4-20-2015

Evidence Based Design in Healthcare: An Applied Study on the Impacts of Interior Design for Cerebral Palsy

Katie D. Phillips
Georgia Southern University

Evidence Based Design in Healthcare:
An Applied Study on the Impacts of Interior Design for Cerebral Palsy

An Honors Thesis submitted in partial fulfillment of the requirements for Honors in
The School of Human Ecology

By
Katie D. Phillips

Under the mentorship of *Professor Amy Boyett*

ABSTRACT

Evidence Based Design (EBD) is an informed approach to design where designers base their decisions on quantitative and qualitative research. The design of the Universal Access Center for United Cerebral Palsy, discussed in this paper, encapsulates this approach to design. The five stages of EBD and how they were achieved within this project is defined. In the first phase, programming, current trends in healthcare as well as issues surrounding design for adults with Cerebral Palsy (CP) are discussed. In schematic design, initial issues of the project are resolved, and creative ideas are explored leading to the design development stage. In this phase, initial concepts are further developed and accompanied by detailed drawings. In the contract documents phase design drawings are finalized and made ready for construction and permitting. The final phase of design, contract administration, is the implementation of the design through construction, and it will not be explored in the context of this paper. This paper and the corresponding project end in the contract documents phase. Examples of the final drawings created as part of the design process can be seen in the following paper.

Thesis Mentor:_____

Mrs. Amy Boyett

Honors Director: _____

Dr. Steven Engel

April 2015
School of Human Ecology
University Honors Program
Georgia Southern University

Acknowledgements

A special thank you to all who supported and encouraged me during this venture and my long nights in the studio.

To Professor Amy Boyett, thank you for the wisdom and guidance in the completion of this project and the interior design program. Without your words of encouragement and directional nudges, I would have missed out on great opportunities and a love of mezzanines.

To my studio class: it was the best of times, it was the worst of times. We have survived through the lows and risen to the highs as a team. I am grateful to have been part of a group which fostered community support rather than competition. I will miss you all and look forward to see where you are taken in the future.

To The School of Human Ecology I extend my sincerest gratitude for upholding the integrity of the interior design program and the financial support of my endeavors. Without that support, I would not have been able to explore new horizons.

To my family, I know you are all proud of the woman I am today. I will always be grateful of the support and encouragement I have received from you all, and I hope to return the favor wherever possible.

To Alex Langub and Beth Martin, thank you for holding me together during my bad times. You are my shoulders to cry on and my absolute support. Without you both I would have lost my sanity a long time ago.

Evidence Based Design in Healthcare*:*

An Applied Study on the Impacts of Interior Design for

Cerebral Palsy

The Universal Access Center

Designed By: Katie Phillips

Defining Evidence Based Design

Successful design meets immediate needs and anticipates needs of the future, and may be accomplished in a variety of ways, the most effective being Evidence Based Design (EBD).

> EBD is defined as 'a process for the conscientious, explicit, and judicious use of current best evidence from research and practice in making critical decisions... about the design of each individual and unique project'...in other words, EBD is an informed approach to design where designers intentionally base their decisions on quantitative and qualitative research - two forms of systematic inquiry (Nussbaumer 3).

EBD for interior design is divided into five phases: programming, schematic design, design development, contract documents, and contract administration. Programming begins by identifying the initial problems of the project, gathering information in precedent research, case studies, and interviews, and outlining this information in a document referred to as the project program. Doing this creates a guide by which the designer may begin to understand and create an effective design solution. In the schematic design phase, initial concepts for the project are developed. This includes projecting what the space could look like, creating and analyzing adjacency and bubble diagrams to determine space allocations, and sketching preliminary plans and drawings. By doing this, the major issues of the design are worked out to gain a better understanding of what will and will not work for the specific project.

Once schematic design is completed, the designer moves into the third stage of EBD, design development. In design development, the designer uses the project program to shape specific details of the project, refining the best possible solution out of those explored in schematic design. In the contract document phase, construction

documents, commonly referred to as CD's, are drafted based on the final design developments; CD's finalize all plans and outline information necessary to begin the building process. As defined by the American Institute of Architects, CD's are "a vital, creative… instrument of communication… that sets the parameters for the building process… They describe, in detail, the components of a project that need to be fabricated and assembled in order for [the project] to be built" (AIA).

The fifth and final phase of EBD, contract administration, is the stage in which all plans are administered and the building is constructed. This phase will not be completed within this project due to reasons explained later in this paper.

Project Overview

It is the practice of Georgia Southern University's interior design program to use previously completed building plans given by reputable design firms as learning tools. These plans are stripped down to the building's shell and act as the foundation of the student's project. They are carefully selected to provide challenges at every turn while simulating real-world experience. Students use this tool to practice and further understand EBD; however, the final phase, contract administration, is not performed by students because of the nature of the tool. The original floor plan for this project (Fig. 1) is one such tool and was provided by the international planning, design, and consultation firm, Perkins Eastman.

Fig. 1. The original floor plan for the Universal Access Center supplied by Perkins Eastman (Perkins Eastman).

Under the guidance of Professor Amy Boyett, I performed an advanced and integrative research and design that is complex and based on current trends in design. The project emphasizes “programming and research, schematics, design development, construction documents, and presentation of design decisions for a medical facility catering to patients with cerebral palsy (CP)” (Boyett, Syllabus).

Approximately 30,000 square feet in size, the Universal Access Center (UAC) was designed for United Cerebral Palsy (UCP), a non-profit organization which “advocates and provides support services to ensure a life without limits for people with a spectrum of disabilities. UCP works to advance the independence, productivity and full citizenship of people with disabilities through an affiliate network that has helped millions” (UCP). The facility includes centers for dental health, rehabilitation, mental health, assistive technology services, activities for daily living, audiology, ophthalmology, medical specialties, and clinic administration. The Universal Access Center is open to all for use, but is designed specifically to cater first to cerebral palsy clients and their families.

I performed the first phase of EBD and part of the second as a member of a group in the INDS 4446 design studio course. The aforementioned health centers within the Universal Access Center were divided up among the course group, and each student was responsible for becoming a specialist in their assigned area. As a specialist, students gathered project program information regarding the activities performed within their space, the equipment and furniture necessary to complete activities, the selection of appropriate finishes based on health and building codes, and other considerations. Once the project program, and first phase of EBD, was completed, the course group moved into the second phase, schematic design. The group worked to develop an adjacency matrix and bubble diagrams for the overall facility. In this way, specialists

were able to explain and defend where and why their area should be located within UAC. Once these were completed, each student took a copy of the plan to expand and further develop based on individual concepts and research.

Stage 1: Programming

Due to the complex nature of the type of space as well as the relevance and importance to cerebral palsy people, I chose the rehabilitation center for my specialty area.

