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Med/Architecture: the Typological evolution of Paradoxical Buildings.

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ABSTRACT

"The challenge for all of us is to look back at history but envision the path ahead. There seems to be no question that our future depends on this vision" (Guenther, Vittori, 2008).
This sentence summarizes the revolution that is happening in the world of healthcare architecture since few years. The development of the design of new hospital buildings is growing as well as the interest for the specific field. Flexibility, adaptability, cost effectiveness, standardization are just some of the criteria to which a new hospital nowadays has to respond.

However, the architectonical research with the development of new plans for large hospitals is still prerogative of the northern European countries. In the southern countries of Europe the attention for this sector is still too much neglected and the solutions obsolete. Moreover, in this field often the architectonical solutions are the expression of political choices. In the Contemporary Age hospitals became complex bulwarks of science and medical technology. The era of designing them as techno-buildings has finished and Architecture is moving towards patient-oriented solutions, looking back at old and simpler typologies.

However hospitals still remain paradoxical buildings. They have to be small in order to be more human and large and general for cost effectiveness. They have to be more open in their spatial layout, but also safe in order to avoid the spread of infections. They have to contain a high number of facilities and at the same time decentralize secondary departments in order to reduce the costs.

This paper aims at analyzing some of the architectonical trends on going in hospital architecture, by looking back at the historical evolution of their typologies.

KEYWORDS: Architecture, hospitals, public buildings, urban development, typology

1 THE BACKROUND

The morphology of hospital buildings has been contingent upon continuous evolutions over time, even though such modifications have never been of the same level of the phenomenon that generated them. The vision of considering the hospital as an autonomous entity, a product of science obedient to the medical technology evolutions, a sort of bulwark of medical science, is not in line with the demands imposed by our times. This complex typology of buildings, often identified as subsystem of the system city, and continuously challenged by the winds of change generated both by the socio cultural and economic conditions, as well as by its own environment, should follow much more constantly the evolutionary trends. Hospitals urge to take back their function within the society, a function which has been gradually lost during their lifespan, as shown by the frictions between complexity and dimension,

territoriality and distribution of specializations, as well as segregation and urbanization. Hospitals are not intended to be only the product of an excellent work of space rational organization; they have to be also habitable places, places reflecting the plurality and dynamism of the society, places for the people and designed around the people.

Hospitals were originally born for the need of isolating the sick, cure and care them, assist charitably the ones that were unable, for several reasons, to care about themselves.

The goal of architecture, the need of building around an *arché*, expressed as the act of enclosing the man within a portion of space, a system of spaces connected to the outer unlimited territory by means of elements that support a relation of continuity between the hospital and the city, the hospital and the surrounding buildings, has been gradually lost; it has been reduced to be on one hand, a product of technical knowledge, and on the other hand, a consequence of logics of profits.

Since few years, the community of healthcare architects and also of hospital managers has begun to feel the need of change, of restructuring of an issue that became too complex: the hospital.

"The challenge for all of us is to look back at history but envision the path ahead. There seems to be no question that our future depends on this vision" (Guenther, Vittori, 2008).

This statement better summarizes the way how the new reformers of the hospital system are acting.

All along experience and knowledge symbolize the golden strings of a wisdom, concise and rationalised, in which the concept of building and living are wrapped up. However, sometimes, the wrapping process goes too fast, as the case of the evolution of medical technology, and what was a simple and concise bundle, becomes a tangled in knot difficult to unravel.

This is the case of hospitals, that evolved from simple buildings close to the form of healing temples, where the patient and his condition was positioned at the first place, such as the Greek *Asklepeia*, to complex massive buildings, typical of the Contemporary Age. Nowadays flexibility, adaptability, standardization and a return to the importance of the patient, together with his surrounding environment, seem to be the leading principles of this '' back to the roots'' process of rationalization.

2 THE TYPOLOGICAL EVOLUTION

To go back over the typological evolution of hospital buildings is a fascinating journey in that healthcare environment in which, back to the time, as nowadays, medical and social events intersect with architectural and technological, legislative and organizational ones, defining a polyhedral set.

The elements of such a set changed their level of importance during time: the patients in need of care, the caregivers, the administrative staff, and recently all the stakeholders that have seen into the healthcare market a reason to develop their business.

For a better clarity the ages analysed, have been divided into four temporal frames: from the origins to the Middle Ages, from the Renaissance to the Enlightenment, from the nineteenth to the twentieth century, to later conclude with the contemporary debate.

