CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

The relationship between the built environment and human behavior is complex and confounding. Psychologist Roger Barker (1951) states that the ecological environment does not demand much but permits some behavioral pattern to take place naturally, while in the built environment, it tends to act as a catalyst in providing space for the users to perform, and also as a despot in making the users alter their needs and behavior to the built setting. In the case of healthcare buildings, the functional intricacy adds further to this conflicting connection between the built environment and the user, making his experience appalling and multifarious in built space. The literature review attempts to understand the complexity by discussing the broad theories and concepts in the generic and specific context of healthcare facilities. This is done by first understanding the user’s physical and psychological needs and behaviour in the healthcare built environment. The user needs based on his or her perception, cognition and his response to space (indoor and outdoor) in a hospital setting are discussed in the literature review by studying the survey and review of the research and literature from the books, research reports and case studies conducted in recent decades.

Much of the research in India refers to the patients’ perceptions towards the standards of the Medicare system and service operation. Importance is given to their views, responses and attitudes to health and sickness arising from the service received during their period of treatment.
There is, however, little research into the patients’ perception of the hospital built environment specifically. Hence, this review proposes to discuss the user needs for a therapeutic environment in healthcare building in five segments in the generic and specific context to healthcare. The first segment involves a review of selected samples of the psychological literature on perception, human values to provide fundamental understanding of this issue/of this area of concern. The second involves a review of the literature on user perception and behavior in the indoor, outdoor built and landscape environment in architecture to give an insight into how the profession perceives or conceptualizes the built spaces. The third reviewed a range of literature and reports relating to hospitals as a therapeutic environment followed by the next segment on the appraisal for therapeutic aspect needs in cancer care facilities. Such studies are satisfactory surveys; nevertheless they provide useful insights into patients’ views of the built environment. The final segment involves a review of the various measuring tools and the method used in case studies and followed by research organization to evaluate the qualitative aspects (that is therapeutic aspects) of the built environment, it’s impact on the built form and building physical profile studies to trace the patients’ experiences within the built environment of the hospitals.

2.2 PERCEPTION AND USER NEEDS

The perception and needs of the users (patients, relatives and staff) in a healthcare setting are essential. The necessity of the review of literature to understand the psychological perception and its physical needs in its many forms and guises provide useful insights into the way patients may perceive the built environment of a hospital. The individual needs have their bases in the biological, physiological, psychological and social makeup of the person which contrives within any setting and in the backdrop of a built environment, be it a place of work or a place to live-in or place for cure; these bases are
integral and legitimate. The quest and the objective of the built environment and solution to gratify the individual user needs (which implies the societal needs) lie at an understanding of the values and ideals of the need-basics and specific functional context of the building. Lawson (2005) advocates this view by expressing the built environment as “social art with psychological, social and partly cultural phenomena”, and Harold Proshansky (1974) an environmental psychologist has a firmer views “building are social and physical phenomenon” (Proshansky, Ittleson and Rivlin 1970).

“I take the stand that buildings are not primarily art, technical or investment objects, but social objects” (Markus 1993).

Apart for these basic requirements, the users’ needs can be described by other attributes namely – the cause of the needs, the origin and purpose of the needs, the societal expression of the needs and environmental association with the needs.

Murphy (1989) views human needs as an embodiment of behavior, which is described by the psychologists as goal-directed activity with a unity of motive, perception, thought and action. He views user need as the controlling factor, which not only prompts behavior response but also regulates the pattern of the individual person’s activities and sustains the activities in process. Walter H. Moleski (1978) expresses that within the envelope of the environment organism; the human needs are triggered by the perception, organized by the cognition to the space and conclude to regulate the spatial behavior1 (Figure 2.1 - behavior model).

1 The author describes the model constituting the following: Perception is the process of obtaining information from the environment through the use of sensory mechanisms. Cognition, consisting of thinking, memory, learning and symbolic knowledge, is the mechanism by which information is processed for the selection of behavioral patterns. Affect is concerned with the emotional response to perceptual and mental activities. Spatial behavior is an external, observable action of individual people and social groups within a spatial context.
The Rokeach (1973) provides a deterministic view on the user needs (physical, psychological) in the built environment by emphasizing the antecedent view on human value. He defines that human values are conceptualized as fundamental life goals or standards that serve as the guiding principles of life and essentially provide a basis for the formation of attitudes and act as guidelines for user behavior in the environment. The individual’s human value on the quality of life is universal and representative of the society, and are groomed from the society they live-in and are nurtured by the cultural ethics they observe. Poortingga et al (2004) categorizes the human values to the quality of life (QOL) model (Table 2.1) expressing the user needs, values, and human well-being in relation to the built environment believed to represent a wide range of aspects that are important to users².

² Poortingga et al (2004) in the research paper expresses the priorities of human values through the list of quality of life and used the concept of quality of life(QOL)to decipher the role of values in the field of household energy use. These results show that it is relevant to distinguish between different measures of environmental impact and different types of environmental intent. Several studies have shown that values contribute to the explanation of various environmental attitudes and behaviors. The value scales of Rokeach (1973) and Schwartz (1994) have been successfully used for explaining general environmental concern (Schultz & Zelezny, 1999) as well as more specific environmental attitudes and beliefs (Stern & Dietz, 1994; Stern, Dietz, & Guagnano, 1995).
Table 2.1  User needs based on the human values Quality-of-Life Aspects and their Description

<table>
<thead>
<tr>
<th>Quality of Life aspect</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aesthetic beauty and image</td>
<td>Being able to enjoy the beauty of nature and culture.</td>
</tr>
<tr>
<td>Comfort</td>
<td>Having a comfortable and easy daily life.</td>
</tr>
<tr>
<td>Environmental quality</td>
<td>Having access to clean air, water, and soil. Having and maintaining a good environmental quality.</td>
</tr>
<tr>
<td>Health</td>
<td>Being in good health. Having access to adequate health care.</td>
</tr>
<tr>
<td>Identity/self-respect</td>
<td>Having sufficient self-respect and being able to develop one’s own identity.</td>
</tr>
<tr>
<td>Nature/biodiversity</td>
<td>Being able to enjoy natural landscapes, parks, and forests. Assurance of the continued existence of plants and animals and maintaining biodiversity.</td>
</tr>
<tr>
<td>Privacy and dignity</td>
<td>Having the opportunity to be yourself, to do your own things, and to have a place of your own.</td>
</tr>
<tr>
<td>Safety</td>
<td>Being safe at home and in the streets. Being able to avoid accidents and being protected against criminality.</td>
</tr>
<tr>
<td>Security</td>
<td>Feeling attended to and cared for by others.</td>
</tr>
<tr>
<td>Social justice</td>
<td>Having equal opportunities and having the same possibilities and rights as others. Being treated in a righteous way.</td>
</tr>
<tr>
<td>Social relations</td>
<td>Having good relationships with friends, colleagues, and neighbors. Being able to maintain contacts and make new ones.</td>
</tr>
<tr>
<td>Spirituality/religion</td>
<td>Being able to live a life with an emphasis on spirituality and/or with your own religious persuasion.</td>
</tr>
<tr>
<td>Status/recognition</td>
<td>Being appreciated and respected by others.</td>
</tr>
</tbody>
</table>

For Carterette and Friedman (1975) the problem of perception is one of understanding the way in which organisms transform, organize and structure information that arises from the world in *sense data* or memory. These points to the difficulties that design teams have in providing single environment sets that are for the consumptive experience of a wide variety of people who occupy a given space, in various group sizes, at different times, for different periods of time, and from different cultures, backgrounds and incomes. Table 2.2 provides a listing of some of the stimuli discussed by Carterette and Friedman (1975). Many of these stimuli are of specific significance to personal or individual perception by way of information flows and reception of such data within the built environment context. As Table 2.1 shows, they include vision, spatial factors, space and motion, hearing, smell and taste as major stimuli. Within the hospital built environment context, patients accordingly experience their environmental surroundings and respond according to the experiences perceived or to the stimuli received.

