

ABSTRACT

Title of Thesis: **ENHANCING RECOVERY:
ARCHITECTURE THAT HEALS**

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This thesis will explore how architecture and the natural environment can aid in the recovery of one's health by dissecting the current relationships between landscape and building, and its impact on healing. Traditional relationships of healing are explored to understand how those elements may be incorporated into modern healing.

The project will focus on a design of a rehabilitation and wellness center in Bethesda, Maryland. Due to an existing 'medical hub' in the vicinity, the proposed building will assimilate well into the existing program on the site. The design is being approached by understanding what factors can contribute to healing including how views out the window, being immersed in nature, and materiality affect health. Biophilic design, healing gardens, and the senses in architecture are analyzed as means to effectively design healing spaces. Further primary observations of local hospitals and interviews with medical staff were conducted in order to grasp what the needs of the users in these spaces are.

ENHANCING RECOVERY: ARCHITECTURE THAT HEALS

by

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Dedication

This thesis is dedicated to Vovó (Dulce Jones) and Vovô (Norman Jones) for always being there for me and making me understand the value of hard work. I have many fond memories of my grandparents taking me to school in the morning when I was younger. Everyday my grandpa would say “fazer, fazer direito” (“when you do something, do it right”) and this is exactly my mindset when I approached this thesis. They also told me that education is the most important thing and that no one can take that away from you. Thank you Vovó e Vovô for instilling me with those values!

Amo vocês para sempre!

Com amor,

Teu olhinho azul

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List of Abbreviations

ADA: Americans with Disabilities Act

AIA: American Institute of Architects

AOTA: The American Occupational Therapy Association, Inc.

APTA: American Physical Therapy Association

ASHA: American Speech-Language- Hearing Association

CCS: Cardiovascular and Pulmonary Rehabilitation

COPD: Chronic Obstructive Pulmonary Disease

DPT: Doctor of Physical Therapy

EAMP: East Asian Medicine Practitioner

ECS: Clinical Electrophysiology

FT: Feet

GCS: Geriatrics

ICU: Intensive Care Unit

IV: Intravenous Therapy

MPT: Master of Physical Therapy

MSPT: Master of Science in Physical Therapy

NCCAOM: National Certification Commission for Acupuncture and Oriental
Medicine

NCS: Neurology

NK: Natural Killer Cell

OCS: Orthopaedics

OT: Occupational Therapy/ Occupational Therapist

OTA: Occupational Therapist Assistant

OTD: Doctorate in Occupational Therapy

OTR/L: Occupational Therapist, Registered, Licensed

PCS: Pediatrics

PT: Physical Therapy/ Physical Therapist

PTA: Physical Therapy Assistant

SCS: Sports

SQ: Square Feet

WCS: Women's Health

Chapter 1: The Metamorphosis of Healing Environments

“The (patients) should be able... to see out of (the) window from their beds, to see sky and sun-light at least, if you can show them nothing else, I assert to be, if not of the very first importance for recovery.”¹

- Florence Nightingale

This chapter focuses on understanding the evolution of healthcare practice, including its history and development. The first section reviews the history and the progression of the healthcare profession, including hospital design, inclusion of healing gardens, and the emergence of rehabilitation centers. The second section identifies the key issues associated with certain advancements in medicinal technology and how that has attributed to a current deficit in healthcare design.

¹ Terri. Peters, *Design for Health Sustainable Approaches to Therapeutic Architecture AD*. (John Wiley & Sons, Incorporated, 2017).

HISTORY OF HEALING

Hospital and Nature Space Harmony: Gardens at the Crux of Healing

The word, *hospital*, has a very different connotation in the past than in the present. The meaning of a hospital has evolved over time, along with the building typology which has gone through several transformations. In the ancient world, a hospital was linked to the idea of a sacred space and manifested itself in a religious setting, such as temples and monasteries. For instance, in 500 BC, the Temple of Asclepius (Asklepios), in Epidaurus, was referred to as a healing space for those that came to worship Asclepius (Asklepios), who is known as the ‘Greek God of Health and Wellbeing’. At its inception, a hospital became a means of “connecting with the wider world and letting the healing power flow through the body and mind.”²

In addition to the sacred notion of healing, hospitals also had a strong dependency on nature for healing. In the plan of St. Gall, which was never realized, there was a balance and harmony between the building space and the nature space.³ This plan included cloister gardens adjacent to the Abbey of Saint Gall, along with cloister gardens within a subsidiary church to the north of the Abbey (Figure 1). The plan for these gardens was not only to provide an abundance of medicinal plants, but also to create spaces for healing.⁴ In this respect, nature was perceived as a healing entity.

² Sunand Prasad, “Typology: Hospitals,” *The Architectural Review*, April 2012, <https://www.architectural-review.com/rethink/typology/typology-hospitals/8629443.article>.

³ Clare Cooper Marcus and Marni Barnes, “Healing Gardens: Therapeutic Benefits and Design Recommendations,” *John Wiley & Sons, Inc*, 1999.

⁴ Ibid.

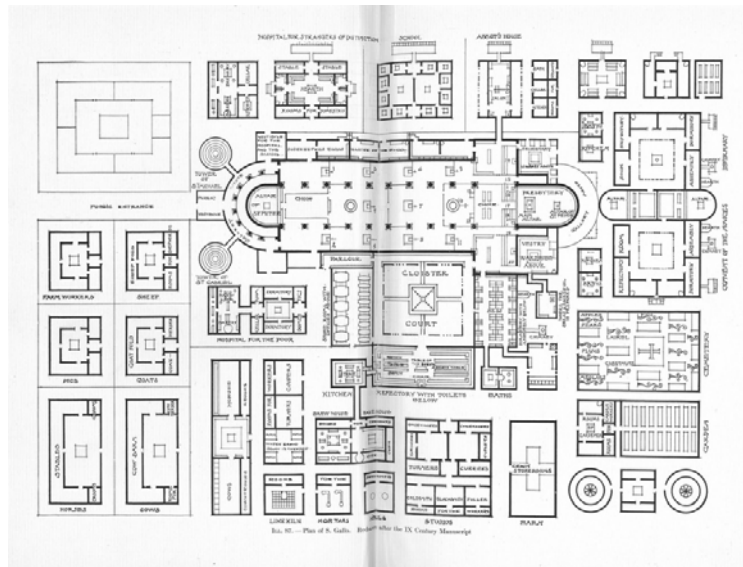


Figure 1: Proposed Plan of St. Gall, Switzerland (Source: flicker, Penn State University Libraries Architecture and Landscape Architecture)

This sacred tie between nature and healing persisted throughout several centuries. In the 15th century, hospitals were located in high density areas where there was a high concentration of the disadvantaged. These dense areas were home to vast amounts of diseases, linked to poor hygiene and sanitary issues.⁵ The design of hospitals took form with courtyard configurations, where ventilation and connection to nature were high priorities of the healing environment. An example of this is the Ospedale Maggiore in Milan, Italy, built in 1456. The hospital has a central courtyard with two separate wings that have an additional four courtyards embedded in each wing. Figure 2 highlights the courtyards within the building and the arrows show a visitors' view into this courtyard. The building and nature spaces are well balanced. In addition to this, the architect employed a covered arcade around the courtyard to create ambulatory spaces. Figure 3 is an example of one of the courtyards.

⁵ Cor. Wagenaar, *The Architecture of Hospitals* (NAi Publishers, 2006).



Figure 2: Building and Nature, Ospedale Maggiore (Source: author, google map base)



Figure 3: Courtyard, Ospedale Maggiore, Milan (Source: Wikimedia Commons, G. Dallorto)

Similar to the typical courtyard hospital, which incorporated the building into the urban fabric, the pavilion type hospital also created spaces that would benefit the public. The pavilion type hospital maintained the idea of courtyards and added a series of smaller buildings, that together formed the larger campus. This can be seen

in the plan of L'Hopital Lariboisiere, designed by MP Gauthier in 1839, and known as the first pavilion hospital.⁶ In the plan (Figure 4) there is a central courtyard area that includes pavilions on each side. A courtyard is present between each pavilion and the pavilions are connected with an arcade. The arcades encompasses the central courtyard, providing access to different pavilions.

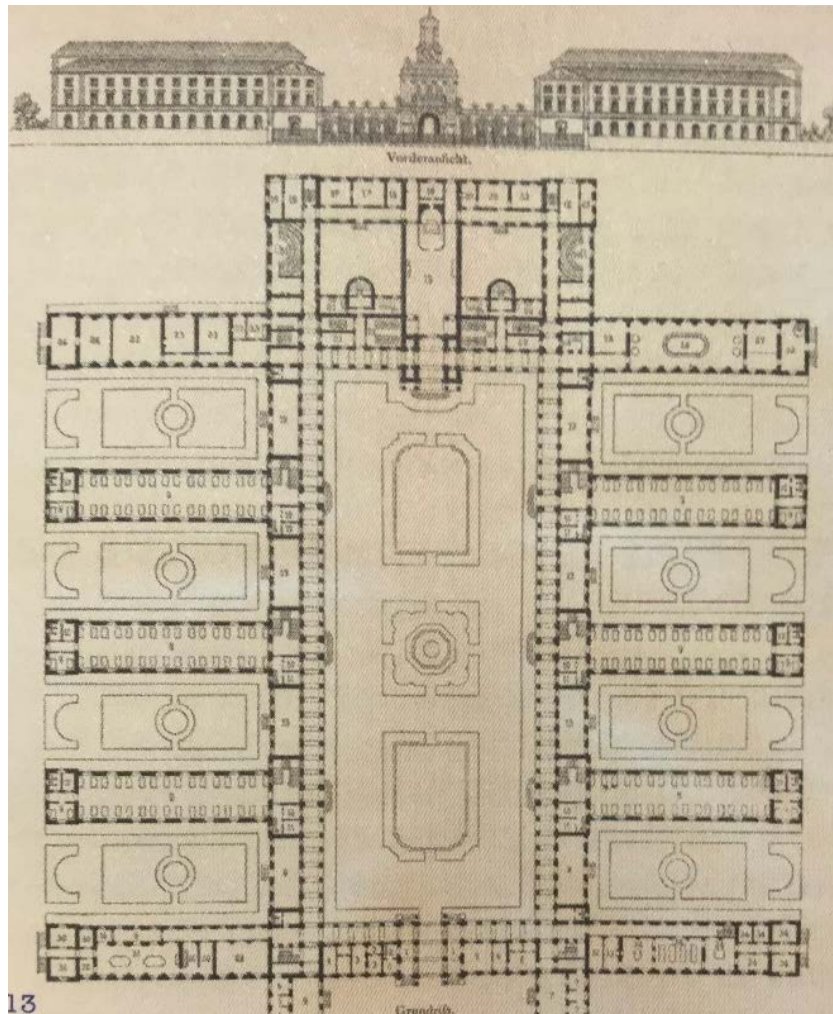


Figure 4: Plan of Hôpital Lariboisière, Paris (Source: *The Architecture of Hospitals*)

⁶ Ibid.

Florence Nightingale recognized patterns of healing by observing the relationship of pavilions, or wards, and her surroundings. She wrote all of her comments in the 1859 book 'Notes on Nursing'.⁷ Her notes stated that

*“the (patients) should be able, without raising themselves or turning in bed, to see out of (the) window from their beds, to see sky and sun-light at least, if you can show them nothing else, I assert to be, if not of the very first importance for recovery, at least something very near it.”*⁸

While Florence Nightingale captured the ideals of the pavilion type, the architectural design began to shift when the pavilions started to become specialized wards and morph into several “mini- hospitals” within the main complex.⁹ This notion affected the current design of hospitals. As a result, many of the benefits of the pavilion style hospital were lost.

⁷ Peters, *Design for Health Sustainable Approaches to Therapeutic Architecture AD*.

⁸ Ibid.

⁹ Wagenaar, *The Architecture of Hospitals*.

A Pivotal Shift in the Attitude of Healing

Current healing measures vary greatly from the past. Primary healing elements are no longer regarded as sacred spaces. The majority of hospitals today are designed as mini cities, with corridors acting as streets that connect various disciplines within the hospital. This concept extends back to F Beer, who in Bern, in 1718, developed the idea of hospital corridors. The concept was to connect two separate programs across a space and improve accessibility to various parts of the hospital.¹⁰ Although this improved accessibility, it may have hindered the use of courtyards within the central space of the hospital.

A major defect of current design, however, is that these 'streets' do not see the light of day and the different sections of the hospitals often do not get adequate sunlight or connections with nature. Functionality has gained priority over the end user's interaction with nature and created a major disconnect between the building and its environment. It has, therefore, aided in the departure of what it means to 'heal.' Figure 5 illustrates the evolution of the different types of hospitals. Essentially, after the corridor plan was introduced, and the medical field began to grow, hospitals became mega-structures that housed several different disciplines and program. As hospitals evolved, several disciplines and specializations branched out to become their own building type. Even though rehabilitation is still present in hospitals, rehabilitation centers, that focus primarily on patient rehabilitation, have grown out of an increased demand.

¹⁰ Ibid.

sacred

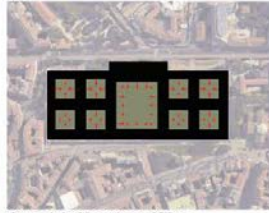
500BC



Temple of Asclepius in Epidaurus

- + Sacred setting for healing
 - + Asclepius is the Greek god of health and well-being
- Source: Wikimedia Commons

1456



Ospedale Maggiore, Milan

- + central courtyard
 - + two wings with 4 smaller courtyards
 - + views and ventilation
 - + currently hospital with over 900 beds
 - + currently research institute
- Source: author, google maps base image

healing
for the poor

condense

1926



**James Gamble Rogers'
Columbia- Presbyterian Medical Center**

- + condensed program, specialties
- + super block
- + move away from pavilion type

RELIGIOUS BEGINNINGS

COURTYARD

PAVILLION

BLOCK

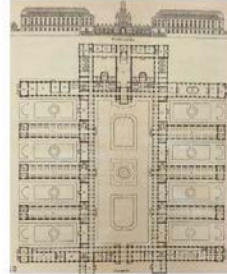
820BC



Plan of St. Gall

- + never built
 - + cloister gardens
 - + contemplation + healing
 - + medicinal plants
- Source: flicker, Penn State University Libraries
Architecture and Landscape Architecture

1839



Hôpital Lariboisière, Paris

- + maximum ventilation
 - + health and recovery
 - + pavilions on either side of main courtyard
 - + connect pavilions with arcade
- Source: The Architecture of Hospitals

ventillation

Figure 5: Sequential Hospital Typologies (Source: author)

Specialization Hospitals: The Inception of Rehabilitation Centers

As the specializations within the medical field began to grow, the need for specialized sectors started to become eminent. Rehabilitation hospitals and rehabilitation centers are one of the many disciplines that have grown from this field. Physiatry is the medical field that specializes in physical medicine and rehabilitation. One of the major catalysts that expedited the need for this division was World War I and World War II to “improve functional restoration of injured soldiers.”¹¹ In 1917, reconstruction units were added to almost 55 hospitals throughout the U.S. By the 1920’s, physical therapy was further developed and became widely practiced as a “third phase in medical care” to appease other doctors and not make them feel that this field was not taking over their disciplines.¹² There was a large growth spurt in the knowledge of physical therapy in the 1930’s. In addition to this, in 1938, The Society of Physical Therapy Physicians was founded. World War II expanded on previous research regarding recuperation. Injured soldiers sought out more rehabilitation. During this time, other types of therapy became more prevalent, such as occupational therapy and hydrotherapy. Rehabilitation has evolved to not only include soldiers, but those recovering from other injuries. Utilizing rehabilitation in treatment has become a current norm.¹³

¹¹ “History of Physical Medicine and Rehabilitation,” *Medical College of Wisconsin Physical Medicine and Rehabilitation*, accessed November 2, 2017, <https://www.mcw.edu/Physical-Medicine/History.htm>.

¹² Ibid.

¹³ Ibid.

DEVELOPMENT OF HEALING ENVIRONMENTS: WHAT ARE THE CURRENT CHALLENGES?

This section highlights developments in history that have altered the designs of hospitals and other healthcare facilities and analyzes why this is a current issue. In the past, the landscape was prioritized and nature was viewed as a healing element through the 'Enlightenment' period. Then, due to medical advances, there was a shift to prioritize function in the building, thus the idea of nature as a healing element was lost. Figure 6 illustrates the relationship between building and landscape in hospital design overtime, including how the current thinking must shift into a symbiosis of landscape and building.

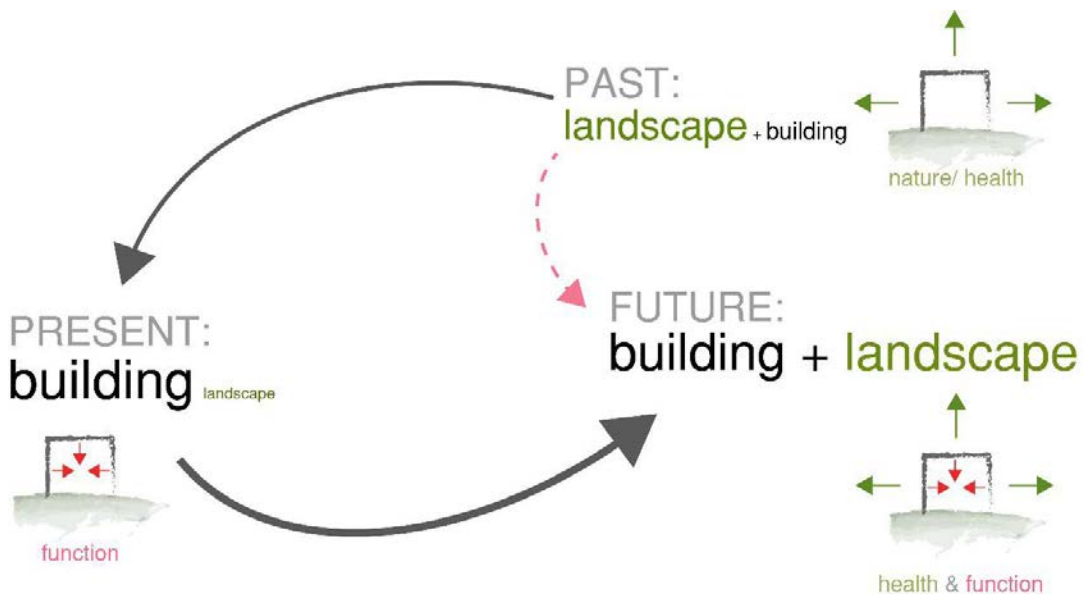


Figure 6: Building and landscape relationship in hospital design; past, present, and proposed future (Source: Author)

How did the design of hospitals shift so far away from the healing power of nature? Several elements attributed to this attrition. The 19th century was a period where there was a vast amount of scientific discovery and advances in technology. In the 1870's, Louis Pasteur discovered and developed the vaccine. This created a shift in hospital design. Since medicine could heal, less emphasis was placed on the healing power of the landscape and eventually function took over as a primary design element.¹⁴ The vaccine helped the prevention of getting particular diseases that were prevalent at the time, while the development of antibiotics in the 20th century allowed for those who were sick to make a full recovery. This included those that had tuberculosis, which was a major threat to human health during that period. Another advance in technology was the discovery of the XRAY, by Wilhelm Rontgen, in 1895.¹⁵ Since the technology was new, it was very expensive. In order to provide doctors with accessibility to this new technology, these machines were placed in hospitals. This in turn, created a higher density of specialties in the hospital and the block type was introduced, where all the programs were condensed.¹⁶

All of these improvements in medical science and technology “shifted the focus of healing entirely to the body as an assemblage of physical parts, and elevated the status of the physician to the all-knowing master of cures.”¹⁷ This solidified the idea that a hospital is like a well-oiled machine and that healing was only achieved

¹⁴ Wagenaar, *The Architecture of Hospitals*.

¹⁵ Ibid.

¹⁶ Ibid.

¹⁷ Peters, *Design for Health Sustainable Approaches to Therapeutic Architecture AD*.

through doctors. Nature's contribution to healing was significantly minimized and the adoption of continuous hallways and minimal interaction with nature became the norm.

Even though the overall current design of most hospitals has moved away from nature as a primary focus, there have been examples of hospitals being designed with the landscape in mind. Alvar Aalto's Paimio Sanatorium, which was built in 1933, strived to connect the patient with outdoor spaces. Aalto thought of the building at multiple scales and was scrupulous with details. The building is located in a highly vegetated area where the patients are able to look out into the landscape which aids in the healing process. In the 1980's, there was a large push for "patient-centered design."¹⁸ This shift to "patient-centered design" improved the types of spaces that were being designed within the hospital. This included additions of large atriums which allowed more natural light to enter the hospital.

The word hospital is derived from the Latin word 'hospes', which means guest.¹⁹ The current design of hospitals has become more closely linked with hospitality. It has become more like a hotel in the aspect of comfort. Although these are great strides in the right direction, the lack of attention placed on the relationship between the building and nature takes away from additional modes of recovery. Several studies show that a view from the window are shown to either benefit or delay a patient's recovery. These studies, which will be discussed in further detail in

¹⁸ Wagenaar, *The Architecture of Hospitals*.

¹⁹ Peters, *Design for Health Sustainable Approaches to Therapeutic Architecture AD*.

the upcoming chapters, confirm that a view of nature is beneficial to one's recovery. It allows patients to heal faster, while taking less pain medication.

The relationship between hospital and landscape is illustrated in Figure 7, which highlights certain pivotal moments in history that have shifted the focus from nature as a healer to medicine as healer. In order for healing to occur, medicine must not be viewed as the sole healer. Moving forward, society must incorporate the lessons from the past and acknowledge the many benefits of when building and landscape work in unison.

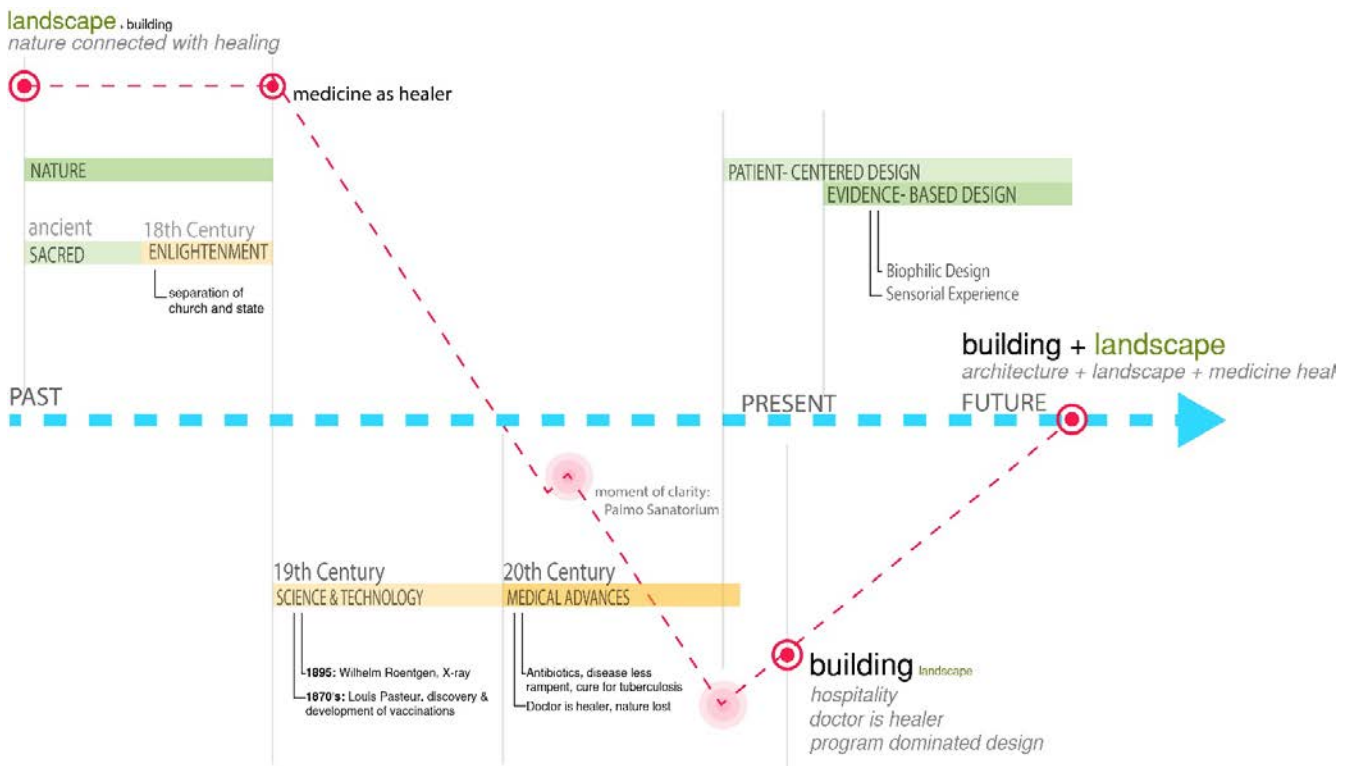


Figure 7: Hospital and Landscape Relationship Timeline (Source: author)

Chapter 2: The Deficit in Current Healthcare Design

“The 21st century world faces great challenges in terms of delivering wellbeing and healthcare to an increasing and ever- changing patient demographic.”²⁰

CURRENT HEALTHCARE PRACTICES

Relationship Between Patient Rooms and Nursing Station

The relationship between the patient rooms and the nursing stations in the in-patient unit is vital. A nurse must be able to have a line of sight to patient rooms and must be able to access patients in a timely manner, in the event of an emergency. They must also be readily available if the patient requires assistance. Figure 8 outlines the current common configurations of patient rooms and nursing stations based on a diagram by Stephen A. Kliment, a former editor in chief of Architectural Record.²¹

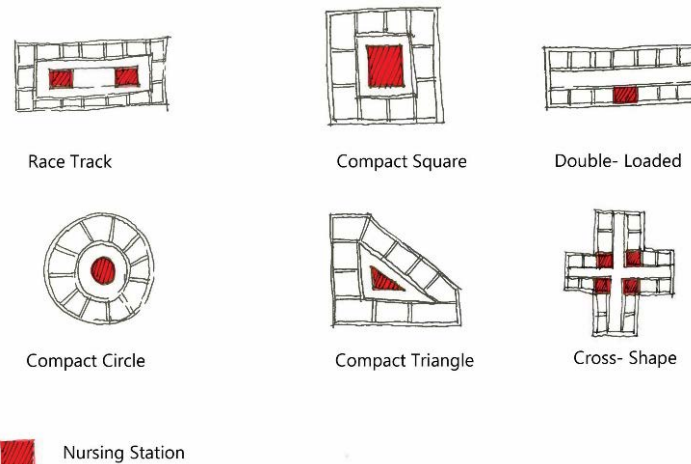


Figure 8: Diagram of Patient Room and Nursing Station Configurations (Source: author, based on a diagram by Stephen A. Kliment)

²⁰ Ibid.

²¹ Richard L. Kobus, *Building Type Basics for Healthcare Facilities* (J. Wiley, 2008).

Current Program According to AIA Guidelines

The AIA has required program for healthcare projects. Figure 9 outlines this required program from the AIA Guidelines for Design and Construction of Healthcare Facilities.²²

| |
|--|
| <p>Medical Evaluation Unit</p> <ul style="list-style-type: none">• Psychological Services Unit (and offices for testing, evaluation, and counseling)• Social Services Unit (and office space for private interviewing and counseling)• Vocational Unit (and office space for training, counseling, and placement) |
| <p>Service Areas</p> <ul style="list-style-type: none">• Patient dining, recreation, day spaces• Dietary Unit, Personal Care Facilities• Unit for teaching activities of daily living• Administration Department• Engineering Service and Equipment Areas• Linen Service• Housekeeping Rooms, Employee Facilities, Nursing Unit |
| <p>Optional Units</p> <ul style="list-style-type: none">• PT Unit (office space, waiting space, treatment area, exercise area, storage)• Sterilizing Facilities• Prosthetics and Orthotics Unit• OT Unit (office space, waiting space, activity areas, storage)• Speech and Hearing Unit• Therapeutic Pool• Dental, Radiology, Pharmacy Unit• Laboratory Facilities• Home Health Services• Out-patient Services• Convenience Store |
| <p>Evaluation Unit</p> <ul style="list-style-type: none">• Office• Exam rooms (min. 140 SF floor area, min. room dimension: 10'; must have handwashing station, desk, counter, or shelf space for writing)• Evaluation Rooms |
| <p>Laboratory (or Nearby Facility)</p> |
| <p>Dining, Recreation, and Day Spaces</p> <ol style="list-style-type: none">1. 55 SF/ bed, storage |
| <p>Dietary Department</p> |
| <p>Housekeeping Rooms</p> |
| <p>Patient Rooms</p> <ol style="list-style-type: none">2. 4 people max per room, min. 140 SF area (not including restroom and closet), must include window |

Figure 9: AIA Guidelines for Design and Construction (Source: chart organization author, AIA guidelines information)

²² *Guidelines for Design and Construction of Hospital and Health Care Facilities* (The American Institute of Architects Academy of Architecture for Health, 2001), accessed November 14, 2017, <https://www.fgiguilines.org/wp-content/uploads/2015/08/2001guidelines.pdf>.

Primary Source Rehabilitation Observations of Current Practice

Primary observations were conducted at several hospitals with both in-patient and out-patient rehabilitation services, in order to gain a better understanding of the program, circulation, and vital program relationships. All hospitals shadowed are highlighted in Figure 10.

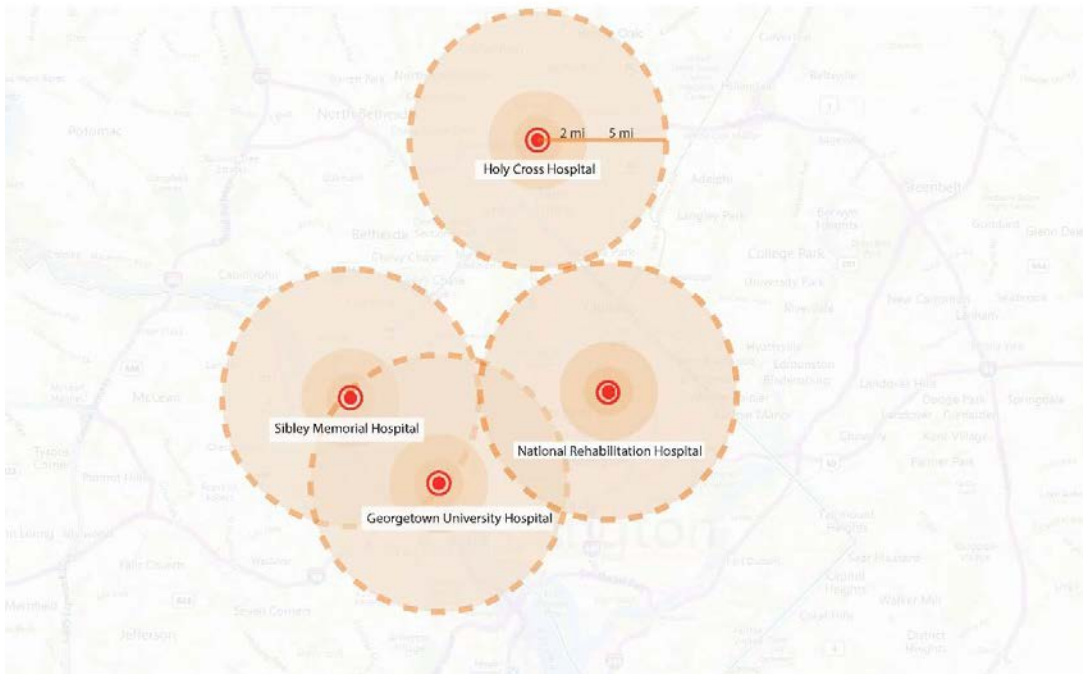


Figure 10: Primary Hospital and Rehabilitation Observation Locations (Source: author, google base map)

Holy Cross Hospital

Holy Cross Hospital is a teaching hospital founded in 1963 and is located in Silver Spring, Maryland. It currently has a total of 443 beds, with a total of 192,000 patients admitted in 2016.²³ Holy Cross offers both in-patient and out-patient rehabilitation care. Figure 11 illustrates the location of parking and an out-patient's trajectory from the car to the rehabilitation area, which is located in the basement of the hospital. The distance from the parking lot to the out-patient center is approximately 800 feet, which is about 1/7th of a mile.

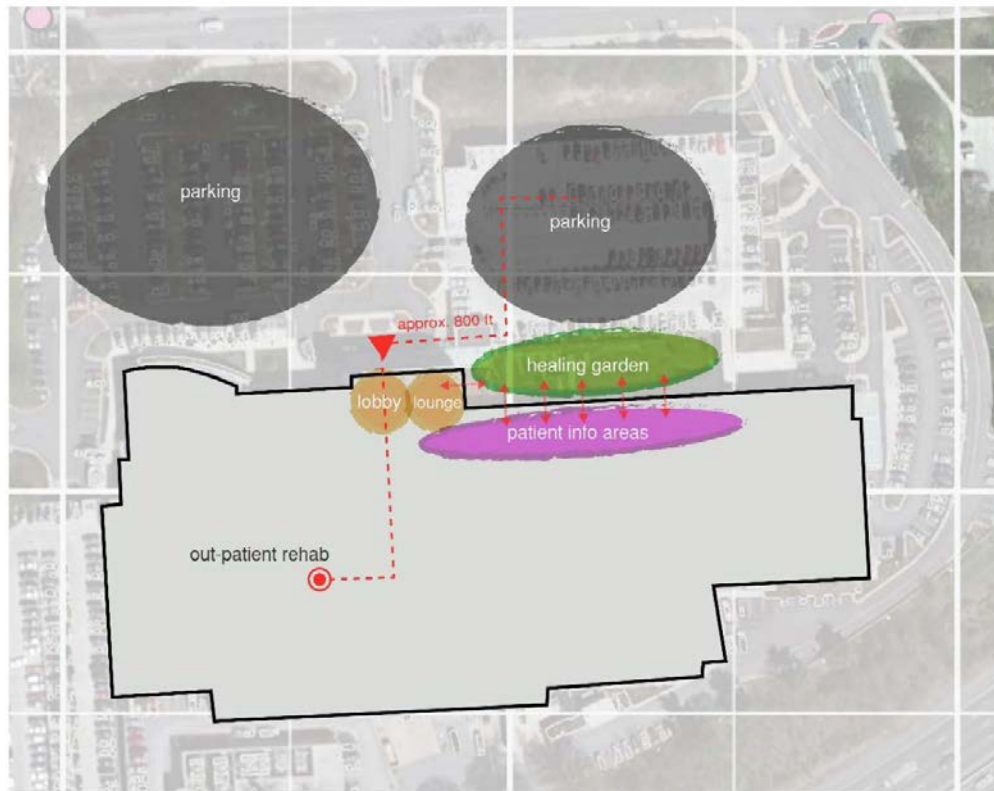


Figure 11: Holy Cross Hospital Out-Patient Site Diagram (Source: author, google map base)

²³ "Holy Cross Health," accessed November 13, 2017, <http://www.holycrosshealth.org/HCH>.

There is a healing garden that is visible from a bridge that connects the parking garage and the hospital. It is accessible from the lounge area and the patient information area. Patients have no direct access to this healing garden from any rooms or rehabilitation spaces. In addition to this, once an individual has gone to the healing garden, he or she must go back to the main entrance in order to re-enter the hospital. The day that the observations were made, it was sunny, and a family was using the space. The parents were sitting on a bench staring at the water feature, while the children were playing on the pavement, jumping from one type of material to another. Figure 13 shows images of these spaces. No images of people in the healing garden are shown in order to maintain privacy. Figure 12 is an assemblage of images taken of the outpatient rehabilitation area, including the gym and the therapy rooms.

OUT-PATIENT REHABILITATION AREA



KEY PLAN

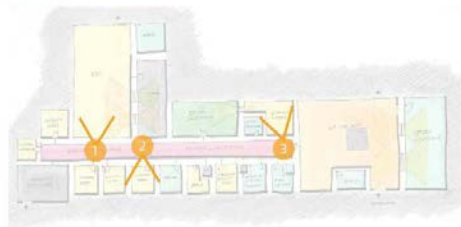


Figure 12: Photographs of Out-Patient Rehabilitation Areas at Holy Cross Hospital (Source: author)

ENTRY SEQUENCE OVER PEDESTRIAN BRIDGE



1 View from parking garage to entrance



2 View from pedestrian bridge to healing garden
Wall about 3-1/2 feet tall



3 View from parking garage to healing garden
(looking over wall)

HEALING GARDEN



4 water feature



5 seating towards water



6 view towards patient info area



7 juxtaposition of materiality

INTERIOR SPACE



8 View from customer info area to healing garden



9 View from lobby to lounge

KEY PLAN



Figure 13: Photographs of Holy Cross Hospital (Source: author)

Sibley Memorial Hospital

The day of the observation, the primary parking lot was full and therefore the parking garage was used. The building is organized around four sub-buildings, which made it easier to navigate. They were clearly labeled A ,B ,C and D. The rehabilitation center was in building D. When visitors travel from the parking garage to building D, they pass through an expansive space, similar to a mall or airport terminal. This space includes a piano that plays soothing, continuous music. From this ‘terminal space’ there is a clear view to a garden space. This circulation space around the garden is present in other levels of the hospital and acts as a wayfinding device for visitors. Figure 14 illustrates the location of these spaces while Figure 15 showcases photographs of these essential spaces within the hospital.



Figure 14: Sibley Memorial Hospital Out-Patient Site Diagram (Source: author, google map base)

Georgetown Med Star University Hospital

Georgetown University Hospital was difficult to navigate through during the observation day. After parking the car, the trajectory into the out-patient rehabilitation areas are approximately 800 feet. The design of the out-patient services are easy to navigate. One of the issues is, the building layout is a little confusing so it is difficult for patients to understand where to go once they leave. Many patients may often take a longer route to the car. Most of the rehabilitation spaces had no natural light, except for a glass egress door in the gym space.

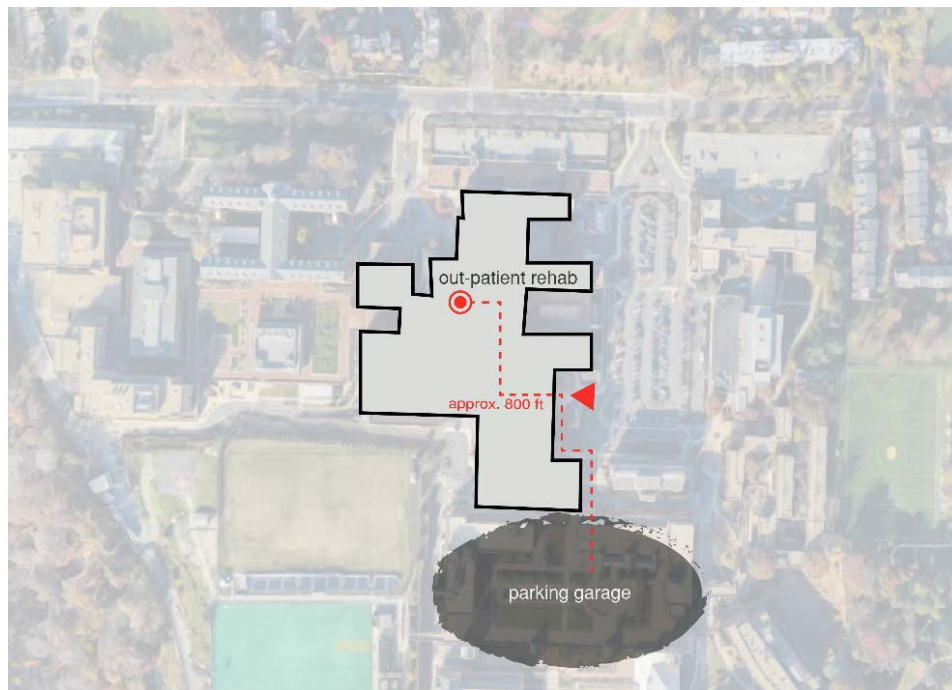


Figure 15: Georgetown Med Star University Hospital Out-Patient Site Diagram (Source: author, google map base)

National Rehabilitation Hospital

The rehabilitation building has a skywalk and covered walkway from the parking garage to the building. Upon entering the building, the out-patient services are on the same level as the entry and are located on the right side as an individual walks in. The ‘rehabilitation square’ is located in the back left-hand corner of the building. This is where most of the occupational therapy occurs for both in-patients and out-patients. The ample light shining through in the atrium space illuminates the different levels of therapy above. Each level above the entry level houses in-patient therapy around the atrium space.



Figure 16: National Rehabilitation Hospital Rehabilitation Square Diagram (Source: author, google map base)

IDENTIFYING AND ANALYZING THE DEFICITS- PRIMARY SOURCES

Shadowing and Observations

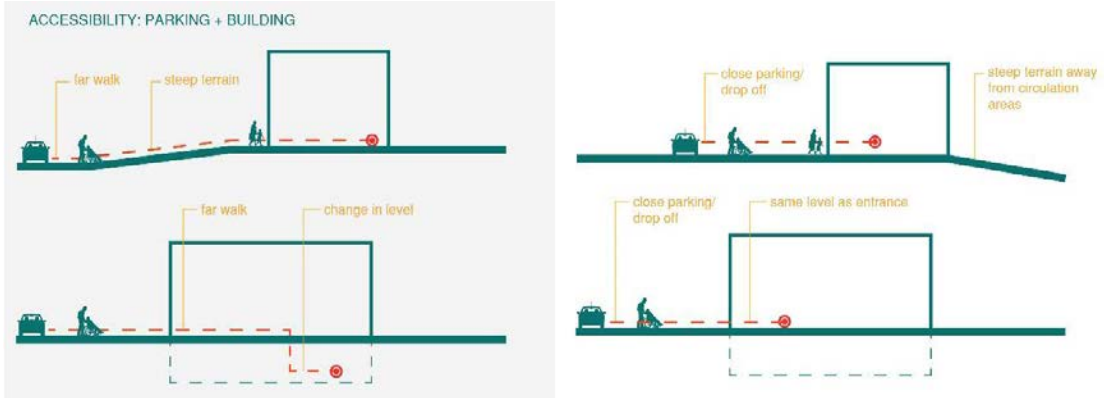
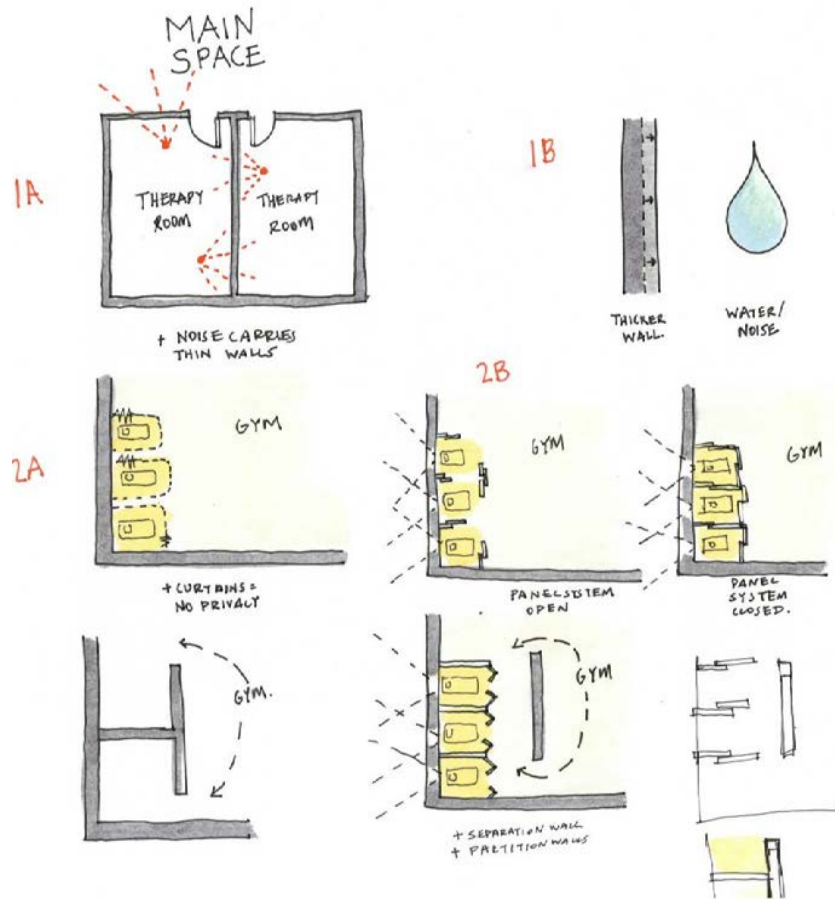


Figure 17: Accessibility- Relationship of Parking and Building (Source: author)



Lack of Implementation of Other Types of Therapies

Currently, most of the therapy used for patient recovery is occupational therapy (OT), physical therapy (PT), and speech therapy. There are other types of therapies that can be used in conjunction with OT, PT, and speech therapy in order to accelerate healing. These types of therapies include hydrotherapy, chiropractic, aromatherapy, horticultural therapy, and acupuncture.

Hydrotherapy

The first recorded use of hydrotherapy dates back to the ancient Greek and Roman civilizations, where those who were ill were told to bathe in spring water. Hydrotherapy gained more notoriety in the early 1800s, because it was seen as a more natural and personalized treatment than the traditional medicine of the time. Hydrotherapy became more popular in the U.S. during the 1850s. Currently, this type of therapy is more common, and it is often used in conjunction with physical therapy.

Hydrotherapy involves the use of water during therapy- typically a pool. The water helps alleviate pressure from joints, increase circulation, and helps to reduce swelling.

Chiropractic

Typically, chiropractic therapy uses spinal and joint manipulation to help patients who are suffering from back, shoulder, and neck pain. It is an effective practice that helps alleviate pressure from those areas.

Aromatherapy

Aromatherapy uses essential oils that can either be released into the air or massaged onto the body. Aromatherapy soothes the mind and body and allows an individual to feel more relaxed.

The rehabilitation center will house a series of healing gardens. One of them will be a sensory garden where the plants will emit various scents. This natural therapy will help make patients unwind and feel more relaxed.

Horticultural Therapy

The American Horticultural Therapy Association defines horticultural therapy is defined as an “engagement of a person in gardening and plant-based activities, facilitated by a trained therapist, to achieve specific therapeutic treatment goals.” Horticultural therapy allows for those recovering from various ailments to work in a garden, as a means of aiding in their recovery. There have been studies of patients recovering from brain injuries or surgeries that have had success with horticultural therapy.

There is the opportunity to incorporate horticultural therapy into the program spaces. It can be placed either within one of the courtyard spaces or it could even be one of the spaces that has a relationship with the main social space.

Acupuncture

Acupuncture is derived from Traditional Chinese Medicine, where needles are inserted at precise locations along the body. In Chinese medicine, it is believed that different points on the body correspond to different organs in the body. Needles are placed on specific points in order to help the body heal itself.

Acupuncture, like chiropractic therapy, can be done in private rooms within the rehabilitation center. It is also not uncommon to have music playing during the session. Typically, the patient will lie still on the table, as needles are inserted. Once the needles are inserted, the patient typically rests for several minutes to an hour. During this hour, it is imperative that the patient be relaxed. This setting is a good opportunity to introduce biophilic design. These rooms could have a water feature and aromatherapy, to link the patient with nature. There could also be a small outdoor area that extends from these rooms so that this type of therapy can be done outdoors.

Chapter 3: Biophilic Design Approach and the Future of Healthcare

“Humanity evolved in adaptive response to natural conditions and stimuli, such as sunlight, weather, water, plants, animals, landscapes, and habitats, which continue to be essential contexts for human maturation, functional development, and ultimately, survival.”²⁴

A holistic approach to both understand and implement all facets of healing components is an integral part of design. This chapter introduces biophilic design and discusses the positive aspects of utilizing this evidence-based design strategy in improving an individual’s health, its existing presence in architecture, and where the future of healthcare is headed. Current examples of biophilic design are also discussed with emphasis on patterns that can be applied to healthcare design. Patterns of biophilic design are further analyzed through sense-sensitive design and include how to design with the senses in mind. Even though biophilic design has a powerful positive impact on one’s health, there are special precautions that must be accounted for when designing a healthcare facility. There is chapter highlights these benefits and potential limitations, such as the feasibility of plants in healing areas.

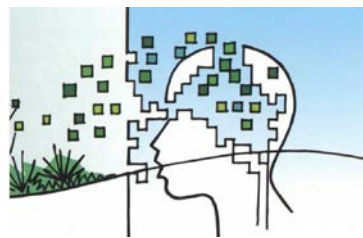


Figure 18: Biophilic Design Diagram (Source: Design For Health Sustainable Approaches to Therapeutic Architecture, edited by Terri Peters, IBI Group, Biophilic Design- Nature Nurtures, 2015, p 44)

²⁴ Stephen R. Kellert, Judith Heerwagen, and Martin Mador, *Biophilic Design : The Theory, Science, and Practice of Bringing Buildings to Life* (Wiley, 2008).

WHAT IS BIOPHILIC DESIGN?

The definition of biophilic design extends from the word ‘biophilia’ which is “humankind’s innate biological connection with nature.”²⁵ Biophilic design takes this ‘innate biological connection’ and applies it to the built environment. This term became well-known after Edward Wilson, a biologist, wrote the book *Biophilia* in 1984. He stated that

*“biology, psychology... neuroscience, endocrinology, architecture, and beyond all relate back to the desire for a (re)connection with nature and natural systems. We should be genetically predisposed to prefer certain types of nature and natural scenery.”*²⁶

Biophilic design is evidence based design, supported by studies that show the correlation between sensory driven design and its positive impact on an individual’s wellbeing. Some of the benefits include reduced inflammation, stress relief, improved work performance, and accelerated patient recovery. Figure 18 is a diagram from *Architectural Digest, Design for Health*. It suggests a connection with nature and an individual’s sense of wellbeing.

