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Healthcare Design: Designing Healthier and Happier Environments for Patient Care

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HEALTHCARE DESIGN: DESIGNING HEALTHIER AND HAPPIER ENVIRONMENTS FOR PATIENT CARE

By

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ABSTRACT

This paper will discuss research regarding the best practices in developing a healthy environment in a medical facility in order to better aid the recovery of patients and help facilitate a more efficient work environment for the nursing staff. Medical facility design will be discussed in terms of safety and infection control; the psychological effects of certain design elements on patients; and appropriate accommodations for patients, staff, and family.

The research discussed has been used to develop an updated and healthy environment for the Olivet Nazarene University Virtual Learning Center (VLC) housed in Wisner Hall of Nursing Education. This paper will discuss the design for the VLC as it pertains to the aesthetics including color, artwork, and space planning. Limitations to the project including budget and time will also be addressed.

Keywords: Health Facilities, Interior Design, Color Psychology, Green Design

INTRODUCTION

With recent advancements in science, Americans are enjoying an increased life expectancy. Baby boomers, born between 1946 and 1964, are living as much as 30 years longer than those Americans born in the early 1900's. As a result, the proportion of aged individuals in the United States is growing. According to the Center for Disease Control, the American population has tripled since the 1900's, "but the number of older adults has increased by 11-fold from 3.1 million in 1900 to 35 million in 2000" (2008, p. 3). This number is projected to grow to 71 million by the year 2030, meaning that in the very near future about 20% of the American population will be of the age 65 or older. These individuals will be occupying medical facilities across the nation, and although the American population is rapidly evolving in terms of age, medical facility design has remained fairly stagnant. Despite research in evidence-based design linking better design to a healthier medical environment for patients and staff, many medical facilities remain outdated and unwelcoming. This is not to say that hospitals have not renovated their facilities. Many hospitals have updated public areas, such as entryways, facades and lobbies; however, many times areas such as treatment rooms, exam rooms and waiting rooms go untouched. These rooms remain outdated and feel institutional; they are typically dreary with white walls, windowless rooms and obsolete décor (Landro, 2008). Ironically, these are the rooms in which patients spend most of their time. Research has shown that the poor design of these rooms can have a negative effect on a patient's physical and psychological health, as well as the productivity of medical staff. Updating design in medical facilities is crucial to creating a healthier environment for patients and staff.

One of the main challenges of healthcare design is the need to create a space that improves safety; betters patient outcomes; and meets the needs of patients and residents; caregivers and staff; as well as, family and friends. Today, more than ever, hospitals are

sensitized to the healing effects good design can have on patients and staff, and they are looking to interior designers for solutions on how to meet safety standards and accommodate the needs of residents, caregivers and families, all while making the patient experience positive and beneficial (Eagle, 2007a, p. 41). The remainder of this paper will examine the effects of good healthcare design in relation to safety and infection control; the psychological effects of design on patient wellness; and how design can work to accommodate the patient, the caretakers and the visitors in a patient unit.

DISCUSSION

Safety and Infection Control

Perhaps one of the most important factors that must be considered when designing for a medical facility is the issue of safety and wellness. A designer must account for the safety of all individuals entering and exiting the facility, especially patients.

Within the issue of safety is that of infection control, a serious and often time's life threatening concern. "Hospital-acquired infections kill nearly 90,000 patients in the U.S. each year, according to the Centers for Disease Control and Prevention" (Banholzer, 2005, p. 23). It is for this reason that hospitals are continually considering ways in which to reduce the chance of infection for patients, as well as staff and visitors. There are many ways to address the issue of infection control from a design perspective. One way designers can address this challenge is through the furniture and the materials they specify. Furniture chosen for a medical facility should always be upholstered with fabrics that can easily be cleaned and that are stain, moisture, and bacteria resistant (Eagle, 2007c, p. 47). Today, there are many companies creating upholstery that is suited for these purposes, and that serve as a more aesthetically pleasing substitute to the outdated vinyl upholstery of the past. Crypton Fabrics is one such company that offers upholstery for commercial and residential applications. Crypton textiles offer "permanent stain, moisture, mildew, bacteria and odor-resistant protection" and are EPA approved "when used in conjunction with Crypton Disinfectant and Deodorizer" (Crypton). These fabrics are "not flat and plastic looking anymore," notes L. Nicholson Carter, IIDA, AAHID and founder of Carter Design Associates, "They now have depth and texture and feel good to the touch" (Eagle, 2007c, p. 47). Textile manufacturers are also making progress in the area of nanotechnology, "a process that bonds to the fibers at the molecular level to create durable, comfortable, breathable fabrics" (Eagle, 2007c, p. 47).

> Nanotechnology can be combined with solution dying, a process in which color is incorporated into nylon fiber rather than being applied to its surface. This allows the product to withstand use of a water-bleach solution without fading, which can simplify cleaning processes for environmental services personnel. (Eagle, 2007c, p. 48)

With these recent advancements in textile development, designers are now able to choose from a wide variety of fabrics and furniture that offer superior safety technology while still enhancing the beauty and comfort of the space. Other companies like Hill-Rom and IOA Healthcare Furniture also offer upholstered furniture that meet these standards.

The design of the furniture itself is also an important consideration. Furniture should be ergonomically designed. Chairs with armrests should be utilized in any area where patients may be present because the armrests serve as an aid in getting in and out of the chair (Watkins-Miller, 1998, p. 10). If a patient room is designed with a sleeper sofa in mind for visitor overnight stays, the sofa should not have loose cushions in order to "support infection control guidelines" (Eagle, 2007c, p. 47). The design of all furniture in a medical facility should be carefully considered in terms of safety and wellness.

The choice of flooring materials needs to be carefully considered as well. Many medical facilities utilize some sort of vinyl flooring; in choosing hard surface flooring, designers must consider glare, contrast, and slip-resistance (Eagle, 2008b, p. 32). Today, more hospitals are beginning to install carpet on patient floors. Carpet technology, similar to upholstery, has come a long way in terms of cleanability, moisture backed seals and solution dyed fibers (Watkins-Miller, 1998, p. 10). Carpeting offers several benefits in terms of patient and staff wellness. Carpeting reduces caregiver fatigue. It also serves as an acoustical material that reduces distraction and disruption caused by excessive noise. In a quieter, calmer environment, caregivers make fewer mistakes and patients can get more rest. Carpeting can also create a

softer, more familiar atmosphere for patients, which can reduce patient anxiety. If a designer specifies carpet for a patient floor, the pattern must be thoughtfully chosen. Patterns that are too busy can have negative impacts on patients with vision problems or vertigo and can contribute to patient falls; some patterns have even been linked to seizures (Eagle, 2008b, p. 32). A designer must always consider the patient population before specifying patterns for carpet or any other type of upholstery.

Other material selections that can be specified in order to limit the spread of infection include materials like solid surface for bath and shower surrounds, and quartz for countertops. Quartz has recently become more popular in hospitals because it is non-porous, so not only is it more sanitary than granite, but it also does not need to be sealed like granite. It will resist stains and is stronger and more durable than granite.