The significance of the integration of the user’s need integration in the built environment is measured by the degree of need satisfaction achieved in that environment. The important issues of need satisfaction are not only what constitute a need, but how the person goes about gratifying that need. Psychologist G. Murphy (1989) states, “system of wants organized in a directed form towards familiar satisfiers; it is a system of anticipations and preparations for a round of experiences which have compelling value because they are the specific ways in which the diffuse and generalized wants have in the past been converted from tension of satisfaction”.

Table 2.2  User needs based on stimuli and elemental component of perception

<table>
<thead>
<tr>
<th>Stimulus</th>
<th>Elemental component of perception</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vision</td>
<td>Visual functions</td>
</tr>
<tr>
<td></td>
<td>Light and reflections</td>
</tr>
<tr>
<td></td>
<td>Factors affecting functioning</td>
</tr>
<tr>
<td></td>
<td>Factors relating to colour</td>
</tr>
<tr>
<td></td>
<td>Brightness and contrast</td>
</tr>
<tr>
<td></td>
<td>Temporal factors in visual perception</td>
</tr>
<tr>
<td>Vision and art</td>
<td>Natural perspective</td>
</tr>
<tr>
<td></td>
<td>Linear perspective</td>
</tr>
<tr>
<td></td>
<td>Appreciation of art</td>
</tr>
<tr>
<td>Pattern, object, colour hue and colour wavelength</td>
<td>Organization and form</td>
</tr>
<tr>
<td></td>
<td>Perceptual stability and clarity</td>
</tr>
<tr>
<td></td>
<td>Perceptual illusions</td>
</tr>
<tr>
<td></td>
<td>Attentional and emotional aspects of pattern perception</td>
</tr>
<tr>
<td></td>
<td>Subjective description and ordering of colour</td>
</tr>
<tr>
<td></td>
<td>Physical ordering of colour</td>
</tr>
<tr>
<td>Spatial</td>
<td>Spatial resolution</td>
</tr>
<tr>
<td></td>
<td>Spatial interaction</td>
</tr>
<tr>
<td>Space and motion</td>
<td>Visual space perception</td>
</tr>
<tr>
<td></td>
<td>Visual motion</td>
</tr>
<tr>
<td></td>
<td>Mobility</td>
</tr>
<tr>
<td>Hearing</td>
<td>Perception of sound</td>
</tr>
<tr>
<td></td>
<td>Auditory stimuli</td>
</tr>
<tr>
<td></td>
<td>Speech</td>
</tr>
<tr>
<td></td>
<td>Auditory reaction</td>
</tr>
<tr>
<td>Smell and taste</td>
<td>Odour and stimulant</td>
</tr>
<tr>
<td></td>
<td>Odour pollution</td>
</tr>
<tr>
<td></td>
<td>Chemical signals in the environment</td>
</tr>
</tbody>
</table>

Source: Carterette and Friedman (1975)
Walter H. Moleski (1978) expresses his view on the individual need satisfaction with the built environment in two ways that are related experientially and mentally. He explains that, by experiment an individual or a group of individuals learn through their needs and behavior, the reality of the building setting to support behavior and satisfaction needs; while, mentally, the individual thinks how the environment will accommodate needs and what the important facets of the environment are in need satisfaction. Also, Murray’s (1982) theory on need satisfaction in the built environment is its ability to facilitate or impede the efforts of a person to reach need satisfaction either based on what exists in reality or what he psychologically perceives it to be, eventually becomes accepted by default to the user also establishes the nature of built environment over user satisfaction. Hence, the need satisfaction is largely determined by three factors, namely – the strength of the needs and intensity of gratification, the socialized behavior patterns in conjunction with the person’s previous experience of need gratification and perceived importance of the need. In reality, each person responds to a need as an organized whole and each of the processes are interconnected with the others (Lawson 2005).

Hence, to summarize, the individual needs have their bases in the biological, physiological, psychological and social makeup of the person which contrives within any setting and in the backdrop of built environment. The user needs (physical, psychological) in the built environment are emphasized by the antecedent view on human value and the quality of life. While the perception of an environment is the view or outlook given by the user and it stems from the mode by which the user needs are delivered, it is principally perceived through sense data or stimuli of the user from his experience in the environment. The perception of the environment becomes comprehensible and liable when the need satisfaction is attained.
2.3 PERCEPTION AND USER NEEDS IN BUILT HEALTHCARE ENVIRONMENT

Environment is defined as the “physical condition that exists; affect behavior and development of the subject” (Oxford 2000). In the context of architecture, the built environment is defined as the physical built form, which personifies its character to accommodate the prime human factor- the needs of the user. The built form actually functions, contrives and serves the human needs at varied levels, serving from individual to groups within societal and cultural level incorporating the changes in the activity patterns caused by the levels.

The built environment is conceived as a series of behavior setting (Baker 1968) that have a milieu made up of physical boundaries, internal spatial differentiations and objects, and have standing link patterns of behavior made up of a sequence of extra individual activities, expectations, rules and social encounters and forms the activity systems in buildings (Moleski 1978). So the physical built environment and the behavior of the user form a transaction between themselves, in which a user modifies the environment to achieve his/her objective or modifies him/her and their need system to fit to the environment. The perception and the user needs satisfaction is ultimately the consequence of the transaction between the built environment and the behavioral pattern of the user.

And so, Chien (1972) in his book believed that the built environment supports a range of behavior patterns within its boundary and are maneuvered by the user to seek the fulfillment of his needs. He also identifies the built environment has a significant impact on the behavior of the user in several ways, namely:
- Physical setting acting as goal objects that serve to satisfy needs; as stimuli that trigger off behavior toward goals;
- As directors that induce specific patterns of behavior to take place;
- As a support that facilitates activities; and
- As constrains that hinder certain behavior form-taking place.

Thus, the needs of the built environment refer to the physical conditions of the environment that support the objective – directed activity of the user to satisfy his needs and wants. The functional objectives of the built environment on the user needs are well defined through an inter-relational matrix for needs, variation of behavior and the environment. This matrix is well perceived in Maslow’s hierarchy of needs by defining the function of the environment as physiological, behavioral and mental against the hierarchy of user needs namely physiological, safety, belonging, esteem, actualization, cognitive and aesthetic. The built environment provides three ways of supporting the objective-directed user needs-firstly; the built environment sustains the physical states necessary for a user to satisfy his need mainly in response to his five senses namely-color, smell, touch, sight etc. Secondly, the built environment aids specific activity pattern to take place and hinder others from taking place. The final functional aspect of the built environment is that it generates and maintains mental and emotional states necessary for need satisfaction by fulfilling aesthetic, symbolic and ambient functions.

Lam (1977) defines user perception as an active information process that reflects a number of important biological needs of the user and ultimately helps in the understanding of the human perspective from the architect’s and designer’s viewpoint. As defined by Carterette and Friedman (1975), it is the stimuli - a facet of perception to identify the users’ needs from
the built environment and a medium to comprehend the subconscious perception of needs. The perception process involves many mechanisms within the sense organ of the user and operates either consciously, voluntarily, or unconsciously, involuntarily to predicted familiar stimuli from the surrounding environment.