²⁵ Ibid.

²⁶ William Browning, Catherine Ryan, and Joseph Clancy, *14 Patterns of Biophilic Design Improving Health and Well-Being in the Built Environment* (Terrapin Bright Green, 2014), accessed November 16, 2017, <https://www.terrabinbrightgreen.com/report/14-patterns/>.

Biophilic Design Categories

Biophilic design can be divided into three categories, including the nature in space, nature of the space, and natural analogues.²⁷ These categories are showcased in Figure 19. Each image captures the essence of each of the design categories.

Nature in the Space

The nature in the space focuses on the direct presence of nature in space. This includes the incorporation of plants, animals, and water into the design. “Bringing nature into the space can involve a series of different strategies... including planted terraces, courtyards, and atriums; green roofs that are visible from occupied spaces, fountains, and water features.”²⁸

Nature of the Space

Nature of the space involves the human response to spatial configurations and patterns.²⁹ This includes the manipulation of views and how this affects an individual. Having varying experiences where a visitor has unimpeded views to a distance or obstructed views as well as providing spaces where he or she has the opportunity to withdraw from the main space and be reflective.³⁰

²⁷ Kellert, Heerwagen, and Mador, *Biophilic Design : The Theory, Science, and Practice of Bringing Buildings to Life*.

²⁸ Ibid.

²⁹ Ibid.

³⁰ Browning, Ryan, and Clancy, *14 Patterns of Biophilic Design Improving Health and Well-Being in the Built Environment*.

Natural Analogues

Natural analogues include design moments that have an in-direct relationship with nature.³¹ This includes utilizing the natural forms present in nature, the inclusion of natural materials, and having a sense of complexity and order which includes spatial hierarchy.³²



Figure 19: Biophilic Design Categories (Source: author, base images: Wikimedia Commons, *A Beautiful View of a Forest*, Ayush2162002, May 3 3017; Creative Commons maxpixel.freegreatpicture.com, *Stairs, Spiral Staircase, Emergence, Gradually*, Max Pixel; Wikimedia Commons, *Piazza Navona, Myrabella*, August 5, 2009)

³¹ Kellert, Heerwagen, and Mador, *Biophilic Design : The Theory, Science, and Practice of Bringing Buildings to Life*.








³² Browning, Ryan, and Clancy, *14 Patterns of Biophilic Design Improving Health and Well-Being in the Built Environment*.

Parameters of Biophilic Design




The design categories of biophilic design include several different parameters.

Figure 20 highlights the distinctive design parameters within each biophilic design category.

NATURE IN SPACE

-  visual connection with nature
-  non-visual connection with nature
olfactory/ auditory
-  non-rythmic sensory stimuli
connection with nature, statistically analyzed
-  thermal and airflow variability
subtle changes in temperature
-  presence of water
see/ hear/ touch water
-  dynamic and diffuse light
vary light intensity to mimic nature
-  connection with natural systems
aware natural process, seasonal, temporal

NATURAL ANALOGUES

-  biomorphic forms and patterns
symbolic references to contoured, patterned, textured, numerical arrangements in nature
-  material connection with nature
material elements from nature
-  complexity and order
rich sensory information, spatial hierarchy as in nature

NATURE OF THE SPACE

-  prospect
unimpeded view over a distance
-  refuge
place of withdrawl- protect from above and behind
-  mystery
obstructed views
-  risk/ peril
identifiable threat with safeguard

Figure 20: Biophilic Design Parameters (Source: author, content based on information from 14 Patterns of Biophilic Design)

Benefits of Incorporating Nature in Design

There are several health benefits associated with an exposure to nature. The benefits of this exposure can be scientifically measured. Several studies have proven that nature reduces inflammation, boosts the immune system, aids in stress relief, improves work performance, and accelerates patient recovery.

Reduced Inflammation

In 2012, the *Journal of Cardiology* published a study which explored the healing effects of a forest environment on individuals suffering from hypertension.³³ The study, which was conducted in China, included a group of twenty-four elderly participants. Half of the participants stayed in the city, while the other half stayed in the forest for seven days. Each patient was tested several times a day to measure blood pressure. At the end of the study, it was concluded that being immersed in nature reduces inflammation within the body and therefore lowers blood pressure.³⁴ This natural remedy alleviated the participants from their symptoms of hypertension.

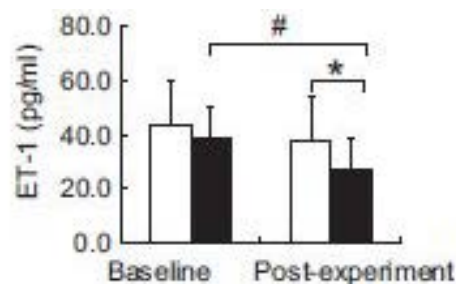


Figure 21: Chart Comparing Cardiovascular Disease Prior and After Experiment (Source: *Therapeutic Effect of Forest Bathing on Human Hypertension in the Elderly*, *Journal of Cardiology*, 60, no.6, 2012)

³³ Gen-Xiang Mao et al., “Therapeutic Effect of Forest Bathing on Human Hypertension in the Elderly,” *Journal of Cardiology* 60, no. 6 (2012): 495–502, <http://linkinghub.elsevier.com/retrieve/pii/S0914508712001852>.

³⁴ Ibid.

Immune System Boost (Increased Presence of the Natural Killer Cell)

In addition to reducing inflammation in the body, nature also acts as an immune system boost. Research is currently being conducted to progress the treatment of cancer by analyzing how nature naturally boosts the immune system. The Department of Hygiene and Public Health in Tokyo has researched the impact of phytoncides, a chemical released by plants into the air, to protect themselves from pests.³⁵ Although this chemical is bad for pests, the antibacterial and antifungal properties have a very different impact on humans. Once this airborne chemical is inhaled, it increases a specific white blood cell known as NK, or natural killer cell. The NK cell has been shown to fight tumor-like cells in the body.

Relationship of View and Recovery

The healing powers of nature are not only being studied when a visitor is immersed in a landscape, they are also being studied when an individual has a view of a landscape. In a study conducted by Roger Ulrich in 1984, it was concluded that the view from a patient's window can either be a catalyst of recovery or could inhibit it.³⁶ During the study, patients who were recovering from gall bladder surgery were either given a view of trees or view of a brick wall. The study found that patients that had the view of trees not only had a speedier recovery, they also took less pain medication. Figure 22 depicts the amount of pain medication patients took.

³⁵ Q. Li et al., "Effect of Phytoncide from Trees on Human Natural Killer Cell Function," *International Journal of Immunopathology and Pharmacology* 22, no. 4 (October 2009): 951–959, accessed November 16, 2017, <http://www.ncbi.nlm.nih.gov/pubmed/20074458>.

³⁶ Christine Nickl-Weller and Hans Nickl, *Healing Architecture*, 1st Editio. (Deutsche Nationalbibliothek, 2013), accessed October 30, 2017, <https://www.braun-publishing.ch/en/architecture/healing-architecture.html>.

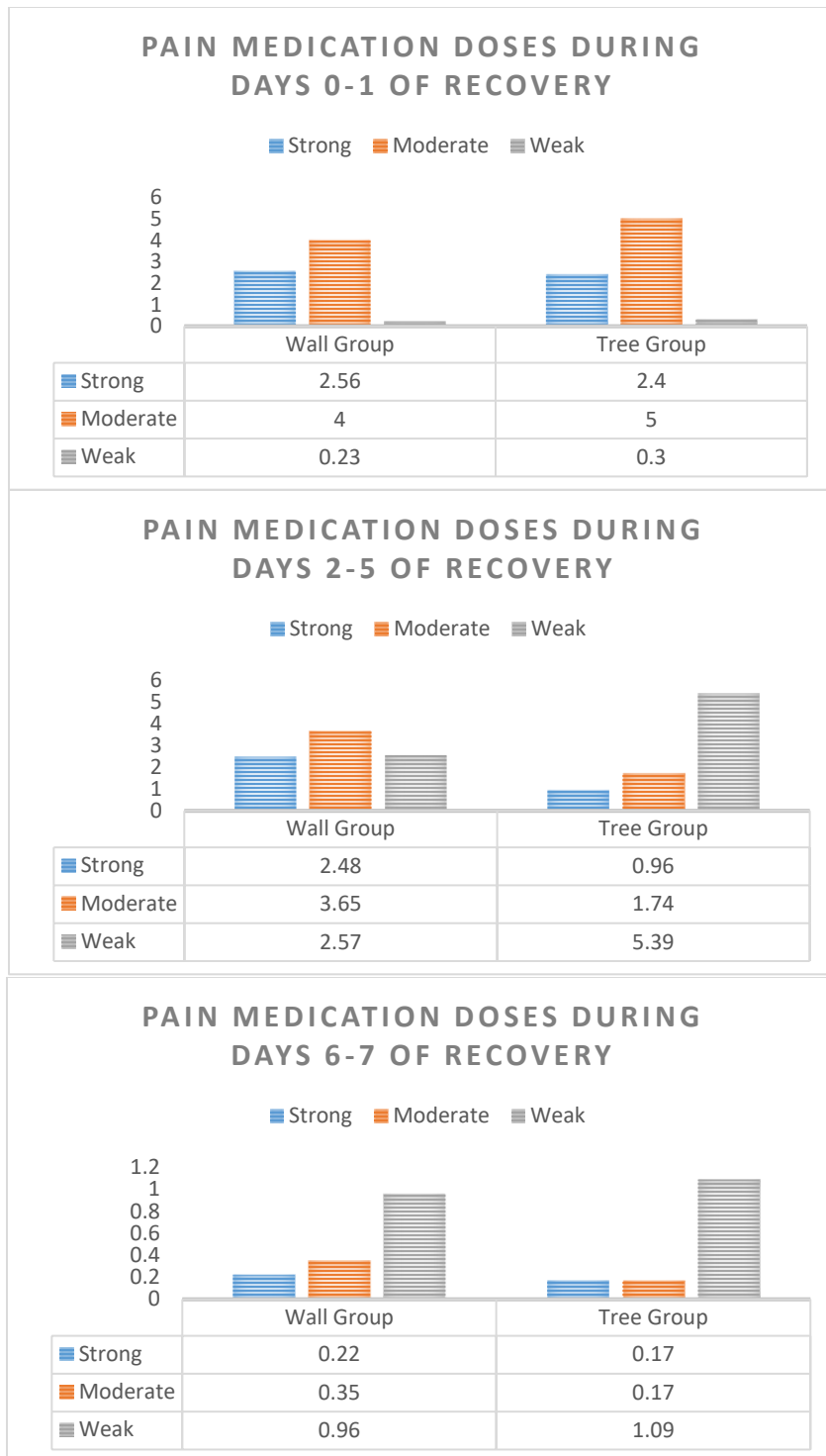


Figure 22: Results from Roger Ulrich Study Analyzing View with Recovery; Pain Medication throughout Recovery (author, information from *Biophilic Design: The Therapy, Science, and Practice of Bringing Buildings to Life*, Kellert, Heerwagen, and Mador)

The view of the window not only shapes a patient's recovery, it also has been shown to reduce stress and improve work performance for those in an office setting. The *Journal of Clinical Sleep Medicine* published a study regarding the effects of a window view on the quality of an office workers' work.³⁷ The study analyzed the work performance of workers who had a window view in their office versus workers who did not. It was found that individuals with no windows in their offices had higher cortisol levels than those with windows. Cortisol is a hormone that the body naturally releases when an individual is stressed. Higher cortisol levels have a negative impact on health and can lead to increased anxiety, depression, heart disease, sleep issues, and concentration impairment. Those that had a window in their offices were not only more productive, they were also more positive. This was displayed when they interacted with their co-workers.

Additional Benefits

There are additional studies that support the findings that biophilic design is beneficial for one's health. Figure 23, a chart from the book *14 Patterns of Biophilic Design*, organizes those findings by placing them in the specific biophilic design categories. They are categorized by stress reduction, cognitive performance, and emotion, mood, and preference categories. The orange bands in this figure highlight the specific biophilic design parameters that the project will follow.

³⁷ Mohamed Boubekri et al., "Impact of Windows and Daylight Exposure on Overall Health and Sleep Quality of Office Workers: A Case-Control Pilot Study," *Journal of Clinical Sleep Medicine* 10, no. 6 (June 15, 2014): 603–611, accessed November 16, 2017, <http://jcs.m.aasm.org/ViewAbstract.aspx?pid=29503>.

| 14 PATTERNS | * STRESS REDUCTION | COGNITIVE PERFORMANCE | EMOTION, MOOD & PREFERENCE | | |
|---------------------|--|--|---|---|--|
| NATURE IN THE SPACE | Visual Connection with Nature | <ul style="list-style-type: none"> Lowered blood pressure and heart rate (Brown, Barton & Gladwell, 2013; van den Berg, Hartig, & Staats, 2007; Isenhardt & Kyriakou, 2006) | Improved mental engagement/ attentiveness (Fiedlerman & Vesali, 2009) | Positively impacted attitude and overall happiness (Baron & Preilly, 2010) | |
| | Non-Visual Connection with Nature | <ul style="list-style-type: none"> Reduced systolic blood pressure and stress hormones (Park, Tsurutaoka, Kurohara et al., 2009; Hartig, Evans, Jamner et al., 2003; Onega-Smith, Mowen, Payne et al., 2004; Ulrich, Simons, Eastin et al., 1991) | Positively impacted on cognitive performance (Molina, Zhu & Cheung, 2012; Ljungberg, Nisly, & Lundstrom, 2004) | Perceived improvements in mental health and tranquility (Li, Kobayashi, Inagaki et al., 2012; Ahnho, et al., 2011; Tsurutaoka, Park & Miyazaki, 2010; Kim, Park, & Redding, 2007; Hagedorn & Gohm, 2003) | |
| | Non-Rhythmic Sensory Stimuli | <ul style="list-style-type: none"> Positively impacted on heart rate, systolic blood pressure and sympathetic nervous system activity (Li, 2009; Hartig et al., 2008; Kubota et al., 2008; Okamoto, et al., 2005; Ulrich et al., 1991) | Observed and quantified behavioral measures of attention and exploration (Wendhager et al., 2011) | | |
| | Thermal & Airflow Variability | <ul style="list-style-type: none"> Positively impacted comfort, well-being and productivity (Poonkongke, 2005; Thom & Wilm, 2005; Wipl, 2005) | Positively impacted concentration (Hartig et al., 2003; Hartig et al., 2001; H. Kubota & Kubota, 1992) | Improved perception of temporal and spatial pleasure (alliesthesia) (Parkinson, de Dear & Hancock, 2012; Zhang, Arens, Hultine & Han, 2010; Arens, Zhang & Hultine, 2006; Zhang, 2003; de Dear & Brager, 2002; Heschong, 1979) | |
| | Presence of Water | <ul style="list-style-type: none"> Reduced stress, increased feelings of tranquility, lower heart rate and blood pressure (Aronsson, Wiers, & Nilsson, 2010; Pleasant, Fisher, Actis et al., 2010; Biederman & Vesali, 2006) | Improved concentration and memory restoration (Aronsson et al., 2010; Biederman & Vesali, 2006) | Observed preferences and positive emotional responses (Wendhager, 2011; Baron & Preilly, 2010; White, Smith, Hanchrysis et al., 2010; Karmakar & Hamed, 2008; Biederman & Vesali, 2006; Hancock & Onais, 1993; Russo & Mowbray, 2003; Ulrich, 1982) | |
| | Dynamic & Diffuse Light | <ul style="list-style-type: none"> Positively impacted circadian system functioning (Figueroa, Bruns, Fiback et al., 2011; Sacketh & Soden, 2009) Increased visual comfort (Elvezadi, 2012; Kim & Kim, 2007) | | | |
| | Connection with Natural Systems | | | Enhanced positive health responses; Shifted perception of environment (Kokert et al., 2009) | |
| NATURAL ANALOGUES | Biomorphic Forms & Patterns | | Observed view preference (Wesell, 2012; Kaya, 2007) | | |
| | Material Connection with Nature | <ul style="list-style-type: none"> Decreased diastolic blood pressure (Tsunenaga, Mizozaki & Sato, 2007) Improved creative performance (Suzuki et al., 2012) | Improved comfort (Tsunenaga, Mizozaki & Sato, 2007) | | |
| | Complexity & Order | <ul style="list-style-type: none"> Positively impacted perceptual and physiological stress responses (Sallehards, 2012; Jove, 2007; Taylor, 2006; S. Kubota, 1992) | | Observed view preference (Sergentov, 2012; Hagedorn, Link, Taylor et al., 2008; Hagedorn, Parakita, & Taylor, 2004; Taylor, 2006) | |
| NATURE OF THE SPACE | Prospect | <ul style="list-style-type: none"> Reduced stress (Grain & Stigsdotter, 2010) | Reduced boredom, irritation, fatigue (Chenauer & Goss, 1991) | Improved comfort and perceived safety (Heug & Byron, 2007; Wang & Taylor, 2005; Pothardt, 2008) | |
| | Refuge | | Improved concentration, attention and perception of safety (Grain & Stigsdotter, 2010; Wang & Taylor, 2006; Wang & Taylor, 2006; Pothardt, 2008; Lind et al., 1995) | | |
| | Mystery | | | Induced strong pleasure response (Biederman, 2011; Serresauer, Bennewy, Latsch et al., 2011; Kernl, 2005; Bond & Zatorska, 2007) | |
| | Risk/Peril | | | Resulted in strong dopamine or pleasure responses (Goehne et al., 2013; Wang & Tsien, 2011; Zuo et al., 2008) | |

Figure 23: Biophilic Design Patterns and Its Impact on Health (Source: author highlighted and added icons, base chart from 14 Patterns of Biophilic Design Improving Health and Well-being in the Built Environment, Terrapin Bright Green, Browning, Ryan, Clancy, 2014, p. 14)

Understanding the impact that nature has on the body is a fundamental element of healing. Through biophilic design, a visitor gets exposure to nature which promotes the healing process. In a medical setting, this not only helps the patients, it also helps the medical staff who work with the patients. By being more productive and having less stress (lower cortisol levels), medical staff can be more attentive and patient with patients, especially during emergency or challenging situations. The healing properties of a medical building are not only for the patients, but for all users, including family and medical staff.

PRECEDENTS WITH BIOPHILIC DESIGN ELEMENTS

Skydeck- Willis Tower- Chicago, Illinois



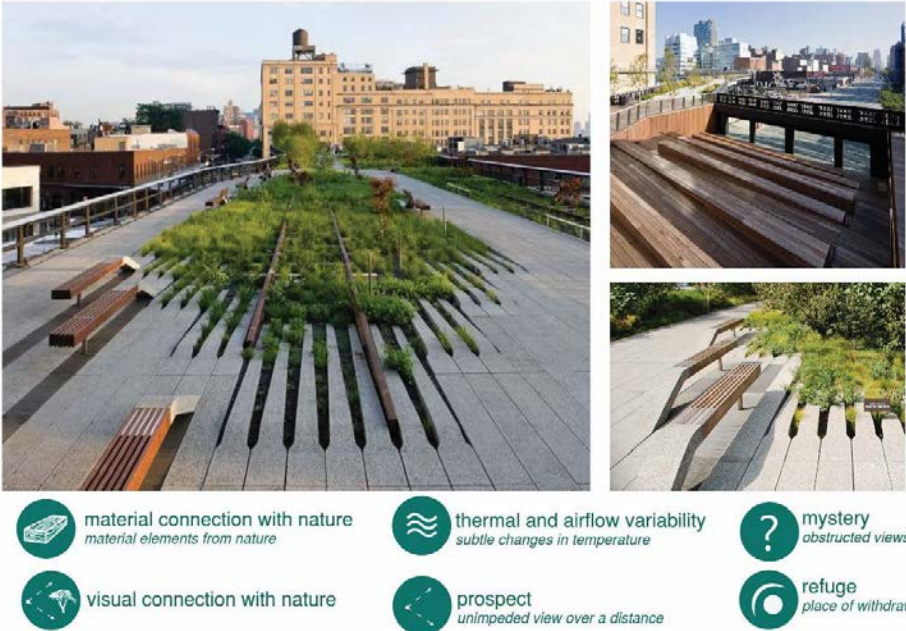
Figure 24: Biophilic Design Elements- Skydeck Willis Tower (Source: author icons, images: Wikimedia Commons, Willis Tower- Skydeck Chicago, David Berkowitz, 29 January, 2012; www.citypass.com)

Exeter Library- Louis Kahn- New Hampshire



Figure 25: Biophilic Design Elements- Exeter Library (Source: author icons, images: Flickr, Phillip Exeter Library, September 23, 2011, Xavier de Jauregulberry; Wikimedia Commons, Phillips Exeter Library atrium, August 14, 2011, Carol M. Highsmith)

Highline- New York



- material connection with nature
material elements from nature
- thermal and airflow variability
subtle changes in temperature
- mystery
obstructed views
- visual connection with nature
- prospect
unimpeded view over a distance
- refuge
place of withdrawal

Figure 26: Biophilic Design Elements- Highline (Source: author icons, images: www.nycgovparks.org/parks/the-high-line; www.archdaily.com)

Sidwell Friends School- Bethesda, Maryland



- connection with natural systems
aware natural process, seasonal, temporal
- non-rhythmic sensory stimuli
connection with nature, statistically analyzed
- material connection with nature
material elements from nature
- visual connection with nature
- non-visual connection with nature
olfactory/ auditory

Figure 27: Biophilic Design Elements- Sidwell Friends School (Source: author icons, image: www.biohabitats.com; www.dirt.asla.org)

HOW ABOUT THE SENSES IN DESIGN?

In order to successfully design a healing environment, there should be a variety of different spaces that enhance the senses. In terms of sight, this includes thinking about how light enters a space, what colors are used within the space and what emotions those colors evoke, and how a view out of a window may affect a patient's wellbeing and aid in their overall recovery.

Incorporating a water element into a design not only stimulates the sense of sight, it also stimulates the sense of sound. Listening to water can create a soothing, peaceful ambiance. Materiality and the corresponding sounds produced by specific materials can also be used to soothe the patient, such as the sound heard when walking over certain types of flooring.

In terms of touch, there have been several studies that have shown that horticultural therapy stimulates cognitive function. The American Horticultural Association defines horticultural therapy as an “engagement of a person in gardening and plant-based activities, facilitated by a trained therapist, to achieve specific therapeutic treatment goals.” Horticultural therapy allows patients recovering from various ailments to work in a garden as a means of aiding in their recovery.

The sense of smell is another sense that can be evoked in design. The rehabilitation center can be designed to include gardens that have aromatic plants. These plants are known to promote a soothing, relaxed state when inhaled, such as lavender. There could be an ‘aromatic walk’, a threshold the patient passes with aromatic plants, prior to the patient entering the therapy spaces. This would put the

patient at ease at a subconscious level and most likely make them more relaxed and able to focus on the therapy session.

Figure 28 is a diagram from the IBI Group that highlights the interaction of the body with nature. It goes from the macro, which is the nature, to the meso, which is the ‘building skin’, and varying levels of public and private space, to the micro, which is the ‘body skin’. It includes allusion to the senses and how the body is affected by that initial nature. The diagram concludes with the neuro, which is how the mind processes all of this information. The scope of the rehabilitation center will incorporate elements of this notion. The project will be analyzed and designed from the macro to the neuro, as the sum of all of those parts affect the overall healing process.

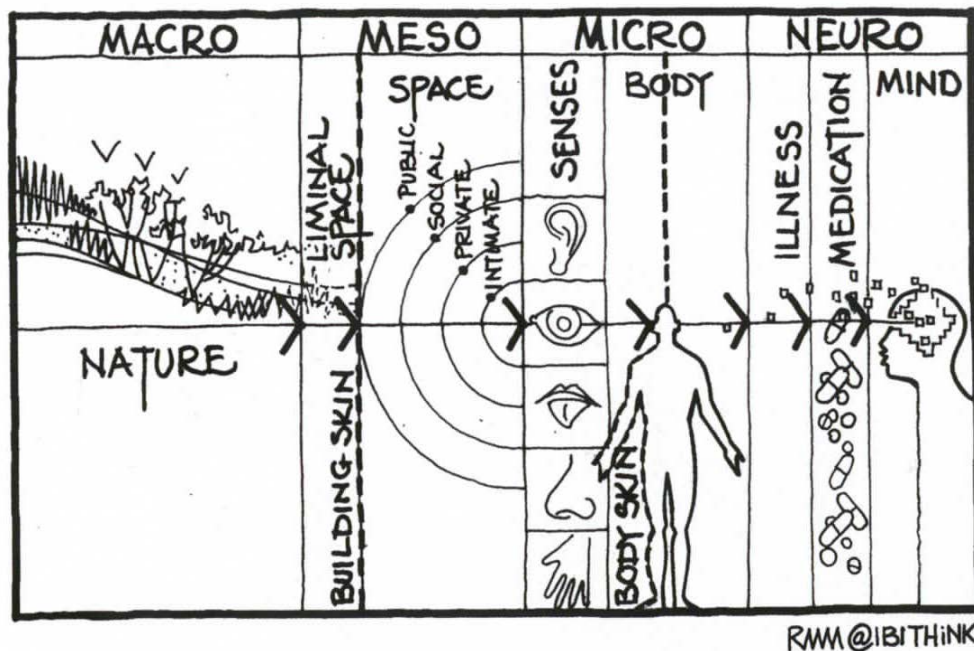


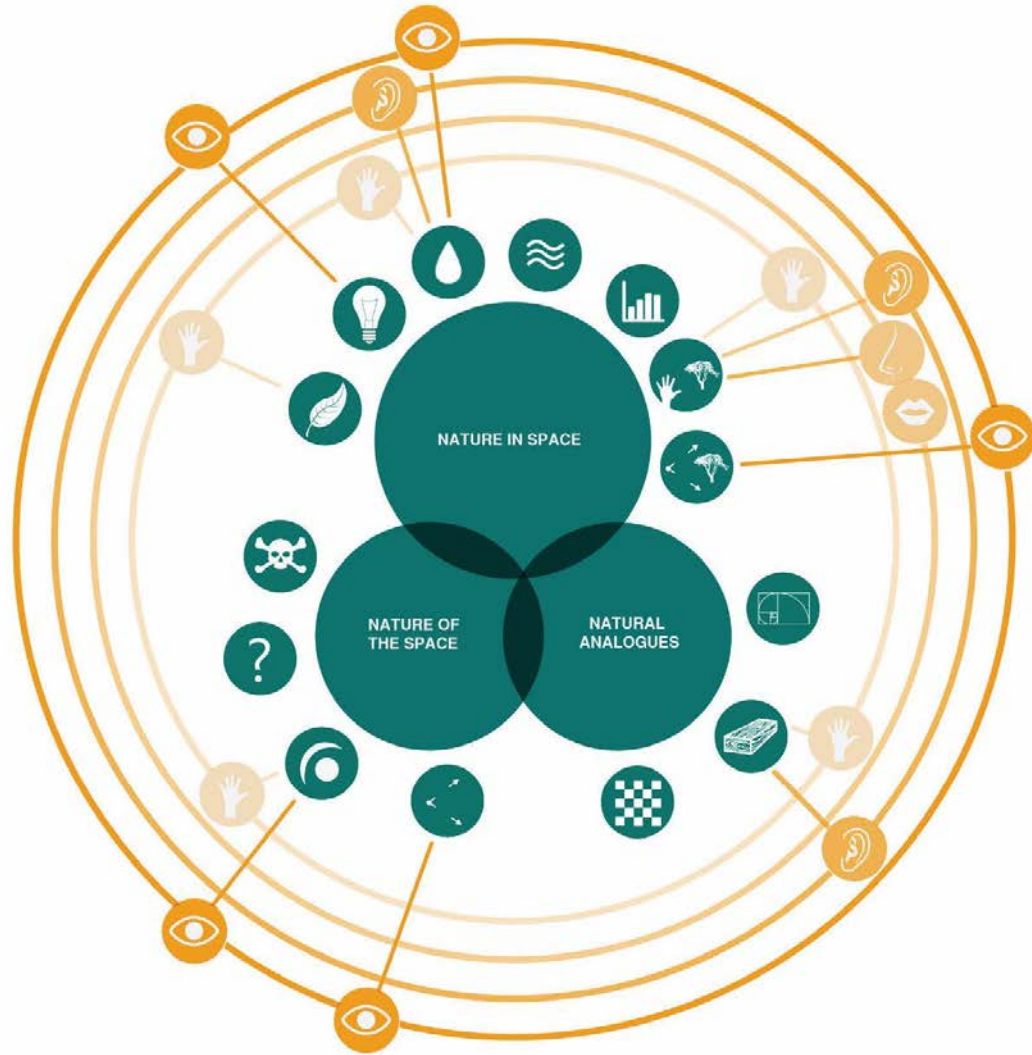
Figure 28: Biophilic Design Diagram (Source: *Design For Health Sustainable Approaches to Therapeutic Architecture*, edited by Terri Peters, IBI Group, *Nature Nurtures, Macro to Neuro*, 2016, p 46)

MARRYING BIOPHILIC DESIGN APPROACH WITH ENHANCED SENSORY EXPLORATION

To determine which biophilic design parameters the project will focus on, an analysis was done to compare the different biophilic design parameters and the five senses. Figure 29 highlights which parameters were selected for the project design by filtering them with what affects the senses the most.

The following are the parameters selected to complete the design of the rehabilitation center:

1. Presence of water
2. Dynamic and diffuse light
3. Connection with natural systems
4. Visual connection with nature
5. Non-visual connection with nature
6. Refuge
7. Prospect
8. Material connection with nature



- | | |
|--|---|
|  visual connection with nature |  connection with natural systems <i>aware natural process, seasonal, temporal</i> |
|  non-visual connection with nature <i>olfactory/ auditory</i> |  prospect <i>unimpeded view over a distance</i> |
|  presence of water <i>see/ hear/ touch water</i> |  refuge <i>place of withdrawl- protect from above and behind</i> |
|  dynamic and diffuse light <i>vary light intensity to mimic nature</i> |  material connection with nature <i>material elements from nature</i> |

Figure 29: Filtering Biophilic Design with the Senses (Source: author)

THE FUTURE OF HEALTHCARE ACCORDING TO AN ARCHITECT IN HEALTHCARE

To have a better understanding about current healthcare practices, and where the healthcare profession is going, a primary interview was conducted with an architect who has experience in healthcare. Jim Curran is the Vice President and Design Lead of the Healthcare Studio for Callison RTKL, in Washington, DC. He has over 19 years of experience working on healthcare projects. The three major topics that Mr. Curran mentioned during the interview were the caregiver continuity, the importance of the entry sequence, and fostering community connections (Figure 30).



Figure 30: Future of Healthcare Diagram (Source: image based on primary interview with Jim Curran, diagram by author)

The first major point about the future of healthcare design is the caregiver continuity which is to make sure to encourage family comfort. This means that rooms should provide spaces for both patients and family. Family comfort within the room includes a work area, internet, and sleeping area.

The next major topic that Jim Curran discussed during the meeting was thinking about the entry sequence and the concept of 'active waiting'. The idea is to minimize the actual wait time a patient has before they are seen by a therapist. Before the patient goes to the appointment, they pre-register on the phone, thus streamlining their check in time. The next important element in the sequence is thinking about parking proximity. It is important to especially think about the outpatients and their journey to rehabilitation services. If the parking is too far, it can pose issues for the patients and they can arrive at the therapy appointment already exhausted.

The final major topic about healthcare that was discussed is the idea of enhancing community wellness. Mr. Curran mentioned several times that often healthcare buildings tend to be isolated from the community and the only time the community has any involvement with them is if anyone is sick. The future of healthcare propels the community to be connected with healing. The idea is to try and have a relationship between medical and community program. Ways to do this is to start to incorporate retail areas within certain medical settings, and also by extending the idea of wellness into the community by means of wellness classes or farmers markets.

Chapter 4: Healing Garden Design

“Form must have a content, and that content must be linked with nature.”
- Alvar Aalto

Since the birth of the first hospital, nature has played a vital role in healing. In the past, nature has had a larger role in healing. This is exemplified through the earlier hospital typologies, such as the courtyard and pavilion typology. Striking a balance between the ‘natural’ and built environment was essential for overall health. Having open spaces, such as courtyards, allowed for better ventilation. Due to advances in technologies, there has been a shift from seeing nature as a healer to medicine and doctors as primary healers. In order to create future healthcare environments that are effective, one must learn from the past and incorporate more nature into the design of the spaces. This chapter introduces how these exterior healing spaces can be designed and what elements are necessary for their success.

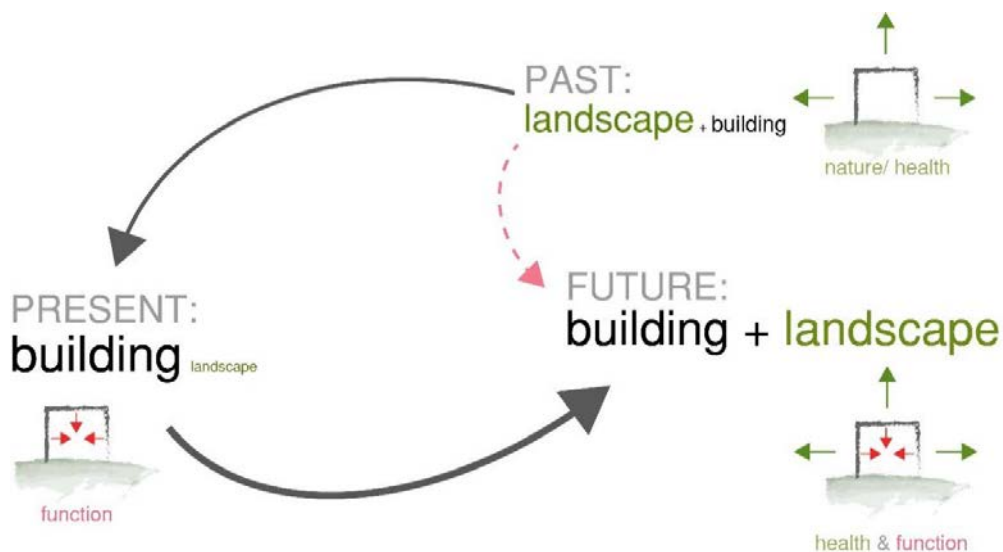


Figure 31: Building and landscape relationship in hospital design; past, present, and proposed future (Source: Author)

DESIGN FEATURES: PORTAL, PATH, DESTINATION, SURROUND

Healing gardens in medical facilities should be located in areas where different users in the hospital or medical center can easily access them. This includes accessibility by medical staff, visitors, and especially the patients. While healing gardens should be easily accessible by these parties, they should also provide a sense of privacy and withdrawal from the more public areas. According to a lecture at the University of Maryland by Jay Graham, the principal at Moody Graham Landscape Architects, a successful healing garden keeps four design features in mind. Figure 32 highlights these features, which include portal, path, destination, and surround.³⁸



Figure 32: Design Elements of a Healing Garden (Source: author, base images from left to right: Wikimedia Commons, Suzhou Youyicun Garden in the Lingering Garden, Gislign, November 30th; Pexels free personal and commercial use, Person, Tobi; Pixels free personal and commercial use, Bench, Pixabay; Wikimedia Commons, Jardim do Paco Episcopal, Vista geral do Jardim do Paco Episcopal Castelo Branco, Dinah Raphael, August 29th 2009)

³⁸ Jay Graham FASLA, “The Role of the TKF Foundation in the Study of Evidence Based Design for Wellness Spaces in Cities” (College Park, 2017).

Portal:

The first design feature, the portal, could be achieved both literally or figuratively. A literal portal could include a gate or a solid entry into the healing garden. A figurative portal could include a marker such as a tree, which could be placed so that when the visitor enters the space between two trees; the canopy acts as a surround (Figure 33).

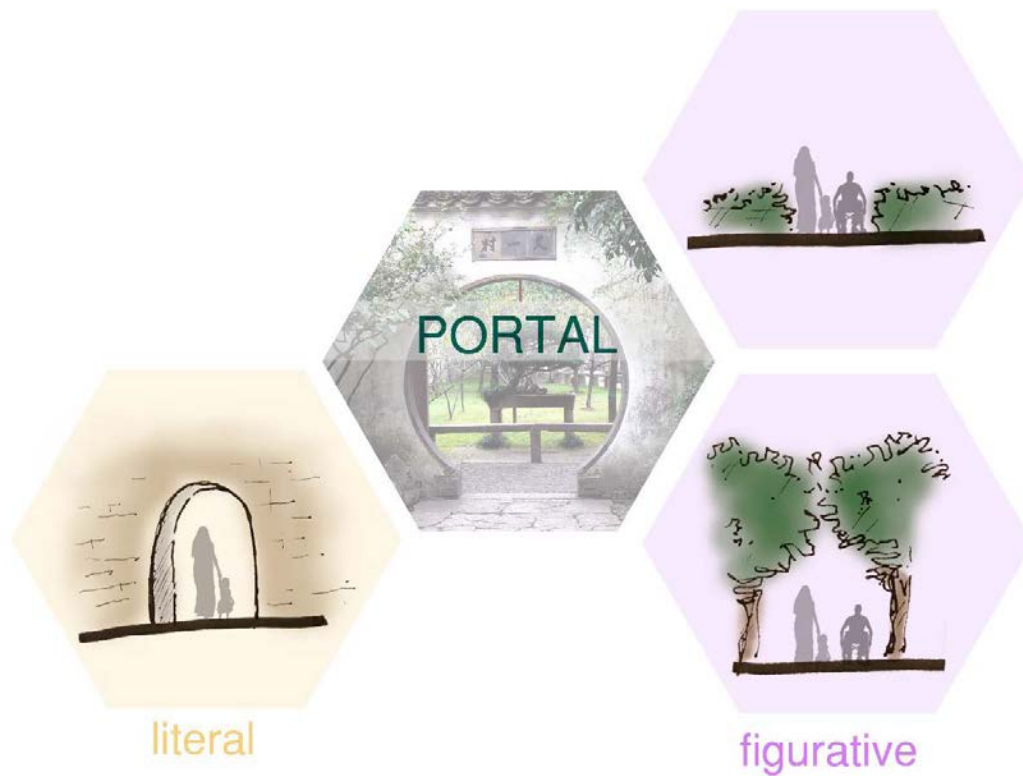


Figure 33: Healing Garden Feature- Portal (Source: author, base image: Wikimedia Commons, Suzhou Youyicun Garden in the Lingering Garden, Gislign, November 30th)

Path:

While the portal signifies an entry to the healing garden, the path dictates where the visitor goes next. A path can be designed in many ways to provide various patient and visitor experiences. A path can meander, to allow the visitor time to contemplate or it can be linear, to allow the visitor a clear view of a specific destination. A sequential space could also be designed in order to allow the visitor ample time to stop at various nodes; while a complete loop, would have the visitor travel in a full circle back to the portal. A path could be a combination of these entities (Figure 34).

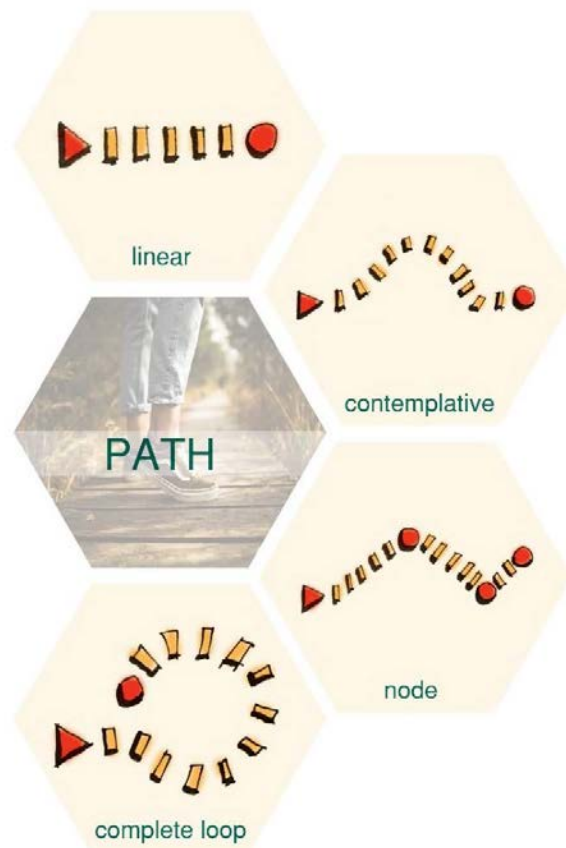


Figure 34: Healing Garden Feature- Path (Source: author, base image: Pexels, free personal and commercial use, Person, Tobi)

Destination:

While a path dictates where the visitor goes, the destination is a marker of the healing space and is of vital importance to the success of the space. A destination could include a water element, that has an ability to soothe and create tranquility through the rhythmic falling of water and the sounds created by the water flow. Another destination could be a bench. Typically, in a healing space there are minimal amounts of benches in order to maintain the privacy of an area. Once one visitor leaves, another can enjoy it. A third destination could include a view. Typically, the view from the bench can dictate the amount of healing a visitor can have. It is important to have a space that promotes inner thought and peace (Figure 35).

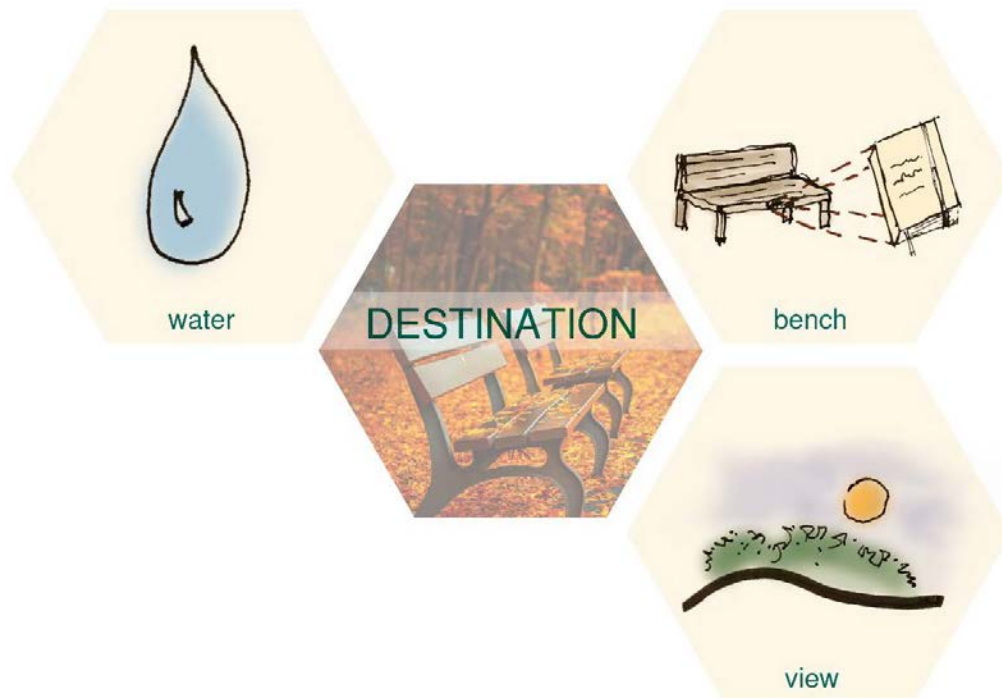


Figure 35:Healing Garden Feature- Destination (Source: author, base image: Pixels free personal and commercial use, Bench, Pixabay)

Surround:

Finally, the fourth element in designing a healing garden is the surround or enclosure. It is important that a visitor feel safe and secure within the healing garden and that the space is not too- large. This can be done in achieved in several different ways including ground materiality, grade change, and the enclosure materiality. In ground materiality, the enclosure is defined by a material change in the ground plane. This edge could also be defined by manipulating the ground plane to create berms around the healing space. The third way that the surround can be defined is by the enclosure materiality. This includes both the literal sense of enclosure, such as a wall, or a figurative sense, such as trees or shrubs that would create both privacy but transparency into the space (Figure 36).

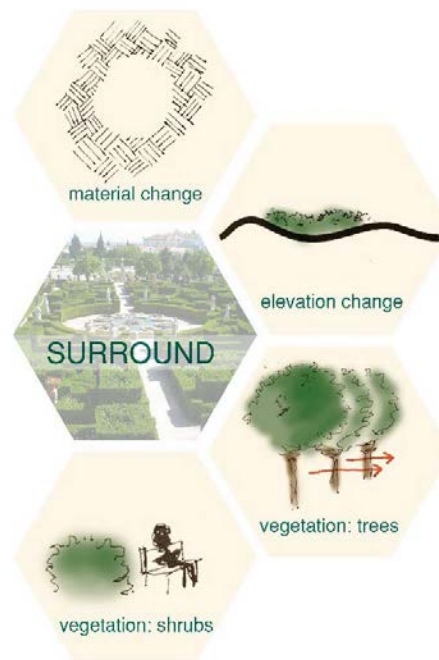


Figure 36: Healing Garden Feature- Surround (Source: author, base image: Wikimedia Commons, Jardim do Paco Episcopal, Vista geral do Jardim do Paco Episcopal Castelo Branco, Dinah Raphael, August 29th 2009)

GARDEN OF REMEMBRANCE - UNIVERSITY OF MARYLAND

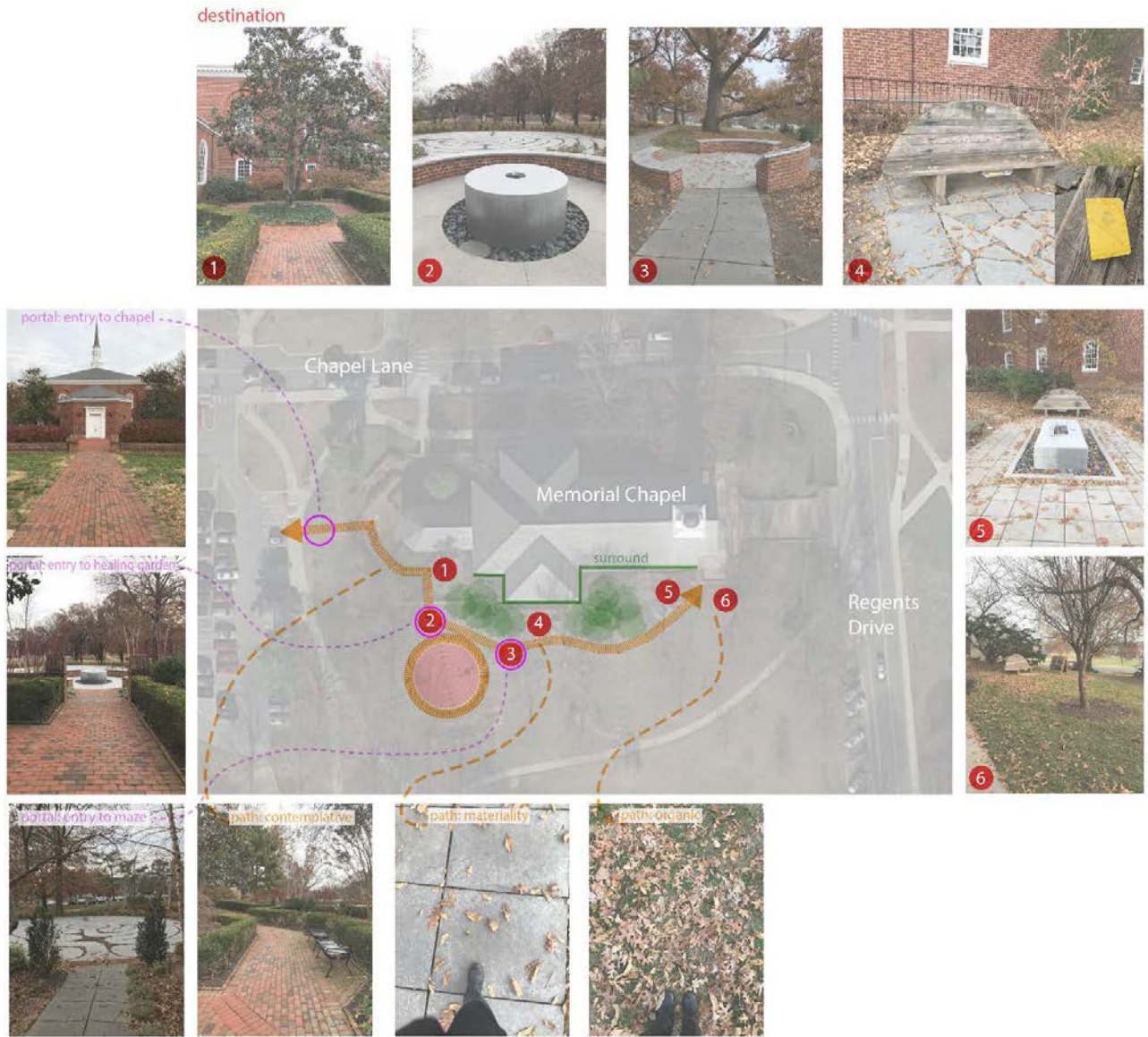


Figure 37: Garden of Remembrance (Source: images and diagram author, base map google maps)

Chapter 5: Further Precedent Studies

“If the architecture is any good, a person who looks and listens will feel its good effects without noticing.”