An additional area involved with safety and wellness, and perhaps one that may not initially be thought of when discussing safety, is that of green design. Green design is a trend that has been readily on the rise, not only in the residential realm, but also the commercial realm. Designers for commercial interiors are more often than not specifying sustainable and environmentally friendly materials; more specifically, those that conserve natural resources and do not contain volatile organic compounds or dangerous chemicals. Although many new construction projects, in the medical field, have begun to adopt some of these sustainable design elements, many existing medical facilities are reluctant to start making changes to become more environmentally friendly. This reluctance is mainly due to the cost of implementing sustainable projects. It is true that these changes are slightly more costly on the front end, but in most cases, the costs are quickly recouped and savings continue over the life of the design. Green design will not only save money and resources, but more importantly, it provides a healthier environment for individuals and can have a fairly large impact on the

productivity and performance of employees. Employee performance is crucial in a medical care facility where the health and well-being of patients depends on caregiver attentiveness. Many sustainable practices have been introduced in office settings and have resulted in astoundingly positive feedback. In the case of the U.S. Department of Energy's Research Support Facility, which was designed with sustainability as a priority by NRL design (a company based out of Denver), employees were given a post occupancy evaluation to assess the updated space. The evaluation was significantly positive:

> On the issue of productivity, sixty-nine percent of the respondents felt that the new space improved organizational productivity; fifty-nine percent said it improved individual productivity. Eighty-two percent of the staff felt that the new space would improve recruitment and retention, and ninety-four percent felt it was better than the previous space. (Gould, 2009, p. 63)

The previous example concerns feedback conducted from a traditional, business suite, but another example, from the Affinity Health System in Appleton, Wisconsin demonstrates the affects of green design in a medical facility in relation to staff turnover. The president and CEO, D. Neufelder, states, "Our data shows the . . . lowest staff and physician turnover occur in our green facilities" (Popely, 2009). Lower staff turnovers result in staff members who are better acclimated and familiar with the facility, less time and money spent in hiring and training new employees, and ultimately a better experience for patients. These facilities have also been found to reduce employee absenteeism (Woodard, 2006, p. 40). Although further research is required to determine the affects of green design on medical staff, the existing data presents an incentive for medical facilities to begin implementing some of these sustainable practices. Some of these practices include supplying low-flow rate faucets, showerheads and toilets which reduce water consumption; utilizing high performance lighting, such as LEDs which last much

longer and use significantly less energy than incandescent and fluorescent lamps; and adding windows and sky lights as a way to reduce energy costs by using daylighting.

The benefits for patient wellness, in regards to green design, are many. Environmentally friendly facilities cause fewer illnesses and patients in these facilities are known to take less medication and experience shorter hospital stays (Woodard, 2006, p. 40). Many newly constructed hospitals have implemented these changes, but existing facilities are slower to do so because of the major renovations involved in adapting some sustainable features. Small, less expensive changes can be made in existing facilities, like setting up recycling units on floors, swapping out water wasting fixtures with greener alternatives, using low VOC paints for renovations, and taking advantage of natural lighting. All of these suggestions are ways that existing facilities can begin working towards sustainability.

Psychological Effects

Interior design can have a profound effect on the human psyche. From color and texture, to lighting and storage, design can create a comfortable and welcoming space even in an intimidating and sterile environment like a hospital room. There are many ways to make a positive impact on the mental and emotional states of staff and patients through the use of several design techniques. In most medical design, the intent is to create a homelike atmosphere, similar to a bedroom or a hotel room, where patients feel a sense of familiarity and comfort. Due to the developments in technology, as discussed earlier, many floor coverings, furniture pieces, and upholstery items are now offered in natural finishes that are still suitable for a medical environment. Natural wood flooring and paneling can easily be mimicked and laminates can mimic natural stone finishes (Eagle, 2007a, p. 41). Other things like cabinetry and artwork play a large role in disguising medical equipment and designating a place for personal items; shelving provides a place for the display of personal items, as well as flowers, cards and

photos (Eagle, 2007a, p. 41). When clutter is reduced and large, intimidating medical equipment is tastefully disguised a peaceful environment is created. Providing furniture for storage of personal items gives the patient a sense of belonging and ownership of the space. This allows for them to feel more at ease in a room that feels essentially theirs.

Color is one of the most important considerations in modern design because of its large impact on a person's emotional state; "color is ahead of form in a person's unconscious mind, and therefore is more closely related to emotional responses, whereas form elicits intellectual processes" (Birren, 1969, p. 29). It is essential for designers to understand the concepts of the science of color when designing any space, but especially when designing a space in a medical facility. The science of color is referred to as color psychology and is the study of how color affects human emotional and behavioral responses. As an example, red has been known to evoke feelings of anger and restlessness in a person, while the color blue can soothe and relax. The color orange is more appealing to extroverted people, whereas the color purple may be preferred by artistic persons (Birren, 1969, p. 31). Certain colors can evoke different moods, but color in its most simplistic form is "diverting and pleasing," and for an ill patient this distraction is conducive to recovery (Birren, 1969, p. 86). S. Wagner (2008) points out that "color should convey safety and tranquility," and choosing colors that reflect the outside environment aids in healing "through familiarity and emotional tranquility" (p. 31). Color should also be carefully considered in regards to the function of the facility and the individuals that will be present in the location. Some colors may "disorient older or impaired patients, or agitate patients and staff" (Carr, 2009).

Another aspect of color psychology is the prevention of sensory deprivation. Color plays an important role in keeping the mind alert and active; "vision seems to degenerate unless stimulated and so also does the mind itself drop into lethargy" (Birren, 1969, p. 28). Many

hospital walls are painted white or off-white, but this contributes to environmental brightness. “High environmental brightness not only handicaps seeing but also severely constricts the pupil opening of the human eye; an action that is muscular and very fatiguing” (Birren, 1978, p. 105). Stimulating hospital décor, as well as the use of color, creates a pleasing and comfortable environment that is better suited for patient recovery.

Not only can color have a significantly large impact on an individuals’ emotional state, but it can also affect that way that a patient looks, as far as complexion and pallor. Certain colors can make patients look sickly and can affect assessments of the patient’s health. Muted colors are often chosen for patient rooms because they do not affect caretakers’ “visual impressions like skin tone” says S. Borgquist, president of California based interior design firm Interspec (Eagle, 2007a, p. 42).

Suggestions for medical facilities are as such;

> Ceilings should be tinted; wall areas and floors should be soft in tone, with a reflectance between forty and sixty percent; furnishings and draperies should not be too pure in hue or too pronounced in design. Brilliant reds, yellows, and blues may be too overwhelming for ill patients. (Birren, 1969, p. 87)

These are suggestions, and more freedom may be taken in areas where patients do not inhabit such as, waiting rooms, recreational areas, and cafeterias.

Similar to color, the type of artwork that will be featured in a medical facility should also be carefully considered. Some images may upset or trouble patients, for instance artwork that “depicts food or alcohol, especially in chemotherapy areas, as well as pieces that incorporate sharp or jagged edges,” should be avoided (Watkins-Miller, 1998, p. 10). Hospitals should focus on displaying artwork that will encourage recovery. Landscape art or art featuring familiar images are more pleasing to patients as opposed to abstract art (Litch, 2006, p. 34). The

Overlake Hospital Medical Center in Bellevue, Washington has four large murals in new outpatient units; these murals depict pictures of “beaches, mountains and meadows” (MacDonald, 1987, p. 1). Tranquil images like these provide a restful place for patients and staff to rest their eyes. They also serve to provide natural scenery in a place where an outdoor view is not accessible. Patients prefer to have calming and familiar images to focus on, rather than chaotic or disorienting shapes.