Apart from the stimuli response, Lam’s (1977) model also specifies the biological needs for visual information and their implications for the humane environment, which can be adopted to represent the possible biological needs that patients require in the built environment of hospital. As Table 2.3 shows, the main biological needs relate to orientation, physical security, relaxation of the body and mind, adjustment of the biological clock, contact with nature, sunlight and with other people and personal definition of personal territory; these needs play an important role and manifest in the design of a built environment. If there is a perceived change in any of these statuses of the environmental aspects, the changing information flow results in a reactive and exacerbated response and users’ perception. Eventually, the users become uneasy and uncomfortable if the sensory data that they receive from the environment around them are ambiguous, whereas they remain relaxed and in control if such information flows are clear and familiar. This observation is significant in healthcare built environment when patients finding themselves in unfamiliar and complex surroundings caused by the building spaces, such as corridors, wards, dayrooms, waiting areas, clinics, bathrooms etc., and heightened the users’ misjudged sense of perception and embroidered response. Patients, while in a state of good health tend to react in a negative manner to environments with poor or unfamiliar information flows. They tend to show emotions of fear, insecurity and unfamiliarity. Those who are unwell may react in a similar but intensified manner. In the latter case of people who are ill, such reactions may affect their health further and possibly delay the rate of recovery from their illness.
Table 2.3 Biological needs for environmental information

<table>
<thead>
<tr>
<th>Environmental aspects representing biological needs for visual information</th>
<th>Critical times/ situations</th>
<th>Visual information required to surmount the problem from the situation perceived</th>
</tr>
</thead>
</table>
| Orientation                                                              | At all times               | • Level horizontal reference clues  
|                                                                          |                            | • Definition of ground surface contours enclosing boundaries, obstructions, level changes  
|                                                                          |                            | • Location relative to destinations and exits |
| Physical security                                                        | When danger is expected from people or animals | • Location of potential threats  
|                                                                          |                            | • The nature of the surrounding enclosure |
|                                                                          | When danger is expected because the structure is perceived as threatening | • Comprehensive structure with clear continuity and visual logic |
| Relaxation of body and mind                                              | During work  
|                                                                          | While awake, but idle visual environment | • That required to maintain sensation of security  
|                                                                          |                            | • Uniform condition of light  
|                                                                          |                            | • Uniform condition of sound  
|                                                                          |                            | • Uniform condition of temperature  
|                                                                          |                            | • Interesting visual rest centres  
|                                                                          |                            | • Interesting visual environment |
| Contact with nature, sunlight and with other beings                      | Interior environments      | • Evidence of sunlight in every space or in nearby and accessible spaces |
| Definition of personal territory                                         | Particularly in public or work environments territory | • Visible evidence of personal control and occupational territory |

Source: Lam (1977)
The Picker Institute, Boston (1998) research report brings together the user stimuli; biological requirement of the user (especially the patient and relatives) extended to the context of healthcare, namely, ambulatory, acute care and long term care setting. The research enquired the focus groups to learn the patient’s experience in built health environment and the result showed various, mixed responses based on their personal experience with the environment setting. Yet, the groups were able to classify the experience distinctively - if not in architectural terminology - through their emotional understanding. Hence, the outcomes of the research were, in the ambulatory care settings of the hospital, the patient and relatives view ‘waiting’ as a “fact of life”, in acute care settings they view ‘clinicians’ as their “lifeline” and in long-term care settings they, especially the patient, often sense an irreversible loss of independence or decline in function and performance.

Hence, a study of the user perception in healthcare buildings is essential, as it establishes the values and hierarchy of human needs against the functional and action system of a built environment. The research probes and enquires the specific needs of the user as per the current scenario and its implication and manifestation in a built environment. The impact of the built environment on the behavior of the user as goal objects that serve to satisfy needs, as directors that induce specific patterns of behavior to take place, as support that facilitates humane activities and also as constrains, are identified.

2.4 PERCEPTION AND USER NEEDS IN THERAPEUTIC HEALTHCARE ENVIRONMENT

There is a growing awareness internationally among healthcare administrators and medical professionals of the need to create functional environments that also have patient-centered or supportive characteristics to help patients cope with the stress that accompanies illness. The key factor motivating the awareness of the facility design has been creating scientific
evidence that environmental characteristics influence the patient’s health outcomes.

 Though the concept of the integration of user needs in the built environment is mandatory and normative in any design of building typology, it is only in healthcare building types that the issues are profound. This is due to the explicit character and requirement of the end-user, that is - the patient (who approaches the hospital for the treatment of his/her clinical illness) and the accompanying relatives. Also, the state of illness that the user confronts, its clinical and biological variation add enormous physical and emotional stress and affect the normalcy of the individual patient and also influence the relatives, friends, family members and others associated with the patients.

 The work and commentaries of architects and landscape designers reflect the main stimuli and elemental factors discussed in the psychological literature presented above. Studies by Sommer (1969); Lam (1977); Nasar (1988); Preiser (1992); Hoskin and Haggard (1999); Francis et al (1999); Beer and Higgins (2000) and Francis and Glanville (2001) give useful insights into the need for intervention, planning, responsible humane design and promotion of good practices to improve the nature of the built environment for human consumption.

 Numerous studies, post evaluation and comparative studies have been conducted in various countries, on patient utilization and needs in a hospital to identify its significance and to probe and classify the architectural factors necessitated for the physical and mental healing of the sick patients (as cure from illness was the principal user need expected from the built healthcare environment). The basic fundamental needs which the patient as the primary user expected from the therapeutic built environment are:
1. Recognition of patient’s identity and dignity.
2. Distraction from pain and illness.
3. Family supportive spaces and
4. Healing sensory dimensions (sound, light, humidity, temp., color etc).

Stern et al 2003, under the sponsorship of Picker Institute and the Center for Health Design, conducted a multiyear survey to identify what the end consumers of healthcare seek in the built environment and what supports or detracts from their healthcare experience. The research was conducted on focus groups of patients and family members, to ultimately learn that the built environment does affect the quality of their experience expressing their needs from the built environment in terms of connection to staff, conducive to well-being, convenient and accessible, caring for family, confidential and private, considerate of impairments, facilitates connection with the outside world, and finally safety and security. Picker Institute, Boston (1998) recognizes the patients and family members as the "experts" about expressing the subjective quality of their experience, and what matters to them at creating "life-enhancing" environments. While the concrete details of consumers’ perceptions varied depending on the particular setting of care from which they were drawn, the themes that emerged from the focus groups were nevertheless remarkably consistent across all three settings of care (Table 2.4).
### Table 2.4 User needs in built healthcare environment

- facilitates a *connection to staff* and caregivers
- is *conducive to a sense of well being*
- is *convenient and accessible*
- promotes *confidentiality and privacy*
- is *caring of the family*
- is *considerate of physical impairments*
- is close to nature and the outside world.