- Carlo Scarpa

HEALTHCARE

Paimio Sanatorium- Alvar Aalto- Finland- 1933

When Alvar Aalto’s designed the Paimio Sanatorium in Finland, he thought about how to design a building so that it would help those healing from tuberculosis. There was special attention paid not only to the view from each room, but how the room was designed as well. Every aspect in the room was designed to help those who are healing. Figure 38 illustrates the typical view out of a patient’s window. There is a view point not only from the bed, but also from the desk. Patients on different floors are exposed to different portions of the forest canopy that encompasses the Sanatorium.

With the design of the rehabilitation center, there will be special consideration placed on the patient experience, including the view out of each patient’s window. The overall design and layout of the room can be designed to help patients feel more comfortable during their recovery.

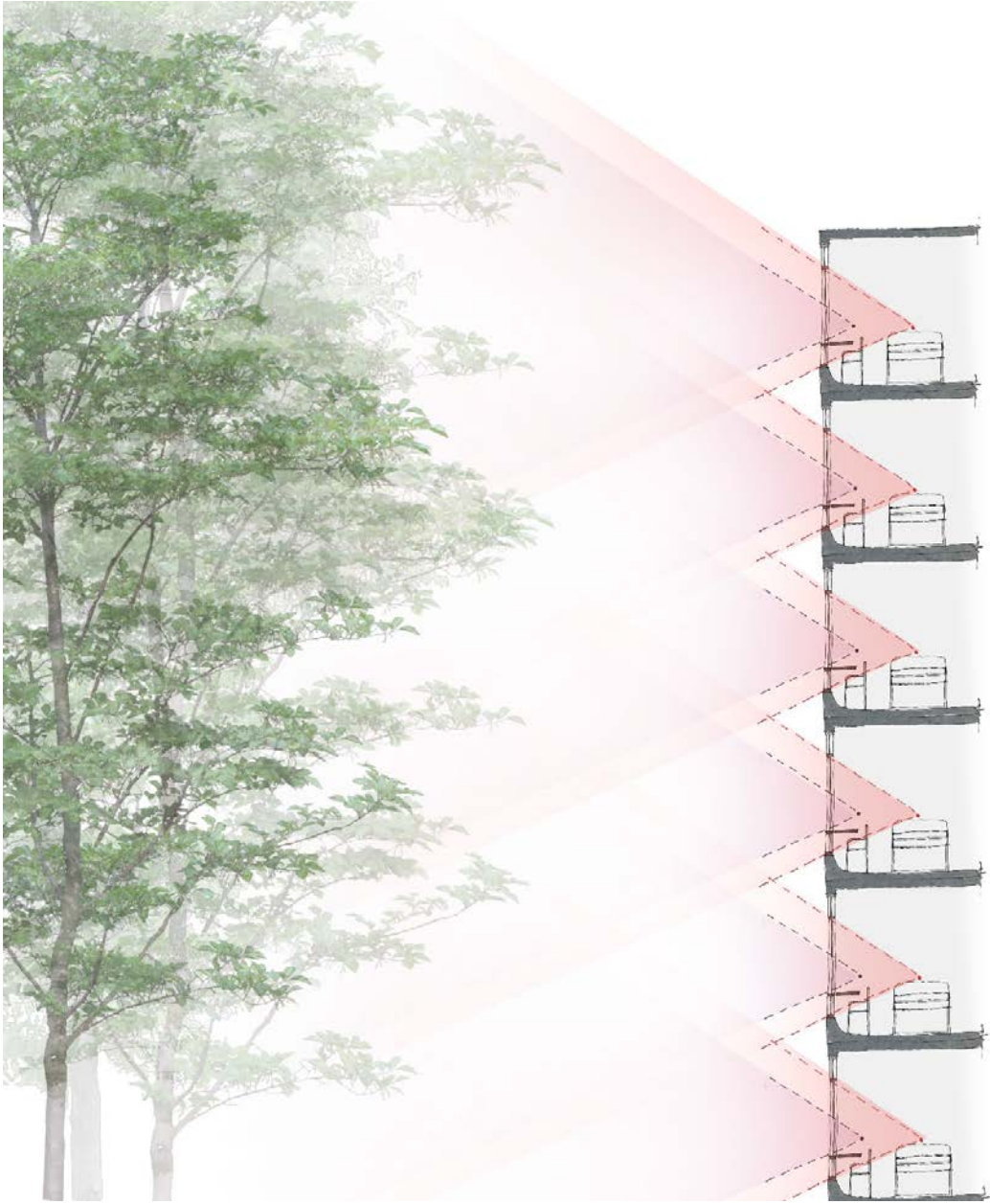


Figure 38: Paimo Sanatorium- Relationship Between Patient Rooms and Exterior (Source: author)

Maggie Centres- Europe

Maggie Centres offer emotional aid to individuals with cancer and their family members. There are several centres located throughout Europe, each one constructed using donations. Each Maggie Center is designed as a place of comfort and for this reason, they are well sought out.

The rehabilitation center could take those principles of offering a place for family and friends who need emotional or practical support and implement it in the design. It would also allow patients who are in severe emotional distress, due to their injuries, to enter an environment where they can cope. This could also provide an opportunity for individuals who are struggling with similar injuries to help and provide emotional support for each other.

The Maggie Centres are designed to incorporate a “home sweet home” quality and provide an aspect of hospitality and comfort to those who visit. The Maggie Centres have private rooms for those who need private consultation, but they also all include a kitchenette in the center, where individuals are free to feel at home which provides them with a familiar comfort. The rehabilitation center could be designed so it includes a similar comforting environment for friends and family. Figures 39 and 40 show an example of a successful Maggie Centre in Scotland. Figure 41 is a proposed Maggie Centre in Manchester.



Figure 39: Maggie Centre in Scotland (Source: www.MaggieCentres.org)



Figure 40: Maggie Centre in Scotland: Interior View of 'kitchen style' area (Source: www.MaggieCentre.org)



Figure 41: Proposed Maggie Centre in Manchester (Source: archdaily.com)

Woy Woy Rehabilitation Center- Australia- 2013

In 2013 an extension was added to the Woy Woy Public Hospital to create a rehabilitation wing. According to Arch Daily, the main theme of the design was “home in the park,” where emphasis was placed on healing environments in the form of ‘therapeutic outdoor courtyards.’³⁹ Figure 42 is an example of one of the outdoor courtyards that is used for physical therapy. Figure 43 is an image taken from an interior corridor looking outward to a courtyard.



Figure 42: Woy Woy Rehabilitation Center- Therapeutic Courtyard (Source: www.archdaily.com, Peter Bennetts)

³⁹ “Woy Woy Rehabilitation Unit / Woods Bagot | ArchDaily,” accessed December 14, 2017, <https://www.archdaily.com/551038/woy-woy-rehabilitation-unit-woods-bagot>.



Figure 43: Woy Woy Rehabilitation Center- View from Interior Corridor (Source: www.archdaily.com, Peter Bennetts)

Incorporating courtyards into the design provides these rehabilitation spaces with ample access to light and designed views to the outside. Figure 44 starts to analyze the program spaces and how the programmatic elements relate to one another. The green color symbolizes the different garden spaces throughout the healing center. Figure 45 analyzes this relationship in section by analyzing the courtyard and patient rooms. Figure 46 further dissects the relationship of each room to another within the main programmatic space.

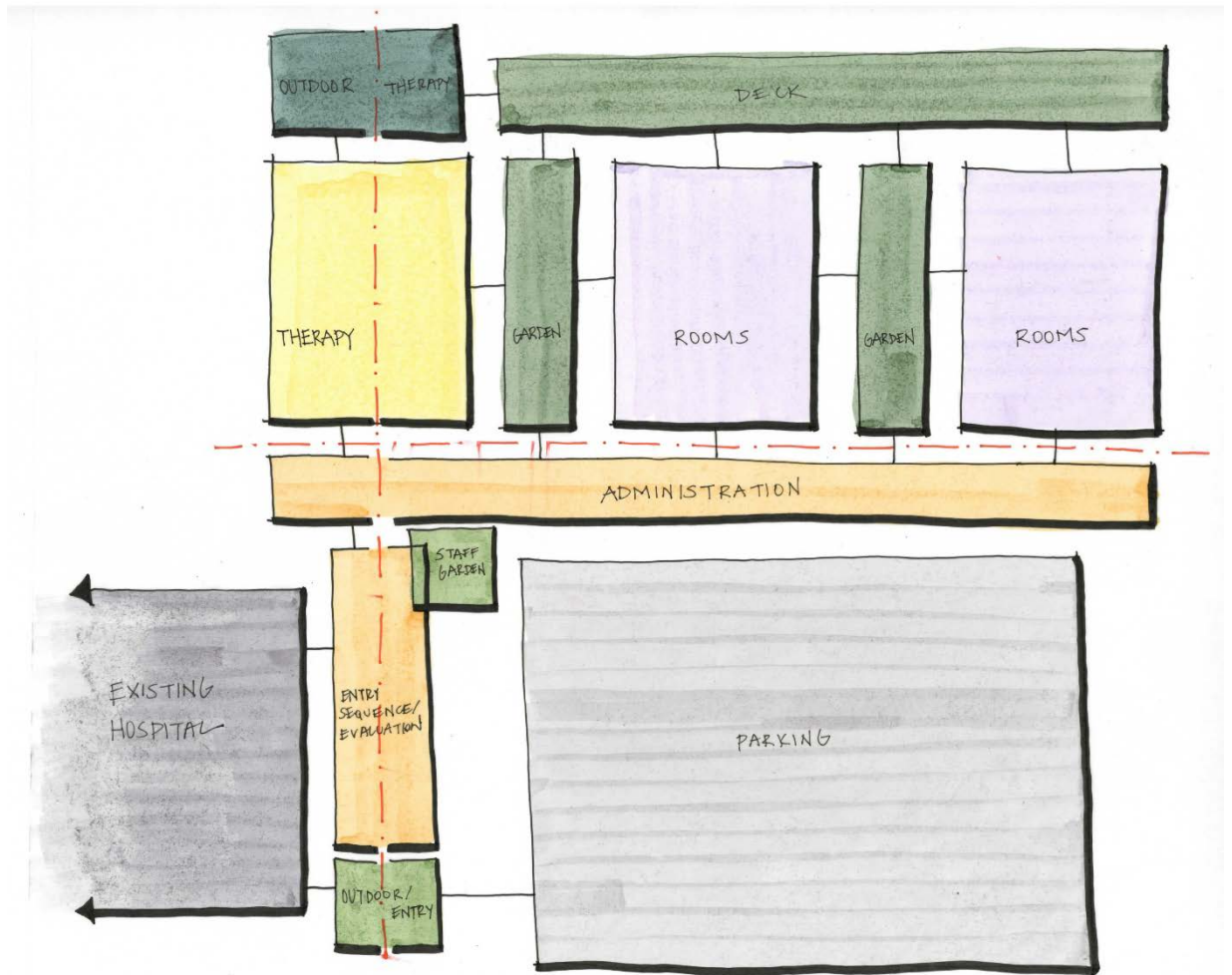


Figure 44: Woy Woy Rehabilitation Center- Main Program Spaces (Source: author)

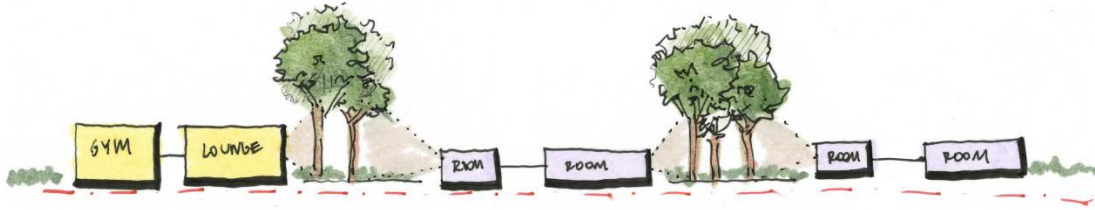


Figure 45: Woy Woy Rehabilitation Center- Section- Relationship Between Patient Rooms and Courtyards
(Source: author)



Figure 46: Woy Woy Rehabilitation Center- Further Program Diagrams (Source: author)

LIGHT AND WATER

Church of the Light- Tadao Ando- Osaka, Japan

The Church of Light is a minimalist design that captivates the visitor. The church is encapsulated by concrete, with portions of the concrete carved out at specific areas. Orientation to the sun was considered when designing this church. According to Tadao Ando, there was a strict budget for the design and construction of the building.⁴⁰ He looked at simple forms. By orienting the building correctly, he was able to have light seep through the wall in the form of a cross. Visitors fill the chapel every day because of the simple, yet powerful message that he was able to convey with the balance of building and light. Figure 47 is an image looking at the cross carved out of the wall and the light seeping through it.



Figure 47: Church of the Light- Interior (Source: www.archute.com, Church of the Light by Tadao Ando, November 5th, 2015, Brenda Nyawara)

⁴⁰ Dalia Tawil, "Tadao Ando Church of Light Documentary - YouTube," July 25, 2015, accessed December 14, 2017, <https://www.youtube.com/watch?v=7ZtfYOD5I8M>.

Church of Water- Tadao Ando- Tomamu, Japan

Similar to the Church of the Light, the Church of Water uses a minimalistic design to create a captivating experience. Instead of light as the main focus, water and contemplation are the main subjects. While a visitor who goes to the Chapel of Light will have a similar experience during any season, the Church of Water changes the experience with each season. From the chapel it is easy to see the change of time. Figure 49 and 50 compares the same view from different seasons.



Figure 48: Church of Water- Exterior View (Source: Flickr, Tadao Ando- Church of Water)



Figure 49: Church of Water- View Looking Out- Summer (Source: Wikiarquitectura.com)



Figure 50: Church of Water- View Looking Out- Winter (Source: the-talks.com)

DYNAMIC SPACE

Parc de la Villette- Paris, France

Parc de la Villette is a park located in Paris, France. Throughout the park, the visitor experiences many different types of spaces. Figure 51 is a plan and section of a portion of the park that includes a pathway and the Bamboo Garden, which is carved out of the ground. The pathway and the garden complement each other, because they provide the visitor with varying experiences. The pathway with the allee of trees is linear and has a certain order to it. It acts like a type of wall or guiding force throughout the park. While in the Bamboo Garden, the trees have no order to them and the pathways are meandering. In the allee of trees, the canopy of the trees do not touch above, so there is a sense that the space extends into the sky. In the garden, however, the trees are more densely populated and the canopy of the trees becomes more apparent. These two separate spaces come together and overlap with a series of walkways across the sunken Bamboo Garden. This also brings a different dimension to the experience. When walking across the series of pedestrian bridges, the visitor is looking down at the tree canopy. This provides one not only with the sense of being high up, but also with the sense that one is walking amongst the tree canopies.

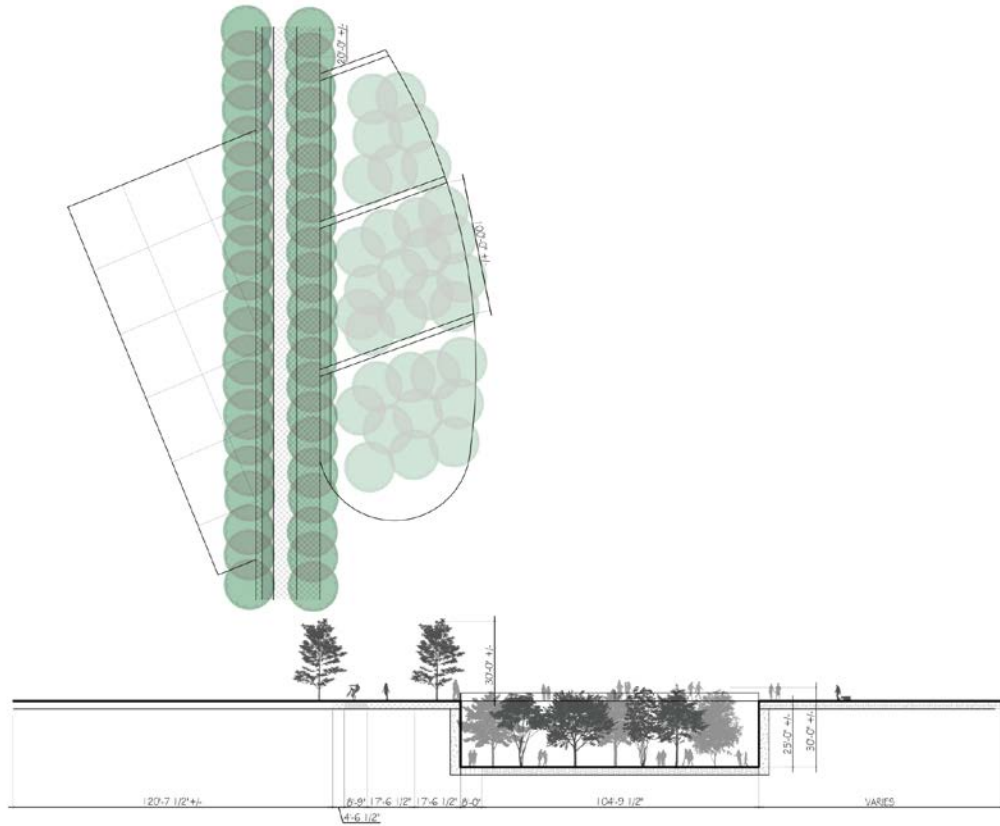


Figure 51: Parc de la Villette Plan and Section of Bamboo Garden (Source: author)

The concept of complementary experiences can be utilized in the project to enrich a patient’s experience and allow for multiple experiences to be had within the same space. This concept can not only be utilized to overlap similar programs, but it can also help activate the space.

Chapter 6: User Profile

The major users of the space include the users of the wellness center and the rehabilitation center. The wellness users are individuals in the community who will utilize the free screening clinic, those who want to engage in cooking classes, and those looking to learn healthier eating, work, and exercise habits.

The three major users of the rehabilitation space will include patients, medical staff, and family members. This chapter includes the typical routine of patients and therapist's, along with the types of injuries patients face and their recovery. Furthermore, it introduces a therapists medical training and highlights certain findings from primary interviews with physical and occupational therapists.

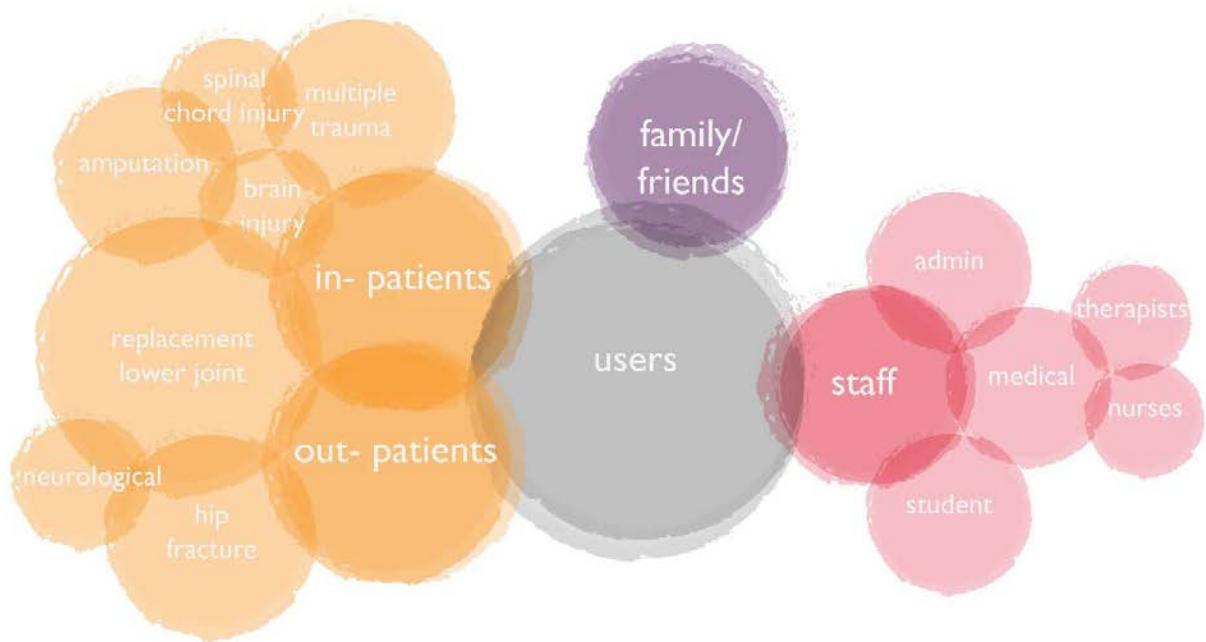


Figure 52: Typical Rehabilitation Users (Source: author)

REHABILITATION CENTER: PATIENT BACKGROUND

Patients are the first major users of rehabilitation centers. This section will discuss a patient's typical daily routine, the types of injuries they may have incurred, and the treatment process for those injuries.

Typical Routine

Out-Patient

Out-patients typically have therapy sessions three to five times a week, for 45 minutes to an hour for physical therapy and 30 to 45 minutes for occupational therapy, depending on the injuries. Patients typically have therapy for 3-5 months depending on the type of injury and severity.

Typically, patients come into the rehabilitation area and wait in the lounge until it is time for their appointment. It is not uncommon for out-patients to be accompanied by family members. Family members often provide the transportation and are typically the ones who help patients at home assimilate back to their daily routines. After being called for a treatment, the therapist asks about any issues the patient may be having and the treatment begins. If the therapist has any concerns regarding the patient or the progress of the treatment, he or she will oftentimes invite the family members into a private conference area after the therapy session in order to discuss those concerns.

In-Patient

The main difference between in-patients and out-patients is that in-patients stay at the facility where they are having the therapy. They typically have a private room or they share one with another individual going through physical therapy. In a hospital setting, the average length of stay varies. Some patients must have post-op physical therapy. This could mean that a patient is in the hospital for a few days to weeks or even months. Typically, even after a patient leaves the hospital, it is not uncommon to either be transferred to a rehabilitation center or to be prescribed out-patient services. It is oftentimes safer for a patient to be transferred to a rehabilitation center because there is less risk of infection than in hospitals.

Patients in rehabilitation centers are recovering from an array of different injuries and have varying lengths of stays; from weeks to months. A typical day for a patient is to stay in the room most of the day and leave for therapy. Some locations have activities that incentivize patients to leave the rooms, however, many end up staying in their rooms. In hospitals, patients usually remain in the room, because they are usually attached to different machines or an IV (Intravenous Therapy).

Patients are typically given breakfast, lunch, and dinner in their rooms. Some rehabilitation centers offer dining halls where patients can go to eat. Typically, patients have physical therapy six times a week, for 45 minutes to an hour, and occupational therapy four or five times a week, for 30 to 45 minutes. Physical therapy involves a physical therapist going to patient's room and taking the patient to the gym, where a series of exercises are performed. Occupational therapy is typically

done in the patient's room. It is meant to help an individual get comfortable with everyday activities. Some occupational therapy may also include going to an occupational therapy room with a kitchen. Some patients learn to cook something to test their motor skills and their development and progress with the therapy. This type of therapy is essential, since it helps patients assimilate and transition back to their normal routines. Figure 53 summarizes the typical program spaces both an out-patient and in-patient encounter during a stay or visit to a rehabilitation center.

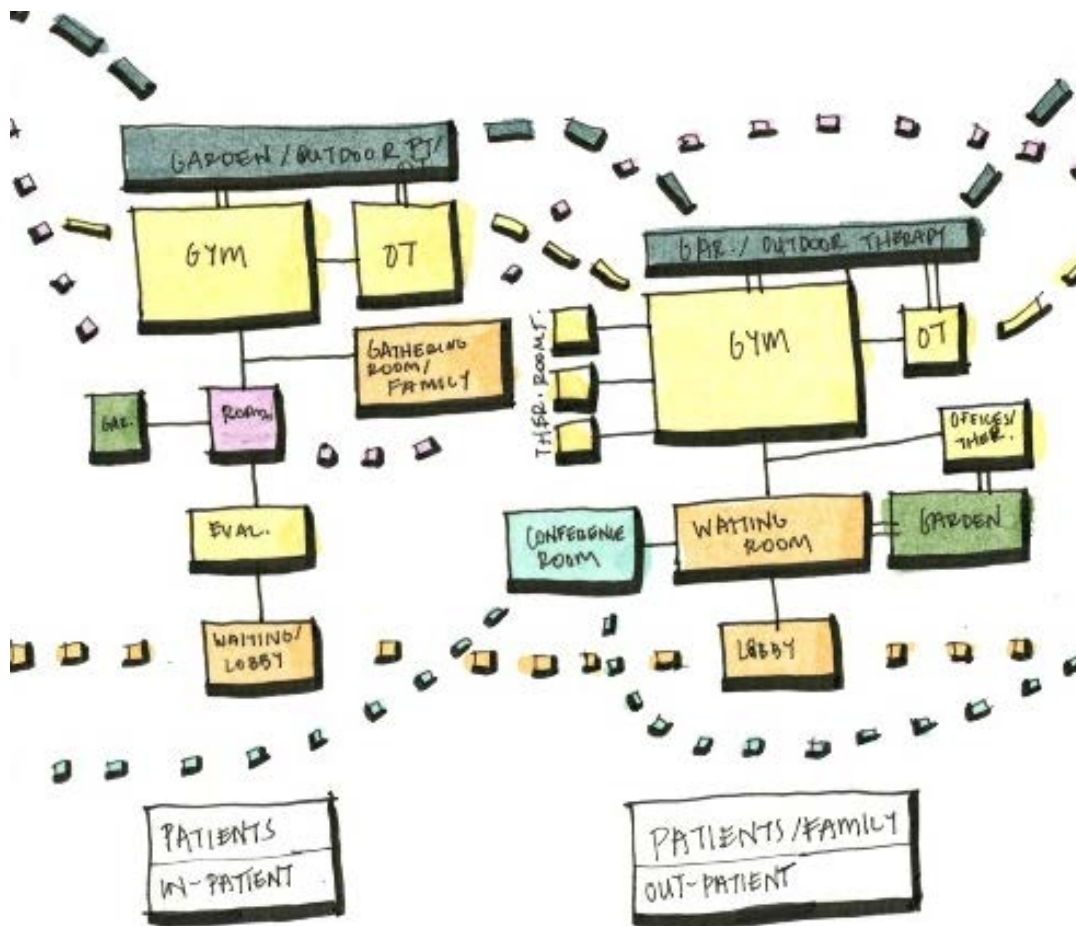


Figure 53: Patient Typical Program Trajectory (Source: author)

Types of Injuries and Treatment Process

The typical injuries for patients at rehabilitation centers can vary greatly.

Figure 54 is based on information gathered by the American Medical Rehabilitation Provider's Association.⁴¹ This diagram highlights the typical injuries that patients have suffered. The larger circles represent a greater portion of the population that has those injuries, while the smaller circles represent a smaller portion of the population.

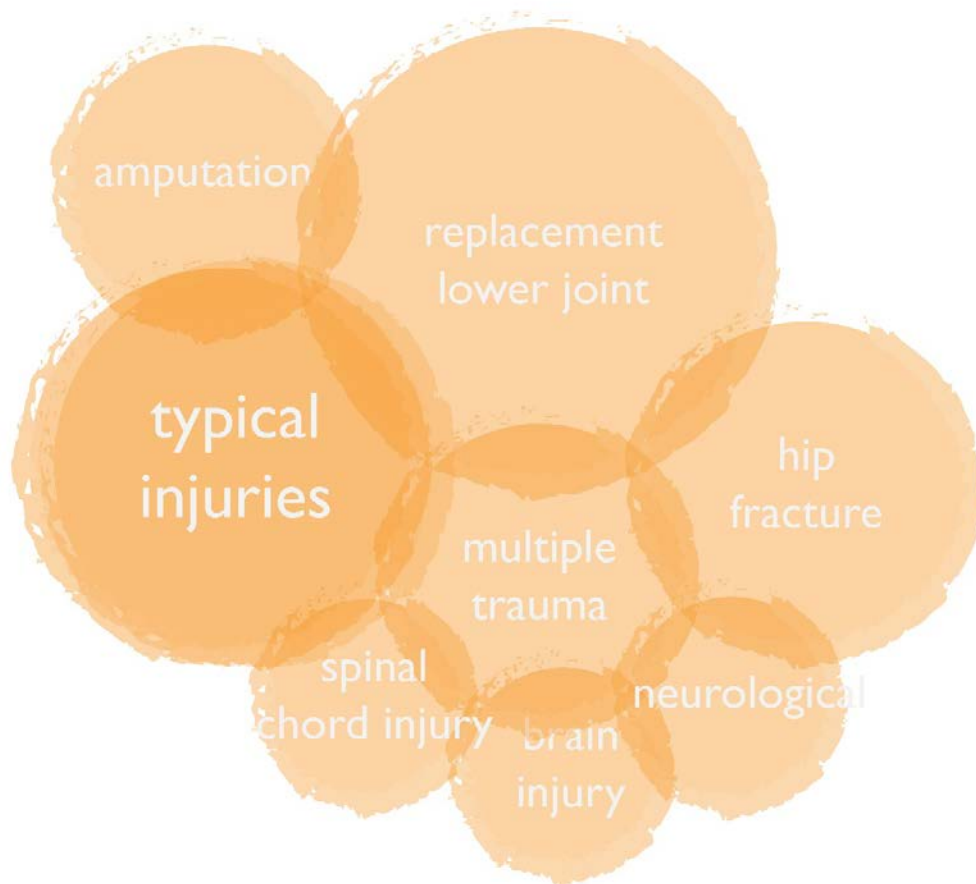


Figure 54: Diagram of Typical Patient Injuries (Source: author)

⁴¹ American Medical Rehabilitation Provider's Association, "Length of Stay and Costs of Injury Rehabilitation by Injury Category," accessed December 15, 2017, <https://icsw.nhtsa.gov/people/injury/research/RehabCosts/pages/AppB.htm>.

REHABILITATION CENTER: MEDICAL STAFF BACKGROUND AND INTERVIEWS

Aside from patients, another major user of rehabilitation centers is the medical staff. This section highlights the diverse types of credentials they may have, their educational background, and their typical daily routines.

Education and Credentials

Physical Therapist

According to APTA, the American Physical Therapy Association, in order to become a physical therapist in the U.S., one must be enrolled in a Doctor of Physical Therapy degree. Typically, the degree is a three-year program after one has earned a bachelor's degree.⁴² There are also options for a 3+3 program which is a pre-professional bachelor's degree and then the Professional Doctor of Physical Therapy degree. Upon getting the degree, a physical therapist can become certified in a variety of areas, including cardiovascular, clinical electrophysiology, geriatrics, neurology, orthopedics, pediatrics, sports, and women's health.

Occupational Therapist

According to the American Occupational Therapy Association, in order to become an occupational therapist, an individual must complete a master's degree or

⁴² Melissa Clark, "Physical Therapist (PT) Education Overview" (n.d.), accessed November 30, 2017, <http://www.apta.org/PTEducation/Overview/>.

doctorate degree in occupational therapy.⁴³ The master's degree is typically achieved in two to three years if the individual does not have a background in medicine. There are programs available that allow an individual to get both a bachelor's and master's degree in five years.

In order to become an occupational therapy assistant, an individual must have an associate's degree.⁴⁴ If those individuals wish to become licensed, they must complete an accredited Occupational Therapy Assistant Program, a bachelor's program, and a bridge program of two to three years to get their master's.

Typical Routine

Every therapist has a slightly different routine, however, based on primary interviews with therapists at different hospitals, there are some commonalities. Typically, the therapist will enter the building and go to the workroom where they will catch up on patient notes. Oftentimes, they will then have a group huddle where patient treatment and progress is discussed. From there, the therapists get assigned additional patients that they will be working with throughout that day. Then, the therapists either go to the patient room to take their patient to therapy, if they are an in-patient, or to the waiting room, if they are an out-patient.

Nurses must engage with the therapists in order to coordinate the scheduling of each patient. Some patients must be seen by the nurse first, and given certain

⁴³ "Common Academic Program Formats - AOTA," accessed November 30, 2017, <https://www.aota.org/Education-Careers/Considering-OT-Career/Resources/Sample-Admissions-Criteria.aspx>.

⁴⁴ Ibid.

medications, while other patients benefit more from seeing the therapist first. For example, in occupational therapy, a task that the OT might have the patient complete is dressing themselves. In order to do this, they must first communicate with the nurse and make sure that the patient has bathed, but not gotten fully dressed before meeting with them. The way the program spaces are organized can help promote ease of conversation between the therapists and the nurses. Figure 55 outlines the typical program spaces that the medical staff typically engages with on a daily basis.

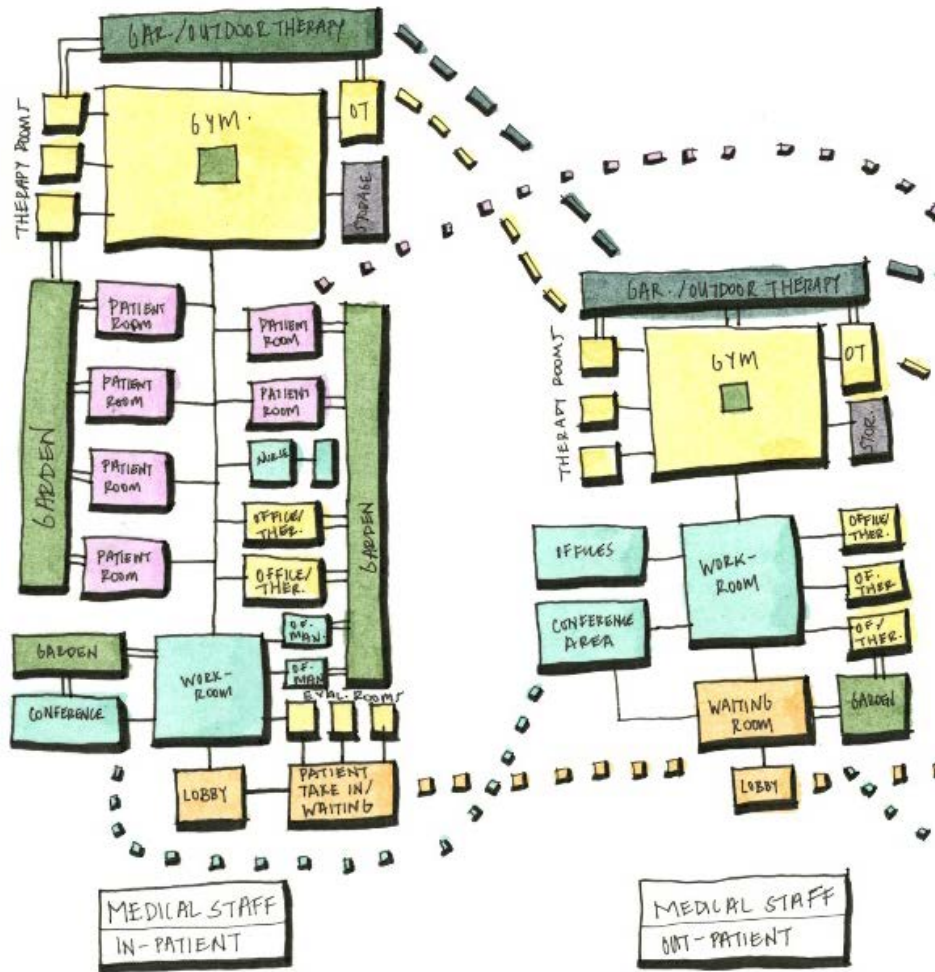


Figure 55: Medical Staff Typical Program Trajectory (Source: author)

Interviews

To further understand how to design for the users of the space, several hospitals and rehabilitation centers were surveyed and observed. In addition to this, interviews were conducted with medical staff in various hospitals and rehabilitation centers. This sub-section summarizes those findings from each location. The full findings from these interviews can be found in Appendix A.

Overall Findings

Overall, there were five main topics that were primarily brought up by therapists during the interviews. This included issues of accessibility, privacy, and inadequate space and quality. In addition to this, suggestions of outdoor simulated spaces and the importance of wall and floor design were also discussed. Figure 56 and 557 break down the percentage of therapists that brought up issues in each category. The next section discusses the findings in more detail.

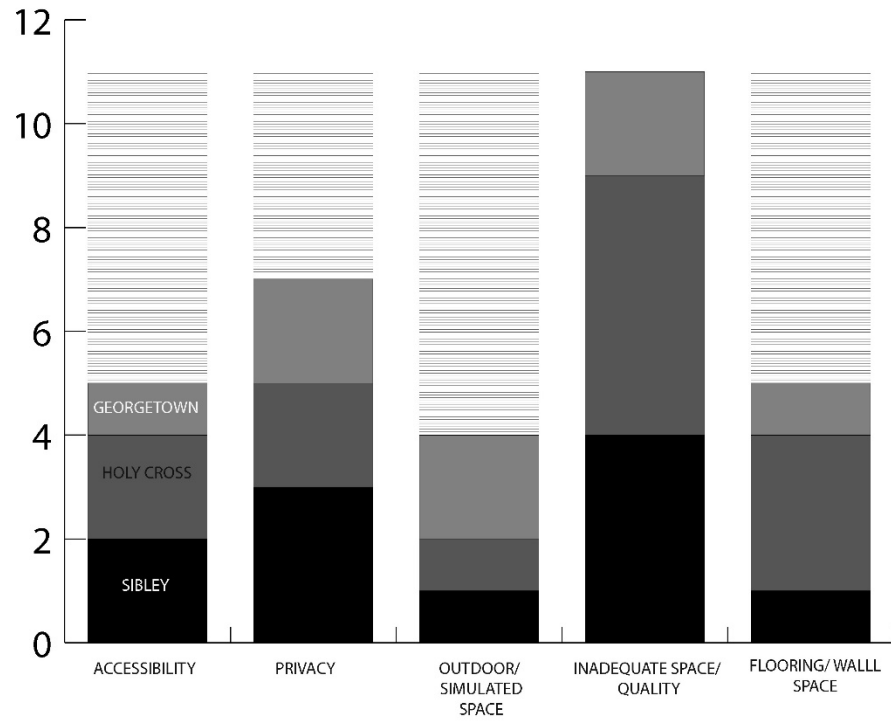


Figure 56: Graph of Primary Observations of Rehabilitation Areas, Y-axis indicates number of medical staff interviewed (Source: author)



Figure 57: Pie Graph of Findings from Primary Observations of Rehabilitation Areas (Source: author)

Overall Findings from Primary Observations

Holy Cross Hospital

In-Patient Area

“I like that there is good wall organization here which helps to keep crutches and other supplies on the walls.”

- Kim McRae, Physical Therapist, Holy Cross Hospital

The overall consensus was that the in-patient gym was well organized. The only thing brought about this space was about providing a better means to contain soiled utility (so it is not as obvious). The windows provide plenty of sunlight but since these windows are south facing, sometimes the light can be too intense. It would be helpful to have a mechanism where the therapists or the patient could control the amount of sunlight into the space.



Figure 58: Holy Cross Hospital In-Patient Gym (Source: author)

Out-Patient Area

*“There are no windows here. It is typically referred to as the **dungeon**. I am **Vitamin D deficient** and my doctor has told me that I must use supplements and advises me to go outside during the day.”*

- Theresa Catterton- Doherty, Lymphedema Specialist, Holy Cross Hospital

The outpatient gym at Holy Cross is located in the basement. This creates health issues for the medical staff because all of the staff interviewed was Vitamin D deficient. The gym also has a high influx of patients and at times becomes too-crowded.



Figure 59: Holy Cross Hospital Out-Patient Gym (Source: author)

Therapy Rooms

“Computer faces away from patient in the therapy rooms which is bad because you always want to be facing the patient.”

- Theresa Catterton- Doherty, Lymphedema Specialist, Holy Cross Hospital

The existing therapy rooms in the out-patient gym present a few challenges. The rooms are tight and make it difficult to maneuver once a wheelchair enters the space. The therapy room could benefit from re-arranging the existing furniture so that the therapist’s computer could face the patient instead of away.



Figure 60: Holy Cross Hospital Therapy Room (Source: author)

Overall Findings

| BENEFITS/ POSITIVE FEEDBACK | CONCERNS/ CHALLENGES |
|--|--|
| Good wall organization: Easy to keep crutches organized | Health concern: No natural light = Vitamin D deficiency |
| Implement some elements of yoga in therapy: the breathing and stretching | Lack of wall space for activities |
| Opportunity for outdoor simulated spaces with curbs and sidewalks | Gym gets crowded- not a lot of space for family |
| | Accessibility issues: Computer should face patient not away from patient- eye contact is important |
| | Rehab should be more central alongside the nurse and the doctor, often the PT and the OT are seen as add ons |
| | Therapy rooms are tough for bariatric patients- space too tight to maneuver and door is not wide enough (there are scrapes along the door from patients entering through the door) |

Sibley Memorial Hospital

In-Patient Area

“Typically, we will get those recovering from the same type of injury, for example hip fractures, and put them in a group. They get chatty and competitive which is good. It pushes them to do more.”

- Lisa Ronayne, Orthopedic Unit (In-Patient), Sibley Memorial Hospital

The PT’s and OT’s were enthusiastic about this space since it was recently renovated. There was discussion about the incorporation of a non-ADA bathroom which is helpful for patients transitioning home. One of the major drawbacks of this space is the lack of natural light.



Figure 61: Sibley Memorial Hospital In-Patient Gym (Source: author)

Out-Patient Area

“The updated flooring pattern in the gym includes a pattern change every 10 feet so patients know how far they have walked. Different flooring patterns are also used for floor activities”

- Dianne McCarthy, Occupational Therapist, Sibley Memorial Hospital

The out-patient gym includes a pool located adjacent to the space. It also has ample amounts of natural light with windows framing views to an egress door. The paving pattern on the floor is a helpful tool during therapy sessions.



Figure 62: Sibley Memorial Hospital Out-Patient Gym (Source: author)

Therapy Rooms



Figure 63: Sibley Memorial Hospital Individual Therapy Room (Source: author)

Overall Findings

| BENEFITS/ POSITIVE FEEDBACK | CONCERNS/ CHALLENGES |
|---|---|
| Community space in the in-patient area allows for activities | Accessibility: Some spaces are very narrow and difficult to maneuver |
| Most doors in rehabilitation spaces are automatic sliding doors- great! Especially for patients with walking devices | Modality (individual therapy rooms) are small and computers face away from patient. Ideally therapists always faces patient |
| Flooring pattern on floor very helpful because allows to know how far they have walked (pattern changes every 10 feet) | Walls are thin. Privacy issue between rooms |
| Non-ADA bathroom included in the orthopedic unit (in-patient)- great for patient transition home! | Most in-patient gyms have no windows |
| Dedicated conference room would be beneficial | |
| | |

Georgetown MedStar Hospital

Out-Patient Area

“Currently use the hallway as treatment space but it is tough because people are walking by. I would add a space that is athletic in nature- so you can have running or stop drills.”

- *Pamela Jennings, Physical Therapy (Out-Patient), Georgetown MedStar Hospital*



Figure 64: Georgetown MedStar Hospital Out-Patient Gym (Source: author)

| BENEFITS/ POSITIVE FEEDBACK | CONCERNS/ CHALLENGES |
|---|--|
| More ambulatory space would be nice- incorporation of a track or a loop | Privacy concern: curtains don't provide much privacy |
| More wall space would be helpful | Gym gets very crowded |
| Incorporating simulated spaces would benefit patients (curbs, stoplights, car) | Evaluation room too-small: makes it difficult for therapist to face patient |
| | |

National Rehabilitation Hospital

In-Patient Area (Atrium)



Figure 65: National Rehabilitation Hospital Atrium (Source: author)



Figure 66: National Rehabilitation Hospital Atrium Area- Group Therapy Tables (Source: author)

Independence Square (In-Patient and Out-Patient Occupational Therapy)



Figure 67: National Rehabilitation Hospital- Independence Square Entry (Source: author)



Figure 68: National Rehabilitation Hospital- Independence Square Cafe and Kitchen Areas (Source: author)



Figure 69: National Rehabilitation Hospital- Independence Square Car OT Area (Source: author)

Overall Findings

| BENEFITS/ POSITIVE FEEDBACK | CONCERNS/ CHALLENGES |
|--|--|
| Development of ‘smart rooms’ | Space in atrium can get tight- difficult to maneuver, especially with patients |
| A breakroom for medical staff would be beneficial | Conference rooms can be cramped |
| Tables recess into ceiling- allow for group therapy | Patient rooms are often too-small- makes it difficult to maneuver |
| Atrium space allows for a lot of natural light into in-patient gym areas | In-patient area lacks waiting area for family |
| | |

REHABILITATION CENTER: FAMILY MEMBERS

Even though patients and medical staff are the major users of rehabilitation centers, family members are also an integral part of the rehabilitation experience and should be considered in the design. Family members are there to provide emotional support and help the patient transition to home. Figure 70 outlines a potential family members experience through the different program spaces in the rehabilitation center.

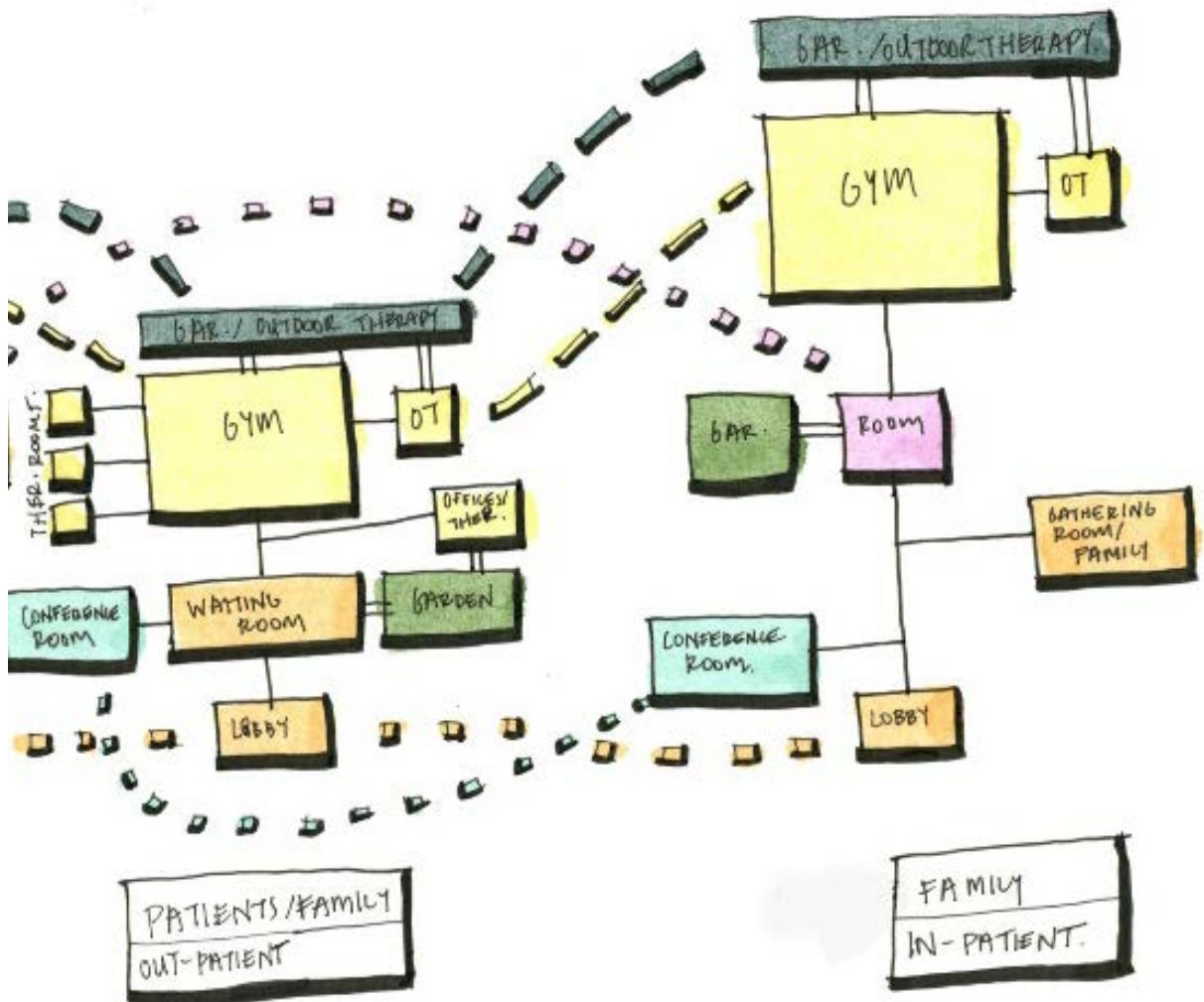


Figure 70: Family Members Typical Program Trajectory (Source: author)

WELLNESS CENTER USERS

The users of the wellness center are individuals in the community who are looking to develop healthier habits.

Users of this space amenity:

- Individuals in the community who would benefit from free screenings and a clinic
- Individuals who would like to take cooking classes and learn how to make healthy meals- farm to table
- Individuals who want to learn how to successfully maintain a garden and what vegetables are good for each season
- Individuals who want mind and body classes where there is emphasis placed on meditation and yoga
- Individuals who want to move! Understand what a healthy workout routine consists of

Chapter 7: Program Spaces as a Vehicle for Recovery

The program of the rehabilitation center will focus primarily on its three major users which are the patients, their families, and the medical staff. The major components of the program include therapy areas, a central social area, designed outdoor spaces, and the patient rooms.



Figure 71: Main Program Spaces Diagram (Source: author)

PRIMARY REHABILITATION SPACES AND DESCRIPTIONS

Clinical Areas

Clinical areas consist of exam rooms and therapy areas, which include both public and private areas. The public areas include the physical therapy and occupational therapy areas. The rehabilitation center will include both **in-patient** and **out-patient** care and will be two stories. The first level will be primarily for out-patient therapy, while the second floor will focus on the in-patients. There will be a main **therapy gym** which will have a relationship in section, in order for in-patients and out-patients to partake in physical therapy within the same realm. In addition to the typical therapy spaces, the rehabilitation center will also include **outdoor therapy** areas for **occupational therapy**. It is important to include ambient walking areas so that patients can practice walking or practicing other day-to day activities.