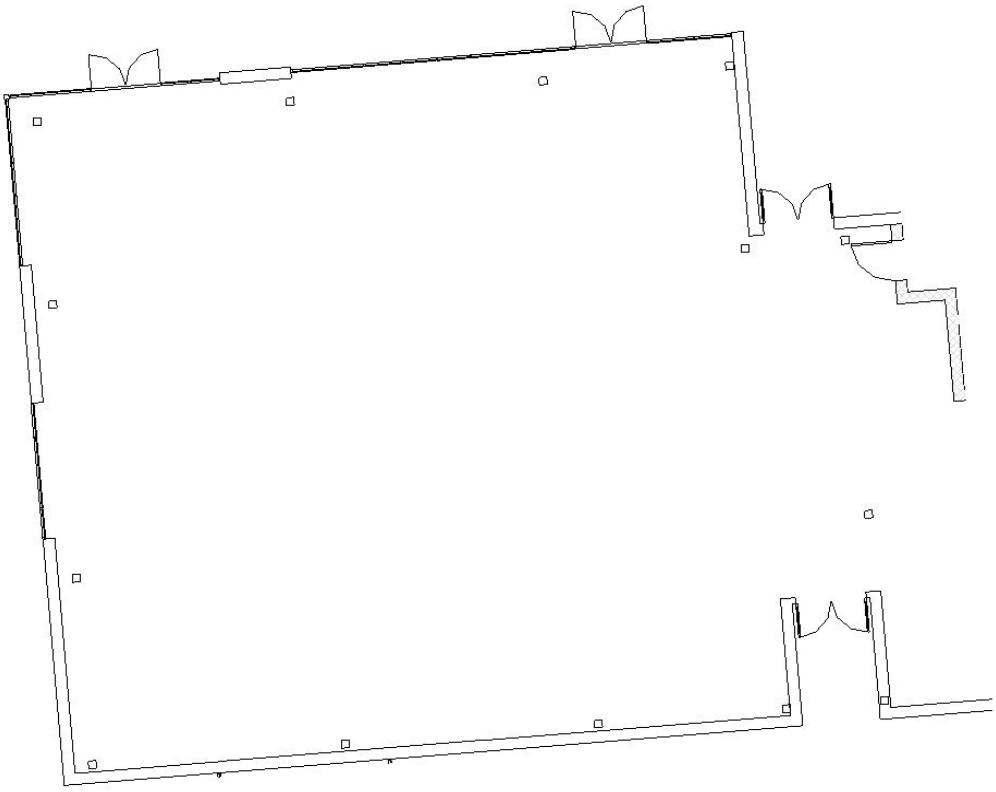


Fig. 2. Original floor plan for the rehabilitation center of UAC (Perkins Eastman).

It was my duty to plan the rehabilitation space based on a basic program, see Table 1, provided by Professor Boyett. The space (Figure 2), approximately 4,200 square feet, features four exits, windows of varying sizes and heights throughout, a 20 foot high ceiling in the main area, and structural columns. Obstacles inherent to the space include the volume, arrangement of structural columns, and wall space needed on which to mount equipment.

Table 1. Rehabilitation Program (Boyett, Space Program)

Program Space	# of Staff	# of Units	Unit Square Feet	Net Square Feet	Notes
Reception	2	1	30	30	
Waiting		1	120	120	Seating space for 5 persons minimum
Rehab Director	1	1	120	120	Private office
Assistant Rehab Director	1	1	60	60	Private office
Therapist Charting/Work Area	6	6	40	240	With files or reduce/eliminate some additional square footage if electronic files provided
Treatment Room	1-2	1	110	110	1-2 staff with patient
Hydrotherapy Treatment	1	1	120	120	Limb tanks
Assessment Room	3	1	180	180	With shared equipment and cushion storage. Mat table and handwash sink
Occupational Treatment Room	3	1	180	180	With shared equipment and cushion storage. Mat table and handwash sink
Mobility Training	1-6	1	400	400	Open area with gym type equipment
Central Occupational and Physical Therapy Area (Central OT/PT)	1-6	1	1,000	1,000	10 clients max at 100 SF each
Equipment Storage			80	80	May be spread throughout
Soiled Workroom		1	50	50	May be combined with clean WR as long as areas areas are visually separate (ie: color)

Clean Workroom		1	50	50	May be combined with soiled WR as long as areas areas are visually separate (ie: color)
Toilet/Shower Area		1	60	60	For use by patients in Rehab. May be incorporated into nearby area as long as it is close to Rehab patients.

The basic program provided by the professor served as a launching point from which I began the first phase of EBD, programming. Before gathering information about items to include in the space such as equipment and furniture or the current trends which would influence aesthetics, I sought to better define and understand the UAC end user: clients with cerebral palsy (CP).

Programming: General

Cerebral palsy, commonly referred to as CP, is caused by brain damage occurring in the womb or before the age of two years old and is a blanket term for a variety of symptoms regarding loss or impairment of motor functions. “The brain damage is caused by brain injury or abnormal development of the brain that occurs while a child’s brain is still developing - before birth, during birth, or immediately after birth” (CerebralPalsy.org). CP affects motor skills in a variety of ways including balance, posture, reflexes, oral motor functioning, and muscle control and coordination. CP manifests in a variety of areas and degrees; it is unique to the person. “One person may have total paralysis and require constant care, while another with partial paralysis might have slight movement tremors but require little assistance” (CerebralPalsy.org). CP is a non-progressive, non-life threatening condition, however; it is incurable. “[T]he brain lesion is the result of a one-time brain injury and will not produce further degeneration of the brain” (CerebralPalsy.org). Treatment and therapy may help a patient manage their condition but the brain will not recover from the damage as other parts of the body may. It is for this reason rehabilitation which houses occupational therapy and physical therapy was chosen as the primary focus of this project.

Therapy is used to help a patient cope with pain, develop strength/balance, and practice daily living activities among other skills; it is a more effective, and often safer, alternative to surgeries and/or pharmaceuticals. Conditions related to CP include intellectual disability, seizures, problems with vision, hearing, and/or speech, and joint problems leading to a variety of therapies applicable to CP. Additionally, “most people living with CP will go on to develop other conditions, including multiple sclerosis, due to the muscle and posture issues caused by their cerebral palsy” explains physical therapy student KM Phillips. Not all, but a significant number of people with CP rely on

wheelchairs for mobility in public areas; often these chairs are tailored to the individual as their posture does not fall within typical ergonomics.

The intense variation of CP informs design in many ways. Finishes must be soft and slip resistant as many CP people are prone to falls. Transitions between different flooring must be smooth as to not deter a wheelchair or walker from crossing the threshold. Acoustics must be a high priority in order to balance out the louder patients and avoid overwhelming noises. Lighting must be able to accommodate impaired vision while also diminishing glare. Electrical outlet placement must be taken into consideration as certain people may not understand the consequences of playing with them. Body contortion or intellectual disability may lead to a CP patient having difficulty reading signage, so images and/or color should be included to assist in wayfinding in unfamiliar spaces.

These and many other issues were added to the project program and influenced the design of the Universal Access Center. Additional areas I researched so that the space may be better informed are current trends in healthcare design. During research, I identified four categories of trends: sustainable practices, color and wayfinding, design for staff, and residential warmth.

Programming: Trend 1

Sustainable practices have experienced a massive surge in interior design over the past 10 years. According to the U.S. General Services Administration, "[s]ustainable design seeks to reduce negative impacts on the environment, and the health and comfort of building occupants, thereby improving building performance. The basic objectives of sustainability are to reduce consumption of non-renewable resources, minimize waste, and create healthy, productive environments" ("Sustainable Design"). Ultimately, sustainable design has resulted in a transformation of how designs may be improved and inform the aesthetic of interiors. Studies have shown windows and daylighting improve human health and offer energy savings (Wymelenberg). The shape and composition of commercial furniture has taken a minimal and often organic turn to mimic nature and use fewer materials. Furthermore, furniture is being marketed in a manner which addresses the life-cycle of the furniture. Haworth, one of the United States's leading commercial furniture manufacturers, demonstrates this with their Very Side Chair. Along with the seat's brochure and pricing information, a purchaser may now read about the chair's ergonomic benefits as well as recycling instructions and an "environmental data sheet" which outlines how the chair contributes to sustainable certification (Haworth, Very).

