HEALTHYCOLLAB
CRITICAL DESIGN FOR CRITICAL CARE

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Master of Architecture Thesis

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THESIS STATEMENT

Hospital-acquired infection prevention through a new paradigm of collaborative construction.

ABSTRACT

The quality of human life is eternally dependent on the harmony of man and his environment. Man’s basic needs are food, clothing and shelter. As society has advanced his expectations of life has grown to enhancement and fulfillment. This is only possible through what is “justly referred to as the most complex of contemporary social institutions.”1 The hospital. Conversely where man finds life he also finds one of the leading causes of death. One in every twenty five hospital patients are affected by a hospital-acquired infection (HAI).2

The architects behind hospitals are not only responsible for impacting the emotional experience of the space but the health of the patients being cared for and the staff who is tending to them. The design is thereby crucial to the hospital’s success at treating patients and keeping them healthy.

The current design process begins with new relationships between each of the essential entities. The design suffers from these “tabula rasa” connections when they could be improving exponentially with each project through a continuously transformative process. The static logic of space is used in an effort to overcome the inherent complexities of each project.

Hospital-acquired infections can be prevented through a new paradigm of collaborative hospital construction. Can changing the approach to hospital design be a catalyst to preventing HAIs? Incorporating LEAN principles from both healthcare and construction will evolve the current framework in which hospitals are constructed. This will break many of the current boundaries and setup a new platform for future hospital developments.

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Hospital acquired infections (HAIs) are detrimental to the health of patients across the United States. There is a direct link between these infections and the facilities that contain them. Through the application of design thinking to the issue of HAIs and other hospital construction issues it is possible to paint a future of healthy patients and staff. Hospital architecture is both heavily discussed and misunderstood. The physical construction and process of hospital architecture leads to some of the most deadly problems plaguing the US healthcare industry. Therefore it is imperative that an attempt be made at consolidating some of the issues and translating them into a design solution for future hospital developments. It is possible for a live prototype be developed for HAI mitigating environments, through the vehicle of a critical care unit, attached to a larger research based university healthcare system. The larger picture of how the health center is sited, designed, and constructed are all key ingredients to solving ineffectiveness and inefficiency in the healthcare architecture field.

Hospital Acquired Infections

Hospital acquired infections, also known as nosocomial infection, is an infection acquired while staying in a hospital. According to the CDC it can be attributed to around 99,000 deaths each year. These infections are the result of poor hygiene practices. The infections are also nearly impossible to treat because they are immune to common antibiotics. They can be transmitted via a number of different methods, the most common of which is contact transmission. Contact transmission can be broken into two distinct types; direct contact transmission and indirect contact transmission. The former is when skin contact is made between two people. The latter is when a host object is contaminated and makes contact with the individual. Droplet transmission and airborne transmission are transported via natural elements, water and air.

In order to prevent HAI’s, indoor air quality must be monitored and hygiene protocol needs to be enforced. Microorganisms can survive on surfaces which patients touch, therefore these touch surfaces are the key sources from which the bacteria can spread and infect patients.

Possible HAI risks.
Hospital Construction

Architects are responsible for the design and construction of hospitals. There are many interest groups involved in the process, but the architect, to realize the final product, must synthesize their various needs. It takes a vast knowledge of both the medical profession and technical building construction to execute a successful hospital. This challenge often leads to compromises in the design in order simplify the process. In the current market, architects provide designs to meet the functional needs of doctors who may not understand building construction. Similarly architects cannot possibly keep up with medical advances that translate into design strategies. Unfortunately, much of the experience and knowledge gained from each hospital project is usually retained only by the individuals and not shared with the industry as a whole. In a sector that is so reliant on bleeding edge information in order to protect the patients’ health, it is imperative that this disconnected practice change. The collecting, evaluating, analyzing, and applying of information is part of practice called “evidence-based design”. This turns a primary creative field into one that is scientifically proven. Through studies, testing, surveying, and other means of evaluation architects are able to measure success of particular design strategies. This is important for not repeating mistakes and allowing forward movement into better, infection free environments.

There are many aspects of the hospital’s design that directly affects the chance of contracting an infection and maintaining the health of the patients. One of the most critical design aspects of a hospital is how the circulation system operates. From long double loaded corridors that are often seen in institutional health, or open floor plan wards seen in clinical health in lower cost facilities, circulation of air is just as important as how the patients and staff flow through the spaces. If infectious diseases are considered as the third circulation parameter in the design, HAI’s can be more effectively mitigated. Enclosed spaces in hospitals are often doored in without consideration of an additional touch surface (the door handle) where infections could be easily hosted. Is it possible to eliminate the handle all together? Since each time a surface is touched by multiple people,
the chance for disease transmittal is increased. Since infections can also be transmitted through the air, high amounts of air-changes are required to limit the risk.