The private therapy areas will be individual **rooms for treatment** that will be sound-proof and private. These rooms will be located near the main therapy areas. The rooms will be designed so that patients have the adequate accessibility into the room, the therapists have a view of the patient when sitting at the computer, and that there is enough storage for not only medical equipment and supplies, but for for wheelchairs or walkers as well so that they do not obstruct egress.

Direct Clinical Support

Direct clinical support areas are areas that provide a backbone to the main therapy areas. This includes **medical supply** areas, **utility** areas (both clean and soiled utility), medical equipment, and **patient restroom** areas. These areas should be located near the main therapy areas so that they are easily accessible by the medical staff. While these areas should be easily accessible to therapists, they should be inconspicuous to patients and families. Other than the patient restroom facilities, patients and families should not have any direct contact with these areas.

Ancillary Clinical Support

Ancillary clinical support are areas that have a secondary relationship with the clinical areas. This includes the **waiting area**, front desk, **public restrooms**, **storage** areas, and any other administrative work areas.

Staff Support

Staff support areas include **conference rooms**, breakrooms, **offices**, PT and OT **workrooms**, and manager office areas. These staff areas should be close to the main therapy areas, while also having a relationship with the waiting room. The conference room, however, should be located in a private area in order to maintain patient confidentiality. Conference rooms are often used to discuss a patient's treatment and other sensitive information with the patient and his or her family members.

Additional Areas

Upon analyzing precedents and the primary observations of rehabilitation areas, the following are additional areas that the rehabilitation area will have:

- **Healing garden-** including private (from some patient rooms), semi-private (conspicuous areas throughout the rehabilitation center), and more public (connect with community, potentially offer as a benefit to the public), also include horticultural therapy
- **Non-denominational chapel** (to help with healing process)
- **Rooms for alternative medicine** (chiropractic care, aromatherapy, hydrotherapy)
- **Family and activity space**
- **Community space-** area that can be rented to public, hold different events, hold classes for community (public benefit)

PROGRAM APPROACH THROUGH USER EXPERIENCE

In order to further understand how program spaces should be spatially arranged in the design, a linear approach of program per user was utilized. Figure 72 includes the users of the rehabilitation center and what program elements are most relevant to them for both in-patient and out-patient areas. The diagram also shows the connection of similar program spaces to provide a diagram of how the program could potentially be arranged.

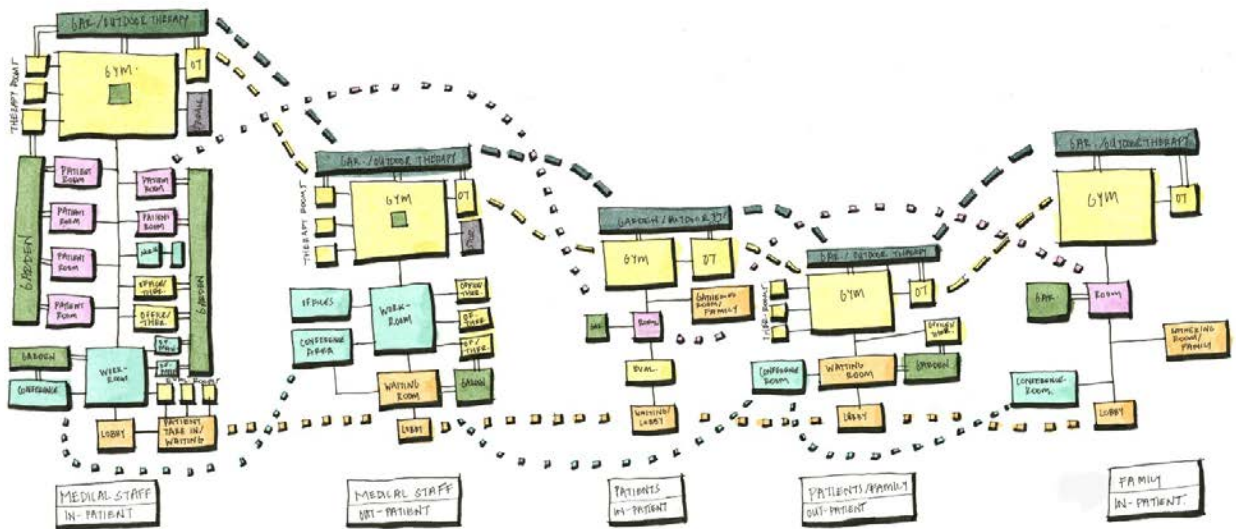


Figure 72: Linear Program of Main Spaces Per User (Source: author)

PROGRAM SYNTHESIS OF PRIMARY OBSERVATION

To understand how large the proposed program spaces in the rehabilitation center should be, an analysis of the program dimensions and areas were conducted, from primary source observations. Figure 73 includes program from out-patient areas.

| Out-Patient Program of Primary Observation | | | | |
|---|---------------------------------|-----------------|-------------------|-------------------|
| | Holy Cross | Sibley | Georgetown | Nat. Rehab |
| Clinical Services | | | | |
| <u>Therapy Room</u> | | | | |
| <i>Dimension (FT)</i> | 8 x 12 | 10 x 18; 8 x 12 | 12 x 16; 8 x 10 | |
| <i>Area (SF)</i> | 96 | 180; 96 | 192; 80 | |
| <i>Quantity</i> | 6 | 1;4 | 1; 2 | |
| <i>Sub-Total Area (SF)</i> | 576 | 564 | 352 | |
| <u>Exam Room</u> | | | | |
| <i>Dimension (FT)</i> | | | 7 x 10 | |
| <i>Area (SF)</i> | | | 70 | |
| <i>Quantity</i> | | | 3 | |
| <i>Sub-Total Area (SF)</i> | | | 210 | |
| <u>Pool</u> | | | | |
| <i>Dimension (FT)</i> | | 30 x 50 | | |
| <i>Area (SF)</i> | | 1,500 | | |
| <i>Quantity</i> | | 1 | | |
| <i>Sub-Total Area (SF)</i> | | 1,500 | | |
| <u>Physical Therapy</u> | | | | |
| <i>Dimension (FT)</i> | 23 x 48 | 40 x 60 | 24x50; 24x60 | |
| <i>Area (SF)</i> | 1,104 | 2,400 | 1,200; 1,440 | |
| <i>Quantity</i> | 1 | 1 | 1; 1 | |
| <i>Sub-Total Area (SF)</i> | 1,104 | 2,400 | 2,640 SF | |
| <u>Occupational Therapy</u> | | | | |
| <i>Dimension (FT)</i> | | | 12 x 20 | |
| <i>Area (SF)</i> | 14 x 20 | | 240 | |
| <i>Quantity</i> | 280 | | 1 | |
| <i>Sub-Total Area (SF)</i> | 280 | | 240 | |
| Total Clinical Area: | 1,960 SF | 4,464 SF | 3,442 | |
| Direct Clinical Support | | | | |
| <u>Medical Supplies</u> | | | | |
| <i>Dimension (FT)</i> | 10 x 30 | 3 x 45 | 8 x 12 | |
| <i>Area (SF)</i> | 300 | 135 | 96 | |
| <i>Quantity</i> | 1 | 1 | 1 | |
| <i>Sub-Total Area (SF)</i> | 300 | 135 | 96 | |
| <u>Patient Toilet Room</u> | | | | |
| <i>Dimension (FT)</i> | 7 x 8 | 7 x 8 | 7 x 8 | |
| <i>Area (SF)</i> | 56 | 56 | 56 | |
| <i>Quantity</i> | 1 | 2 | 1 | |
| <i>Sub-Total Area (SF)</i> | 56 | 112 | 56 | |
| <u>Soiled/ Clean Utility</u> | | | | |
| | (same room as non- med storage) | | | |

| | | | | |
|--|-------------------|---------------|---------------|--|
| <i>Dimension (FT)</i> | 14 x 20 | 8 x 8 | 5 x 5 | |
| <i>Area (SF)</i> | 240 – 215 (stor.) | 64 | 25 | |
| <i>Quantity</i> | 1 | 1 | 1 | |
| <i>Sub-Total Area (SF)</i> | 25 | 64 | 25 | |
| Lockers | | | | |
| <i>Dimension (FT)</i> | | 15 x 15 | | |
| <i>Area (SF)</i> | | 225 | | |
| <i>Quantity</i> | | 2 | | |
| <i>Sub-Total Area (SF)</i> | | 450 | | |
| Total Direct Clinical Support Area: | 381 SF | 761 SF | 177 SF | |

Ancillary Clinical Support

| | | | | |
|---|--------------------|---------------|---------------|--|
| Waiting Room/ Reception | | | | |
| <i>Dimension (FT)</i> | 20 x 28 | 18 x 22 | 25 x 26 | |
| <i>Area (SF)</i> | 560–office-mech | 396 | 650 | |
| <i>Quantity</i> | 1 | 1 | 1 | |
| <i>Sub-Total Area (SF)</i> | 431 | 396 | 650 | |
| Front Desk/ Patient Intake | | | | |
| <i>Dimension (FT)</i> | 7 x 20 | 9 x 6 | 10 x 10 | |
| <i>Area (SF)</i> | 140 | 54 | 100 | |
| <i>Quantity</i> | 1 | 1 | 1 | |
| <i>Sub-Total Area (SF)</i> | 140 | 54 | 100 | |
| Storage (non- medical) | (same as utility) | | | |
| <i>Dimension (FT)</i> | | | | |
| <i>Area (SF)</i> | 14 x 20 | 8 x 10 | 8 x 12 | |
| <i>Quantity</i> | 280 – 25 (utility) | 80 | 96 | |
| <i>Sub-Total Area (SF)</i> | 1 | 1 | 1 | |
| | 215 | 80 | 96 | |
| Total Ancillary Clinical Support Area: | 786 SF | 530 SF | 846 SF | |

Staff Support

| | | | | |
|----------------------------|-------------------|------------|-----------------|--|
| Breakroom | (same as OT room) | | | |
| <i>Dimension (FT)</i> | | | | |
| <i>Area (SF)</i> | | | | |
| <i>Quantity</i> | | | | |
| <i>Sub-Total Area (SF)</i> | | | | |
| Staff Restroom | | | | |
| <i>Dimension (FT)</i> | 7 x 8 | | 7 x 8 | |
| <i>Area (SF)</i> | 56 | | 56 | |
| <i>Quantity</i> | 1 | | 1 | |
| <i>Sub-Total Area (SF)</i> | 56 | | 56 | |
| PT/OT Staff Room | | | | |
| <i>Dimension (FT)</i> | 14 x 28 | 15 x 20 | 12 x 24 | |
| <i>Area (SF)</i> | 392 | 300 | 288 | |
| <i>Quantity</i> | 1 | 1 | 1 | |
| <i>Sub-Total Area (SF)</i> | 392 | 300 | 288 | |
| Office | | | | |
| <i>Dimension (FT)</i> | 10 x 12 | 12 x 14 | 8 x 10; 12 x 15 | |
| <i>Area (SF)</i> | 120 | 168 | 80; 180 | |
| <i>Quantity</i> | 5 | 2 | 2; 2 | |
| <i>Sub-Total Area (SF)</i> | 600 | 336 | 520 | |
| Lockers | | | | |

| | | | | |
|----------------------------------|------------------|-----------------|-----------------|--|
| <i>Dimension (FT)</i> | | | 7 x 24 | |
| <i>Area (SF)</i> | | | 168 | |
| <i>Quantity</i> | | | 1 | |
| <i>Sub-Total Area (SF)</i> | | | 168 | |
| Total Staff Support Area: | 1,048 SF | 636 SF | 1,032 SF | |
| TOTAL: | 4, 175 SF | 6,080 SF | 5,497 SF | |

Figure 73: Program Analysis of Primary Observation Areas- Outpatient (Source: author)

| Out-Patient Program of Primary Observation Ratios | | | | |
|--|----------------------------|---------------------------|--------------------------|--|
| Total Clinical Area: | 1,960 SF | 4,464 SF | 3,442 | |
| Total Direct Clinical Support Area: | 381 SF | 761 SF | 177 SF | |
| Total Ancillary Clinical Support Area: | 786 SF | 530 SF | 846 SF | |
| Total Staff Support Area: | 1,048 SF | 636 SF | 1,032 SF | |
| TOTAL AREA: | 4, 175 SF | 6,080 SF | 5,497 SF | |
| Ratio of Clinical and Direct Clinical Areas: | 5 : 1 80%, 20% | 6 : 1 85%, 15% | 20 : 1 95%, 5% | |
| Ratio of Clinical and Ancillary Areas: | 5 : 2 60%, 40% | 17 : 2 89%, 11% | 4 : 1 75%, 25% | |
| Ratio of Clinical and Staff Areas: | 1.8 : 1 65%, 35% | 6 : 1 85%, 15% | 4 : 1 75%, 25% | |

Figure 74: Ratio of Program Analysis- Outpatient (Source: author)

PROPOSED PROGRAM TABULATION

The proposed area of each program is derived from both the AIA Guidelines for healthcare facilities and from analyzing primary observations from Figures 73 and 74. The ratios were utilized to help achieve an appropriate balance between major program sections. Some of the ratios were adjusted in order to account for the feedback received from the medical staff interviews. Some of the office spaces, exam rooms, and staff areas can be shared with both the out-patient and in-patient areas, thus they are not included in the proposed in-patient areas tabulation.

Below is a detailed summary of how each program section was tabulated for out-patient areas:

Clinical Services

- based on Figure 36 tabulation
- physical therapy larger due to medical staff interviews deeming existing space too- small

Direct Clinical Support

- based on Figure 37 ratio
- medical supplies larger due to medical staff interviews deeming existing space too- small

Ancillary Clinical Support

- based on Figure 37 ratio
- waiting room and storage larger due to medical staff interviews deeming existing space too- small

Staff Support

- based on Figure 37 ratio
- PT/OT staff room larger due to medical staff interviews deeming existing space too- small, also including in-patient OT and PT

Additional Areas

- based on precedent studies and sizes of other program spaces

| Proposed Program: Out-Patient Areas | | | | |
|--|------------------|-------------|------------------------------|-------------------------|
| Clinical Services | | | | |
| | Dimension | Area | # Rooms | Sub- Total Area |
| <u>Therapy Room</u> | 11 x 14 | 144 | 7 | 1,008 SF |
| <u>Exam Room</u> | 10 x 14 | 140 | 3 | 420 SF |
| <u>Physical Therapy</u> | | 3500- 4000 | 1 | 3,500 – 4,000 SF |
| <u>Occupational Therapy</u> | | 250 | 1 | 250 SF |
| Total Clinical Area Approx: 5,200- 5,600 SF | | | | |
| Direct Clinical Support | | | | |
| <u>Medical Supplies</u> | | 600 | | 600 SF |
| <u>Patient Toilet Room (OT)</u> | 7 x 8 5 x 7 | 56 35 | 1 ADA 1 non- ADA (for OT) | 91 SF |
| <u>Soiled/ Clean Utility</u> | | 80 | 1 | 80 SF |
| Total Direct Clinical Support Area: 771 SF | | | | |
| Ancillary Clinical Support | | | | |
| <u>Waiting Room/ Reception</u> | | 700 | | 900 SF |
| <u>Front Desk/ Patient Intake</u> | | 100 | | 100 SF |
| <u>Conference Room</u> | 14 x 30, 10 x 15 | 420, 150 | 1, 1 | 570 SF |
| <u>Storage (non- medical)</u> | | 700 | | 700 SF |
| Total Ancillary Clinical Support Area: 2,270 SF | | | | |
| Staff Support | | | | |
| <u>Breakroom</u> | | 400 | | 400 SF |
| <u>Staff Restroom</u> | | | | |
| <u>PT/OT Staff Room</u> | | 800 | | 800 SF |
| <u>Office</u> | | 700 | | 700 SF |
| <u>Lockers</u> | | 500 | | 500 SF |
| Total Staff Support Area: 2,400 SF | | | | |
| Additional Areas | | | | |
| <u>Healing Gardens</u> | | 200 | 4 | 800 SF |
| <u>Chapel</u> | | 200 | | 200 SF |
| <u>Community Space</u> | | | | |

| | | | | |
|--|--|-------|---|--|
| <u>Therapy Rooms for Chiropractic Care and Acupuncture</u> | | 140 | 3 | 420 SF |
| <u>Café- seating, kitchen</u> | | 2,000 | | 2,000 SF |
| | | | | Total Additional Area: 3,420 SF |
| | | | | TOTAL: 13,831 SF |

Below is a detailed summary of how each program section was tabulated for

in-patient areas:

Clinical Services

- based on in-patient primary observation
- AIA Guidelines

Direct Clinical Support

- based on Figure 37 ratio
- medical supplies larger due to medical staff interviews deeming existing space too- small

Patient Areas

- based on in-patient primary observation and precedents
- AIA Guidelines

| Proposed Program: In-Patient Areas | | | | |
|---|------------------|-------------|----------------|------------------------|
| Clinical Services | | | | |
| | Dimension | Area | # Rooms | Sub- Total Area |
| <u>Therapy Room</u> | 11 x 14 | 144 | 5 | 720 SF |
| <u>Physical Therapy</u> | | 3,500 | | 3,500 SF |
| <u>Occupational Therapy</u> | | 1,500 | | 1,500 SF |
| Total Clinical Area: 5,720 | | | | |
| Direct Clinical Support | | | | |
| <u>Medical Supplies</u> | | 500 | | 500 SF |
| <u>Patient Toilet Room</u> | | | | |
| <u>Soiled/ Clean Utility</u> | | 80 | | 80 SF |
| Total Direct Clinical Support Area: 580 SF | | | | |
| Patient Areas | | | | |
| <u>Patient Room</u> | | 200 | 50 | 10,000 SF |
| <u>Dining, Recreation, Day Spaces</u> | | 2,750 | | 2,750 SF |
| Total Patient Area: 12,750 SF | | | | |
| Other Areas | | | | |
| <u>BOH- Kitchen</u> | | 1,500 | | 1,500 SF |
| Total Additional Area: 1,500 SF | | | | |
| TOTAL: 20,550 SF | | | | |

Add kitchen area- back of house area, nurse areas, meeting rooms, conference rooms

| Total Building Area | | | |
|----------------------------|-------------------|--------------------|-------------------|
| Out-Patient | In-Patient | Circulation | Total Area |
| 13,831 | 20,550 | 6,875 | 41,256 SF |

PROGRAM SPACES DIAGRAM

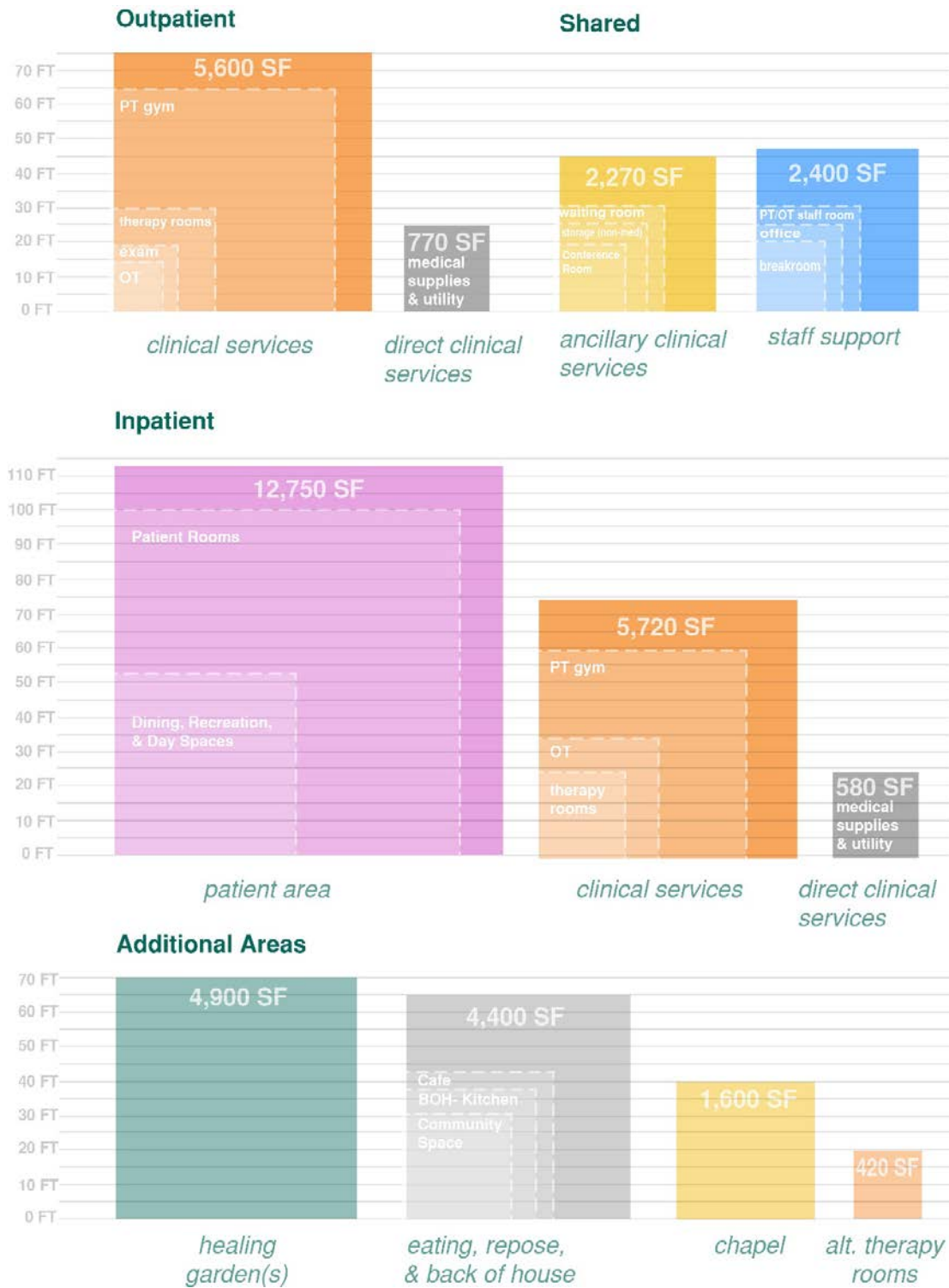


Figure 75: Program Spaces Diagram (Source: author)

Chapter 8: Site Selection and Design Approach

The essential program spaces begin to set a standard for the type of location necessary to implement them. This chapter highlights the process of selecting a site while also providing initial concept designs for each potential site.

SITE SELECTION CRITERIA

Before selecting a site, it is necessary to create certain site parameters pertinent to the project development. These parameters include a proximity to medical buildings, a connection with nature, and minimal disruption to the land. One of the most important factors in selecting a site for this project is the proximity of the site to existing medical buildings. Proximity to medical buildings, such as a hospital or medical hub, would provide a framework for the proposed rehabilitation center to have a relationship with current programs or expand upon them. Proximity to a hospital also offers the reassurance that in a medical emergency, patients are able to be transported to the hospital in a rapid manner.

While having proximity to a medical building is extremely important, having a site that would allow for connection with nature is equally as important. The relationships between the indoor and outdoor spaces in this project are critical, therefore, the existing or potential vegetation on the site can make or break the design vision. This includes sites that have an existing landscape that is already abundant and

would provide the opportunity to weave in several garden spaces, as well as sites that offer an opportunity to revitalize an existing landscape.

In addition to both medical proximity and vegetation on the site, another vital element in site selection is how the proposed building will affect the existing land. This project revolves around healing and this concept, which includes one's overall wellbeing, should extend to the landscape. Sites that have underutilized parking are a plus. These sites have the potential to have the building occupy the footprint of the parking lot and minimally disturb the land.

The following parameters (**primary priority** in bold) were used for site selection:

- ACCESSIBILITY
 - Road (how heavy is the traffic?)
 - **Transportation** (any metro or bus stops? Proximity?)
 - Terrain (slope- relatively flat site priority for ease of accessibility)
- VEGETATION
 - Existing (quality of existing vegetation, amount)
 - **Expandability/ implementation of a park** (probability of creating a park or series of gardens)
 - Views to existing landscape (how well can building fit into existing landscape and maintain quality views)
- MEDICAL CONNECTION
 - **Proximity to medical buildings** (proximity to hospitals or medical hubs)
 - **Opportunity to expand medical program**
- SITE CONDITIONS
 - Flexibility of site
 - **Potential noise corridors** (any highways or heavy traffic areas?)
 - **How well fits within context** (how easily can this program fit in?)
 - Potential Views (site allow for expanded vegetation or park views?)
- POTENTIAL IMPACT
 - **Impact on site**
 - **Vegetation disruption**
 - **Utilizing existing infrastructure** (any parking lots or vacant buildings?)
 - Public benefit (how will this benefit the public?)

PRELIMINARY SITE OPTIONS

Upon defining the site parameters, it is key to the identify local hospitals in the area, as well as vegetated areas. Upon looking closely at several medical buildings and their current relationship to vegetated areas, a few site options stood out. Figure 76 highlights the four sites, 3 of which are located in Montgomery County, Maryland; and the other which is located in Washington, DC. This section will discuss the selection of each site and give an introduction to the feasibility of each site.

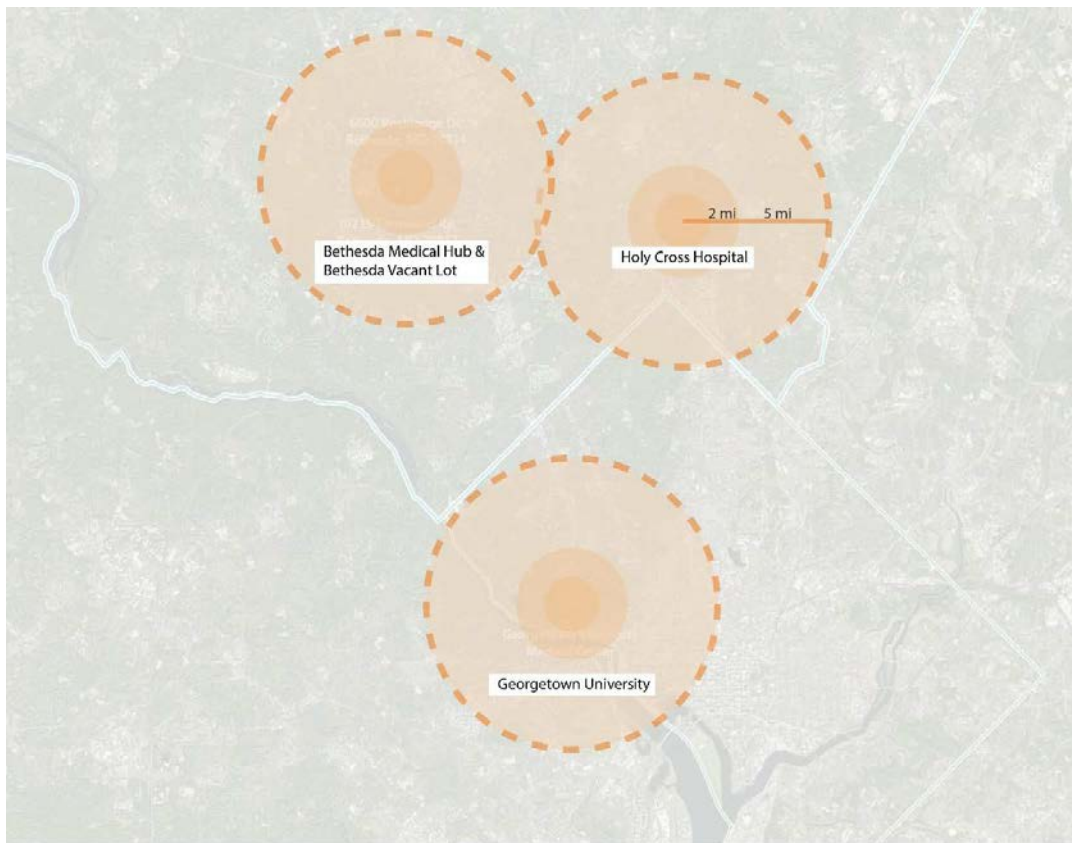


Figure 76: Preliminary Site Options (Source: author)

The Bethesda Medical Hub and Bethesda Vacant Lot options have a close proximity to each other and are located within the Rockledge Drive division in Bethesda, Maryland. These are both prime candidates due to their proximity to Suburban Hospital and the existing presence of medical buildings on the site. Figure 77 is a zoomed in context map that highlights these two potential sites.



Figure 77: Bethesda Site Options (Source: author)

SWOT Analysis by Site

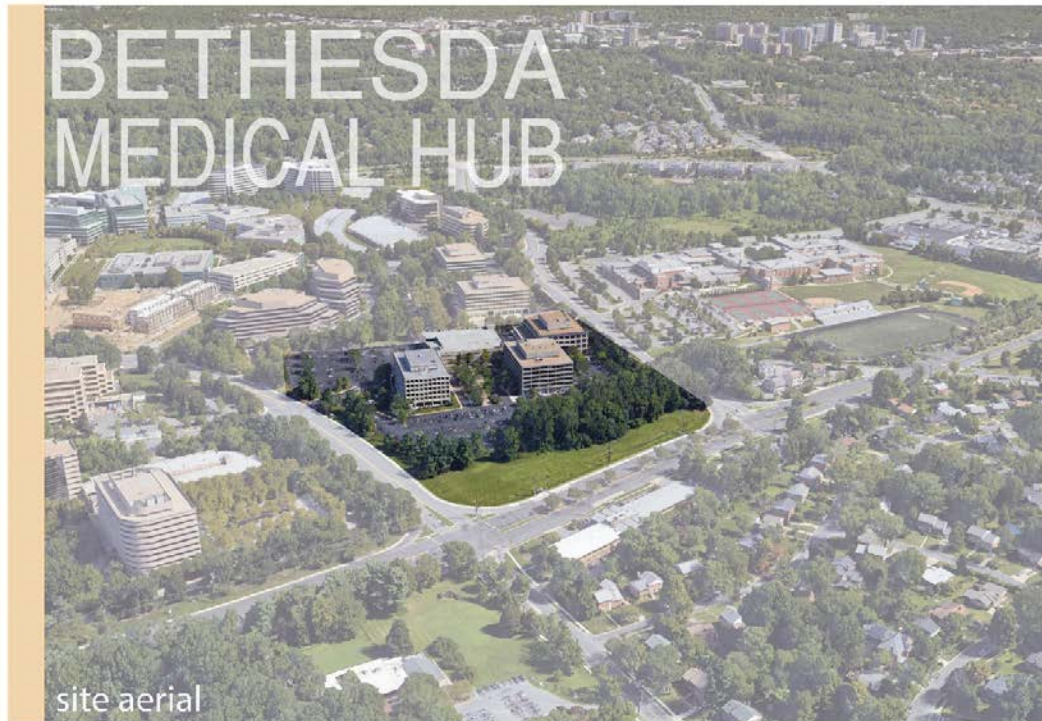
To gain a better understanding of each potential site, each site was analyzed to compare the strengths, weaknesses, opportunities, and constraints (Figures 78-81). Upon making these observations, option 3, Georgetown University, was eliminated as an option for the rehabilitation center.

Elimination of Georgetown Site as an Option

Even though Georgetown was a strong candidate for the rehabilitation center, it lacked some elements that the other sites offered. One of the vital elements of site selection is its proximity to a medical facility. Initially, Georgetown stood out as a viable option for this reason. It has the MedStar University Hospital on the campus, which is a teaching hospital. This site presented the opportunity to extend this teaching hospital into the rehabilitation center as well.

Even though the Georgetown site has many good qualities, it has some challenges compared to the other sites. Due to the urban context, Georgetown would be less accessible- not only is parking already difficult in Georgetown, it also does not have a metro system. In addition to this, the topography on the campus presents challenges because the rehabilitation center wants to be one or two stories to prevent patients from having to go great distances to get the care need. In addition to this, a major drawback is the limited vegetation on the site. While Glover Archibold Park, which is adjacent to the site, provides views to a beautiful parkscape, it is not enough for the purposes of this thesis. The other sites provide more opportunities to have more freedom with vegetation and healing gardens.

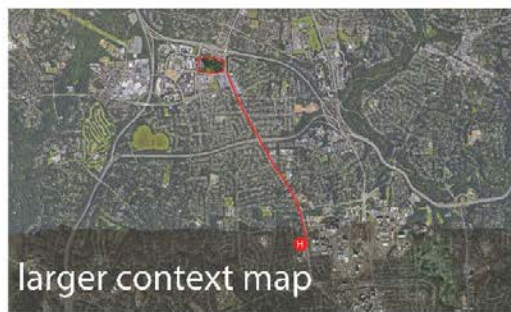
Option 1: Bethesda Medical Hub



| STRENGTHS | WEAKNESSES | OPPORTUNITIES | CONSTRAINTS |
|---|--|--|--|
| <ul style="list-style-type: none"> + proximity to Suburban Hospital + location and context + demographics (age distribution) | <ul style="list-style-type: none"> - already dense site - limited vegetation (compromised views) - amount of needed parking | <ul style="list-style-type: none"> + expand medical hub + parking lot could be revitalized + healing gardens could benefit other patients | <ul style="list-style-type: none"> - noise- Democracy Blvd busy street - high traffic area |

Figure 78: Strengths, Weaknesses, Opportunities, Constraints- Bethesda Medical Hub (Source: author)

Option 2: Bethesda Vacant Lot



| STRENGTHS | WEAKNESSES | OPPORTUNITIES | CONSTRAINTS |
|--|---|---|--|
| <ul style="list-style-type: none">+ proximity to Suburban hospital+ existing water element+ copious vegetation | <ul style="list-style-type: none">- distance from medical hub | <ul style="list-style-type: none">+ expand medical hub+ utilize parking lot (revitalize)+ expand vegetation for views or forest bathing | <ul style="list-style-type: none">- plans for mixed-use development- noise? near to 270 |

Figure 79: Strengths, Weaknesses, Opportunities, Constraints- Bethesda Vacant Lot (Source: author)

Option 3: Georgetown University

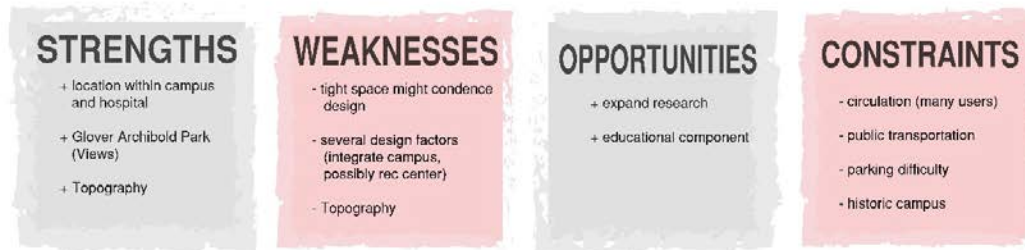
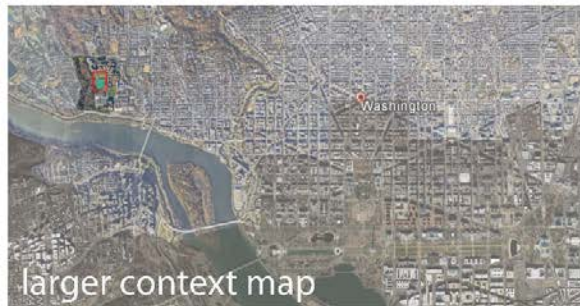
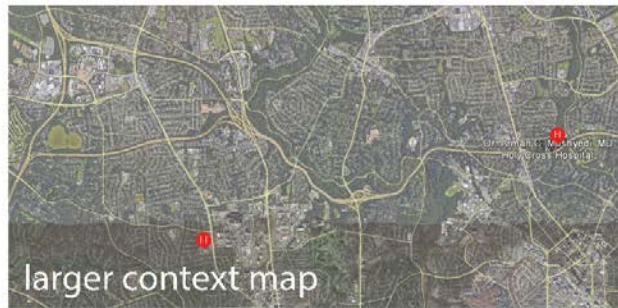


Figure 80: Strengths, Weaknesses, Opportunities, Constraints- Georgetown University (Source: author)

Option 4: Holy Cross Hospital



| STRENGTHS | WEAKNESSES | OPPORTUNITIES | CONSTRAINTS |
|--|---|---|---|
| <ul style="list-style-type: none"> + large footprint + proximity to hospital + vegetation | <ul style="list-style-type: none"> - noise from 495 - next to busy hospital | <ul style="list-style-type: none"> + trails or nature walks or forest bathing + connection/ extension of hospital | <ul style="list-style-type: none"> - ecological (removing potential parkland) - high traffic area |

Figure 81: Strengths, Weaknesses, Opportunities, Constraints- Holy Cross Hospital (Source: author)

SITE EXPLORATION AND SELECTION

To determine which site would be most appropriate for the project, a site analysis, program study, and concept sketches were completed. This section highlights this selection criteria.

Site Analysis

Option 1: Bethesda Medical Hub

Medical Proximity

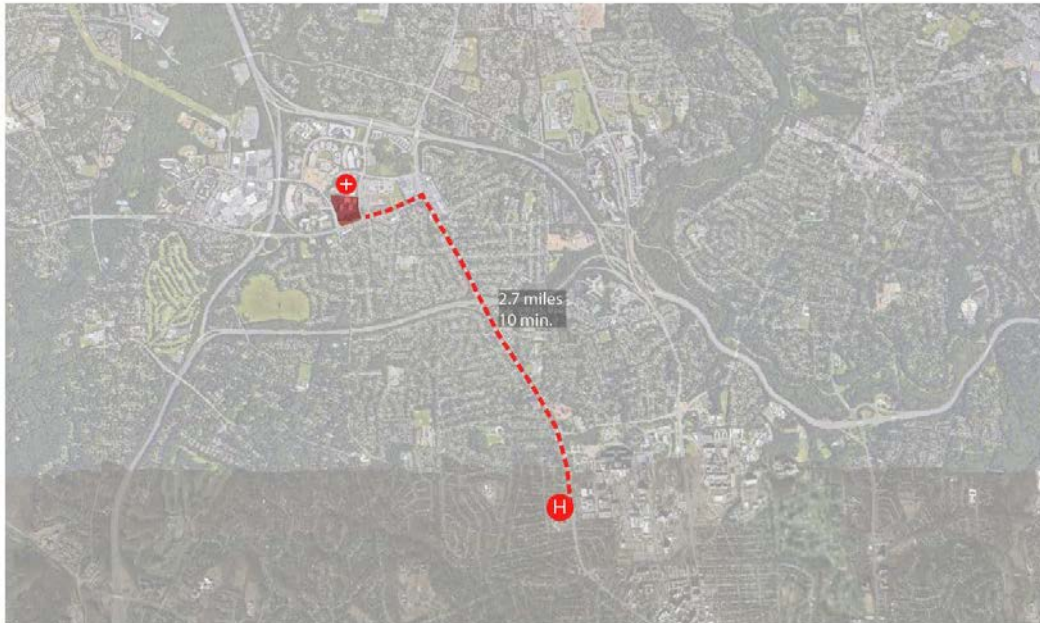


Figure 82: Medical Hub Medical Proximity (Source: author)

Context



1 Labcorp and medical offices



4 Center for Advanced Orthopedics



2 Dermatology Center



3 Maryland Orthopedic Institute



3 Suburban Outpatient Medical Center

Figure 83: Medical Hub Surrounding Context (Source: author)

Hydrology and Floodplain



Figure 84: Medical Hub Hydrology and Floodplain (Source: author)

Option 2: Bethesda Vacant Lot

Medical Proximity

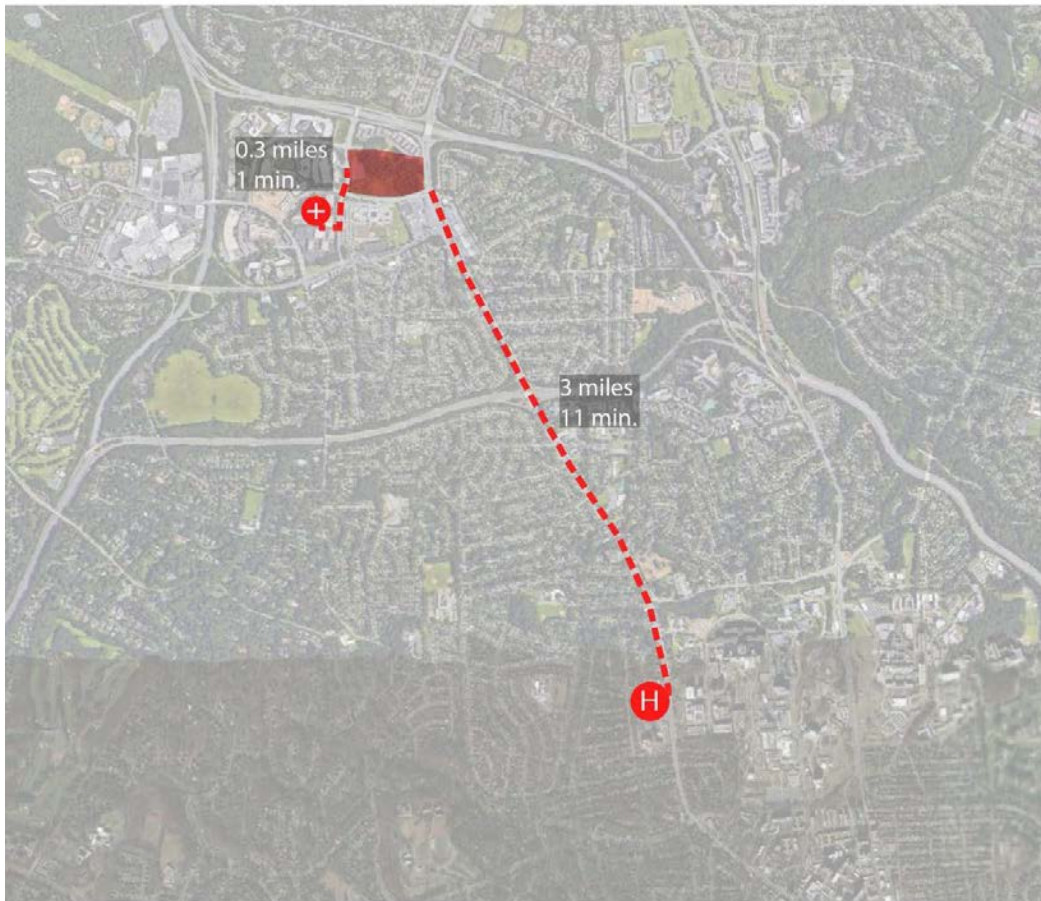


Figure 85: Vacant Lot Medical Proximity (Source: author)

Boundaries



Figure 86: Vacant Lot Boundaries (Source: author)

Context



1 Walter Johnson High School



2 Georgetown Square Shopping Center



3 Wildwood Shopping Center



4 NIH Office of Science Policy



5 Montgomery Apartments



6 NIH Headquarters/ Offices

Figure 87: Vacant Lot Context (Source: author)

Option 3: Holy Cross Hospital

Medical Proximity



Figure 88: Holy Cross Medical Proximity (Source: author)

Boundaries



Figure 89: Holy Cross Boundary (Source: author)

Context



Figure 90: Holy Cross Context (Source: author)

Hydrology and Floodplain

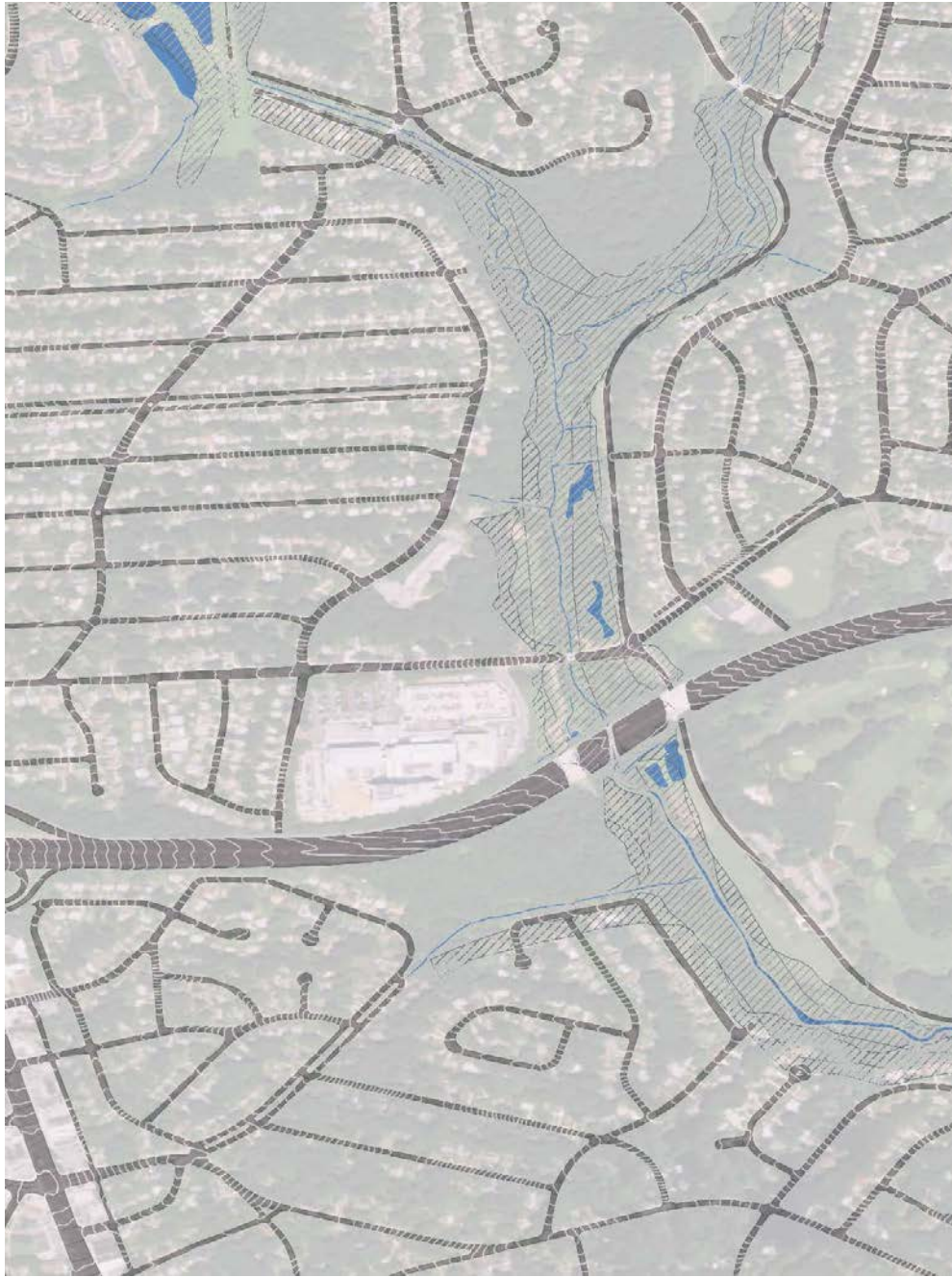


Figure 91: Holy Cross Hospital Hydrology and Floodplain (Source: author)

Site Selection

Upon analyzing the three sites, the strongest two candidates for the site was the Bethesda Medical Hub and the vacant lot. Holy Cross, while a strong candidate, is located on a floodplain. According to Montgomery County Planning, no building or structure can be placed on the floodplain. As a result, this would limit the already limited size of the site. Figures 92 and 93 outline the provisions of each site and were used to select the strongest candidates.