Additionally, councils and foundations dedicated to the monitoring of sustainable design have risen. The primary organization in the nation for monitoring sustainable design is the United States Green Building Council (USGBC), who is responsible for the creation of the Leadership in Energy & Environmental Design (LEED) certification system which "recognizes best-in-class building strategies and practices. To receive LEED certification, building projects satisfy prerequisites and earn points to achieve different levels of certification" (U.S. Green Building Council). It is important to note, the

project this paper addresses was originally designed to meet the LEED Silver rating and as such, the interior's design must contribute to that rating.

This was achieved primarily through materials and layout. All materials make use of pre- and/or post-consumer recycled content, are easily recyclable after use, and emit low volatile organic compounds (VOCs) which diminish the risk of health problems. The final layout of the space was one that made use of the large windows allowing for natural light, had rooms arranged so that less building material was required, and created organized (ganged) plumbing systems to minimize piping for shared resources.

Programming: Trend 2

Color and wayfinding, “is always an essential [healthcare] design component, but it’s particularly so for… patients whose physical and cognitive abilities may be compromised. This includes signage and directional cues presented in multiple modalities, colors, languages, and symbols, so that [patients] can more easily read and process the information, says Dorothy Lloyd, director of the global healthcare practice at HOK (San Francisco)” (Horwitz-Bennett). Wayfinding, a term to identify spatial problem solving, plays an important role in the healthcare realm, and along with color is, particularly important to note within the context of this project. CP people have a higher tendency to become over or under stimulated and as such may lose their way more easily, especially in an unfamiliar environment. Where words may be confusing, color may be used to better direct patients, define and separate open areas within a whole space, highlight patient spaces, and identify staff only sections while also setting the tone for the area. The overall goal of any design is for the end-users to feel welcome and happy within an easily navigable space.

Addressing color and wayfinding requires creating first a color palette and second a design to apply the palette. According to the Sherwin Williams 2015 color forecast, bright colors in combination with a neutral palette are the best option to set a comforting tone that will not overpower the senses (Sherwin-Williams). The color palette for the rehabilitation space includes black and tan as the base tones with blue as the accent color along with yellows and oranges to compliment the blue. Within the open spaces, mobility and central occupational and physical therapy (OT/PT), different colors were applied to the flooring to better define the spaces and help patients navigate.

Private rooms (treatment, assessment, and hydrotherapy) contain the same base color palette to create unity, but each has a unique accent color to define the room

allowing for better communication between staff and patients. A therapist may easily be understood by other staff when saying, “I have a patient in the blue room.” A simple statement such as this lets all parties know the availability of a room.

Programming: Trend 3

A newly emerging trend, design for staff, was addressed at the 2014 Healthcare Design Conference. A poll taken at the conference revealed exactly how fresh this trend is: Participants were asked what issues in healthcare were 'keeping them up at night.' The top concerns for healthcare providers were redesigning the care process, staff culture, and staff satisfaction while the primary concerns for architects and designers included designing for an aging population and reducing infections. All are important concerns, but it was alarming that designers are not on the same page as healthcare professionals whose two out of three concerns involve staff (Levin).

The design for patients has been studied, analyzed, and formulated yet staff needs are still being ignored. While a patient may be comfortable within the space, the layout and function is causing serious damage to the staff meant to be assisting the patient; a serious problem resulting in consequences ranging from inefficient use of time to a short lived career and multiple surgeries.

Why are staff wasting time? Simply put, it boils down to thoughtless design. Designers still default to old practices that are proven not to work despite other readily-available alternatives. Nurses and doctors often spend all day on their feet causing lethargy and a slow work pace, yet designers still default to the basic flooring which causes pain and further exhaustion over a padded flooring which could help alleviate pains associated with standing for long periods of time. Centralized nurses stations are still specified even though new equipment offers better alternatives. An advertisement in Healthcare Design Magazine's March 2015 issue boasts a slender wall mounted cabinet with a keyed-padlock for security and ample storage for frequently used items and pharmaceuticals which may be dispersed throughout, closer to patient's rooms where the staff attend to them, thus maximizing the amount of time a nurse can spend with a

patient. This cabinet, referred to as a 'point-of-care unit' has the potential to "improve efficiencies, reduce errors, and enhance the patient experience by keeping clinicians where they should be: at the point of care" (Pierson).

Why are staff becoming the patients? National Public Radio released a series in early February 2015 simply titled "Injured Nurses." The article topics encapsulate the main problem facing healthcare staff today: "Even 'Proper' Technique Exposes Nurses' Spines to Dangerous Forces," "Hospitals Fail to Protect Nursing Staff from Becoming Patients," and "At VA Hospitals, Training and Technology Reduce Nurses' Injuries." According to the "Proper Technique" article, proper body mechanics, "the utilization of correct muscles to complete a task safely and efficiently," is not enough to keep staff from harm. In fact, William Marras, director of the Spine Research Institute, states "it is why nursing staffs are getting hurt lifting patients" (Zwerdling). The magnitude of forces are severe enough that the perfect body mechanics will not keep anyone away from harm. Marras conducted multiple studies on the issue in his lab, discussed in the "Proper Technique" article, which concluded the best solution to lifting a patient is not strength in numbers but rather strength in technology. Healthcare professionals are now being urged to invest in body lifting systems which are "designed to lift and move patients with motor instead of muscle" (Zwerdling).

The Universal Access Center addresses these issues in simplistic ways. Storage was dispersed throughout the entire space for easy access rather than at one or two key points. Charting stations were made mobile so that therapists may move to the patients. Padded flooring was selected to cushion falls while also alleviating some of the pain experienced by the staff. Finally a variety of body lifting systems were implemented throughout the space: Ceiling mounted lifts were placed in each private room as well as

in certain parts of the open area, and mobile lifts, also known as Hoyer lifts, were stored in the open space ready for use where a ceiling mounted lift is not available.

Programming: Trend 4

Hinted at throughout the past few years, residential warmth's presence was solidified at NeoCon 2014, a conference held annually in the Chicago Merchandise Mart. The best and brightest fight for the top spot, voted on by designers and vendors from across the globe. The 2014 'Best in Show' winner, Openest, looked more like a college dorm than a commercial office desk as what it is marketed. The official brochure states,

> People need flexible, comfortable spaces to interact or work alone. Spaces that are warm, and inviting. Spaces that balance visual privacy. Spaces where teams or individuals can gather to share ideas—or just relax. Openest is an ensemble of lounge furniture for the new landscape of today's work environments... Openest is both playful and poetic, yet pragmatic and functional. (Haworth, Openest)

The concept behind residential warmth is to bring home to work rather than bringing work home. The days of the workaholics is going as we bring in the era where home-comfort is everywhere. This trend poses a particular challenge in the world of healthcare where there is such an emphasis on sanitation, something not often associated with comfort. This trend was accomplished in the project by incorporating soft finishes, lounge-type seating, colors associated with comfort, and, for the staff, a lounge area away from patients where they may enjoy privacy.