An architect considers ventilation when designing spaces. This is often achieved through sophisticated mechanical systems that a consultant is delegated to design. The oldest form of ventilation is passive. An operable window or natural air vent that uses little or no energy is also a viable solution.

Typically when designing a hospital, aesthetic considerations for patient well-being are prioritized over those of technical expertise. Since time and cost have such high impacts on the project outcome, research for improving how a hospital can be better designed and constructed are left by the wayside favoring outdated methods. There are many design criteria that have direct correlation with healthier patients, some of which pertain to eliminating infections spread in the hospital environment.

The major problems that affect the architecture, engineering construction (AEC) industry can be studied in scale through the case study of healthcare architecture. Current approaches to project delivery systems have shown a bias toward the traditional “competitive bid” option, a process that separates the risks of the owner, architect, and contractor. The division of interests often presents legal problems when blame is assessed during the process. While architects are notorious for having slim margins and low revenue streams, contractors end with large profits. There are many other team members of a typical hospital project, such as engineers of varying specialty, construction material vendors, civic and code consultants. The more separations of business units add more overhead to the project. By collaborating under the same roof, the design process can become a transformative one. The elimination of waste: materials, time, and knowledge are the key ingredients to paradigm shift in the building industry.

In a place where all stakeholders do not have financial, and competitive barriers a new architecture emerges, one with more focus on quality
design and attention human experience. Unburdened from the common themes of protocols, standards, litigation, technology, architecture has gained the reputation as the elitist profession of design, so disconnected with the final product: the building. The reality is architects are in a multi-disciplinary environment where “billable” tasks are needed to sustain a firm’s future in practice. If you consider a comparable industry, manufacturing where the product is designed and produce in a highly efficient operation, it becomes clear that the AEC industry has a lot to learn.

LEAN

“Lean” methodologies is a body of principles carefully articulated and geared at improving workflows of the manufacturing industry. However these ideas can and have been translated into other industries where they become applicable and effective change makers. Lean is a Japanese concept for the elimination of waste (Muda), overburden (Muri), and unevenness in work loads (Mura), based mostly on the Toyota Production System used to grow the world’s largest auto manufacturer from a small company. In architecture the waste occurs mostly during the largest phases of the design/construction process. Construction documents and construction are the longest and most resource consuming phases. This is where applying theories of Lean manufacturing can reduce waste when it comes times for production. HSBC by Norman Foster was built using JIT Construction which is a large pillar of Lean. All forms of improvement come from improved workflow. Architects go through similar steps of production when creating construction documents and assembling a building.


Certain issues arise when applying such theories to architecture. Manufacturing is based on the serial reproduction of the same product, while architecture has a dynamic product that is only confirmed after the completion of sufficient documentation. The current paradigm requires a completed set of documents before any of the construction process begins. If the construction process can be initiated once a design has been solidified the construction timeline can be significantly reduced by unprecedented amounts. By collapsing the production schedule through collaboration and a transformative process, the design phase can be proportionally increased. This would make it possible to develop and “transform” hypercomplex designs into built works. This new “design collaboration” can be used as a vehicle for architecture and beyond.

Hospitals have many complex organizing and functional systems that require careful planning in order to achieve a successful project. Future proofing and space transformation into undiscovered fields of medical care requires thoughtful anticipation. Much of the current hospital stock is dysfunctional because of its focus on a need that is either no longer relevant or new processes have been adapted to fit inflexible spaces. Technology plays a new role in healthcare, but the current hospital stock does not have the capability to effectively
adapt into the physical structure of the building.

The field of medicine is one of the most fast paced research areas in the world. Humans are the vehicle for which much of the research is needed, keeping our lives healthy and long lasting. It seems counter productive to be constructing spaces that are not capable of reflecting this ever changing body of knowledge. In order to keep up, this information needs to be readily accessible to the architect when the commission of a new hospital is commencing. It is widely known that the majority of hospital construction is outdated before its certificate of occupancy is issued. This sad realization places even more urgency on the need for a change.