**SITE SELECTION
MATRIX
CONCLUDING RESULTS**

● BETHESDA VACANT LOT
 ● BETHESDA MEDICAL HUB
 ● HOLY CROSS HOSPITAL

negative characteristic → positive characteristic

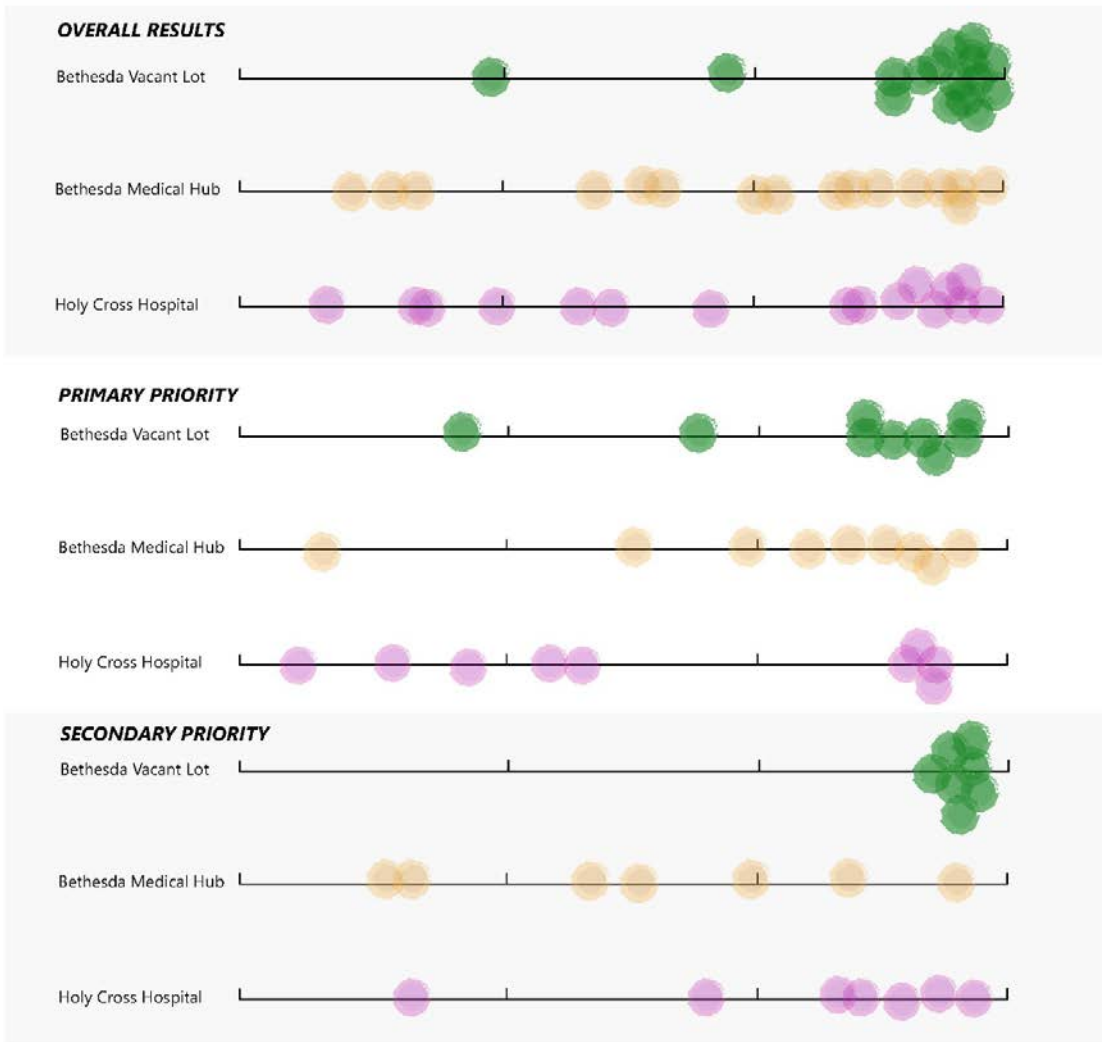


Figure 92: Site Selection Matrix- Concluding Results (author)

SITE SELECTION
MATRIX
 SUPPORTING RESULTS

● BETHESDA VACANT LOT
 ● BETHESDA MEDICAL HUB
 ● HOLY CROSS HOSPITAL

negative characteristic → positive characteristic

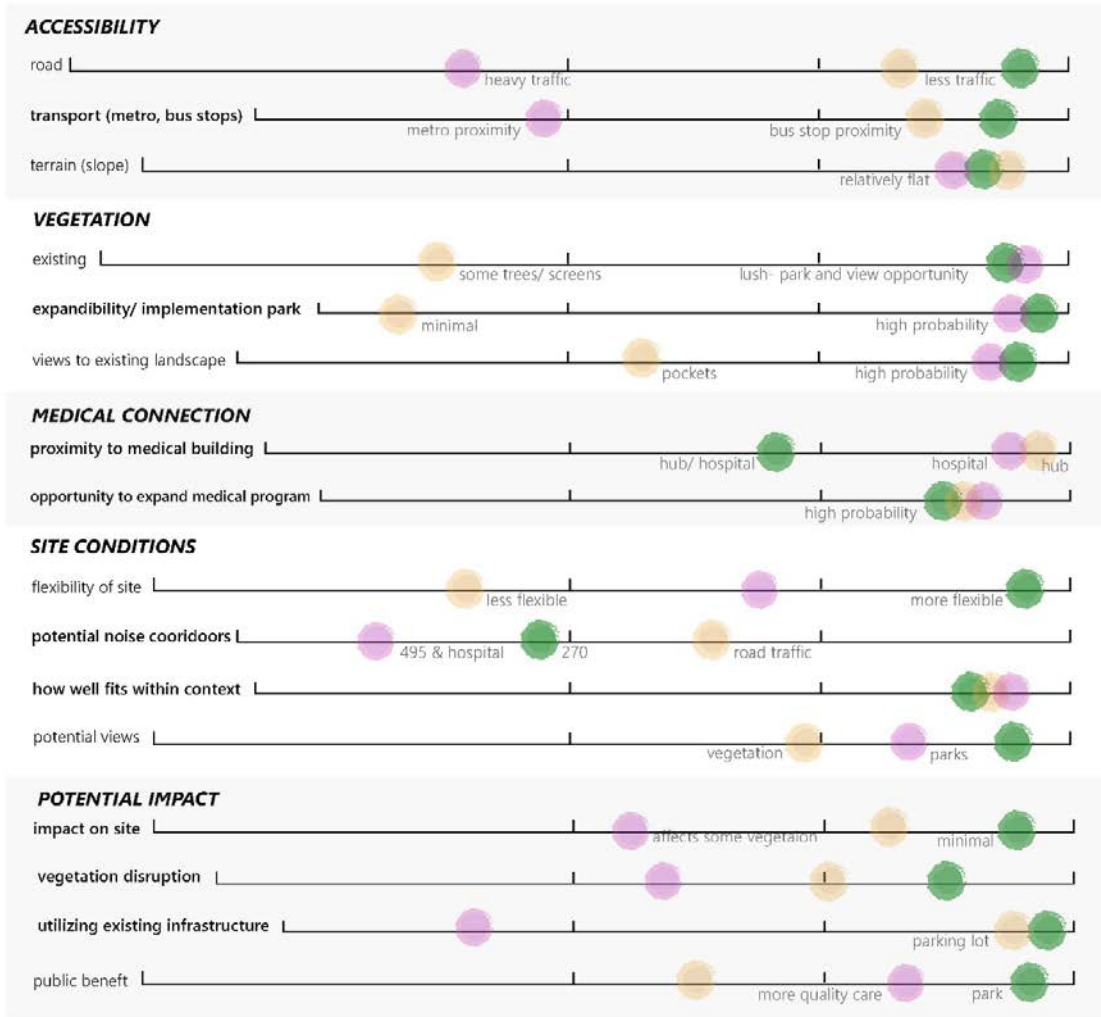


Figure 93: Site Selection Matrix- Supporting Results (author)

PROGRAM EXPLORATION

To get a better sense of which site is the most suitable, program studies were conducted. This included looking at the scope of work from several different scales: how it relates to the community (macro), how the building relates to the landscape (meso), and how the interior spaces are designed to promote healing. To understand program relationships, program studies were analyzed and divided into schemes which included exploring a compact, courtyard, and pavilion typology. Next, these typologies were placed on each site as a means of dissecting the feasibility of each site and how well it would fit into the existing context.

Situating the Site into the Fabric of the City- Macro

Bethesda Vacant Lot

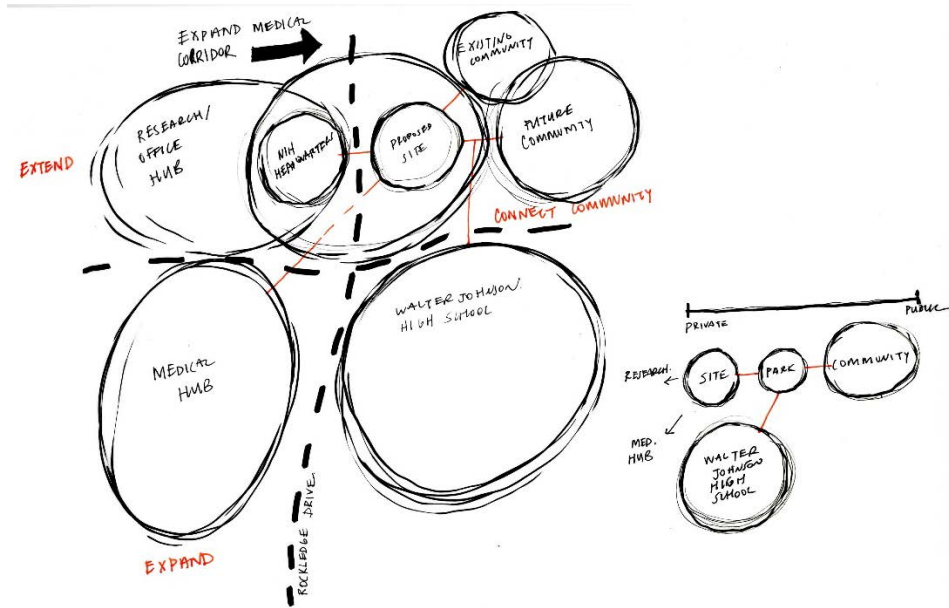
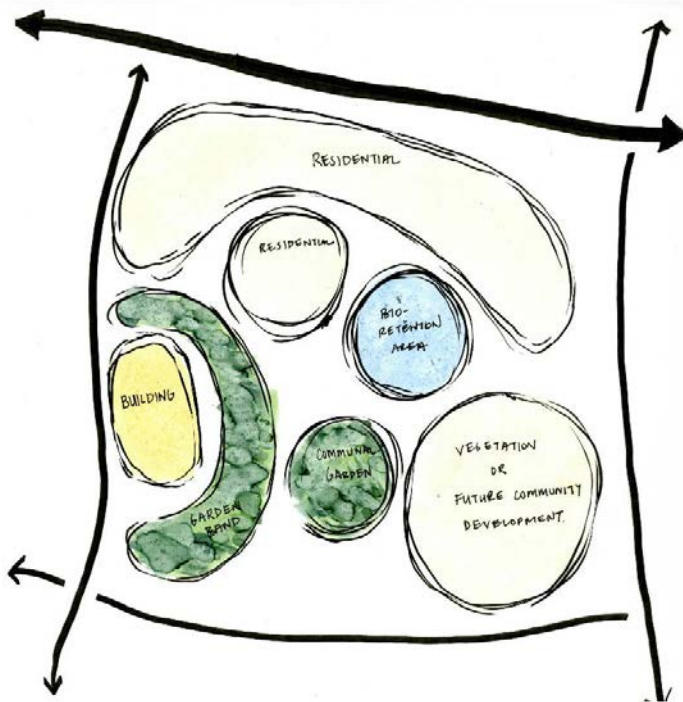


Figure 94: Vacant Lot Macro Concept Scheme (Source: author)



Bethesda Medical Hub

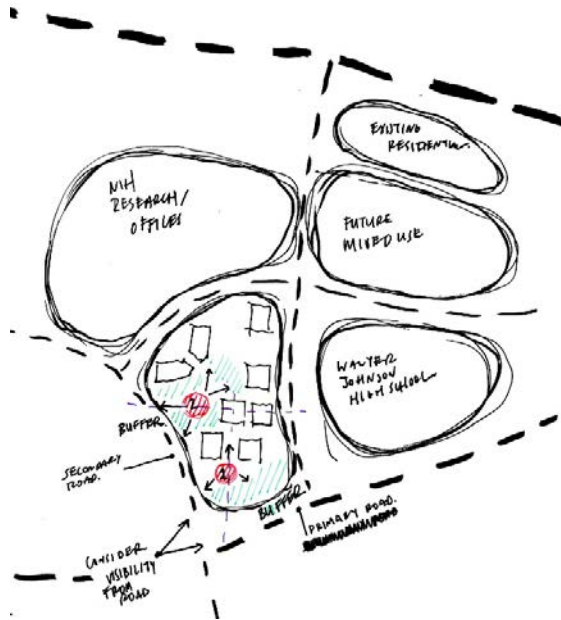


Figure 95: Medical Hub Macro Concept Scheme (Source: author)

Holy Cross Hospital



Figure 96: Holy Cross Proposed Concept- Linear Spine (Source: author)



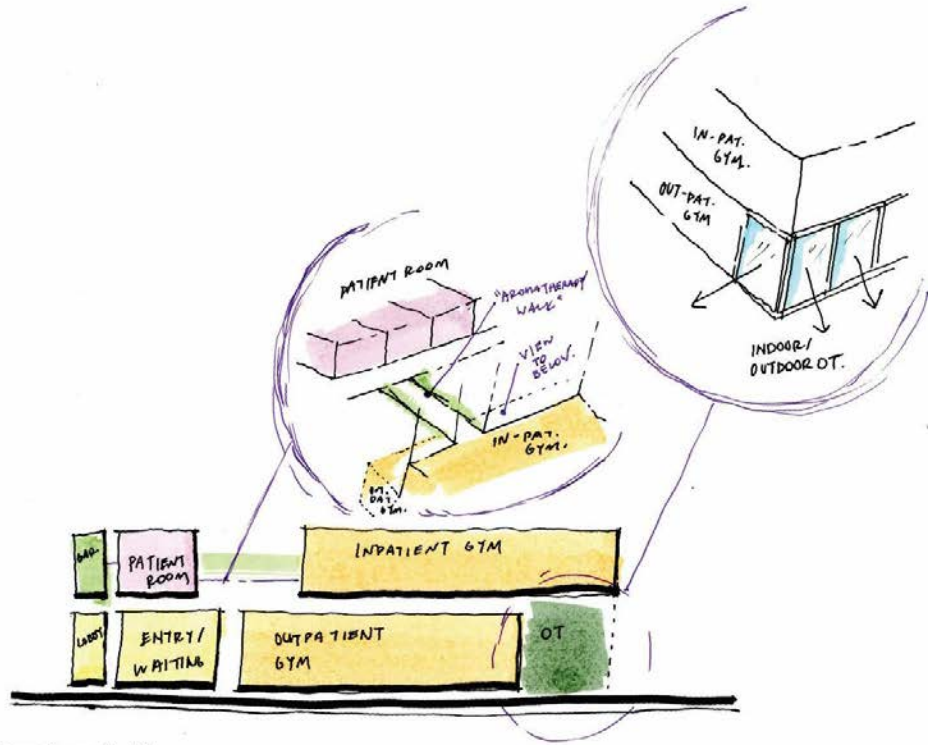
Figure 97: Holy Cross Existing Concept (Source: author)



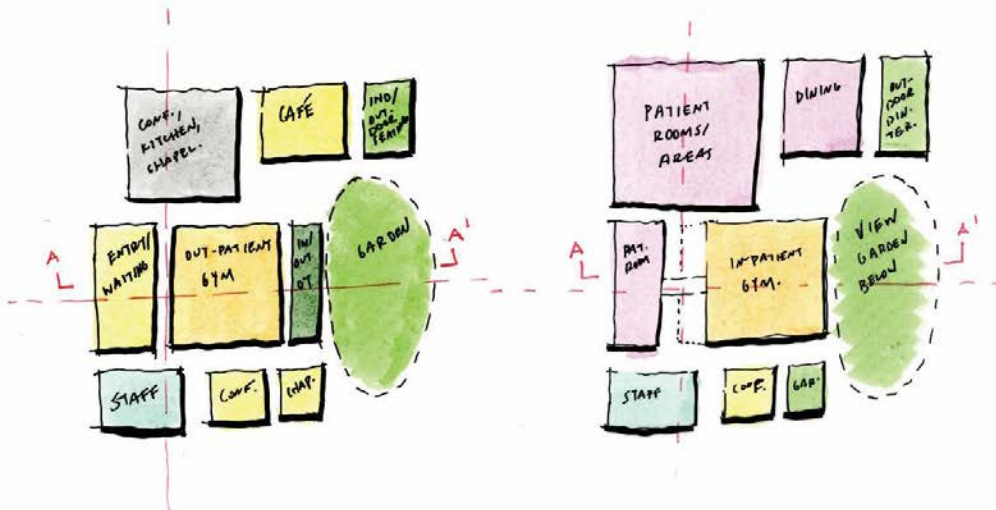
Figure 98: Holy Cross Proposed Concept (Source: author)

Overall Concepts- Meso

Option 1



Section A-A'

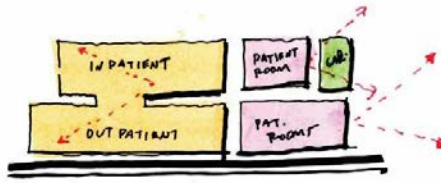


lower level plan

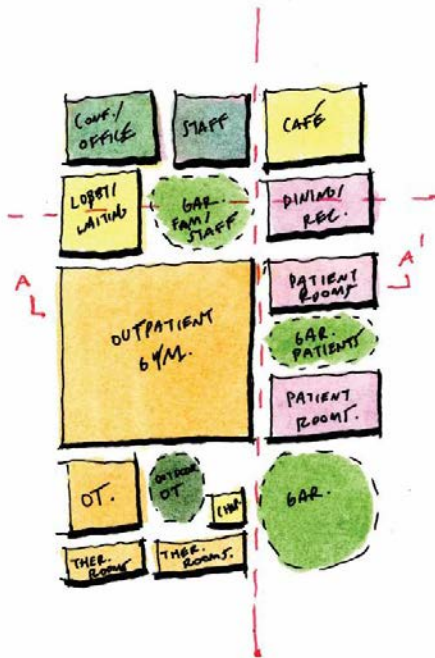
upper level plan

Figure 99: Concept Scheme 1 (Source: author)

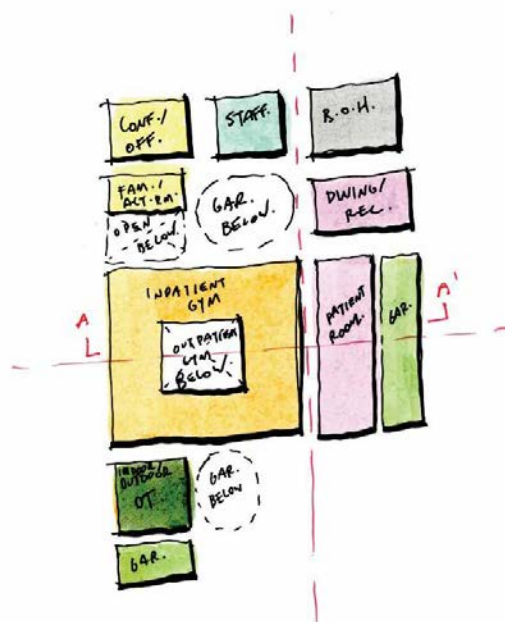
Option 2: therapy core- multiple courtyard concept



Section A-A'



lower level plan



upper level plan

Figure 100: Concept Scheme 2 (Source: author)

Option 3: one level courtyard concept

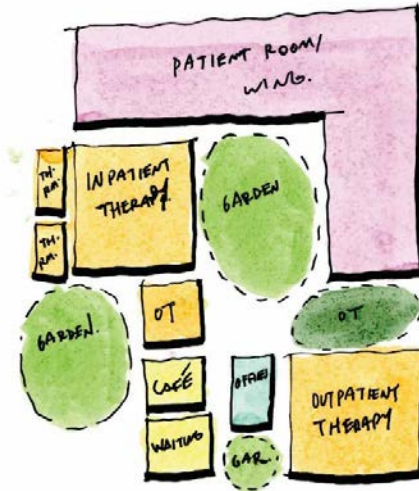


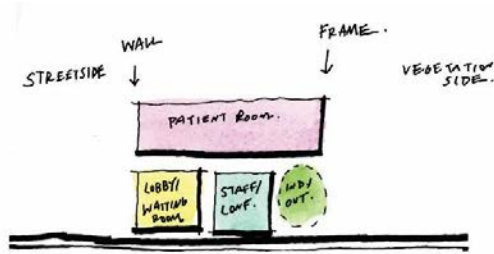
Figure 101: Concept Scheme 3 (Source: author)

Option 4: pavilion concept

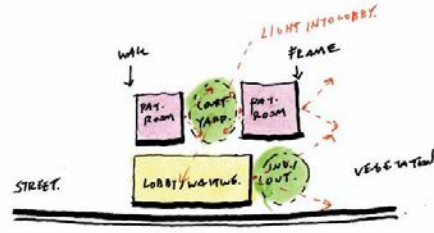


Figure 102: Concept Scheme 4 (Source: author)

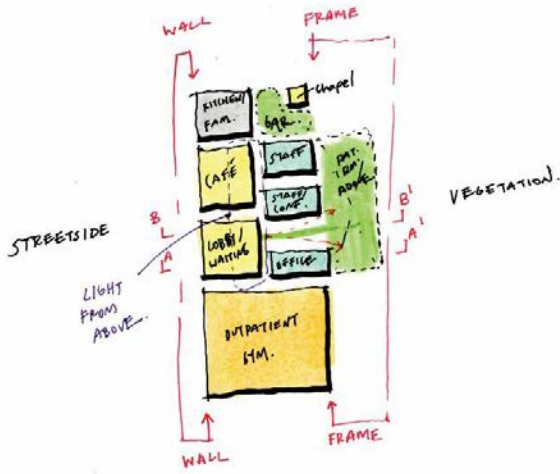
Option 5: compact-wall and frame



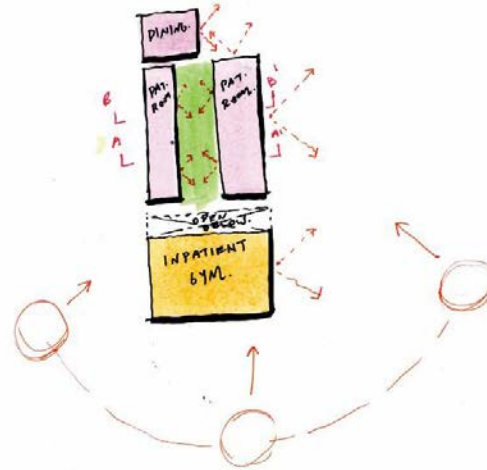
Section A-A'



Section B-B'



lower level plan



upper level plan

Figure 103: Concept Scheme 5 (Source: author)

Bethesda Vacant Lot

Option 1

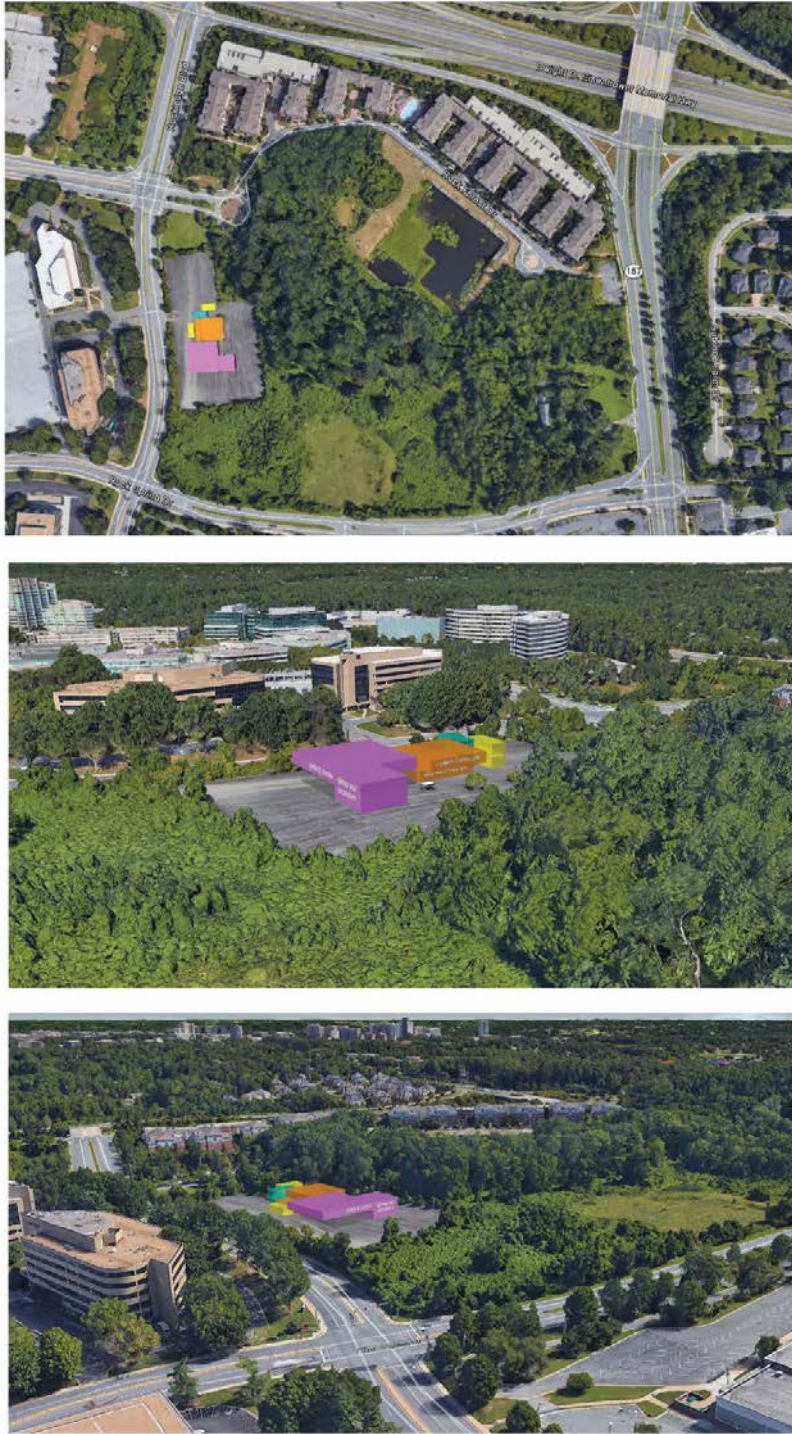


Figure 104: Vacant Lot Concept Scheme 1 (Source: author)

Option 2: therapy core- multiple courtyard concept

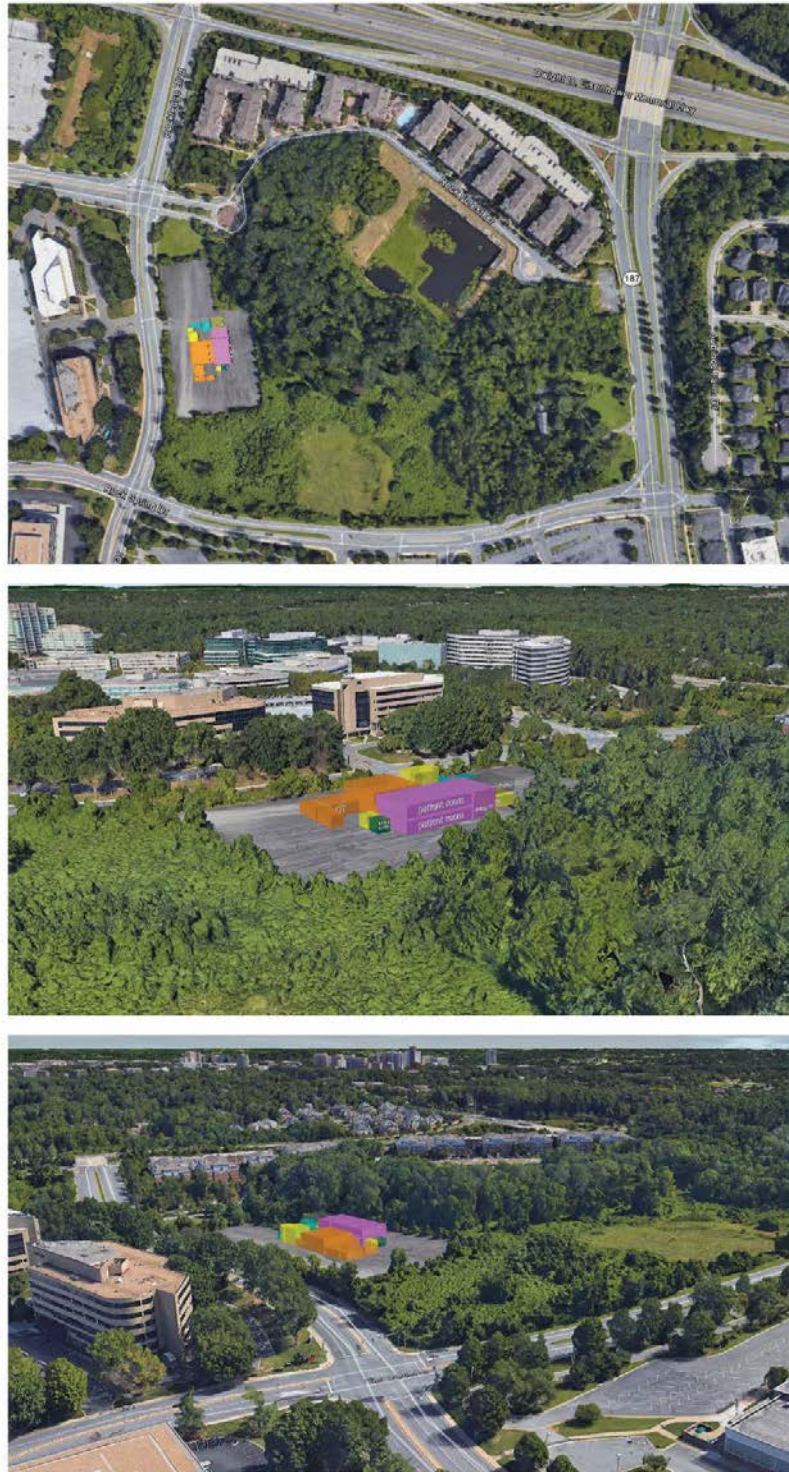


Figure 105: Vacant Lot Concept Scheme 2 (Source: author)

Option 3: one level courtyard concept



Figure 106: Vacant Lot Concept Scheme 3 (Source: author)

Option 4: pavilion concept



Figure 107: Vacant Lot Concept Scheme 4 (Source: author)

Option 5: compact- wall and frame



Figure 108: Vacant Lot Concept Scheme 5 (Source: author)

Bethesda Medical Hub

Option 1A Democracy Boulevard Frontage



Figure 109: Medical Hub Concept Scheme 1A (Source: author)

Option 1B Rockledge Drive Frontage



Figure 110: Medical Hub Concept Scheme 1B (Source: author)

Option 2: therapy core- multiple courtyard concept

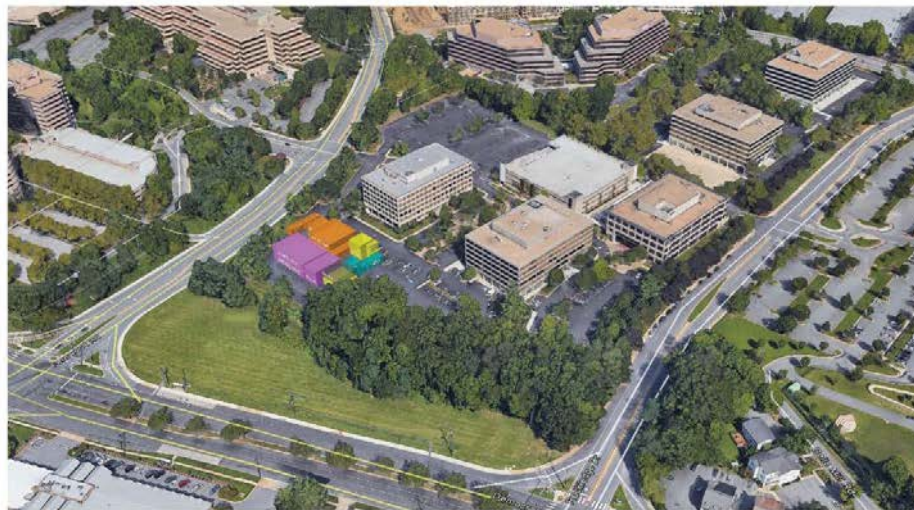


Figure 111: Medical Hub Concept Scheme 2 (Source: author)

Option 3: one level courtyard concept



Figure 112: Medical Hub Concept Scheme 3 (Source: author)

Option 4: pavilion scheme



Figure 113: Medical Hub Concept Scheme 4 (Source: author)

Option 5: compact- wall and frame

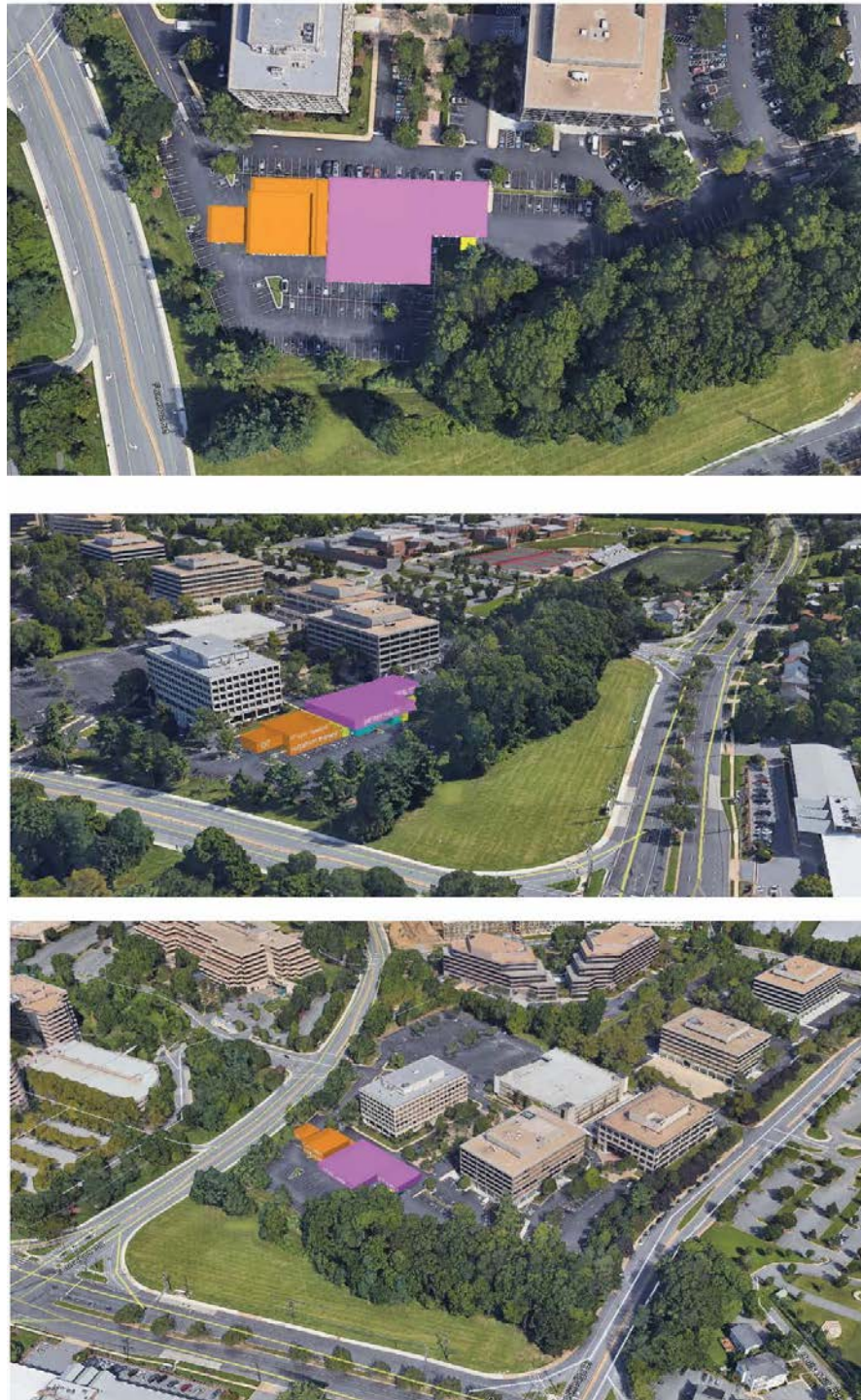


Figure 114: Medical Hub Concept Scheme 5 (Source: author)

Holy Cross Hospital

Even though the Holy Cross site has many positive attributes, the proposed site is on a floodplain which would create several issues in the design. Program exploration was focused on the two sites in Bethesda. However, a quick exploration was done on the Holy Cross site.

Option 1: Compact, Linear Design

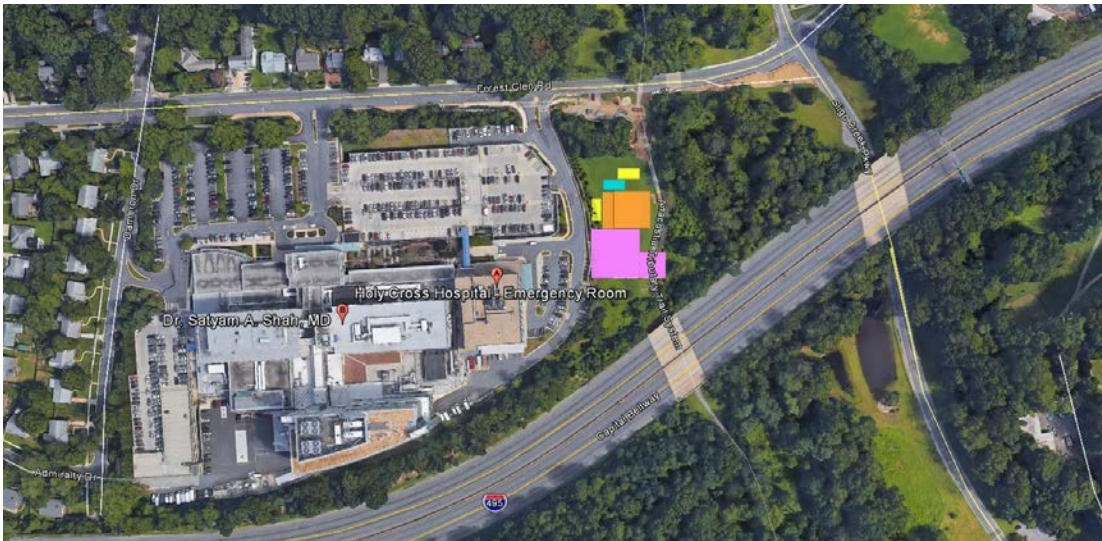


Figure 115: Holy Cross Scheme 1 (Source: author)

Option 2: compact- wall and frame

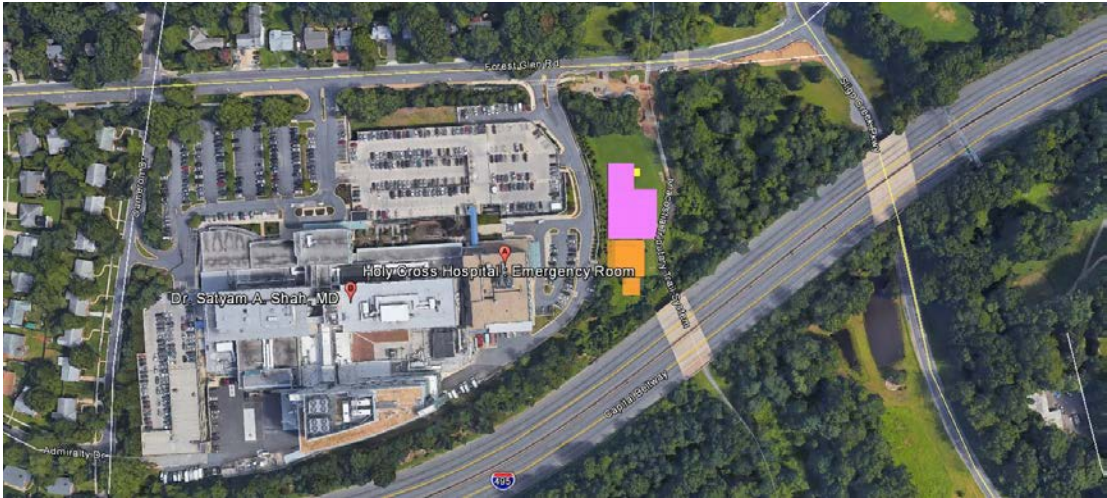
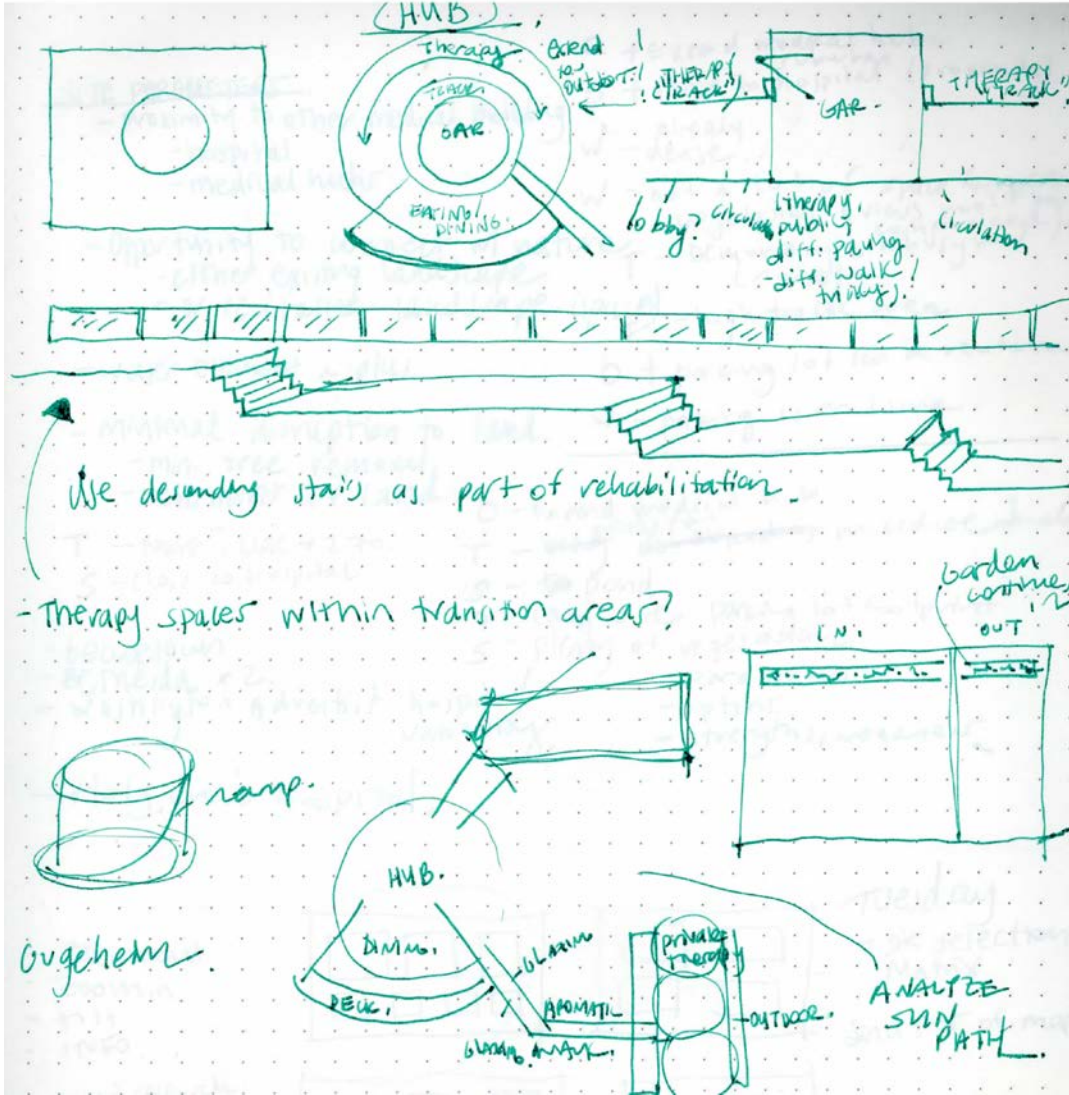


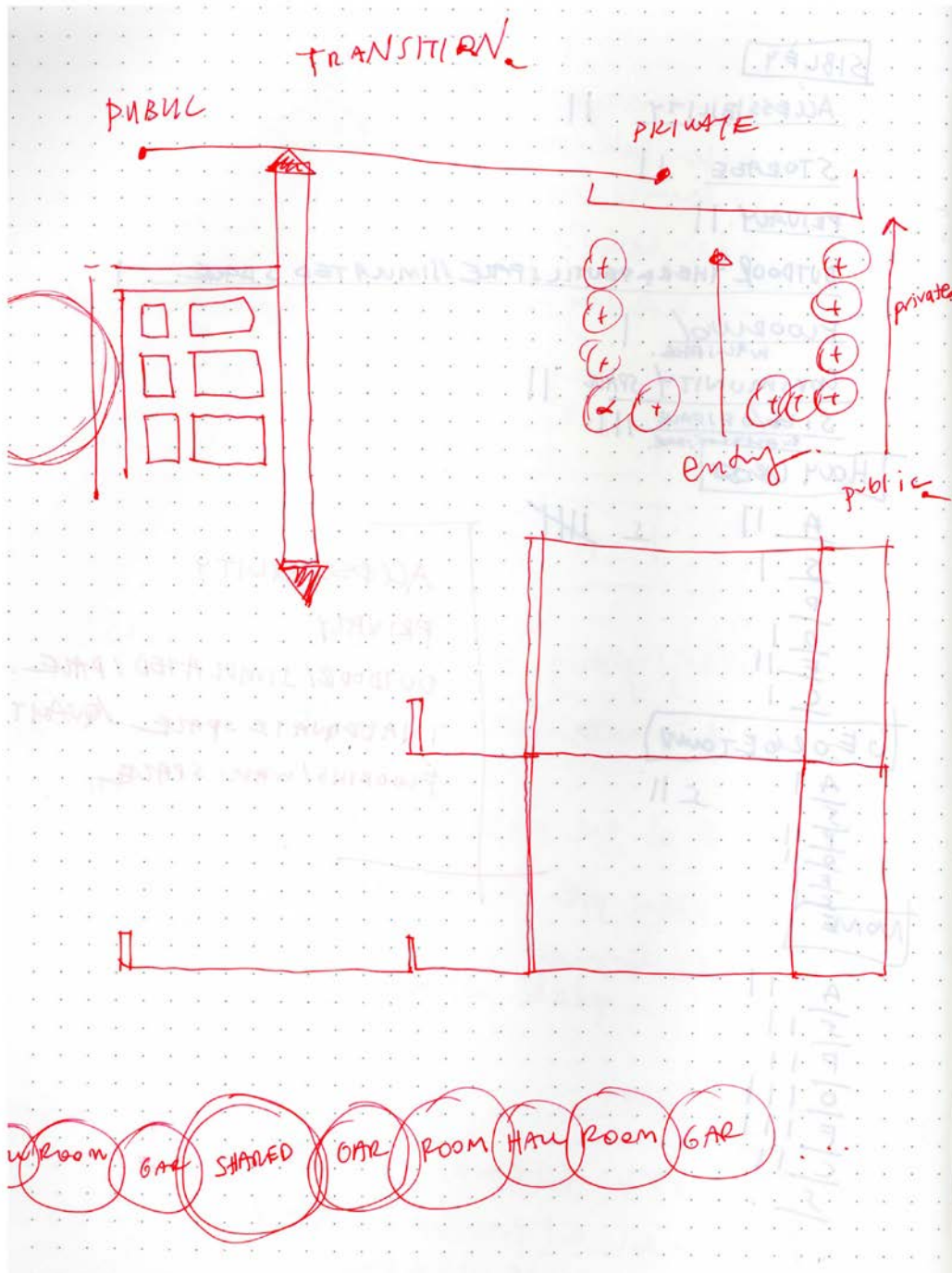
Figure 116: Holy Cross Scheme 5 (Source: author)

