The impact of the physical environment on patient's psycho-social perception

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Abstract The paper is a response to the National Health Policy drafted in India on cancer services which recommended that an ideal model of care should focus not only on clinical treatment, but relieve suffering by taking account of the practical, emotional, psychological and spiritual needs of patients and their families. While in Architecture, built spaces influences human behavior and affects the psychological and physiological perception ; in cancer care buildings with the importance given to the patient and his illness, the adverse condition of the building cause more harm than cure to the patient. This research paper tends to explore and evaluate the clinical environment on its role to provide sensory healing along with clinical cure based on the psycho-social perception of the patients.

The scope of the research is to identify healing design elements for the patient to recover and to include them as practical design guidelines specific to the Indian context. With the user-focused objective, the paper identifies healing design elements based on positive psycho-social response from patient .The research paper helps to see cancer care buildings, like any other typology, to provide homely ambiance valued with patient social behavior and cultural values.

The patient experience is measured and monitored by his sensory perception (by touch and sight) and his relationship with the built space by measuring the limits of physical accessibility and visual visibility within the space (Fig. 1). For the tracking mode, stimulation based software 'Depthmap' (developed by Tasos Varoudis at UCL's Space group) is used in conjunction with patient behavior.

Fig. 1 Artist sketch of the Adyar Cancer Institute Chennai

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"People say the effect is 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, by light, we do know this, that they have a physical effect. Variety of form and brilliancy of colour , in the objects presented to patients is the actual means of recovery."

Florence Nightingale 'Notes on Hospitals', 1863

The built environment can and does influence human behaviour (Bell et al 1996), and are the source of stressors or boosters which initiates variety of reactions, both psychological and physiological to the user. The perception of healthcare built environment as a contributory element in the patient recovery and wellbeing is prerogative and archaic in nature and given the importance to the individual's surroundings, it is clear that the clinical environment can affect clinical outcomes. Yet, in the healthcare buildings, the complexity in function, utility pattern and building form manifest on the healthcare environment to create more harm than cure to the patient. This results in affecting the patient's thought and action "leading to emotional distraction and physical barrier" (Berg, 2005).

Statement of the problem and need for the study

Carver (1990) admit that modern hospital is like 'entering an alien spacecraft", where the atmosphere can be "intimidating and unfamiliar". Ulrich (1991) argues that "such emotions derive directly from a design ethos which emphasizes the functional delivery of healthcare at the expense of patient needs". The result, he concludes, are hospital designs which are "psychologically hard" and "unsupportive" and which "work against the well-being of patients".

This image is observeant in older hospitals in India, showing built environment with least understanding on the user's physical and psychological needs but rather prioritize on the integration of Medicare procedures, building services, the administrative demands and the (ever) changing technology within the built environment. But with the present emphasis on the patients perceptive/needs and change in the Medicare treatment concepts, "the immediate need to recognize the hospital physical form and structure to imbibe the aesthetic ambiance and therapeutic function had emerged vital in Indian healthcare delivery system" (Waravalla, 2012).

Also,the policy and statements issue by WHO (World Health Organization) in 2000 and Indian National Health Policy 2002 and Vision 2020 for Healthcare of Planning Commission of India, the current and future hospitals are to be prepared for the future change and essentially focus on matters specific to patients and in understanding the patient needto be the base for the functional structure of the hospital facilities .

Aims and objectives

This research objective is to observe and trace the user's interaction with their hospital environment and is based on "informed suppositions" established in past research and by the patient enquiry methodology. Extent of this research is to know about what happens during environmental interactions, and also why humans respond the way that they do and about what might be done by designers to influence experience. In this research process, details on the users - namely patient perception on the hospital environment are collected through feedback questionnaire, and scientific spatial analysis of built form and design.