Source: Picker Institute, Boston 1998

Anjali Joseph (2006) expresses the need for case sensitive built healthcare environment for the medical staff too, especially for the staff directly treating the patients. This observation is highly commended since the treating doctors and staff apart from the relatives; influence the patient’s stay in the hospital. The sense of security and safety needs of the patient and the relatives lies in the manner in which the treating staff and doctors interact with and serve them, while in turn, the good work environment conducive for work efficiency would aid in staff effective performance. The physical environment plays an important role in improving the health and safety of the staff, increasing effectiveness in providing care, reducing errors, and increasing job satisfaction. These improved outcomes may, in turn, help in reducing staff turnover and increase retention - two key factors related to providing quality care in hospitals. However, it has become increasingly clear that efforts to improve the physical environment alone are not likely to help an organization achieve its goals without a complementary shift in work culture and work practices.
The building layout - its visibility and physical contact of the built environment become essential for the user in the context of perception. And Warren (1978) claims that the user once inside the built environment, is a manipulator and exploiter of the environment who typically searched, avoided, explored and moved about in his or her given perception. The successful approach and avoidance in movement and visibility depended upon the ability to perceive and guide one’s own displacements, or ego motion, which in turn, was dependent upon the users’ ability to perceive the layout of the environment. Thus, based on the needs to access or curb the movement, the physical obstacles, safe paths and openings such as windows or doors need to be detected and negotiated. Analogously, the patients’ perception of the environment during their period of hospitalization allows them quickly to learn and take on board the surroundings in which they find themselves. Although hospitalized due to circumstances of ill health, patients have a sense of place, e.g. the hospital, and a sense of space, their own area within a ward, and are nevertheless active yet, perceptive to sensory information flows. Hence, the major themes and research findings obtained from various studies show that several healing outcomes have resulted due to the physical characteristic of the built healthcare environment. The research by Lumsdon 1996 and Mitry 1979 on consumer’s (patients) needs and satisfaction also indicates that users require the built environment to permiss them to consider design aspects like privacy, waiting times, convenience, accessibility, and a sense of control.

Another outcome is users’ satisfaction on the quality of care (Ulrich 2005) based on aspects like patients’ emotional duress, pain reported and intake of pain drugs, poor sleep quality, injuries from falls, lengthened stay at the hospital, patient room transfer, hospital acquired infections, quality of staff communication to the patient and eventually increased cost of care. Apart from users’ physical and psychological needs, the user expects
convenience and accessibility to services in the hospital design, which also requires change in the managerial and Medicare service with freedom and option to select the type of care given to the user.

The built healthcare environment requires sensitivity to the user needs with patients and relatives to experience an environment that is physically and psychologically healing and stress free, while the medical staff treating the patient also requires a built environment with supportive characteristics to increase the work efficiency and retention. When the built environment fails to consider the physical and emotional requirement of the user, discomfort tends to cause extreme stress to the user (be it the patient, relatives or even the medical staff treating the patients) resulting in negative effects of stress like physical, psychological and behavioral alteration. Many physiological research studies have shown that poorly designed environments can, for instance, increase anxiety and pain and affect cardiac performance etc. (Table 2.5).

**Table 2.5 List of negative stress**

<table>
<thead>
<tr>
<th>Physical</th>
<th>Psychological</th>
<th>Behavioral alteration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased blood pressure</td>
<td>Anxiety</td>
<td>Sleeplessness</td>
</tr>
<tr>
<td>Elevated levels of stress hormones</td>
<td>Depression</td>
<td>Aggressive outbursts</td>
</tr>
<tr>
<td>Reduced immune functions</td>
<td>Anger</td>
<td>Persistent patient habits</td>
</tr>
<tr>
<td>Source: The Centre for Health Design (2004)³</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

³ The three categories of negative effects have been identified consistently through 600 allied research papers linking patient health and the quality of care with the way a hospital is designed and notified in the workshop “Designing the 21st Century Hospital” conducted by the research organization The Centre for Health Design and The Robert Wood Johnson Foundation (RWJF) on June 2004.
2.4.1 Therapeutic Design aspects in Healthcare built Environment – International Perception and User Needs

Across the decade, the healthcare built environment has undergone tremendous changes in terms of its overall objectives and perception due to the changing priorities in Medicare process and the healthcare economic developments. With the advent of modern medicine, the healthcare industry saw the healthcare building serving as a reclusive institution isolated from the society taking care of the terminally ill and the poor. In the late 20th century, the transformation was obvious, showing healthcare buildings as clinical and institutional conclave with ominous and somber environment primarily focusing on the Medicare process and the needs of Medicare providers i.e. the medical staff. While in the present situation, the healthcare industry shows affinity to the end user (patients and relatives, also the treating medical staff) with slow transformation and shift in perspective and ambience of the built environment to accommodate the care.

There appear to be four major factors that have currently been shaping the global healthcare market for therapeutic healthcare environment. These factors are universal and are applicable in any western country or in the Indian healthcare system. At present, this market trend is noticed in Indian healthcare scene with the private healthcare provider adopting the trend faster than the public providers. First, the hospital market is highly competitive, and health care executives are forced to invest in newer designs to remain desirable to patients and affiliated physicians who influence patient referrals, and payers (Morrisey 2001; Salkever 1980). Competition among hospitals reportedly is influenced more by the availability and sophistication of services and facilities than by prices (Salkever 1980). The growth of patient-driven health care has created a demand for hospitals to focus on patient-centered care with services such as concierge services, bedside internet access, spaces
to involve families in the therapeutic process and private rooms (Carpenters 2004). A second factor driving the market for therapeutic hospital design is the need to incorporate new technology (Shactman et al 2003). The research report from the Ministry of Health and Family welfare has shown that hospitals increasingly are housing more sophisticated diagnostic and treatment technology to satisfy the needs and quality of service to the users.

The Therapeutic Environment theory stems from the fields of environmental psychology (the psycho-social effects of environment), psycho neuro immunology (the effects of the environment on the immune system), and neuroscience (how the brain perceives architecture). Hence, theories, concepts and environmental elements relating to the therapeutic built environment discussed as follows, show the multidisciplinary approach drawing strength from fields like medicine, psychology, social science, neuroscience, art and so on.

“Normalisation” is one of the first therapeutic concepts adopted in the late 20th century with the comprehensive definition given by Bengt Nirjee (1970). He says “The application of the normalization principle will not make the subnormal normal but will make life conditions of the patients’ subnormal normal as far as possible...” (Nirje 1970). Normalization, (as per Peatross 1997), has affected hospitals and other care institutions in the 20th century both socially and spatially. As a result, traditional practice has shifted from being medically oriented and dominated by professionals to a more holistic approach where the whole person is taken into account, not just his handicap or illness.

The introduction of the concept and “The Theory of Supportive Design” highlights on the elimination of stress in the user, the main deterrent for the patient recovery. The theory and guidelines are underpinned by a large
amount of “indirectly” relevant research in health psychology, environmental psychology, behavioral medicine, and other health-related fields (Ulrich 1984, 1991, 2003). Because the guidelines suggest comparatively evidence-informed directions for design solutions, the design approaches seem likely to prove successful in promoting improved patient outcomes.

The psychological and social dimension has stressed the design of healthcare built form to categorize and marginalize in creating exclusive functional spaces (Dilani 2004 and 2006). In his three decade research on built healthcare environment for therapeutic integration, he observes that during the traumatized hospital experiences, little priority has been given to create surroundings that calm patients, or help to strengthen coping resources and healthful processes, and hence, recommends ‘psychosocially supportive design’ and implement support that stimulates and engages people, both mentally and socially. The basic function of a psychosocially supportive design is to start a mental process that, by attracting a person’s attention, would enable to reduce or eliminate anxiety, bringing about positive psychological changes of stimulation, creativity, satisfaction, enjoyment and admiration to the user.

The model developed by the architects and designers, “patient-centered care” or supportive characteristics help the patients to cope with the stress that accompanies illness. This model further extends to be a “family-centered care” bringing in the family into the supportive framework and prepare the support families and professionals for working together in a collaborative process.