Programming: Furniture and Equipment

The final component of my research was to determine what furniture and equipment must be included in the rehabilitation center. During my personal interview with KM Phillips, each space was better defined. “The charting area is essentially a space for therapists to document patients’ progress, input information into computers, post schedules, and store paperwork to give patients. There is little physical storage here because government has mandated patient files be stored digitally” (KM Phillips). Treatment and assessment rooms are used to privately treat patients. “Often patients are not comfortable being treated in open spaces; they feel exposed. In these cases, we treat patients in private rooms so they may be comfortable” (KM Phillips).

Hydrotherapy is another private space; “the important thing to keep in mind here is that there will be water so slip resistant, waterproof materials must be used here. Furthermore, patients will often undress in the bathroom and then move into the hydro room for treatment; this means a door should connect these two rooms so the patient does not have to enter the public area partially or totally nude” (KM Phillips).

The physical therapy student went on to explain that the mobility and central OT/PT areas are often intermingled and include an array of equipment, the type and volume of which is determined by the type of facility. “A facility catering to CP people would require wheelchair storage units, body lift systems, gait trainers which are used to train a patient to walk, parallel bars, ramps, an ambulation staircase, among several other pieces” (KM Phillips). Along with Professor Boyett, I went on to determine the quantity and type of equipment suitable to the space which may be seen in Appendix B.

Additional notes from my personal interviews b may be found in Appendix A . After all research was compiled and added to the basic program provided by Professor

Boyett, I moved into schematic design. A concept was chosen which reflects and informs the space and end users, diagrams were created, and preliminary drawings completed.

Stage 2: Schematic Design

The concept for this project was to highlight vertical space in the same manner of the totem poles and art of the First Nation Indians located throughout Ontario and British Columbia, Canada. The building houses many clerestory windows and high roof lines which invite the use of vertical lines, a major component of totem poles. Additionally, First Nations' art is applied to totem poles in a way which tells the story of the specific person or people of the area; an idea which is fitting for CP people. Each pole is unique to a particular story, just as cerebral palsy symptoms are unique to the person. The original idea was to draw attention to the total volume of the space rather than what is at eye level. Not all with CP will view at the typical 5' 5" eye level. Some's condition may contort their body in such a way that they spend the majority of their time looking toward the ground or at the ceiling. This concept first and foremost informed the design of the project; it is primarily demonstrated in the multiple levels created by the mezzanine, later discussed, as well as in the finish selections.

After defining the project concept, I began planning the space by creating an adjacency matrix (Fig. 3) which allows one to visually see the spacial relationships set forth by the project program. This matrix then informed the creation of bubble diagrams (example in Fig. 4). The analogous figures, which represent the different areas within the rehabilitation center, allow for creativity by thinking of the space in a non-traditional way.

Upon completing the bubble diagrams, I moved to creating preliminary plans. These plans (examples in Fig. 5 & 6) illustrate the spaces in a more realistic form and further define the space allocations for each individual area. By first sketching on tracing paper, I was able to place it over the desired bubble diagram and quickly sketch a more defined plan to discuss with my mentor. After discussing problems and successes of the early preliminary plans, I moved into a computer-aided drafting program called Revit©

where the remainder of all preliminary plans and construction documents were completed.

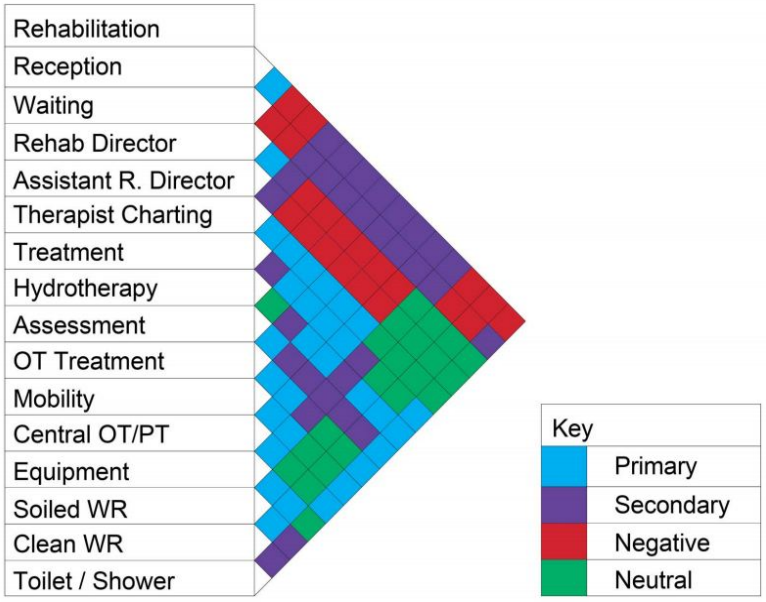


Fig. 3. Adjacency Matrix (Katie Phillips, Adjacency Matrix).

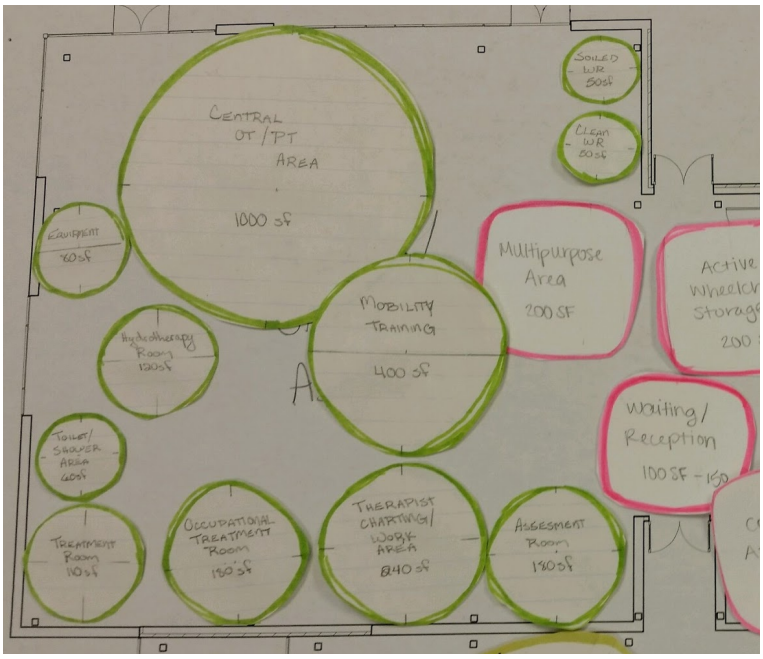


Fig. 4. This reconfigurable bubble diagram allowed me to analyze the possibilities for the space and perform initial space planning. (Katie Phillips, Bubble Diagram)

