

The Evolution of Healthcare Design: From the Dark Ages to the Age of Enlightenment

.4 CEU Seminar

Presented by InteriorDesign-ED

Website: www.InteriorDesign-Ed.com

Attn: Beverly Vosko

Tel. 713-464-0055

Cell: 713-269-6909

Author and Instructor: Brenda Weiss, MS

Registered Interior Designer, Florida License ID #0003477

ASID, IIDA, IACC, CAPS, NCIDQ Certified #11521

NOTES

Health Care Design: From the Dark Ages to the Age of Enlightenment

A. Introduction:

Health Care design has come a long way since the Victorian days. In those times, anyone diagnosed with Tuberculosis was sent away to be treated in places that looked pretty much like these photos. Hospital rooms in the early 1900's to even the 1980's were not given much attention or thought in terms of how the patient would respond to the actual environment.



Those of us who have had experience in Health Care design may think about those places and literally cringe with fear. It is difficult for us to imagine that anyone could possibly get well in rooms without life, imagination, color, or ambiance.

Those of us who now wish to delve into the sphere of designing for health and well being have a great opportunity to impact a patient's environment by understanding the human response to the built environment. In Health Care design, this is most important. A patient, his family, and the staff who work within the walls of the hospital or facility complex require more from their environments, if they are truly to participate in the therapy of healing, and not just be a "place" of treatment. These spaces can and should be so much more.

On a personal note, but still with a designer's eye, and as I wrote this exact page, my husband was being put to sleep and his heart was being shocked back into normal rhythm. In the hospital waiting area, I was listening to a live pianist (who I just spoke with and told her how wonderful hearing her music was). All the while, I was sitting on a comfortable lounge chair

next to a wall of full pane windows, looking at a lovely garden with a waterfall. The floors were a wood looking vinyl which gave a warm and soothing feeling to the setting. I felt relaxed, as I gazed at the garden and much less anxious than I thought I would have been. The environment without a doubt had much to do with my emotional state of mind and greatly contributed to feelings of reduced stress.

B. Associations Connected with Health Care Design:

- 1. EDRA:** The Environmental Design Research Association: an international, interdisciplinary organization founded in 1968 by design professionals, social scientists, students, educators, and facility managers. The purpose of EDRA is the advancement and dissemination of environmental design research, thereby improving understanding of the interrelationships between people, their built and natural surroundings, and helping to create environments responsive to human needs.
- 2. Center for Health Design:** a research organization and affiliated with Healthcare Design
- 3. AAHID: The American Association of Healthcare Designers**
- 4. ACHA: American College of Healthcare Architects**
- 5. EDAC: Evidence-based Design Accreditation and Certification** is an educational and assessment program that tests individuals on their understanding of how to base healthcare building design decisions on credible research evidence and project evaluation results.

C. What Is Health Care Design?

Healthcare Design is a specialty within the Interior Design profession which focuses on the healing and nurturing aspects of interior design particularly in healthcare spaces.

D. Can Healthcare Design be considered therapeutic?

The definition of therapeutic according to Webster is: “tending to overcome disease and promote recovery”. It would make sense then that the practice of Interior Design can assist in promoting recovery and enhance one’s environment and the perception of that environment in a manner which would enable one to more effectively deal with adversity and stress, thereby assisting in overcoming the illness or disability.

E. What is a Health Care Designer?

The healthcare designer is trained specifically or has acquired intensive knowledge to evaluate and understand the impact of illness and/or disability on an individual and their family members, and utilize this training to effectively design healthcare spaces to not only be aesthetically pleasing, but to participate in the therapeutic treatment process.

The Healthcare Designer further understands the human response to the built environment in general, as well as specifically an individual's response to the environments in which treatment modalities occur.

A Healthcare Designer's goal is to improve the quality of the healthcare environment, enrich the experience of both the patient and the patient's family members, and participate in the path to wellness by creating an environment of healing, thereby contributing to the therapeutic treatment process.

F. Unique Aspects of Healthcare Design

Healthcare design is unlike any other industry. It deals with a multitude of complex issues affecting the patient, the patient's family, and the facility employees. Healthcare design not only touches lives, but, among its goals, is to improve and prolong life.

A patient and his/ her family member, walking into a healthcare setting, is looking for guidance, hope, and reassurance. A positive environment will communicate credibility and encouragement to patients and families.

The environment needs to instill ultimately trust in the knowledge that the patient will receive the best care, from the best staff, in the best conditions...all to promote a positive outcome, namely a cure or restoration of health to the best possible level.

The Healthcare Designer must be aware of and concerned about many aspects of the patient's physical and emotional health. The Healthcare Designer must also address these same needs of the patient's family, as well as the facility's employees.

G. An Age of Specialization

As our world has become more complex, it is impossible to be proficient in every aspect of one's profession. As an Interior Designer, specializing in a specific industry sector,

such as restaurant design, retail design, hotel design, residential design or healthcare design, allows the designer the opportunity gain specific knowledge in an area and become an expert within it.

Within a specialty of Healthcare Design, there are sub-specialties which require intensive and specific knowledge for the design professionals, such as:

- Hospital departments such as dialysis, cancer treatment, Labor and delivery, pulmonary, emergency rooms, etc.
- Med-spas and spas
- Congregate care facilities, such as independent living facilities, assisted living facilities, nursing homes, dementia units
- Hospice Centers
- Medical Offices
- Dental Offices
- Outpatient or Ambulatory
Surgery Centers
- Chiropractic Offices and
Wellness Centers
- Psychologists' Offices
- Physical Therapy or Occupational Therapy Offices
- Diagnostic Imaging Centers
- Cosmetic Surgery Centers
- Psychiatric Facilities
- Substance Abuse Treatment Centers
- Group Homes for Special Populations
- Rehabilitation Hospitals
- Urgent Care Centers
- Specialty Care Centers , such as cancer centers
- Ancillary spaces within hospitals and facilities, such as: gift shops, lounges, chapels and grief rooms, coffee shops, restaurants for visitors and staff, cafeterias, medical records, administration offices, nursing offices, laboratories, visitor restrooms, family waiting rooms.

H. The Aging Population:

The baby boomers (those individuals born between 1946-1964) are aging.

The population in general is increasing. These changing demographics foster a need for specialization within the healthcare spectrum. This is creating a need for architects,

designers, and developers who understand the medical issues of this population, the aging baby boomers. Young adults will continue to have children. The growing population, in general, will be receiving medical attention in more facilities that meet the needs of the young to the old.