Hospitals operate in various degrees of severity. Operating rooms and trauma centers require haste while rehabilitation and treatment rooms do not. However the interrelations between the different functions presents infection risks. Both patient types are vulnerable to hospital acquired infections, often the types highly resistant to antibiotic treatments. More careful considerations on the roles of the architect and contractor are necessary to reduce and ultimately eliminate the risk. It seems only possible through this new paradigm shift for these theories to become realized.

Since there is such a great overlapping paradigm shift in both the medical and the architecture fields, it seems logical to begin to align these goals and setup a new era for hospital development. By breaking down the fundamental principles required to shape change in each of these complex fields, we can only then begin to make progress. The hospital’s issues usually arise only after it has been in service for a number of years. This comes in the form of facility management. Medical professionals and architects alike need to attend to the long-term goals of the medical facility. The best way for doctors, nurses, and staff to monitor the performance of the building is through a comprehensive building model keyed up through a portable device that can synthesize and track patient health records with the building systems and spaces. This would allow doctors to track infections if they arise and easily crackdown and quarantine zones of the building and people who might have
been affected. This would only be possible through a fully integrated Building Information Model from the architect.

Building Information Modeling (BIM) is the framework by which architecture, engineering, and construction can collaborate and design a complete picture of the final product without requiring a single shovel of dirt to be moved. Building Information Modeling works in complete harmony with the physical building as well as the digital model. By integrating sensors and identifiers into the wall surface, construction can be verified through X-rays and laser precision instruments. This ensures the building is designed exactly how the architect envisioned. Also this would allow the operators and users of the facility to monitor, identify and report any physical, health, or technical issues that could arise between doctors, nurses and patients. BIM can transcend all disciplines including construction, facility management, and even consumers. By developing a hybrid medical / BIM system the future of hospitals can be measured much more precisely with less time, money, as well as reducing risks of infections to its users.

According to the Facility Guidelines Institute, single-occupancy rooms are the single most successful design implementation that reduces the risk of hospital acquired infections. This design element has the ability to reduce cross infection through a universal or “acuity adaptable” rooms. The spatial separation between rooms mitigate airborne pathogen transfer. The number of roommate exposure directly correlates with the rate of acquisition of HAIs. HVAC ventilation designs are also extremely effective design implementations that either induce are reduce airborne infection transmission. Being able to isolate rooms from airborne infections through tightly sealed rooms and proper ventilation can protect the health and safety of patients. Doing a computational fluid dynamics study or airflow model you can assess the dispersion of infections into larger space where many occupants may be present. Natural ventilation is also an option, but is more commonly used in resource limited areas where mechanical systems are not a feasible option. Toilet rooms and human waste disposal are key places if not properly designed can present issues for the transmittal of
infections. Location of bedpan disposal and toilets for ICU patients are primary concerns when bodily fluids are passing through the hospital environment. Floor and wall surfaces do not appear to be major culprits for transmitting HAIs but there should be notes as to not go outside the already developed guidelines. All of these are design issues that should be communicated a by the Infection Preventionists on the project team.

Conclusion

Through careful understanding and problem solving of the issues of both hospital acquired infections and architecture, a vision for healthier safer hospitals can be established. Through the synthesis of Lean principals and Building Information Modeling a new paradigm in hospital construction can be established. In a field as complex as hospital design and a field so multidisciplinary as architecture a new breed of collaborative workflows can be achieved to create medically sound spaces. Also, a focus on single-occupancy based health center as a proponent for an overall healthier and safer environment for treating patients. It’s imperative that a new relationship emerge between the patient and the environment he is being treated in. A future of healthier Americans can foster a new appreciation for
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DESCRIPTION

MASS Design Group’s Michael Murphy has conceived of a new architectural practice that focuses on helping society. With the Butaro District Hospital they focused on mitigating infectious diseases spread in typical sub-saharan hospitals. Overcrowding of double loaded, unventilated corridors led to the rampant spread of Tuberculosis to the patients waiting for medical treatment. Design attention of the sick wards was focused on an increased cross-ventilation and re-orientation of beds along a central wall.

Large fans donated to the project sucks air upwards and through the clear story windows to achieve over 12 ACH per hour. Special lights hang in the wards to clean the air with UV. The exterior arcades connect the various functions of the hospital under a canopy.

