Conception and Design of Humanization of Healthcare Space based on USS System

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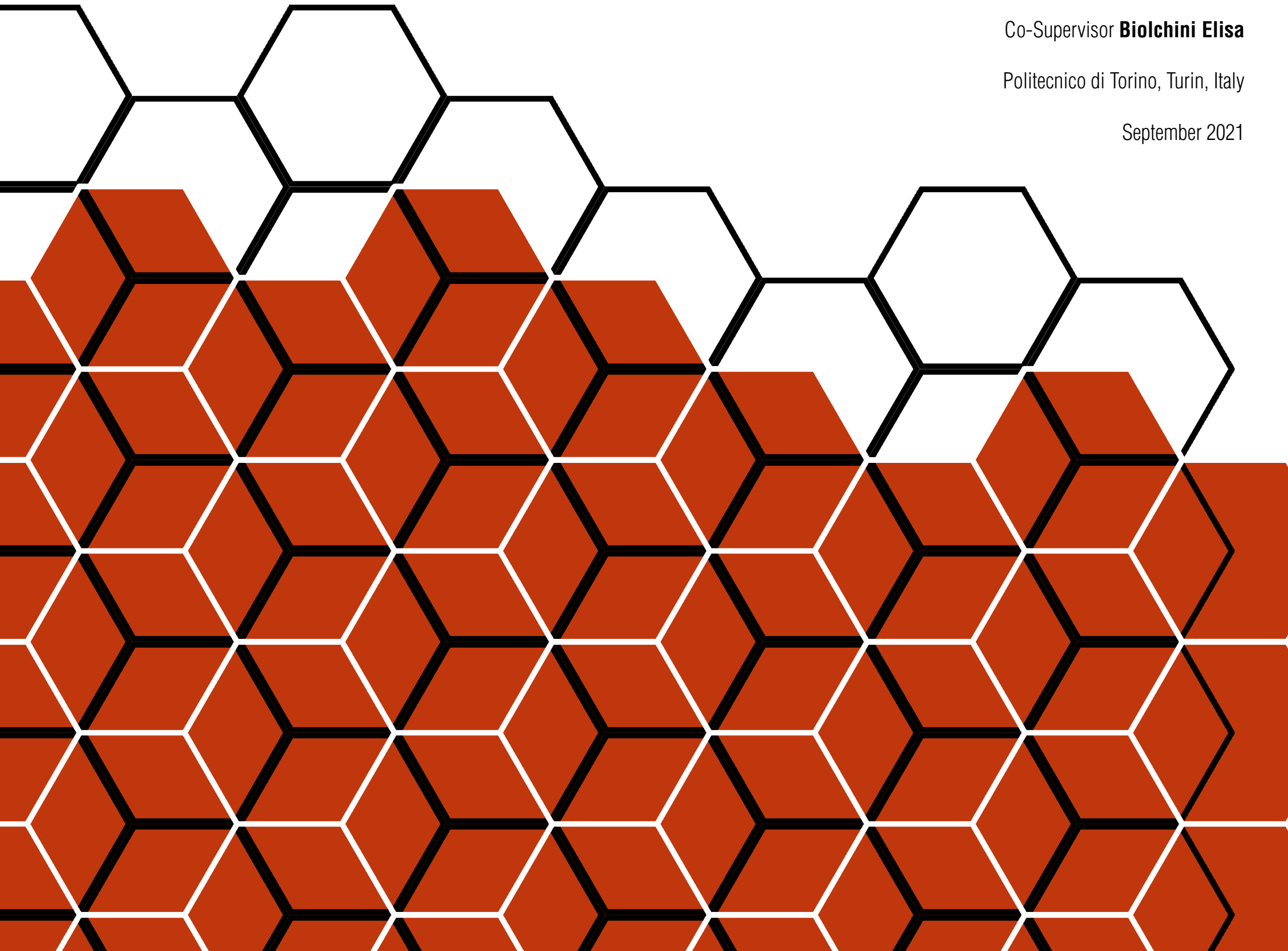

Abstract

In contemporary society, the design of healthcare space does not just stop at the level of basic functional layout and the setting of medical equipment. Humanized intervention is getting more and more attention from the relative stakeholders, such as patients with families, medical staff, etc. In order to meet the dual needs of the users on the physical and psychological levels, in this study I introduce the USS approach to realize humanized interventions. USS means User - Space - Story, which can be applied to any functional type of architecture, especially to the healthcare spaces. In this triangular framework, on the one hand, I sorted out the interrelationships between the three elements, that is, the two of them have corresponding needs and influences on each other. On the other hand, I interpret and upgrade the understandings of these three elements separately with corresponding humanized intervention methods, namely the Hierarchical analysis and Cross-levels Connections of Users; Deconstruction, Redefinition and Reorganization of Medical Space and Deduction of Story based on the relationship between Users and Space.

The thesis deals with numerous issues including at least two points, one is how the consideration of “people” affects the process and outcome of design and the other is whether the design of space affects people’s behavior and guides the occurrence of the story. In this research, my goal is to try to conceive the USS approach to find answers to the above two questions and prove its feasibility. The desirable result of this research is that, no matter who the user is, a patient, family member or medical staff, when it enters the “hospital”, developed with the USS approach, it will enjoy more the comfort and humanization brought by the space and suffer less from stress or pain.

Content

Introduction

With the advancement of scientific technology and the refinement of the division of labours and occupations in society, the contemporary hospital has developed into a complex with completed functions. In terms of architecture design, the wellbeing of patients and families should be taken into prioritized consideration by designers. What's more, the purpose of contemporary hospitals is to minimize the workload of medical staff and ensure that the internal environment is not polluted. At the same time, the efficiency of the entire medical system needs to be maximized (Kelly, 2008).

However, the hospital itself is a huge and complex project. It does not only need to consider the introduction and deployment of professional medical facilities, or to set aside technical factors such as special wiring, pipelines, and non-waste. More importantly, it should serve as one of the service institutions in the society network, by means of responding to the demands of related stakeholders. Among these, patients should be placed in a priority position.

At this moment, the introduction of humanized design provides new ideas and multiple possibilities for the future of hospitals. Hospitals can be established with a huge bureaucratic management organization - centered (Wagenaar, 2006), or established with medical staff of specific professions - centered, or established with the patient - centered. Then, if we stand with patients, we need to learn to see what the inpatients see in the hospital. What they hope to see and experience may not be the same as the reality that is filled with intravenous bottles, the smell of disinfection and potions, and the white hospital beds (Liang, 2018). Therefore, is it possible for hospitals to be designed not like an ordinary medical place after the humanized design? I will find the answer during this research.

There are 5 chapters to be presented in this research of humanized design of healthcare spaces.

In chapter 01, I learned and extracted the basic functions of existing hospitals, and subdivided them into 9 space typologies by understanding, analyzing and summarizing them one by one. Moreover, the hospital is not just made of the 9 typologies mentioned above, the combination and organization of these spaces is also important to the design of this complex. Therefore , I took the Jiangnan Hospital in China as a case study to learn and summarize the effective traffic flow and reasonable combinations of different kinds of functional areas.

In chapter 02, I introduced the USS, the triangle system of User - Space - Story, to apply it to this architectural design. The reason why the User, Space and Story are chosen in this system is that all of them are key elements to the process of humanized design in the field of architecture. In order to realize this process, we need to put the User as the priority consideration , which means that the design strategy should be user-centered rather than architecture-centered. The roles, interaction and spatial experiences of the users should be paid attention and regarded as key considerations during the design process. The Space should be designed to reponse the demand and requirement from the users. When people have certain events in a specific place, such as a benign interaction with others, the Story thus happens, which will make the medical space not be just a boring interior decoration combination.

I made the detailed design strategy in Chapters 03 to 05, that is , strategy - Users, Space and Story respectively, to enrich and make the concept of USS feasible. For the design strategy, I took the maternity department as the spatial research object. In Chapter 3 about the analysis of the relationship of the users, I arranged a pregnant woman as the central character, and tried to analyze the influence of important relatives around her, as well as possible interaction in the medical space. In Chapter 4 of the space design, I conceived a hexagonal space as a primary module. Through its characteristics, while responding to the demands of users, it grows, combines and develops into a complete maternity complex. The last chapter 5 is to consider the possibility of events that occur in the medical space. The protagonist of this story is Emily, a girl who is about to transform into a mother. What kind of things will she experience in the hospital and what kind of interesting partners will she meet? These will be answered in detail in Chapter 5.

The goal of this thesis is to conceive one creative solution, that is, the USS system to answer the topic of humanized design of healthcare space. Under this framework, I hope the Users, especially the patients, are no longer regarded as “sick people ‘’; and enjoy the service, instead of suffering the pain and stress in the hospital.

Chapter 01
Basic Design of general Hospital

"Hospitals complement and amplify the effectiveness of many other parts of the health system, providing continuous availability of services for acute and complex conditions. Hospitals concentrate scarce resources within well-planned referral networks to respond efficiently to population health needs. They are an essential element of Universal Health Coverage and will be critical to meeting the Sustainable Development Goals."
"Hospitals". World Health Organization. Retrieved 29 October 2020.

1.1 **The structure of general hospital**

1.1.1 Concept of Complex

Hospital is a great complex with multi-functions, which can be regarded as a relatively independent community. The staff works in this complex every day, for treatment activities, administrative management, maintenance, etc., while patients are treated in this "community" during a temporary period. All these activities, even the maintenance of a garden in the backyard, are under the control of the well-organized structure of this complex. Lorelei Jones once mentioned in his article that in the United Kingdom, contemporary hospitals, the characteristics of large-scale public hospitals for their location, scale and internal organization are largely derived from the hospital plan proposed by the National Health Service (NHS) in 1962, which explains why Large-scale, single function buildings organized as a great complex can be seen in the UK, 1960s (Jones, 2015). On the one hand, this plan is to rationalize the inventory of a large number of temporary emergency medical buildings established during World War II (Jones, 2015); on the other hand, the local government hopes to improve the hospital's medical conditions and Improve work efficiency by increasing the financial investment in the complex institutions - the public hospitals (Bai and Liu, 2014). Figure 1.1 shows the general layout of the Queen Elizabeth Hospital, Birmingham, which was designed by the Hospital Research Unit, Bartlett School of Architecture, University College London. From this case, we can figure out some main independent-functional buildings combined into a great complex as the hospital. In this case, Treatment buildings, Relative educational departments, Inpatient buildings, Residence of Staff and Commercial facilities are recognized and organized. Treatment buildings included a Day Hospital, Prolonged Care, Children Hospital, Maternity Hospital and Diagnosis& Treatment Facilities; the Relative Educational Department was a Training School; the Inpatient building was recognized as a Patients' Hostel (Peter, 1967).

Because of the similarities in the supply and distribution of goods, administration management, transportation organization, personnel services and so on, John Green and John RB Green directly compared hospitals to shopping malls in their articles which was a research on hospital planning. (Green and Green, 1972). As a complex, the hospital contains many departments that are not very different from other service institutions in society. In addition to specific medical and clinical departments, there are wards based on hotel measures, as well as offices, schools, restaurants, warehouses and other building types (Green and Green, 1972).

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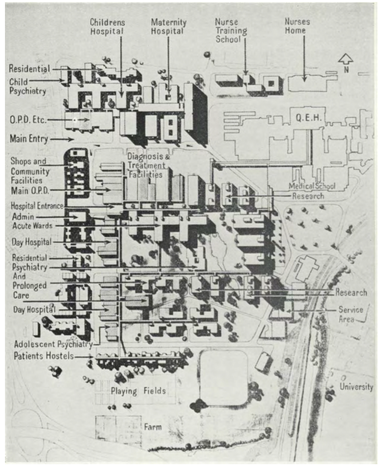


Figure 1.1
The plan of Queen Elizabeth Hospital, Birmingham
(Peter, 1967)

1.1.2 Structure of General Hospital - Classification based on 6 kinds of services

In contemporary times, there are different kinds of hospitals based on the different target groups served for and different size scales, for example, general hospital, oncology, etc. (Del Nord and Peretti, 2011). Among these, the general hospital, as the research object, is the typical type that handles many kinds of diseases and injuries as a complex.

As for the structure, the general hospital has six main services as below (Vilcahuamán and Rivas, 2017):

1, Administrative Services 2, Informational Services 3, Diagnostic Services 4, Therapeutic Services

5, Supportive Services 6, Study Services

- Administrative Services

As for the Administrative Services, it plays the role of manager of the whole complex. This department focuses on the “Running” of the hospital, therefore they manage the work of Policy establishment, the budget and finance that will affect the whole running system. (Vilcahuamán and Rivas, 2017)

- Informational Services

The Informational Service is the intersection point where information is collected, recorded, exchanged, and delivered among the hospital staff, patients, and other relatives. In reception, one important type of informational service, patients can make a registration, consultation and have a report delivered. At the same time, reception is the GATE of the hospital, which means it is a place where patients from outside firstly meet and get touch with the facilities of the hospital. Therefore, reception should be regarded as a “Welcome Point” of the hospital, to make patients and relatives be relieved with less depression. In addition, the workstation for doctors and nurses also has informational service, that is because when the staff work in the station, they will have a visual control of the patient’s area in order to handle each situation. Such a key position of the workstation will lead to inevitable communication between staff, patients and other relatives. (Vilcahuamán and Rivas, 2017)

- Diagnostic Services and Therapeutic Services

Diagnostic and therapeutic activities are coherent steps of clinical medicine that take place in outpatient rooms, day hospitals and emergency departments. Hospitals typically include the emergency department as one part of a hospital outpatient setting. There is no standard for the classification of the specialized departments of outpatients setting related to the diagnostic and therapeutic activities, but the department types still can be found in a common way of most of the existing hospital cases (Teleki et al., 2017).

Basically, the departments are divided into some main parts: Surgical, Internal, Obstetrics and gynecology, Pediatrics, Stomatology, Otorhinolaryngology, ophthalmology and other kinds of medicines. According to the ANNEX V, *the chapter of 5.1.3 of Directive 2005/36/EC Of The European Parliament And Of The Council Of 7 September 2005 On The Recognition Of Professional Qualifications*, the latest amendment version on 24/04/2020, there is the list of detailed specialties which are responses to the departments related to Diagnostic Services and Therapeutic Services in European Union and European Economic Area (eur-lex.europa.eu. 2020):

Table 1.1
List of Specialties of Diagnostic Services and Therapeutic Services
(eur-lex.europa.eu. 2020)

List of Specialties of Diagnostic Services and Therapeutic Services			
Accident and emergency medicine	Gastroenterology	Obstetrics and gynecology	Preventive medicine
Allergology	General Practice	Occupational medicine	Psychiatry
Anesthetics	General surgery	Oncology	Public health
Cardiology	Geriatrics	Ophthalmology	Radiation Oncology
Child psychiatry	Hematology	Oral and maxillofacial surgery	Radiology
Clinical biology	Immunology	Orthopedics	Respiratory medicine
Clinical chemistry	Infectious diseases	Otorhinolaryngology	Rheumatology
Clinical microbiology	Internal medicine	Pediatric surgery	Stomatology
Clinical neurophysiology	Laboratory medicine	Pediatrics	Thoracic surgery
Craniofacial surgery	Nephrology	Pathology	Tropical medicine
Dermatology	Neuropsychiatry	Pharmacology	Urology
Endocrinology	Neurology	Physical medicine and rehabilitation	Vascular surgery
Family and General Medicine	Neurosurgery	Plastic surgery	Venereology
Gastroenterological surgery	Nuclear medicine	Podiatric surgery	

- Supportive Service

Supportive Service refers to the logistic management and daily maintenance that adequately back up the normal operation of a hospital. This part includes some Specialized departments as below (Vilcahuamán and Rivas, 2017):

1, Central Supply, which includes orders, receivers, equipment stocks and distribution, etc.