“Evidence based design” is a concept adopted by the Center for Health Design, where designs are decided based on facts and research results and are used in creating therapeutic built environments in healthcare. This
concept stems from the clinical concept “evidence based medicine” which brings the designer, together with an informed client, to make decisions based on the best information available from research and project evaluations. The prime objective of this concept is to improve the healthcare organization’s clinical outcomes, economic performance, productivity, customer satisfaction, and cultural measures. Kirk Hamilton (2003) also observed that exemplary evidence-based architecture comfortably blends the architect’s rich experience, understanding of classic design principles, and creative inspiration with design decisions based on insightful interpretations of a broad range of research results.

Though the concept and theories have varied perceptions to comprehend, utilize and attain the purpose, the prime objective to provide enhanced therapeutic built environment within the healthcare facilities for the betterment of the users was always the same and ubiquitous. Similarly, the identification and utilization of architectural idea and building design elements as therapeutic tools is seen to be in parallel. Hence, for the humane dimension in the built environments, hospitals are slowly adopting architectural design ideas which are very subtle but meaningfully design elements such as big windows, soft lighting, art, gardens etc. into their designs to enhance patient and staff satisfaction. Changes in hospital design to improve staff satisfaction and safety is also one of the approaches followed for showing high staff turnover rates, especially among nurses.

As discussed earlier, the primary user’s response to the built environment is based on the sensory perception of the built environment. The sensory perception, namely, what they see, hear, feel is vital and is used to comprehend and weigh up built health care environment for its humane integration. So, while being ill or physically ailing, the sensitivity of the patient and the relatives are is crucial and their perception and expectation
from the healthcare environment are gets based on what they perceive to gratify their sensory needs and the societal needs.

The common hypothesis that typified the following research studies was that hospital physical environments had a direct bearing on the wellbeing of patients and their families and staff workers. In a discussion on enhancing physical comfort, Walker (1993) points out that people’s perception of their surroundings affects their mood and thinking. In the report studied by Maslow and Mintz (1956), subjects’ ratings of the energy and wellbeing of the healthcare building were influenced by the aesthetic environment of the surrounding room. In further studies reported by Walker (1993) it was shown that elemental forms such as the appearance of the building, light and air quality, noise, privacy, colour and pleasant furnishings were predictors of psychological wellbeing.

Therapeutic Concept in built healthcare environment

A. Resultant from social cultural values and sensory perception of the user

- Environment quality and control of the environment (Way finding, privacy, choices given to the user)
- Sensitivity and consideration to the physical impartment
- Care for the family
- Design that promotes social support

The building design within the built mass, in terms of lighting, temperature, air quality and noise directly affects the sensory perception of the user. Though in the presence of the technology, the environmental comfort achieved, is mechanical, but yet, the patient and relatives prefer their
independence and choice to control the environment within the vicinity and choose the quality of the environment. **Way finding** is another aspect of demanding users’ control over the environment, a term to describe the strategies used to navigate through space. The user’s preference to identify and negotiate the space with no or least assistance provides a sense of independence and control on the environment. Landmarks are critical elements for navigation in providing cues to direct and identify location and destination.

The physical and emotional needs among the users, especially the patients for whom the presence in healthcare built environment tends to manipulate their notion and actions; view it as a healing alcove. While undergoing treatment in the hospital the patients undergo myriad kind of emotions and thoughts and desire for privacy in the building. In the healthcare built environment, the level and degree of privacy are varied in acute care setting, ambulatory care setting and other areas based on the their socio cultural habits. The user choice of privacy and retaining dignity in the ambulatory care setting, patients expressed concerns about confidentiality and privacy in waiting areas, especially during intake interviews, as well as during clinical encounters. In acute care settings, patients and family members emphasize the need for privacy – especially in patients’ rooms – and for places where they can get away from the noise and bustle of the nursing unit. Residents of long-term care facilities and their families express even stronger concerns about privacy in the residents’ rooms (Picker 2003). Respect for privacy and confidentiality when doctors visit and examine the patient is also important. Chandrasekar (2006) observes that hospitals encroach on a person’s privacy and individuality thus affecting human privacy and dignity which can be corrected through efficient layouts and a barrier free environment that helps patient mobility and wellness. This can be
achieved by providing architectural spaces like lounges, worship places, gardens, and kitchen activity rooms with minimal expenditure.

The other concern by the user in the hospital setting is **sensitivity and consideration to the physical impairment** caused either due to the age or due to the illness. “……*Even in ambulatory care settings, many patients want an environment that takes the physical symptoms of illness into account. They also want equipment and signage that is sensitive to the needs of people who are sick, old, or physically impaired…. Patients in acute care settings are almost always either ill or infirm, or recovering from illness. Some patients are on medication that distorts their sensory experience, while others are learning to adapt to new physical limitations. Patients and families want an environment that takes these experiences into account….. Residents of long-term care facilities need environments that accommodate their impairments, disabilities, and special needs in order to carry out the activities of everyday living…..*” (Picker 2003).

Picker (2003) expresses in the report that the three most commonly-mentioned environmental concerns were restful waiting areas with comfortable seating, well-placed signage, barrier free maneuver and accommodating special-needs patients to avoid multiple uses of residents’ rooms.

**Care for the family** is one of the prime aspects that the patient and relatives consider. Apart form the Medicare support given by the medical staff, the recovering patient looks upon family support and care - the concept now recommended by the healthcare industries. Picker (2003) identifies the significance and the active role played by the family members accompanying the patients through his journey from the out-patient area to the diagnostic area and in the in-patient area, the relatives’ involment in the daily activities
of the patients. The research also proposes and stresses the need for the healthcare facilities to provide specific facilities for the relatives to do their task work well.

**Therapeutic Concept in built healthcare environment**

**B. Resultant from building anatomy**

- Appearance (site layout and overall design of the building)
- Nature, garden, healthcare interior – art
- Architectural design elements-window, spaces like court, atrium
- Architecture design layout and spatial quality

The majority of studies seeking patient views on health care provision have been concerned with the delivery and outcomes of healthcare (Bruster et al 1994; NHS Survey of NHS Patients: General practice 1998; Hiscock et al 2001). Little work has been focused on patients’ preferences and views on how the building plan and design can influence the decision of their needs and affect the quality of care. Historically, the focus has been on topics related to managers’ and professionals’ priorities and agendas - not necessarily patients' priorities. Examples of processes addressed in patient satisfaction surveys include, for example, how long they had to wait for a bed, whether or not they were given enough information about their condition by the staff, pain management and staff communication with patients.

The therapeutic design aspects - **appearance, site layout and overall design of the building**, play the primary role to satisfy the user need of the building in removing the sense of anxiety and apprehension caused while approaching the buildings (Lawson and Pheri 2003). Lawson and Pheri (2003), conclude from their research on UK hospitals, that patients and relatives gained confidence and acquired comfort as a positive response by
perceiving the physical appearance, building ambience and the spatial quality of the hospital with therapeutic character.

**Nature** set in a natural setting or in a man-made landscaped garden; provide a fitting site for the built healthcare environment to be therapeutic. The presence of nature as a garden, provides a restorative view and improves medical outcome by promoting access to social support amongst the patients and relatives, encourages physical exercise and an escape from stressful clinical settings; the research also reveals that gardens are used by the staff to relax (Ulrich 2003).