Lighting is another aspect of design that is not given enough attention in the medical field. Much of the lighting in hospitals comes from artificial sources, such as fluorescents. Fluorescents remain the most cost effective option and are a good choice for public areas; however, fluorescent lighting can often be harsh and cold. This type of lighting in an exam or treatment room can create an institutionalized feeling. Some hospitals are experimenting in using warmer types of lighting in patient rooms as a way to create a home-like atmosphere (Peacock, 1995, p. 32). Fluorescent lighting is now being offered in warmer color temperatures, which can mimic incandescent lighting. Although fluorescent lighting has improved, there are other lighting options worth considering. An alternative to fluorescent lighting is LED lighting. LEDs give off a light color similar to fluorescent lights but are much more energy efficient. LED light bulbs only use two to ten watts of electricity, much less than fluorescent and incandescent; they also last up to ten times longer than fluorescent lights. The down side to LEDs is that they have a high upfront cost. This cost is easily recouped due to the fact that these lights last much longer than other lighting options, require less maintenance, and use less electricity. Regardless of the facility type, a combination of lighting technologies is essential in creating an environment that can assist staff and provide comfort to patients.

Artificial lighting is not the only lighting that needs to be considered. Increasing amounts of research are finding that natural light can act as a natural healer (Romano, 2007, p. 24). One

study reported findings that nurses stated they felt more alert and less stressed when exposed to natural light and windows with a view (Robeznieks, 2009). Natural lighting can have an even larger effect on patient health.

> A 2005 study compared patients recovering from elective spinal surgery whose rooms were on the sunny side of a ward with those one the dimmer side. Those in the sunnier rooms rated their stress and pain lower and took 22% less pain medication each hour, incurring only 80% of the pain medication costs of the patients in the gloomier rooms. (Postrel, 2008)

In this case not only did the natural lighting aid in the patients' wellness, it also reduced the costs for the medical facility in terms of medication expenses. Generally research shows that patients exposed to more natural light "have shorter hospital stays, use less medication, and have higher satisfaction with their experience" (Landro, 2007). In medical facilities being newly constructed it is easy to take this information into account and provide more windows as a means of infiltrating rooms and corridors with natural lighting, but for existing medical facilities it is more difficult to access natural lighting without undergoing major renovations. One way existing hospitals can address this need is by using proper lighting techniques. For instance, light in the blue-green spectrum can induce a calming reaction, and in "areas without natural light proper lighting can prevent people from becoming disoriented and out of touch with normal circadian rhythms" (Eagle, 2008a, p. 36). Lighting should be considered for its color temperature and color rendering index or CRI. In any case natural lighting needs to be accounted for and lighting techniques need to be considered in order to provide the best possible environment for ailing patients.

Accommodating Patients, Staff, and Family

Often times patient rooms can feel cramped and claustrophobic, with staff treating the patient and visitors often times crowding the space. Each of these groups has unique needs and

individual objectives. Patients, the most important group of the three, require sufficient care and a comfortable and pleasing environment in which to be cared for and recover. Caregivers and staff must have adequate and easy access to their residents and medical equipment. Family members require the necessary accoutrements and accommodations, as many will visit and stay for extended periods of time with their ill loved ones. The question arises as to how to accommodate all essential groups of individuals in a medical environment.

One way is through the use of better space planning. The impact of space planning in medical facilities is an area that designers have begun to explore in relation to its effect on residents and staff. “Efficient space layout can ease navigation and speed the healthcare delivery process” (Watkins-Miller, 1998, p. 10). Finding the best possible solutions in regards to placement of nursing stations and equipment can help to provide patients with the highest level of care and attention. Decentralized nursing stations are one way hospitals are implementing better space planning. Decentralized nurse’s stations place nurses closer to patients. Often times this means making the patient the center of the wing. Several hospitals have implemented pods layouts or layouts that use a “concentric circle theory,” where nurses’ stations and medical supplies are centered on patient rooms (Eagle, 2007b, p. 17). This allows nurses to be able to respond quicker to patient requests and emergencies and also reduces travel time to both the patient and medical supplies, which in turn reduces caregiver fatigue. Decentralized stations also are less noisy than centralized ones. Noise can interfere with communication between caretakers; can cause stress for nurses and patients, and can interfere with patient sleep (Hellmich, 2010, p. 29). Furniture in administrative areas also plays a large role in employee productivity and satisfaction. Upholstered, ergonomically designed chairs should be specified in administrative and nursing station areas, as well as adjustable desks, privacy screens, and

moveable walls (Breunig, 2007, p. 30). All of these things allow medical staff more control over the environment and creates a more comfortable space for them to work and care for patients.

Another way to better allocate space is to designate certain zones; for instance, zoning for patients, caregivers, and family or overnight guests. By designating specific zones to each group, patient care is improved "by increasing comfort and minimizing disorder and stress" (Consulting, 2007, p. 18). Patients require a space where they feel comfortable and one that is conducive to recovery. Private care rooms are one way in which recovery is encouraged in a medical facility. "As of 2006, the American Institute of Architects' guidelines, which many states use for their regulatory codes, specify single rooms in new medical-surgical and postpartum units" (Postrel, 2008, p. 119). These guidelines are in large part due to research that has proven the positive effects of private rooms on patient outcomes. When patients are given private space it results in: "lower infection rates, shorter stays, less noise and hence better sleep, fewer expensive patient transfers and subsequent medical errors, and much less stress for patients" (Postrel, 2008, p. 119). Another important aspect of the patient zone is patient control. When patients are given control over their environment they are given power and confidence, in an otherwise uncontrollable situation. Many medical facilities are giving patients access to DVD players and computers. Television and DVD players allow the patient a pleasant distraction from treatment. Computers allow them to research their illness, communicate through e-mail or other social networks with friends and family, and search the Internet for entertainment. Placing lighting controls in reach of the patient is another way to allow patients control over the environment. The goal of the patient room design is to create an environment that supports emotional tranquility and essentially speedy recovery.

Zoning for caretakers is of equal importance. In the patient room there should be a designated spot for caretakers. This area should include hand washing stations. "By making

hand-washing sinks and alcohol based hand washing gel dispensers prominent in the interior design, and by placing them at the bedside and other convenient locations, designers can help improve hand-washing compliance" (Eagle, 2008b, p. 32). Allowing for desk space and storage in the caretaker zone accommodates nurses and staff who practice in-room charting. It also reduces travel for caretakers if there is a place for medications and other medical tools needed for that particular patient. A designer should specify separate lighting controls in this space. Lighting should include task lighting which can be lowered so as to not disrupt patients during the night (Eagle, 2007a, p. 44). White boards in the patient room allow for doctors to explain diagnoses and treatment options to the patient and family (Babcock, 2005, p. 62). When nurses and doctors can accurately and comfortably perform their tasks it promises an optimal experience for the patient.

The third group of individuals that a designer must account for in the patient room is that of visitors. Social support from family and friends is crucial in a patient's well-being and recovery process. Creating a space where family feels welcomed and comfortable will encourage longer stays and a better experience for the patient. Upholstered furniture in a patient room makes guests feel welcome and gives them a space to reside while the patient is being treated or resting. Including furnishings like desks, mini refrigerators and separate television access creates a more accommodating space for visitors (Eagle, 2007c, p. 47). Family members often times need to keep up with work related issues and providing a desk allows them somewhere to set up a personal laptop or other work related items. Some medical facilities include small kitchenettes in an area off of the patient room where family can prepare food without needing to leave the hospital for an extended period of time. These separate suites often times include showers and sleeping accommodations (Eagle, 2007c, p. 47). Family support is critical to a

patient's experience and recovery, and better design can encourage longer family stays while also keeping spirits up in an otherwise bleak situation.