2, Biomedical Equipment maintenance.

3, Housekeeping, this is the important logistic work to maintain the cleanliness of the hospital environment.

- Study Service

Due to the strong connection between medical school and hospital, it is necessary to set up study areas in hospitals to offer medical / nursing education, training, and practice for students. In addition, the experiment rooms should be considered for the research. (Vilcahuamán and Rivas, 2017)

In conclusion, the structure of the general hospital is constructed as in Figure 1.2.

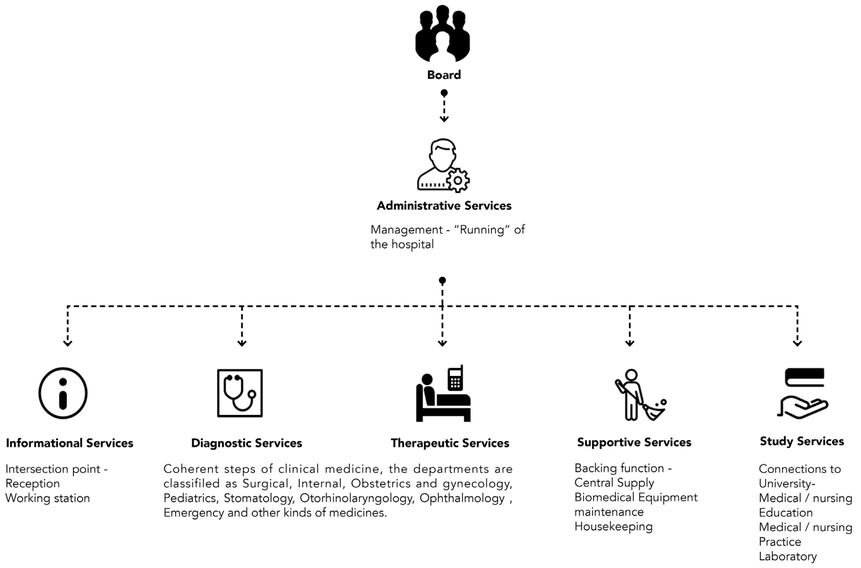


Figure 1.2
The Structure of General Hospital
(Vilcahuamán and Rivas, 2017)

1.1.3 Structure of General Hospital - Classification based on Space

The departments of general hospital can be classified in terms of functional spaces (Del Nord and Peretti, 2011) as below:

1, Inpatient room / Day hospital

2, Outpatient / Consultation / Interview

3, Workstation for doctors and nurses

4, Acceptance / Information / Delivery of reports

5, Waiting

6, Livingroom

7, Meetings

8, Connective of distribution

9, Outdoor space

Based on this Function-Structure, I will try to explain these departments to express how the functional spaces service the targeted users in terms of function, facility, activity and scenario.

Inpatient room / Day hospital

- Function

The inpatient room and day hospital are the places where the patient can stay for treatment, nursing care and resting for a period. The difference between Inpatient room and day hospital is that in the former one, patients stay for more then one day, while patients can leave the hospital in one day without staying there at night. It can be regarded as Therapeutic steps after Diagnostic as the sector 1.2.2 mentions, which means patients will be decided to stay for the healthcare and treatment in the inpatient room by doctors when they are in the diagnostic stage. Another situation is that patients with an emergency condition are sent to the inpatient room in a short time (What Is Inpatient Care? - Definition, Services & Delivery., 2017) .

- Facility

Facility	Note
· Mobile hospital bed	The size of this bed should be matched with the size of the door, so that the patients can be moved from other places without any barrier.
· Washroom	
· Working area for doctor and nurse	This area, where the computer, working desk and some chairs should be placed, should meet the needs of professional activities such as interviews, and clinical data's reading.
· Mobile treatment equipment	
· The cabinet	The furniture that can be used for food and supplies storage and clothes.
· Monitor	This equipment is used for the real-time monitoring of the ward in case of an emergency.
· Garbage collection	In addition to routine waste sorting, medical waste should be considered.
· Other facilities	Such as TV, and projector for entertainment.

Table 1.2
The facilities in Inpatient room / Day hospital
(Del Nord and Peretti, 2011)

- Activity

Activity	Note
· Communication and interview between the doctors / nurses and patients / relatives.	
· Treatment on the hospital bed.	
· Patients are cared for by nurses, their families and other relatives.	

Table 1.3
The Activity in Inpatient room / Day hospital
(Del Nord and Peretti, 2011)

- Scenario

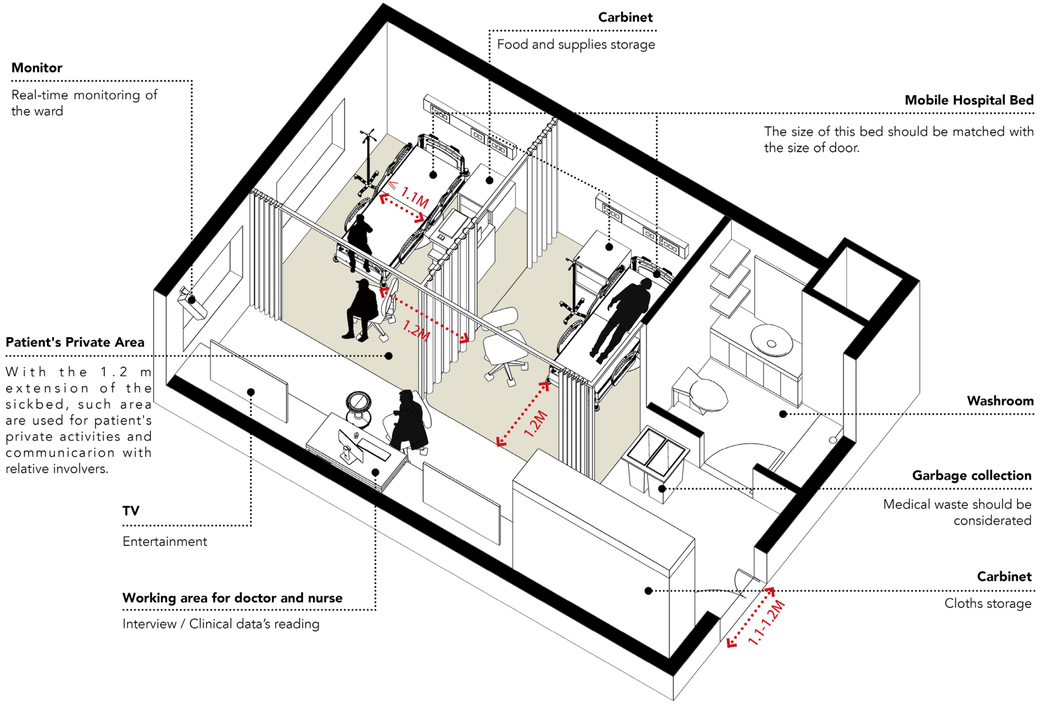


Figure 1.3 Scenario of Inpatient room

- Function

The outpatient department is the place where the diagnostic and therapeutic activities are carried out, with a strong connection to the waiting area or corridor that patients use, workstation for doctors and nurses, and pharmacy (Samah, Ibrahim and Amir, 2013). The patients will stay here only in daytime, but if the outcome of the diagnostic shows the necessity of deep observation and long-time treatment, he/she will be sent to the inpatient room.

The types of services mainly are (iFHG, 2020):

· General Practitioner Clinics
· Primary Care centers
· Women and child health services
· A comprehensive range of surgical specialties
· Medical specialties including diabetes and multidisciplinary team reviews e.g. chronic disease clinics, infectious diseases services
· Pain management
· Genetics clinics
· Health Promotion initiatives.

- Facility and Activity

Facility
· Office desk and chairs
· Computer and other office digital devices
· Cabinet for data
· Changing area
· Hospital bed
· Wash basin for sanitation
· Mobile partition elements
· Specialized treatment equipment

Activity
· Diagnostic through the interview with the patients, consultation from doctors and specialized checking.
· Therapeutic activity operated by specialized doctors on the same day.
· Patient screening prior to surgery – perioperative services (iFHG, 2020).
·Health education or counselling sessions for patients and families (iFHG, 2020).
· Referral of patients to other units or disciplines for ongoing care and treatment (iFHG, 2020).
· Referral for admission to a hospital for inpatient services (iFHG, 2020).
· Physical examination on bed / chair (Del Nord and Peretti, 2011).
· Other activities such as hand sanitation, cloth changing, etc.

Table 1.4
The Facility and Activity in Outpatient
(Del Nord and Peretti, 2011)

The equipment should be dependent on the specialized clinics; some examples are sorted out as the table 1.5 shows (Del Nord and Peretti, 2011).

Table1.5
The specialized facilities of clinics
(Del Nord and Peretti, 2011)

TYPE	SPECIALIZED FACILITY	NOTE	AREA REQUIREMENT
Cardiology clinic	Cycle Ergometer	Main facilities	The total area should be above of 20 ㎡ (13)
	Trolley with an electrocardiograph		
	Statistics Scales		
	Polygraph with monitor and printer	Additional facilities	
	Sphygmomanometer		
	Treadmill		
	Defibrillator with resuscitation set		
	Infusion set		
	Cardiopulmonary Ergometry equipment with respiratory gas analysis		
Surgency clinic	Surgical bed	Main facilities	
	Electrosurgical unit		
	Surgical aspirator with relative tubes		
	Surgical lamp		
	Service table		
	Tubs for pre-sterilizing the cutting edges		
	Containers for special waste		
	Space for the preparation of the staff for the surgical visit	Additional facilities	
	Changing room for the patient and / or staff		
	Space for "short post-surgery observation"		
	Space for decontamination, cleaning and sterilization of medical devices		
	Toilet		
Neurology clinic	Walking Area includes of 4m×2m of Barrier-free area		More than 20 ㎡
	electroencephalograph		
	polygraph		
	bed / reclining chair for the patient		
	trolley with the necessary equipment for mounting the electrodes		
Ophthalmology clinic	The presence of two opposite walls placed at a distance of not less than 5 meters.	The guarantee of specific lighting conditions (natural and artificial) to ensure a completely dark environment.	
	Dark room		
	Ophthalmological chest of drawers		
	Wardrobe		
	Display case		
	Eye chair		
	Luminous optotype		
	Ophthalmometer		
	Slit lamp		
	Foster perimeter		
	Fluoroangiograph		
	Equipment for washing the lacrimal ducts		
	Trolley for surgical instruments and an ophthalmoscope		
Dental clinic	Dental chair	acoustic insulation requirement	
	Arm for drill and instrument		
	Cabinet		
	Portable radio diagnostic device		
	an additional space dedicated to laboratory for impressions, prostheses, mixtures, etc		
Otolaryngology clinic	Silent room for audiometry	in conditions of sound insulation	
	Medicine trolley		
	Patient chair		
	Equipment for capillaroscopy or videocapillaroscopy		
	Control pane		
	Aphonic box		
Obstetric-gynecological clinic	Gynecological table		
	Ultrasound machine		
	Device for detecting the pulse fetal heart (BCF)		
	Trolley for surgical instruments		
	Mobile cold light and / or surgical lamp		
Pediatric clinic	Ultrasound system		
	Changing table		
	Scale table		
Urological outpatient clinic	Dedicated toilet	It should be accessible from inside the clinic	

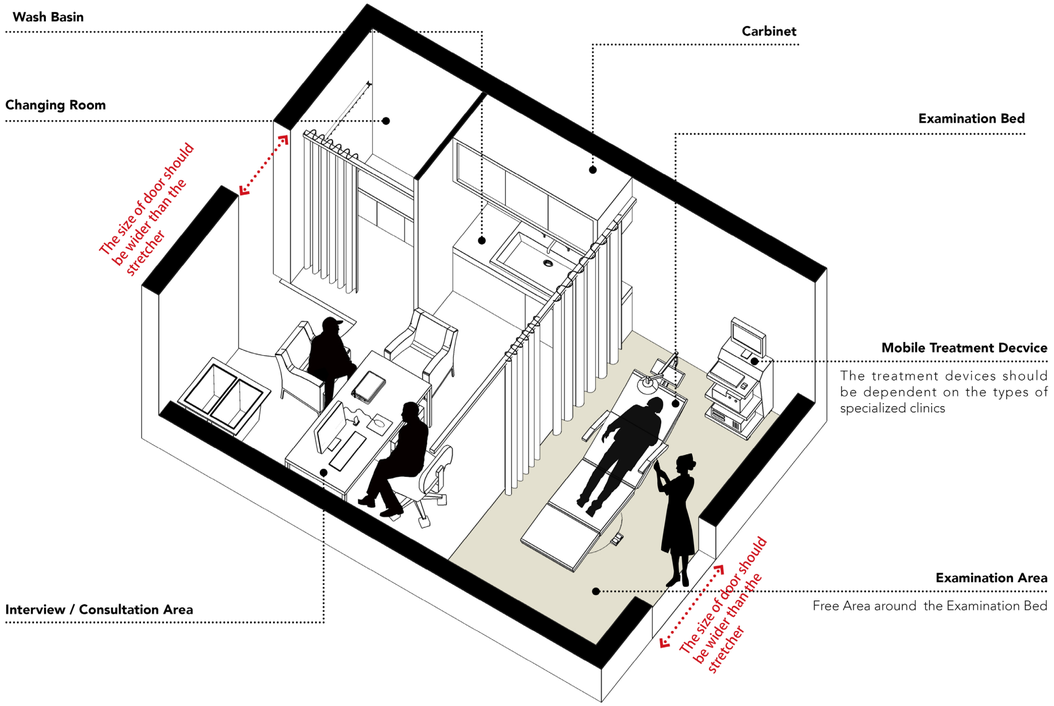


Figure 1.4
Scenario of Outpatient room

Workstation for doctors and nurses

- Function

The workstation is an open office where the staff such as doctors and nurses work in the area of outpatients, inpatients, day hospital, waiting, etc. This space is more than a working place for the staff, that is because of its feature of opening and the setting positions. The opening design makes it look more similar to the reception, at least in the eyes of patients and his/her relatives. Therefore, this place is likely to be another occasion that communication and information exchanging possibly happen among the users including doctors, nurses, patients, and other relatives. Another function is that the staff can have a visual control to the inpatient areas and the other public areas because the workstation is always set in the intersection of different departments. What is more, the workstation should be linked closely to the restroom of staff.