Therefore, the research probes into the following research query at coding and interpreting the issue as stated:

- To outline the consequence of built environment on the patient and identifying its relative behavioral responses.
- To identify the therapeutic aspects in the hospital building as per the patient psycho social perception.
- To identify and classify architectural design spaces/elements based on positive psycho-social response and interact from the patient.

Research design

This stage enquires and surveys at broader level the requirement of therapeutic aspects of built environment in cancer care hospitals within the context of Chennai city.

- Identification and categorization of therapeutic aspects based on the experience and knowledge of the novice in the healthcare setting and environment. The expert's opinion and suggestion and the inference drawn from the novice group was gathered to classify the architectural design aspects addressing the psycho-social needs of the patient. Also, the novice expert method guided to formulate the questionnaire for patient feedback. Based on this. Novice -Expert method, lack of psycho –social environment in the hospital can increase anxiety and depression, trauma, stress and depression in patient.
- Identification of five case studies on cancer care healthcare facilities in and around Chennai city selected for the research work to represent regional cancer care healthcare facilities based on the building functional classification (i.e. as an independent department to specialized hospital) and the cancer care provider types (i.e. public to private types) and to study/observe the impact of the identified therapeutic aspects on these types.
- Conduct of quantitative preference analyses based on the patient's attitude and perception over the built environment through a survey of structured questionnaire interviews and through visual observation at the patients response to the therapeutic aspects within the hopsital context. Patients both inpatient and outpatient of the five case-studies were contacted to get their response. The feedback concludes that need for therapeutic design aspects in the cancer specialty healthcare building are necessary and it's integrated in the built environment is exclusive and mandatory.
- The combined qualitative and quantitative spatial study on the impact of building physical profile on the patient perception and behavior using spatial Depth map software which correlate and corroborate the user perception and behavior through questionnaire survey and participant observation..Using Depth map software and user response ,the result analysis concludes with the optimistic justification on the need of psycho – social perspective in the design of cancer care building along with specific subjective observation and inference on the evaluation of the building layout and design .
- The correlation of the general and specific inference drawn from about research design phases is completed to provide information on the level of preference and significance of therapeutic design aspect in Outpatient Area, Diagnostic Area, and Inpatient area of the cancer hospitals.

Psychological and social need based behavior

In Indian scenario with existing multi-cultural diversity and sensitivity, the hospital building endeavors patient a "sense of belonging based on land (environment), religion and family" (Cloninger, 2004). With the trepidation scar on the cancer illness, the Indian patient undergo psychological disturbance leading to socially alteration , individual's emotions turmoil leading to anxiety, nervous, restless, feeling or looking tense, concern about losing control , an uneasy sense that something bad is going to happen,etc. The hospital environment perceived through the visual and accessibility perception can intuitively influence the patient psychological and physical perception. As Warren (1978) claims, "the user once inside the built environment, is a manipulator and exploiter of the environment", patient too in his/her perception on the environments during the period of hospitalization allows him/her to quickly to learn and take on board the surroundings and identify a sense *of place*, e.g. the hospital. To a patient, senses of space means their own area within a ward, and are nevertheless active yet, perceptive to sensory information flows. Also, patients with social needs , has approval-based perception extended to the built environment to consider architectural design aspects like privacy, waiting times, convenience, accessibility, and a sense of control.

Evaluation system on the impact of building on patient

Using of Space Syntax software namely Depth map (developed by Tasos Varoudis at UCL's Space group), follows the Hooper's theory 1978 at evaluating complex built form and analyzing spatial layout by measuring the hospital building interior and exterior in conjunction with patient behavior. Using evidence based technique, Depth map observes patterns of space usage within the hospital environment and design of hospital layouts and circulations and allows discerning the intangible psycho-social attribute with experience of the patient within the built spaces. The patient experience is measured and monitored by his sensory perception (by touch and sight) and his relationship with the built space by measuring the limits of physical accessibility and visual visibility within the space.