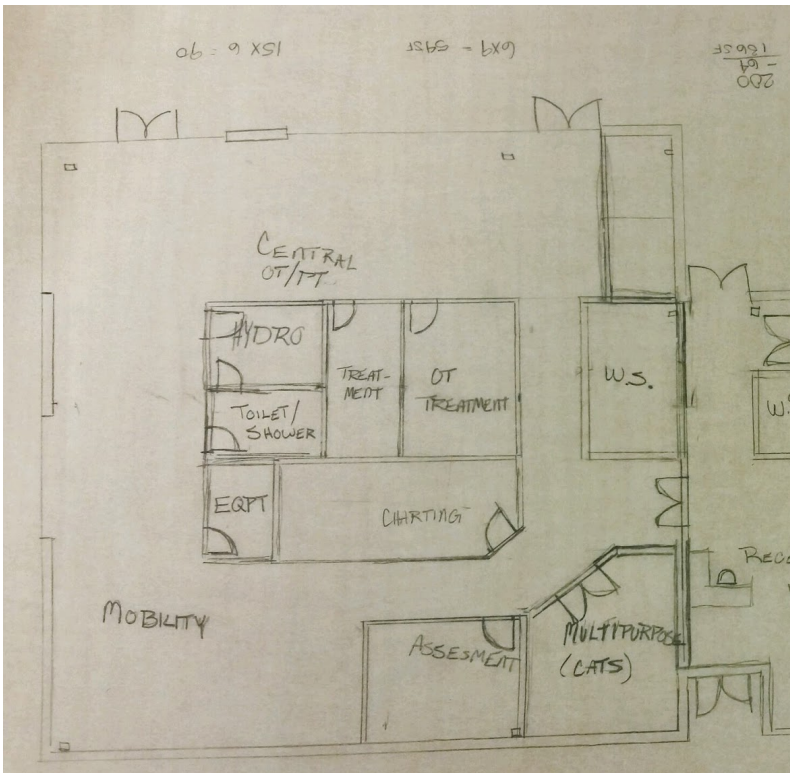


Fig. 5. The preliminary floor plan for the rehabilitation center sketched on tracing paper demonstrates an initial plan for the space and some of the ideas for space allocation (Katie Phillips, Preliminary Floor Plan Sketched).

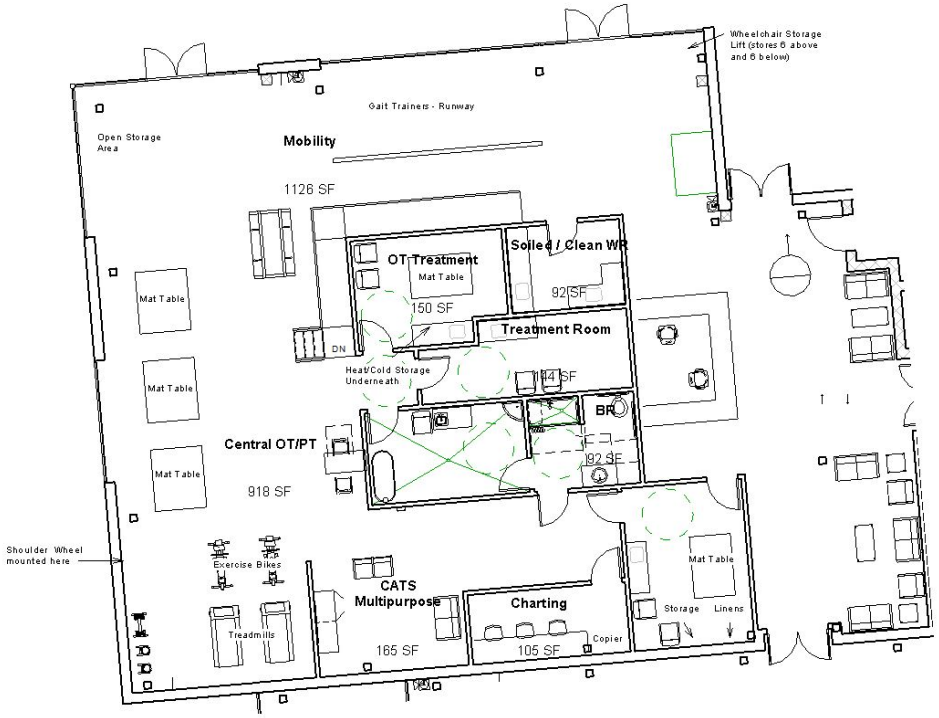


Fig. 6. The first preliminary floor plan in Revit© demonstrates the style of computer-aided drafting as well as some typical drafting conventions such as room labels and notes (Katie Phillips, Preliminary Floor Plan in Revit).

Stages 3: Design Development

I transitioned preliminary plans into the final floor plans which are demonstrated in figures 6 and 7. These figures reflect the research discussed in this paper as well as the training received in the interior design program at Georgia Southern University.

Key features of the space include a centralized block which houses the private rooms, a mezzanine, and open floor space for the mobility and central OT/PT areas. The centralized block was chosen as the best private room layout for multiple reasons. First, it created additional wall space for mounting equipment while maintaining the windows inherent to the space. It included all of the private areas in one location allowing for efficient movement between rooms. And lastly, the centralized block created visual privacy between the reception/waiting area and the open spaces which was an important requirement set forth by the Health Insurance Portability and Accountability Act (HIPAA).

The larger spaces were designed as an open plan in order to create clear lines of sight throughout. “Visibility by staff is essential for safety and efficiency … therapists may work with several patients, alternating between them,” and an open plan easily facilitates this (Malkin). Creating a line of sight across the main space was essential, but in order to create a sense of separation, I used changes in flooring and low partitions to divide the space.

The final primary feature of the rehabilitation center was the mezzanine which houses the private offices of the director and assistant director as well as the therapist lounge area. As stated in the concept, the goal of this project was to highlight the volume of the space. A mezzanine, “an intermediate floor between main floors of a building,” achieves this with the addition of walls which visually attach the lower space to the ceiling as demonstrated in figure 9 (Mezzanine).

In addition, the mezzanine was the best solution in order to include the private offices within the rehabilitation center. According to PT student, KM Phillips, it “is important for the directors to have access to the rehab center, but they need to be situated away from the patient areas. They supervise the whole center but are not directly involved in the day to day tasks” (KM Phillips). This statement dictated early sketches of the space where the director and assistant director’s offices were located in another department of the overall building. The mezzanine, a later addition to the plan, was realized to be a natural home to the private offices as these spaces did not have the same accessibility requirements as patient spaces. In this way, the directors became immediate to the rehabilitation center but maintain distance away from high traffic areas.

The rehabilitation center design is one filled with energy, visual and tactile interest, and spatial awareness. A patient may enter the rehabilitation center’s reception and waiting area which is directly located off of the main lobby of the overall building. New patients have direct access to the assessment room rather than having to navigate additional areas during their first visit to the center.

Two gaps on either side of the reception desk lead the user into the open area where larger equipment is stored and used. The central OT/PT area houses mat tables, treadmills, exercise bicycles, a wall-mounted shoulder wheel, weight equipment, and an occupational therapy table for patients to practice use of small items. The mobility area features parallel bars, an ambulation stairway, a ramp, gait trainers, a “runway” area, and swings. One of the primary concerns when designing the mobility area was to create a safe space for patients to practice mobility. “A runway space is essential for mobility training; typically it is separated by a low wall-like partition which helps to define the space. You do not want people to accidentally walk into this practice zone while it is in use” (KM Phillips). I achieved this by defining the runway with parallel bars and the

ramp; while a patient uses the runway, others have the option to walk the ramp or through the parallel bars to move through the area instead.

A space not included in the original rehabilitation project program but seen in the final floor plan is referred to as the 'CATS multi-purpose area.' This space falls within another department of the building but was included in this area due to spatial limitations and the nature of the area. This area features wall-mounted televisions and gaming systems along with lounge furniture for patients to sit and practice other forms of mobility and coordination. "The purpose of the space is one that patients may practice hand-eye coordination using equipment like a Nintendo Wii" (KM Phillips).

Each treatment room and the assessment room features a mat table, guest seating, a small hand sink, a linen closet for patients to store personal belongings during examination and treatment, and a variety of storage for equipment and supplies. Located off of the open area, these rooms also include space for wheelchair turnarounds, circulation space around mat tables for therapists, and ceiling-mounted body lift systems to assist staff in the movement of low-mobility patients.