- Facility and Activity

Table1.6
The Facility and Activity in Workstation
(Del Nord and Peretti, 2011)

Facility	Activity
· Office desk and chairs	· Administrative management of personnel shuffling and transfer, stock and distribution of supplies, hospitalization and discharge, treatment, and therapy planning, etc. (Del Nord, Peretti, 2011).
· Computer with printer, copier, and other office digital devices	· Management of medical data, such as collection and delivery.
· File cabinets including temporary flies	· Conversation and informational exchange among the health care staff.
· Communication devices such as telephone and fax machine	· Private conversation between staff and patients/families.
· Cabinets and refrigerators for storing	
· Wash basin for sanitation	

- Scenario

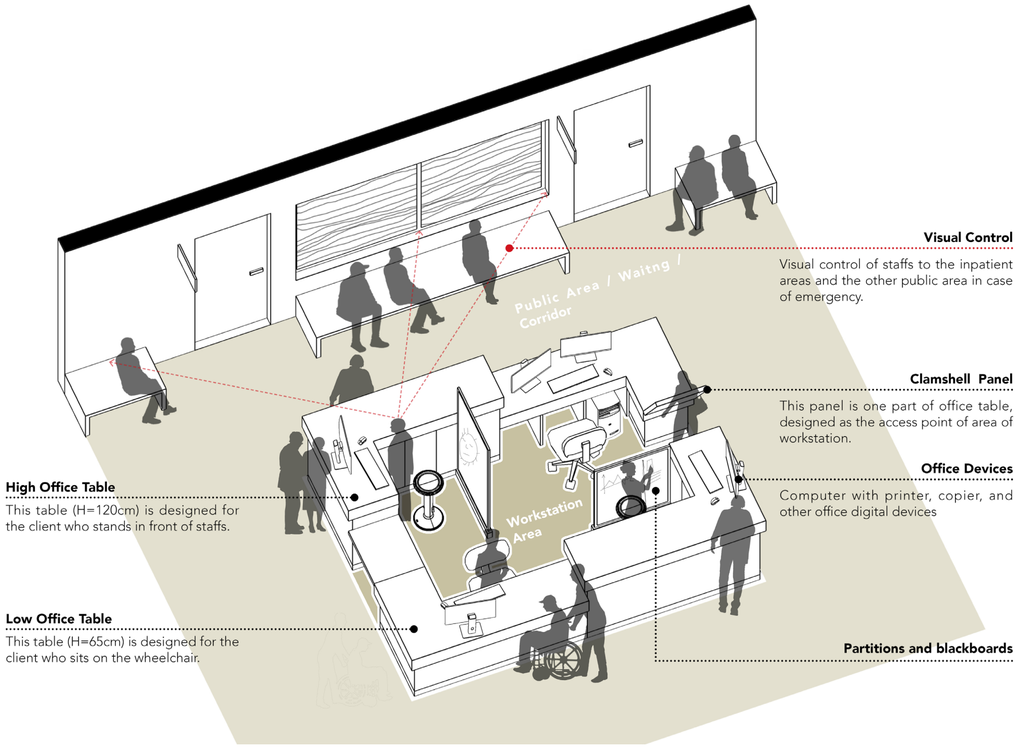


Figure 1.5
Scenario of workstation for doctors and nurses

Acceptance / Information / Delivery of reports

- Function

Reception integrates the functions of acceptance, information, and delivery of reports.

As for the patients, the acceptance is the first point that the patients from outside get in touch with in the hospital. From this area, patients and their relatives are able to get clear information from the staff, such as the way to other departments, registration of the treatment and physical examination, etc. Reports are also delivered by acceptance, which requires enough privacy protection of patients. In addition, the acceptance service has payment and checking/checkout from inpatients and day hospitals.

As for the staff, the acceptance is the open office for administrative management that has intersection parts with the workstation. In some cases, the reception is also compatible with the Admission Units (iFHG, 2020).

- Facility and Activity

Facility
· Reception counter and chairs
· Computer with printer, copier, and other office digital devices
· File cabinets
· Lockers
· Communication devices such as telephone, fax machine

Activity
· Consultation service to users
· Registration service
· Check in / Check out
· Delivery of reports
· Administrative management
· Visual control of the public area by CCTV

Table1.7
The Facility and Activity in Acceptance
(Del Nord and Peretti, 2011)

- Scenario

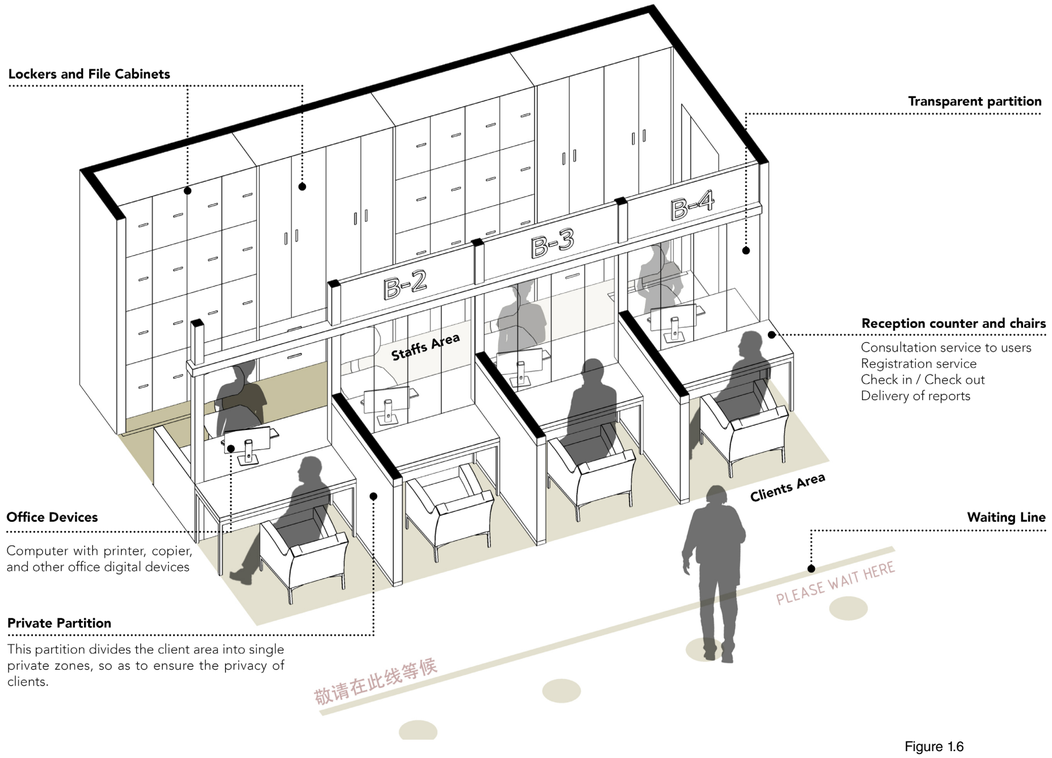


Figure 1.6
Scenario of Acceptance / Information / Delivery of reports

Waiting

- Function

In this area, patients and his/her families have to wait without doing other treatment activities in the hospital, which is also the time of transition between the steps of treatments. The waiting areas are classified into some main types but still have common functions, which are areas connected to surgery rooms, outpatient, and reception/workstation, respectively.

- Facility

Table1.8
The Facility in Waiting
(Del Nord and Peretti, 2011)

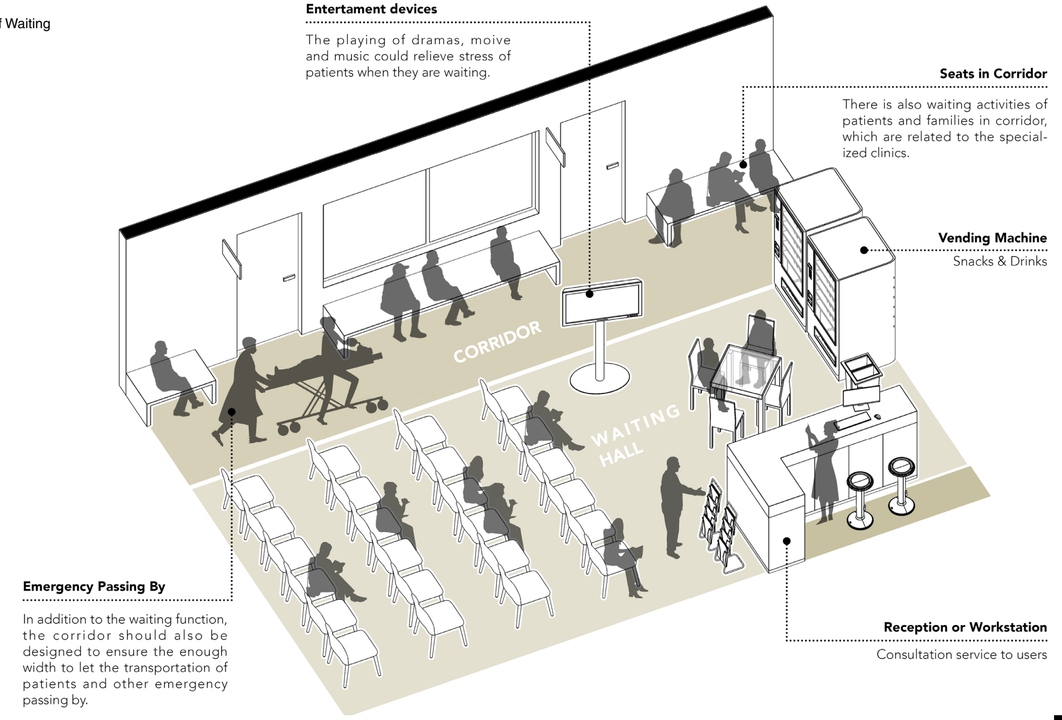
Facility
· Tables and seats
· Consultation that related to Reception or Workstation
· Vending machine for snacks and drinks
· Magazines shelf
· Wash basin for sanitation

- Activity

It is exact that the main activity in this area is waiting. During this transition moment, the patients and relatives wait for the diagnosis, treatments, receiving updates and results, etc. (Steelcase, 2020). In addition, people are always having conversations, light food and drinks, even some entertainment.

- Scenario

Figure 1.7
Scenario of Waiting



- Function

RIf we regard the hospital as a residential unit, the public area generally with a big size that accommodates lots of people from different identities is the “Living hall” of a hospital. In this area, people are able to stay together to have social communications, or to have relaxation activities individually. This is a public area where people mainly do the non-hospitalized activities, at least not be recognized in such an atmosphere of “living hall”.

- Facility and Activity

Facility
· Tables and seats
· Consultation that related to Reception or Workstation
· Vending machine for snacks and drinks
· Magazines shelf
· Toilet
· Entertainment devices
· Wash basin for sanitation

Activity
· Patient’s meeting, and communication with his/her families and friends, or other families.
· Patients’ communication, such as sharing their own experience of being hospitalized.
· The conversation between patients/families and doctors/nursing staff at informal occasions.
· Relaxational and entertainment activities.
· Dining.
· Communications with people with different identities from outside of the hospital.

Table1.9
The Facility and Activity in Living
(Del Nord and Peretti, 2011)

- Scenario

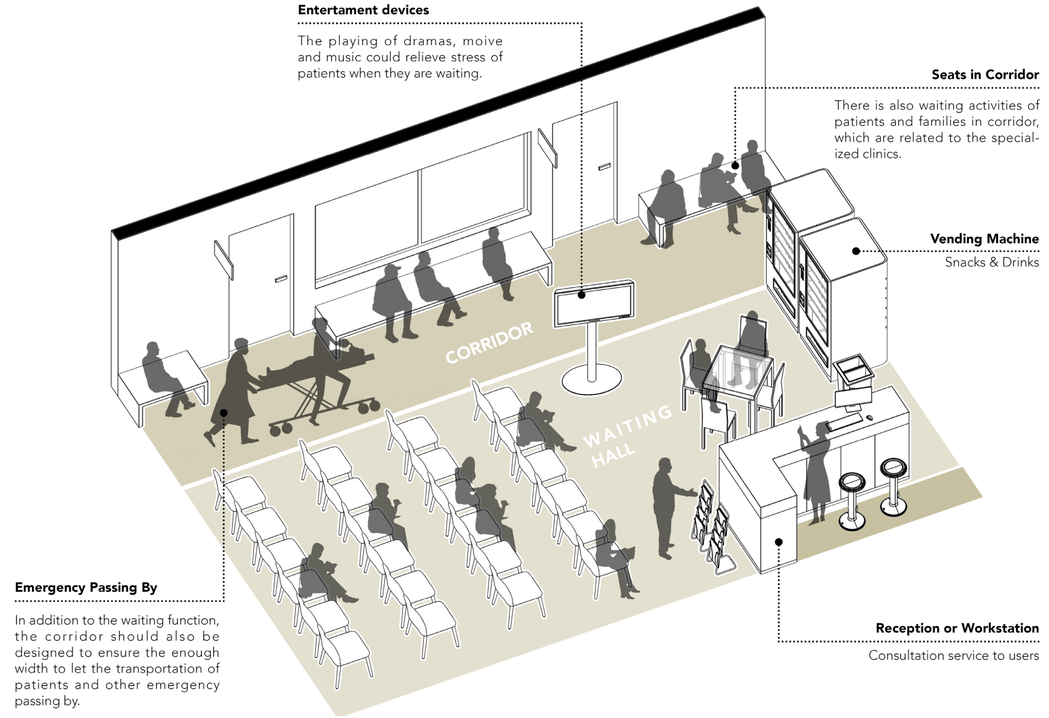


Figure 1.8
Scenario of Living

Meetings

- Function

This is a closed space serviced for the users, such as doctors, nurses, administrative staff, students, etc. Most of the activities held in the meeting room are continuous for a long time, therefore, the users should not be disturbed by outside factors.

- Facility

- Activity

In the meeting room, the users are able to have meetings, training, informational exchanging, administrative decisions, etc.

Facility
· Meeting tables and seats
· Computer with printer, copier, and other office digital devices
· Projector
· The controller of temperature, light and ventilation (Zoltan, 1995)

Table1.10
The Facility in Meeting
(Del Nord and Peretti, 2011)
(Zoltan,1995)

- Scenario

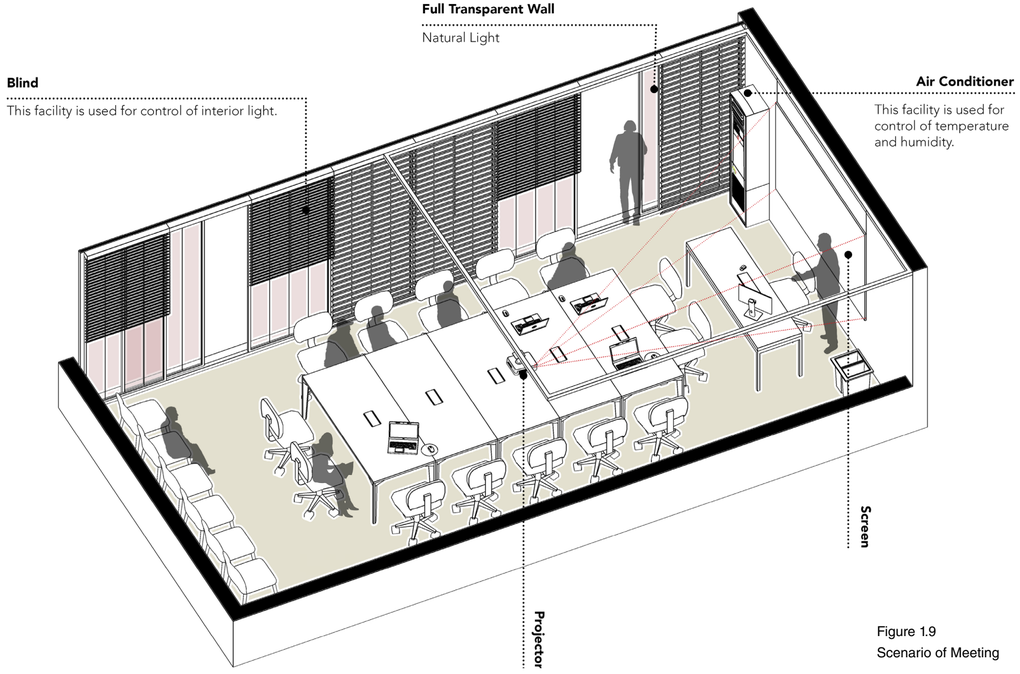


Figure 1.9
Scenario of Meeting

Connective of distribution

- Function

The connective spaces are generally classified into two types: one is used to connect the external environment and internal space; the other is used to connect different kinds of departments in the hospital.