“Patients in ambulatory care settings find natural scenes and settings pleasant and relaxing, especially while they are waiting, ....... in acute care settings, both patients and families want direct access to the outdoor nature, as well as an indoor landscape environment that allows sights and scenes of nature .........residents of long-term care settings relish the sights and sounds of nature and a visual connection to life outside the institutional setting” (Picker 2003).

The opinion on the appearance of the healthcare interior is subjective with the user’s reaction on the decoration, finish and furniture being different with both favorable and negative comments. Yet, the patients and relatives uniformly favored the use of artwork and pictures of nature, decorative wall and floor finish (Lawson and Phiri 2003). The interior finishes containing aesthetic artwork and functional ergonomic serves as a key indicator to measure the caring organization and as a reflector of the hospitals’ socio-cultural values (Redshaw 2004). Murals, wall paintings, sculpture, are some of the artwork used commonly and integrated with the interior’s theme. Limited but convincing scientific research shows that emotionally appropriate art or pictures can reduce stress and anxiety, reduce
pain and increase patient satisfaction, but inappropriate art styles and subjects may worsen outcomes. Overall, the interior is to have an appearance of homeliness as stated by Lawson and Phiri 2003.

“There is some evidence that patients like to see a place that they consider “homely”. From the comments made, this seems to include having variety and texture in all matters. Variety is desirable in lighting, colour and materials.

(Lawson and Phiri 2003)

The next most frequently mentioned concern was that of views, or more often the lack of them. The study conducted by Lawson and Phiri (2003) frequently mentions the building element – window. A window is one building element that is multi-therapeutic in nature at providing an option for the users inside the building to view the outside. Windows influence the healing process by means of variations in environmental variables by affecting brain processes that in turn, alter outcome measures. In fact there is a growing body of empirical work in the literature studies supporting the idea that both natural lighting and sunlight have therapeutic qualities. However, the sill heights of the windows and bed arrangements in some rooms prevented the bedridden patients from seeing them.

In the healthcare building, the interior layout, the paths of movement, connectivity to spaces deduce the user’s perception and notion of the building at establishing their attitude towards the built environment.

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Ulrich, Lawson and Martinez (2003) in their presentation on the research commissioned for NHS Estates, explain with reference to ward design, ward dimension, interior furniture with wall partition and window/door opening that they significantly affect the movement, observation and interaction between staff and patients.

Others

- Cleanliness
- Aural environment
- Olfactory environment

Finally, the patient and relatives respond to the cleanliness of the built environment. Though the maintenance and the service of the surroundings only cater to the functioning system of the healthcare building, cleanliness of the built space determines the effectiveness and usability of the building. Lawson and Pheri (2003) were able to reveal the impact of cleanness on the user perception of the environment. The research was able to quantify the effect the cleanliness of the bath and the toilet on the user feedback on ward design.

Studies in the aural environment have found that noise levels can have an adverse effect on patients and can enhance the perception of pain (Falk and Woods 1973). Lack of sufficient rest and sleep is one of the main causes of stress facing patients in hospitals and the most frequent and important cause is noise (Hurst 1996) and it is generally accepted that the need for sleep increases with illness (McCarthy 1992) while other studies (Minckley 2002) found that increased noise increased the patient need for analgesia. However, studies have also found that hospital nurses may become
accustomed to a certain level of noise (Parrack 1957) and will not notice sounds that may disturb patients, particularly at night.

In hospital environments medicinal smells can bring about a level of anxiety amongst patients. Unpleasant odours are known to increase heart rate and respiration, whereas pleasant fragrances can lower blood pressure and heart rate. Of all the senses, smell is the most intimate and elusive, reaching more directly into memory and emotions. Often the olfactory sense is underestimated both as a cause of stress and, when positive, as a therapy or as an agent to distress. Nonetheless, some people claim that smells are retained more acutely in memory than visual images or sounds. However, what is not in doubt is that smells reach into our emotional life – suggesting, stimulating associations, evoking, frightening as well as arousing (Ballard 2002). Strong odours may stimulate the central nervous system, eliciting changes in body temperature, appetite and arousal. Studies (Knasko 1989) have demonstrated that odours impact on people’s health and well-being. This can include tasks, mood, perceived health and perceptions of the environment. In terms of design, hospitals have areas of residual bad smells, for example, crowded spaces or day rooms where inadequate ventilation has left unpleasant odours. It has been identified that deep plan buildings are even more susceptible to residual smells.

The need for a therapeutic environment applies to all age group be it a child or an adult; the expression and degree of user’s needs vary depending on the user’s perception and sensitivity. Susan et al (1998) in her study of the Neonatal Intensive Care Unit in the Children’s Medical Center (CMC) in Dayton, Ohio, was able to conclude that there was the need for a home-like atmosphere with “family centre care” for the newborn, children and mother. While research conducted by Redshaw (2004) in the Children’s Hospital in Bristol, UK, was able to scientifically conclude that children apart
from patents and staff of the hospital were sensitive to the surrounding with feelings of fear, uncertainty and unfamiliarity. And in the context of the therapeutic needs of the elderly, Zeisel et al (2003) report on the behavioral outcome of elderly people in nursing homes, similar observations and the result is seen where the user’s positive responses towards the built environment were traced.

Steinfield and Dunford (1999) bring a further strand to consider in discussions of perception and raise the question of whose perceptions and the existing state of wellness or embodiment of the user of the environment. These writers, in considering enabling environments from the viewpoint of disability and rehabilitation, pointed to the importance of the physical environment as a factor in determining the degree of independent living and in defining the status of people with disabilities in society. Commenting on the environment, the authors have argued that most people with impairments and the professionals who serve them recognize the important role that the environment plays in the life of those with impairments.

2.5 THE NEED FOR THERAPEUTIC ASPECT IN CANCER CARE BUILT ENVIRONMENT

Cancer is globally recognized as the most expensive and life-threatening concerns within healthcare and with the emerging trend in the field of cancer there is a need to design comprehensive cancer care built environment that creates atmosphere of hope, balanced with the high tech aspect of Medicare facilities.

The uniqueness in the cancer care is the nature of cancer treatment and therapy which demands the cancer patients to deal with pluralistic manner provided by varied medical specialties and subspecialties including surgeons,
medical oncologist, radiation therapists’ etc working on the prime objective of the patient cure. Also, the systemic nature of cancer biology leads to multimodal treatment involving surgery; elaborate diagnostic procedure, radiation therapy and/or chemotherapy. And depending on the severity of the cancer this multimodal care would be repeated on the patient, leading to circumstances of patient frequently visiting cancer care built environment for either surgery or treatment or in some case the final visit. This somber association with the cancer Medicare process often creates a feeling of anxiety and helplessness amongst the patients and their families and they are always physically and emotionally debilitating and similarly is the case of staff-nurses and the doctors taking care of the patients, they are also subjected to the similar emotional and physical toil too (HSK Inc.1994).

Faced with the shocking crisis of the cancer, patient-user not only turns to healthcare providers (doctors and nurses) but also turn to the cancer care built environment for physical and psychological support. Ahmedzai (2001) states that,

‘supportive care for cancer patients is the multi-professional attention to the individual’s overall, psychosocial and cultural needs and should be available at all stages of the illness, for patients of all ages, and regardless of the current intention of any anti-cancer treatment’.

The quality of Medicare and the architectural character of the built environment that patients with cancer receive and encounter have demonstrable effect on themselves and their relatives to a level of distress. The distress caused by the illness is logical and is addressed holistically to the concept of ‘supportive care’ (Brennan 2004)\(^5\) and ‘quality of life’\(^6\) (Schou and

\(^5\) The supportive care is holistic patient centered care with importance given to the patient and relatives that provided physical, psychological, social and spiritual needs of the patient and their families.
These concepts, through research and feedback on existing cases studies in UK and US, proves that, the care to cancer patient and his relatives are to be holistic with the built cancer care environment playing a significant part in the cure of the illness.

