CHARACTERISTICS OF THE HOSPITAL BUILDINGS: CHANGES, PROCESSES AND QUALITY.

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Abstract

Since the second half of the twentieth century to today, the architectural design of the hospital building has undergone great changes. These are related to the role that it plays within the city and the community, but also to the recovery of values that are different from those of quantity and function, characterizing modern hospitals in the first half of the twentieth century. These 'new values', really recovering from the past and agreeing to a humane and humanistic vision of reality, together with the recent technological discoveries and new ways of treatment and care, influence the design choices in hospitals contemporaries.

The proposed research *Architectural of hospital space: Changes and Design Methods* seeks to define the characteristics and the architectonic qualities of the contemporary hospital. It is care centre and hub of scientific and medical knowledge and it is also the important place for observations on the relationship between the man and the built environment.

The study of typological and theoretical contribution, the analysis of representative examples of recent architecture, Italian and international, give scientific basis - to the reflections that define the variant and invariants typological characters,

- to explain the meaning of the changes, specifying the architectural quality,
- to provide the guidelines for design.

Architectural value of the hospital building

Functional aspects of a hospital building often overshadow the others that characterize its architecture.

The reason for of this "inattention" in favour of the fictional aspects concerns the difficulty to define the quality of the architecture is and how this can be assessed. Once, the architectural quality was synonymous with safety and functional efficiency. Now, it is searched in the aesthetic and cultural values. Moreover, there isn't a scale of absolute values of quality depending on the different "users" and aims. Specifically in hospital buildings, assessment tools and related quality indicators are numerous. They are referred more to specific sanitary functions than others. These appraise the hospital only as a building system and not as architecture. As such, the hospital building has to consider the physical and psychological needs of the person (the sick in particular). The hospital plays a catalytic role within urban environment, carries out some positive correspondences for the city and the citizens. It works to promote the recovery of the values of belonging and integration with the socio-cultural context.

These values were known in the past. Filarete, for example, in the hospital of the *Ca' Granda* in Milan in 1456, created an innovative building, which meets the planning and health needs of city of Sforza, symbolizing political power and spiritual views of the time.

In 1859 Florence Nightingale in *Notes on Hospital* wrote *"It may seem a strange principle to enunciate as the very first requirement in a hospital that it should do the sick on harm"* (Williams, 1992) and in 1888 in the book *Notes on Nursering* specified *"The effect in sickness of beautiful objects, of a variety of objects and especially of brilliancy of colour, is hardly at all appreciated. People say that the effect is only on the mind. It is no such thing. The effect is on the body too. Little as we know about the way in which we are affected by form, colour, and light, we do know this: they have an actual physical effect"* (McKahan, 1993).

Humanization in the hospital space

In the late fifties, within the psychology outlines a new area of study, the *Architectural Psychology*. It studies the behaviour response to physical environment and the special factors that involve a direct sensory activity of the subject, helping to specify the quality of the environment. "*Both architects and designers, like it or not, must always care the 'psychological implications' of their design decisions"* (Canter, 1972).

Another issue of the *Architectural Psychology* is the humanization of physical space. In the case of the hospital buildings the attention was focused first of all on the patient. He is considered like a completely person, with his physical and emotional needs. The hospital building is just a functional centre of knowledge and therapeutic technologies, and also the place professional and human relational aspects coexist.

Previously, the *Declaration on Primary Health Care* stated at the first point *"The Conference strongly reaffirms that*

health, which is a state of complete physical, mental and social wellbeing, and not merely the absence of disease or infirmity, is a fundamental human right and that the attainment of the highest possible level of health is a most important world-wide social goal whose realization requires the action of many other social and economic sectors in addition to the health sector" (Alma Ata, 1978). This sentence points out the need to produce a change about attitudes and organization of health services are developed from needs of the man in its totality. On the next the *Charter for Health Promotion* (Ottawa, 1986), in a point specifies the need to *"Create Supportive Environments"*, recognizing the inextricable link between man and built environment. The process of humanization involves a holistic vision of people, spaces and activities. In 2001, in Italy, a Ministerial Committee chaired by the architect Renzo Piano, developing a *New Model of Hospital for acute care and high technology,* put at the first point of its theoretical principles, the humanization of hospital space. Besides *"A health service, even if careful and delivered through trained personnel, is devalued where the environments, rather than reflect, contradict any attention to the man"* (Spinelli, 2006).