In any situation it is critical that designers account for all members involved in a patient care unit. Patients should always be the center of care, and made to feel comfortable and secure; staff should be placed in an area where they can easily monitor patients and respond quickly to an emergency; and visitors should have a designated space where they can be near the patient but out of the way if necessary. Space planning and zoning, done correctly can support an efficient and successful environment for patient care and recovery.

APPLICATION

Problem Defined

The Olivet Nazarene University Virtual Learning Center (VLC) housed in Wisner Hall of Nursing Education is a hands-on learning center where Olivet nursing students work with SimMan patient simulators. Students practice all kinds of nursing procedures with these life-like patient simulators, everything from assessment and taking vitals to realistic practice of chest tube insertion and needle and surgical cricothyrotomy. The VLC is also a center where classes and professor instruction can take place and where students can study, conduct on-line research and collaborate with their peers. The space itself is divided into two large sections. One section is designed to mimic a patient floor of a medical facility. This side includes two medical-surgical rooms, one OB and pediatrics room, a nursing station, and several patient beds positioned across from the nursing station, as well as medical equipment storage. The adjacent side is designed for traditional learning. In one corner, the room is set up for classroom teaching with a podium and projector. The other corner is used mainly as storage for SimMan simulators, and in between are computer pods set up for student use. The layout of the space was overall fairly functional, and only minor changes needed to be made to the floor plan, in terms of storage, in order to address the expressed needs of the nursing department.

It was the overall design aesthetic of the space that was lacking most. All the walls were painted a stark white, and the 80's inspired pastel pink privacy curtains were outdated and faded. The chair upholstery, chosen to match the curtains, was dirty and torn on many. The nursing station was barely recognizable from the rest of the space and dominated by overly crowded open cabinetry. The patient rooms were void of color and very dark. Simply put, the VLC was in dire need of an update.

Description of Design

The design of the VLC was developed with functionality and aesthetics in mind. Since the VLC is mainly for student use, and is not a place where ill patients reside, safety in terms of infection and bacteria resistant materials was not a primary concern. The goal was to provide a more enjoyable and workable space for students to learn.

In terms of functionality, the space needed more computers to accommodate the students, and more storage was needed for books and student belongings. To provide space for more computers, the SimMan storage was relocated in order to clear a wall for the installation of seven more computers on the classroom side of the VLC. Storage for books and student belongings was made available through four large shelving units retrieved from university storage.

The nursing department also requested that the designer bring in additional privacy curtains to add to the functionality of the patient beds located in the open space across from the nursing station. The privacy curtains were the largest and most involved aspect of the project. Five privacy curtains were constructed by hand. Four of the curtains measured eight feet long by seventeen feet wide; one curtain measured seven feet long by six feet wide. The curtains were made out of a cotton blend, printed fabric and backed with white muslin. The printed fabric was mostly navy and the pattern featured stylized leaves. The fabric was chosen to coordinate with the existing carpet, the new paint, as well as because of its gender neutral pattern. The curtains were constructed with a three inch, double header and a one inch, double hem. Grommets were used in the header to hang the curtains from the existing track in the VLC. The curtains provided a way to separate the patient beds and created a private setting for nursing students to interact with student and faculty volunteer patients.

The colors for the space were chosen in an effort to elicit a calming, yet fun atmosphere. Since the space is mostly used for students, and not for recovering individuals, brighter, more vibrant colors were used. A brighter, pastel green paint was used behind the nurse's station in order to create a focal point and define the station from the rest of the room. The same color was repeated on the wall parallel to the nurse's station in the classroom side of the VLC. In the medical-surgical rooms, a light blue was used on the walls. The color blue induces a calming and relaxing atmosphere, which would be ideal for a space where patients would be present. The OB/pediatrics room was painted in a light, pastel yellow. Pastel colors are reminiscent of childhood and the color yellow is typically associated with happiness. Due to budget constraints, the remainder of the walls was left white.

The chairs in the classroom and at the computer stations were fairly outdated, and after discussion with nursing department faculty, it was decided they needed to be reupholstered. The upholstery material was navy blue, with monochromatic polka dots. The chairs coordinated with the curtain fabric and greatly enhanced the aesthetic of the classroom. Two sofas, found in storage, were upholstered in the same fabric and placed in the VLC to act as lounge seating for students.

Two pendant lights were added in the nurse's station. The space was lacking illumination and the pendants provided additional task and decorative lighting. The pendants also helped to define the space from the rest of the room and create a station that appeared more similar to nurse's stations in established medical facilities.

Artwork is a defining aspect of any space, and the nursing department desired to bring in a piece of artwork for the OB/pediatrics room. The art department volunteered to donate a mural for the space. The designer requested that the mural depict a realistic landscape scene. The mural was a realistic depiction of a field full of flowers. This type of

landscape art is most preferable in a medical setting and provides a happy escape for patients and in this case for students.

Limitations

There were several limitations in the implementation of the VLC design. Time was one such restriction. The planning for the design of the VLC was finished in December of 2009 and the physical execution of the plans needed to be completed by April of 2010. Painting and placement of storage units, as well as chair re-upholstery was completed on schedule; however, material for privacy curtains was to have been on hand by January of 2010, but due to ordering delays, was not accessible until two months later. This setback threatened to delay the completion of the project seeing as curtain construction would be time consuming. In addition, student volunteer participation for the construction of the privacy curtains was low. Two fashion merchandising students volunteered to aid in the assembly of the curtains, but due to schedule conflict the curtains were not finished until the first week in May. Although the project was finished close to the projected completion date, scheduling could have been improved by allowing time for ordering errors and labor limitations.

The largest restriction in this project was the $1,500 budget allotted by the nursing department. Due to the budget, many changes that would have been ideal additions to the design were unable to be included, such as new flooring, new bed linens, refinishing of existing cabinetry, additional light fixtures and other miscellaneous accessories. Likewise, the designer would have preferred to incorporate some green and sustainable materials into the design of the VLC, but the budget did not allow for the extra expenses of doing so. As it was, the design came to approximately $1,400, just under budget. The budget breakdown is as follows:

The new design for the space included paint for two medical-surgical rooms, the OB and pediatrics room, as well as the wall behind the nurse's station and a wall in the classroom; paint for the VLC came to roughly $200. The material for the five privacy curtains cost approximately $700. Upholstery material for chairs and two sofas cost $360. The two pendants over the nurse's station came to $80. The four shelving units and two sofas were found in university storage and cost nothing to use. The mural was donated and free of charge as well. Overall, the cost for the project was approximately $1,350, and with tax came to a little over $1,400.

Feedback

Six months after project completion, a post-occupancy evaluation was sent out to nursing department faculty. Feedback was generally very positive. Most felt the newly designed space was more aesthetically pleasing and created a more psychologically enjoyable experience for students and staff. All agreed functionality of the space had improved by way of added computers and additional storage units. All expressed an improved perception of the space after the redesign had been implemented.