Mobile and permanent charting stations are dispersed throughout giving therapists a variety of options. Mobile charting stations allow therapists to take down notes while speaking with patients. The permanent stations are located in private areas giving therapists a quiet place to focus on transcribing notes. The first set of permanent charting stations is located off of the reception area and shares a copy machine with the receptionists. The second set of permanent charting stations is located in the lounge area of the mezzanine (figure 8).

The hydrotherapy room features slip-resistant, waterproof finishes, a wall-mounted body lift system, open storage for large equipment, a full-body limb tank, closed storage for smaller items, and a linen closet for patients to store personal items. The

bathroom features an accessible lavatory and water closet as well as a roll-in shower suited to fit a wheelchair. In addition, the bathroom has two access points: one that joins it to the overall rehab center and one that joins it to the hydrotherapy room which directly meets project program requirements.

Stage 4: Contract Documents

Figures of the final construction documents, phase 4 of EBD, may be seen below. The final floor plans demonstrate the spaces discussed above, and the rendered line drawings give a realistic understanding of the end product. A disc has been included with this paper which has digital copies of finalized construction documents including detailed floor plans, reflected ceiling plans, elevations, a life safety plan, a partition plan, a finish floor plan, electrical plans, millwork and ceiling details, and legends and schedules.

Fig. 7. The final floor plan for the rehabilitation center (Katie Phillips, Final Floor Plan - First Floor).

Fig. 8. The rehabilitation mezzanine is home to the private offices and a lounge/work area for staff (Katie Phillips, Final Floor Plan - Mezzanine).

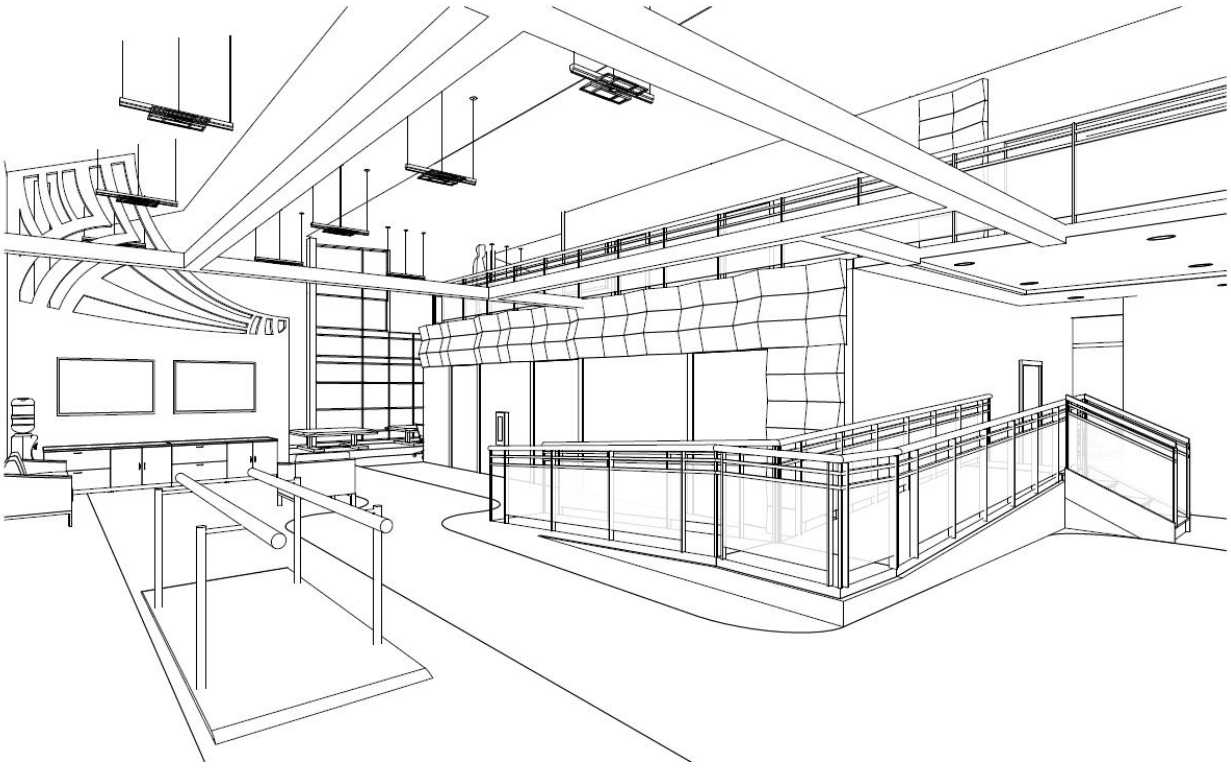


Fig. 9. A line drawing represent the three dimensional space of the rehab center. This figure demonstrates the mezzanine, a key feature of the center, and the vertical lines through which it created.

My design of the Universal Access Center for United Cerebral Palsy encapsulates evidence based design and the training I received during my time in Georgia Southern University's interior design program. The influence of research in current trends and healthcare practices is apparent; the space balances visual privacy and an open feel. Tactile features invite interaction with and within the space which enhances user comfort. The UAC is a welcoming facility without limitations for patient and staff alike.

Bibliography

AIA, American Institute of Architects. Emerging Professional's Companion: Construction Documents. (5080 Ritter Rd., Mechanicsburg 17055-6903): Pennsylvania Bar Institute, 2000. 2013. Web. 21 Mar. 2015.

Boyett, Amy. INDS 4446 Design Studio V Course Syllabus. Spring 2015. School of Human Ecology at Georgia Southern University, Statesboro, Georgia. Print.

Boyett, Amy. Space Program: UCP Universal Access Center. Spring 2015. School of Human Ecology at Georgia Southern University, Statesboro, Georgia. Print.

CerebralPalsy.org. "Definition of Cerebral Palsy - What Is CP?" CerebralPalsy.org. MyChild, 25 Jan. 2015. Web. 3 Feb. 2015.

Edmundson, Karen. "Five Need-to-Know Trends Shaping Healthcare Design." Five Need-to-Know Trends Shaping Healthcare Design. Healthcare Design Magazine, 22 July 2011. Web. 21 June 2014.

"Featured Medical Supplies." Alimed.com: Alimed Medical Supplies. Brave River Solutions, n.d. Web. 24 Jan. 2015.

Haworth. "Openest." Haworth. Haworth, June-July 2014. Web. 21 Mar. 2015.

Haworth. "Very Side Chair." Haworth. Haworth, 2015. Web. 11 Mar. 2015.

HIPAA, Health Insurance Portability and Accountability Act. "Guidance Materials for Consumers." Guidance Materials for Consumers. U.S. Department of Health & Human Services, Jan. 2015. Web. 21 Mar. 2015.

Horwitz-Bennett, Barbara. "Designing For The Generational Shift." Designing For The Generational Shift. Healthcare Design Magazine, 10 Mar. 2015. Web. 21 Mar. 2015.

International Code Council. "Chapter 12 - Interior Environment." Chapter 12 - Interior Environment. International Code Council, n.d. Web. 25 Jan. 2015.

Levin, Debra. "What Issues Keep Healthcare Providers And Designers Up At Night?" What Issues Keep Healthcare Providers And Designers Up At Night? Healthcare Design Magazine, 19 Mar. 2015. Web. 21 Mar. 2015.