Recognizing the interactive processes that occur between the man and the environment, building the concept of humanization means design environments and spatial distributions in which the needs of the patient (sense of acceptance and familiarity, respect for privacy, space and sensory comfort, ease of orientation) are fulfilled destroying at the same time the factors of stress.

The ways through which you can implement a project of humanization are numerous. Concern to the build space, it can be made through the distribution and composition of spaces, the shape of the exterior volume of the building, the presence of views to outside, green and worship spaces, furnishings, materials, finishes, colours, signage, light (both natural and artificial), elements of visual reference (for example, art installations). In according to *Architectural Psychology* beneficial effect of these factors, each studied by specific disciplines, derives by their combination with each other.

Comparing the hospital contemporary to the old models, it is evident that it has had many changes also for the discovery of new technologies and new ways of care and assistance. In the next time, it is thinking that the hospital model will be organized into a "*network system and specialized nodes"* (Del Nord, 2008). The hospital buildings, the nodes of the network, will stand out in clinics – smaller, disseminated in large numbers on the landscape and depute to provide local urgent care and health services – and fewer peripheral complexes, larger, strategically located, with specialized functions in higher technological level. In both cases, the number of beds will be content being the shortest period of hospitalization and early transfer to residential structures. Moreover, it confirms the role of the hospital as a catalyst, social and cultural, for the city, incorporating activities such as sports, information, educational, commerce, etc.

Conversely, the issue of flexibility, on which it is contrived so much experimentation and some innovative spatial inventions, is now obsolete. It is synonymous with vagueness and instability, rather than the ability to coordinate different types of functions in a single place. So, it is replaced by the concept of *multiplicity,* through the help of modern computer technology, experiences and explores new types of spaces. Finally, the major formal innovations over the past achievements, concern the system of routes, internal and external, which is closely connected with the entrance hall and the expressive value of the wrapper. The building of the future hospital speaks a new language which we must learn the new semantics.

Approach to the issue

The proposed research *Architectural of hospital space: Changes and Design Methods* defines the features and the architectonic qualities of the contemporary hospital, it is care centre and hub of scientific and medical knowledge and it is also the important place for observations on the relationship between the man and the built environment. Research defines also features about the supporting areas to health activities, because they are more representative than others about the quality of the service and especially about the quality of the building. These spaces for the absence of direct health activities are often overlooked. They are both spaces where the public role is prevailing, like entrance hall, corridors, waiting areas, common areas (especially the day rooms for the patients) and those where it is vital the use more private, like the rooms of hospitalization. In each of these areas there are specific psychological and emotional needs of the users. The humanization is more important than in others hospital spaces and the issue of architectural quality is most obvious and sensitive. In each of these areas there are specific psychological and emotional needs of the users. They must be satisfied and find answers first of all within the requirements of the acceptance and orientation.

The general objectives of research are:

- defining the typological features of contemporary hospital;
- explaining the meaning of the changes;
- specifying the architectural value;
- giving a scientific base to human dimension to the hospital space;

- providing guidelines for design of areas supporting the health activity.

These objects were pursued also through the contribution of disciplines very different: like Environmental Psychology, expressive arts, ergonomic, art of gardening, Evidence Based Design, studies on the perception of shape and colour. Several of these are related to the architecture in general, other are related to the hospital building in particular. For example, the Cognitive Psychology says that a corridor with more than two changes of direction doesn't help to create a mental maps for the orientation. Therefore, such corridor isn't good.

OUTPATIENT DEPARTMENT – WAITING AREAS	
Activity	Waiting
Architectural spaces	Waiting area
	Transit zone
	Acceptance / Front Office
Psychological needs	Visualizing access area
	Distraction elements (attractors)
	Recognize clearly the area
	Absence of unpleasant or disturbing elements
Requirement	Usability
	Pleasure/Comfort

Table 1. Waiting areas: definition of main features and requirements of the architectural spaces.