CONCLUSION

The professional world of interior design is often times perceived as a superficial one; a profession concerned only with the aesthetics and outward appearance of a space. Some might argue that design is only a means of enhancing a physical environment, but this assumption would be incorrect. Not only can interior design enhance the physical appearance of a space it also plays a large role in enhancing the lives of the individuals that interact with and inhabit the space. This statement may not hold truer for any other environment than that of a medical facility. Interior design can have a largely positive effect on the physical, emotional, and mental wellness of individuals, and in a medical environment, where patients are present, proper interior design can serve as a supplementary healer. Creating a beautiful environment for patients and staff is important, but if the design does not include appropriate materials and finishes, the design is not conducive to patient wellness or staff performance. In designing for a medical facility, a designer cannot merely consider the aesthetics of the space, he or she must also be able to design an environment that fosters a healthy and suitable atmosphere where patients can heal and staff can perform. This type of environment is one that can be appreciated by patients, staff and visitors alike. When patients are comfortable, caretakers are equipped, and family is near, the outcome is better for everyone.

REFLECTION

It has been about a year and a half since the VLC design plans were discussed and solidified. Looking back, I now realize the full magnitude of the project, and can easily identify areas of the design that could have been improved. At the time, I was very inexperienced in working with such a large space and such a small budget, as well as unfamiliar with many aspects of commercial design. The process, from client contact to finished product, was a learning experience.

During the initial meeting with Professor Susan Day, I felt fairly confident that I would be able to address the many needs she outlined for the VLC; however, as I researched material I realized I would have to narrow my focus to three or four of the largest requests, as the money was just not available to address every concern.

The privacy curtains were the largest and most difficult aspect of the project to produce. Volunteer participation to construct the curtains was low, and I had very little sewing experience. If I were to do it over, I would have made sure the fabric had been ordered on time so that construction of the curtains could have started upon return from winter break. I also would have rigidly scheduled time for myself and student volunteers to meet weekly and work on the curtains. Due to my ignorance of curtain construction and scheduling conflicts with volunteers, the curtains took much longer than planned and were almost not completed before the end of the academic year.

Another area of the design that could have been improved upon was the paint color chosen for the walls. I had originally chosen samples from a paint brand that featured no VOC's (volatile organic compounds); however, upon request from Professor Day that paint with a primer built in be used, I changed the brand and was forced to find comparable colors to the ones I had originally chosen. In the end, some of the colors, particularly the green color, did not

match the original sample I had chosen as well as I had hoped it would. In retrospect, I wish I would have tested the paint on the VLC walls before specifying a certain color. Although the color specified is acceptable for the space, I feel I may have been able to specify a more appropriate shade or tint of the color had I tested it first.

With any project, there are always limitations and problems that arise. As an aspiring designer, this project forced me to deal with many difficult and unexpected challenges. From my mistakes, I learned how to better develop strategies for communicating with future clients, as well as how to manage team members and future associates. I also learned the importance of choosing products based on their appropriateness for a space and the value of testing materials and colors before solidifying specifications. Although the process of redesigning the VLC may not have been a complete success, it was an integral and revelatory experience which made me aware of the many challenges I will face as I move forward into the professional world of design. I can truthfully say I am proud of the completion of such an overwhelming task, but, in all honesty, the most significant accomplishment I will take away from this project is the many lessons learned along the way.

REFERENCES

Babcock, R. (2005). Bedside manner. *Buildings, 99*(5), 62. Retrieved from Master FILE Premier database.

Banholzer, M. (2005). A vital link. *Health Facilities Management, 18*(11), 23. Retrieved from MasterFILE Premier database.

Birren, F. (1969). *Light, color, and environment: A thorough presentation of facts on the biological and psychological effects of color.* New York, NY: Van Nostrand Reinhold Co.

Birren, F. (1978). *Color and human response: Aspects of light and color bearing on the reactions of living things and the welfare of human beings*. New York, NY: Van Nostrand Reinhold Co.

Breunig, D. (2007). Finding furniture. *Health Facilities Management*, *20*(5), 27. Retrieved from MasterFILE Premier database.

Carr, R. (2010). Hospital. *WBDG Health Care.* Retrieved from http://www.wbdg.org/design/hospital.php.

Center for Disease Control. (2008, November 8). The state of aging and health in America 2007 report. Retrieved from http://www.cdc.gov/aging/saha.htm.

Consulting-Specifying Engineer. (2007). Healthcare facilities go green, combat energy waste. Retrieved from ABI/INFORM Global. (Document ID: 1343827301).

Crypton Fabrics. (2010). Retreived from http://www.cryptonfabric.com/commercial/.

Eagle, A. (2007a). Creating the patient centered room. *Health Facilities Management*, *20*(6), 40. Retrieved from MasterFILE Premier database.

Eagle, A. (2007b). On a higher plane. (cover story). *Health Facilities Management*, *20*(11), 14. Retrieved from MasterFILE Premier database.

Eagle, A. (2007c). Putting families first. *Health Facilities Management*, *20*(6), 46. Retrieved from

MasterFILE Premier database.

Eagle, A. (2008a). Finishing touch. *Health Facilities Management*, *21*(6), 34. Retrieved from MasterFILE Premier database.

Eagle, A. (2008b). Safety by design. *Health Facilities Management*, *21*(6), 30. Retrieved from MasterFILE Premier database.

Gould, J. (2009) Sustainable workplace design creates innovation opportunities. *Buildings, 103*(7).

Hellmich, L. (2010). Patient focus. *Health Facilities Management.* Retrieved from MasterFILE Premier database.

Landro, L. (2007). The informed patient: Hospitals set blueprint for a better 'healing environment'; Outdated facilities redesign patient areas to lift quality of care. *Wall Street Journal* (Eastern Edition), p. D.9. Retrieved from ABI/INFORM Global. (Document ID: 1239305151).

Landro, L. (2008). The informed patient: A treatment room with a view. *Wall Street Journal* (Eastern Edition), p. D.1. Retrieved from ABI/INFORM Global. (Document ID: 1535326131).

Litch, B. (2006). The healing power of art. Art displays in hospitals reduce stress, improve outcomes. *Healthcare Executive*, *21*(5), 34.

MacDonald, S. (1987). Hospital walls adopt new look. *Wall Street Journal.* Retrieved from ABI/INFORM Global.

Peacock, J. (1995). Redefining the nurse's station. *Nursing Homes, 444*(7), 32. Retrieved from ABI/INFORM Global. (Document ID: 6991866).

Popely, D. (2009). Beyond the bin: How healthcare is responding to the sustainability movement. *Healthcare Executive, 24*(3), 9,6. Retrieved from ABI/INFORM Global. (Document ID: 1710328331).

Postrel, V. (2008). Art of healing. *Atlantic Monthly*, *301*(3), 119-122. Retrieved from ABI/INFORM Global. (Document ID: 1482519061).

Robeznieks, A. (2009). The pressure builds. *Modern Healthcare, 39*(11), 24. Retrieved from ABI/INFORM Global. (Document ID: 1665284011).

Romano, M. (2007). Evidence of an evolution. *Modern Healthcare, 37*(13), 24-28,30,32. Retrieved from ABI/INFORM Global. (Document ID: 1248470161).

Wagner, S. (2008). Supply and demand. *Health Facilities Management*, *21*(5), 27. Retrieved from MasterFILE Premier database.

Watkins-Miller, E. (1998). Design cures. *Buildings, 92*(2), 10. Retrieve from Master FILE Premier database.

Woodard, N. (2006). Hospital redesign can offer patients the best clinical care. *Managed Healthcare Executive, 16*(10), 40,42. Retrieved November 1, 2009, from ABI/INFORM Global. (Document ID: 1151635501).