Malkin, Jain. Medical and Dental Space Planning. Fourth ed. Hoboken: Wiley, 2014. Print.

"Mezzanine." Wikipedia. Wikimedia Foundation, 7 Mar. 2015. Web. 22 Mar. 2015.

Nieuwenhuijsen, Channah, Mireille Donkervoort, Wilbert Nieuwstraten, Henk J. Stam, and Marij E. Roebroeck. "Experienced Problems of Young Adults With Cerebral Palsy: Targets for Rehabilitation Care." Archives of Physical Medicine and Rehabilitation 90.11 (2009): 1891-897. Web. 25 Jan. 2015.

Nussbaumer, Linda L. Evidence Based Design for Interior Designers. New York: Fairchild, 2009. Print.

Opheim, Arve, Reidun Jahnsen, Elisabeth Olsson, and Johan K. Stanghelle. "Walking Function, Pain, and Fatigue in Adults with Cerebral Palsy: A 7-year Follow-up Study." Developmental Medicine & Child Neurology51.5 (2009): 381-88. Web. 25 Jan. 2015.

Perkins Eastman. Original Floor Plan. N.d. Digital.

Phillips, Katie. Adjacency Matrix. 20 January 2015. Digital.

Phillips, Katie. Bubble Diagram. 22 January 2015. Photo.

Phillips, Katie. Final Rehabilitation Floor Plan - First Floor. 23 January 2015. Digital.

Phillips, Katie. Final Rehabilitation Floor Plan - Mezzanine. 23 January 2015. Digital.

Phillips, Katie. First Preliminary Floor Plan in Revit. 23 January 2015. Digital.

Phillips, Katie. First Preliminary Floor Plan Sketched. 23 January 2015. Photo.

Phillips, KM. "Interview with Physical Therapy Student from Georgia Regents University." Telephone interview. 23 Jan. 2015.

Pierson, John. "Point-of-Care Workstations Contribute to Improved Nursing Workflows." Point-of-Care Workstations Contribute to Improved Nursing Workflows. Healthcare Design Magazine, 18 Mar. 2015. Web. 21 Mar. 2015.

Sherwin-Williams. "2015 Colormix Color Forecast From Sherwin-Williams." 2015 Colormix Color Forecast From Sherwin-Williams. The Sherwin-Williams Company, Jan. 2015. Web. 22 Mar. 2015.

"Sustainable Design." GSA. General Services Administration, 22 Dec. 2014. Web. 10 Jan. 2015.

"UCP | United Cerebral Palsy." UCP | United Cerebral Palsy. N.p., n.d. Web. 05 Apr. 2015.

U.S. Green Building Council. "LEED | U.S. Green Building Council." LEED | U.S. Green Building Council. N.p., 2015. Web. 16 Mar. 2015.

U.S. Government and Millitary. "DoD Space Planning Criteria for Health Facilities: Physical Therapy." Wbdg.org. Department of Defense, 27 Oct. 2006. Web. 25 Jan. 2015.

Wymelenberg, Kevin Van Den. "The Benefits of Natural Light." Architectural Lighting. N.p., 19 Mar. 2014. Web. 21 Mar. 2015.

Zwerdling, Daniel. "Injured Nurses." NPR. NPR, Feb. 2015. Web. 21 Mar. 2015.

Appendix A

Interview with Physical Therapy Student - Notes

January 23, 2015

Therapist Charting Room / Work Area - Charting occurs after seeing the patient. Document every single patient to write down what happened what you found your records how you charge insurance. Desk. Most places have a table along a wall and 4 or 5 computer stations on that. Therapy is a team approach. Avoid cubicles, bad for teams. Also needs to be in this room, a table or shelving unit where they put the schedule for the patients, therapists' schedules. Could be white board or cork board. Some people set the schedules on a table or hang them on a shelf. Also needs to be a place to store folders of pre-made home exercise programs (HEP). Could put a printer in there but most places use the printer in the office station. All of this is done on computers now. No hard copies stored.

Director and Assistant Director never go in the same area as the reception area. Do not need to be in a high traffic area. "It is important for the directors to have access to the rehab center, but they need to be situated away from the patient areas. They supervise the whole center but are not directly involved in the day to day tasks."

OT does work in CATS, ADL, and the rehab gym.

Code, the waiting room cannot view the treatment gym. HIPPA privacy

Body Weight Support System: lifts patient and helps them walk.

Hand Stationary Cyle

Treatment Room - Hoyer Lift (on ceiling; body weight support system): some patients can't get out of their wheelchair. Sling goes under patient to lift patient. Table to set patient on, could be hi-low.

Hydrotherapy Treatment: two caveats. For full body immersion: adequate water. Place to shower; not desirable to have shower in seperate room for patient privacy. Could have a door connecting bathroom to hydrotherapy room to save space. May need one female or one male room. A

patient could be in there for 30 minutes working with a cathater. CP would need one on one with PT. Each patient would be there for up to an hour. Scratch need for two bathrooms

Heating and cooling can be in supply closet, not a treatment room

Assessment Room - she thinks (they call it an eval room) asses their full body.

Occupational Treatment Room - for private OT treatment. Treatment rooms can double as assessment room incase 2 new patients come in at the same time.

Mobility Training - walking; in the big open center room, up against one of the walls they put a partition wall 10 feet from the window/wall to create a runway. Gives patients a goal and gives enough area to give obstacles but also separates it from people getting in the way.

Central OT/PT Area - therabands hanging on a rack, not a storage room. Theraband rolls go in the storage room. Dumb bells, really light weight, arm cycle, stationary recumbant bike lays back so they can pedal, treadmill? (only had one in her facility and only used it once) two types of tables: plinth table (taller so to reach patient without having to bend; hi-low table mat is a little wider. Probably would need several tables. Therapist will have to get on the table with patient to work with them and some patients may not handle having another patient next to them well. Max patients is 6-8 at one time?

Table that wheelchair and regular chairs can pull up to. OT will use, put hand cycle on this table for patient to work. Table for hand working. Peg board, silly putty with beads in it to pick out, fake medicine bottles to work on opening. Occupational Therapy Table.

Standing frame: one type you walk up to and it has a big tray where you play a game and work on standing endurance. and the other has a chair that pumps the patient up to go from sit to stand.

Walkers in the area.

Lofstrand Crutches used to help them walk. Could go in equipment room, hung on walls, they come in varying heights.

Water fountains or water jug with little cups

Equipment Storage - alot of people keep medicine balls out in the big gym and it looks messy. Need to fit hoyer lift, transfer board (can hang on wall, only need two or three),

Appendix B

Equipment (Featured Medical Supplies)

All images and brand names were found at www.alimed.com unless otherwise noted. Dimensions are specific to the model shown in the image.

http://www.alimed.com/physical-therapy/

1.  Hi-Boy Whirlpool; 60 gallon; 20”W, 36”L, 28”D. Used in hydrotherapy to perform the functions of heat, massage, sensory stimulation, and pressure as well as wound care. This technique is often used in diabetic patients.

2.  Self contained unit designed to maintain a temperature of 168 degrees Fahrenheit in order to heat packs. Requires electrical outlet, no plumbing needed. Varies in size, comes with optional side rack. Some versions of this unit require water; the model shown does not.