2.1 From the origins to the Middle Ages

Health and disease have always gone along the life of every man. Sickness, back to the times was considered a phenomenon of difficult comprehension. There were not many ways to fight against it. To pray and invoke the help of a divinity, through the help of a minister, was widely widespread.

The temple, kingdom of the minister and of worship, and the place where infirm people were cured and cared, very often were combined in the same space. From the Vth century B.C., a new 'health and cultural movement', which provided a holistic view of man in the context of his total environment, began to spread in Greece (Kjisik, 2009). This holistic vision of health and sickness, that was giving particular importance to the healing power of the surrounding environment, and that was in contrast with the theories of the school of Cnido, prevailed, together with the systematization of Galeno in the IIth century A.C., the Western medical thinking for more than two thousand years. The Asclepieion was the first typological form that accommodated this new approach to cure and care. The Asclepieion at Pergamon

was considered one of the biggest of the Greek ancient world (Figure 1). This huge healing complex, 130m long and 110m wide, was made of buildings with several functions on the eastern wing, and of 'stoa'

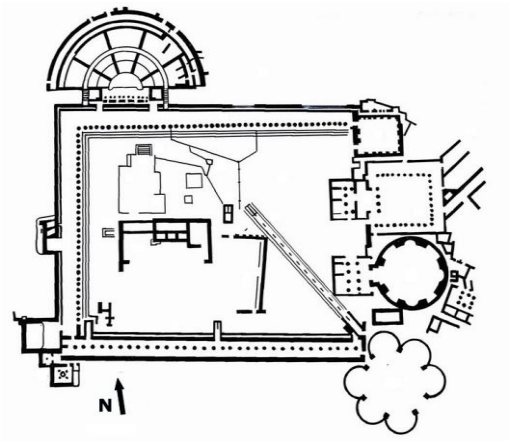

Figure 1: The Asclepieion at Pergamon

colonnades on other three wings of the western side. The northern 'stoa' was directly connected to a theatre and the other inner spaces of the entire complex. The theatre and the socio-cultural activities connected with it were considered to have an active part into the healing process. The buildings of the eastern wing were aimed not only at religious worship, but also to medical treatment and cultural activities, such as a library. Among the treatment building and what nowadays may be called a ward, there was an 80m long connecting tunnel. In the middle of this Asclepieion open structures, such as mud-baths, several pools and specific spaces aimed at the practice of 'incubatio', were located.

With the beginning of Christianity, and its liable and charitable values, the typology of care and cure centres temples began to change. More emphasis started to be given to charitable functions based on rational practices of medicine, rather than rituals of temples. The Roman hospital Novaeseum at Dusseldorf, dated 100 A.C., is a good example of healthcare building with a typology deriving essentially from the functions the building was intended to fulfil. However, the plan of Roman hospitals, developed more often for military purposes, was still remarkably based on a layering of public, semi-public and private spaces. In the Roman age there was no space for public health, therefore sickness and health were seen as a private issue.

The real change came after the Council of Nicea in 325 A.C., when it was prescribed that each bishopric and monastery had to establish in every city guesthouses for pilgrims, poor and sick people. These new cure and care institutions, in between a guesthouse and a hospital, were called 'Xenodochi', and were offering a wide range of services, not only healthcare oriented. With the Code of Giustiniano in 534 A.C. a distinction of the cure and care institutions on the basis of their final purposes was introduced. This is the time when the words orphanage, hospice, and hospital were coined.

With no doubt, the first forms of medieval hospitals were conceived as a container of suffering and death. The imprint of the religious orders, managing these institutions, and the strong link with spirituality was projected onto the general arrangement of the layout of the building and its architecture. A cruciform layout, with a nun's station in the centre and the altar at the end, was quite common into medieval hospitals (Figure 2). Ideally the altar had to be visibly accessible to all the patients, due to the centrality of Christ into the life of every human being and into their healing process.

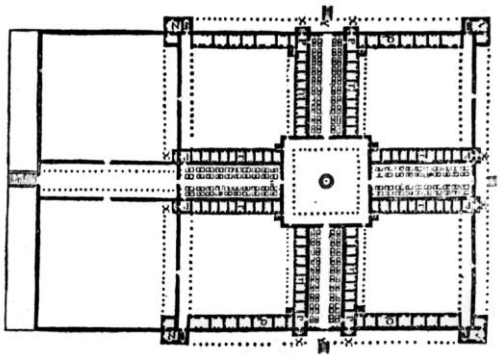

Figure 2: A typical cruciform plan in use during the late Middle Ages.