In order to the multiplicity and interdependence of all contributions, the research is divided into steps.

We look into the architecture of the hospitals in its historical evolution, the characters and the organizational and spatial relationship of functional areas. The aims of this work were: identifying the innovative of contemporary hospitals as regards to traditional ways of thinking the hospital space, the use and perception of space by users, the way putting on and integrate into the urban environment, the expression of the architectural language.

We analyze more representative example of recent hospital buildings. The case studies represent a range of different design experiences. The criteria of their selection are: hospitals building since ten years in industrialized nations of different types; the interest shown by designers to solutions steered allowing the comfort of users

Analysis of case studies

In order to achieve the overall final results, a series of cards have been programmed. They are inherent cases of study constituting an atlas of the state of the art. In the first part of the card, there are general information about history of building, location and relationship with the place, building plan connection, layout of corridors, functional distribution, materials that characterize the external surfaces, utilization of non-traditional building technologies and presence of qualitative elements such as art installations, gardens or places for spirituality. In the second part, it was deepened knowledge of individuals *'characterizing areas'*, that's to say the supporting areas to the healthcare activity, object of our study. The activity and psychological needs, corresponding to classify by Jordan (Jordan, 1999), defines the requirements for recognition, accessibility, acceptability, orientation, usability, pleasure/comfort and privacy. The characteristics of requirements are detailed and 'specifications' are listed: notes related to the physical properties (size, position, shape), perceptual (colour, materials, finishes) and compositional

We report three tables, one (Table 1) about the waiting areas of the clinics, the others (Table 2) showing the example about F. Miulli Ecclesiastical Regional Hospital (Fig. 1) in Bari (2002-2005).

Figure 1: F. Miulli Ecclesial Regional Hospital: waiting area

The requirements and the performance, combined in a table, are the evaluation indicators of case studies.

The assessment system assigns a quantity which can vary in the range from A to D. now we attribute four values corresponding to levels of satisfying the requirements. A is the maximum value and D is the minimum value, when the requirement isn't absolutely satisfying (see Table 2).

AREA	REQUIREMENT	PERFORMANCE	SPECIFICATION	VALUE
Entrance Hall	Acceptability	Exterior / Interior continuity	Glass wall	A
			Natural lighting from above	A
			A bring sign	A
		Connection with the others areas	Barycentre	A
		Variedness of spaces and services	Hospital service (offices, booking office . box for payment, reception, banking windows, shops)	A
			No hospital services (congress centre)	B
		Harmonic composition of shapes, colours, lighting and materials	On two floors connected by sliding scale	B
			Natural lighting from above	A
			Three colours: white, orange and blue.	B
	Orientation	Easy identification vertical connections	No	D
		Absence of visual barriers	Evident composition and shape	A
		Wayfinding system	No	D
Corridors	Accessibility	Signals	Indicating the main directions and functions	B
			Generic use of colour	C
		More lighting at the access	No	C
	Orientation	Wayfinding system	Only some (Paediatric Department)	C
		Absence of visual barriers	Visibility of the whole	A
		Continuous ways without too many changes of direction	Two changes	A
		Clear identification staircases / lifts landing	No	D
	Acceptability	Presence of standing areas	No	D
Waiting areas	Pleasure / Comfort	Harmonic composition of shapes, colours, lighting, materials	Natural light from above	A
			Red armchairs, in contrast with the clear floor, apricot-coloured vertical surfaces	B
			The environment is bright, cheerful and friendly	A
	Usability	Presence of 'attractors'	A large bronze panel	B
		Distinction between the waiting areas and transit	No	D
		Position of the access	Peripheral	C
Patient rooms	Privacy	Different areas for privacy and socialization	No	D
		Seeing entrance from the station–bed	No	D
	Acceptability	Harmonic composition of shapes, colours, lighting, materials	Rectangular plan with bathroom	C
			Walls: soft yellow	B
			Bed-head: apricot and no refined	B
			Floor and ceiling: neutral colour	C
		Accessible outdoor spaces	No	D
		Furniture and furnishing accessories not 'medicalized'	Fitted wall wood	B
		Acting independently on light elements	No	C

Table 2: Features of the supporting areas in the F. Miulli Hospital in Bari and valuation of their requirements in according to the assigned levels (A=High, B=Medium, C=Low, D=Null).