3.  Hydrocollator® ColpaC® Chilling Unit. This particular unit requires no plumbing, but rather electricity, and comes with 6 standard and 6 half size ColpaCs. Chilling unit: 15.5"W x 31"H x 27"D. Side rack: 13.75" x 30" x 20". Used to chill cold packs for cold therapy.

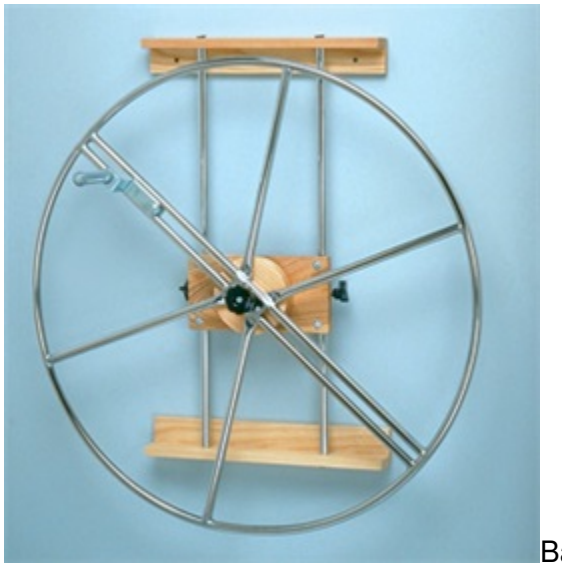
4. Hydrocollator ColpaC. Packs range in shape and size depending on the area being treated. They require terry cloth covers during use.

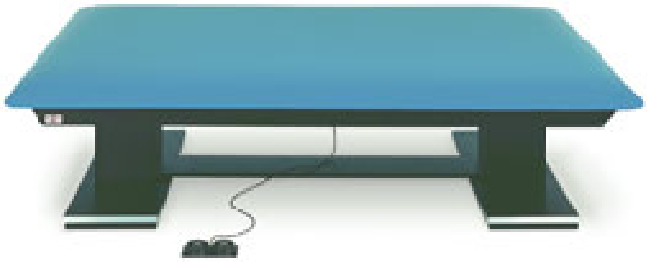
5. Sedona Stationary Massage Table. Adjustable Height, 30” W, 73” L. Used for massage therapy.

6. Harmony DX Massage Table. Eco-friendly managed forest hard maple legs, braces and dual headrest outlets and birch plywood decking. Full length piano hinge and Mid-brace™ Cradle-lock cabling system with 1,000 lbs test cables. Firm, yet lightweight 2-1/2” multi-density cushioning system. Non-slip, Stablefoot™ traction pads. Includes deluxe adjustable headrest, single pocket carry case and armrest sling. 30”W x 73”L x 23”-33”H. Used for massage therapy.

7. Hausmann Power Parallel Bar. Auto or manual height adjustment available. Base width: 34" • Height: 27"-37" • Length: 10' • Width between bars: 15"-27" • Width between uprights: 30-1/2"W. Used for gait training to help patients learn to walk.

8.  Clinton Convertible Staircase (Ambulation staircase). Converts from straight to corner arrangement. Hardwood with steel uprights and rounded handrails. Platform: 30"W x 30"L x 24"H. Three 30"W x 6"H x 10"D steps. Five 30"W x 4"H x 10"D steps.

9.  Bailey Shoulder Wheel. Wall mounted with adjustable handle. Arc of motion ranges from 10" - 39" by moving handle. 37-1/2" diameter. Height adjustable up to 26".



10. Hausmann® Dual-Lift Powermatic Mat Platform Table. Height adjustment from 19" to 28". Tear-resistant, seamless, nylon-reinforced vinyl-upholstered top with 2" foam padding for comfort. Rounded corners for safety. Size varies from 4’ x 6’ to 6’ x 8’ in this model. Probably would need several tables. Therapist will have to get on the table with patient to work with them and some patients may not handle having another patient next to them well.

11. Hoyer Partner HPL 402 Lifter and Patient Lifter Full Body Sling. This particular model is mobile but there are also options that can be wall mounted to save space in smaller areas such as the Assessment Room. Adjustable base &bull, Base: 24" to 42-1/2"W x 41"L x 5-1/2"H. Functional lifting range from floor to 36". 4" casters. Used to lift patients from wheelchair to another area such as a mat table.

12.  Body Weight Support System. Essentially, tracks on the ceiling hold patients up. Used to move patients throughout the workout area as well as to support the patient's weight while the therapist focuses on another feature of the training (demonstrated on the left of above photo).

13.  ADP400 4 Section Traction Table. Four-section table offers smooth, comfortable traction for your patients. Features include friction-free gliding lumbar section, turret-mounted traction pedestal, head and foot sections that incline up to 90°, head section that lowers to 25°, 400-lb. lifting capacity, height range that adjusts between 21-1/2" to 41-1/2", and standard hand control. Dimensions: 27"W x 77"L x 21-1/2" to 41-1/2"H • 400-lb. capacity • Main power: 120V, 50Hz. Would be used for Traction and Mobilization therapy.

14. SyStim 208. Neuromuscular Stimulator for electrical stimulation therapy. This is a portable unit that would be taken from storage when use what needed.



15.

TENS patches, conductive garment, and remote. Used in TENS therapy. Requires small storage.

16. Iontophoresis unit.

17.

Gait Trainers. Used by patients in the open area to practice walking on their own. Would need storage and space in the gym to move around. *Found at: http://www.rifton.com/products/gait-trainers/pacer-gait-trainers

18. Treatment table. Can be simple or complex. Some have storage, others may be height adjustable. Overall dimensions approximately 28”W x 72”L x 30”H

19. Kangoo Horizontal Universal BandRac and Cano Accuforce Resistive Band. Resistive bands

are used to stretch and strengthen. Rolls for the day are stored on a rack (as pictured in the first image) and extra rolls for replacement or to send home with patients are stored away.

20.  

Swings are often used in rehabilitation for CP. They come in a variety of forms and sizes for children and adults. They are used to help balance, muscle strengthening, motor skills and helping patients become comfortable with movement. Swings may use a frame (left image) or be suspended from the ceiling. In the case of the latter, a note should be made on the floor plan or RCP so the swing will be properly reinforced. Images taken from a google search. Similar tools may be found at: http://www.especialneeds.com/adaptive-equipment-swings-swing-frames.html

21.  Fluidotherapy unit. Chattanooga Fluidotherapy Three different models each have specially designed fluidized beds combine the precise control of dry heat temperature and airflow with CELLEX® media. This combination works to generate the mechanical effects of skin desensitization and limb buoyancy. Continuous or pulsed operation modes for oscillating pressure. Adjustable temperature settings up to 125°F. Electronic treatment timer, wake-up pre-heat timer and locking casters standard. Model 110D Single extremity use for treating hand, wrist, elbow, ankle or foot. Holds 30 lbs. (13.5 kg) of CELLEX media (included). 11-1/2"W x 33"H x 34"L • 120V • 50/60 Hz • 70 lbs.

Model Ultra115D Treats two extremities at one time-two hands or two feet. Unit is removable from stand for easier lower extremity applications. Holds 40 lbs. (18 kg) of CELLEX media (included). 18-1/2"W x 33"H x 34"L • 120V • 50/60 Hz • 60 lbs.CELLEX® Dry Heat Medium is the original medium processed to run efficiently in all fluidotherapy devices. Made of natural and organic cellulose, which is environmentally safe and recyclable. Available in a 10-lb. (4.5 kg) containers.