APPENDIX A: Program and Design Concept Statements

Program Statement

The Olivet Nazarene University Virtual Learning Center (VLC) housed in the Wisner Hall of Nursing Education is part simulated medical facility and part classroom. In their third and fourth years, ONU nursing students spend much of their time in the VLC. This is a space where aspiring nurses can practice patient assessments, as well as treatments and procedures. Much of this hands-on learning is done by using SimMan patient simulators. The nursing department also occasionally brings in real volunteer participants that nurses can interact with and practice taking blood pressures, listening to heart rates and assessing physical conditions. The other side of the VLC is delegated as a classroom and study space for nursing students. This area consists of several long tables with chairs, a projector and podium, as well as several computer stations for students to complete assignments and conduct research.

The space is overall outdated and fairly stark. All the walls are cement block painted white; the few privacy curtains in the space are dingy and an outdated, dusty rose color. The chairs are upholstered in a color very similar to the curtains, and many are stained and faded. The nurse's station is barely distinguishable and is overpowered by a background of overly crowded open cabinetry.

In discussions with nursing Professor Susan Day, VLC needs were identified and outlined. Day requests that the space be updated and brightened through the use of paint color and artwork. New privacy curtains are a necessity. Curtains will be used to divide four beds in an open part of the VLC in order to create four distinguishable patient units within which students can work. Additional needs include extra storage and lounge seating in the classroom section of the VLC.

The nursing department is allotting the designer $1500 to complete the project. The budget will be a limitation as the designer works to specify materials for privacy curtains, storage, paint, and artwork.

Design Concept Statement

The design of the Virtual Learning Center presented several design challenges. The space needed to be updated in terms of color and overall aesthetics, five large privacy curtains needed to be made by hand, additional storage was necessary and the chairs needed to be re-upholstered. The goal of the design was to provide students and professors with a pleasing environment in which to work and learn.

A palette of colorful pastels was used to brighten and enliven the space. A soft blue color was used in the two medical-surgical rooms. Blue is a color that induces calmness and would be appropriate in a patient unit. A warm yellow was specified for the pediatric/OB room. Yellow is a soft pastel, reminiscent of childhood that brightens the room and creates a cheerful atmosphere. Finally, a brighter, pastel green was used as a focal point behind the nurse's station located in the main portion of the VLC. The same green was repeated on a wall in the classroom side of the space, parallel to the nurse's station, in order to create repetition and harmony between the two rooms.

A piece of artwork was donated by the art department. The piece featured a realistic rendering of a field full of flowers. This type of landscape art is appropriate for medical facilities and helped to brighten the OB and pediatric room.

The largest feature of the newly renovated space was the privacy curtains. The curtains were made by hand due to budget constraints. Curtains were constructed from a cotton blend fabric that featured a gender neutral pattern of stylized leaves in navy blue, and backed with white muslin. The patterned curtains were youthful and fun and served to bring life into the atmosphere. The pattern was also chosen for its ability to hide future stains and dirt.

Additional storage was necessary mostly for supplementary text materials and student belongings. Four shelving units were retrieved from university storage and placed on the far wall

of the classroom side. Much of the literature and other resources that had currently been dominating the space behind the nurse's station were moved to these units. This freed up space in the nurse's station for other more relevant materials, such as medical equipment, to be stored and made easily accessible.

Two sofas were also found in university storage and were used to create a small gathering place for students to relax or study. The sofas were re-upholstered in a monochromatic navy blue textured fabric. The chairs in the classroom were upholstered in the same upholstery material.

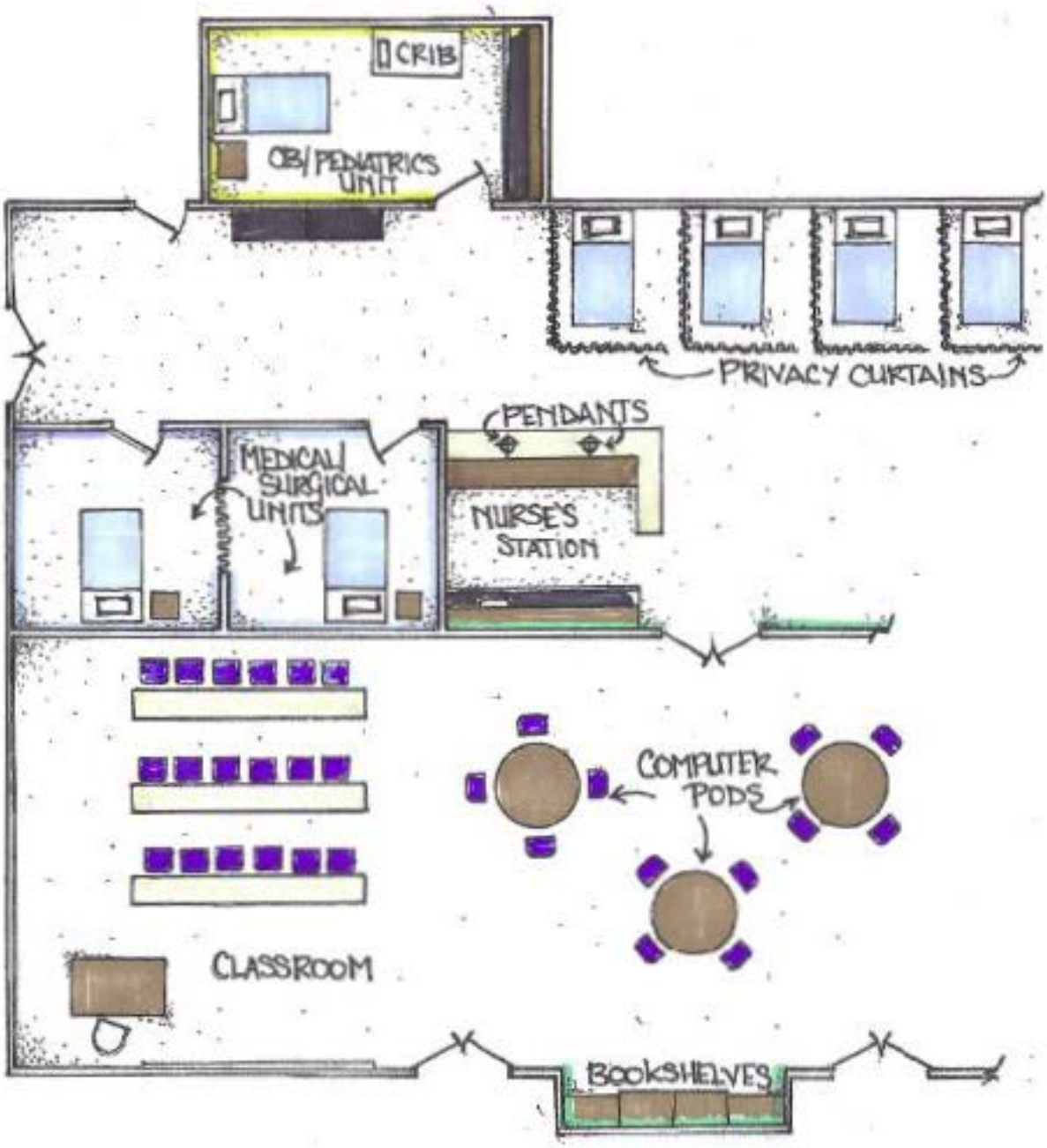
The budget also allowed for two small, white pendant lights to be placed over the nurse's station. The lights gave definition to the space and brightened up an otherwise dark corner of the VLC.