These techniques work by measuring the properties of spatial layouts those users perceive i.e. visibility and physical accessibility in terms of lines of sight along room and corridors, visual fields from public spaces, reception areas and nurse stations and degrees of privacy and openness. Using Space Syntax methodology it is possible to measure the direct consequences of layout design such as movement, levels of co-presence and interaction, and patterns of social behavior.

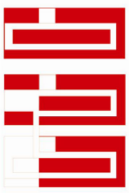
The context

The research was conducted in cancer care facilities in Chennai with total of 475 respondent patients from all five case studies. The selection and number of respondents in the case studies represented 5% of the patient population of the study area (i.e. Chennai) in order to get the definite users result findings representative of the region.

The study was done in prime spaces of patient use area namely Outpatient area, Diagnostic area and Inpatient area , yet this paper primarily focus on the patient social needs with reference to Inpatient area dealing with functional spaces - ward /bed area, nurse station, facilities for social interaction like waiting area, religious space etc.

Analysis based on patient's perception and syntax method

Configurationally, aspects of the building environment have significant cognitive and perception consequences to the user's psycho social needs. Hillier (1996) has argued that "spatial configuration may place constraints on spatial experience because it encourages or impedes aspects of human activity through spatial cognition and subsequent behavior", while Le Corbusier's (1962) statement concede that "the cognition of built environment is based on the movement" along with human visual perception. Hence, the research paper focus on the patient experience measured by Space syntax tool in combination with the patients' behavior to provide insight to the impact of building configuration /layout on patient psycho-social necessity with reference to the impatient area in five cancer care case studies (Fig. 2).

	CS1	CS2	CS3	CS4	CS5
Basic spatial organization					
No. of floor of in-patient activities	Two	Two	Two	Two	Four
Ward Layout	• Nightingale wards type with NS at one end. • Centralized NS with concentric ring of beds.	• Modular unit : four row of bed headed with a NS and treatment room	• Centralized NS with ward rooms surrounding it. • Street corridor with rooms on the both sides	• Axial corridor with rooms on either sides	• Loop corridor with ward rooms on both the sides and two anchor NS at two sides.
Circulation pattern - between ward and nurse station	• Parallel type • Radial type	• Parallel type	• Radial type • Linear type	• Linear type	• Branch type

NS – Nurse Station

Fig. 2 Comparison of building configuration/layout pattern in inpatient area of the case studies

The cognitive process are discusses in three fraction - tracking of respondents' behavior, deciphering their questionnaire feedback given on the built environment and mapping the socio-physical behavior using Depth map Space Syntax software. First fraction deals with the patients' behavior in a building depend on the physical character of the space and the building profile and are sensed by the way the user perceives and experience. In the next fraction, the determinants namely visual visibility, physical accessibility and the movements are used as the basic to identify the issues. The evaluation of the case studies to identifying the therapeutic aspects in the case studies was done by respective respondents using self-completed questionnaire.

Social patterning of psycho-social need of the patient

Questionnaire on psychosocial needs inventory (PNI) constituting nine psychosocial needs statements evolved through research's one year pilot phase were given to patients admitted in five hospitals. The cancer patients in the hospital were to fill the self-completion questionnaires on PNI with reference to *their own* needs within the context of the hospitals building he/she are treated in. These PNI are basically the qualitative and quantitative characteristic which manifests on the architecture of the hospital namely building form, space and circulation of a hospital in relation with the perception of the patient. Principal finding from the patients as per the questionnaire feedback were determined as Image and Scale; Privacy and Dignity; View to the outdoor; Presence of Nature; Physical comfort / Control; Legibility of place; Interior appearance/ finishes; Therapeutic design elements indoor; Therapeutic design elements outdoor.