In the example, the waiting room of the outpatient department of the F. Miulli Hospital in Bari is enough comfortable, although some *soft*[2] actions could improve the perception of comfort. Regard the usability[3], is low satisfied.

The analysis of case studies has allowed the rafting of an abacus of types expressing the different organizational and morphological state of the structure. This method for evaluating the quality of supporting areas of health activity, together a typological abacus, are the basis for defining guidelines to guide the choice of designers.

Furthermore, the comparative assessment of the case studies can be derived the strengths and problems of these 'characterizing areas' in contemporary hospitals.

Regarding the entrance hall, which is configured as a 'Main Street' or as a 'Square', is the site of the initial impact with the hospital, the interface between the healthcare facility and the user, the communications centre and junction of crossing flows. Entrance hall, like a 'Street' or a 'Square', presents hospital services (reception, offices, outpatients, etc.) and not hospital services (shops, bank, post office, cafes, restaurants, charities, classrooms, auditoriums, etc.), waiting areas, break areas and vertical connections. For example, into the foyer of the Ascau Pediatric Clinic (Germany), there is a wall for climbing having therapeutic and also recreational purposes (Fig. 2).

Figure 2: Ascau Pediatric Clinic: the entrance hall.

The entrance hall is often the extension of the outside space, like the lobby of the Hôpital Mutualiste Mountsouris (Paris), with its glass walls and the variety of items inside.

In some projects, such as Assuta Hospital in Tel Aviv, the entrance hall is a hybrid combination between the 'Main Street' and the 'Square'. To respond appropriately to natural and urban site, bounded by a road and a park, two transverse cuts cross the block and the building, jointing up in a glazed multilevel 'Street'. This is the main axis of vertical and horizontal connecting the building, beautiful views of the park. The entrance hall is unitary, divided in many very different areas. Inside there are a square, a winter garden and a panoramic promenade.

In many recent examples, especially German, the entrance halls are more austere and minimal. They are essentially places to stay and relax. In these relaxing places you can talk with friends sitting in comfortable sofas, read near a fountain, watch other people.

However, the presence of numerous and diverse activities and services, hospital and not, can cause a 'sensory overload'. For this the morphology of the environment is particularly important. It should facilitate the identification of main directions. The unitary language of the architectural elements and furnishings is important too. In Italy, one of the most successful examples is the entrance hall, the 'bioclimatic greenhouse', of the Meyer Paediatric Hospital of Florence. The structure of greenhouse of wood laminated is like as a fairy forest (Fig. 3).

Within very bright environment the "kiosks" for information and for the acceptance are located with the waiting areas, whose colourful character are part of a larger artistic project. In this art project, coordinated by the designer Andrea Rauch, every single interior are designed as parts of an imaginary tale: the *artistic glass*, separating the giant waiting room from the service corridors, gives stylized natural forms; the *zodiac* is made up of a group of metallic installations suspended; the *clouds in the sky* are a group of painted placed along the walkways connecting and under a large skylight; the *light cones* are two great spinners coated ceramic glazed in bright colours; the *fantastic fishes*, the *multimedia installation*, the *sails as curtains*, the *care toys*.

In Italy, the most magnificent example of entrance hall is the large covered one, enriched with luxuriant vegetation, in the new Mestre Hospital (Fig.4). This is thought to be a large garden square with reception, bar, restaurant, shopping areas, offices for the public, religious services and offices for the associations. On its face, on the upper floors: the outpatient department, the day hospital, medical offices and wards.

Although the hospital is a building complex, also for the distribution, the user should be able to perceive it as simple

and cross instinctively, without being confused. So the presence of a system of wayfinding assumes a fundamental role, contributing to the construction of mental maps.