With regards to the built environment response to the user needs, Miller et al (1999) expresses the views that attitude and preference of the patient is essential for creating humane built environment and for cancer patient, particularly, personal attitude and preference both patient and relatives and the treating staff’s too—contribute to healing outcome, as shown by numerous studies. Miller et al (1999) states “logic, therefore, follows that a patient’s surroundings in a cancer care facility can create a perception or mindset of either optimism or pessimism. This is where the holistic approach to architecture and interior design enters the picture.”

This holistic approach is being identifies as a means to cure the patient in ‘humane’ manner and is valued in cancer care built environments (Brennan et al 2004). Though the basic user need - the physical, psychological needs – is universal in any healthcare building type, the exceptional therapeutic needs in cancer care built environment would lie on the inimitable needs of the user and the means and method of providing the architectural aspects.

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6 Core component of quality of life are: physical concerns, functional ability, family well being, emotional; well being, social functioning and treatment satisfaction.

7 Quality of life is in reference to cancer care process(both in clinical system and building design) brings in psychosocial oncology along with the quality of life values of the patient and relatives social needs.

8 Case study in UK with the integration of therapeutic environment is United Leeds Teaching Hospital NHS Trust, Salford Royal Hospitals Trust.

2.6 THE NEEDS FOR THERAPEUTIC ENVIRONMENT IN CANCER CARE BUILT ENVIRONMENT IN INDIA

In order to cater to large cancer population in India, the Indian healthcare delivery system operates through independent RCC (Regional Cancer Centre). Oncology department in medical colleges, Trusts/NGO and private own corporate hospitals with authority to operate vested on the government in first two types and by the group individual in the latter. In delivery centers, these different healthcare providers influence the administrative, functional and utilitarian purpose of the built cancer care environment.

The Indian cancer care buildings respite the authority of varied healthcare provider, is subjected to cope with various factors, i.e. change in cancer care treatment, newer and sophisticated radiation and chemotherapy equipments, newer diagnostic system and ultimately the user requirements. With the advent of information and technology, the patient requirement and perception have undergone a rapid change from being a dormant and ignorant receiver of care to an active and well-informed user with specific demands and needs. The patient and relatives' awareness on the disease and curative methods have provided them the choice to take decision on their healthcare needs and also enabled them to express and demand the quality of care. Correspondingly, in 1980s, Medicare delivery concept underwent transformation from a somber and closed system of providing ailing Medicare to more multidisciplinary, psychosocial participatory care with patient centered care.

With the changing trends in cancer care delivery system, recently the Indian government had initiated various new government hospitals to modernize healthcare facilities and promote patient centered care. Also, the
private healthcare provider in India realized the importance of patient-centered concept and implemented the concept within their building framework in order to enhance and increase the measurement of patients' response and satisfaction level on the quality of care and healthcare delivery system (ICMA 2005). Chandrasekar (2005, 2006) and Chawla (2005) observe that the advancement in the scientific and technological research has taken the healthcare skills and facilities especially in the private healthcare provider to a higher state-of-the-art level... ‘In fact, improved efficiency in health care has raised the expectations of patients in the health facilities planning leading to merger of need-led planning with resource-led planning’ Chandrasekar (2006). Also, the advancement had changed the acute care provider needs to establish an operative system for the immediate present and future to demonstrate and express its commitment for patient-centered care and remove the maze and cheerless hospital. Ar. Hussain Waravalla (2004) says ‘In fact, many (if not most) of the hospitals built in India during the latter part of the last century seem to have been designed to provide a roof over the increasingly complex medical procedures being performed within, with their architects being little more than “doctor's draftsmen”, translators of medical and technological requirements into built form. Grim and cheerless buildings cannot be dignified with the word “architecture”, but today the hospital planning trends, concepts, equipments, indoor finishes have changed to make the hospital a “real” place to convalesce and rest’.

Through various research and case studies conducted on cancer hospitals by the ICMR and other NGO research organization, on the discipline of hospital administration and management, Medicare process, medical ethics, clinical relationship between the patient and the medical staff but seldom no scientific study on the need and character for patient-centered built environment were conducted. However, to date, quality assurance of the structure and environment in which care is delivered does not have scientific
evidence of what the user requires for the built environment and identification of the architectural design aspects that are therapeutic in nature (Nancy 2007).

2.7 MEASURES OF BUILT HEALTHCARE ENVIRONMENTAL APPRAISAL USING EMPIRICAL AND SOFTWARE ANALYSIS METHOD

Planning healthcare built environment involves complex design process commencing from initial conception to comprehensive blueprint solutions, but yet it is just the beginning. The change in the healthcare building is so immediate that even before the building starts functioning building becomes obsolete. The buildings undergo multiple changes, adjustments, and alterations and are universally significant in large and small-scale healthcare buildings, where the built form, function and character are always subjected to change and modification across the decade of existence. This alterations drastically distant the performance of the built healthcare environment away from the primary objective to serve the patient to cure and becomes complex to rectify the fault. So, the system of measuring and evaluating the building performance for its shortcoming at reaching the primary goal or purpose of care becomes essential.

Various concepts and methods are adapted by researchers and organization as discussed below, and are predominantly conducted on existing healthcare built environment for upgradation, or, evaluated to compare the building performance before and after the alteration in the planning layouts, or evaluate a new healthcare built environment to show it as an ideal model or theoretical research on schematic design to test the veracity before being built. The evaluation model or tools developed can measure and evaluate the whole to part within the building zones of a hospital to study the context specific
issues at close quarters. The following methods are used as evaluation tool in
countries of UK and US.

The concept of evaluating spaces in the built environment (for its
physical and psychological characteristics) is based on the architectural views
of perception and perceptual psychological views of architecture in order to
explain the nature of perceptions within the built environment as described by
Hooper (1978). Hooper considered a number of evaluative responses to
questions about relations between perceptions, architectural forms, the nature
of the design process and the limits the structure of the perceiving human
mind placed upon newly built environments. The evaluation pointed to human
perceptions expressed in terms of cognitive, affective and symbolic responses.
Accordingly, Hooper (1978) explained that cognitive responses were based
upon perceptual information that was integrated by each person in their
comprehension of the basic form of an area. Affective responses described the
state of the person who is making the judgment. Such responses were,
according to Hooper, derived from cognitive responses and reflected how
these responses had been combined in the individual’s personal assessment of
an area. Symbolic responses reflected the meaning and intent of the
architecture. Thus, the author explained that:

“Cognitive attributes, such as clearness and complexity of an area,
are combined at this level to yield affective responses, such as
comfortableness and friendliness. .... Most affective responses are clearly
evaluative, as in cases where observers indicate their judgments of beauty
and attractiveness”.

(Hooper 1978)

The following evaluation method AEDET, ASPECT and software
Space syntax (Depth map) and Intelligence Space Partnership (Fathom) are
based on the perception concept stated by Hooper. The AEDET Evolution toolkit is one of the tools used to assist UK Health Trusts and the NHS (National Health Service) in determining and managing their design requirements of the healthcare buildings from initial proposals through to post project evaluation. AEDET Evolution has 3 main sections – Impact, Build Quality and Functionality – split into 10 assessment criteria. Scoring these criteria assesses how well a healthcare building complies with best practice. AEDET is a tool for evaluating the quality of design in healthcare buildings by means of scoring system. It delivers a profile that indicates the strengths and weaknesses of a design or an existing building. AEDET can either be used by individuals or in workshops by groups. The AEDET were used in various healthcare building case studies to evaluate the built form on social quality of the ward design, user behavior in the outdoor setting, healthcare environment and its effect on the patient health outcomes and layout design in wards to name a few.