Design of Healing Spaces- Micro

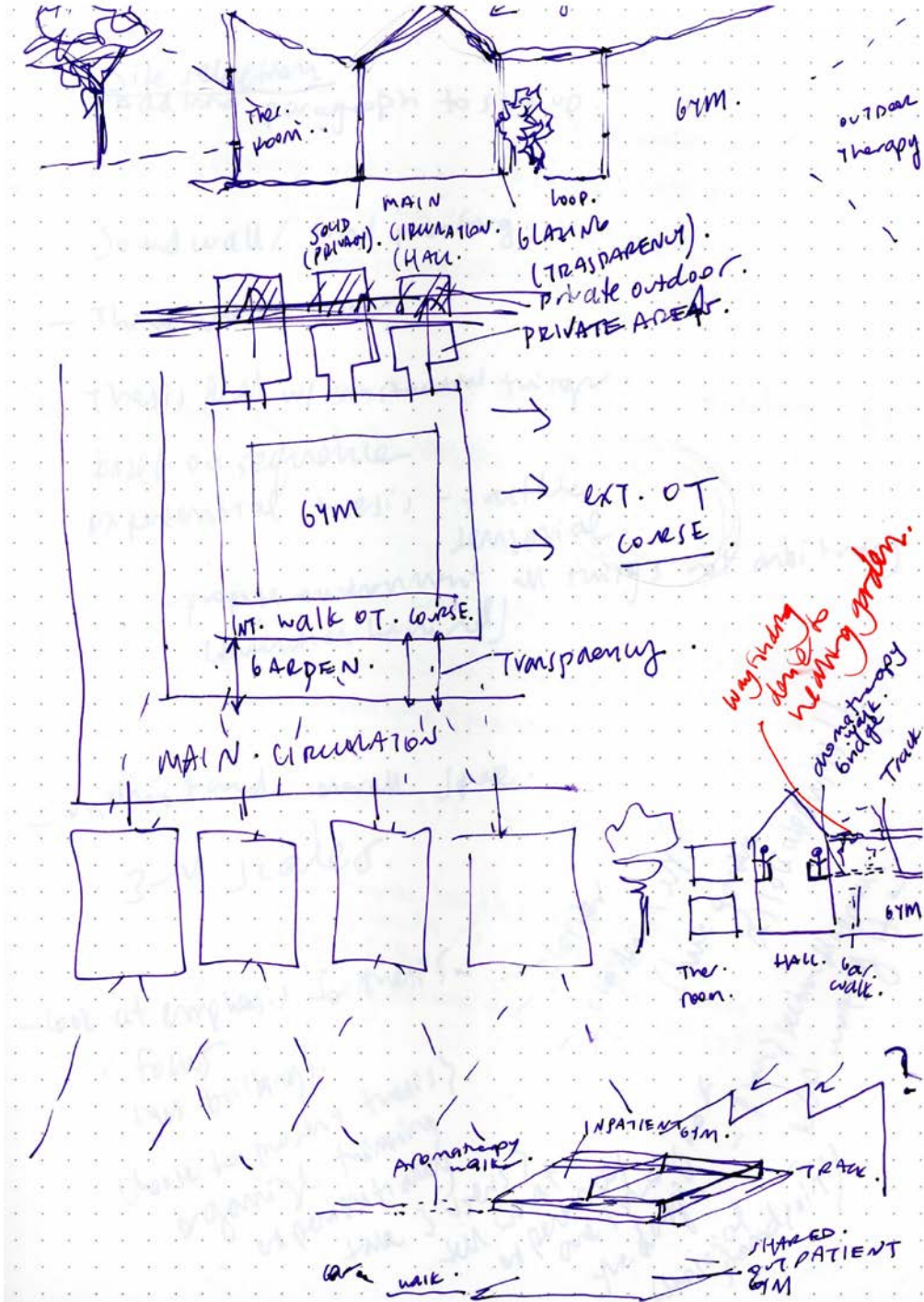
Interior Details in Therapy Areas



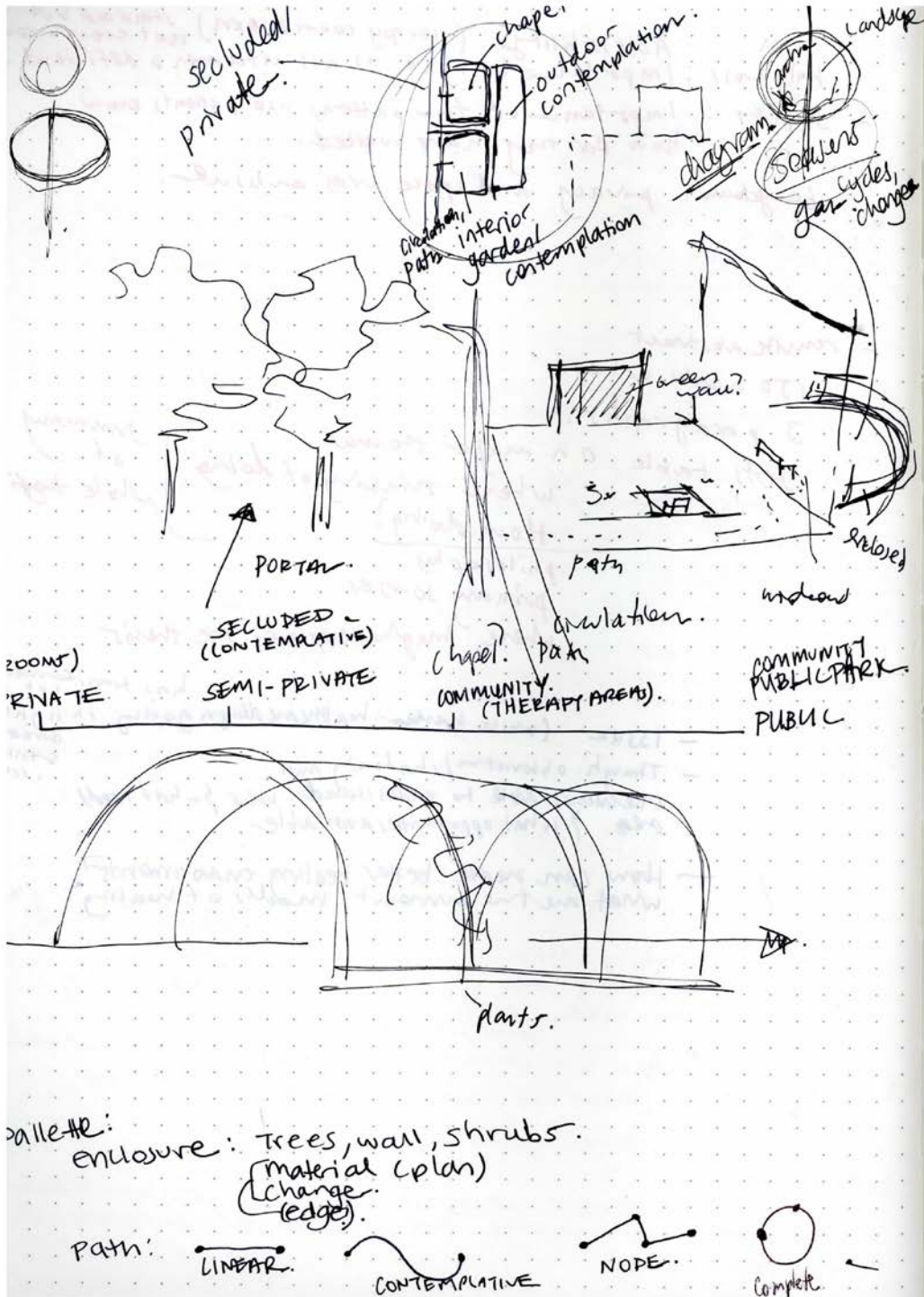
Transition from Private to Public- Sequence

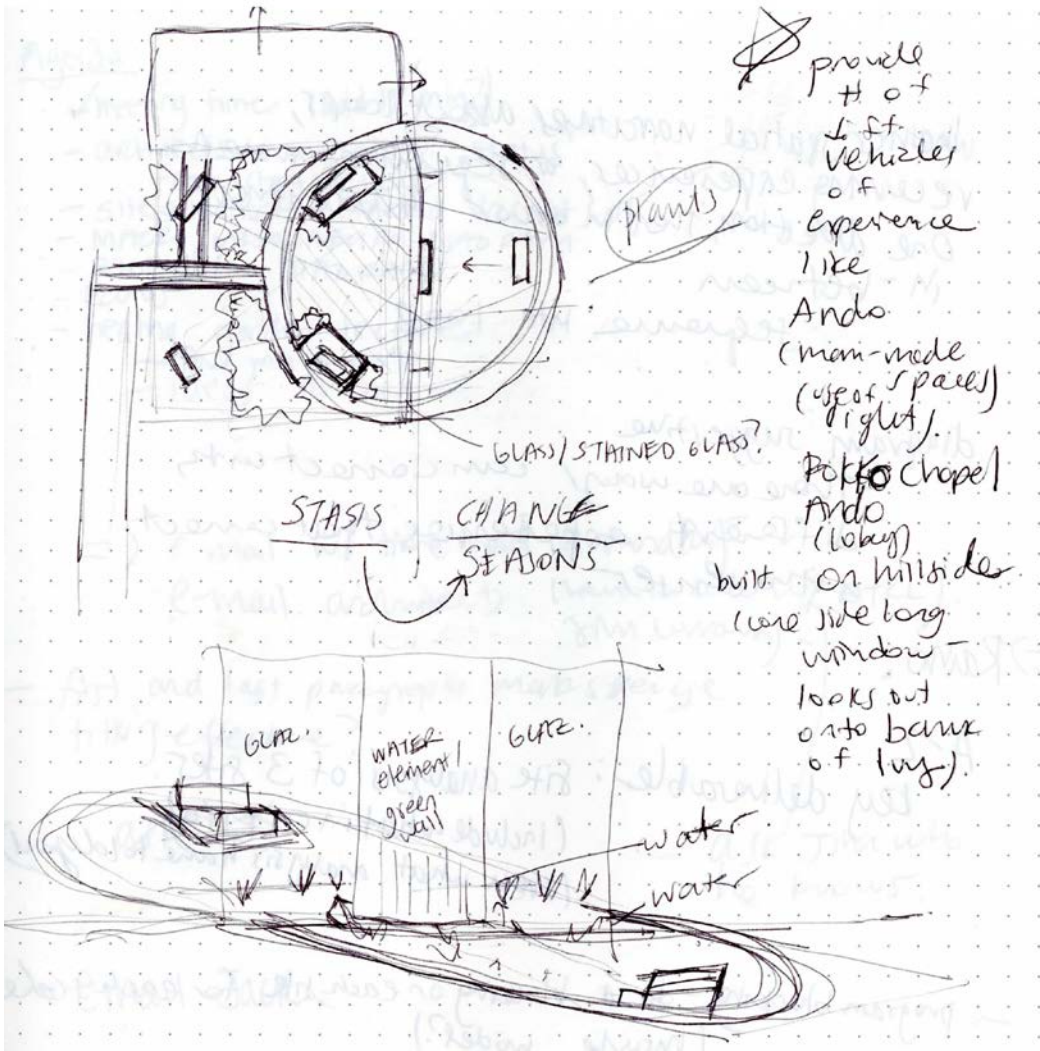


Therapy Area

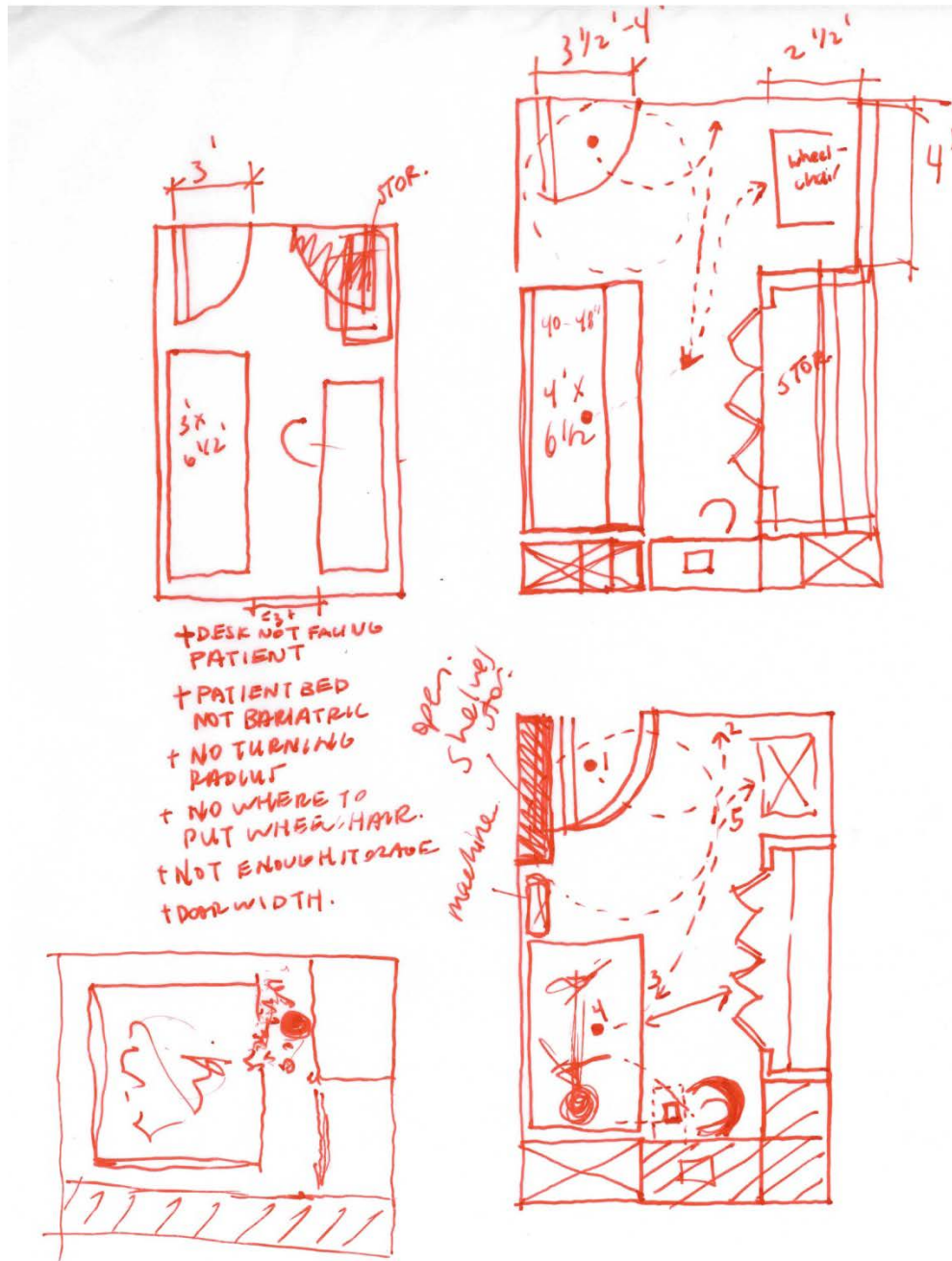


Incorporating Healing Garden





Therapy Rooms



Overall Findings and Site Selection

Of the spaces analyzed, the best site for the project is the Bethesda Vacant Lot, because of its minimal impact to the land, the potential for it to become part of a larger community, and its proximity to a medical hub. The site also has bountiful vegetation, which allows for more opportunities to have nature filled, window views from the patient rooms. The site is also located off a secondary road, while the medical hub site is located on Democracy Boulevard, a main road. The location on a secondary road will allow for reduced noise and increased privacy. It is also adjacent to office buildings that house the NIH headquarters and training center. This provides an opportunity to make this building part of a larger network of research.

Chapter 9: Design Proposal

DESIGN APPROACH

The rehabilitation and wellness center design is approached from several different scales. Figures 117-120, which are based on figure 27-the biophilic and sense sensitive design diagram, highlight this multiple scale approach and adapts it to the project. The different design scales include the macro, meso, micro, and neuro.

The macro scale looks at the rehabilitation center on a large scale, examining how the site connects with the community, environment, and local medical facilities. The wellness center adds another dimension to the community connection since it makes the idea of healing areas more approachable to the public. Amenities such as the free clinic, which could have a connection with the existing NIH headquarters adjacent to the site; cooking classes, that have a connection with the new terraced gardens; and wellness classes which include classes that teach about healthy eating habits as well as mind and body classes, all incorporate different members of the community.



Figure 117: Design Approach- Macro Scale (Source: author)

While the macro focuses on the site as a whole, the meso scale focuses on the connection between the building and nature. This relationship is best seen in section, especially the connection between the wellness gardens and teaching kitchen. Those taking classes can go into the garden and learn about harvesting fresh food and then learn how to prepare a healthy meal. This type of design allows for program in the landscape to correspond to program in the building. Other examples of this program relationship include the presence of nature in the healing hub, primarily the band of aromatic plants that surround the central hub, and also the exterior therapy areas which include healing gardens and horticultural therapy areas.

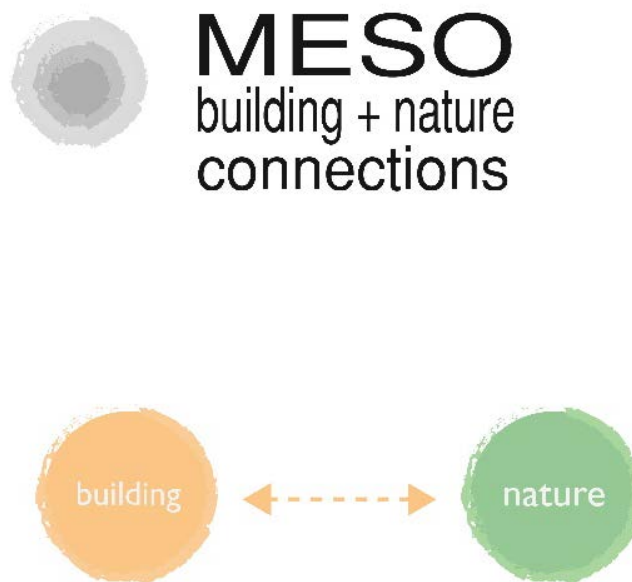


Figure 118: Design Approach- Meso, Scale (Source: author)

The micro scale is the design of the patient rooms and therapy rooms and how those affect health. The rooms are designed with patient experience in mind- including thinking about a patient's view from the bed as well as ambulatory space and family comfort.

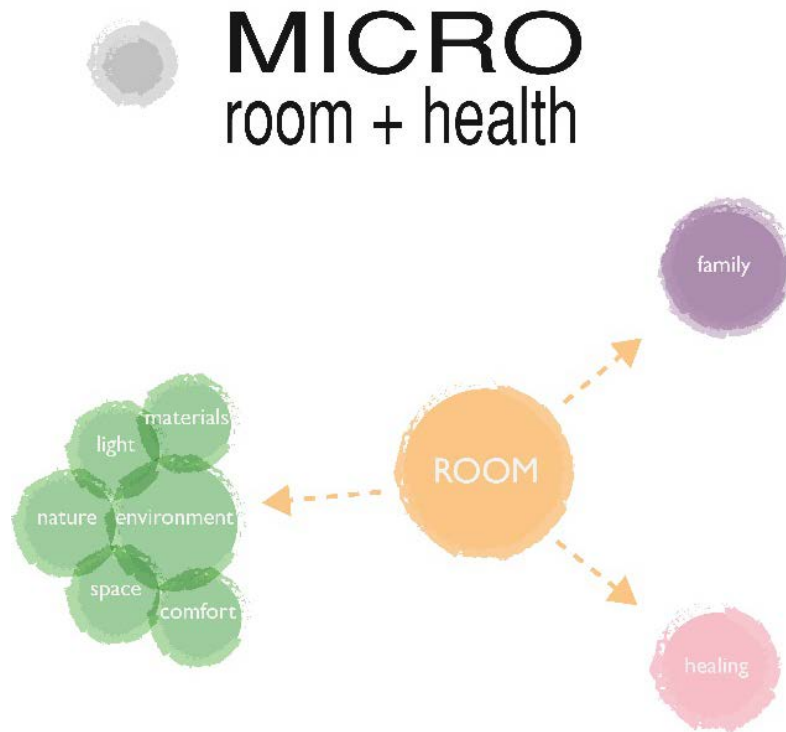


Figure 119: Design Approach-Micro Scale (Source: author)

The neuro scale analyzes all the components of the macro, meso, and micro scale and how those affect the mind and health of the patient. Every design decision is made thinking of the neuro and healing. Special consideration was given to the biophilic design patterns selected in chapter 3 (figure 28) as they have been proven to increase a patient’s sense of comfort and improve his or her healing potential. It has also been shown to have a positive impact on the medical staff and other users of the space, including family.

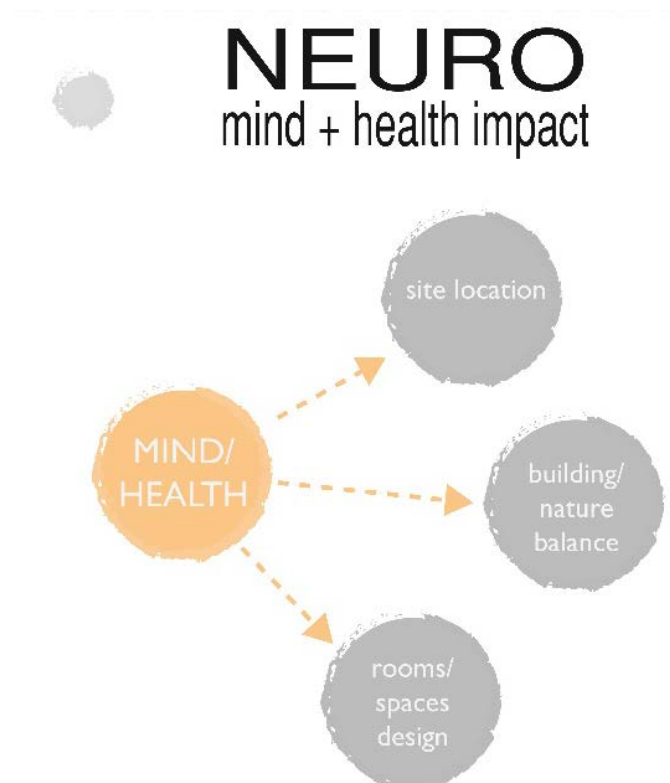


Figure 120: Design Approach- Neuro Scale (Source: author)

SITE DESIGN

The building is located on the southwest portion of the site with the wellness center acting as the public edge of the building.



Figure 121: Proposed Site Plan (Source: author)

Main Vehicular Site Circulation

The site has a main entry which includes the main drop off area and access to the parking garage (Figure 122) and a secondary entry which includes overflow and staff parking, as well as a service entry (Figure 123).

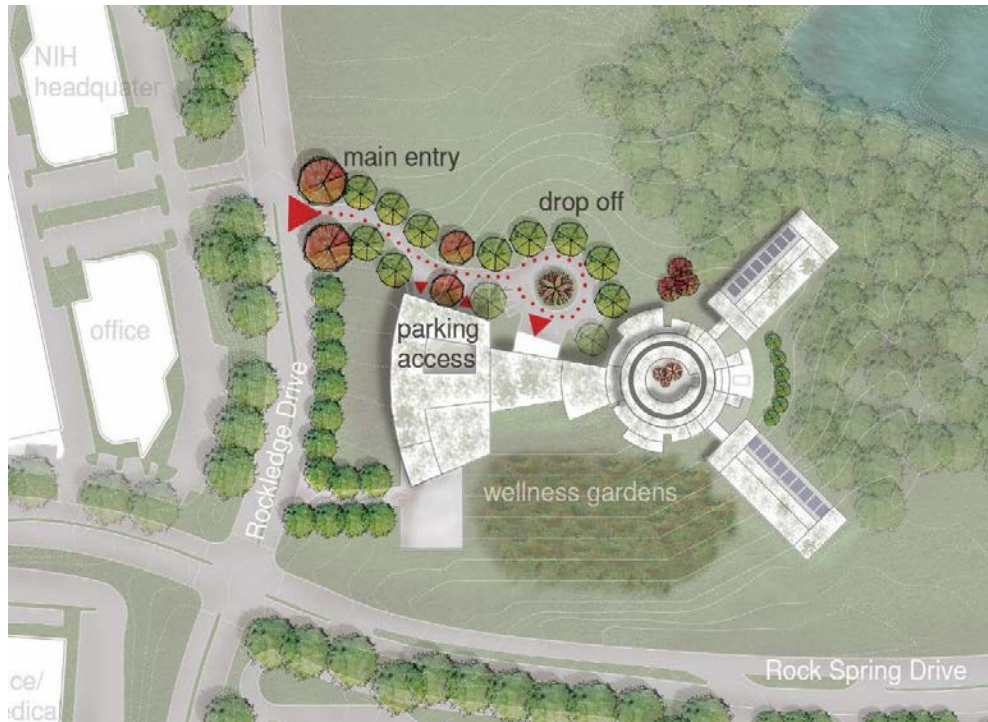


Figure 122: Main Site Entry Sequence (Source: author)



Figure 123: Secondary Site Entry Sequence (Source: author)

Sustainable Site Design

Terraces, Rain Gardens, and Swales

There are several sustainable site design solutions integrated into the proposed design of the building. The existing area where the wellness gardens are being proposed had evidence of sheet erosion from the excessive slope. To resolve this issue, terraced gardens were introduced to the south of the site. This terracing allows more water to infiltrate and minimizes or eliminates the evidence of erosion. In addition to this, rain gardens were added as a buffer between the building and the terraced landscape. If there is an excess amount of water that flows from the terraces, the rain garden will help to infiltrate it.

Since the building is situated on terrain that is sloping downward, it is important to consider the grading of the site so that water is mitigated away from the building. A swale on the east side of the site was added to help channel water away from the building (Figure 124).

Green Roofs, PV Panels, PV Glass

Intensive and extensive green roofs are utilized throughout the building to help mitigate the heat island effect and also to help stabilize the temperature in the building. Photovoltaic Panels are situated on the northside of each butterfly roof on the bed wings in order to get as much sunlight as possible. Additional photovoltaic glass panels are used on the north side of the healing hub help provide energy for the building.



Figure 124: Sustainable Site Design Initiatives (Source: author)

Program Zones

Rehabilitation Zones

The building is divided into two main parts. One end of the building houses the wellness areas, which are the semi-public areas of the building, while the other end includes the rehabilitation spaces which are considered private areas of the building. The area between these two parts is the lobby which acts as a transitional zone between these two main programmatic spaces (Figure 125).

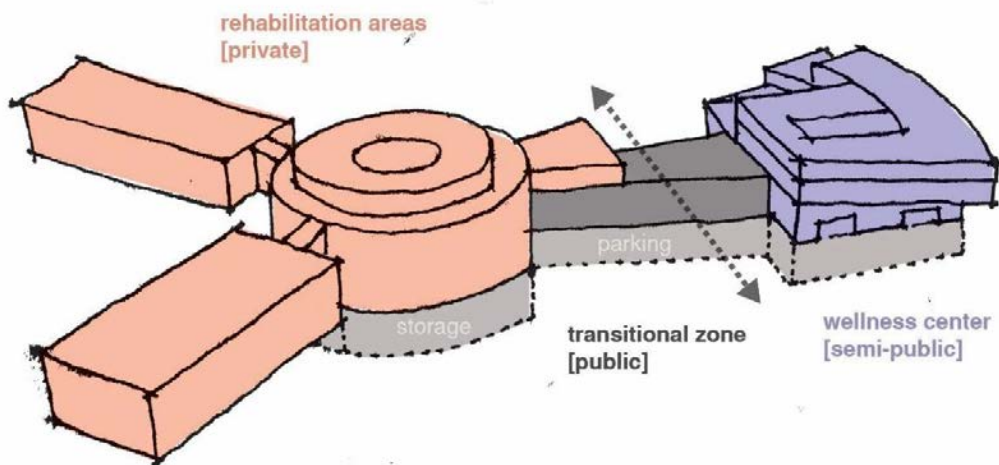


Figure 125: Rehabilitation and Wellness Zones (Source: author)

Refined Program Zones

The rehabilitation and wellness areas can be further defined by additional zones. The rehabilitation areas include a healing hub, which is where the majority of the therapy occurs, as well as two wings that extend into the landscape. The wings are each two stories with patient rooms above and therapy areas below (Figure 126).

The wellness center is subdivided into two main stories. The first level includes the wellness classes, while the second level includes the wellness clinic.

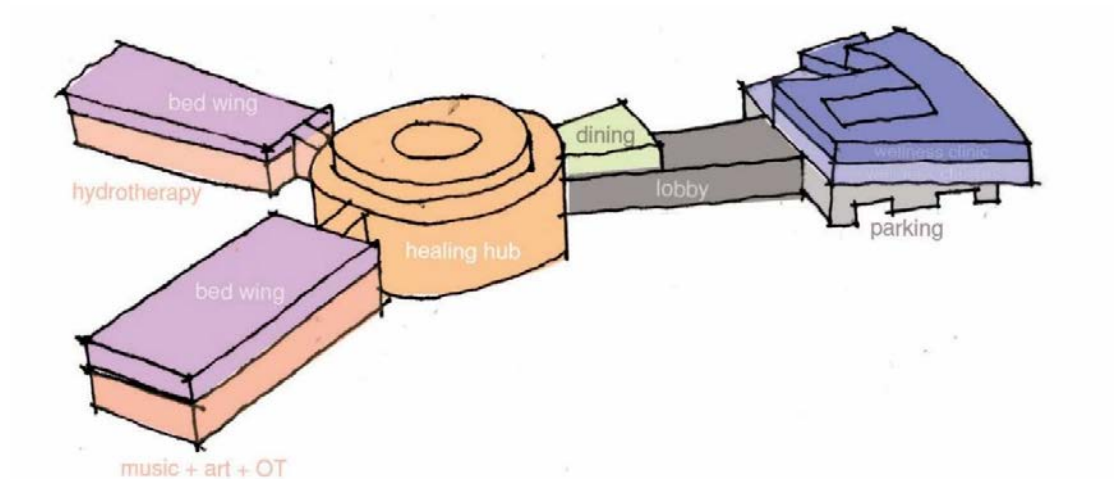


Figure 126: Overall Program Zones (Source: author)

Rehabilitation Hub Program Spaces

The rehabilitation center can be broken down into further programmatic zones. The healing hub includes two main levels in addition to a mezzanine level on the first floor. The lower floor is primarily for out-patient services, while the second level is for in-patients. The administrative areas are located in-between the first and second level, making it easy for the medical staff to access out-patients and in-patients relatively quickly. Being housed on a mezzanine level also provides the medical staff privacy, while at the same time allowing them to observe the therapy occurring below (Figure 127).

The upper floor of each wing includes the patient rooms. These rooms are sectioned off with day spaces where the patients can go to if they want to leave their rooms. The wing culminates with a day space, which provides additional space for patients and family to gather.

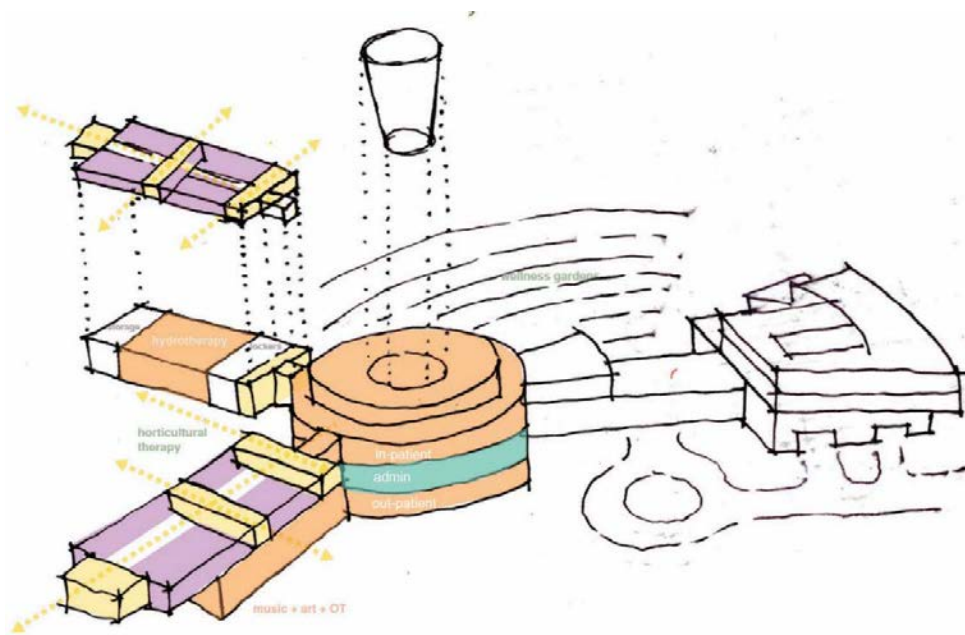


Figure 127: Rehabilitation Program (Source: author)

Landscape and Celestial

The rehabilitation hub opens up to the landscape and invites the landscape into the central healing space. The central portion of the hub is also open to the sky, allowing for a connection with the celestial (Figure 128). Other programmatic elements of the landscape include horticultural therapy and healing gardens between the two wings, and terraced gardens beyond the lobby entrance.

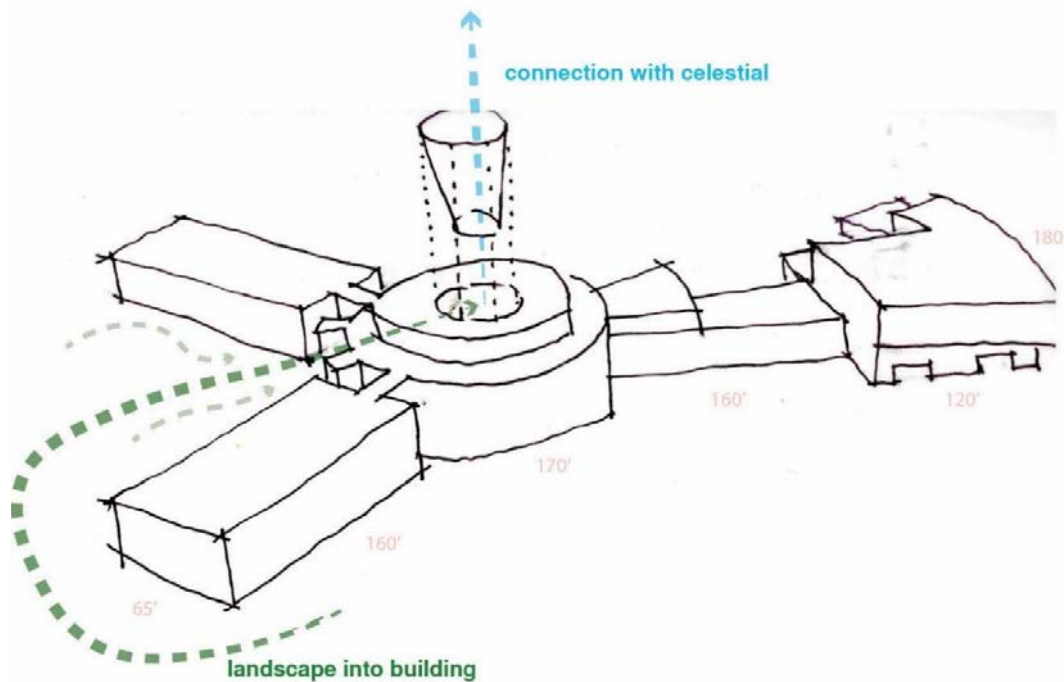


Figure 128: Landscape and Celestial (Source: author)

First Level Plan

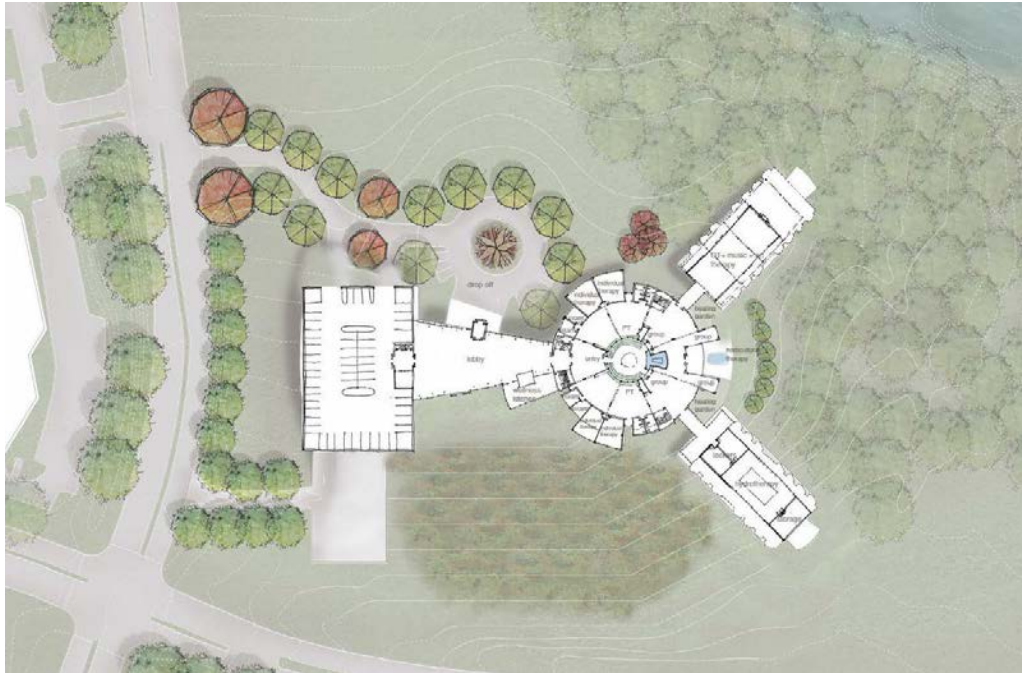


Figure 129: First Level Floor Plan (Source: author)

Mezzanine Level Plan

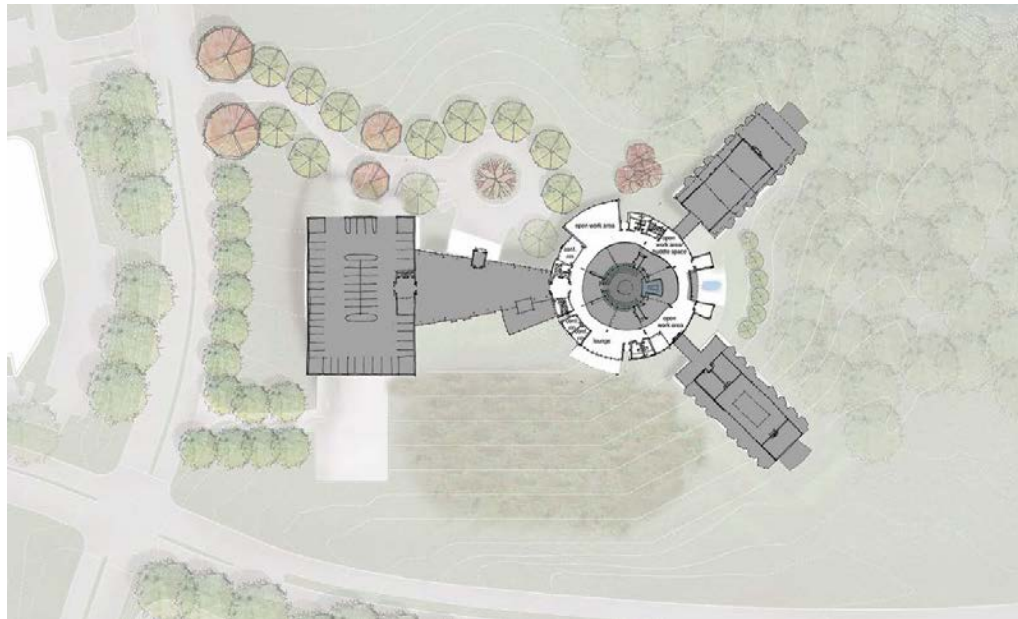


Figure 130: Mezzanine Level Floor Plan (Source: author)

Basement Level Plan

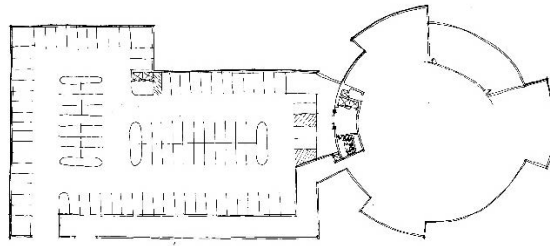


Figure 131: Basement Level Floor Plan (Source: author)

Second Level Plan

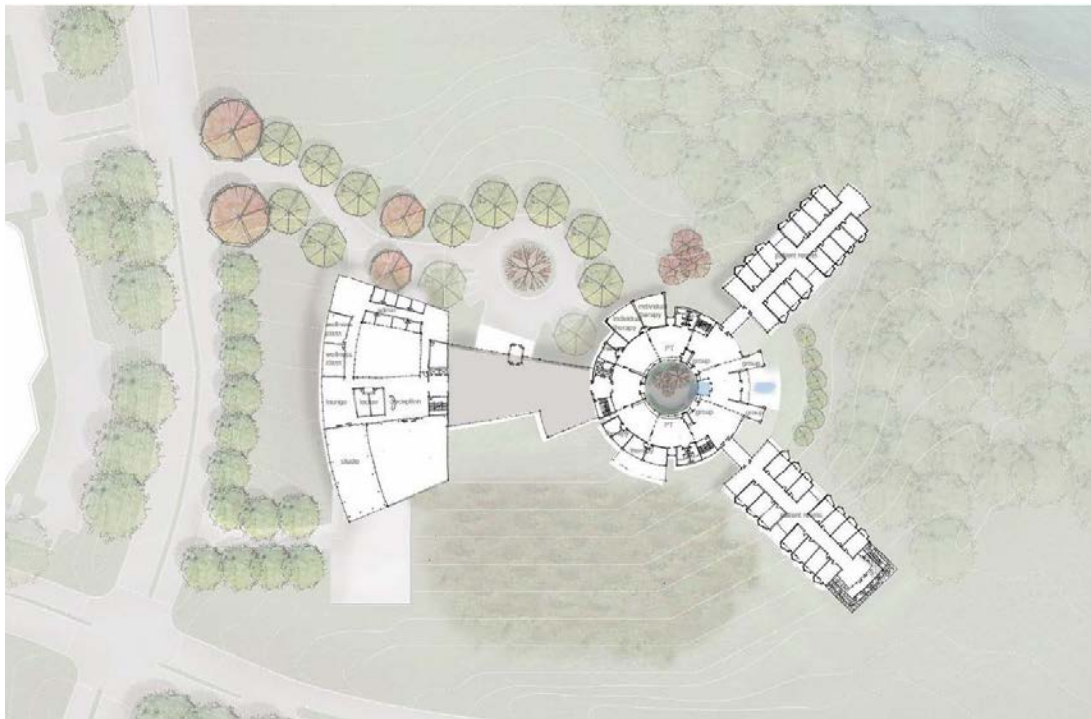


Figure 132: Second Level Floor Plan (Source: author)

User Experience

Building Approach + Wellness Sequence

Building Approach

When the users approach the drop off area, the transparent lobby and the healing hub are evident (Figure 134). The lobby's transparency is marked with a curtain wall which makes the wellness gardens visible in the entry sequence.

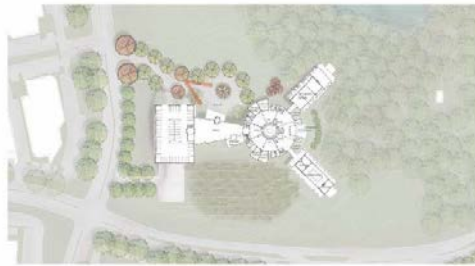


Figure 133: Key Plan for Building Approach (Source: author)



Figure 134: Building Approach and Drop Off Area (Source: author)

The healing hub is marked by the wood cladding on the façade which provides privacy to the patients on the first and second floor, but opens up in the center portion of the building where the administration areas are (Figure 135). This provides transparency from the administrative areas. The wood cladding also resembles the pitter patter of trees within a forest. The small trees and shrubs on the intensive green roof above give the illusion that the building has emerged from the ground. This undulating use of wood is also mimicked on the inside of the building- acting as the railing for the mezzanine level.

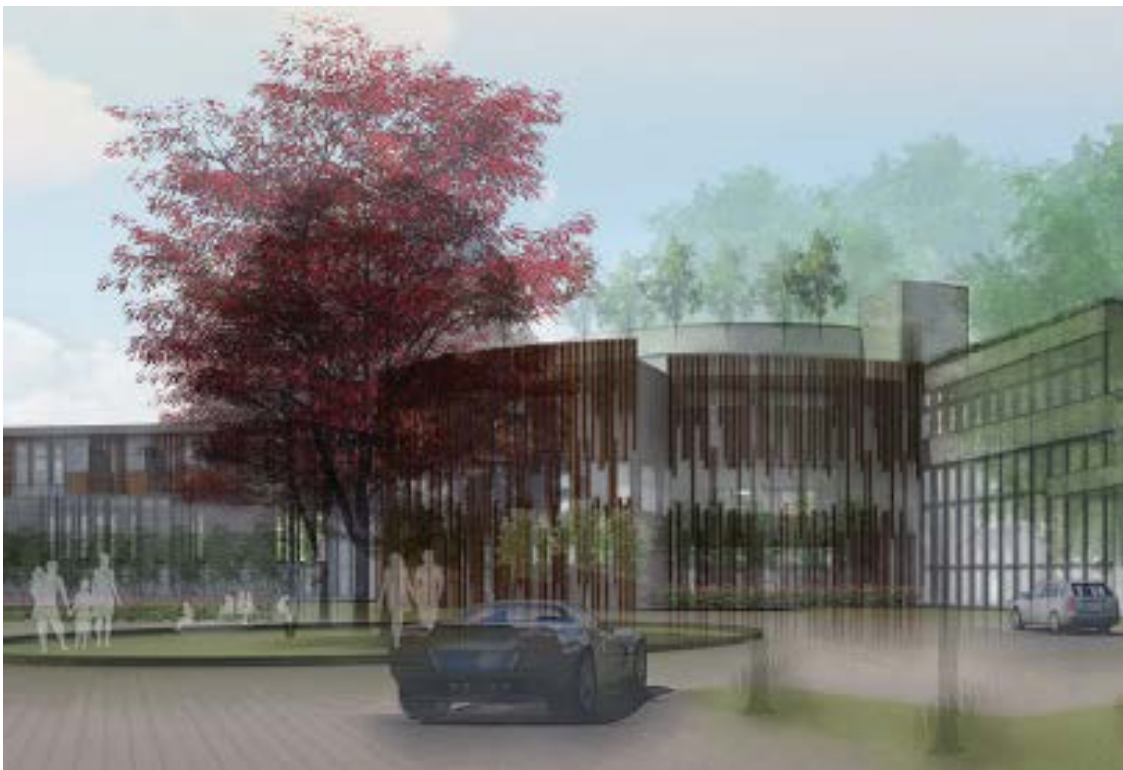


Figure 135: Rehabilitation Hub Entry Detail

Entry Sequence

After an individual has been dropped off and enters the lobby, he or she has an unimpeded view to the wellness gardens beyond (Figure 137). These wellness gardens are terraced to provide an opportunity for the community to learn about healthy eating options and compliments the cooking classes the wellness center offers.

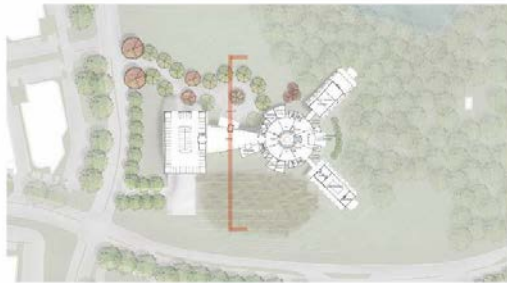


Figure 136: Key Plan for Section Cut Through Lobby (Source: author)



Figure 137: Section Through Drop Off Area and Lobby (Source: author)

Some of the vegetables that could be harvested in this zone include onions, peas, lettuce, eggplants, tomatoes, and beets. Figure 138 represents viable food options the wellness center could plant based on the time of year.

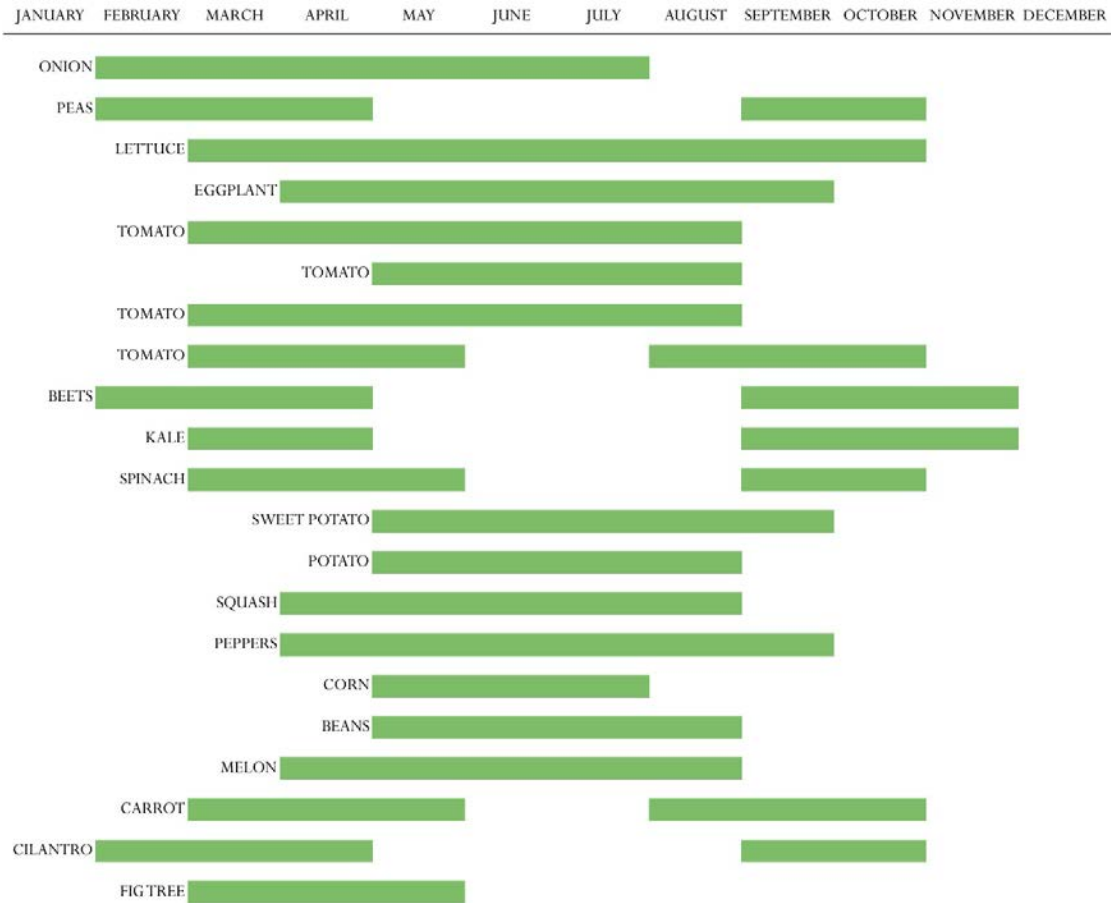


Figure 138: Diagram of Healthy Food Option to Grow Seasonally in the Wellness Garden (Source: author)

Wellness Amenity

Users of the wellness center also have access to wellness classes that enrich one's understanding of building a healthy lifestyle. This includes not only classes that focus on healthy eating habits, but also on those that promote a healthy mind and body balance. Figure 140 is an example of a meditation and yoga class that is offered.

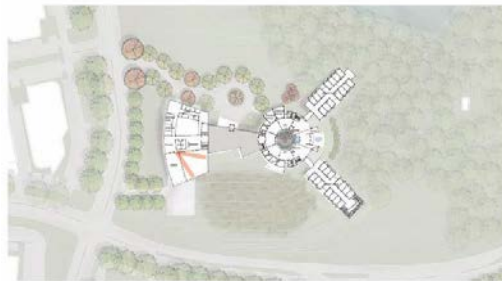


Figure 139: Key Plan for Wellness Perspective (Source: author)



Figure 140: Mind and Body Meditation Studio (Source: author)

Rehabilitation Sequence

Interior Healing Environments

After an individual enters the lobby, he or she may go to the right to enter the wellness building or to the left to start the rehabilitation sequence. Oftentimes, outpatients are dropped off by loved ones and will then proceed to the outpatient rehabilitation spaces.