For example, the Circolo and Macchi Foundation Hospital in Varese, a sequence of colour was adopted for different floors. It is based on the balance principle about the 'harmony of the four colours' by Jorrit Tornquist, international artist. Four different pastel colours alternate, with a modulation exponential of brightness, by lower floors (dark) to the highest (unclear). Where the transition is fast, colours are more saturated, as in the living areas, the colours are de-saturated. In a *wayfinding* system are important: the visual, acoustic and tactile signs and also the lighting and the shape and distribution of the ways. Communicative elements (signals, flooring, lighting, finalized use of colour, presence of 'attractors', etc.) are also designed.

In fact, these are often sewing up between different parts, instead of an organic and contextual operation of whole building. Sensitive points in the design of the routes are: landings of stairs and lifts, which must be clearly identifiable, and the waiting areas, presence and location, which need not be an obstacle for either visual or walk.

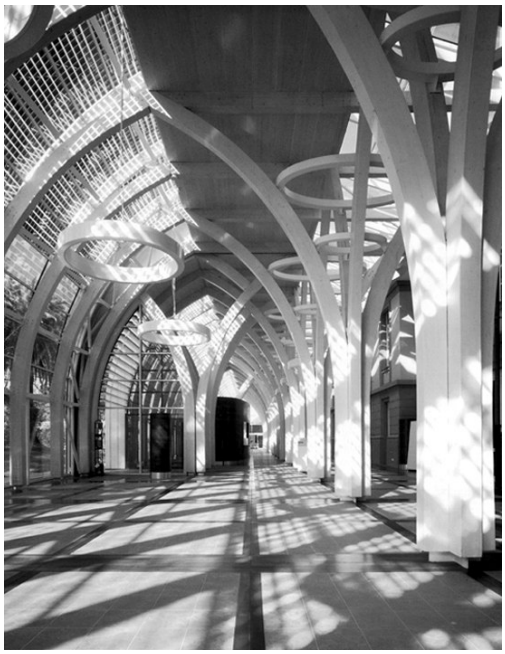

Figure 3: Meyer Pediatric Hospital (Florence): the entrance hall.

Color is not just a tool for orientation is also an integral part of the hospital's aesthetics and a form of therapy with beneficial effects. Thanks to the work of the American 'color specialist' Gary Glaser, in the Pôle Santé Sarthe et Loir, the alternation of colors set spatial layout like signposting, Besides, "the colors emphasized the structure, add depth to the rooms, raise the heights, draw us towards the landscape and help instill a sense of overall peace and quiet" (Pargade, 2008).

Figure 4: New Mestre Hospital: internal 'Square'.

The corridors, although are clear and linear[4], are the simple connections between parts of the building and they haven't standing areas. Moreover, they are not particularly characterized: the artificial lighting is zenith, which would avoid the problems of glare, but confuses the orientation.

The colours of floors, walls and rubber buffers are harmonized with each other but they aren't enough to guide the users. However, in many cases, such as the Gubbio and Gualdo Tadino District Hospital, the corridors have a strong relationship with the windows opening to the countryside or into the inner courtyards.

Even the waiting areas, such as the corridors, are not always designed together functional articulation of building. They are often made out of residual space. They are peripheral to the area to which you have to access and show no element (a view out, art object, the composition of plants, etc.) drawing attention to the user, detaching his from stressful waiting. Outlining the requirements and performances of waiting areas, it is necessary to distinguish different types of 'waiting', because for each of them corresponds different ways of using and different psychological needs. Waiting areas of the outpatient hospitals are characterized by a high state of anxiety and emotional tension and a perception of dilated time. Waiting areas in the atrium, support to other functions, have a considerable degree of representativeness and there is a greater tendency to socialization, between users and between users / operators. The waiting areas in the corridors, punctiform through the building, have the force of disruption and characterization of pathways and they are an extension of functional areas more defined.