The challenges of the Butaro hospital caused Michael Murphy and MASS Design Group to change there level of involvement in the design and build process. “We learned that we could not act as architects are trained to act. We couldn’t rely on drawing to communicate design intent; we had to get actively involved in every aspect of building.” By using local labor to construct the hospital MASS Design Group was able to reduce labor costs and put more money into doctors and medical equipment.

http://www.healthcaredesignmagazine.com/print/article/part-1-qa-michael-murphy-mass-design-group

Aerial view of the hospital.
Project: Butaro District Hospital - Burera, Rwanda
Architect: MASS Design Group

Outdoor walkways prevent infectious diseases.

Outdoor walkways connect all the buildings.

Wall divides room, keeps beds orderly and oriented towards window.
DESCRIPTION

REHAB is a recovery facility for spinal and brain injuries. It inverts the hospital stereotype from clean white hallways to become a more residential natural environment. Considering the needs of wheelchair-bound patients, the various therapy spaces are separate but easily accessible by pathways on the exterior and interior. Walls and floor with natural wood finishes, grass roofs, decks, and skylights make for a very therapeutic environment for patients to actually recover.

The numerous courtyard spaces break the 250,000 sf building into more intimate spaces. Bringing natural light and greenery into view at all times decreases the patients recovery time. Connected by numerous exterior pathways and sliding doors, they create an ideal environment for infection prevention.

Since patients can spend up to eighteen months in REHAB, the plan is organized like a small village. Plentiful amounts of non-programmed space are spread out amongst clusters of public and private components to create a sense of community.

The building has a high amount of sliding doors and large operable windows allowing for cross-ventilation throughout the deep floor plate.

Project: Encircle Health Ambulatory Care Center - Appleton, Wisconsin
Architect: HGA Architects and Engineers

DESCRIPTION

Encircle health is an ambulatory care center that houses primary health with supplementary services such as radiology and endoscopy. The design’s unique “pod” concept embodies shared resources and flexible space. A centralized office for reception connects with a front and back of house circulation for public/private separation.

ThedaCare, the primary tenant of the complex utilizes lean principles for their healthcare operations. They were able to organize an Integrated Project Delivery method for shared contractual risk and decision making throughout the process.

The ideas of “Lean” principles permeate the project. From an environmental standpoint the project received LEED Gold certification in its ability to reduce waste of natural resources. Encircle allows multiple specialties to cooperate and collaborate using shared resources. Throughout the construction process as well, the use of Integrated Lean Project Delivery promoted value-adding and efficient material use.

After debriefing the project team, the spirit of collaboration was a key driver that lead to one member saying “I’ve never had a job run this smooth in 23 years…wasn’t any of that silo mentality”
DESCRIPTION

The Oasis Terrace in Punggol is a neighborhood healthcare clinic, and mixed use center commissioned by Singapore’s housing and development board. The project features many community programs such as a gym, retail, dining, gardens, and learning spaces. The slopes to the nearby waterway creating a lush landscaped connection to the water.

The gardens are to be cared for by the community in a new prototype for community architecture. The integration of a poly clinic into this mixed use development is a game changing strategy to removing the stigma of austerity usually associated with healthcare institutions.

The light and airiness of the grounds and exterior walkways is key to enhancing the passive health and well being of the visitors. The principle strategy of the development was to integrate landscape with the community.

 DESCRIPTION

Gates Vascular Institute (GVI) is a collaborative academic medical center consisting of the joint use of three distinct disciplines and their evolving needs: University of Buffalo, Kaleida Health and Jacobs research institute. The vertical tower provides an efficient environment for each of its functions: research, education, business, and clinical care.

The building is a model for adaptability and future proofing of healthcare facilities. Its dedicated “planning module” gives the GVI the ability to change the facility to radically different functions and incorporate future medical technologies.

Many atrium bring light into the deep floor plate. These spaces become nodes of collaboration for the multiple adjacent science departments. Breaking out of traditional isolated institutions, the GVI is able to house future generations of healthcare services.

Project: Gates Vascular Institute - Buffalo, New York
Architect: Yazdani Studio of Cannon Design

Department divisions in sections showing collaborative spaces.

Visibility and connection shown in collaborate work environment.

Split level atrium breaks down massive block.
DESCRIPTION

The British Columbia Centre for Brain Health is a clinical research facility at Vancouver University specializing in neurological and psychiatric diseases. Antenna+Allen of Stantec Architecture had great success with Population-Based design; an environment that is conducive to both attentive patient care and fully participatory patient-based research.

A matrix of movement, cognitive and psychosis was created for the neuro-psych patient population. The designers used this tool to refine their plans improving on the needs of individuals and the population as a whole.

