and 63). Therefore, like Wilkins, Roger Smith also provided easy access for the European doctors.

In the proposed plan, custodians were distributed in different floors of the hospital. In order to get to the stewards and matron’s space only 2 steps were needed (Fig: 07 Nodes 33 and 36), whereas 7 steps were needed to reach the warrant officer’s space (Fig: 07 Nodes 99 and 112). All most all the custodians’ spaces were accessibly within 2 steps and additionally none of the custodians had direct connection with the internal spaces of the hospital (Fig: 08, Nodes: 1, 11, 12, 39, and 46). That means the built plan has provided better outdoor access for the custodians but stopped all the internal connections from their designated rooms. In the built plan custodians were not allowed to access any internal corridor or vertical circulation from inside but in the proposed plan they had access to vertical and horizontal circulation.

In the proposed plan, surgery room was accessible within only 5 steps (Fig: 07 Node 54) as there was a single operating room on the first floor, whereas in the built plan surgery rooms were 7 steps away from the outdoor area, and had controlled entry only through the corridors (Fig: 08 Nodes 82 and 88). That means in the built hospital surgery became more private compared to the proposed hospital plan.

On the proposed hospital, patients’ wards were spread all over the hospital, therefore some wards were easily accessible, and the others were difficult to get access (Fig: 07 Nodes 38, 53, 57, 60, 62, 73, 76, 79, and 102). In the built one, patient wards were 7 steps away from the outdoor area (Fig: 08 Nodes 72, 74, 79, and 83). As a result, the wards appear in the same depth representing the equivalent importance of each ward. In the built hospital patient wards became more organized.

From the perspective of permeability and accessibility in the built hospital custodians areas became more accessible from outside but less accessible from inside. Surgery units became less permeable and more private. Inpatient units became more organized and less accessible. Doctors spaces had the similar permeability in both designs as in both case European doctors received similar benefits. Overall connectivity with outside area was increased in the built hospital but overall internal connectivity was decreased.
3. RESULTS:

3.1 CORRIDORS

The integration value of the corridors was increased significantly in the built hospital.

The proposed hospital plan (Wilkin’s proposal) contained two corridors running throughout the building, one along the east side (back side), another one along the west side (front side). The east side corridor was linked with the outdoor area with multiple connecting points, whereas the west side corridor had a single connection with outside. Both the corridors provided connections to internal spaces throughout the building. In the built hospital (Smith’s design), both the east and west corridors contained multiple linking points with the outside area. However, the corridors were divided into segments with solid walls; as a result, the corridors were treated as private verandahs rather than connecting passages. In Smith’s design spaces for the custodians and apothecary were acting as separate units or blocks, and private verandahs were the substitutes of entry foyer. Smith did not provide any internal connecting corridors additionally his design discouraged the internal movement of native custodians and provided privacy for the European patients. Each unit was directly linked
with the outdoor area through the private verandahs.

3.2 DOCTOR’S AREA

The connectivity value of the doctors’ area was increased in the built hospital. But in both Smith’s built hospital and Wilkin’s proposed plan, 2 steps from the outside were needed to access the doctors’ area. In the proposed plan (Wilkin’s proposal) surgeon’s room, apprentice’s room and doctor’s room were connected with other facilities of the hospital through two internal corridors. Among these two corridors only one had multiple outdoor connections. The justified graph (Fig: 7) shows that multiple spaces were accessible through the doctors’ area.

In the built hospital, the doctors’ area was connected with the outside area through the west corridor. The east side corridor was treated as private verandah and worked as personal entry foyers between the outside and inside. Doctors’ area was treated as an individual suit with attached bedroom, so s/he could use the space along with her/his family. No other spaces were accessible through the doctors’ area. With reference to the space use pattern in the Indian context, a separate suit for the doctor’s family would have provided more privacy for the European doctors.

3.3 CUSTODIAN’S AREA

The overall connectivity and accessibility of the custodians’ areas increased significantly in the built hospital. In the built hospital both the east and west corridors worked as connecting spaces with the outdoor area. Whereas in the proposed one (Wilkin’s proposal) only the east corridor worked as the connecting point. In the built hospital internal connectivity of the custodians’ areas decreased but connectivity with the outdoor area increased. The accessibility of custodians’ spaces also increased due to direct access from the outside area. To limit the free movements of native custodians, internal corridor connection was omitted in the built hospital.

Table 02: Integration values of doctors’ area

Table 03: Integration values of custodian’s area
3.4 APOTHECARY

In architect Smith’s built design connectivity of the apothecary decreased. In this case architect avoided direct links with adjacent rooms and the apothecary. Apothecary was designed as a block or unit with only one entrance from the west side. The apothecary was only attached with a bedroom space for the pharmacist. In Smith’s built hospital, no internal corridor was provided from the apothecary to avoid the internal movement of native pharmacist and his customers. Also, in the built hospital the apothecary area had a single connection with the outside. Although, the apothecary was part of the hospital, it was not internally accessible from the hospital. Therefore, connectivity of the apothecary block was decreased. Considering the use pattern of apothecary in the Indian context, isolation of the apothecary block improved European patients’ privacy. Therefore, isolating the apothecary block was certainly a direct response to the local context.