Into the typology of medieval hospital was still possible to have also a strong contact with nature. The spaces were arranged around a cloister and the ground floor porticoed; if the building had two floors, the upper one was provided with a lodge. Seen as an emulation of the monastery or church from which they were depending, these hospitals were also always provided with a chapel.

2.2 From the Renaissance to the Enlightenment

With the beginning of the Renaissance the process of cure and care began to be considered less and less a monopoly of the Church. Hospitals started to be a sign of the social commitment of the king, prince, in charge; but also a way of glorification of his government, above all through buildings of great architectural and artistic significance. By the end of the 1300, the beginning of the demographic catastrophe generated by the plague, amplified this laic interest for healthcare.

The hospital 'Cá Granda' (Figure 3), later defined 'Maggiore', designed by Filarete in 1456 in Milan, is a prime example of the Renaissance healthcare re-organization, characterized by a pronounced interest for architectural innovation. The goal of this project was to give a rational solution to the different needs of hospital's users. The typology of project was based on a rectangular plan, divided into two main squares, separated by a rectangular courtyard with a church located in the middle. Each quadrangle contained four wards, disposed on a cross vault way. The cross vault layout of the wards defined four other smaller outer courtyards. Big arcades surrounded both the quadrangles and the smaller courtyards.

The vision of this project was still highly influenced by the Christian models of the Middle Ages. The innovation is on the way Filarete used the classical typology to reach new goals: spaces designed to provide a right quantity of air for each patient, the right amount of space, good ventilation and a proper lightning of the environment. For the first time in the history of hospitals, the architectural typology started to be strongly influenced by issues such as hygiene. Innovative was also the way how the 'Cá Granda' had been conceived in terms of functions. This was a consequence of the dispositions of the archbishop Enrico Rampini. One of the most important part of the Rampini's code concerned the definition of the hospital, which stopped to be a general place for 'pauperes et infirmi', and started to be more 'infirmi' oriented only. Also the role of the physicians within the hospitals began to be more central and important: they were the ones making the hospital operative; therefore the spaces should fulfil their needs. Between the VIIth and the VIIIth century, the healthcare scenario of all Europe was characterized by the developments of medical science and the academic environment of universities. The reformation process of the hospital buildings was on the way, but still only on the functional level. Well-being was not yet considered a right for everybody, and the conditions of the patients within these buildings, were certainly not decent. The mortality rate, due to nosocomial infections, was extremely high.

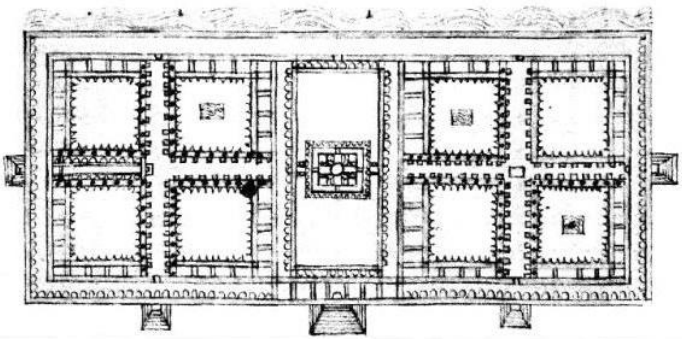

Figure 3: The hospital Cá Granda, by Filarete, Milan, 1456.

Beds were often shared among two patients; the possibility of getting fresh air circulating within the environment was very poor; the wards were often overcrowded.
These conditions led to the explosion of the real revolution of healthcare buildings in France.
By setting on fire several times the Hôtel-Dieu in Paris, people started to claim the right to have better places where to be cured; places supporting the condition of sick people, places well located into the urban context, not segregated containers of death and viruses. In 1784 a committee of experts of the Academy of Science was appointed by Breteuil, minister of the French government, to evaluate proposals and ideas for the project of the new Hôtel-Dieu.
Tenon, surgeon at the hospital 'Salpêtrière', was a member of this group of experts. It was him to state that hospitals have to be considered machines to cure a large number of sick people and at the lowest costs possible: 'Machines à guérir' (Tenon, 1788). The new typology envisioned by the commission for the Hôtel-Dieu, as well as for other hospitals, should have been based on: a pavilion system with a minimum distance among them of no less than the double of the high of the building's floors; division of men and women into the wards; a bed for each patient; allocation of no more than 36 beds in two parallel rows for each ward; staircases opened and ventilated from the outside; windows extended until the ceiling. Furthermore, the committee also gave new dispositions at functional level: the hospital should be made of several main departments, to be divided later on in secondary departments, and into smaller units (Foucault, 1979).