The interlocking double bars carry different spatial qualities based on the ideas of air/ground and synapse. The laboratories above are light and airy, the patient rooms below are supportive and calm, and the atrium is a “constructive collaboration” space for the researchers, physicians and patients.

Sustainability is also at the core of the Centre for Brain Health. The flexible zoned ventilation system can accommodate different air changes for separate parts of the building. This saves significant amounts of energy.

Project: Providence Sacred Heart Medical Department - Spokane, WA
Architect: Mahlum Architects

SIZE
27,000SF

DESCRIPTION

The Providence Sacred Heart Medical Department Pediatric Emergency Department Expansion in Spokane emanates tranquility while successfully providing 17 exam rooms for emergency procedures. They surround the perimiter of the facility with a nurse stations located centrally. Glass sliding doors gives the nurses complete visibility of the patients. This emergency room has less special space requirements than a typical Critical Care Unit.

Patient Station x15........................150sf  
Treatment Room x2.......................240sf  
Nurse Station x5............................240sf  

Patient Care Zone.......................7100sf  
Unit Support Zone.......................1800sf

Project: Cleveland Clinic Abu Dhabi - UAE  
Architect: HDR

SIZE  
42,600SF

DESCRIPTION  
The Cleveland Clinic Abu Dhabi features a 3 level, cantilevered Critical Care Unit extending out towards the street. It is anchored by a stair core connecting to the ground. The critical care unit has about 1:2:2 balance between the unit support, clinical support zones, and patient care zones.

Clinical Support Zones × 2........ 2300sf  
Documentation Area × 12..........50sf  
Patient Station × 24.......................300sf

Unit Support Zone.........................9200sf  
Clinical Support Zone...............4600sf  
Patient Care Zone......................8200sf

Project: New Parkland Hospital - Dallas, Texas
Architect: HDR + Corgan

SIZE
330sf (Room)

DESCRIPTION
The New Parkland Hospital by HDR + Corgan used evidence based design and full scale patient room mockups to create the most efficient and effective setup for Critical Care. By placing the family zone at the back near the window the patient zone is easily accessible by the nurse from the clinical support zone. The caregiver can address both the patient and the family at the same time from this arrangement. The patient support zone has ample space at the foot and sides of the bed. Finally the hygiene and toilet is located at the footwall to give maximum space on the headwall for CCU care equipment.

Rooms perforate the exterior facade.

Separation of zones within patient room.

Bathroom........50sf
Nurse zone.......80sf
Patient zone.....150sf
Family zone......50sf

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PROGRAM PREFACE - CRITICAL CARE UNIT

The functional program requirements of a Critical Care Unit is based on the guidelines provided by the 2014 Facilities Guidelines Institute Guidelines for Hospital and Outpatient Facilities. The critical care unit requires consideration for special spaces and equipment for effective and safe, nursing staff operations, patient care and family accommodations.

Knowledge of the workflow and operation of the CCU is required to begin planning the functional program of the space. CCU accommodates long visits from family and visitors sometimes over night stays. The staff is constantly under extreme pressure in a high stress environment for long periods of time. Therefore support for basic human needs outside occupational needs is necessary without leaving the CCU. A self sustaining architecture is important for the staff who are sustaining the lives of the patients. Vertical circulation needs to accommodate larger than typical loads with extra equipment and support staff during transportation of the patient.

To design for the future of hospital acquired infection prevention one must begin with an understanding of these functional relationships.

PROGRAM ZONES

The Patient Care Zone

Where all the direct patient care occurs. This included the patient rooms and the immediately adjacent spaces. Since family support has become deeply integrated part of the Critical Care Unit is necessary to provision space adjacent the patient rooms.

The Clinical Support Zone

Space that provides treatment / diagnosis of the patients in the CCU. Some of the spaces need direct proximity to patients while others that have intermittent use can be centralized nearby. Ease of access for staff is essential to proper function.

The Unit Support Zone is simply the administrative component of the Critical Care Unit. This also includes functions for the staff and logistics for operation of the CCU.

The Family Support Zone is the lounge and nourishment space where the family of the patients can be accommodated.
### Patient Care Zone

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### Clinical Support Zone

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<td>Nurse or supervisor office</td>
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<td>Medication Safety Zone</td>
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<tr>
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### Unit Support Zone

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### Family Support Zone

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### Circulation / Structure/ Mechanical

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### Total

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<td>Clinical Support Zone</td>
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Proximity and scale to the patient care zone.
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The BioDistrict New Orleans is the proposed zone for all future expansion and planning of hospitals and medical buildings in the city. It contains the latest developments by LSU (University Medical Center) and the Veterans Administration (VA Hospital). The site is located in the Tulane - Gravier Neighborhood. This community used to contain shotgun housing according to the 1937 Sanborn maps below. Bounded by the I-10 / Claiborne Ave. and Galvez streets the site is at the heart of BioDistrict.
BioDistrict expansion zone.