ASPECT (A Staff and Patient Environment Calibration Tool) a evaluation tool similar to the AEDET were developed for the NHS developed

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10 AEDET is an evaluation tool and forms the key agenda for therapeutic design evaluation. It is being used as a benchmarking tool, and forms part of the guidance for ProCure21, PFI, LIFT and conventionally funded schemes. The NHS has worked closely with CABE, the CIC and Sheffield University to develop AEDET evaluation criteria to work within the common NHS industry framework.


based on a database of over 600 pieces of research\textsuperscript{15}. ASPECT can be used as a stand-alone tool, or it can be used to support AEDET Evolution to provide a more comprehensive evaluation of the design of healthcare environments. When used to support AEDET Evolution it enables the user to score the Staff and Patient Environment aspect of AEDET Evolution in a more detailed, accurate way. ASPECT can be used to evaluate existing buildings in order to compare them or understand their strengths and weaknesses and ASPECT tool is used on the plans for new buildings to evaluate and compare designs, or used on ‘imaginary’ buildings in order to set standards for a brief and have the benefit of using at various stages during the design of healthcare buildings.

Space Syntax follows the Hooper’s theory at evaluating complex built form and analyzing spatial layout especially in healthcare buildings. The Syntax software namely Depth map deals exclusive to the built form and is used on buildings likes housing, office, museum, prison and hospitals etc based on accessibility and visibility analysis\textsuperscript{16}. In healthcare environment, using evidence based technique, Depth map observes patterns of space usage within the hospital environment and design of hospital layouts and circulations, which optimize space use and interaction and also aid to perceive

\textsuperscript{15} That research deals with the way the healthcare environment can impact on the levels of satisfaction shown by staff and patients and on the health outcomes of patients and the performance of staff. This research and the ASPECT toolkit itself are set out under 8 headings namely Privacy, company and dignity, Views, Nature and outdoors, Comfort and control, Legibility of place, Interior appearance, Facilities and staff.

\textsuperscript{16} Accessibility and visibility analysis is a way of modeling what user in any building type can see and where they can go within buildings and between buildings. Using accurate maps and design CAD files, Space Syntax’s (Depth map software) and Intelligent Space Partnership’s (“Fathom” software) identifies which routes will be visible to a user from every square metre of a plan. The computer then travels from each square metre to every other and maps the accessibility of all routes for user journey within the space. This identifies the desire lines for movement. The advantage of visibility analysis is that it takes the stand of the user perception within the space and traces their behavior. The accessibility and visibility analysis works on the concept stipulated by Beer and Higgins (2000) namely sense of place, sense of space and making environments livable.
the psychological needs of the users namely comfort, safety, privacy and dignity to the users. 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 rooms 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. Depth map used extensively in Healthcare design and helps in identifying the expectations of all users in the hospital - patients, staff and visitors. With the use of Space syntax software the evidence – based design technique with human perspective are also perceived with the objective to ensure that hospital designs fulfill the expectations of all their users: patients, staff and visitors. And also use the computer models at every stage of the design process from briefing to strategic design and evaluation for the compliance of human dimension in creating built places that offer comfort, safety, privacy and dignity to their users as observed in the following case studies by providing assistance in the development of design principles for the Department of Health Future Healthcare Network, UK (2005), Evaluating new hospitals for Healthcare Design in Norway, NHS Estates (2005), Strategic Layout Design Guidance for NHS Estates (2005), Patient Dignity: Ward Design for NHS Estates (2002), evaluation of design proposals UMIST Biocentre, Manchester (2002) and others.

The computer models works on the concept as defined by Beer (1991) and Beer and Higgins (2000) on the physical planning of the built form and architecture for humane design and its importance on the role of human perception with respect to location and positional information, flows of activities and functions. These notions of perception are discernibly linked
to the research and are: **sense of place, sense of space and making environments livable**\(^{17}\). The Syntax software –Depth map is used extensively for the NHS Estates to investigate their hospitals on the physical and psychological needs and performance. The recent study for NHS Estates to investigates different ward types – (Nightingale, 50/50s and exclusively single bed wards) for its movement and social interaction patterns.

Similarity, the Intelligence Space Partnership (ISP) model observes patterns of space used by the user at providing a clear understanding of the visual perception and accessibility of the users. Intelligent Space Partnership has developed observation methods that do not require disturbance to the building users and favorability used in complex environments of the hospitals to analyze crowd density, public space activity levels, patient, relatives and staff communication analysis and finally the behavior analysis. The ISP is used to find the usability of the healthcare building by assessing both existing buildings and new buildings during the design phase, utilization phase or modification phase. The evaluation (NHS, 2004) on the accident and emergency department in two NHS hospitals studied the issues namely patient flows, walking distances, visibility, way finding, privacy and dignity and space utilization based on accessibility and visibility analysis. The software is

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\(^{17}\) The notions of place and space, as represented by examples of the visual characteristics of spaces, factors influencing perception of spaces, and sense of place are particularly useful and applicable within the present case of the built environment, albeit within the healthcare sector. For Beer and Higgins (2000), people experience and react to the place in which they live their lives and in which they carry out occasional activities. Thus, in discussing the factors that influence peoples’ perception of space, Beer and Higgins (2000) argue that:

“It is not just the image of a particular space which determines how it is perceived and understood. Perception of the special characteristics of an individual space also relates, amongst other factors, to the sequence and types of spaces passed through on the way to the space, to the other spaces seen from the particular space, to past knowledge of the space and of similar spaces, to the state of mind, to past experiences of the natural environment, to the individual’s cultural, educational, social and economic background, to aesthetic sensibilities and to such factors as state of physical well being. It also relates to the evidence of human activities such as noise, dirt and smell, who is in the space when its visited or observed and what the visitor feels able to do or prevented from doing when there.”

Beer and Higgins (2000),
also employed in the project to support design guidance and identify optimization strategies for care delivery in a study of 9 hospitals for NHS Estates based on space use surveys, space use analysis on surveillance levels in hospital ward layouts and Spatial Analysis of Critical Care Wards for NHS Estates.

2.8 SUMMARY

This section has examined research and the literature for a variety of perspectives of the built environment from the viewpoint of the disciplines of psychology, architecture, Medicare process and from health care studies that examined health care facilities as therapeutic environments. The review of the studies and observations showed the possibility to use the built environment to enhance patients’ recovery and validate its needs in Indian context. The research reviewed and suggested that the built environment of hospitals influenced the therapeutic process and directly had impact on patients’ health outcomes by enhancing patients’ recovery from illness. Therapeutic design aspects like image of the environment, privacy and dignity, views to the outdoor, good way finding, lighting, presence of nature, therapeutic indoor and outdoor design elements are some design concepts that assist in creating a healing environment. The study highlighted the cancer care system in India and Chennai, established the need for effective therapeutic environment and the needs to review and evaluate the Indian cancer care for therapeutic compatibility. The various evaluation methods and tools utilized universally and the method utilized in the research were discussed to highlight the significance of evaluating for therapeutic environment in the cancer care facilities since it aids in identifying the value of the user needs.