The waiting areas are in direct visual contact with the area in which the user must come in, decreasing the stress factors. These areas are lighted in different ways, depending on the composition of the various groups of chairs for waiting. At the end there are 'attractors' often views to the outside that distract the waiting user.
Together with the entrance hall another area that is subject of special attention is the patient room. There are more avant-gardes examples in profit health system. These rooms, using the studies of Evidence Based Design, have hotel-like characteristics. They improve the quality of life of patients. Inside the room a semi-private area is foresaw. This is a living that allows more and better interaction between the patient and family members who assist him, ensuring a greater sense of 'territoriality', too. From the room the patient can see out. In temperate zones, the rooms are also equipped with a solarium, to enjoy the therapeutic effects, including psychological, of the sun. The furniture, taking care to the tactile and visual characteristic, allows customizing the environment by patients. However, medical instruments and equipment technology tend to be camouflaged, almost hidden. Patients may act independently on the systems of lighting / dimming and on those for the temperature control in the room.
The day rooms are not designed like the others supporting areas. If they are present, are unadorned rooms with chairs and tables. But, these rooms are very important for the socialization: they may be used as a dining area, or to meet relatives and friends. They should be equipped with comfortable furnishings, they should be directly connected with the outside, a garden or a courtyard, and if is not possible to have pleasant views. They should also have a space for media and internet access.
An area that has assumed considerable importance is the so-called 'Room of Peace". Previously it was an anonymous room inside the morgue, now it is designed appropriately. It is a place where the light plays an important role and in which religious symbols aren't present necessarily.

Conclusions

Previous considerations about trends of contemporary hospital buildings and about humanization of spaces supporting the health activity are the basis defining design guidelines.
The next step of the research is to specify a system of criteria that the designer can take into account to humanize important spaces, like those supporting the health activity. These criteria will be written for each aspect analyzed and derive directly from the evaluation of its architectural quality according to the optimal parameters introduced.
In fact from the analysis carried out and observing actual trends, we have saw that in those areas optimal levels of architectural quality in terms of humanization have not been achieved.
Obviously taking into account emerging criteria will be easier for new hospitals. More complex is to act within existing hospitals, where however is always essential to solve the problem of humanization. In existing buildings humanization doesn't follow the same logics of new buildings. Sometimes it is better to change their use making them housing or dormitories.
One of many problems is to create a strong system of relationship with external spaces that sometimes it is impossible to achieve because of the easy conditions of the urban context. Specifically the Italian hospitals have features that are different from other countries. Italian designers give great importance to the relationship between building and place, and use forms and languages that don't contradict local history and identity.

Notes

1."*The Centre for Health Design is a leading research and advocacy organization fo forward-thinking healthcare and design professionals who are leading the quest to improve the quality of healthcare through building architecture and desig"* (www.healthdesign.org).
"The International Academy for Design & Health was founded in 1997 by scientists at the Karolinska Institute in Stockholm as a non-profit organisation dedicated to the stimulation and application of research concerning the interaction between design, health, science and culture. It is is a global, interdisciplinary knowledge community dedicated to the stimulation and application of research concerning the interaction between design, health, science & culture" (www.designandhealth.com).
2. The *soft* actions are those in wich materials, colours, finisches, lighting acting complementary, qualify the space. For example, floors and walls must be color-matched. Their 'draw' helps to measure the space and, at the same time, highlights the configuration.
3. ISO 9241-11, "Ergonomics of human-system interaction - Guidance on usability": *"The extent to which a product can be used by specified users to achieve specified goals with effectiveness,efficiency and satisfaction in a specified context of use".*
4. According Cognitive Psychology the corridors should not have more than two changes of direction, becouse these prevent the construcition of a mental map that guides the users inside the costructed space.

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Illustrations

Figure 1: By. "Progettare per la Sanità", 97/2006, p. 27.

Figure 2: By Nickl-Weller C., Nickl H. (ed), *Hospital Architecture*, 2007, Vergaghaus Braun, Berlin, p.23 (Photo: Stefan Mülleer-Naumann).

Figure 3:By "EdA Esempi di Architettura", 4/2008, p. 114.

Figure 4: By "L'Arca", 240/2008, p.21.