Based on Hiller (1996), *"image and the scale of the hospital building produce a positive experience for the patient"* leading the confidence and reliability towards the Medicare treatment and positive outlook towards the future. In inpatient area, the patients stay longer in the hospital till the treatment /surgery was completed and the space he stays become his domain temporarily. The patient prefer total transparency in the perception of space with effortless visibility and accessibility to facilities. The linear building form, double loaded corridor, well lit and ventilated space, strategically located staircase /lift confirm the patient on his opinion to the scale of the built space.

The patients mainly required easy negotiation and approach to the ward area with minimal variation and change of direction for easy legibility of the place. The questionnaire responses given by the patients identifies that privacy and dignity is vital for Medicare process in Inpatient area emphasis on atmosphere for private conversation in the bed area and establishing high level of confidentially (regarding their medical ailment and treatment) during the doctors visit, but in parallel required the proximity and availability of staff for security and reassurance. The able patient found comfort in accessing the outdoor or large corridor space, temple space (Fig. 3, 4, 5) for the patient to have conversations with the relatives - this activity is possible during the four hours visitors time and especially in case study CS 4 and CS 3 with building profile permitting the interaction.

Fig. 3 Oudoor and indoor spaces in Inpatent area

Analysis on the prevalence of psycho-social needs

The of importance to the majority of cancer patients needs are on the valued qualities in health care professionals and systems providing sensitivity, receptivity, transparency, respectfulness, speedy access in the building room layout and circulation. The building with the open type accessibility system integrated with choice-based decision of the patient allows the patient to relax and recoup. Inpatient area with functional spaces creating and securing good social support and assistance for the family and friends to interact and integrate with the patient recovery process is a positive attempt. Important minorities and sub-groups of patients and carers had additional psychosocial needs, especially in the 'emotional and spiritual', 'identity' and 'practical' needs categories. For example, patients and carers of lower socio-economic status had higher levels of practical need for help with financial matters and transport than the more affluent.