I. What is a “Healing Environment”?

Many of us have heard the term “healing environment” over and over, yet it still begs for a definition. On a basic level, a “healing” space would be one that has the following minimal components:

- Thermal comfort
- Clean air
- Noise control
- Privacy

Beyond the four above necessary components, we need to think beyond the basics and consider the psychological, emotional and physical factors of those who use these spaces: the patient, the family members, and the people who work within them.

Among the major issues to consider are safety, privacy, stress management, perceived and actual loss of control, feelings of depression and despair, fear of the unknown, fear of pain and discomfort, and even the fear of death.

A major goal of a healing environment should be to participate in the therapeutic process from an environmental design perspective. We have come a long way over the last two decades from the sterile and cold medical facilities of the past, but can continue to improve, as we understand more fully the impact of environment on the human psyche and physiology.

J. Who are we designing for?

The Patient: Whether we have had a baby, or an MRI, or seen a doctor for a routine annual exam, we were at that particular time considered to be “the patient”. With that change in role, came an abundance of new and possibly uncomfortable feelings such as anxiety, fear, embarrassment, lack of control, worry, to name just a few. The Healthcare Designer must be mindful of the feelings which the patient is experiencing and must step into their shoes and view the world from this perspective.

The Family:

The patient, while being the one afflicted, is not the only person impacted by his/her illness or disability. The dynamics of the family will or have already changed significantly. Illness will become a great new stressor to the patient, and the individual family members. The family as a unit will change, as well. The normal daily routine will be disrupted, with family members often requesting assistance from outside the family or to members of their extended family. Life has now shifted to a new and unknown reality.

The Employees of the Facility:

While we might think that employees of medical facilities get “used to” illness or disability, the fact of the matter is that they don’t. After all, they are human too and each new patient and family is a new experience for them. The designer needs to keep in mind that these individuals go through the experience of illness with each new patient, again and again.

K. The Hospital Setting and Complex

To name just a few departments within the hospital campus are:

- Acute Care Patient Floors and Rooms
- Laboratories
- Pharmacy
- Emergency Room
- Intensive Care Units (ICU)
- Labor and Delivery
- OR (Surgery Department)
- Outpatient Surgery
- Outpatient Treatment
- Pulmonary Department
- Radiology Department
- Neo-natal Units (NICU’s)
- Dialysis
- Cardiac Catheterization Laboratories
- Palliative Care Unit (PCU)
- VIP Patient Suites

- Libraries for medical students and/or families
- Outdoor Spaces: Meditation Gardens
- Gift Shop
- Lobby
- Cafeterias / Coffee Shops / Restaurants
- Patient Waiting Lounges
- Medical Records
- Registration
- Chapel / Grieving Rooms
- Restrooms
- Administration Offices
- Nurses Offices

L. The Psychology of Illness

There is no question that illness and disability, whether chronic or sudden can be devastating and impacts both the patient and the family. With chronic illness or congenital disabilities, there is a longer period of adaptation. The patient and family have had to cope with the events caused by the condition over time and have adapted their lifestyle, possibly their environment, and their expectations of their loved one's capabilities and limitations, which may be lifelong. Frequent visits to healthcare facilities are required for years. Sudden illness brings other emotions to the forefront. Surprise, dread, a change of goals and ambitions have to be contended with. As designers, we must be cognizant of these feelings and emotions which are at the very core of our human experience. Facility design must respond to the complexity of emotions and stressors which the patient and the family experience. Among these are:

- Feelings of helplessness
- Perception that the illness or injury was a punishment, which may lead to feelings of unlovability
- A sense of betrayal, as if life has betrayed the patient, "why me", survivor's guilt in the event of an accident
- Changes in self. For instance, treatments and surgeries may result in a person "not even recognizing themselves", either immediately or overtime
- Concerns of the illness/injury become a preoccupation for both the patient and the family

- Sense of loss, of life no longer being the same, of status, of employment or occupation, etc
- Depression, which may be short-term or ongoing and which will need to be addressed

M. The beginnings of Patient-Centered Design:

1. **The Planetree Model Hospital Project**, pioneered by Angelica Thieriot in 1978, was developed for a medical-surgical unit at Pacific Presbyterian Medical Center in San Francisco.

Planetree is a not-for-profit organization that has been at the forefront of the movement to transform health care to the perspective of the patient. The Planetree Model recognizes the importance of architectural and interior design in the healing process.

In the Planetree Model, the patient is the center of the care paradigm. The shift in the Planetree Model is to allow the patient to choose various types of nurturing care, with an active involvement in his own care, family support, and privacy to satisfy personal needs.

This differs from the typical acute care setting, in which the patient must fit in with the system by suppressing personal needs and preferences. The empowered patient in the Planetree model becomes actively engaged in the process of healing. The patient's energy is expended on fighting his disease, rather than on coping with strict hospital regulations. Planetree believes:

1. That we are human beings, caring for other human beings
2. We are caregivers
3. Care giving is best achieved through kindness and compassion
4. Safe, accessible, high quality care is fundamental to patient-centered design
5. Families, friends, and loved ones are vital to the healing process
6. Access to understandable health information can empower individuals to participate in their own health care
7. The opportunity for individuals to make personal choices related to their care is essential

8. Physical environments can enhance healing, health, and wellbeing
9. Illness can be a transformational experience for patients, families, and caregivers

2. Pebble Project[®]

Launched in 2000, the Pebble Project is a research initiative of The Center for Health Design and selected healthcare providers. The purpose of the work is to create change in the healthcare industry by providing researched and documented examples of healthcare facilities whose design has made a difference in improving patient and staff outcomes, as well as operating efficiency. The Pebble Project is committed to the application of **Evidence-Based Design**.

N. What is Evidence-Based Design?

Evidence-based design (EBD) is the process of basing decisions about the built environment on credible research to achieve the best possible outcomes.

The Center for Health Design's main research initiative aims to help any type of healthcare facility:

1. Improve the quality of care for patients
2. Attract more patients
3. Recruit and retain staff
4. Increase philanthropic, community, and corporate support
5. Enhance operational efficiency and productivity

Anecdotal evidence is not enough to convince decision makers to invest more in new healthcare facilities. If hospital CEOs are to embrace and implement evidence-based design, they will first want to evaluate potential costs, identify benchmark facilities, and see credible and relevant research. This is where The Center for Health Design's (CHD) Pebble Project comes in. It plays an important role in contributing to the body of knowledge and evidence that exists in the field of healthcare design today.