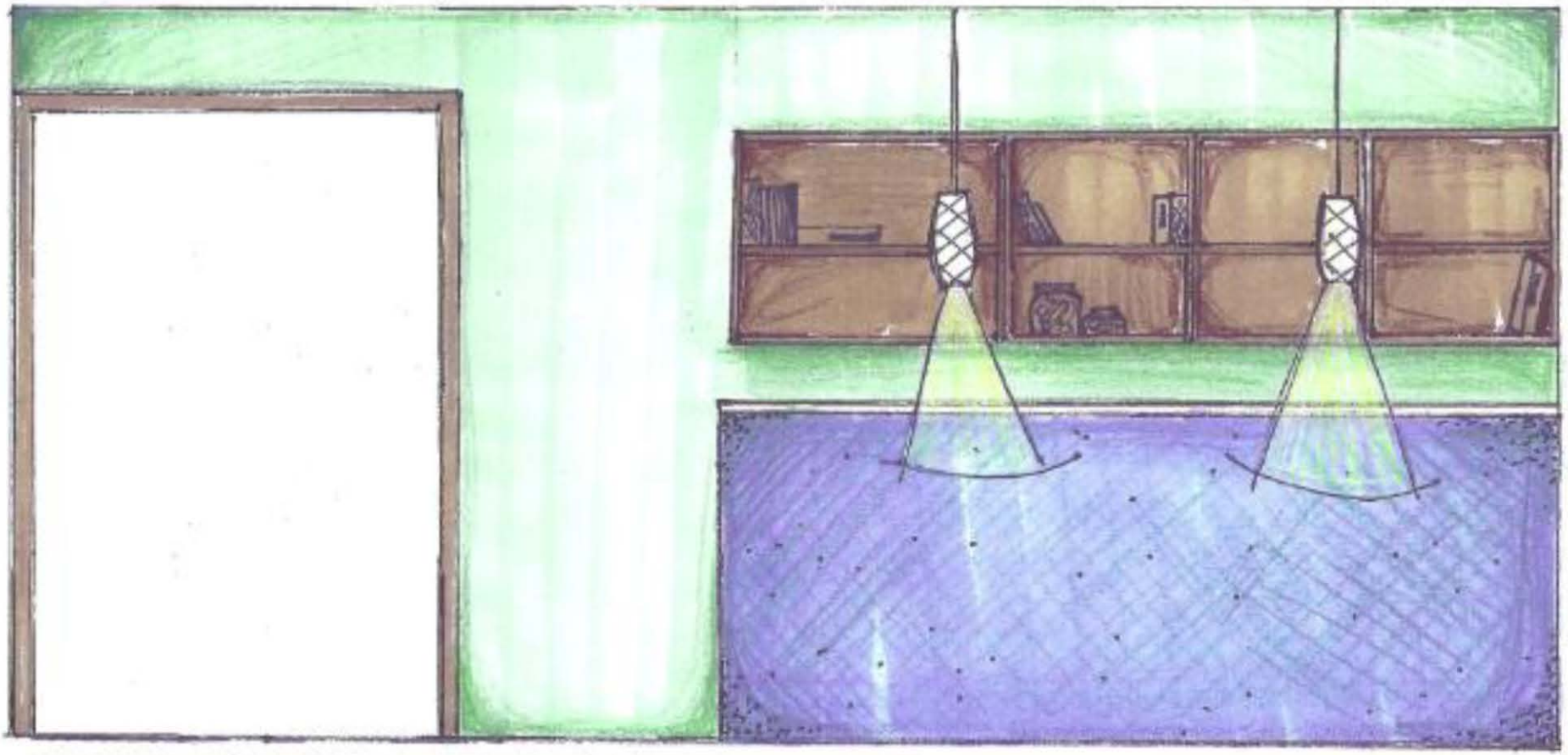
APPENDIX B: Specifications Sheet

VLC Specification Sheet					
Item	**Item #**	**# Units Needed**	**Manufacturer**	**Price per Unit**	**Total Price**
Spring Lawn Paint	6006-9C	3 Gallons	Valspar	$24.97	$74.91
Blue Whisper Paint	5005-9A	3 Gallons	Valspar	$24.97	$74.91
Warm Summer	3008-2B	2 Gallons	Valspar	$24.97	$49.94
Leaves on Navy Fabric	40014390669	80 Yards	JoAnn Fabrics	$3.99/yd	$319.00
Roc-Lon 100%	2832525	30 Yards	JoAnn Fabrics	$144.99/15 yds	$289.98
White Thread	N/A	2 Spools	Coats and Clark	$2.79/spool	$5.58
Grommets	N/A	13 packs	Dritz	$3.29/pack	$42.77
Grommet Pliers	2549798	1 Pair	Dritz	$20.99	$20.99
Pendants	270693	2	Checkolite International	$39.98	$79.96
Upholstery Fabric	N/A	36 Yards	Rader's	$10.00/yd	$360.00
Mural Supplies	N/A	N/A	N/A	Donated by Art Dept.	$0.00
Bookcases	N/A	4	N/A	ONU storage	$0.00
Couches	N/A	2	N/A	ONU storage	$0.00
				Grand Total:	$1,318
* Prices listed are retail prices and do not reflect tax.					

APPENDIX C: Working Drawings

*Drawings are only visual representations of the space and are not drawn to scale.





VIRTUAL LEARNING CENTER-NURSE'S STATION

APPENDIX D: Photographs of Field Work

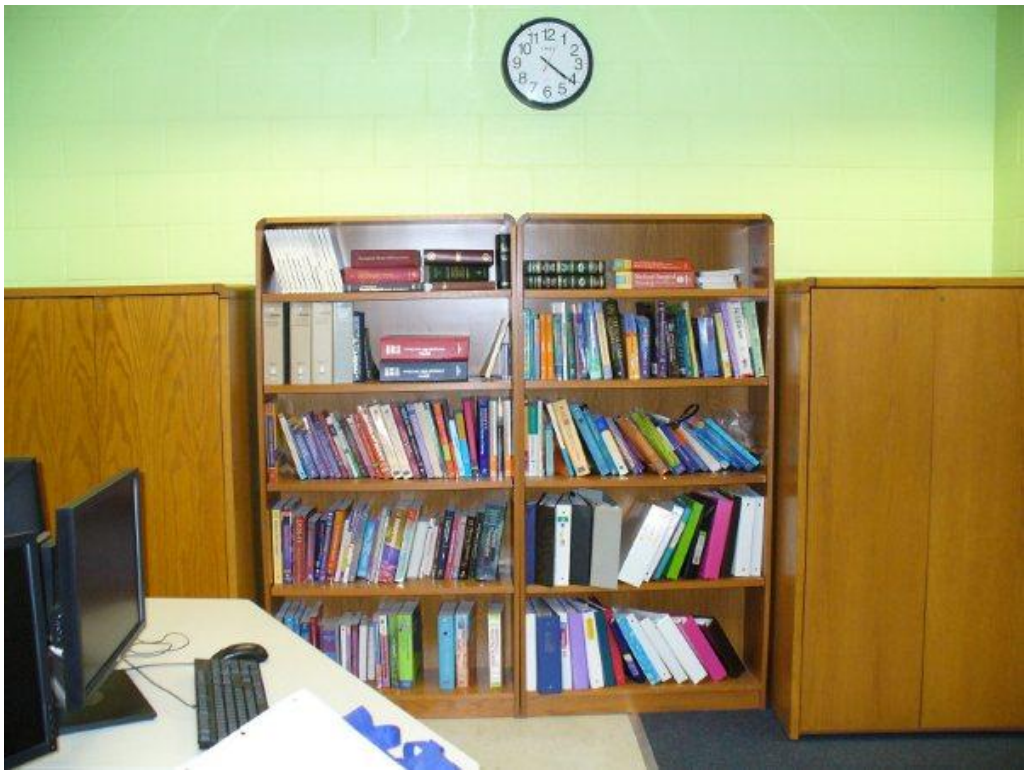
1: Newly designed nurse's station in the VLC. Paint color: Spring Lawn by Valspar

2: Patient beds with newly constructed privacy curtains.