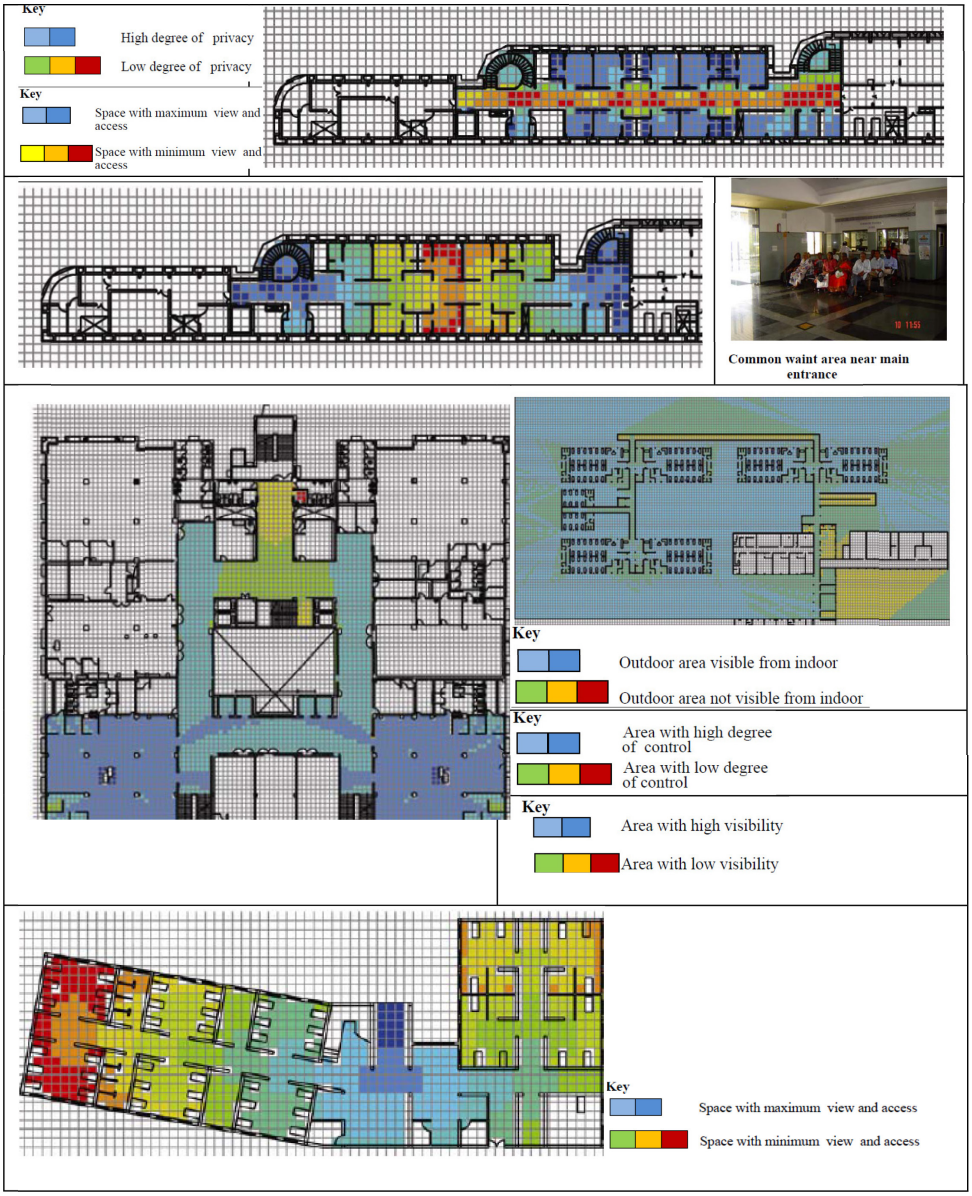


Fig. 4 Syntax analysis - Inpatient area

As Meyer and Mark's meta-analysis demonstrates, the evidence base for the benefits of psychosocial intervention is in the process of construction (Fallowfield, 1995; Fawzy et al., 1995). The research confirms that building environment shall guarantee for:

- built space and facilities to accommodate and facilitates interaction between health professionals and patient intergrating he expectations of the patient in conjunction with the Medicare needs;
- need to include support services to help in maintaining a patient's independence and sense of control over events, space rather being an obstruction;

- need to provide services to help patients deal with a range of emotional and spiritual issues, or if these services exist elsewhere patient carers can access them on behalf of their patients or are aware of the practical needs (including child care).

Fig. 5 Independent temple structure within the hospital premises

Inference and conclusion

To outline the consequence of built environment on the patient's social experiences and physiological behavioral responses in inpatient area of cancer hospitals, the study found that the patients' journey and resulting experience were influenced by the nature of the built and open spaces that they encountered along their way or on the place where they spend their hospital time. Within the context of a health care complex, these spaces are the elemental components of the patient's journey from home to hospital and back. These spaces are also represented by the areas within a building or between buildings that link them and provide access to each of the separate areas within them.

The empirical evidence based on users preference and evaluation to built environment within the case studies proves the patients staying in the hospital were sensitive to the built environment and required the ward layout to have high level of privacy with need value of 75%, good view to the outdoor 74%, physical comfort and control 78% and legibility of place 60%.Spatial requirements in the cancer care hospital based on the research are:

- A sense of personal space and a homely, welcoming atmosphere.
- An environment that meets the needs of visitors and family.
- Good physical design in terms of usability, accessibility and controllability .
- Access to external areas that promotes a sense of normality.
- Facilities for religious conviction and leisure.

In summary, the research has explicitly highlighted the patient's preference and experience in cancer care environment within the given context. However, the ecology of healthcare is necessarily a changing subject for research and evaluation, and improving the patient experience will continue to be an issue for those involved directly and indirectly in the healthcare. What is clear is that many of the principles that were adopted in planning this new environment, including those associated with the planning and consultation process, the integration of humane value, and the recognition of the fundamental and changing needs of the user groups, will continue to inform future developments in this and other care environments.

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