O. Related Fields affected by Health Care Design:

Immunology: The broad branch of biomedical science that covers the study of all aspects of the immune system, dealing with the physiological functioning of the immune system in states of both health and disease.

Physiology: Physiology is the science of the functioning of living systems. It is a

subcategory of biology. In physiology, the scientific method is applied to determine how organisms, organ systems, organs, cells and biomolecules carry out the chemical or physical function that they have in a living system.

Psychoneuroimmunology (PNI):

Coined by Robert Ader, this refers to the role that emotions play in the pathogenesis of physical diseases that are associated with immunological dysfunctions, such as autoimmune and allergic diseases.

Art and Art Therapy:

As a human expression, art therapy in a hospital setting can help to distract people from their pain, enable them to see beauty around them, and encourage them to feel that life that is worth fighting for. We express ourselves through art. Art therapy can be a great stress reliever. Artwork in health care settings can speak to our core instincts of beauty and lift our spirits and emotions.

Music Therapy:

Music has been used to treat depression, reach autistic children and relax violent patients. It affects the limbic system, deep areas in the brain which produce sensations of pleasure and joy. Music in public waiting areas within health care settings can help relax family and visitors and alleviate stress and anxiety. We can lose ourselves in the music, at least temporarily.

Chronobiology:

This is a field which merges the areas of human biology and metaphysics. Time effects as related to circadian rhythms are an area of interest and study as it relates to human healing and environmental design. This area speaks to boredom, anxiety, waiting time, etc. All of these issues affect the patient, family, and staff.

P. Factors in Healthcare Design

1. Beauty:

Have you ever stopped to think about why humans love, seek out, and need beauty? As designers, ask yourself if you have ever been asked by a client to design an ugly space for them. The need for beauty and the relationship between beauty affects our emotions.

The need for beauty is ubiquitous in human nature and, in fact, hardwired into our brains. According to Webster, beauty is “anything by its quality which pleases the senses”. Anthropologists believe that the human being’s need to be pleased is linked to his instinct to reproduce, in order to ensure the survival of our species. Some “pleasing mechanism” needed to be set in place in our pre-human ancestry in order to attract males to females.

Studies of infants and beauty can shed some light on what makes something beautiful and why we humans can’t get enough of it. These studies focus on very young infants, too young to have “learned” responses to beauty, and the human face. In a nut shell, it appears that infants seek out with their hands, smile, and coo at an image of a beautiful human face, using in particular the “universally” beautiful face of actress Hally Berry. What seems to define the perfect face are the elements of harmony, proportion, and symmetry....the very SAME elements of good design.

These infant studies show the pleasure areas of the brain lighting up when the infants view the “perfect” face over the average face of a human. There are in essence pleasure centers in the brain which somehow “know” what is balanced, harmonious, and basically beautiful. Pleasure hormones actually are released into the body when viewing pretty faces.

Applying this information to beauty in architecture and interior design seems to be a fairly easy step. We humans love to see beauty in anything.....from pretty people to beautiful landscapes and gardens...to beautiful buildings and interior spaces. Because beauty, if analyzed, has the same quantifiable factors no matter what the object is....good balance, proportion, harmony, and symmetry, all the factors that create perfect beauty, light up our pleasure centers in our brain, and elicit the pleasure hormones. So, why do humans seek out beauty? One answer comes to my mind: because beauty FEELS good.

2. Humor:

Studies reveal that laughter does play a role in healing by reducing stress, lowering blood pressure, and promoting relaxation. Patients state that they feel healthier when they laugh. The therapy helps patients think about living, rather than dying. Further studies are indicating that the type of laughter which best promotes feelings of wellness is that which can elicit a good belly laugh. As designers, the question becomes: How can we design a healthcare environment which promotes laughter?

How do we incorporate humor into the design? We need to be creative in incorporating therapeutic humor into the healthcare environment. Consider ideas which are part of the environment, such as:

Artwork, Murals, and Posters, TV videos clips in patient rooms, group rooms, waiting areas for families, Wall coverings , Humor Rooms with stage sets

3. Order:

Humans have an innate need for order and a lack of confusion and chaos, which adversely affects health. Designers must ask how we can design affect a patient's perception to create calm and order in the health care setting.

It is a common perception that the hospital environment is "incomprehensible", "alien", "intimidating" and "unfamiliar due to the complexity and variety of functions which occur within it. We must address the "Clarity of Way finding" within these institutions in order to enable the end users to navigate effectively without contributing to additional stress.

- a. **Definition: *Way finding*** in general is a term used to define how people get from one place to another through the use of landmarks or visual environmental cues. The visual cues reinforce the path as it is navigated repeatedly, forming a cognitive map. (cognitive mapping)

At its very core, way finding is an act of spatial problem solving. If one is unfamiliar with his/her surroundings, they will search the environment to read and/or locate important signals. Over time, navigation through familiar surroundings becomes routine without the need for conscious thought.

- Degree of differentiation
- Visual Access
- Complexity of Spatial Layout

As design trends change, one can easily sense the time period in which a hospital department was either built or remodeled. Corridors lead to other corridors, with twists and turns throughout. These corridors, therefore, are to be viewed as significant design opportunities, which can subtly lead and direct one throughout.

Color is an essential element for use in differentiating, accenting key areas, and defining changes in spatial configurations. Color can be used creatively by designers on all surfaces, such as walls, floors, and signage, to signify and call out various elements.

b. Flooring patterns:

Flooring patterns guide one from space to space; communicate changes in departments integral to locating key areas, such as elevators and nurses' stations. Flooring patterns are significant both as a design element and as a visual communicator. The geometry and architecture of the space can be emphasized or minimized by the creation of flooring patterns relevant to pertinent areas to the end user.

c. Signage:

Successful signage is consistent in size and type. However, signs can be color coded to convey different areas and departments. Symbols or logos should be consistently utilized to give conformity while color may vary. Furthermore, the department and/or tower names should be called out specifically in order to reinforce the exact location. Observe ADA compliance requirements as far as size of letters and background ratios for readability and visibility.

d. Wall Treatments:

The use of colors to designate departments, lobbies, elevator lobbies, waiting areas, breakout corridor lounge areas, and transition spaces is also an effective means of communication. Gone are the days of graphics arrows in different colors leading the way from department to department. Subtle changes in color, texture, and use of artwork can enhance the walls while providing communicative visual cues to the user. The designer is able to create wall treatments as part of a refined, dignified, and effective way finding program.