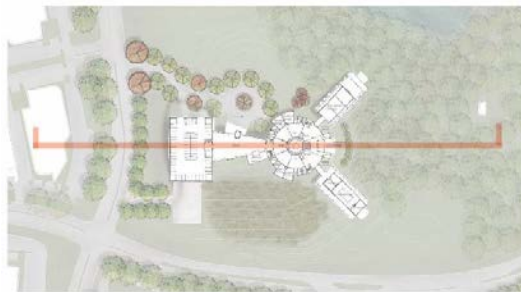


Figure 141: Key Plan for Longitudinal Section (Source: author)



Figure 142: Longitudinal Section Perspective From Wellness and Rehabilitation Spaces (Source: author)

Rehabilitation Approach

When the outpatient, and any other family member that may accompany them, enter the main rehabilitation space, they are greeted with the healing hub. This dynamic space incorporates several elements of biophilic design which have been shown to improve attentiveness, decrease blood pressure, and improve cognitive performance. The material selection includes natural materials such as stone and wood which connect the user with nature.

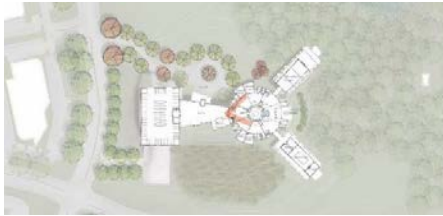


Figure 143: Key Plan for Rehabilitation Entry (Source: author)



Figure 144: Rehabilitation Hub Entry (Source: author)

Inside the Healing Hub

The interior of the healing hub provides a healing space that incorporates vegetation such as crape myrtles, water features, and seating (Figure 146). This area is for multiple users. Family could wait in here after grabbing a healthy snack from the lobby, or patients could enter this space as part of treatment to practice going up and down curbs and varying paving material.



Figure 145: Key Section for Healing Hub Perspective (Source: author)



Figure 146: Inside View of the Healing Hub (Source: author)

This healing hub also includes photovoltaic glass on the northside to capture as much energy from the sun coming from the southside. Figure 147 is a detailed view of this healing space. Attention was placed on soothing the user. The presence of water provides tranquility and enhanced perception, while the band of aromatic plants relaxes and puts the user at ease. This gives the family members who are waiting more patience, and the patients utilizing the space a more peaceful mindset.

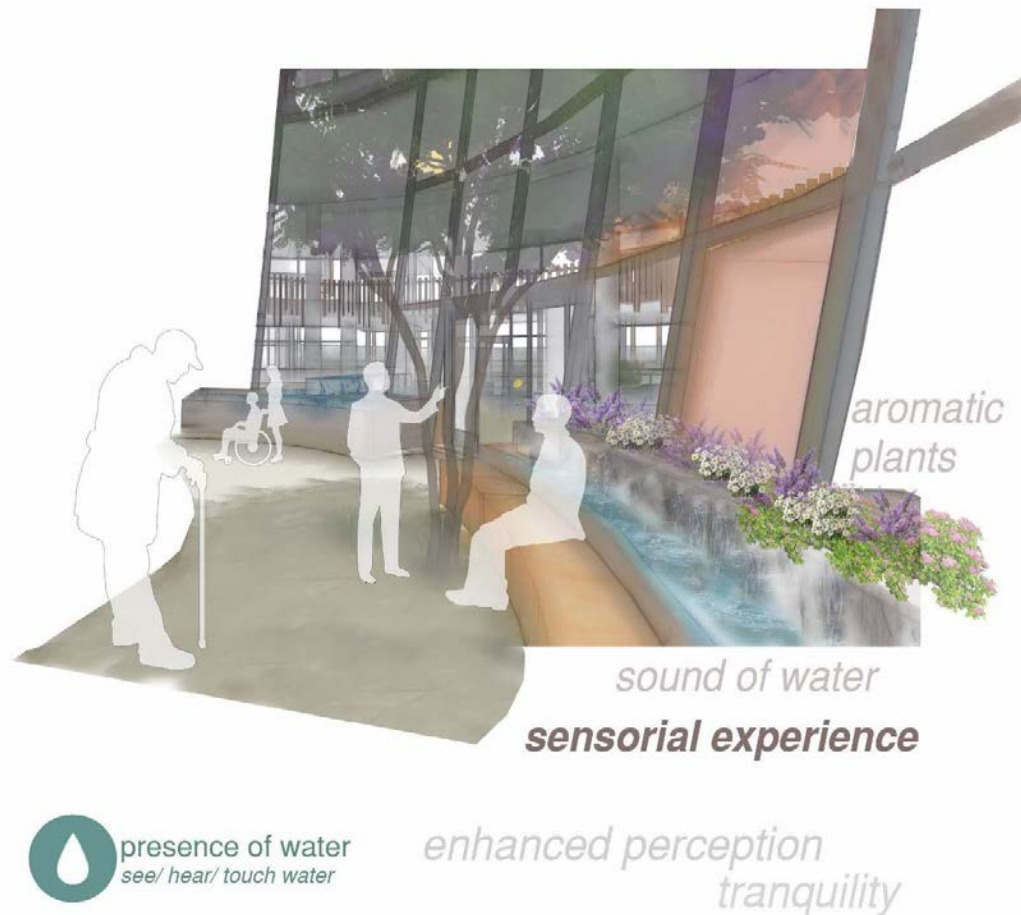


Figure 147: Sensorial Experience of Healing Hub (Source: author)

Exterior Healing Spaces

The exterior healing spaces are an extension of the interior healing spaces. The rehabilitation hub terminates with two smaller arms which house the group therapy extending into the landscape, while the landscape and water features push into the building. Figure 149 shows a view from the exterior of the building which includes horticultural therapy areas as well as pocket healing gardens accessible through a wisteria portal.



Figure 148: Key Section for Exterior Healing Spaces Perspectives (Source: author)



Figure 149: Exterior Healing Spaces (Source: author)

The wisteria climbs the wood trellis which acts as a portal into the healing garden. The wisteria is also present on the façade of the patient rooms and acts as a privacy screen to prevent anyone from looking into the patient rooms. The soothing sound of water helps to create a calm atmosphere in this area and helps to make the users feel cooled down on a hot summer day (Figure 150).



Figure 150: View to Healing Garden Portal (Source: author)

Staff Areas and Areas of Refuge

Key Program in 'Healing Hub'

The rehabilitation hub is designed so that all out-patient services occur on the first floor to increase accessibility. The second floor is primarily for the in-patient therapy services and includes access to the bed wing on the same level- again to ease accessibility. The mezzanine level overlooks the out-patient areas and provides an area for the administrative and medical staff.

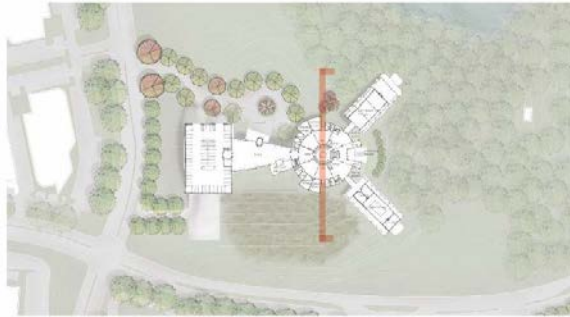


Figure 151: Key Plan for Section Cut Through Rehabilitation Hub (Source: author)



Figure 152: Section Through Rehabilitation Hub (Source: author)

Staff Areas

The medical and administrative staff are extremely important users of this space. They must utilize this building every day they come to work. It is imperative to think about the type of spaces that are created for them. By placing the medical staff on the mezzanine level, it allows them to have a view of the healing hub, the therapy below, the garden views surrounding the building, as well as providing them with privacy from families and patients. Figure 154 illustrates an example of the medical staff lounge area.

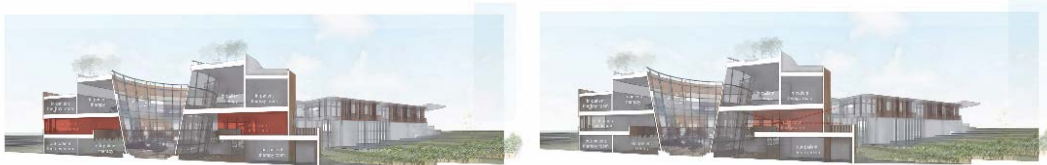


Figure 153: Key Section of Administrative Areas (Source: author)

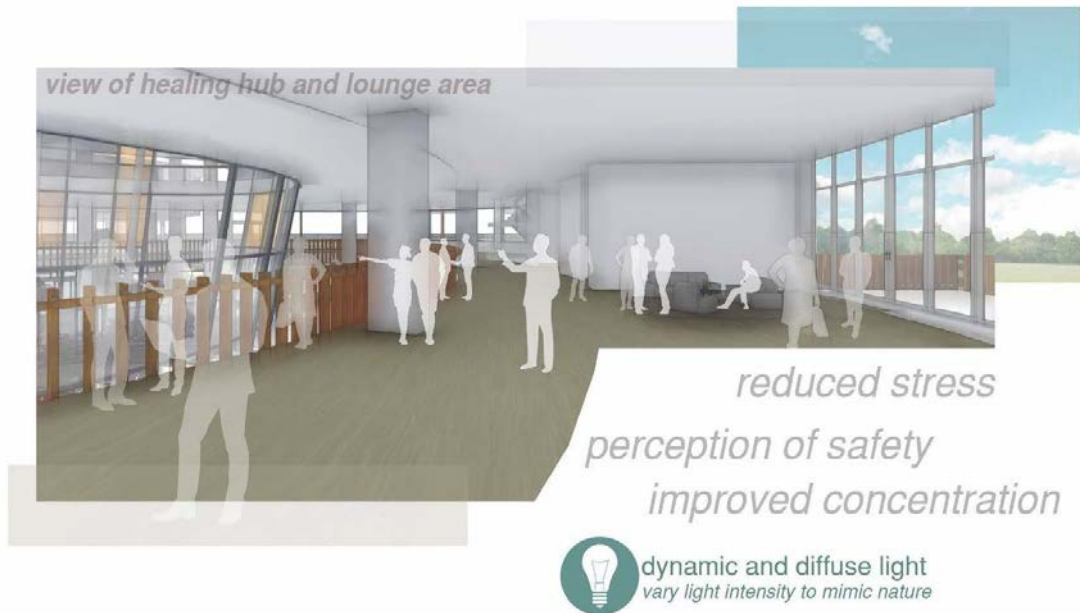


Figure 154: View of Medical Staff Lounge Area (Source: author)

Refuge Areas

There are three areas of refuge located on each level, and accessible to patients, family, and staff. The refuge areas provide a space where individuals can seek if they wish to be alone and gather their thoughts. It has been shown that areas of refuge increase an individual's perception of safety and also improves concentration. Figure 155 highlights the areas on each level that a refuge area exists.

Each refuge area is a private space that is only large enough to fit one wheelchair or two individuals if they choose to sit on the recessed bench. Figure 156 highlights a view of a refuge space which includes a view to the landscape. Generally, each refuge space will have a different view and a symbolic moment, such as a tree or water feature.

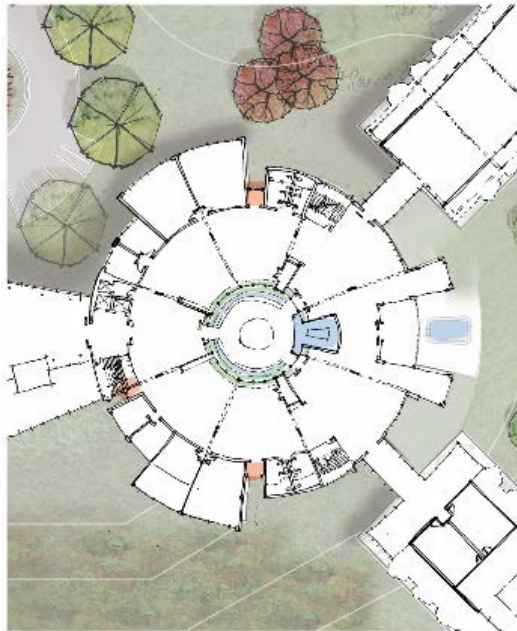


Figure 155: Key Plan of Refuge Locations (Source: author)



perception of safety
improved concentration

Figure 156: View of Refuge Area (Source: author)

Patient Areas

In-Patient Physical Therapy

The out-patient and in-patient physical therapy areas are very similar in that they both have a circulation band on the edge of the space. This allows for patients to be able to walk around as part of their physical therapy, while allowing others to be able to continue with their own physical therapy while on different machines. Figure 158 is an example of the in-patient physical therapy areas. The patients have a view into the healing hub and up at the sky while working on their therapy. This gives the patients a connection with the celestial while keeping them grounded by incorporating a band of aromatic plants around the hub.

There is plenty of storage that is readily accessible by the therapists along the four main walls that truncate the therapy spaces into open rooms. The wall adjacent to the 'circulation zone' provides patients with the opportunity for additional therapy areas. This includes games that can be pinned to the wall.

The circulation band alternates in flooring material. Every ten feet there is a material change so that patients know that they have walked another ten feet. Potentially, this change in material could be a screen on the ground that tells the patient how far they have gone or gives them encouraging words for them to keep going.



Figure 157: Key Section for In-Patient Perspective (Source: author)



Figure 158: View of Main In-Patient Therapy Area (Source: author)

Conference Room

The design of the conference rooms keeps the idea of comfort in mind. Along with traditional conference rooms, the proposed building also incorporates smaller 'conference lounges'. These 'conference lounges' are based on the Maggie Centre's model of hospitality. They create a comfortable place where family members, the patient, and the medical professional can meet to discuss treatment and patient progression.

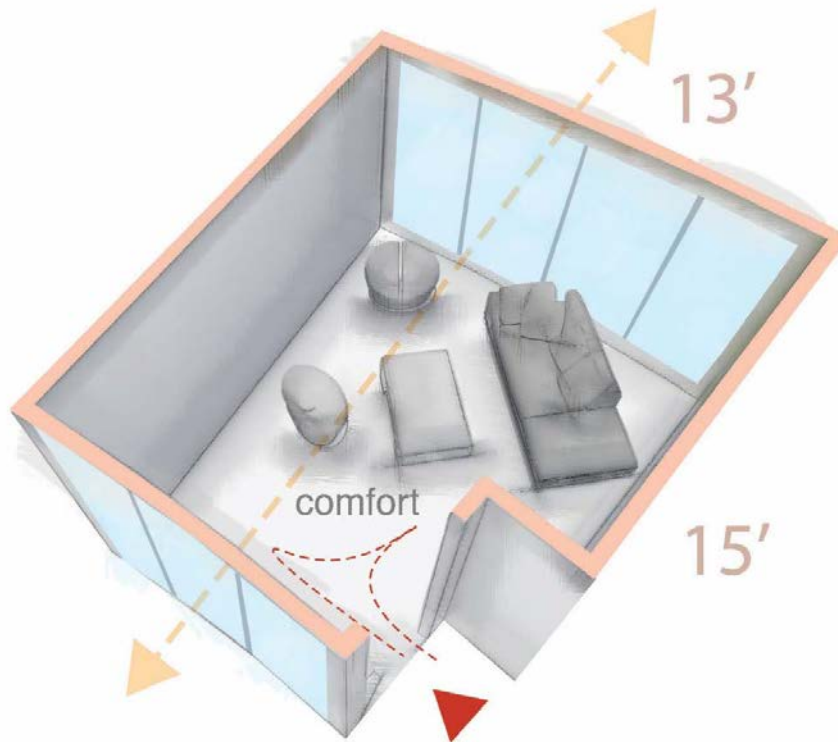


Figure 159: Conference Room Axon (Source: author)

Individual Therapy Room

Individual therapy rooms are included in the design for two major reasons. One, they provide a private area for patients who do not wish to have physical therapy in the rehabilitation hub. Two, these rooms are transition rooms where family members can attend a patient's treatment. This allows an in-patient an opportunity to start transitioning to a life at home. This space includes an area for family members to observe and learn, as well as a non-ADA restroom so that the patient can learn how to successfully maneuver at home.

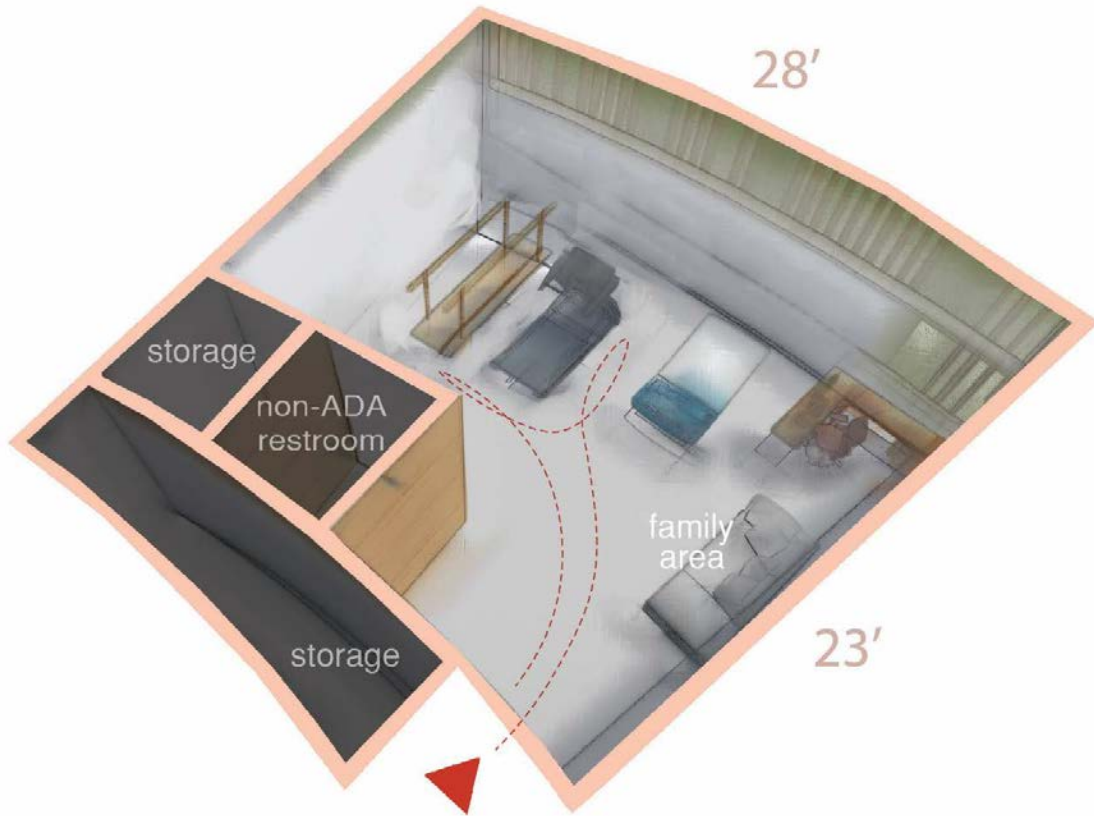


Figure 160: Individual Therapy Room Axon (Source: author)

Exam Room

Exam rooms are one of the first rooms that a first time out-patient or in-patient will visit. It is important to think about ambulatory space within the room as well as views out, while still maintaining privacy. The patient faces the wall with the windows while on the bed and can look out at the sky through the clerestory window. When the therapist is sitting at the desk, they have a direct view of the patient and are eyelevel with them which increases a patients comfort.

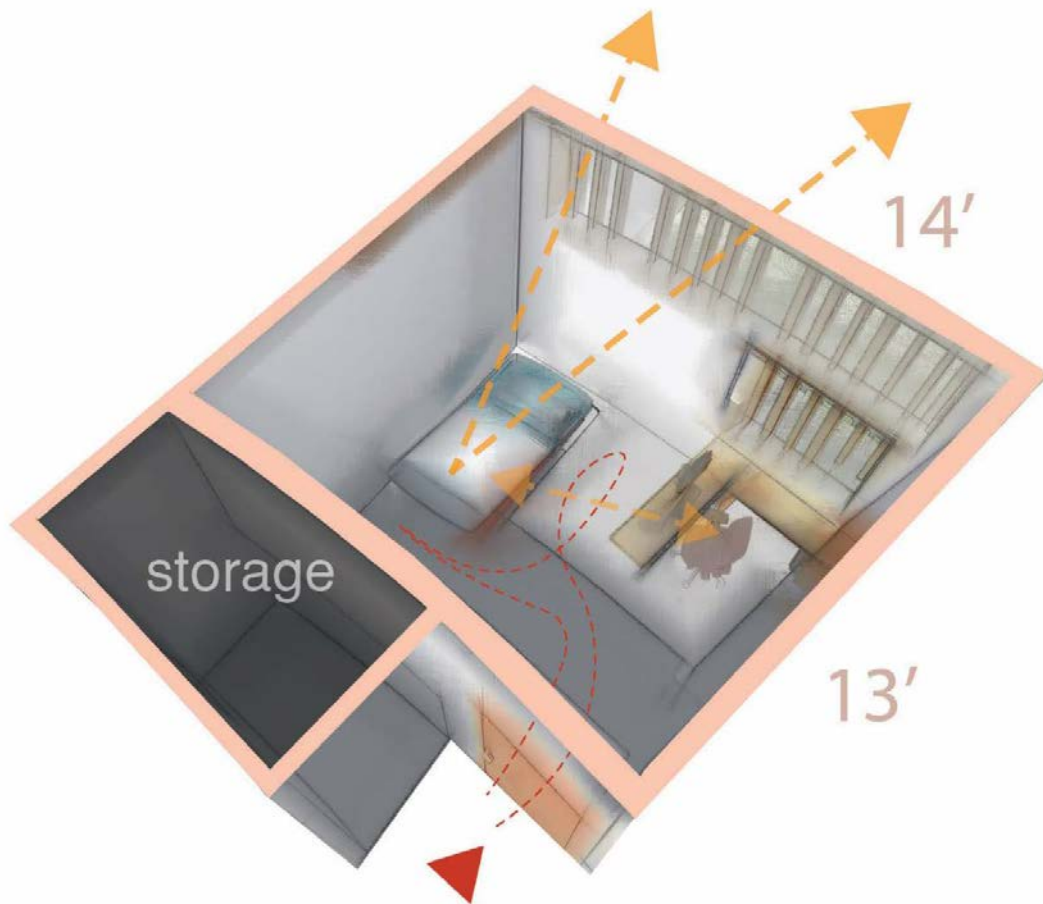


Figure 161: Exam Room Axon (Source: author)

Approach to Patient Rooms

The patient experience is fundamental to the success of this building. This includes the transition a patient makes from the rehabilitation spaces to the patient rooms. Figure 162 illustrates a patient's view when approaching the patient bedroom area. The patient traverses a transparent 'bridge' which is received with a day space at the end. What would be a long corridor is intercepted with light and views of vegetation.



prospect
unimpeded view over a distance

improved comfort
reduced fatigue

Figure 162: Approach to Patient Rooms (Source: author)

Patient Room Location Within Wings

Each patient room has a different view depending what side it is on. On one side, the patients have a view of the wellness gardens, while the other they have a view of the horticultural therapy and additional vegetated areas. Figure 163 is a section of the building that shows the butterfly roof that is designed so that when a patient enters a room, that room opens up to the landscape. The butterfly roof also allows for one roof to have photovoltaic panels on them and the other to have an extensive green roof. PV panels help to capture energy from the sun, while the green roof helps to regulate the temperature of the rooms and offset the heat island effect.

Below the patient rooms are additional therapy rooms in each wing. One wing houses additional occupational therapy areas as well as music and art therapy, while the other includes a pool for hydrotherapy.



Figure 163: Section Through Patient Rooms and Hydrotherapy Area (Source: author)

Patient Room Layout

Each patient rooms is designed so that there is ample area for family members, medical staff while providing patient comfort. A door that is easy for patients to open set on a recessed track, allows patients to open up the room to the outside and occupy the balcony.

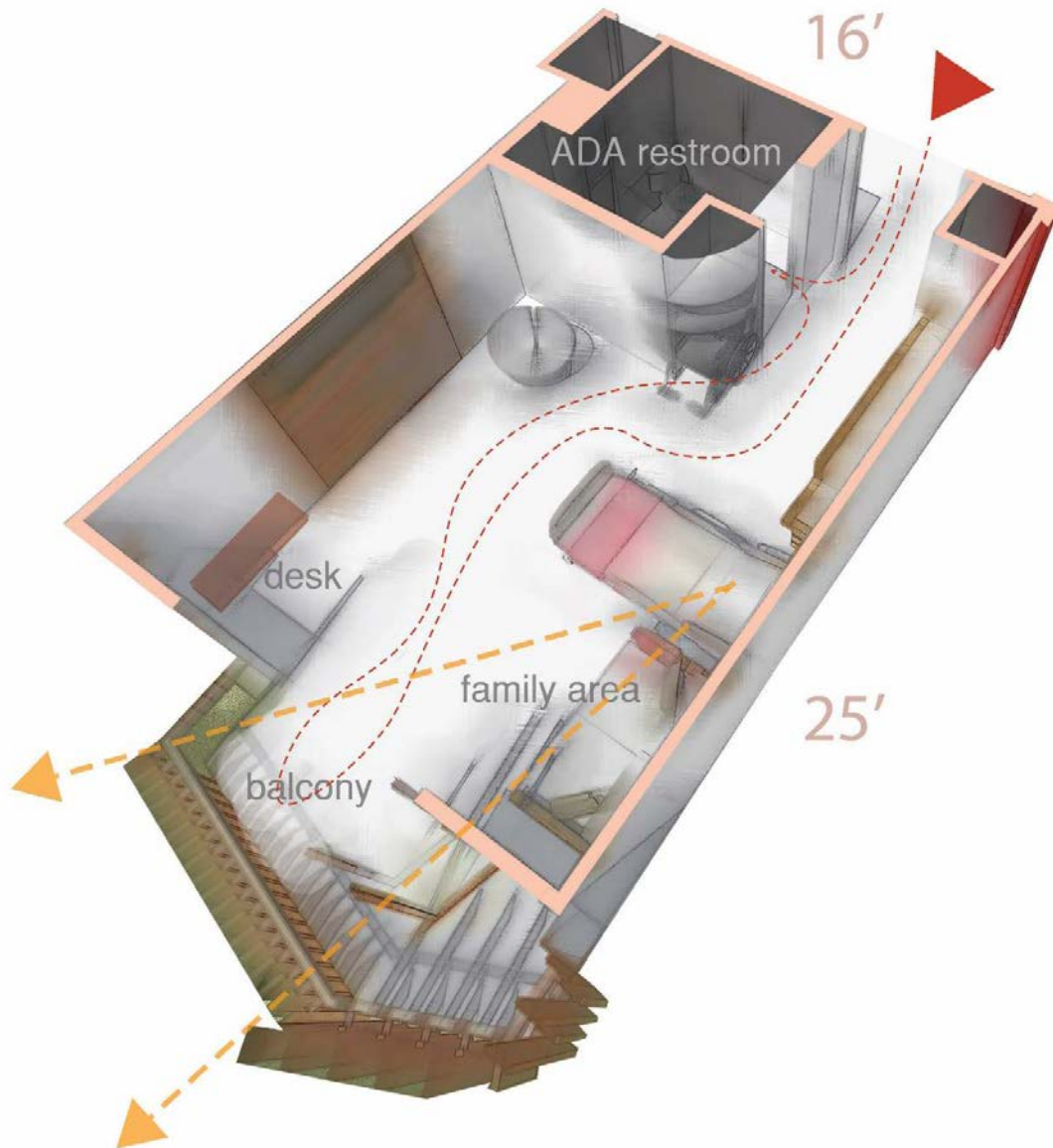


Figure 164: Patient Room Layout (Source: author)

Patient View from Bed

The patients view is an important element in the design of the room. Figure 165 illustrates the patient view from the bed. The vegetated wisteria privacy screen, which protects others from looking into the space, is seen alongside the open balcony view.



Figure 165: Patient View from Bed (Source: author)

Chapter 10: Conclusion

Overall, the project was well received during the review. Discussion about the healing hub was positive and the overall critique of that space was that it provided a good healing environment. There were a lot of comments about how to improve upon the biophilic design principles. One was to make it more evident how the landscape is entering the building, and the other was to think about adding more program within the landscape itself. The reviewers talked about adding a walking path in the landscape between the two wings so that patients have additional areas to meander.

This project has provided several good thoughts on the design of healing spaces. In the future this project could develop the wellness areas more as well as the program in the lobby. One of the comments from the review was to think about the section through the lobby. The reviewers thought it was well developed on the rehabilitation side, but thought the section could use some interest on the wellness side- perhaps adding a vertical element that connects the lobby to the wellness areas.

This project doesn't end here. Learning about what is best for the user experience in healthcare is a lifetime journey. It is always important to think of the different users and to also be mindful of them. Taking time to listen to users, including medical staff and patients, allow us to become better architects.

This building serves as a model of design that incorporates the community in a healthcare setting, creates healing spaces that include both interior and exterior moments utilizing biophilic design principles, and thinks of the user experience at every turn.

If designing with biophilic design principles has been shown to positively impact an individual's health, there should be more emphasis placed on designing with these principles, especially in a healthcare setting. This is a powerful tool.



Figure 166: Final Board Composition- Boards 1-6 (Source: author)



Figure 167: Final Board Composition- Boards 1-3 (Source: author)

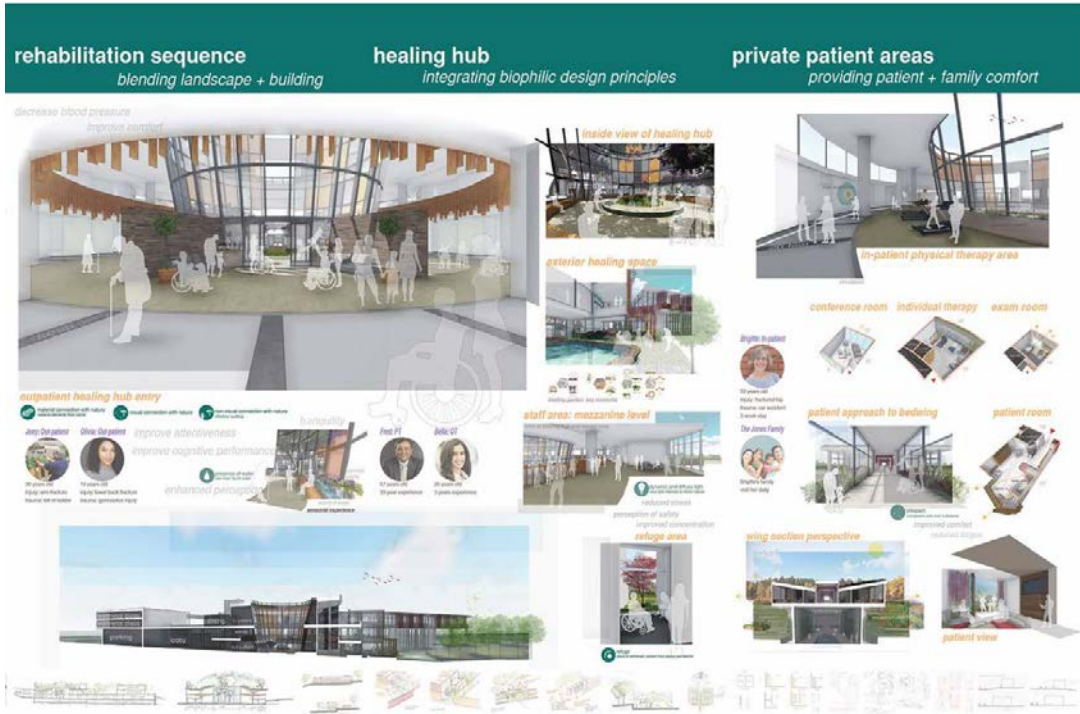


Figure 168: Final Board Composition- Boards 4-6 (Source: author)

APPENDIX A:

PT and OT Interviews

This appendix includes interviews from various physical therapists and occupational therapists with a range of experience. Interviews were conducted on site at the hospital or rehabilitation center. Answers are summarized from interview and do not imply a direct quote. Below are the following dates the interviews were conducted at each hospital or rehabilitation center.

| | |
|-----------------------------------|--|
| September 26 th , 2017 | Holy Cross Hospital 1500 Forest Glen Road, Silver Spring, Maryland 20910 |
| October 5 th , 2017 | Sibley Memorial Hospital 5255 Loughboro Road NW, Washington, DC 20016 |
| October 19 th , 2017 | Georgetown MedStar Hospital 3800 Reservoir Road NW, Washington, DC 20016 |
| December 7 th , 2017 | National Rehabilitation Hospital 102 Irving St NW, Washington, DC 20010 |

HOSPITAL: Sibley Memorial Hospital
Medical Professional: *Dianne McCarthy*

Title: Director of Rehabilitation

Discipline: Occupational Therapist

Experience: 19 years working at Sibley
almost 40 years overall

What does a typical day look like?

- **Oversee 200 patients and all of the staff**
- Attend hospital meetings, sometimes manager meetings
- Take care of staff and family members of patients
- **Coordinate patient care**

Are there any existing spaces that are very successful?

- **Community space** in the in-patient area (place for family members, activities)

Is there anything about the current design of the rehabilitation space that you would change?

- **Accessibility**
 - Doorways should be automatic sliding door especially for patients with assisted walking device
 - Parking should be closer or less steep of a walk to out-patient unit
- More **storage**
- Would add **outdoor therapeutic space** with ramps, steps, curbs, crosswalks
- Is nice to have the therapeutic pool but is a lot of maintenance (operational and expense)

What are some of the benefits of the recent renovation to the out-patient unit?

- In waiting room: high chairs for those who have had hip replacements, bariatric chairs
- Locker room in out-patient pool area: increased size of locker area because too-tight- was hard to fit an electric wheelchair
 - Turning to get into locker room from hallway is still narrow at times
- Updated **flooring pattern** in gym to include pattern change every 10 feet so patients know how far are walking, different patterns on floor for activities

HOSPITAL: Sibley Memorial Hospital

Medical Professional: *Jessica Barron*

Title: Manager

Discipline: Physical Therapist- Out Patient Unit

Experience: 12 years working at Sibley
15 years overall

What does a typical day look like?

- Morning round in out-patient: **check environment of care**, staff, pool, check in with therapists in the gym
- Admin work: review time off requests, deal with any patient concerns
- Work with safety team, work with front desk huddle
- Troubleshoot rest of the day

Is there anything about the current design of the rehabilitation space that you would change?

- Think more about **accessibility** and movement into the space- some spaces are very narrow and tough to move around in especially for those in wheel chairs
- **Privacy!** Walls are very thin and can hear everything going on in other treatment rooms
- The modality (individual therapy) rooms are very small
 - Computers face away from patients- bad to have back facing patient, a therapist should always be facing the patient

HOSPITAL: Sibley Memorial Hospital

Medical Professional: Lisa Ronayne

Title: Manager of Physical Therapy Team

Discipline: Physical Therapist- Orthopedic Unit (In-Patient)

Experience: 12 years working at Sibley
28 years overall

Is there anything about the current design of the rehabilitation space that you would change?

- There are no **windows**- having some would be nice.

What is your favorite part about working in this environment?

- Enjoy having space to see patients together and with group
- Love the new space- they can do what will do at home (kitchen, bathroom, bed mobility)
- **Bathroom** is nice because it is **not ADA** compliant just like they will encounter at home

What are your thoughts on group physical therapy?

- Typically will get those recovering from same type of injury, for example hip fractures, and put them in a group
- They **get chatty and competitive which is good**- pushes them to do more

Do patients typically stay in their room the whole day? Or are there spaces for them to go?

- Before we got this therapy space, we treated patients in the room
- Now we bring them into this space

Do families visit a lot?

- **Yes** they do
- They are only allowed in the therapy room if they are doing **family training** to help the patient once they are home

HOSPITAL: Sibley Memorial Hospital

Medical Professional: Elizabeth Crone

Discipline: Physical Therapist- Skilled Unit (In- Patient)

Experience: 15 or 16 years working at Sibley
30 plus years overall

What does a typical day look like?

- On call on weekends
- **Flexible hours** because of nature of job

Is there anything about the current design of the rehabilitation space that you would change?

- Don't have a **dedicated conference room**- is difficult to have private family and care plan meetings
- Space challenged- as we grow, we need more space- especially gym space
- Need more storage space
- Larger offices

What is your favorite part about working in this environment?

- I love my staff and I like this level of care
- It can get complex dealing with families and managing but I enjoy it

Do patients typically stay in their room the whole day? Or are there spaces for them to go?

- Don't want them to be- unless they have an active infection and are in isolation
- They **leave room for therapy**
- Patients can only walk when there is a therapist or nurse present
- Encouraged to come out for **activities** (coloring, reading, movies, music, games, pizza) in the **family sitting room** (Renaissance Room)

Do families visit a lot?

- Yes and we **encourage that**- it is one of the factors we look at to see if they can go home

HOSPITAL: Holy Cross Hospital

Medical Professional: Ashley Patterson, DPT, CEAS

Discipline: Physical Therapy

Experience: 9 years working at Holy Cross
9 years overall

What does a typical day look like?

- Half an hour to get things together, look at charts
- See patients for an hour each for the rest of the day

Is there anything about the current design of the rehabilitation space that you would change?

- Gym can get **crowded** because share space with pulmonary rehab
- Need more space, is hard to move around sometimes
 - Hard because many patients need assisted devices
 - Need **more wall spaces** (for wall activities)
 - **More floor space** for activities
- There are no **windows**- most of the PT's and OT's are **vitamin D deficient**

Do families visit a lot?

- Yes- usually have to wait in waiting room because there is no space in gym (unless pediatric, then a family member can come)

HOSPITAL: Holy Cross Hospital

Medical Professional: *Melissa Fleury, DPT*

Discipline: Physical Therapy (Out-patient Unit)

Experience: 8 years working at Holy Cross
10 years overall

What does a typical day look like?

- Give patients an **evaluation** if it is the first time they are coming in
- Treat patients the rest of the time

What are the typical injuries and how long are patient's recovery?

- Typical injuries: back pain, shoulder pain, strokes
- Typical treatment: **2-3 times a week for about 8 weeks**
- Some treatments could be 4-5 months

Is there anything about the current design of the rehabilitation space that you would change?

- There are no **windows**- many people Vitamin D deficient
- A **lounge** would be nice

HOSPITAL: Holy Cross Hospital

Medical Professional: Kim McRae, PT

Title: In- Patient Physical Therapy Coordinator

Discipline: Physical Therapist

Experience: 25 years working at Holy Cross
30 years overall

Do you have any experiences with alternative therapies and their role in patient recovery?

- Some have a **massage** degree
- Some have a degree in **Chinese medicine**- such as acupuncture and herbs (not here)

What is your favorite part of working in this environment?

- The **wall organization**- helps keep the crutches and other supplies neatly organized on wall

Is there anything about the current design of the rehabilitation space that you would change?

- The gym gets **very hot** in the Summer but the **windows are great!**
- No discreet place to put dirty clothes

HOSPITAL: Holy Cross Hospital

Medical Professional: Theresa Catterton-Doherty

Title: Lymphedema Specialist

Discipline: Physical Therapist (primarily out-patient unit, sometimes in-patient unit)

Experience: 18 years working at Holy Cross
27 years overall

What does a typical day look like?

- Nothing is routine
- Deal with **Lymphedema patients** (swelling, breast cancer patients)

Is there anything about the current design of the rehabilitation space that you would change?

- Treatment rooms are not big enough (probably average size, have been similar size in other places I have worked but it needs to be larger)
 - **Accessibility**
 - Tough for bariatric patients to enter through door- door is scraped
 - Space too- tight to **maneuver** around
 - Nowhere to put wheelchair
 - Not enough **storage**
 - Computer faces away from patient which is bad because you always want to be facing the patient
- **Windows!** I am **Vitamin D deficient**- doctor said I must use supplements and advises me to go outside during the day
- PT shouldn't be in basement- often referred to as 'the dungeon'

What are the typical injuries and how long are patient's recovery?

- Typical injuries: patients with swelling or breast cancer
- Typical treatment: **2-3 times a week for about 6-8 weeks**

HOSPITAL: Holy Cross Hospital

Medical Professional: Ellen Sullivan

Discipline: Occupational Therapist (mostly in-patient unit, some out-patient unit)

Experience: 11 years working at Holy Cross
about 20 years overall

Do you have any experiences with alternative therapies and their role in patient recovery?

- I used to teach **yoga** so I incorporate some of that into therapy- breathing and stretching

What does a typical day look like?

- **Administrative work** for an hour
- Work with patients for typically 30-45 minutes
- Weekend schedule- supervisor

What are the typical injuries and how long are patient's recovery?

- Typical ailments: Diabetes, asthma, COPD (chronic obstructive pulmonary disease), pneumonia, post-surgical issues (such as having a baby)
- Typical treatment: typically 30 minutes, 45 minutes in ICU (Intensive Care Unit)

Is there anything about the current design of the rehabilitation space that you would change?

- Rehab should be **more central** alongside nurse and doctor, often PT and OT seen as an add on- **should be better integrated into environment**
- **Windows**
- Easily **accessible outdoor space** for patients for OT use (curbs, sidewalks, etc.)

HOSPITAL: Georgetown MedStar Hospital
Medical Professional: Pamela Jennings, DPT
Discipline: Physical Therapy (out-patient unit)
Experience: 6 years working at Georgetown MedStar
6 years overall

Do you have any experiences with alternative therapies and their role in patient recovery?

- Hospital has **art therapy** and **music therapy**- not in this unit
- Use pool in Yates for **aquatic treatments**

What does a typical day look like?

- Treat 6-7 patients in morning
- Documentation or meetings 30 minutes
- 6-7 patients in afternoon

Is there anything about the current design of the rehabilitation space that you would change?

- More **private** areas for patient confidentiality- more partitioned areas instead of curtains (can hear everything that is being said)
- Use the **hallway as treatment space** but is tough because people are walking by
- Need a **bigger central area** to use
- Need **more wall space**- to add more resistance exercises
- Would add space athletic in nature- so can having **running or stop drills**
- More private spaces and offices (staff has grown but space has remained the same)
- **Evaluation rooms too- small**- when evaluate needs to be like an interview setting (therapist must face the patient)

HOSPITAL: Georgetown MedStar Hospital

Medical Professional: *Lauren Taverner*

Discipline: Occupational Therapist (in-patient unit)

Experience: 2 years working at Georgetown Medstar
5 years overall

Is there anything about the current design of the rehabilitation space that you would change?

- **Privacy** is an issue
- **Rooms are too-small**, it is hard to mobilize patients

Do patients typically stay in their room the whole day? Or are there spaces for them to go?

- Yes, the whole time
- Sometimes walk in hallway (difficult because of IV's)
- Sometimes are taken to gym

What are some typical injuries?

- Neuro, ortho, general medicine

What kind of additional spaces would be helpful to have?

- **Simulated city** (like St. Agnes Hospital)- they have **curbs, stoplights, and a car** you can practice getting in and out of

HOSPITAL: National Rehabilitation Hospital

Medical Professional: *Fudiatu Seisay*

Discipline: Registered Nurse

Experience: 12 years working at National Rehabilitation Hospital
about 19 years overall

What does a typical day look like?

- Morning huddle (outgoing night shift must brief morning shift)
 - Go over patient health, if was sick overnight
 - See assigned patients
- Go over patient care- check medications

What is your favorite part about working in this environment?

- Colleagues and team work makes life better
- Good communication and rapport with one another

Is there anything about the current design of the rehabilitation space that you would change?

- Rooms are too-small, sometimes have too many chairs- if there is a code blue is tough- can't move around easily
- Breakroom is very small – not enough space for everyone, there are also no windows
- Lacking a waiting area for family

HOSPITAL: National Rehabilitation Hospital

Medical Professional: Sarah Lewis

Discipline: Physical Therapist

Experience: 1-1/2 years working at National Rehabilitation Hospital-
about 1-1/2 years overall

What does a typical day look like?

- Meetings and team conferences (everyday team gets together to discuss each patient)
- Treat 3-5 patients in a day depending on how many there are in the hospital

What are some things about the current design that you like?

- Tables recess into the ceiling to allow for group therapy to happen during various times of the day- the only thing is, sometimes when the tables are down it can get a little tough for people to circulate through
- Independence Square. It is a good setting for those in need of occupational therapy to transition into everyday life

Is there anything about the current design of the rehabilitation space that you would change?

- Rooms can get cramped because of all the equipment in it which also makes it difficult to fit a lot of guests
- Sometimes the patient bathrooms can be difficult to maneuver, especially with stroke patients, because sometimes there is no space for wheelchair transferring since stroke patients usually have a strong and weak side- having a design that accommodates for both would be helpful

HOSPITAL: National Rehabilitation Hospital

Medical Professional: Lucy Stein

Discipline: Occupational Therapist

Experience: 3 years working at National Rehabilitation Hospital-
about 3 years overall

Is there anything about the current design of the rehabilitation space that you would change?

- Sometimes with all the equipment in the atrium gym, it gets tough to move some patients through- there is not enough clearance
- Patient rooms with a lot of people can get crowded, there is a lot of equipment to move around
- Additional storage that is more accessible would be beneficial
- There is no separate breakroom- maybe it doesn't need to be just for therapists. It would be nice to have something relaxing

What are some of your other responsibilities?

- Attending meetings and team conferences
- Part of the Environmental Design and Research Group Center for Human Factors in Healthcare which MedStar offers
 - Part of the social science field which examines how humans interact with the environment and how design can affect that
 - Specifically look at the built environment and how the built environment in a healthcare setting can increase a patient's safety and reduce burnout
 - On committee to help raise money to make changes to kitchen layouts and add more amenities to 'Independence Square' (See Appendix C for more information)

HOSPITAL: National Rehabilitation Hospital

Medical Professional: *Kristen Mastrony*

Discipline: Occupational Therapist, Assisted Technology Team

Experience: 10-1/2 years working at National Rehabilitation Hospital-
about 10-1/2 years overall

How is technology currently being used in patient recovery?

- Currently use 3D printer to print out games, cup holders, crutch holders, and other items which can be personalized with the patient's name
- Current technology shown to patients in need. They can purchase as a transition to home
 - stylus which can help with arm movement- allows individuals to use their phone
 - Virtual reality- helps some people with spinal chord injury- helps them feel like they are walking

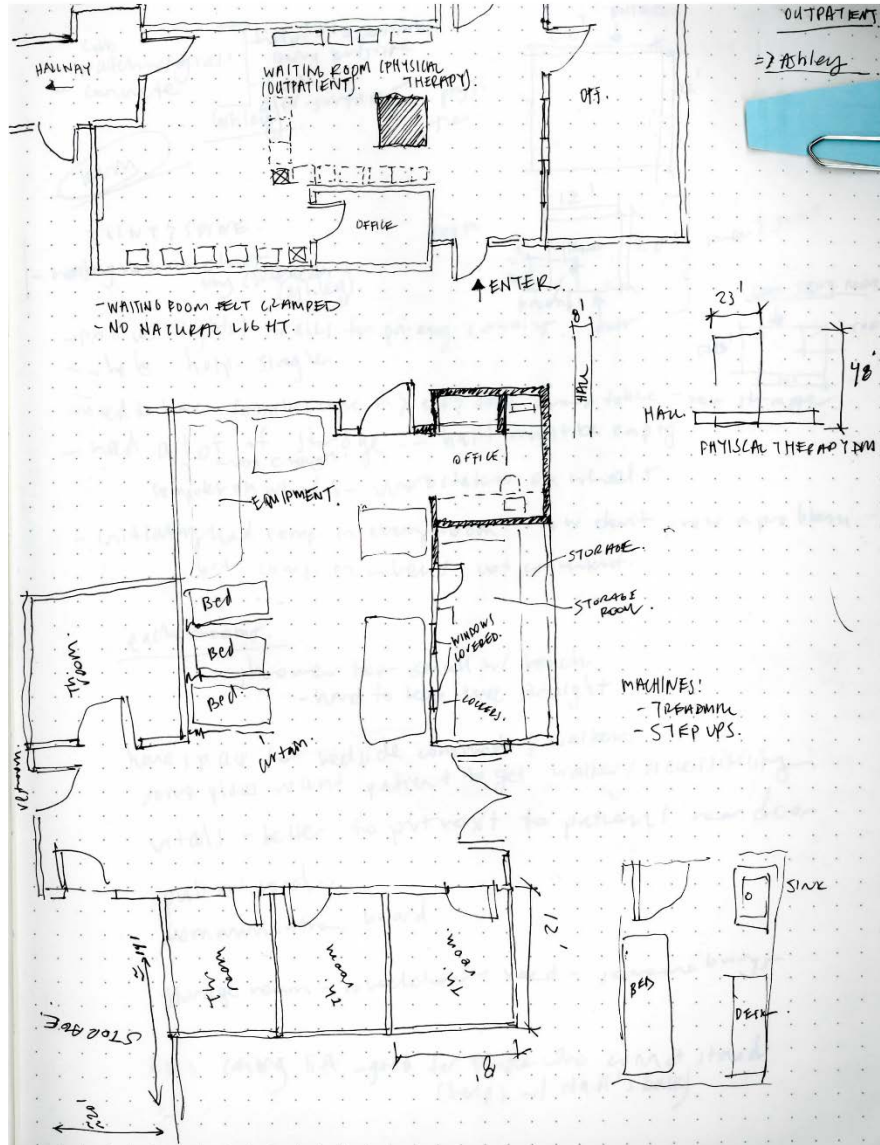
What are future plans to incorporate technology for patient healing?