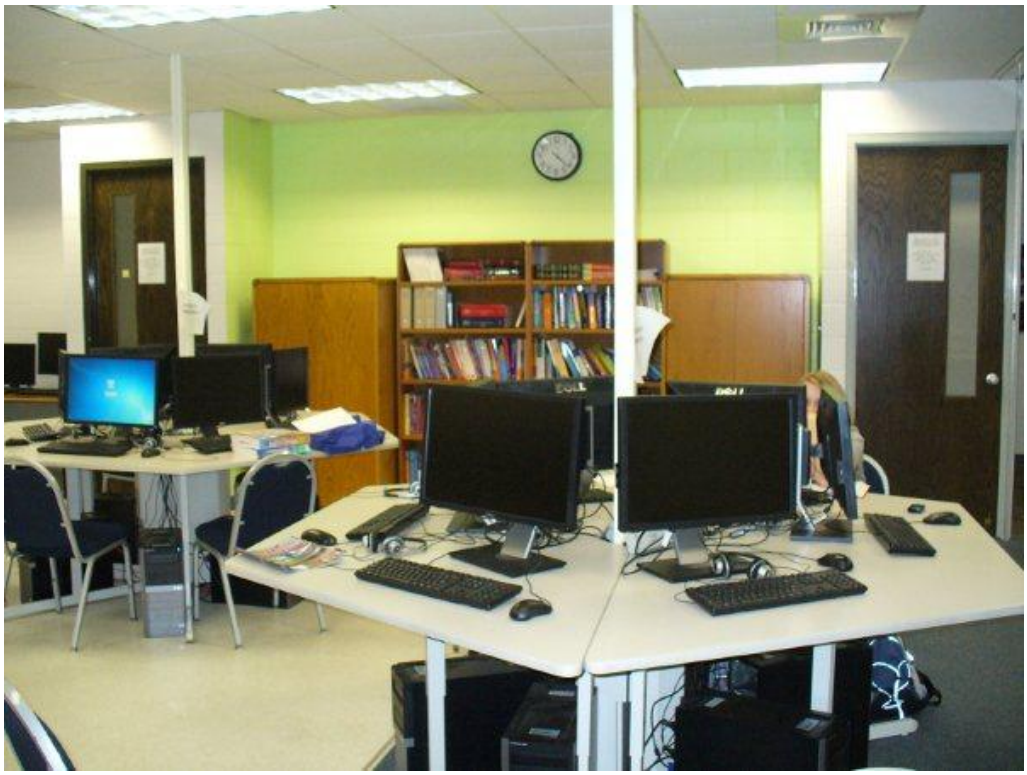
3: Newly painted medical/surgical unit with privacy curtain. Paint color: Blue Whisper by Valspar

4: Newly painted OB/Pediatric unit. Paint color: Warm Summer by Valspar

5: Custom painted mural, donated by Olivet Nazarene art department, in OB/Pediatric unit.



6: New storage units retrieved from university storage. Paint color: Spring Lawn by Valspar



7: New storage units pictured in the classroom side of the VLC.

8: Newly upholstered sofas in classroom side of VLC.

9: Newly upholstered VLC chair.

APPENDIX E: Post-Occupancy Evaluations

Virtual Learning Center
Post-Occupancy Evaluation

1. How does the renovation compare to your original expectations?
   Not met 1 2 3 4 5 Exceeds

2. How well did the designer meet the needs and requests of the nursing department?
   Poor 1 2 3 4 5 Very well

3. How well did the designers' presentation accurately portray the design concept?
   Not well 1 2 3 4 5 Very well

4. How much did the renovation enhance the aesthetic appeal of the space?
   Not at all 1 2 3 4 5 Very much

5. How appropriate are the colors for the space?
   Not appropriate 1 2 3 4 5 Very appropriate

6. How well did the renovation create a more functional place to work and learn?
   Not at all 1 2 3 4 5 Very well

7. How well did the renovation create a more psychologically pleasing place to work and learn?
   Not at all 1 2 3 4 5 Very well

8. How much has the renovation improved your perception of the space?
   Not at all 1 2 3 4 5 Very much

Is there anything about the space, in relation to the renovations, that you would change?

Nothing, I really liked it

Additional comments:

Virtual Learning Center
Post-Occupancy Evaluation

1. How does the renovation compare to your original expectations?
   Not met 1 2 3 4 5 **Exceeds**

2. How well did the designer meet the needs and requests of the nursing department?
   Poor 1 2 3 4 5 **Very well**

3. How well did the designers' presentation accurately portray the design concept?
   Not well 1 2 3 4 5 **Very well**

4. How much did the renovation enhance the aesthetic appeal of the space?
   Not at all 1 2 3 4 5 **Very much**

5. How appropriate are the colors for the space?
   Not appropriate 1 2 3 **4** 5 Very appropriate

6. How well did the renovation create a more functional place to work and learn?
   Not at all 1 2 3 **4** 5 Very well

7. How well did the renovation create a more psychologically pleasing place to work and learn?
   Not at all 1 2 3 4 5 **Very well**

8. How much has the renovation improved your perception of the space?
   Not at all 1 2 3 4 5 **Very much**

Is there anything about the space, in relation to the renovations, that you would change?

Additional comments: The only difference in renovation space I see is the extra computers, book shelf. I didn't know if you suggested this or if Susan Day did. It is nice to have all the nursing skill equipment on one side and the computers on the other. The curtains look great!

Virtual Learning Center
Post-Occupancy Evaluation

1. How does the renovation compare to your original expectations?
   Not met 1 2 3 4 5 Exceeds

2. How well did the designer meet the needs and requests of the nursing department?
   Poor 1 2 3 4 5 Very well

3. How well did the designers' presentation accurately portray the design concept?
   Not well 1 2 3 4 5 Very well

4. How much did the renovation enhance the aesthetic appeal of the space?
   Not at all 1 2 3 4 5 Very much

5. How appropriate are the colors for the space?
   Not appropriate 1 2 3 4 5 Very appropriate

6. How well did the renovation create a more functional place to work and learn?
   Not at all 1 2 3 4 5 Very well

7. How well did the renovation create a more psychologically pleasing place to work and learn?
   Not at all 1 2 3 4 5 Very well

8. How much has the renovation improved your perception of the space?
   Not at all 1 2 3 4 5 Very much

Is there anything about the space, in relation to the renovations, that you would change?

More space to redecorate!

Additional comments: Thank you for all of your excellent and hard work!