As for the former one, the entrance area and atrium are the typical connective spaces, which transits from the outside to the interior, and requires the consideration of changes of temperature, humidity, and light. Therefore, this type of connective area should be regarded as a “filter zone”, providing comfortable climate conditions to users (Del Nord, Peretti, 2011).

As for the second one, the connective spaces are the mobility context of the hospital. The design of this space, always presented in the form of a corridor, reflects the efficiency of operations between different departments. Corridors, as the connective space, “are a necessary backstage for breaking down the barriers among different departments, such as doctors, nursing staff and volunteers from different identities and professional backgrounds” (Carthey, 2008). In addition, informal conversations among the users usually occur in the corridors, especially at the corners without any passing by person. (Del Nord, Peretti, 2011)

In terms of design, the passage should be designed as more than one single type in consideration of different users and sanitation, which should be divided into 2 types: one for patients, families and relatives, with the need of seats for waiting and informal conversations, the other one for doctors and other nursing staff, who are on the way to their destination in a higher efficiency and in the environment of safety and sanitation. In addition, the passage should be classified as clean and dirty. The former one is serviced for users’ normal activities in hospital, while the later one is used for transportation of contaminated things, such as the clothes of patients that needed to be washed, medical wastes, etc(Del Nord, Peretti, 2011).

- Facility and Activity

Facility of Entrance space and Atrium	Facility of Passage
· Tables and seats	· Indicational signs to departments
· Consultation that related to Reception or Workstation	· Controller of ventilation and light
· Public washroom and Wash basin for sanitation	· Table and seats
· Vending machine for snacks and drinks	· Vending machine for snacks and drinks
· Insulation measures of heat and humidity	
· Controller of ventilation	
· ATM and Shops if necessary	

Table1.11
The Facility in Connective space
(Del Nord and Peretti, 2011)
(Zoltan,1995)

Activity of Entrance space and Atrium	Activity of Passage
· Consultation and registration service offered by reception.	· Transitional movement of patients who are in wheelchairs or beds.
· Relaxational and entertainment activities.	· Transitional movement of goods, such as supplies and contaminated wastes.
· Communications with people with different identities from outside of the hospital.	· Informal conversations among the users.
	· Waiting activities.

Table1.12
The Activity in Connective space
(Del Nord and Peretti, 2011)

- Scenario - Entrance Space / Atrium

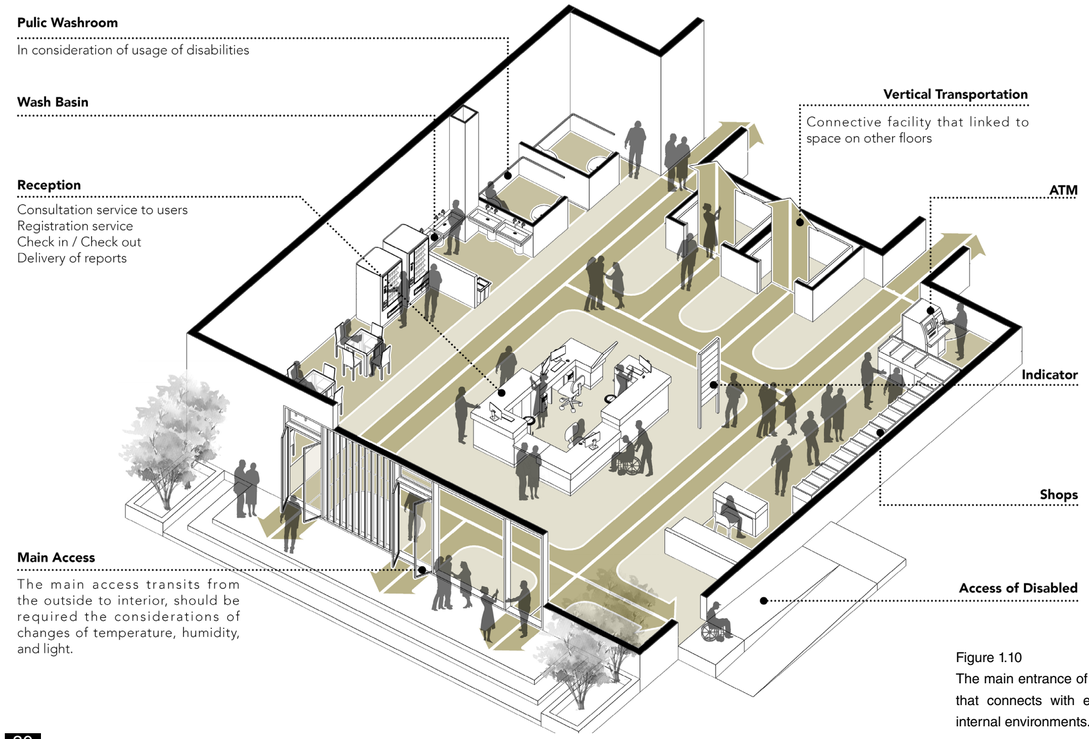


Figure 1.10
The main entrance of the hospital that connects with external and internal environments.

- Scenario - Passage of Patient and staff

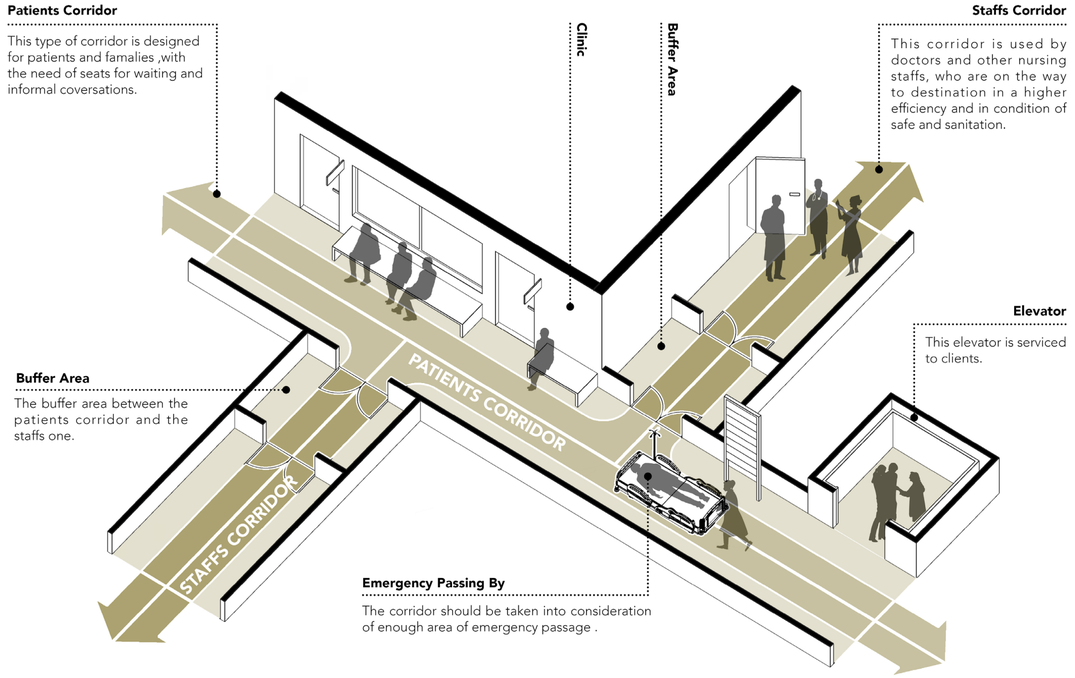


Figure 1.11
The passages of patients and staff

- Scenario - Passage of Clean and Dirt

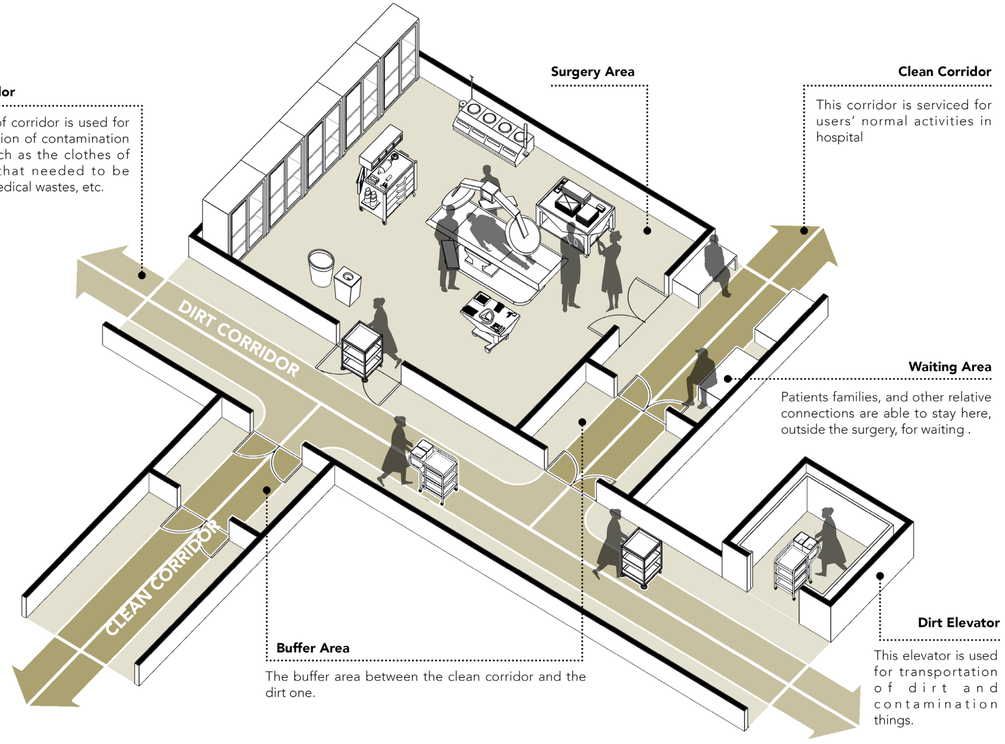


Figure 1.12
The passages of clean and dirt

Outdoor space

- Function

Outdoor space is a key element that is used for breaking down the border between hospital and external environment in aspects of nature and society. Instead of the great and high walls , the outdoor space gives users opportunities to get touch with nature even in the range of a hospital without the feeling that the hospital is a closed box that forces them to go inside. In addition, the outdoor space is used for possible expansion of buildings in the future. During a pandemic situation, temporary medical camps can also be set on the outdoor lands.

In order to realize a better configuration of hospital under the consideration of adequate outdoor spaces, 50% of the total site area of hospital should be designed as outdoor space, but 25%-30% in case of hospitals with a limited capacity for the future expanding (Neducin, Krkljes and Kurtovic-Folic, 2010).

- Facility and Activity

Table1.13
The Facility and Activity at outdoor
(Del Nord and Peretti, 2011)

Facility	Activity
· Tables and seats.	· Physical exercise and movement in the natural environment, such as walking, jogging, running, Taiichi, yoga, etc.
· Natural elements, such as plants, pools and even some animals.	· Mental relaxation and meditation in the natural environment.
· Plank ways, pavilions, and platforms.	· Communication among users.
· Physical and mental exercise equipment.	· Temporary medical camps or fabricated rooms are established during the pandemic periods.
· Children's playground if necessary.	· Expanding construction of the hospital buildings in the future based on needs.
· Toilet	
· Vending machine for snacks and drinks	

1.2 **The Spatial Organization and Flow of Users**

1.2.1 The Rationality and Effectiveness of Spatial Organization

As for the design of general hospitals, it is evident that in addition to the reasonable individual space design, which focuses on the layout of the interior environment, the organization between these departments and the flow of users cannot be ignored.

First, a reasonable relationship of spatial organization will affect the efficiency of personnel mobility in a hospital. Patients need to arrive or be transported to the place of treatment in a short time while doctors need a certain period of time to try their best to handle more consultations and treatments, especially in urgent cases. In addition, logistics personnel should also timely and efficiently make up for a deficiency of supplements, as well as manage the cleaning and maintenance of the interior environment of the hospital. Therefore, it is important to consider the efficiency and convenience of the passage that connects different departments. (iHFG,2020)

Second, the flow of users should be subdivided into specialized categories and be avoided overlapping or conflicting with each other. In terms of the function of each specific flow route, it can be divided into 3 categories: Patients' and Caregivers' flow, Medical staff's flow and Logistic flow. Patients' and Caregivers' flow refers to passages that are mainly used by patients and their families, friends, volunteers, etc. Sometimes these corridors also have the function of waiting. The entrances of Medical flow should be independent from the ones of patient flow with a higher requirement for sanitation and convenience. When the two flows intersect, a buffer zone needs to be designed at the junction point with a strong visual recognition indicating the different departments and directions. Logistic channels are usually considered to transport medical and daily supplies. Such channels should avoid intersections and conflicts with the flow of patients and medical staff. This flow, in terms of levels of hygiene, is divided into two categories: Clean flow and Dirt flow. Corresponding to these two flows there are specific vertical lifts to connect the same flows in different floors. Clean flow is used to transport the medical equipment and medicines with high-sanitation requirements, daily supplements like food, drinks, etc. While Dirt flow is dedicated to the transportation of medical waste, the clothes of patients and medical staff that need disinfection and cleaning. The flows of clean and dirt should be avoided crossing as much as possible. If it happens, the buffer area and obvious visual signs need to be set at the junction point (iHFG,2020).

signs need to be set at the junction point. (iHFG,2020)

Third, the relationship between the transportation system, which is regarded as the "skeleton" of the entire hospital, and the functional departments that it connects to, is just like the relationship between the branches of a tree and the fruits that grow on them. As the tree grows up with more and more fruits, the scalability of the future should be taken into consideration. Because the capacity of the hospital is limited, if the building needs to be expanded in the future, it will need "branch (transportation system)" to extend, so as to develop more fruits (functional departments), and even connect

to another new buildings, which means that the flows of users not only needs to reasonably connect various departments, but also consider the future scalability, that is, the "skeleton" of this hospital is not closed loop but open. As what iHfg emphasizes in its article, figure 1.13 shows how transportation organizations connect to different kinds of departments (iHFG,2020). The yellow line in the schema serves as the main hospital flow, connecting the main entrance of the hospital, the departments of consultation, diagnosis, treatment, surgery, and emergency, etc. At the same time, it is in contact with the exterior of the building, rather than a closed terminal. (iHFG,2020)

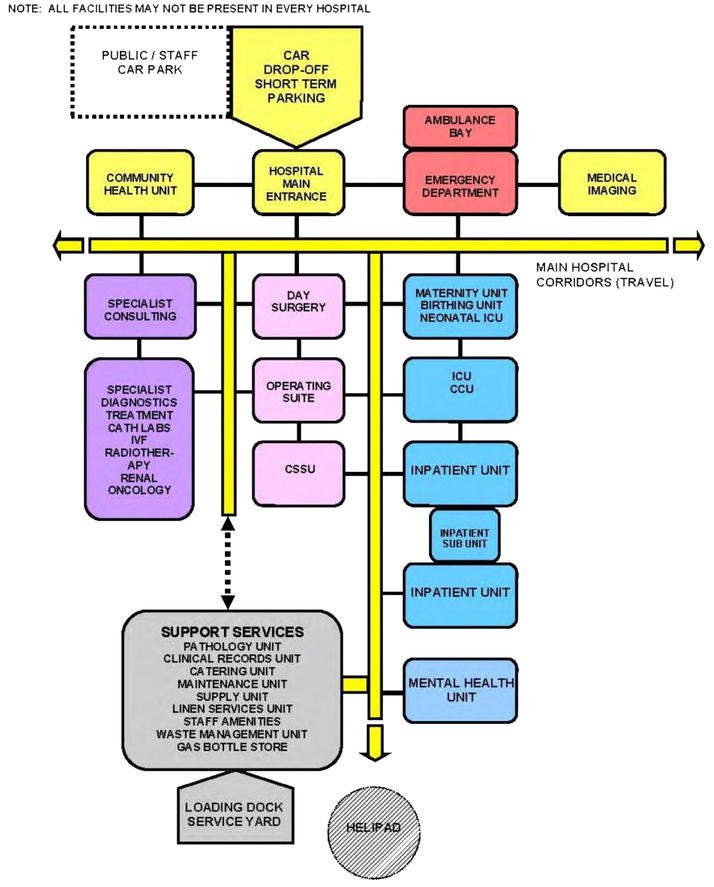


Figure 1.13
Organization of general hospital (iHFG, 2020)

1.2.2 Case study - Jiangnan Hospital in China

1.2.2.1 Background of the case

In the research of hospital space organization and user's flow, I found a case of a general hospital in China. From this case, I have a deeper understanding and knowledge of the effective organization of general hospitals. This is the Second Affiliated Hospital of Chongqing Medical University (Jiangnan Hospital) located at No. 288 Tianwen Avenue, Nan'an District, Chongqing City, China. The designer is China Construction Southwest Design & Research Institute Limited Company (Yang, 2019).