4. Nature:

Did you ever stop to consider why we humans are so drawn to nature? Evolutionary theory would espouse that, since we began our human journey in the outdoors, nature is simply part of our primordial archetypical imagery. In essence, we are so hard-wired

to want, need, crave the outdoors, that we must be around it to simply survive as a species. We need sunlight, trees, animals, water, and plants to simply be who we are...human.

So what does nature actually do for us that makes us crave it so badly?

In 1984 Edward Wilson, a Harvard entomologist coined the term “Biophilia”, which literally means “love of living things”. His hypothesis was that humans evolved as creatures deeply enmeshed with the intricacies of nature. He noted both Biophilic (positive/approach) and Biophobic (negative/avoidance) which might be inherent through a genetic predisposition. Those humans who developed sensitivity to their environment survived. The rewards and dangers associated with the natural environment favored those who readily learned and remembered adaptive responses.

Both research and anecdotal evidence suggests that the natural world has a great impact on our emotional, aesthetic, physiological, and spiritual development. Since the early 80’s healthcare designers, based on the magnitude of research which affirms the benefits of access to nature, have been incorporating nature into all aspects of hospital, assisted living, med-spa, and oncology center design.

Based on evidence-based design, patient rooms, if possible, offer expansive views of the outdoors with beds located specifically for direct views of nature. Studies have indicated better recovery rates for patients as a result of the design for them to benefit from the natural healing light.

In keeping with this approach is the meditation garden, created with trees, rocks, and a flowing water feature. The design concept integrates natural and informal elements, creating a soothing and restorative place to be quiet with oneself.

The Need for Nature Restorative Artwork in Healthcare:

Nature art in hospitals seems to be a positive distraction for patients, as well as families and staff members. Content with appropriate nature content has been shown to reduce one’s perception of pain and stress levels, as measured by blood pressure, heart-rate and skin conductance. In addition, self-reporting by patients using surveys and pain-rating scales are also utilized in the continuing research to understand what types of imagery has beneficial effects on healing.

While evidence is suggesting that realistic and natural imagery is more conducive to wellness, there is a wide range in what might be considered soothing realistic or natural art. The following appear to create the most positive feedback from patients and others:

1. Waterscapes of calm and non-turbulent water
2. Landscapes with visual depth or open foreground and/or trees with broad canopy
3. Flowers which are healthy, familiar, and in natural settings with an open foreground

5.Color:

How does color relate to human emotions, physiology, and healing? How do we measure the effects of color and how do we use color to create a healing space?

Color, simply put, is the visible portion of light energy that we are able to see. And yet, color is so much more than light radiation....in essence, it radiates through our entire lives, bringing depth, intrigue, and value to it in more ways than we can conceive. Studies about the physiological and psychological responses to color continue to point to the power of color in our lives. There is no question that color arouses our emotions, stimulates our desires, and has always been a symbolic element in our lives. Ancient healers associated color with mysticism and magic, and realized the palliative aspects of color, as well.

According to Frank Mahnke in *Color -Communication in Architectural Space*, 2007, "color is much more than an aesthetic statement: it is part of a life-giving and life-preserving process. Simply put, color speaks to us emotionally ...it is a language where no words are necessary."

a. Biological Importance of Color:

In nature, color plays a huge role. The ability to see color developed because it was essential to survive, for many animals, among those, the human being. Color attracts mates, acts as a warning to predators, allows animals to find food, acts as a protective mechanism through the ability of some species to camouflage themselves, and signals mating readiness.

b. Color and the Collective Unconscious

The “collective unconscious”, according to psychologist Carl Jung, refers to that part of our psyche which has nothing to do with conscious or unconscious reactions based on personal experience compiled during our lifetime. Rather, the collective unconscious consists of archetypes or the original pattern or model from which other things of the same kind are made. They are the fundamental images formed in our development as a species, our primordial imagery and latent images that we first developed as a species and are integral to all of us. We have inherited them from not only our prehuman ancestors, but also from our animal ancestral history.

All humans, as a single species, seem to have very similar archetypes, when it comes to color, in spite of minor cultural variations. These “color associations” appear to be universal, and cross cultural, gender, and age boundaries. This is the basis for what we often refer to as “color symbolism”. It is the associations we humans all have with regard to all colors...88% of the time, globally.

c. Color and Culture

While the universal correlations of color between people globally is very strong, cultural variations about color meaning do exist and need to be considered when designing for specific populations. Saturation of color may also vary in terms of specific cultures. Native American arts and crafts commonly utilize more vivid colors than, for instance, the Swedish cultural preference for more unsaturated colors.

d. Color in Healthcare Settings: Psycho physiological Effects

There have been studies done over the years on the biological reactions to color. For instance, in one study, epileptic patients and those with other neurological diseases lost their equilibrium and were more subject to seizures when wearing red.

Some studies have illustrated the red light reduces the pain of arthritis by dilating the blood vessels and producing heat in the tissues. Is there merit to this? Other researchers have noted that blood pressure and respiration increased during exposure to red light. On the contrary, in blue light, blood pressure was noted to decrease.

Understanding color, as sensory input, is essential to creating health care environments. All stimuli enter the brain. Four of the sensory impulses, those being sight, hearing, taste, and touch, converge on a portion of the brain called the thalamus. The messages received are then relayed to the appropriate regions of the cerebral cortex. The stimulation entering our brains, including information from the visual field, affects the ARAS, considered to be the “clearing station” for stimulation ranging from sensory deprivation to sensory overload.

We, as designer, have the weighty task of creating just the right type of environment from a sensory input standpoint. Too much stimulation may be just what the doctor ordered for a nightclub or casino, but think about sensory input and overload when a patient comes out of anesthesia.