3.5 SURGERY

The surgery units became significantly disconnected in the built hospital designed by architect Roger Smith. The proposed plan (Wilkin’s proposal) contained a single surgery unit at the first floor, adjacent to the central staircase, and had direct access from two corridors and adjacent patient ward. According to the justified graph (Fig: 07) at least 5 steps were needed to reach the surgery unit. In contrast, the built hospital contained three surgery spaces at the first-floor level. None of these surgery units were directly accessible through other spaces. Corridors were the only access points for the surgery units. The justified graph (Fig: 08) shows at least 7 steps were needed to reach each of the surgery spaces. As a result, surgery units became less accessible. Architect Roger Smith designed less legible and more organized surgery rooms to achieve more hygienic conditions. Considering the dirt, dust and pollution of India, indirect entrance of the surgery unit was a logical response to the local need.
3.6 PATIENTS’ WARD

The connectivity of patients’ wards increased in the built hospital designed by architect Roger Smith. Four of the patient wards were arranged on the first floor. A separate ward for women with doubtful characters was placed on the ground floor. On the other hand, in Wilkin’s proposed design, among 8 wards, one woman’s ward was on ground floor, five wards were on the first floor and the other two were on the second floor. Due to the number of wards and their organization in different floors the connectivity of Wilkin’s design was less. In the built hospital female wards became less connected with the rest of the hospital due to the local inclination towards female privacy.

4. CONCLUSION

In the initial stage of colonial rule, the British colonial government used the designs of European hospitals directly in the Indian context, as exemplified by Architect Captain H. St. Clair Wilkin’s design. However, due to the cultural difference in Colonial India, the European attitude towards hospital design needed to be modified by the native way of life. Architect Smith’s design showed some of these modifications.

In an apothecary of a 19th century hospital, the pharmacist was responsible for patient supervision and drug production. As a result, the apothecary might have attracted a large crowd. In Smith’s design, apothecary area became less connected with the exterior of the hospital, probably because he wanted to discourage bigger crowd inside the hospital. He also made the apothecary area less connected with the interior to restrict the movement of local customers and native pharmacist inside the hospital. More native population inside the hospital was a threat to the cleanliness and noise level inside the hospital, as well as a threat to the privacy of European patients. Therefore, Smith’s decision of isolating the apothecary was a better response considering the local needs when compared with Wilkin’s response.

For Europeans in colonial India, native environment was always a threat (BEATTIE, M.2003,p.10). They had believed that it was a source of disease; therefore, was a major design concern for the colonial architect. It is then no surprise that Smith, in his response to local needs, had made the surgery unit less permeable and more private. This would have allowed more control of harmful pollutants, dirt and germs inside the unit.
It is well understood that doctors must have easy access to different parts of the hospital. At the same time, they should have privacy to do their work properly. In the context of colonial India, separating doctors’ areas from the native population was also important for social and health reasons (BEATTIE, M. 2003, p.7). We find that Smith had used a private verandah on one side to ensure privacy, and a corridor on the other side improving their connections inside the hospital. In the Indian context, privacy became an important factor for the European doctors. Smith’s design responded to this privacy need better than Wilkin’s design did.

Custodians were responsible for the maintenance and proper function of the hospital, and they provided around-the-clock services. Continuous presence of the native custodians was an obstacle for the European patients’ privacy. Therefore, Smith designed individual suits (room+ bed room+ private verandah) for the custodians’ accommodation inside the hospital with direct outdoor connection and no internal connection. Individual accommodation helped the custodian’s around-the-clock services, while the lack of internal connection discouraged their internal movement and helped to maintain patient’s privacy. Due to the lack of internal connections custodians had to get outside and re-enter the hospital (like an outsider) through service stairs to get to the upper floor. The isolation of custodians’ areas in Smith’s design was a better response for native custodians’ as well as European patients’ privacy when compared with Wilkin’s response.

Smith’s design was a better response for providing additional privacy and reducing the interaction between local service providers and European patients. Segregating the racial population was an important design factor in hospital design in Colonial India. Smith successfully addressed the nuances of the European society in Colonial India in his hospital. Consequentially, Roger Smith’s design was built, and Clair Wilkin’s plan was rejected.

This study shows how local factors related to healthcare impacted the British colonial hospital design in India. Although this study analyzed two proposals for one European General Hospital in India, they represent how the British might have approached hospital design in colonial India. Future studies with proper archival research should be encouraged to understand the European designer’s response towards hospital design in Colonial India.

REFERENCE


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