This project is a complex composed of several main functional buildings. These single-function buildings are: Medical Complex (9F, 1000 beds, 164963.2 square meters); Liver Disease/Infection Center (9F, 200 beds, 16354.5 square meters); Teaching and research (6F, 11260.75 square meters); logistics (6F, 15791.5 square meters); Student apartment (9F, 10505 square meters) (Figure 1.14). As a complex, the hospital integrates the functions of comprehensive medical care, teaching and training, and accommodation for students, as shown in Figure 1.14. Among them, the Medical complex, as the main building of this project, has the main functions of a general hospital: outpatient and inpatient service, medical technology, etc., as shown in Figure 1.15. Therefore, in regard to the hospital's spatial organization and user's flows, I took the Medical complex as the research object and analyzed its spatial organization (Introduction of the Second Affiliated Hospital of Chongqing Medical University, 2019).

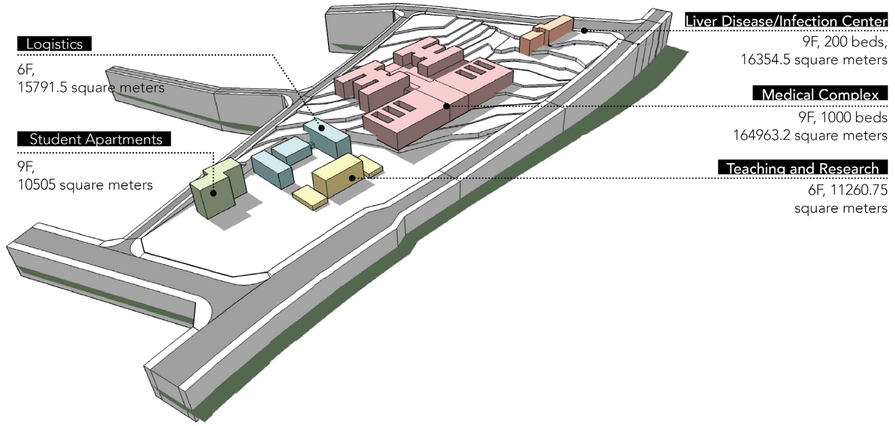


Figure 1.14
The composition of Jiangnan Hospital (Yang, 2019)

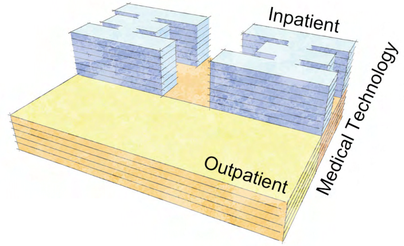


Figure 1.15
The Functions Distribution of Medical Complex (Yang, 2019)

Before the analysis of the Medical complex in this case, it is necessary to explain why this building has two different main entrances on different floors. Because the project is located in Chongqing City, where the buildings are constructed in a mountainous area, which means that the city itself has various differences in height. The site is a hilly landform that is high in the north and low in the south. The elevation difference between east and west is about 15-16 meters, and the elevation difference between north and south is about 20 meters. There are two main entrances directly connected with the external environment on the sides of north and south, as shown in figure 1.16 (Introduction of the Second Affiliated Hospital of Chongqing Medical University, 2019).

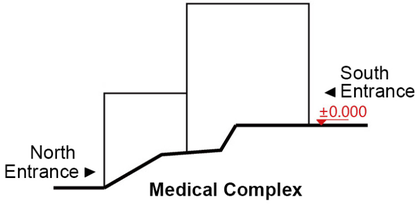


Figure 1.16 Two main entrances directly connected with the external environment on sides of north and south (Yang, 2019)

1.2.2.2 Analysis of Spatial organization and flow of users in Jiangnan Hospital

According to the study of the Medical Complex in Jiangnan Hospital, there are four flows: Patients flow, Medical staff flow, Clean flow, and Dirt flow. For the convenience of understanding, I use A, B, C, and D, as shown in figure 1.17, to name the above four flows and make an analysis mapping of each floor to clarify the logic of spatial organization and how these flows are operated and connected.

In order to make it easier for readers to understand the technical drawings, take the underground floor as an example, I extracted and simplified the spatial organization on the basis of these drawings (figure 1.18-1). In addition, in order to further explain the relationship between different streamlines and specific spaces more clearly and simply, it is necessary to supplement the corresponding simplified diagrams (figure 1.19).

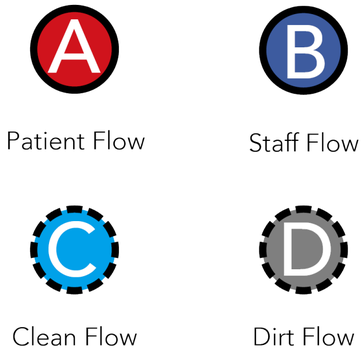


Figure 1.17
A-Patients B-Staff C-Clean D-Dirt

Underground Floor

There are four functions in the underground floor: underground parking, morgue, chemotherapy, and equipment rooms, and three flows connecting those functional areas, which are namely: A-Patient's flow, B-Medical staff's flow and D-Dir flow, as shown in Figure 1.18. For A, this flow connects the underground parking lot with the external environment. Patients and their families usually drive to this parking lot, and then directly use the vertical elevator to reach the upper floors. B, the Medical care flow also uses this underground parking lot as the staying space of commuter tools, medical staff will use the specific elevator to reach the upper office after parking (Introduction of the Second Affiliated Hospital of Chongqing Medical University, 2019).

The morgue is arranged in the underground space to avoid direct contact with other users. The transportation of remains is one of the medical staff's flow lines, directly connecting with the medical staffs' elevator instead of the patients'. At the same time, chemotherapy is also set in the underground space, with an independent entrance located on the ground floor. For D, the dirt flow uses its specific elevator to collect the medical waste from the upper floors and transport it to the outside by vehicles .

In the simplified diagram (Figure 1.19), A-Patients flow, B-Medical flow, and D-Dirt flow will use the underground parking lot in common, while D-Dirt flow will directly connect with the external through closed transporters, completely avoiding contact with A and B. In addition, A and B intersect in the radiotherapy department and the farewell room attached to the morgue.9).

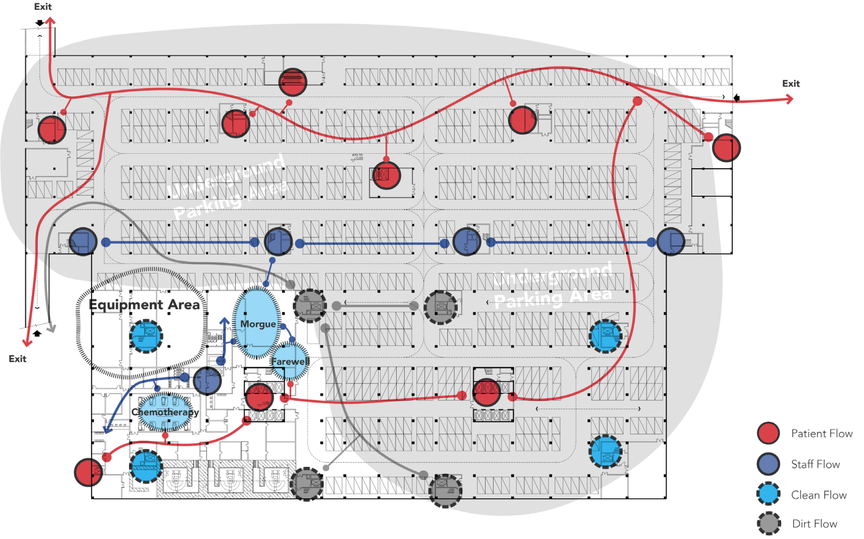


Figure 1.18-1
The overlap between the technical drawing and the analysis of Flow Organization on the Underground Floor Plan

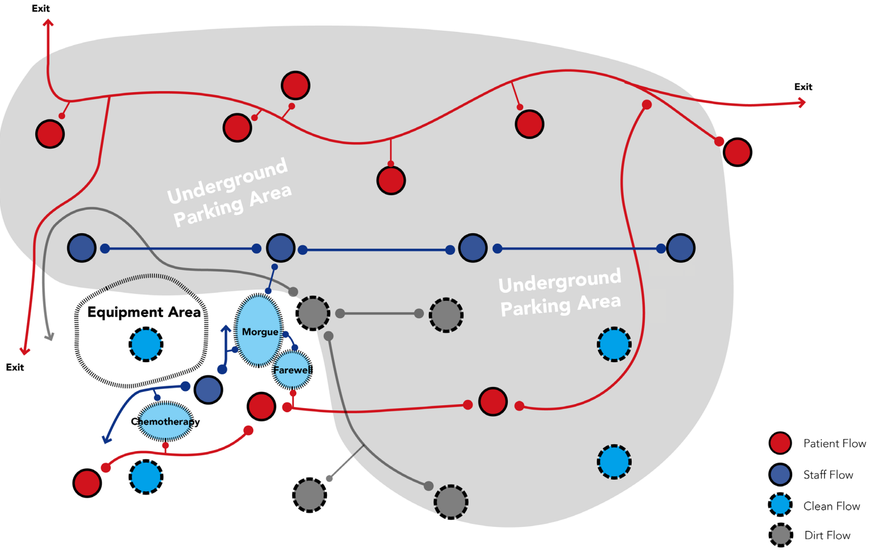


Figure 1.18-2
Spatial Organization of Underground Floor Plan

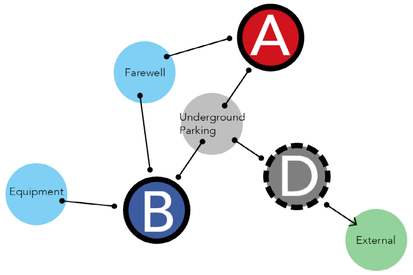


Figure 1.19
Simplified Organizational diagram of Underground Floor

Ground Floor

As the diagram of transportation organization analysis shows (figure 1.20), there is a height difference in the site as the building is located on a slope, therefore the north side is directly connected to the external with a level of 0.000, and the south side is a parking lot under the cover. In order to take advantage of the convenience and accessibility of the ground floor space, several entrances are set on the north side, which are general entrances, and the specific entrances of first aid, physical examination and pediatrics. These entrances guide different flows for different purposes without interfering with each other. In the Red A-Patients flow system, patients who are on the A1-Patients flow generally enter the lobby, through the main entrance, or arrive by elevator from the underground parking lot. The entrance lobby has multiple functions such as registration, consultation, commerce, pharmacy, etc. and directly connects the infusion lobby on western side. For the specialized patient's flow A4-Patients' flow, employees will be organized by the companies for annual physical examinations. This flow is an independent one arranged on the northeast side. The emergency flow A2-Patients' flow is arranged on the northwest side, which is also an independent flow, short and directly connected to the external flow. The Blue B-Medical staff's flow does not need to have direct contact with the external, because medical staff go directly to the ground floor from the underground parking lot. The C-Clean flow collects and imports medical equipment, daily supplements from the outside through a transport vehicle and transports it to the upper floors through its specific elevator (Introduction of the Second Affiliated Hospital of Chongqing Medical University, 2019).

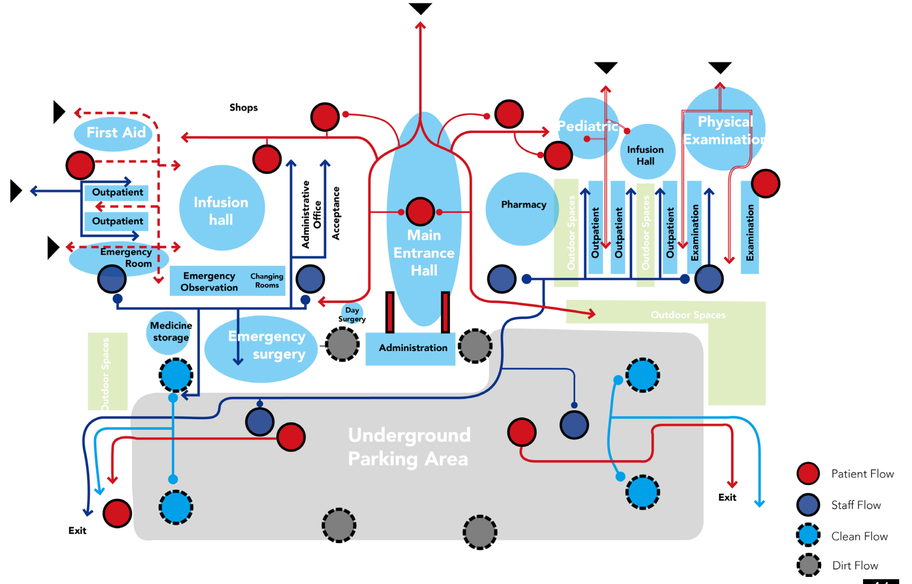


Figure 1.20
Ground Floor Plan

As shown in the schematic diagram (figure 1.21), A1 connects to the entrance hall and infusion hall directly, A2 links with the emergency area, A3 is for pediatrics, and A4 serves for the physical examination area. The four flows of A system are independent of each other but have a common connection with Medical staff flow B. Clean flow C is independent from the other flows and only connects to the underground parking.