Based on the research on color thus far, it can at least be agreed that color and the human response to it is a significant consideration in the design of the healthcare environment, from the symbolic and emotional perspective, as well as from the reported physiological effects as described by research subjects.

e. What does color do:

Color:

1. Communicates symbolic messages
2. Provides help with orientation
3. Contributes to order and differentiation
4. Indicates special functions
5. Is a geographic, ethnic and cultural attribute
6. Expresses style and design trends
7. Crucially influences the statement effect, and acceptance of objects and space

f. Color Effects on Perception:

With regard to the built environment in general, the following guidelines might be utilized:

1. Complementary colors can be selected for rooms and the corridors leading to them.
2. Color does modify architectural space. Warm color can expand it and cool colors contract it. Color can also lower or heighten planes.

3. Color can change the mood of a space. Whether this is symbolic or physiological can be debated, but color does effect and set mood.
4. Values of color can be defined in terms of visual weight. Light and bright colors appear lighter in weight. Light values feel more atmospheric. Dark colors feel weightier.
5. In window walls, use a lighter paint. Dark walls with large windows can create glare and are difficult to look at.
6. Light objects appear larger against a dark background, whereas dark objects appear smaller against light backgrounds.
7. Bright objects appear larger. In order of heavy to light are: red, blue, purple, orange, green, and yellow.
8. Red next to yellow appears greener than it actually is.
9. The absence of variety in a room can cause sensory deprivation. Long term resident or patients in healthcare environments need variation in lighting, color and artwork to stimulate the nervous system. The human being easily adapts to the effects of one color, whatever that color may be. Eventually, it becomes monotonous.

g. Practical Applications of Color Psychology:

1. Red and Yellows seem to foster socialization.
2. Greens and blues appear to be calming and foster the ability to concentrate better.
3. Cool colors may be appropriate for those medical spaces to diminish agitation and anxiety.
4. Red can be used to stimulate an environment.
5. In facilities for eldercare, pastel colors may be difficult to see. Therefore, brighter and stronger coloration may be warranted.
6. Strong patterns and bright colors may not be conducive to psychotic patients, as they may be intimidating and overwhelming.
7. Warm colors seem to make time go by faster. In a cool environment, time feels as though it has slowed down.
8. In patient rooms, use colors which flatter the skin tones, particularly near the head region. In patient bathrooms, peaches and rose colors may be preferred.
9. Looking at a specific color produces an afterimage of its complementary color. In operating rooms, green or blue has been a common color for walls because, during

surgery, the physician is constantly seeing red (blood). The green wall will neutralize the red of the blood.

h. General Guidelines for the Use of Color in Healthcare Settings:

1. Each patient population is to be evaluated specifically for their needs. For instance, the elderly, because of the yellowing of the lens, required more contrast between colors.

2. Take into consideration, not just the universal symbolism of color, but also the specific meaning of color for a particular culture. For instance, the color red is considered good luck, a strong color that can keep away evil spirits. The traditional Chinese wedding dress in northern China usually is a one-piece frock embroidered with elaborate gold and silver designs. 3

3. Become familiar with the laws of perception with regard to color, such as simultaneous contrast, advancing and receding colors, figure-ground reversal, optical patterns, and the balance between under- and over-stimulation.

4. Take into consideration functional factors which include the effect of lighting on color, the age of the patient population for a particular space, the nature and severity of illness, the types of tasks to be conducted in the space, gender preferences for certain colors such as pink, using color to cue the environment, general aesthetics, color trends and their significance in the design, and what the color intent is.

5. Use color to signal hazards and warn of danger

6. Use color contrast as appropriate to emphasize or diminish areas or objects as intended

6. Lighting:

How do we effectively light a space for medical staff and yet create a healing environment with the correct ambient lighting?

Light can affect hormonal and metabolic balance as it enters our body both through our skin and our eyes. It controls, more than we realize, such as our circadian rhythms and bodily functions. Melatonin, secreted by the pineal gland, is influenced by frequency, duration, and intensity of environmental light, and controls sleep and appetite.

Studies suggest that brief light exposure, natural or artificial, could be used to influence health and possibly cognitive performance.

The field of lighting design and, specifically, in the healthcare sector is continuing to emerge. The pervasive influence of light on many human functions supports the value of architectural and lighting strategies that support visual and circadian needs.

The quality of light in an architectural space depends on many variables, which include the relationship between its area and the size of the opening through which light enters, the location of the light source, the direction of the light source, the distribution of the light in the space, as well as on atmospheric conditions. Daylight is the most balanced type of white light because sunlight reflects each hue in the spectrum equally.

The CRI, called the Color Rendering Index, is a measurement of how well colors are rendered by artificial light sources measured against natural sunlight, which has a CRI of 100.

Color temperature, also known as Kelvin, was devised to describe the color of light emitted by a natural source and refers to the temperature in degrees Kelvin. Other considerations in illumination are that daylight changes throughout the course of the day, changing the angle of the natural light, which, in turn, changes its quality and ultimately the way it is perceived. Full spectrum artificial light can simulate natural day light for interior spaces with no or limited fenestration. Studies indicate the benefits of full-spectrum lighting in patient care areas, in particular children's hospitals, since children are used to outdoor play for extended periods of time.

Studies have demonstrated that light with a higher level of illumination intensity and which deviated from natural light, produced stress-level amounts of ATCH and cortisol, which is a stress hormone. It has been hypothesized that hyperactive children may benefit from full spectrum lighting, and many studies have demonstrated that full spectrum lighting can reduce hyperactivity in school children.

The latest in lighting technology, LED lights, are now finding their way into the healthcare setting. Hospitals worldwide are investing in LED's because of their energy efficiency and the reduced heat load, although they are expensive.

The effects of lighting and the differentiation of lighting effects for patients, families, and visitors also needs further study. Lighting considerations are vitally important to the feelings of well-being in a healthcare setting.

Summary: General Lighting Guidelines for Healthcare Facilities

The hospital facility is a complex set of different environments within one campus. Each different space will require different visual demands primarily based on the patient population and the procedures and treatments within. In general, however, the following guidelines are:

1. The facility should be well-lit, attractive, and have a dignified appearance with a high level of illumination which simulates daylight.
2. Colors need to read as true as possible, so lamps should have a higher CRI, such as 90, and a Kelvin of 6500, as colors play a role psychologically and aesthetically.
3. Lighting needs to be an aid in accurate visual medical diagnosis, surgical performance, and therapeutic services.
4. Proper illumination will enhance visual ergonomics, support orientation, supply information, define specific areas, and improve working conditions.
5. Lighting must be selected with consideration given to function, psychological reinforcement, visual appeal, color rendition, and biological matters.