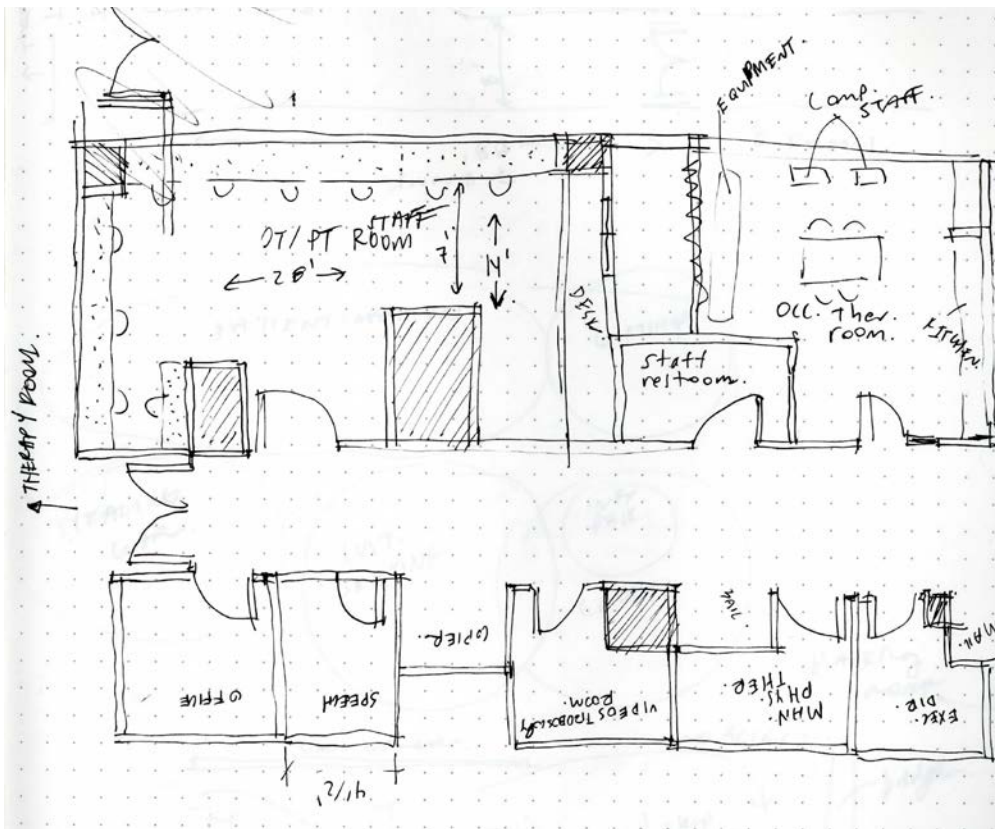
- Smart rooms are close to being implemented
 - Amazon echo- tell lights or T.V. to turn on

APPENDIX B:

Original Sketches from Primary Observations

Holy Cross Hospital:





- c/w
 - pattern/grass
 - concrete

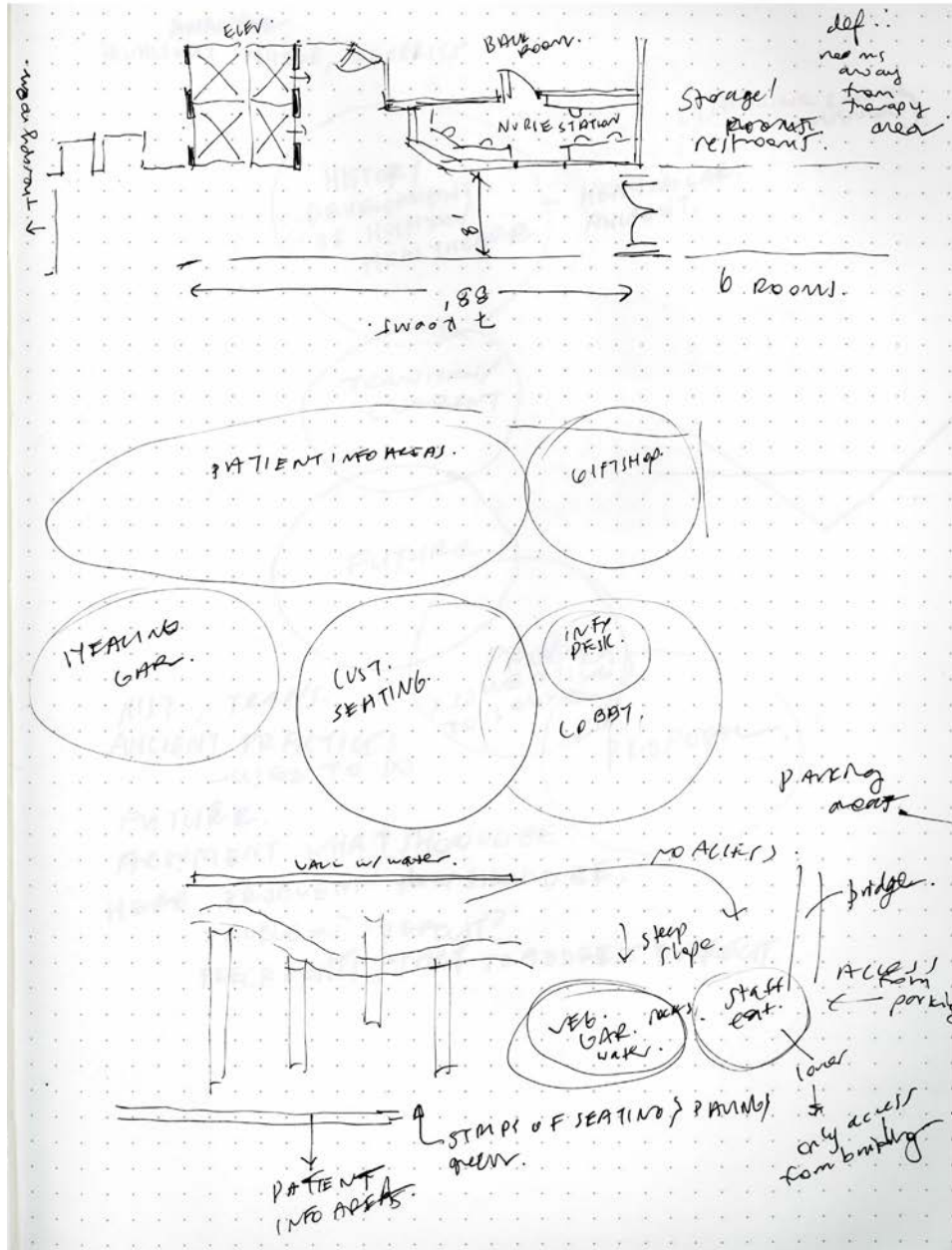
helpful accessible
 going outside
 - train on
 diff. surface. phys.
 (wheelchair) mov.

22' x 22' ENTER

12' x 20' room
 - door
 - window
 - bro.

- waiting room - chair very cluttered (wheelchair)
 - prob. w/ lights & tracks for privacy curtains
 - whole hosp. single
 - used to have families come in & eat & talk around table - now storage
 - had a lot of storage - hall must be empty
 computer on wheels - workstation on wheels
 - initially had comp. in every room - now don't, now a problem
 but comp. on wheels not convenient.

car. serv. near
 bro.



Sibley Memorial Hospital:

SIBLEY HOSPITAL
10/15/2017

McLantry

- ✓ doors should all be automatic open not push/pull
- ✓ parking too - far walk for many - grade also a problem.
- ✓ high chairs for those who have trouble w/ hip replacement. Hall boarder chairs for larger patients.

16yrs old building
renovated 3 yrs. ago.

- ✓ flooring path change every 10'

hydrotherapy

- ✓ - warm water pool.
- a lot of maintenance operational & expense
- ✓ clean/watch.
- inadequate drainage.
- ✓ opened locker room up bc was tight. was hard for elec. wheel chair.

orlando interpreters
- fam: on try to keep separate.
large room in back for pole w/ large families.
modality space
↳ lymph.
↳ manual therapy comp.

10'
18'

Notes:

- ✓ went to electronic medical bad bc have back to patient.
- want to face patient
- 1 therapist
- 1 patient.
- turning to get into locker
- ✓ it tough
- ✓ noise is an issue can hear everything.
- no wall paper can get damaged can stay unclear. bc can splatter
- storage inadequate equipment.

skilled unit
10 bed
12 day av. stay
~10% go home.
two wing

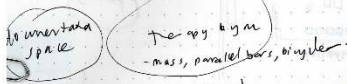
sm. gar.
parking

LOBBY

rehab

✓ patient day room
 imp. to have a community space.
 esp. for family members.

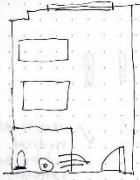
Therapy gym.



prob: not big enough.

Most are double rooms.

Prob: patient can't turn or light from bed.
 control of lighting accessible into w/ patient
 ideal have 4 swich: patients complain
 patient voice, call bell.

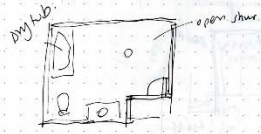


private - disease,



Nurse station.

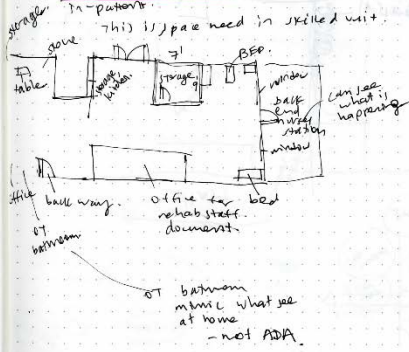
Fam. training space (more convincing if was
 a little space).



Typ. manage ~40 patients, over all 200 patients.

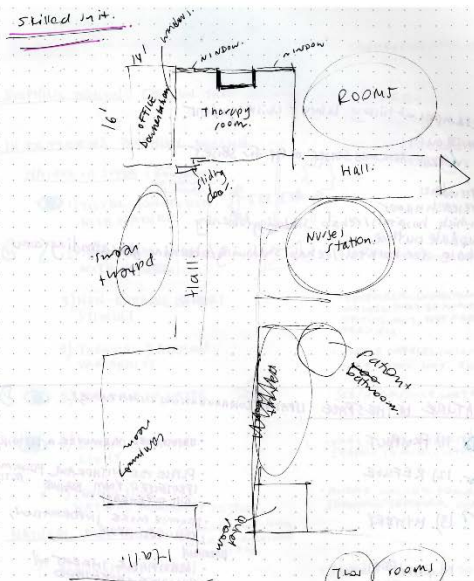
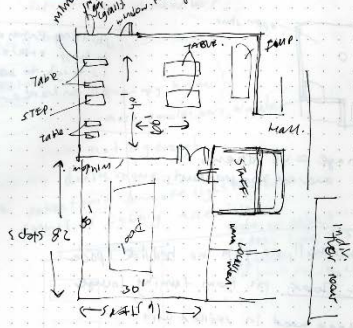
Shifting entrance
 to hosp. area expanded
 is tough to ~~secure~~
 all entrance.

rooms were small, no gym no bedside space.
 Or therapeutic floor fit from family lounge.

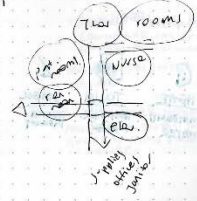


This is space need in skilled unit.
 In-patient.
 can see what is happening.
 office for rehab staff.
 document.
 OT bathroom
 mimic what see
 at home
 - not ADA.

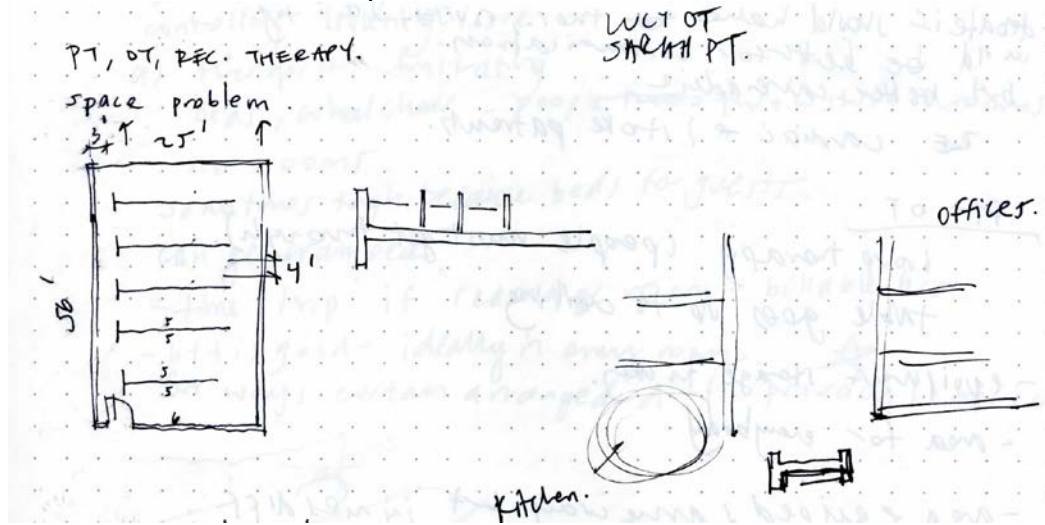
at patient (incl activity).
 could be twice the size
 skilled unit could be twice as size too.



Skilled unit.
 16' x 16' x 16' room.
 Therapy room.
 Nurse station.
 Patient room.
 Hall.
 Sliding door.
 11' x 11' x 11' room.
 Patient bathroom.



National Rehabilitation Hospital

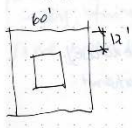


OT for impairment

- stroke would have to have nurses, etc. - eg. would be better for communication but better coverage RE cardiac stroke patients.

PT OT

- group therapy (people must get through).
- table goes up to ceiling.
- equipment storage being.
- area for everybody.
- area equipped same way but injuries diff. (ex. spinal cord need more help with mobility need to be lifted mechanically out of bed).
- storage - sometimes need equipment right now and can be make to not have - need it quick (in gym not as big an issue).
- having blood pressure machine imp. (don't have enough) need in therapy area and room.
- need to be able to find and grab.



usually room shared

- noise and sleep are issues
- controlling lighting issue
- a) transport - frustrating beds, wheelchair - people throw stuff in rooms - no room.
- sometimes tough because bed for guests. can get cramped.
- time imp. if rearrange room - billable h/s.
- lift is good - ideally in every room. but ways certain arranged diff. privacy is an issue



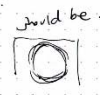
issue patient storage - how can a user what need from mult. positions (stroke patients).

pat. storage

- diff. to access if in wheelchair
- to p. - type for nurses supplies and hygiene.
- need to have everything need.

bathtub

- sometimes things stored - diff. when bring new patient.
- not enough space for wheelchair (transfering).
- Bsp. tough w/ stroke patient bc. have a strong side and weak side. So sometimes can get in but not out.
- shower does not allow to move well. usually all patients in seat. shower if built in should be adjustable.
- not enough space to be in with patient
- sink tough bc. sometimes can't reach (legged).



main floor
INDEPENDENT SQUARE
 or trying to get back into life
 PT steps.

Should it be like this?
 or an example of an advantage?
 should be both

also shower with no step, practice wheel
 like in home.

equipment storage issue.

practice bathroom:
 use to b and shower
 but sometimes need to put equipment, hand out
 need quick versatility.

need things quick.



kitchen
 fire hazard
 practice home skills.

want more variability
 - lower counters
 - pull out stools
 - more movable furniture
 hard to move around if 5 wheelchairs
 island adjustable, movable
 better equip. stor.

cab should be on hydraulics and move up and down.

car area
 many store, metro access.

all patient req. 3 hours therapy per day.
 - divided by OT and PT, speech if they need.

have immense pressure now with medicine
 because count minutes - if they miss one minute
 don't count.

PT rotate to all teams

OT stay on one team
 on stroke team - nurses, techs, collection, and physician
 stroke physician, stroke + cardiac, orthopedic, spinal etc.

Communication important

- nurses
 relationship can be strained (bc. have
 competing priorities).

sometimes doesn't drill or home.

can cause strain.

how could design facilitate collaboration.

Nurse lounge



Ann Smith (Nurse)

ideal space:

- space to put clothes, private restroom

larger.

- this small for all nurses.

- need a space to decompress.

(have a lot of patients).

having gr. regularly w/ therapy and family

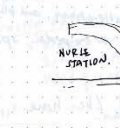
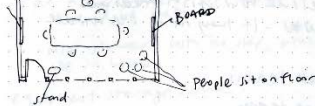
conference room - allocated time half hour.

5-12 people - not large enough

communicate issues

Sometimes ask how can talk to physicians

about issues



- talked about discharging patients, how patients
 - how long think patient should be there

to discharge: talk about home

go to steps in house (toys).

Talk about wearables patients have and any issues

may have

ST talk about supervision or independent (walking, steps).

talk about w/ patient OT,
 any equipment need.

stroke and brain injury patient - 1st floor

- cognitive issues

- not sure why here

try to get out

lower door, in new building want a board floor

so more comfort because have more space to

wander around.

have quiet space if people distracted.



if one person has, can't use.

group meets in here.

- If patient can't be done in room, sometimes nurses put
 in hall so can watch - issue with privacy.

stay depends.

1 month or more stay

orthopedic - 2 weeks usually.

spinal 4 weeks and so

Atten bym

two pattern help

cognitive thing can learn - specific.

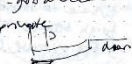
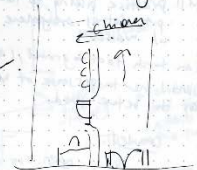
helpful because can incorporate in therapy

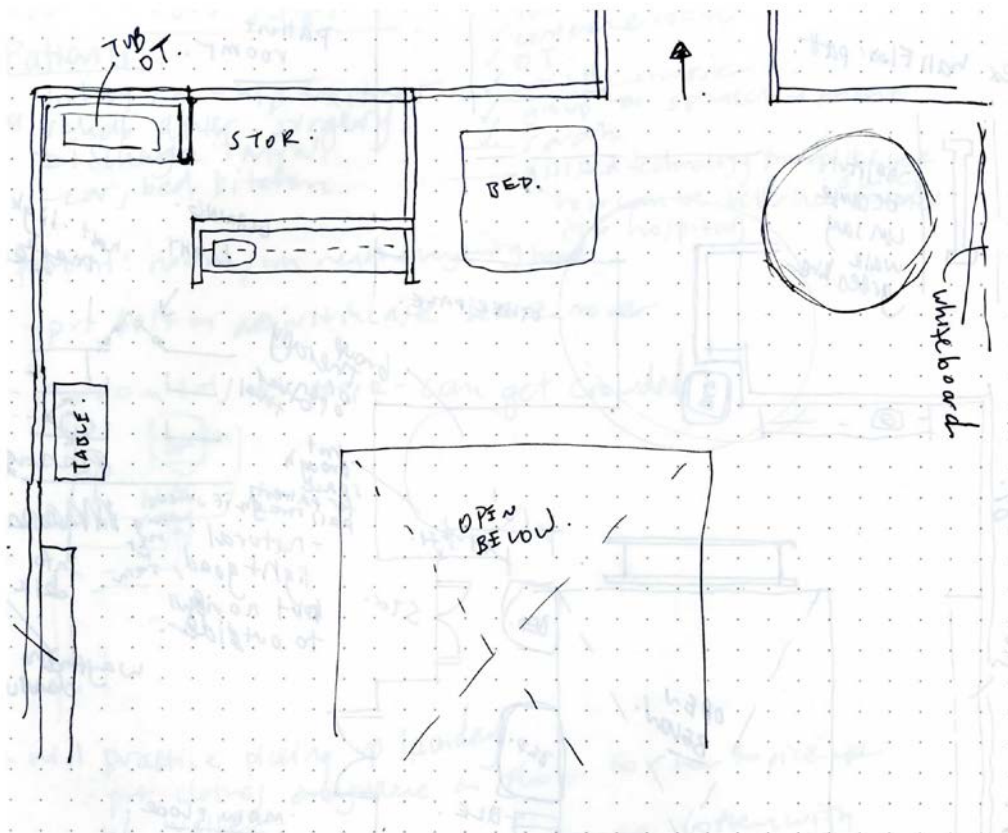
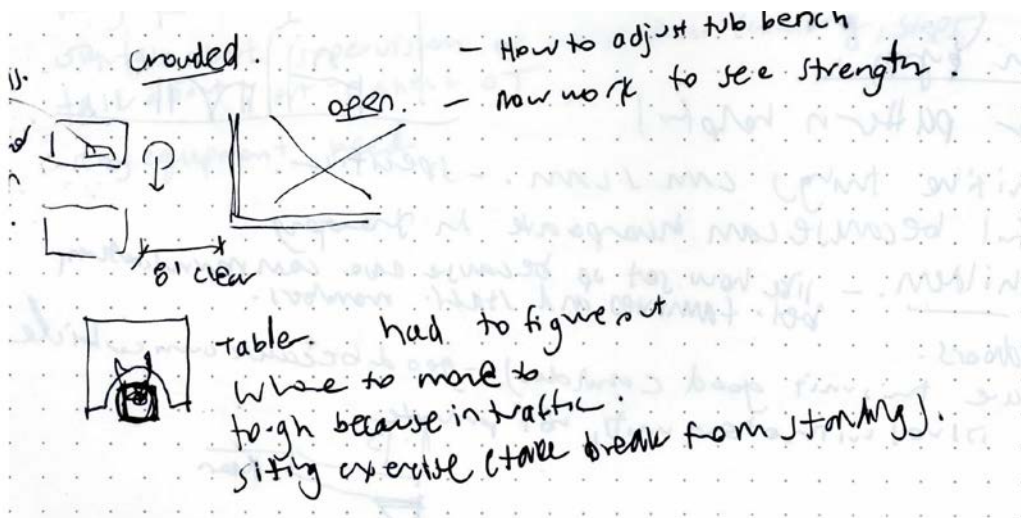
children - like how get up because can motivation

bet. families and staff members.

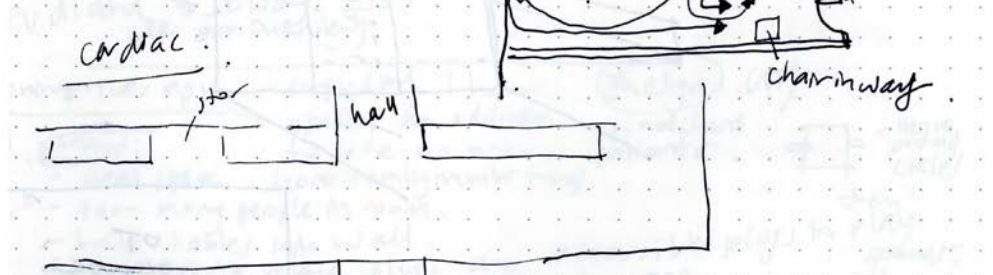
ride doors: not sure if unit good children - good because can include

but also with other unit, not private





- issue with lift be need to open curtain, patient privacy
- not a lot of space
- size of rooms not enough
- put too much in

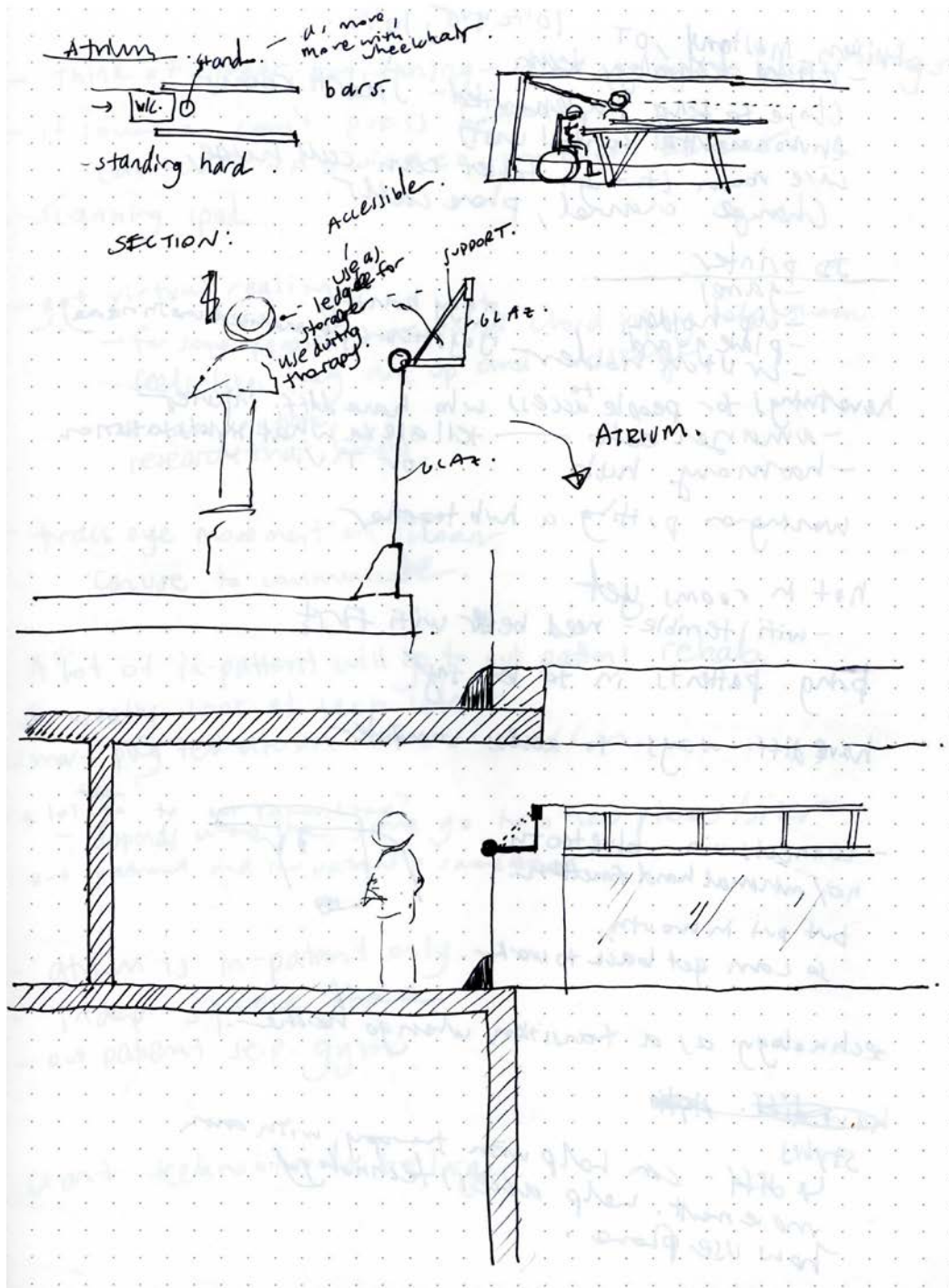


Sometimes rooms have too much tetris pieces.
 (Sometimes need to back a patient in).
 not enough turning radius.
 not all hospital beds same - hard to do certain things with some - tough consistency.

wheelchairs diff. sizes
 power wheelchairs
 diff. widths.
 designated areas.

families come - bring extra chair
 - high because of space.

- have 4 single rooms (4 on this floor).
 - most patients want to be by window, other half by bed.
 - fold to match patients (same thing). - better for nursing (patients who need things).
 make use of bed on



APPENDIX C:

National Rehabilitation Hospital Renovation

The National Rehabilitation Hospital is planning to renovate some of the therapy areas. The medical staff at the hospital came together and discussed what the priorities are for changes in each area are and submitted them to the board for discussion. The list in this appendix is what the medical staff has voiced as necessary items in the renovation. This list was provided by Lucy Stein from National Rehabilitation Hospital.

ENTRANCE TO IND SQUARE:

1. Automatic door on entrance near café or both doors

BEDROOM: (in order of priority)

1. New bed that moves up and down with rails, new linens, stool for high beds
2. New closet doors use open space next to closet for an adapted closet with lower bar and shelving at w/c level and chest of drawers.
3. AT/ECU options, smart locks, thermostats, alarms
4. Remove carpet, paint, new pictures-cosmetic
5. Lighting- Dimmer switch, sconces on wall or bedside lamp (on a built in shelf, bedside table/collapsible, gooseneck lamp)
6. Pocket door between bedroom and hallway

BATHROOM: (in order of priority)

1. Grab bars in tub
2. Lower/normal height toilet
3. Bigger shower stall with built in seat and no threshold
4. Adjustable height counter
5. Cheaper version (that most of our patients get) of the hand held shower head in the stand up shower, Different knob and door handle styles on door/sink
6. Grab bar that doubles as a towel rack and TP holder
7. Divide bathroom space in half to simulate small residential bathrooms and public restroom stall with ability to open the space for training → need more ideas
8. Baby changing station (maybe another place in the hospital)
9. Electric storage option for commodes/tub benches
10. Folding bedside commode

KITCHEN:

1. New paint, pictures, different handles, new utensils, blender, etc-cosmetic
2. Key card access
3. ? Stackable washer and dryer-heavy duty
4. New appliances-stainless steel, French doors
5. Upgrade the counter to granite like look
6. Move 2nd table and use space for the "grocery store" OR move porch and have that space be the grocery store OR have patients be able to access kitchen from the porch
7. Move table back and have an island
8. Move microwave to above the stove-most patients have that set up and move the spice cabinet to above the refrigerator (keep one microwave on counter)
9. Under hood mirror for w/c users
10. Add more organization to area above washer/dryer (another shelf or cabinets)
11. Have a section of counter that is lower in height and more accessible
12. More drawer options
13. Modular kitchen with roll away table and/or island
14. AT options
15. Under cabinet lighting

RAMP and STAIRS:

1. Remove stairs and add curb and curb cut
2. Add strips of various outdoor surfaces to practice walking on
3. Fix/Add working traffic light/crosswalk
4. Lighting to simulate day and night

DINER:

1. New counters, maybe more of an angle to increase storage space or drop down counter
2. Remove the glass cabinet and put shelves in for the toaster and microwave
3. Working clock
4. Menu-smaller font like at a Panera or Starbucks
5. Remove background picture and add hooks and shelves for storage
6. Potentially open up and relocate booth to create a more open space
7. Add dishwasher

BANK:

1. Grocery store (real cash register) and ATM
2. Get rid of the ledge outside of the bank

PLANTS (by uneven ramp):

1. Make it a raised bed for practicing gardening
2. Keep street signs but update them to green

CAR AREA:

1. Rollaway curb
2. Remove or update ATM

NEW ROOMS/IDEAS

LIVING ROOM: (new room or use hallway between kitchen and bathroom)

1. Lazyboy recliner chair
2. Small couch
3. Area rug
4. Coffee table/side tables

GARAGE:

2. Tools set up and work table
3. Garage door to practice opening

METRO/BUS set up:

1. Metro map with routes and rates
2. Ticket machine
3. Metro seats/simulated doors
4. Bus steps

Zero G throughout spaces

Cameras

BP cuffs/PO2 as stations throughout with stations/storage for canes and walkers

Remove mailbox and Gas pump

Display case for Hanger

Storage space

Relocate Booth

Space considerations for porch doors

APPENDIX D:

Interview with Jim Curran- Professional in Healthcare

JIM CURRAN

Callison RTKL

Vice President and Design Lead for the Healthcare Studio

How do you think hospital/ healthcare typology will change in the future?

Expand on patient oriented design?

The future is complicated. It is affected by technology, but also cost and how hospitals recoup costs. That's what drives hospitals. There is a push with insurance to focus on wellness- insurance is typically happy to pay for preventative care. Hospitals push to keep people out of beds.

Doing more outpatient- separate two things

Project

- Good talk about patient, family and staff- used to be incredible burnout with staff (they are stressed)
- **“caregiver continuum”** want to encourage family to be there because they are part of caregiving team
 - Creating environments that make it comfortable for family to be there- within room: bed, place for family member to stay (internet access, place they can work, comfort)
- Term **healing environment** is trite term- term being used is **human centric design**- think of self as staff, family member, and patient and what will want in that situation
- **Waiting rooms** is old fashioned- not called that now- called **active waiting**
 - Patients can pre-register so they know when they are coming
 - ‘active waiting’ so think of not waiting- hospitality, environment
 - Hotels trying to get away from reception desk, hospitals trying to learn from hospitality
 - Trying not to sit and wait- trying to streamline process
 - Greet and talk where need to go
 - Now have to accommodate both but in transition
- **Parking:**
 - Good think of experience of getting there, arriving, getting into facility (the sequence)

- How can think of self as five star hotel, how make comfortable and exciting about--- someone greets you...
- **Opportunity**
 - What if hospital connected to retail environment, may not be part of hospital itself
 - If want food- not limited, or if want to buy
 - Can also have in hospital- cafeteria focused on food, healthy eating
 - Big push in hospitals towards wellness (goes with bringing people to hospital even if not sick)
 - Demonstration on food- what eat, how eat, how eat healthy? How prevent heart disease
 - Farmers market
- **Kaiser Permanente 'Thrive Program'**
 - They have farmers markets every week at hospitals- look at series of healthy things
 - Educate- offer opportunities for education
 - Community programs- lecture series- Venues: auditorium or double functioning room with community meetings
 - Offer free screening- start making hospital part of community
- **Community based function**
 - Look at rehab spaces- could be **health club** amenity for community but have more people with medical training to monitor
- **Hospitals**
 - Combine emergency with main entrance so more airport fashion- some people disagree with this and want the emergency room by itself- separate
 - Emergency department becomes main entrance after hours
 - If its in the back, then its isolated (all amenities at front)
 - Having proximity can share chapel, eating facilities
 - Simplify wayfinding
 - Good to have hospital on sloping site because there are multiple entrances and sometimes having program being adjacent or on multiple levels can work well (emergency below main lobby)
 - Current issues in wayfinding
 - Hospitals have more and more technologies. A lot of them did not require windows (operating room)
 - In Europe of anyone spends more than an hour in a room, there needs to be windows and natural light- even operating rooms
 - In U.S don't have that because of temperature control and infection control- way around that is double layer of glazing to

help with temperature control and also corridors with natural light

- **How can we reduce stress?**
 - Lack of wayfinding can add to stress- now have many different entrances to a hospital- main entrance, staff entrance, emergency, and outpatient
 - “as an architect we can’t cure cancer, but we can take doctor’s motto and ‘do no harm’ so we don’t put extra stress on users.”
- **How do you approach a new project?**
 - First thing to do if doing a new project in healthcare is the first time that you go visit the existing hospital or facility that you get there early so you can assess a situation
 - Only have once chance for first experience- is it obvious where to go? How to get there? Then start asking how to alleviate any issues
 - In terms of **parking- limit decisions- one parking is better, one lobby** is better so you get to one place by foot then you go where you need to go

APPENDIX E:

Additional Process Models and Drawings

This appendix includes additional process models that helped derive the final form of the building as well process sketches. All sketches and models by author.



CONCEPT: Location Options- Fostering Connections

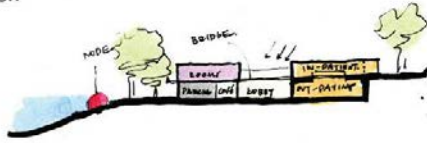


CONCEPT: Option 1 | Utilize (parking) + Compact (rehab and wellness in one)



CONCEPT: Option 2 | Refuge

section



upper floor



lower floor



CONCEPT: Option 3 | Centralized

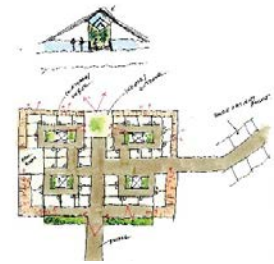
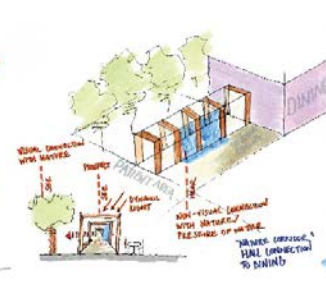
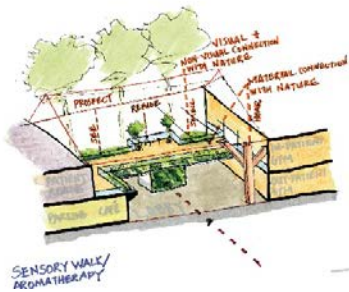
main floor plan



lower floor plan



lower floor plan



MASSING: iterations



MASSING: iterations



MASSING: schemes

Linear Courtyard



two courtyards: intrinsic focused
limited views to water

Linear Transparency



transparency: dynamic (light)
limited views to water

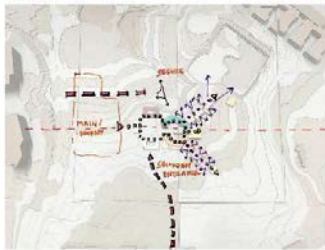
Pivot



shifting viewpoints
dynamic views
view to water

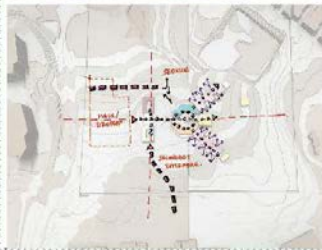
MASSING: circulation and views

Linear Courtyard



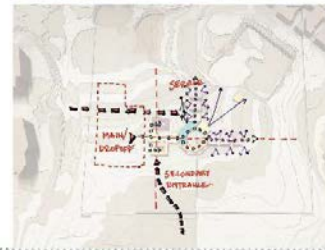
two courtyards: intrinsic focused
limited views to water

Linear Transparency



transparency: dynamic (light)
limited views to water

Pivot

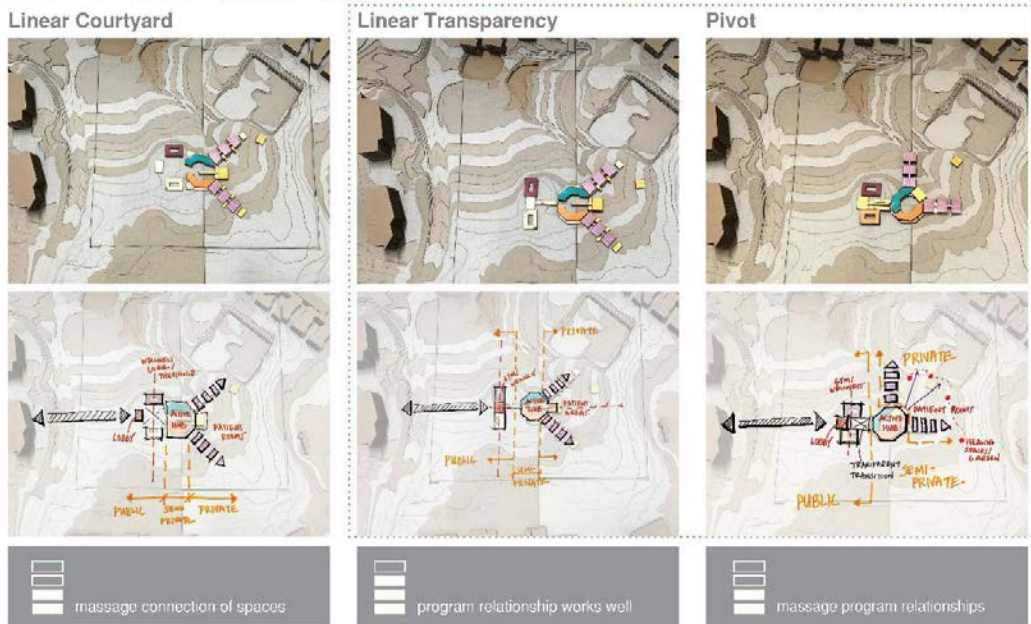


shifting viewpoints
dynamic views
view to water

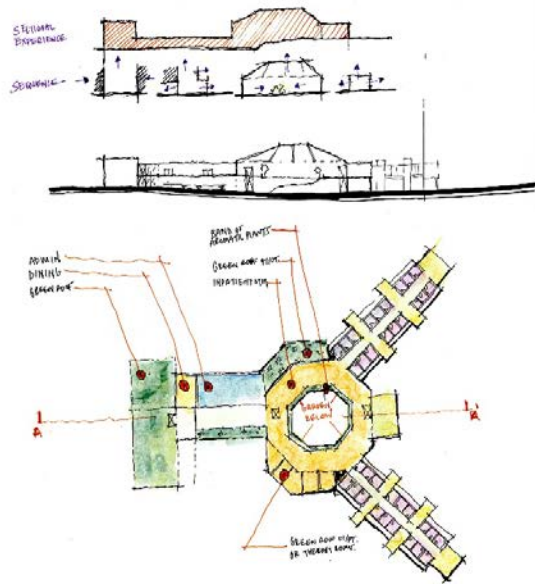
MASSING: landscape and building



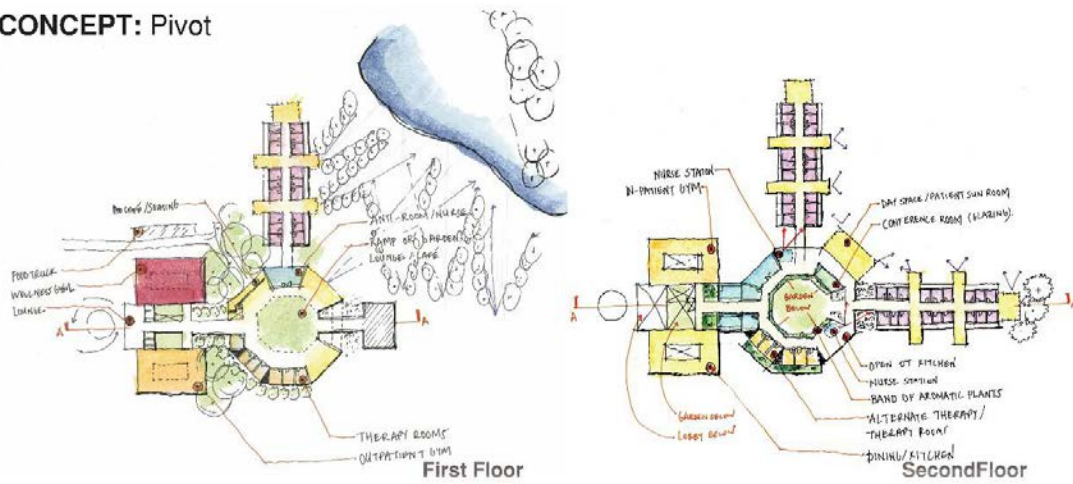
MASSING: organizational relationships



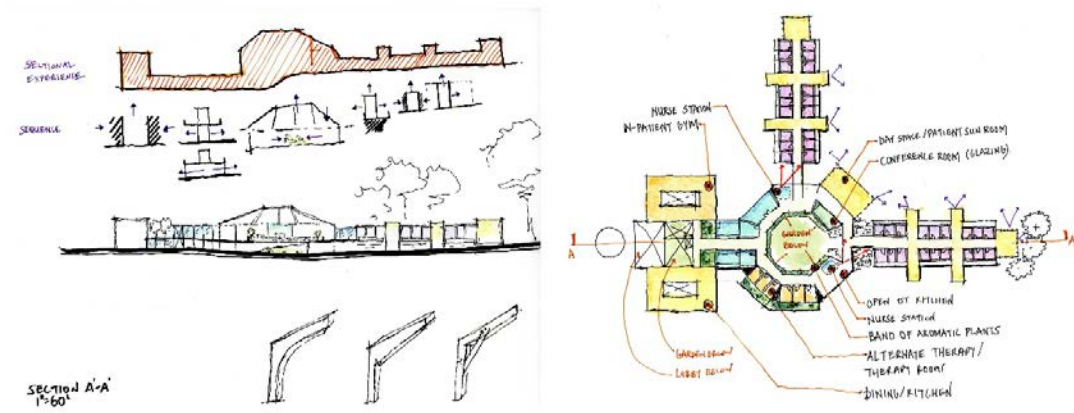
CONCEPT: Linear Transparency



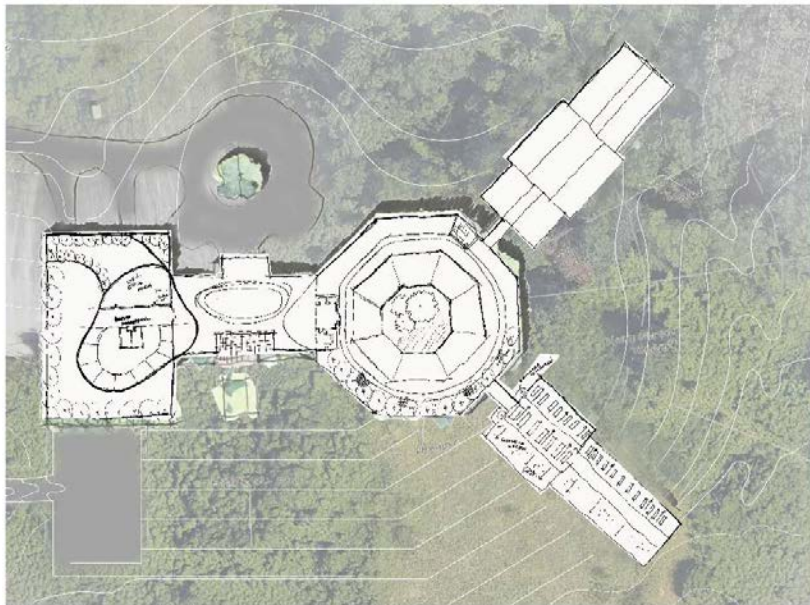
CONCEPT: Pivot



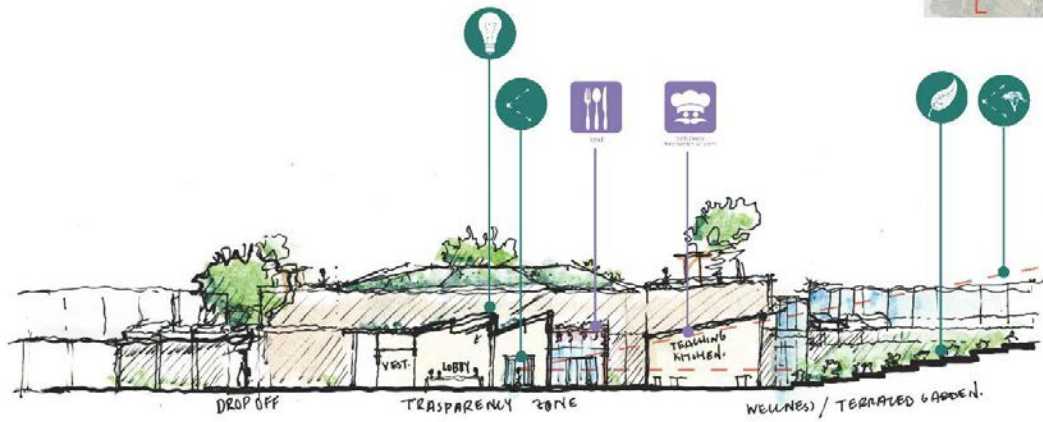
CONCEPT: Pivot



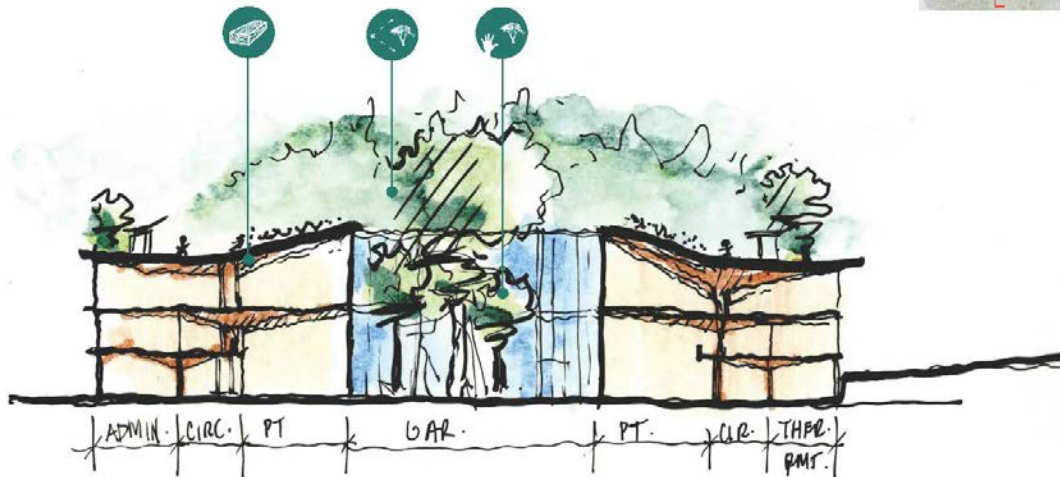
PLAN: Third Level



INTERSTITIAL SPACE: Blending Landscape + Building



HEALING HUB



SITE SECTION



Glossary

As Defined by Encyclopedia Britannica and Dictionary.com

In- patient

When a patient remains at a hospital or rehabilitation center for a period of time during their recovery.

Manual (Manipulative) Therapy

Physical treatment used by physical therapists to treat musculoskeletal pain and disability. It most commonly includes kneading and manipulation of muscles, joint mobilization, and joint manipulation.

Neurology (Neuro)

Orthopedics (Ortho)

Medical specialty concerned with preservation and restoration of function of the skeletal system and its associated structures, i.e. spinal and other bones, joints, and muscles.

Out-Patient Unit

When a patient goes to a hospital or rehabilitation center for treatment but does not stay overnight.

Patient-Centered Care

Providing care that is respectful of, and responsive to, individual patient preferences, needs and values, and ensuring that patient values guide all clinical decisions. (IOM- Institute of Medicine definition)

Pediatric

Refers to medical care involving children and their diseases.

Pulmonary Rehab

Program that aims to improve being of those with chronic breathing problems through exercise training, education, and breathing strategies.

Pulmonary Rehab, Pediatric, Bariatric Patients

Lymphadema

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