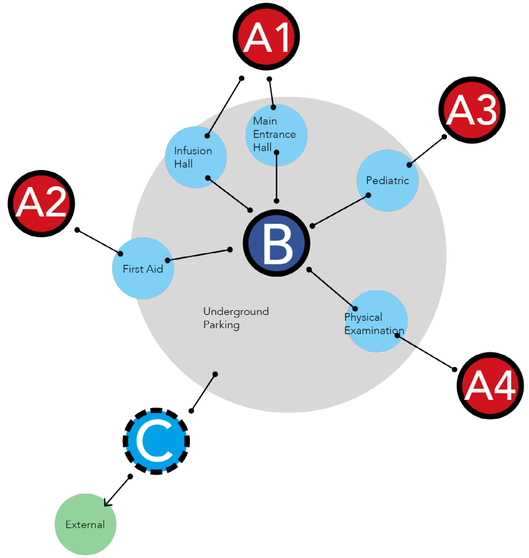
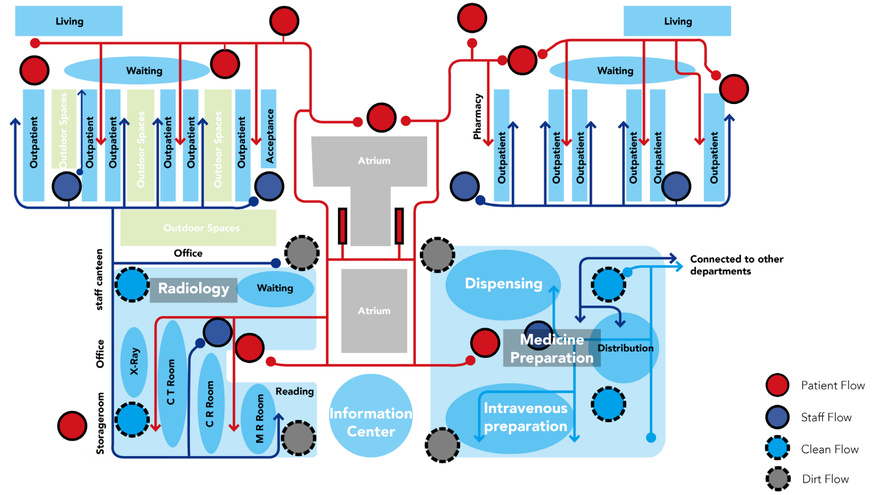


Figure 1.21
Simplified transportation organization diagram of Ground Floor

First Floor

On the first floor, there are three function departments: outpatient clinics, radiology department and drug preparation area, corresponded by three types of flows: A patient flow, B medical staff flow and C clean flow (figure 1.22). In the outpatient area, the medical staff' corridors and patients' are separated, but converge in outpatient rooms. The same logic is also applied to the radiology department. The drug preparation room is mainly used by medical staff, that is because the process starting from dispensing to handling the distribution should be operated by professional personnel, and also be under the control of Clean flow (Introduction of the Second Affiliated Hospital of Chongqing Medical University, 2019). In the simplified diagram (Figure 1.23), A and B intersect in the outpatient area and radiation area, B and C intersect in the drug preparation area .



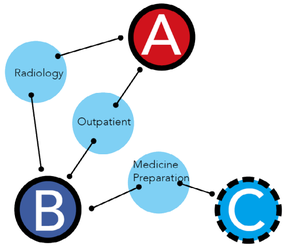


Figure 1.23
Simplified transportation organization diagram of First Floor

Second Floor

The southern part of the second floor is connected to the external ground at 0.000 level (figure 1.24). The main function of this entrance hall is to receive patients who need to be hospitalized. Patients from the external, northern outpatient area, and down floors are able to gather in this main entrance hall. After completing the hospitalization procedures, they can take the patient's elevator directly to the inpatient area above the 4th floor. This floor is also equipped with a laboratory and a restaurant. The laboratory is located on the southwest side, a place where A1-Patient flow and B-Medical staff meet and

and communicate. The restaurant on the southeast side mainly serves patients A1 who stay in the inpatient area for a period of time. In addition, the independent entrance of the radiotherapy department is set on the southwest side of this floor. Patient flow A2 is not related to other flows and directly reaches the radiotherapy department on the basement floor (Introduction of the Second Affiliated Hospital of Chongqing Medical University, 2019).

In the simplified diagram (figure 1.25), the communication activities between A1 and B take place in the northern outpatient area and the southwestern laboratory. At the same time, A2 was guided directly to the radiotherapy department in the basement through an elevator as an independent flow .

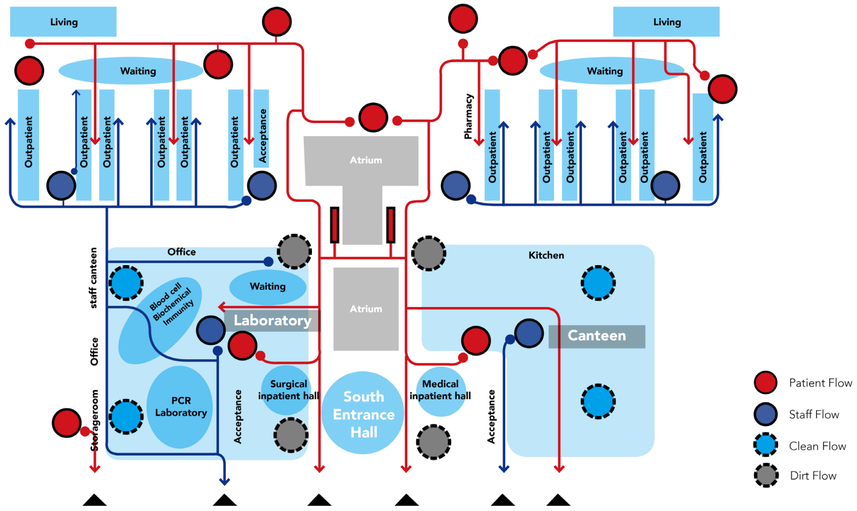


Figure 1.24
Second Floor Plan

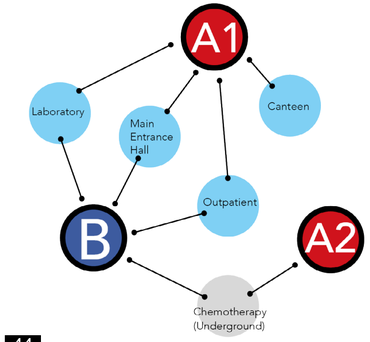


Figure 1.25
Simplified transportation organization diagram of Second Floor

(1) There is a height difference in the site as the building is located on a slope, therefore, on the ground floor, the north side is directly connected to the external with a level of 0.000, and the south side is a parking lot under the cover.

Third Floor

The functional departments on the third floor include the outpatient, the central supply, the pathology, the endoscopy and functional examination. The central supply and pathology department is mainly used by staff of medical and logistics. As for Patients, it is not necessary for them to enter the working area of the laboratory, except for sample reception to communicate with medical staff. The main function of the central supply area is for receiving, sorting, and distribution of clean medical supplies and daily necessities that are transported from the underground parking on the second floor (1) carried out by the Clean flow. The Specialized workers will disinfect and clean these materials, and the sewage waste generated during the process will be collected and transported to the underground floor through the Dirt flow. Patients mainly participate in the departments of outpatient, functional testing and endoscopy (Introduction of the Second Affiliated Hospital of Chongqing Medical University, 2019).

Therefore, as shown in the schematic diagram (figure 1.27), there are intersections between A-Patient flow and B-Medical staff flow in outpatient, functional examination, and endoscopy. C-Clean flow and D-Dirt flow are executed by B-Medical staff flow in the central supply area.

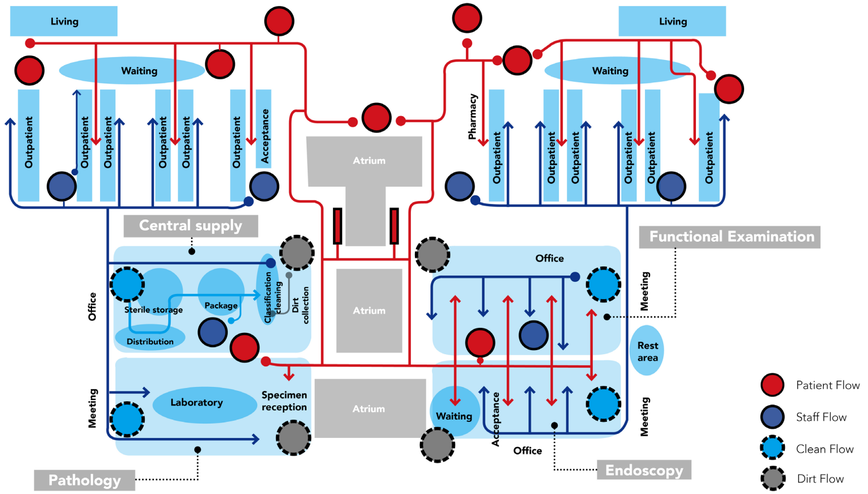


Figure 1.26
Third Floor Plan

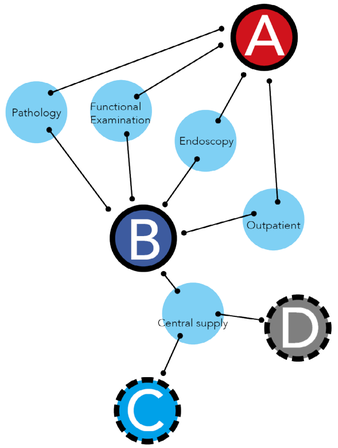


Figure 1.27
Simplified transportation organization diagram of Third Floor

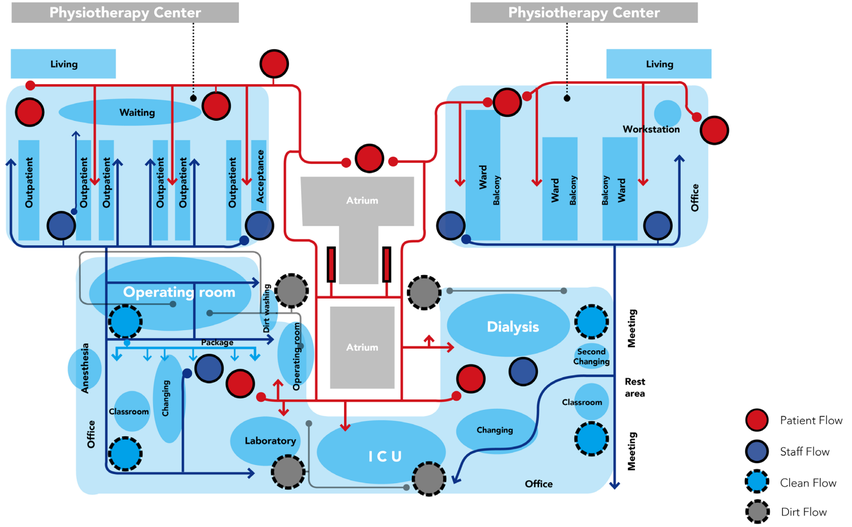


Figure 1.28
Fourth Floor Plan

Fourth Floor

On the fourth floor (figure 1.28), the functional departments include the physiotherapy center, operating rooms, ICU (Intensive Care Unit), and Dialysis. Patients mainly participate in physiotherapy centers with the activities of outpatients and inpatients, which are under the intervention and nursing of medical staff. A large amount of sewage and medical waste, which needs to be transported to the underground through the Dirt flow, are generated inevitably by the medical activities executed in the areas of operation, ICU, and dialysis. The whole process of medical activities in these areas is basically operated by medical staff's flow, meanwhile, patients' activities can be regarded as "passive participation" (Introduction of the Second Affiliated Hospital of Chongqing Medical University, 2019).

The brief relationship diagram (figure 1.29) shows that: Flow A and B communicate by diagnosis and treatment in the area of the physiotherapy center. While in the operation area, ICU and dialysis, B-staff flow performs active operations on A-Patient flow, namely passive participation, requiring C-Clean flow and D-Dirt flow for transportations .

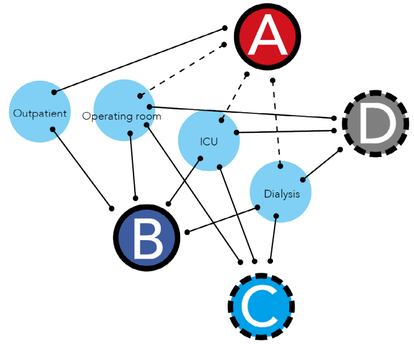


Figure 1.29
Simplified transportation organization diagram of Fifth Floor

1.2.3 Thinking of humanized design intervention

If we say that humanized design of the Functional departments focuses on the Staying State of users in internal space, then the humanized design of the Flows between the departments emphasizes the Mobile State of users. Different from the users' psychological state when they stay inside the rooms, people who are under a physically moving condition, will have a clear purpose of reaching the destination, or be hanging out aimlessly. Therefore, we should have a targeted humanized design intervention for the mobile state (Del Nord and Peretti, 2011).

The main thinking points of humanized intervention are listed as follows:

1. For users, especially patients who have a clear destination, the design of wayfinding should be short and convenient with the signs that be able to be understood easily in a short time , which allows people who are doing physically moving to focus more on the achievement of their goals and be able to maintain peace of mind and self-confidence in the acquisition of information (Del Nord and Peretti, 2011).

2. For users, especially patients who do not have a clear destination, we should redefine the boundary between the flows A-Patients and B-Medical staff when scenario "hanging out" occurs. We should not set a mandatory boundary between A and B, especially when a patient "accidentally" enters the passage of staff , which may create an opportunity for the patient or families to communicate with the medical staff, leading to some information that was not discovered during the outpatient interview (Del Nord and Peretti, 2011). In my opinion, as for the flow design of A and B, we should make more efforts on corresponding flows that should be more convenient to the target users to make them feel more comfortable and confident, instead of setting an administrative prohibition to stop them entering other flows even accidentally .

3. Capillary-style corridor design. On the premise of meeting the basic technical requirements of medical buildings, the scale of the corridor should be as close as possible to the scale used by people at home and avoid becoming giant scales similar to churches or museums. The scale of corridors closed to the home space where users stay daily can relieve their feelings of tension, creating a psychological confidence that is controllable to the surrounding (Vighy, 2010).

4. The patient's flow can be further subdivided into Emergency and non-emergency, in order to avoid these two situations intersecting and leading to some conflicts happening. For example, it could be problematic if a patient, in an emergency situation, needs to pass in front of other patients who are chatting or relaxing. It is better to hide something negative from patients (Wagenaar et al., 2019).

Chapter 02 **USS System Definition and Solution Introduction**

2.1 **USS Frame Definition**

USS, User-Space-Story, is a triangle framework created specifically for this thesis work and applied to show the relationship between these three elements (figure 2.01).

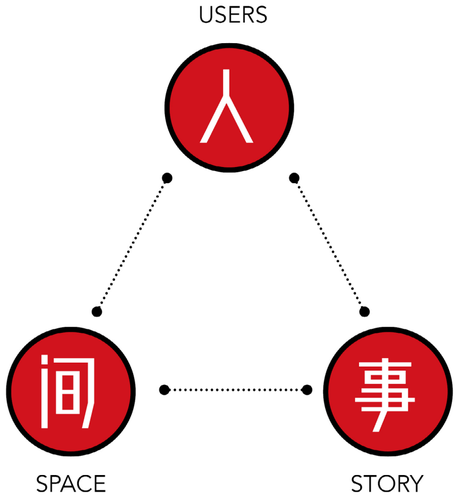


Figure 2.01
User - Space - Story Triangle relationship

The meaning of USS

U means User. Because we are focusing on the “humanized design” of space in this topic, which means that the design strategy should be user-centered rather than architecture-centered. The roles, interaction and spatial experiences of the users should be paid attention and regarded as key considerations during the design process.

S means Space. At the level of basic physiology, the essence of architecture is a container that makes people isolated from the external nature, by means of covers and enclosed walls, to avoid them being exposed to the direct sunshine, wind, rain, thunder, and other natural disasters, thus creating the safe Space. Beyond the level of physiology, architectural designers will pay more attention to the actual experience of users by the internal, semi-internal, or open spaces in various forms that are upgraded from the protective box , connected with the external environment.

The other S means Story. When people have certain events in a specific place, such as a benign interaction with others, it will make the humanized design meaningful, not just a boring interior decoration combination.