7. Noise Reduction:

How do we control unnecessary noise in hospitals? What are the effects of noise on healing? Is there *good* noise which does promote healing? If so, how do we incorporate it into our healthcare design?

Noise must be controlled in healthcare settings of almost every type. Noise is a general stressor and can increase blood cholesterol levels, blood pressure, and heart rate, as well as the need for pain medications, as pain perception can be increased because of noise. Noise can also interfere with sleep which impedes healing. Unfortunately, construction in hospital expansion projects can be a problem, as patients in wings

adjacent to the job site can hear noise which is an interrupting factor. Noise is an unwanted factor not only for patients' recovery, but also for families visiting, as well as for employees, whose work and attention can be negatively impacted by it.

In particular, areas such as recovery area, critical care, sleep labs, intensive care, surgery, and nurseries must be designed with noise reduction in mind. Noise studies conducted in the field of Veterinary Medicine have demonstrated the need for noise reduction as an important factor in facility design, as well. This photo demonstrates the use of noise reducing panels on the soffit.

A Closer Look at Noise in NICU's : Immediate Effects of NICU Noise

The immediate effects of noise in the neonatal unit are reasonably clear. The baby's sleep is easily disturbed and sudden loud noises (bangs on the incubator for example) can have a startling affect on the heart rate and breathing patterns. High and intermittent noise is also unpleasant and distracting for both staff and parents. Defined "Quiet Times", when noise and light levels are kept down, certainly help and are now used in many units.

General Guidelines

In general, designers must consider the noise reduction and sound transmission levels of all materials specified in the design of the facility or department, including ceiling tiles, flooring materials, window treatments, wall coverings, as well as in the space plan and design of partition walls with sound insulation.

1. Select material with a high noise reduction coefficient (NRC) in order to absorb sound bouncing around the room.
2. Select a product with a high sound transmission coefficient (STC). STC is roughly the decibel reduction in noise a material/partition can provide, abbreviated 'dB'. The human ear perceives a 10dB reduction in sound as roughly reducing the volume by half. For example, a sound reduction from 50dB to 40dB seems half as loud.

Noise and Color

The association of color and sound is an interesting phenomenon and one which the designer should keep in mind when creating healing environments. Careful

consideration should be given to hue and value as well. Heinrich Frielding (1980), the director of the Institute of Color Psychology, conducted extensive testing with color and their synesthetic effects (the unity of the senses), noting how color associates with sound. This mental association can influence behavior and physiology.

A bright yellow wall might be described as “loud” and one might perceive the room as noisy. On the other hand, a soft purple is a “quiet” color and would actually be perceived as such. These associations can be used to compensate visually for noise also. An example of this is would be offsetting shrill and high pitched sounds by using sage green for the wall color. Since sage is not perceived to be a “loud” color, it would tone down the level of noise.

Muffled sounds seem more muted in darker-hued rooms, whereas lighter colors like light, clean greens can be used to compensate and make the room be “heard” more. This very interesting phenomenon can be craftily utilized in design, after a careful understanding of the patient population and staff which will occupy a particular type of healthcare facility.

8. Choice and Personal Control:

Studies show that one of the most intimidating aspects of confinement in a healthcare facility is the lack of personal choice and lack of control over one’s environment. What are these effects and how can we bring back personal choice and control into the healthcare space without interfering with medical care?

As designers, we must think:

What can we put in the environment which helps to maintain a sense of control?

Some items which allow a sense of control, as small as they may appear, help to maintain one’s sense of dignity and empowerment in an environment which feels as if it is un-empowering:

1. control of the television
2. control of the window treatment
3. control of the lighting
- 4 temperature control

9. Need for Touch and Connection:

Touch is an important element in life. Through touch, we connect to other people. What kind of touch occurs in healthcare spaces? The patient is probed and poked over and over, mostly in unpleasant ways. How can positive touch be incorporated into the environmental design? Pet Therapy (Eldercare, Pediatrics) has been shown to be a palliative touch modality and needs to be incorporated into the design of spaces for these populations when possible.

Touch is also an important nonverbal communication. Touching helps to promote relaxation, decreases stress, lower blood pressure and enhances feelings of well-being. Connectivity with humans and animals plays a major part in the healing process, as shown by pet therapy programs which are gaining in popularity in a variety of healthcare settings, such as pediatric departments, hospice units, and nursing homes.

Touch and Color Perception

The theory of synesthesia also applies to color, which can also give an impression of texture. Red “feels” solid and sturdy. Pink “feels” soft and less solid. Orange feels dry. Green can “feel” damp and moist. Light blues seem more atmospheric. Dark chocolate, deep crimson, violet and ultramarine blue can feel velvety and luscious. Awareness of these color associations can help the designer make selections not simply based on aesthetics, but that are related to theories of color psychology and the unity of the senses.

10. Communication:

How does the patient communicate with staff? What are the barriers to effective communication and how can they be overcome through design? What does the environment communicate to the patient, family, and staff? How do patients communicate with their families, friends, and medical staff. Designers need to question these areas and, whenever possible, work solutions for better communication into the interior design.

11. Socialization:

What kinds of opportunities exist for socialization, when desired, and privacy when that is preferred. Socialization is a necessity at appropriate times and design needs to

accommodate socialization opportunities. There is always a balance between one's wanting or needing to be alone, and the need for interaction and sharing. Therefore, any good design in healthcare will address this broad range for the need for privacy balanced with the need to interact with others.

accommodate socialization opportunities. There is always a balance between one's wanting or needing to be alone, and the need for interaction and sharing. Therefore, any good design in healthcare will address this broad range for the need for privacy balanced with the need to interact with others.

In some situations, waiting is part of the routine of treatment or a hospital stay. In a treatment situation, such as a dialysis unit or oncology center, a patient may become used to seeing and interacting with others in a similar situation. Seating arrangements which foster communication should be worked into the design, as well as private areas where a patient might wish to be quiet or simply interact with an accompanying family member. Ganged seat with and without intervening arms, in a variety of configurations, are plentiful in the marketplace and speak to the desires and needs for socialization and/or privacy.

A good mix of types of seating, including loveseats for pediatric patients to sit close to a parent, should be kept in mind. It is interesting to note that most people will chose not to sit in a loveseat unless they know the other person. For this reason, single seats should be plentiful in waiting rooms.