2.3 From the nineteenth to the twentieth century

The nineteenth century was largely characterized by the pavilion hospital typology. The experience of Florence Nightingale regarding the spatial layout of the wards, the developments of the military hospitals in England, and the schemes applied to the Hôtel-Dieu in Paris, were extensively used. This new type of hospitals was particularly distinguished by the incredible demand of space needed at urban level. There was a real difficulty in finding the right area, where to place such a huge complex structure. There was also often a problem of connection between the pavilions. Heated corridors and covered galleries were added later to fix these issues of connectivity.

Internally, according to the Nightingale's vision, the most important issues to focus on were: the lack of a central supervision of all the patients, of fresh and clean air, and of daylight.

The Hôpital Lariboisière, designed by Martin Pierre Gauthier, is considered the milestone of a new era of hospital buildings, and of the pavilion typology (Figure 4). Characterized by ten pavilions, divided, on the basis of the clinical specialization, a central administration block, and a large courtyard, this hospital aimed at giving a response to the major cholera epidemic that spread in Paris in 1832. The connection among the pavilions was provided by a long corridor, running along all the perimeter of the healthcare complex. Therefore it wasn't always very fast to walk from a pavilion to another, above all if

they were located into the diametrically opposite side. Pevsner (Pevsner, 1976) stated that this hospital had all the conditions of well-being and healthiness that a building of this type should have.

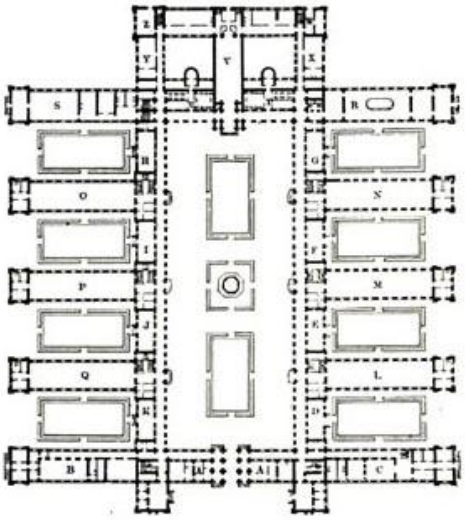

Figure 4: The Hôpital Lariboisière, by Martin Pierre Gauthier, Paris, 1832.

For many years architects continued to work to improve the pavilion system, by isolating the blocks to provide as much daylight and clean air possible. However, with the developments of new healthcare services to provide and the evolution of medical science, more and more space started to be required, and problems of management as well as of walking distances and connection between the pavilions began to rise. In this context a debate between the choices of a horizontal or vertical development of the hospital was initiated. The new solutions for the problems the pavilion system was causing had been found in centralization. The guidelines of this new reformation wave were: reduction of beds into the wards till six units, grouping of wards and departments also into the same block, increase of the high of the buildings and floors, rationalization of technological networks (electricity, water, sewage, heating) and of the connections (Ronzani,1942). The vertical connections began to be believed much more efficient than the horizontal ones.

Due to the discovery of bacteria as cause of most of the illnesses, and the consequent studies on penicillin in 1928, physicians began to believe that miasma was not as important as they were previously believing. This meant that the typology of isolated blocks of the pavilion system, which was allowing good ventilation on at least three sides of the building, could be replaced by a centralized model. So hospital buildings started to shrink and develop in height. This also allowed them to come back into the urban context, due to their more manageable dimensions. The Presbyterian hospital in New York is first big example of the radical change from the pavilion typology into what we might call the high rise, tower typology. The departments were divided by floors and the vertical connections were highly reinforced. Finally the walking distances through the hospital lowered down. This new way of conceiving the hospitals gave to the architects much more power of expression than before.

The importance of the contact with sunlight and fresh air only lasted for the sanatoria, where tuberculosis was treated. Zonnestraal, in Hilversum, the Netherlands, and the Paimio sanatorium of Alvar Aalto are among the best examples. In the former one, Johannes Duiker and Bernard Bijvoet, took the concept of transparency to the extreme: single rooms, less walls, and an extensive use of glass were the key elements. The Paimio's sanatorium, instead, was characterized by a particular emphasis on the healing potential of the medical environment. An example was the light fittings, specifically designed so that the light source was outside the range of vision of patients laid down on their beds. Aalto also

designed washbasins, and worked on the general layout in order to reduce the noise, already considered a stressor for the patients.