BioDistrict Road Network
University Medical Center

Within the University Medical Center the Critical care Unit will be situated adjacent to the emergency room entrance along Palymra St. and bounded by the parking structure on Prieur St. then S. Roman below.

The 1.5million sf, $1.2 billion facility is the largest medical complex in the country. It houses 446 beds and is home the new LSU teaching hospital. The architect NBBJ collaborated with Blitch Knevel Architects.

Zoning - LS (Life Science Mixed Use District)
Max Height - 85’
Max Floors - 7
Dimensions - 302’ x 75’ (22,650SF)
Address - 1901 Tulane Ave., New Orleans, Louisiana
Owner - LSU

Medical Institutions - BioDistrict

- VA Hospital
- LSU HSC
- UMC
- Tulane HSC
Proposed site in University Medical Center
Proposed site.

University Medical Center
Emergency Room Entry
Proposed Site
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Isadore Rosenfield’s Hospital Architecture and Beyond, is primarily a guide to hospital planning, however in his initial deliberations he discusses the needs of hospitals and the architect’s role in execution of the end product. He critically refers to the hospital as a whole instead of the planning of individual autonomous departments. He stresses the importance of the inter-relationships of the project team and the different parts of the building. This thinking is important to incorporating LEAN principles and developing a new approach to a hospital’s design.


Michael Hemmes’ Managing Heath Care Construction Projects is another guide book focusing on the design and construction process of hospitals. However the chapter “Organizing the Internal Project Team” is particularly relevant to managing the project value through “internal structure and organization”. Decision making is a primary concern in the development of the hospital’s design. Hemmes’ breaks down the important groups and committees that would typically weigh in on those decisions. By understanding this organization, the current design process can be evolved to better mesh with the total hospital vision.


Miller and Swensson’s New Directions in Hospital and Healthcare Facility is a guide to future hospital design. By addressing numerous evolving paradigms in hospital design, they are able to create a basis for which to grow new hospital architecture. Applying these principles to a logic of design understanding we can begin to shift the basis for which hospitals are developed. Miller and Swensson’s discusses the current trend of patient focused, vertically integrated hospitals. This concept works with both the internal hospital organization and the architectural constitution process and design. Exploring a new standard for healthcare and architecture we can begin to focus on the biggest risk a hospital faces: hospital-acquired infections.

Tony Monk’s Hospital Builders is a case-study analysis of hospitals in various regions around the world. In the introduction to hospital architecture, Monk refers to the “clinical efficiency” of design and the fundamental functional requirements as the main priority. In an effort to cut capital expenditure the births government uses a new procurement method called Public and Private Partnerships (PPP). David Hutchison discusses the importance of future proof vs future ready: “What happens say 15 years... when the facility is no longer fit for its purpose, is not sufficiently flexible for change and there is a conflict between the evolving technology of health care and rigid pile of bricks and mortar?” Exploring this train of thought can be critical to finding the right solution to hospital design and construction.


Becton Dickinson is an American medical technology company that has a deep interest in preventing HAIs. There article titles ‘Preventing Infection’ goes over the health impact and cost implications of these HAIs. The shocking statistics make the case for an exploration into how architecture can affect the future.


Bartley and Olmsted discusses the current view of health care and hospital construction. Breaking down the various risks in healthcare’s built environments they make clear the need for change in construction practices. Also elaborate on current construction trends and how they affect the health care industry. By attributing design factors and healthcare outcomes, Bartley and Olmsted are able to articulate specific guidelines for the construction industry to improve its effects on patient health.
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BUILDING DIAGRAMS

STARTING FORM
Typical hospital envelope
drivable flanked central
and deep circulation

TWIST AND LIFT
Separate cars floor wide
connecting vertical
connections

SPLIT
volumes wide program
form bustling operation

ACCESS
a final loop formed in
serial translation for
parking and
ambulance shortfall

BUILDING DIAGRAMS
operation
program/evolution/paths
typical vs proposed
SECTION PERSPECTIVE
1/16" = 1' SCALE
STUDY MODEL

1/32" = 1' SCALE
STUDY MODEL