The triangle relationship

There are specific mutual relationships between these three elements. In this triangle system, Users have different requirements for Space in different situations, while Space is designed and improved to respond to the requirements of Users (Ayalp, 2011). On one hand, the interaction relationship between Users and Space is fixed. For example, people will go to different fixed spaces and engage in relative activities according to their own needs (figure 2.02). On the other hand, this relationship is flexible, which means a single pure space is temporarily transformed into different kinds of forms at different periods to meet the needs of users (figure 2.03). For example, during a pandemic, some public parks could be transformed into temporary hospitals to accept more patients. There is a case in Torino, Italy, where a field hospital was transformed and established from an expo pavilion in the Valentino park (Strippoli, 2020) (figure 2.04).

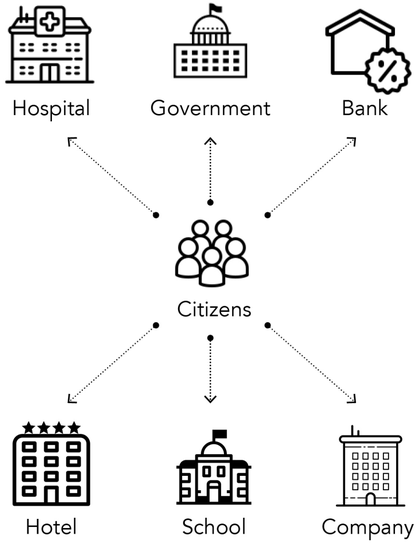


Figure 2.02
Fixed relationship between Users and Space

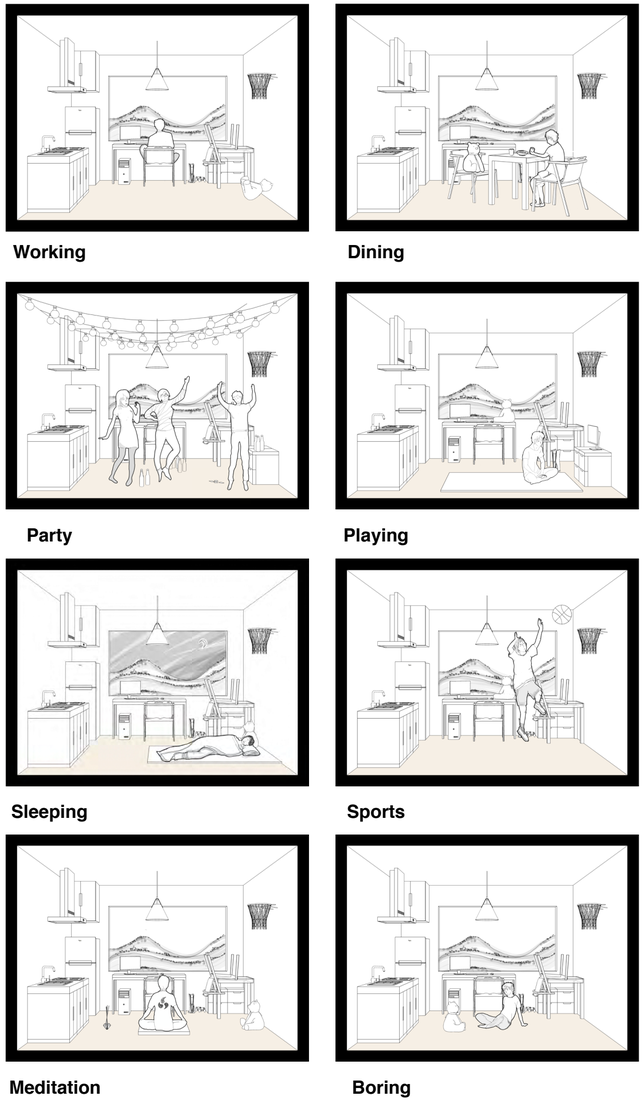


Figure 2.03
Flexible Space and realtived activities

Figure 2.04
Field hospital opens in the Valentino park ,Turin
(Strippoli, 2020)

People will think based on their own interests, and then interact with other people in different degrees of harmony or conflict in the space, thus different stories will happen (CHILDS, 1969). In the relationship between Users and Space, a benign or deteriorating relationship will possibly trigger different possibilities of the Story, although this is not necessarily a decisive factor. Therefore, Space is able to guide events possibly by means of its form and facilities, while events, in turn, may leave physical traces on space, and this is the relationship that we architects need to pay a deep attention to and research on. As for the relationship between Users and Story, it is Users who conduct stories in Space, and the occurrence of Stories will conversely leave people with physical and psychological feedback. Therefore, these three elements are mutually influenced and connected to each other (figure 2.05).

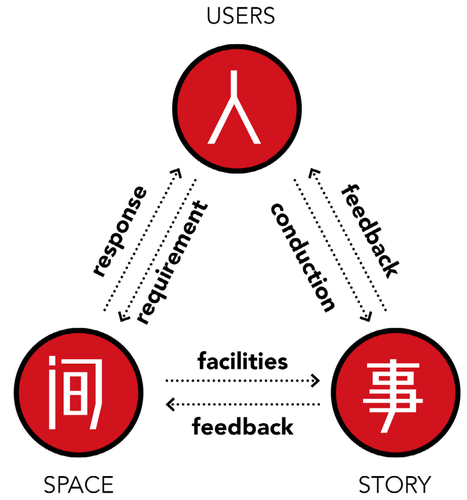


Figure 2.05
User-Space-Story Triangle relationship

Humanized intervention

As for the intervention of humanized design, we need to optimize the Space, to respond to the physiological and psychological requirements of users, so as to guide the occurrence of benign events and stories. We know that people could feel depressed, at a loss and even fearful when he is in an extremely small and closed space like a cage. While in another situation, a space of too large scale may cause a sense of awe and distance from users (figure 2.06). Therefore, the consideration of ergonomic design and response to different possible events and occasions is the basic principle to meet the physical and psychological needs of users.

Figure 2.06
"Namo Amitabha" Space that beyond human scale
(Author's own figure)

2.2 **Solution Introduction**

The USS system can be applied to the design of health care spaces. In the exploration of the humanized design of the medical space. I tried to get rid of its stereotyped perception, that is, to restore it to a space that does not cause medical stress of people who stay inside it (figure 2.07,figure 2.08). The essential function of this blank space is to accommodate the users with their needs and to guide some events, which is not essentially different from other kinds of spaces. In order to introduce the USS system into the humanized design of healthcare spaces, I need to consider three methods corresponding to the three elements in USS, which are listed as below:

1 The hierarchical analysis, redefinition and cross-levels connections of Users

2 Deconstruction, replacement, and reorganization of the medical departments

3 Deduction based on the story of users in the healthcare Space.

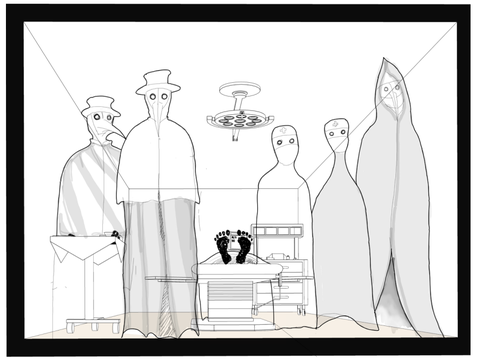


Figure 2.07
Stereotype of being cured
Patients are being observed , treated and do not know the results of recovering or death.
(Author's own figure)

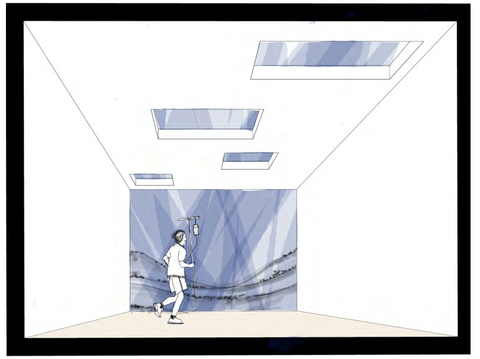


Figure 2.08
Blank Space
(Author's own figure)

2.2.1 The Hierarchical analysis, redefinition and cross-levels connections of Users

WHY- The Reasons for Redefinition

The redefinition is to take off the stereotyped masks of the characters and restore them to ordinary people, as an alternative, understanding, thinking and redesign of them in aspects of humanity. It is a common phenomenon that people always hold the ideas of stereotyped cognition of things that they are unfamiliar with. There are 3 main characteristics of stereotyped cognition listed as below (McGarty, Yzerbyt and Spears, 2002):

1. Stereotype is an interpretation, that is, the description, impression and evaluation that can be positive or negative of objects;

2. Stereotypes enable people to quickly gain information about objects in a short period of time, while such cognition is summary and brief that does not necessarily reflect the authenticity and objectivity;

3. The stereotype conforms to the inherent perception accepted by the group that the perceivers belong to.

Let us go back to stereotypes. Based on these three characteristics, we can find that stereotypes are not objective and inadequate in understanding and evaluating objects. People's inherent cognition of the objects is limited to a certain and comfortable range that they are taught under the environment where they live since their childhood, leading to more ignorance of many other possibilities(Dovey 1985). Therefore, for the "users" in the triangle system, I propose a method of Redefinition.

The significance of Redefinition is to let all the roles involved in the hospital return to "Human". They are "Human" first, then "doctors", "nurses", "patients", and other occupations.

Returning to the essence of human beings means admitting that all of them have the instinctive emotions, such as happiness, anger, sorrow and joy, which cannot be controlled to happen or not, or be controlled to which levels according to the specialized occupation or role in the society. Therefore, as for the humanized design of the hospital, it needs to start from the comprehension of instinctive psychological needs of the person, no matter what role, class, or gender he is.

WHY- For Hierarchical Sorting, it is based on groups rather than individuals

For users in hospitals, I try to divide them into various specific groups, such as doctors, nurses, patients and so on. This identification of different types is based on groups rather than individuals. It is true that we should consider reducing a labeled occupation to a "human" considering his / her instinctive emotions if we emphasize individuals rather than groups. However, when these individuals enter medical institutions with specific functions rather than other places like ordinary public squares, they need to be identified as specific groups, because they have their own specific purpose with corresponding behaviors and activities in medical situations.

Meanwhile, when being recognized as a group, their common interests and demands are also recognized, whose interests may be synergistic or conflicting. Therefore, group-based recognition does not mean ignoring the individual's psychological state and emotions, but introducing humanized intervention to meet the needs of different groups' health psychologically and physically and common interests by means of group induction.

WHO - The group that deserves attention

Fundamentally, a hospital is a place where patients receive treatment and care by doctors and nurses. Therefore, as the relationship diagram of hospital users (Figure 2.10) shows, the patients should be the core characters who need most attention; the families or the closest friends of patients, the doctors and nurses form the first level of relationship.

In this first-level relationship, as the patient's closest family member, they play the most important role of companionship at the non-professional level and provide important psychological support to the patient. Under the guidance of medical staff, they can also participate in the activities of nursing to patients. While doctors and nurses, as medical personnel who contact and interact with the patient directly on the front-line, whose emotions generated from the roles that they play cannot be ignored at the same time. Because in the final analysis, they are all "Human" essentially.

For the medical institution itself, the management and operation of administrative personnel and the maintenance of logistics personnel should be required. In addition, there may be volunteers with specific NGO backgrounds to participate and assist in nursing activities. These related hospital participants constitute the second level.

The first level and the second level construct the internal relationship of the hospital, while the third one reflects the relationship between the external and the internal of the hospital. The intervention of the media can convey information of the internal hospital to the public. Religious groups may also cooperate with hospitals to provide assistance in mental health and belief habits of patients.

The society is at the fourth level, including the different kinds of groups who will participate in hospital activities in the future, such as potential customers, medical interns, employees and so on.

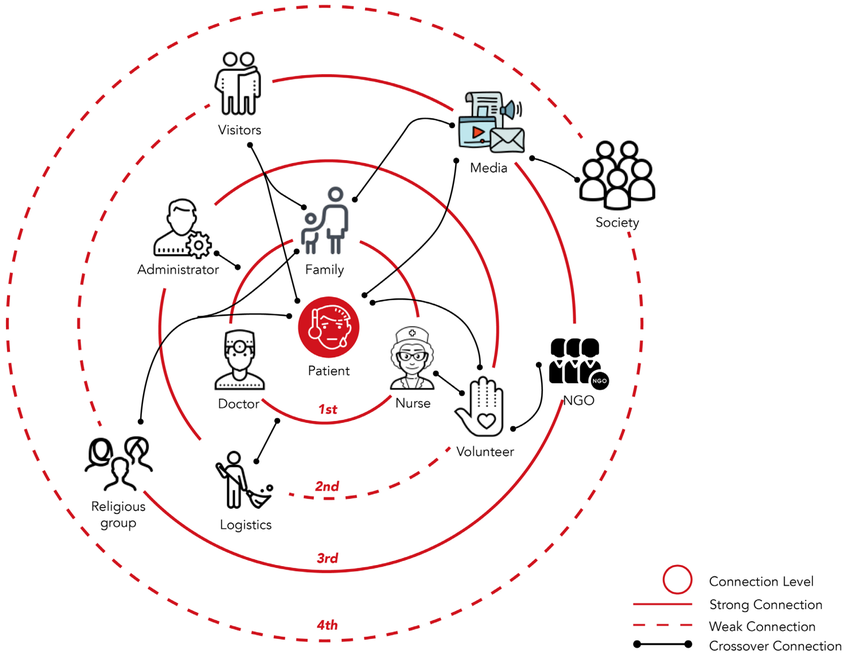


Figure 2.10
The relationship diagram of the users in medical space

HOW- New recognition of Users.

- For patients, on an objective level, they are the group with physical or psychological problems, that is, the most vulnerable group. After returning them to the status of “Human,” we began to try to think about what they need to make up for and repair the characteristic of “Vulnerability.” In humanized design of the medical space, under the premise of medical technology requirements, we should think about Enjoy-service as the starting point, to meet the needs of being treated and nursed like other service places.

- For doctors, on an objective level, they are the group with professional knowledge, experience, and strategic implementations, that is, the treatment group. As the main operators and instructors of the treatment process, in the eyes of the patients who need care services, it is evident that they are “confident, knowledgeable and trustworthy Consultants” for. In a new vision of the role of doctors, more like “human” and not only professional, they allow the patients to have an equal psychological feeling on the personality level, rather than a sense of distance from the authority. In this kind of equal and close relationship, patients could be more likely to reveal more information that is possibly beneficial to treatment.

- For nurses, on an objective level, they are a nursing group with professional knowledge and corresponding experience. On one hand, they serve with their professional knowledge a composite group regardless of gender and age, the patients. On the other hand, they may also be psychologically vulnerable due to the intensity of their work and the various emotions of the patients and in general work.