Moreover, the lack of privacy in healthcare settings can cause undue stress. Feelings of violation and intrusion emerge, causing irritability and anxiety. What design features can we utilize to provide more privacy and personal space for patients?

14. Smell and Odor:

Odor in healthcare facilities is another important human factor. Through our sense of smell, we perceive odors. Good smells and bad smells will hit us immediately, and we will form an instant impression of an environment based on this. We remember places, as well, by their smells, which can call us back to them or keep us far away.

Offensive odors can be prevalent in various healthcare settings. These smells can cause increased stress, increase fear levels, and make a hospital stay very unpleasant. What

can designers do to increase pleasant odors and what are studies indicating?

The perception of the indoor air quality by individuals is related to odors within buildings. Some humans have the ability to sense odors at very low thresholds. Because odors may also be subjective in nature, and odor sensitivity varies amongst individuals, it is not unusual for some individuals to express dissatisfaction, while others will not complain. Individuals often times associate malodors (offensive or unpleasant odor) with their health, which may or may not be the case.

Some studies are indicating that patients may perceive more pain or discomfort as a result of malodors prevalent in the air.

Other issues regarding odor have to do with controlling odors from cleaning products with the building occupant in mind. Cleaning in healthcare facilities can be challenging, and many patients already have compromised immune systems, making them more sensitive and susceptible to strong smells and viruses.

Most facilities are now using healthier cleaning solutions and have improved methodologies for cleaning procedures in order to reduce exposure. These include less toxic chemicals, and less fragrance. According to Dennis Owens, Director of Environmental Services at Memorial Hospital of Rhode Island, “a clean hospital should have no detectable odors”.

Malodors are often confused with poor indoor air quality (IAQ) and can have a lasting effect. Poor IAQ can result from chemicals that have become airborne, either from overuse or from inaccurate use of spray bottles, or from improperly controlling airborne dust and allergens within the facility. These particles can be difficult to combat. The use of HEPA filters on vacuum cleaners and a preventative program to monitor filters in air handling units can help to improve IAQ. Minimizing the use of strong chemicals to time when patients are out of the building would be effective for those facilities not open 24/7.

Odor and Color Perception

Colors can evoke associations with odor, as well. The unity of the senses, synesthesia, is an interesting phenomenon and demonstrates how affected humans can be by color. Think of pleasant smells and colors such as pink, lavender and green come to mind.

Even the names we give colors can elicit images and odors, such as the color “peach”, “cinnamon”, “lemon”, and the like.

Bitter smells can be associated with colors such as brown and even violet. Tart colors would be lime greens. Musky colors are greenish browns like olive green, as well other muted colors. The healthcare designer, aware of the association between odor and color perception can utilize this knowledge to create more effective environments.

15. Tactile Stimulation and Variety:

Because sensory loss in healthcare settings can occur, a rich tactile environment can be created. Diminished variety and stimulation can increase stress and irritability. How can the environment enhance texture and tactile stimulation?

16. Visual Stimulation: We are visual animals, and, as such, require meaningful visual stimulation and input. What types of visual stimulation are important and in what types of facilities? Again, what is the research pointing to when it comes to this topic, and how, as designers, can we create a visually stimulating environment, which can help decrease patient anxiety and stress.

17. Comfort:

There are many aspects of comfort in healthcare facilities, including physical comfort, comfort of temperature, and visual comfort. All of these factors go into the overall satisfaction which a patient, visitor, family member or employee feels in the environment.

Another aspect of comfort in healthcare settings is visual comfort. The lighting in medical facilities is a key part of patient and staff comfort, not to mention how it contributes to the overall environment of care. Just as quality lighting enhances patient comfort and staff productivity, inferior lighting reduces comfort and productivity.

Full spectrum lamps can enhance visual clarity and provide higher apparent brightness and perceptual satisfaction to the environment. Even illumination, control of glare, and individual control are key elements in visual comfort. In eldercare facilities, the healthcare designer needs to consider specific requirements of this population. The elderly require 3.5 times the contrast to see as compared to someone in their thirties. Enhanced lighting should be located at specific areas, such as at the door entrances and

elevators of assisted living facility apartments, at stairs and at intersections, or at transitions between rooms.

Experiments with color have indicated that color can visually influence temperature perception. From a physics standpoint, colors absorb and retain heat in various degrees, depending on their light reflection ratio. The lighter the color, the more light (and heat) is reflected. Conversely, the darker the color, the more light is actually absorbed, thus absorbing more heat. This would, therefore, account, in part, for the reported perceptions of temperature sensation being warm or cool, as well.

Our use of language reflects the concept of color influencing perception of temperature. We name color families “warm” or “cool” because of this. While this knowledge is beneficial, the designer should not determine the color palette of a facility solely based on the results of these experiments. Additionally, each environment should be well-balanced between warm and cool colors, unless a deliberate exaggerated effect is desired.

Q. The Hospital as a Stressor:

As designers, we are tuned into those very first impressions gleaned from the exterior of a building. In real estate, it’s called “curb appeal”. It’s that elusive quality of the outside of a structure that makes you feel good just looking at it and makes you want you to go inside.

While “curb appeal” may be a more appropriate term for a home, it still may be applied to healthcare facilities, with different connotations, depending on the specific type. For instance, when it comes to eldercare, a home-like “curb appeal” is very important. Families looking for the perfect assisted living facility for their loved one will focus on this. The front exterior needs to resonate “home” for a mother, father, or loved one. Even a multi-story facility can have that desired “curb appeal”, with hanging flowers and a friendly entry.

The exterior of other types of facilities is equally important in conveying the desired first impression. It is vitally important that the architecture conveys the message of a healthcare environment, that of friendliness, comfort, and, above all, confidence in the care that will be provided.

When evaluating the appearance of a healthcare facility, ask yourself these questions: Would I want to be a patient here? Does this place make me feel comfortable, as well as instill confidence in my treatment?

The lobby is the area where first impressions will be made immediately by the patient, their family members, and visitors. Potential employees will also form an opinion as to whether they will be able to “see themselves” working there every day. The lobby, while it does not have to be elegant, does need to feel friendly, appear clean, and give the impression (true impression) of competence. In short, these spaces must say immediately to all who step through their doors: “we care” about you, your family and our staff.