Since the end of World-War II, new centralized typologies were investigated by architects. The hospital became more and more the kingdom of medical technology, and expression of the physicians' power. The new post-war hospitals displayed themselves as fortresses, sealed buildings, intimidating because of their bulk, located mostly far away from the city center, a place where to keep sick people (Wagenaar, 2006) . The 'Rode Kruis Ziekenhuis',1959-1964, in 'Sgravenhage, the Netherlands, is a good example of what was named the "H" typology. The building clearly reflects the division among the main functions. The first wing of the "H" was hosting the nursing units, the second one was addressed to the outpatient units, and the bridging wing was aimed at the treatment units. The 'H' typology was later followed by the 'T' one. The 'Diaconessenhuis', in Breda, in the Netherlands, was designed on the basis of this model, where the two wings of the 'T' were reflecting a division between women and men departments, and the central stem, was addressed to the treatment units. The same division of functions was applied into the so called 'K' typology, with the two right wings of the 'K' intended for women and men departments, and the left stem for the treatment ones. The experimentation with different hospital typologies finished to stabilize a bit with the so called 'tower on podium' model (Figure 5). This model, largely applied from the second half of the twentieth century was characterized by a low rise volume, developed horizontally, and a high rise volume on top of it. The low rise volume was addressed to the outpatient and the treatment units. Normally the outpatients' ones were located on the ground floor, and the treatment ones on the upper floors. The high rise tower, instead, was only addressed to the nursing units, where patients were admitted to stay for long periods.

Figure 5: Tower on podium typology, Diaconessenhuis, Eindhoven, 1967.

Between 1960 and 1980 a new subgenre of the pavilion type was presented: the 'comb' type.
The structure was supposed to be quite regular with symmetric axis, designed as group of blocks, connected by means of corridors and galleries.
Modularity and separation of functions started to become in this period very important. The comb type had the great advantage of taking into account the future departmental growth from the beginning, so the hospital was planned to accommodate possible future extensions.
However all these typologies generated the big problem nowadays hospital planners and architects are trying to solve. Hospitals became too big, isolated monoliths, products of a Modernism and Functionalism, that made the space normally sized on the basis of the developments of medical technology, while the patient was only a sort of object to fix and send back home. The size of these buildings became too large, and their structure too complex. These buildings segregated themselves from the city context and the urban life. They were located or at the outskirts of the cities, or within the cities

under the form of ‘sealed medical campuses’. These buildings were destined to become unmanageable under several points of view and potentially harmful for their patients.

3 THE CURRENT DISCUSSION AND THE WAY TO THE FUTURE

Unmanageable, not-urbanized, not flexible and above all not patient supportive, are only few of the negative characteristics that the hospitals of the previous generation had (Verderber, 2000). A lot of these hospitals are still running today, but due to the socio-economical conditions of our times, something started to change.

Throughout the ages, the hospital typology has developed from really simple models to quite complex ones. If until the Renaissance the patient and the environment were taken seriously into account, after the Enlightenment all the focus was mainly concentrated on medical science and technology.

The interest for the environment and a more patient centred approach began to come back on the current debate after the studies conducted by Roger Ulrich on the impact the medical environment can have on the healing process (Ulrich, 2003). Besides that, the inheritance of the modernist and functionalist experience, have left a high number of inefficient and outdated hospitals. The costs to maintain these buildings, operative and updated, are not more affordable nowadays. The contemporary healthcare scenario looks at a simplification of the complexity healthcare buildings have reached. Healing environment and patient centred approaches show a “back to the roots” trend that planners and architects seem to be inspired by.

The new hospitals are conceived as hybrid buildings, with little medical character and above all of smaller sizes, while urban integrated. The most efficient layouts respect a strict division of the paths of the users. Open spaces, such in offices, support a higher degree of internal flexibility. Departments and wards are designed to accommodate future extensions or compressions. Combinations of functional proximities are studied in order to decrease the walking distances. The same level of flexibility is applied externally as well, to some parts of the building, that in future could experience extensions. Gardens and courtyards are leaving a Renaissance period into the contemporary healthcare design scenario. Very often new plans show a clear influence of the Greek and Medieval typology, when it comes to contact with nature.

However, nowadays, what really shapes the hospital environment is money. Flexibility, adaptability, smaller sizes, are intended at raising the real estate value of the medical building: a must in times of financial instability (Marberry, 2006). The same is applicable for the patient centred approach; besides any ethical reasons, in fact, a supportive and well-designed environment that can speed up the healing process, has a direct impact on the daily costs per patient a hospital has to take charge of. Architecture plays a pivotal role into this context, where new typologies, in line with the contemporary demands can be experimented (Niemeijer, 2012).

This should be a challenge not only for few European countries, but for the whole Europe.

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