The lobby of a hospital or treatment center sets the expectations for the quality of care a patient will receive. There should be good follow through between the exterior of the building and this space. Often there is not. We can all think of experiences where the outside façade seemed inviting, or gave the desired impression, only to have the lobby disappoint us, or put us off in some way.

A nursing home that appears well kept and friendly from the outside should offer the same experience upon entering the lobby. Seating to provide conversation in privacy and a highly visible reception area for greeting visitors and families and for inquiries is among the essential elements that all lobbies should offer.

Special Features: Water Features in Healthcare Design

There is no questions that we humans are drawn to water. Theories as to why we crave water are that we started millennia ago as creatures living in the seas, that we are comprised mostly of water, and that, since we are formed in a womb of water, we need to somehow find our way back to water. We need water to exist biologically. Without it, we simply cannot survive.

Facilities, both large and small, should try to incorporate water into their designs. Fountains in lobbies and waiting areas, are extremely popular. Facilities are also carefully evaluating sites in order to offer patients views of natural or man-made lakes. Eldercare and substance abuse facilities incorporate ponds in garden settings, in order to create lovely spaces for reflection and contemplation.

From a practical standpoint, however, care must be taken by the design team to consider the cleanliness and safety aspects of water features in the healthcare setting. Some manufacturers' water fountains actually remove bacteria, dust and other air-borne pollutants from the air while creating a serene atmosphere and bacteria is inhibited from growing in their reservoirs.

Special Features: Founders' Walls

Founders' or Donor Walls are important elements in hospitals. Without the generosity of individuals and corporations, many hospitals simply would not exist. Recognizing donors in a prominent location and in a manner in keeping with their acts of kindness is important, not only to those whose donations made possible the facility, but to the patients, families, and visitors as well.

Special Features: Healing Gardens in Healthcare Design

Young or old, most everyone enjoys the freshness of the outdoors and the joy of nature and the natural surroundings. According to architect Ian Forbes, there is both documented and anecdotal evidence of the influence of the natural world on our emotional, cognitive, aesthetic and spiritual development. "Psychological well being is generated through stress reduction and access to nature helps with stress reduction" (Ulrich 1983, 1993).

Hospital grounds are now being utilized to improve patient outcomes and other types of healthcare facilities are learning the value of incorporating these restorative spaces in their designs. Four essential elements of a successful healing garden design relate to stress, as stress relief does help to bolster the immune system and stimulate the body's natural healing capabilities. There is scientific evidence that four elements that can be supported by design help reduce stress.

These are:

1. the distraction provided by green nature
2. exercise
3. social support
4. a sense of control

The multi-sensory experience which a garden provides can lower our anxiety level and, therefore, lessen our awareness of pain. A healing garden is a powerful distraction with colorful flowers to look at, a multitude of textures of greens and browns, the delightful

sights and sounds of water, small creatures to observe such as butterflies and birds, and the hypnotic effects of watching the swaying grasses and feeling a breeze on one's skin.

Furthermore, a healing garden can provide a sense of escape from the inside of a facility, where one can be alone with their thoughts without interruption for a period of time. And, since evidence supports the fact that exercise has many beneficial effects on both physical and mental health, there should be a variety of longer and shorter pathway loops for strolling and other types of exercise one might choose to do in the space, such as yoga or tai chi.

Any hard surfaces such as concrete must be specified to reduce glare, such as using a tinted concrete. Smooth and even brick is a warm and pleasing product, although it can absorb considerable heat. In the event of a fall, this can result in serious injury.

Additionally, the garden designer must pay attention to details, such as edging in order to mitigate against wheelchairs rolling into planting beds. Expansion joints in paving should be no more than one-eighth of an inch in width to prevent the wheels of IV poles getting caught and stuck.

Evidence also suggests that the more social support a patient receives from family and friends, the better they are able to heal. A garden is one place where a patient and his/her visitor can converse in private in an attractive setting. It is essential that sensitive planting design and site furnishings provide semi-private niches for one or two people or for a family group to be alone.

Conclusion

The evolution of health care design has been remarkable in the past two decades. The needs of patients, their families and the employees have changed significant. Patients are more educated, more informed, and seek more extensive interaction in their own care. Simply put, they expect better treatment, better care, and better facilities in which to receive this care. Health care facility design needs to respond to these changing expectations and demands. It is the job of the health care designer to provide a more effective environment which does not only look "pretty", but is an integrative element in the treatment. In essence, it can be and should be part of the many treatment modalities which a patient will receive.

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**Brenda Weiss, MS
ASID, IIDA, IACC, CAPS,
NCIDQ Certified**



Brenda Weiss earned her B.A. and B.S. in Education and Psychology from the University of Pennsylvania, her M.S. in Rehabilitation Counseling from Boston University, and her B.S. in Interior Design from Florida International University. She also completed post-master's work at Harvard University's Graduate School of Design, receiving certifications in Hospital Interior Architecture.

Brenda founded Weiss Design Group, Inc. in 1993 with her original focus on healthcare design. Among her South Florida and Philadelphia projects are Mt. Sinai Hospital, Westchester General Hospital, Victoria Hospital, University Hospital, and 3000 BC Spa. Her healthcare projects consist of ambulatory surgi-centers, psychiatric facilities, emergency and ICU departments, med-spas and wellness centers, dialysis units, acute care units, labor and delivery units, and assisted living and nursing care facilities, to name a few.

Over the years, Brenda expanded into residential, commercial, and hospitality design, including restaurants and retail spaces, as well as writing columns and articles on many facets of Interior Design for the Sun Sentinel, Broward County's leading newspaper, and a variety of regional magazines. Brenda's first book, Décor Enterprises' *Designing with Fabrics and Color* is available on all on-line bookstores through her publisher Xlibris.

Brenda is a professional member of ASID, the American Society of Interior Design; IIDA, the International Interior Design Association; and EDRA, the Environmental Design Research Association. Brenda is also a professional Color Designer and holds provisional status with the IACC, the International Academy of Color Consultants, anticipating full status in 2012.

Brenda holds CAPS status through the National Home Builders Association, and is a Certified Aging in Place Specialist. She is also a Florida Realtor with Prudential Realty in Coral Springs, Florida.

Brenda's Continuing Education Courses in Healthcare and Commercial Interior Design are offered through InteriorDesign-ED for professional Interior Designers and Architects throughout the United States.

**Weiss Design Group, Inc. | 954.383.3740 | Brenda@weissdesigngroup.net
www.weissdesigngroup.net**