How- Connections that beyond the Hierarchies

From the perspective of hospital operation, there are four progressive levels to express the relevance of different participants. However, in the eyes of specific participants, these four levels are not the existence of hard barriers that cannot be broken. On the contrary, the cross-level connection between specific participant groups can directly and effectively respond to their interest demands. For patients at the core position, the intervention of doctors and the care of nurses are certainly needed, and at the same time, patients also need the support of relatives and friends. In addition, with limited nursing resources, volunteers also have the opportunity to participate in assisting nurses in caring for patients. Religious groups at the third level can also cooperate with the hospital to engage in religious activities inside the hospital, giving patients psychological support. The administrative management and logistical services at the second level have direct contact with the entire first level, because they are the important force supporting front-line medical activities. The media at the third level plays an important role in contacting society and the hospital, which can transmit hospital information by directly interviewing patients, their families and volunteers to the society, especially to those who will come to the hospital in the future as the potential participants. In turn, the society’s feedback on the hospital has the effect of supervising and enhancing the service and image of the hospital. (figure 2.10)

In conclusion , the participation relationship design of users needs to handle the connection of two dimensions, namely, the four progressive levels based on important degrees and the cross-level direct connection. The former is to ensure effective medical activities and the latter is to respond to the psychological demands of specific users. In the process of designing the hospital, as the Humanization design strategies suggest, this medical institution needs to be designed more as a Home. Whether it is for busy medical staff or patients who don't know their future fate, they all need to feel at "home away from home" when they have their specific purpose in hospital. Home is a safe place for everyone in aspects of mental and physical health. Medical staff are faced with daily work pressure and need physical and psychological support from the hospital’s own management and logistics staff; patients also need support from family members and friends who are not frontline staff but equally important and the power of society cannot be ignored. The information transmission of the media and the public welfare support of NGOs are all conveying a kind of social cohesion and the public humanistic care of "you are not fighting alone". Therefore, we need connection.

2.2.2 Deconstruction, Redefinition and Reorganization of Medical space

"The projects in the exhibition mark a different sensibility; one in which the dream of pure form has been disturbed. Form has become a kind of nightmare.

It is the ability to disturb our thinking about form that makes these projects deconstructive. (Mark Wigley, 1988)"

-- As Mark Wigley said when he held the MoMA exhibition (2.1) in 1988 with Philip Johnson.

2.1 MoMA was known as Deconstructivist Exhibition held at New York's Museum of Modern Art in 1988 .

WHY-The Reasons

In addition to stereotypes about "people", people also have stereotypes about "space" or "architecture". Various specific types of functional institutions are naturally derived in a mature social system with its development, such as hospitals, administrative agencies, schools, apartments, etc. For the design of new buildings, designers usually summarize and classify existing functional features of the same type to form the inherent rules and assign them to a new blueprint. Mature skills can certainly ensure that new functional buildings can operate stably and routinely within the controllable range of society. For example, the traditional Chinese architectural form (Figure 2.12) that is based on the "Yingzao Fashi (Song)" (2.2) and "Department Engineering Practice (Qing)" (2.3) remained stable and developed slowly (Addis, 2014).

2.2 The Yingzao Fashi (营造法式) is a technical treatise on architecture and craftsmanship written by the Chinese author Li Jie (李诫 1065–1110), the Directorate of Buildings and Construction during the mid Song Dynasty of China.

However, the architectural design based on inherent rules often ignores the possibility of new spatial volume, form and organization. Even if the intervention of "humanized design" is required, it will be limited to the framework of inherent rules. Therefore, it is necessary to get rid of the stereotypes of functional buildings and let them return to the blank space first. No matter what it is, a hospital, an administrative institution, a school or an apartment, their essence is the "space" enclosed by the components of walls, floors and ceilings. What the most primitive function of "Space" gives the users is the "Safety", which also cannot be abandoned since the concept of house was born in human society. This sense of safety, both physical and psychological, should not be weakened or be replaced with new physical and psychological pressures with the development and the more and more complicated-inherent rules of the buildings (Sami, 2017).

2.3 The Department Engineering Practice (Qing) refers to the "Engineering Practices" promulgated by the Ministry of Industry in the twelfth year of Emperor Yongzheng in the Qing Dynasty (1734), Volume 74, 2768 pages, which was the Chinese architecture standrad released by officals , having an imporant status in field of Chinese architecture design and construction guidlines.

Therefore, I try to break people's stereotyped cognition of specific functional spaces, to dismantle the "global body" that is set by inherent rules and to liberate the "components" from it. After the liberation, the "components "will be redefined and reorganized into a new complex. The purpose of these methods is not only to break the inherent cognition, but more important, to allow more free intervention of humanized thinking on the design, thereby releasing new forms, volumes, unlimited possibilities so as to satisfy better usage needs and psychological appeals of people.

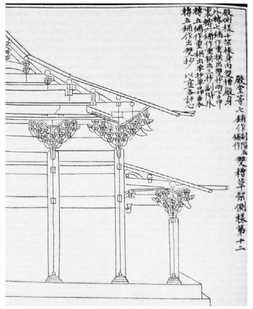


Figure 2.12
Dou Gong
Structure of Chinese traditional architecture, showing that the corbel wood bracket supports ("dougong") holding up a multi inclined roof, from the architectural treatise Yingzao Fashi (1103 AD)

WHAT - Deconstructed Objects of Conventional Medical Space

Before proceeding to "Deconstruction-Redefine-Reorganization", it is necessary for us to confirm the main typologies of the functional departments in conventional medical space according to their structural classification. Let us return to chapter 1.2.3 about the "Structure of General Hospital - Classification based on Space". According to the medical manual "Guidelines for the Humanization of Medical Space" (Del Nord and Peretti, 2011), the main functional departments that constitute a conventional general hospital are:

1. Inpatient /Day Hospital,
2. Outpatient,
3. Workstation of Doctors and Nurses,
4. Reception,
5. Waiting Area,
6. Living Area,
7. Meeting Room,
8. Connective Space,
9. Outdoor Space.

It is necessary to mention here that, unlike the enclosed spaces from 1 to 7, Connective Space and outdoor can be defined as "soft elements" together, because these two types of spaces are flexible and changeable. It can be used as an adhesive for the other 7 types of spaces to form a new composite body.

The above-mentioned functional departments have professional personnel and measures to serve patients with corresponding purposes. Therefore, we can deconstruct and abstract these 9 typologies from the conventional hospital complex, to redefine them with the intervention of humanized thinking and design (Figure 2.13).

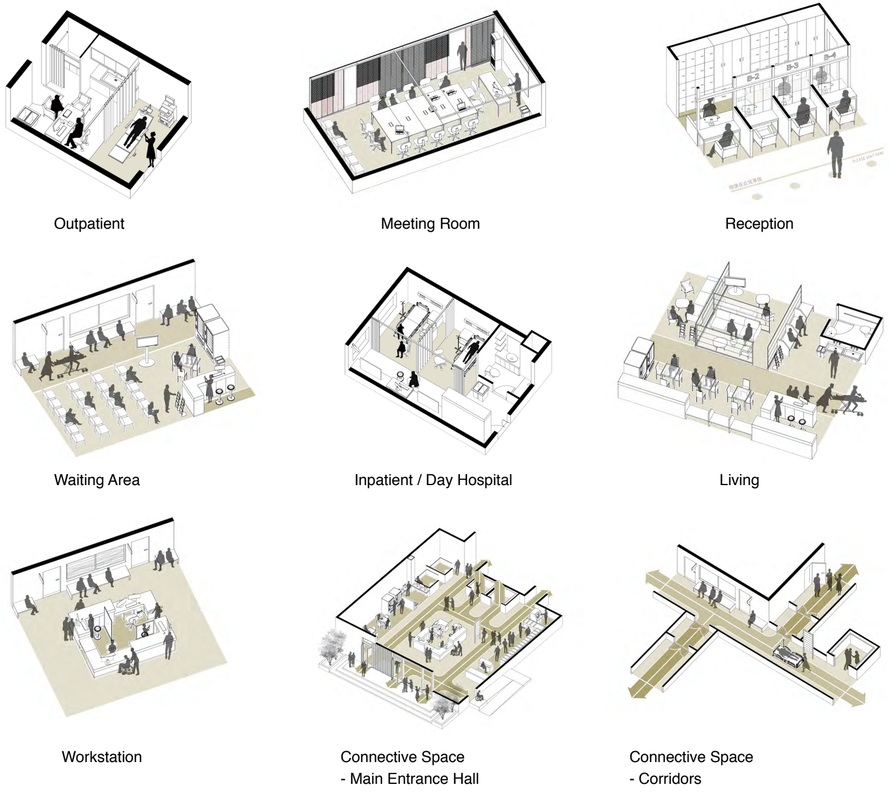


Figure 2.13
NineTypologies of Medical Space

HOW- Deconstruction, Redefinition and Reorganization

The three-steps method is briefly shown in Figure 2.14.

Step 1: Deconstruction. That is, 9 main functional space typologies are extracted from the conventional medical complex.

Step 2: Redefinition. Redefinition does not mean that the basic medical functions of these 9 typologies are completely eliminated and replaced with new ones. Instead, they are redesigned according to different medical functions and the physiological and psychological needs of users, and also take the similar service space in society as reference. This process is called in this thesis the Redefinition of Space. In this step, humanized thinking and design need to be involved.

Step 3: Reorganization. Through step 2, the nine types of spaces have been updated to new typologies. At this time, the conventional stereotyped cognitions of these spaces have been gotten rid of . The purpose of this step is to reorganize these new typologies to form a new medical space complex. This step focuses on the humanization, effectiveness and rationality of the transportation organization in contact with each functional space.

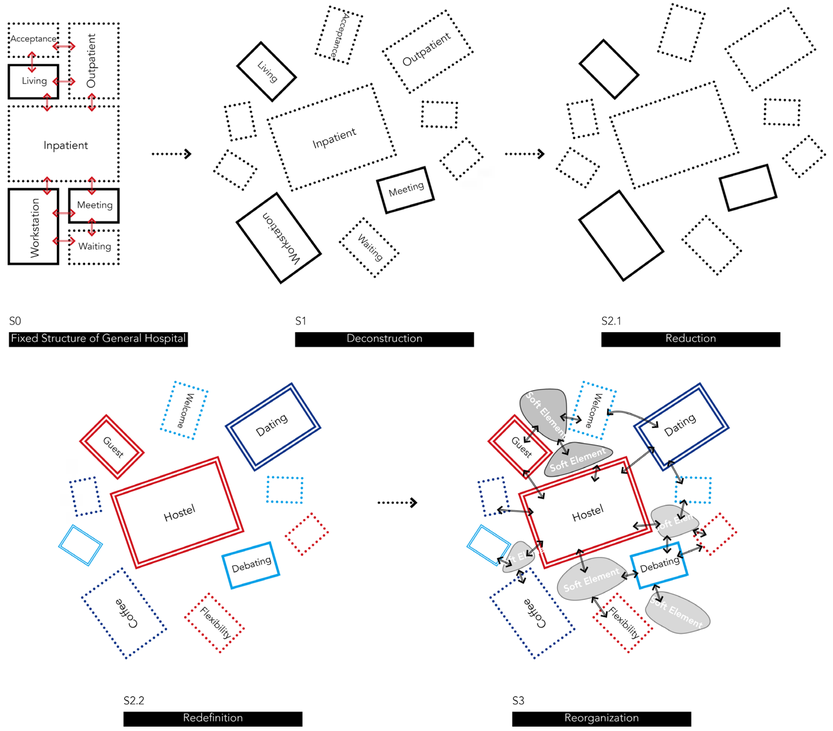


Figure 2.14
The three-steps method
By means of this method, Deconstruction- Redefinition- Reorganization, a new form of hospital with humanized design can be generated.

2.2.3 Deduction of story based on the relationship between “Users” and “Space”

Good story or Bad story

The story of users in space is very inspiring and important to humanized thinking and design. Because the story records what happens to the users in a specific space and also reflects their emotions and feelings as the parties. A good interaction between “users” and “space” can guide the possibility of a good story and leave good memories for users. Conversely, if the design of the space does not actively and effectively respond to the users’ needs, or even be reacted in the contrary way, bad stories may be more likely to happen.

Chapter 03
Strategy-Users

3.1 **The Hierarchical analysis ,Redefinition and Cross-levels Connections of Users in the Maternity Department.**

The Core Character among Users & Relationship Hierarchical analysis

Among the users related to the maternity department, the core character who needs the most attention is naturally the person who is pregnant. Therefore, according to the user methodology of the USS system in the previous chapter, this core character is not only the “patient” in the eyes of doctors, but also a woman who has undergone tremendous changes in her life. Instead, the mother and her baby are set as the centre core, doctors - nurses / midwives - the father, and other closed families constitute the first level. The reason why these three are the first level is that the medical staff can technically guarantee the physical safety of pregnant women and newborns, meanwhile, the father may provide technical assistance under the guidance of medical staff as expectant, childbirth, postpartum recovery, and more often as psychological support for pregnant women.

In the second level, the logistics department is responsible for supporting the running of the maternity department with important functions such as transportation and disposal of dirt during pregnancy, cleaning uniforms and maintaining a clean and hygienic medical environment. Another group worth considering is the “other pregnant women”. Although they don’t know each other before entering the hospital, there will be many possibilities of interaction between them because they have a common purpose and share common space in a coincident period of time.

At the next level, visitors are included as the persons who are in the pregnant women’s social circle. They may be ordinary friends, colleagues, etc. In addition, at this level, the role of the media cannot be ignored as the information transmitter to convey the true service level and experience of the hospital to the society. At least, once there is a situation that is unfavourable to pregnant women, the complaint to the hospital itself is not the only solution. The outermost level is the external society, which includes the future related users, such as potential customer groups, medical interns, and so on. The general Relationship Hierarchical analysis is shown in figure 3.1.

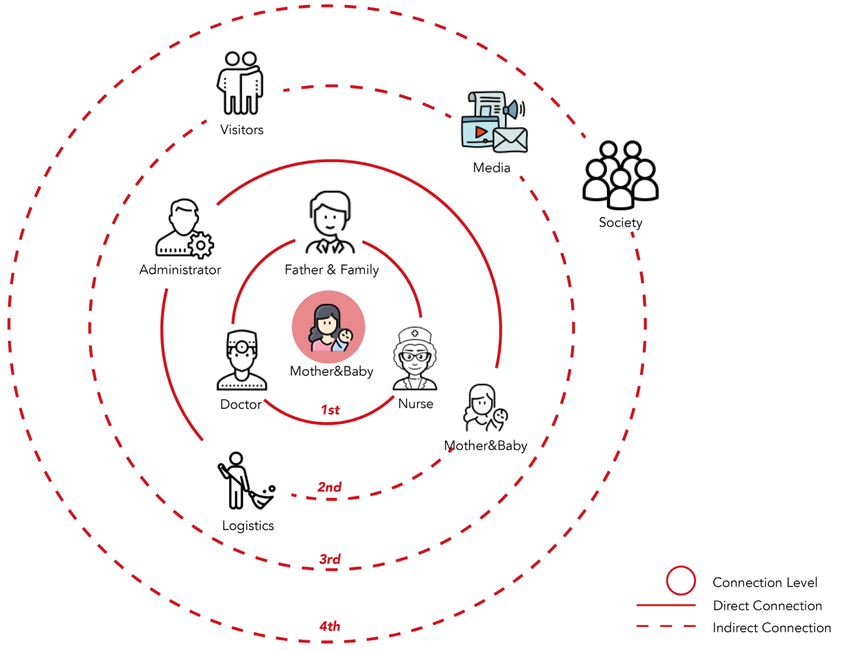


figure 3.1
General Relationship Hierarchical analysis

The mother

As the core character among users, the physical and psychological discomfort caused by the “changes” that the mother experienced in the maternity process should not be ignored. These “changes” have at least three meanings: the first one is the change of the physical environment, that is, the daily living environment is transferred from home to the hospital; the second is the change of living condition, from a state of being able to control the life by herself to a state of being cared of; the third is the change of her role in life, that is, in case of the first son or daughter, from a woman to a mother. In the face of these changes, in addition to the physical changes brought about by the process of labor, delivery and postpartum recovery, it will also cause psychological stress and anxiety. Let’s take postnatal recovery as an example. During the first week after childbirth, new mothers will be exhausted and at a loss due to hormonal changes, especially on the third day after childbirth, psychological stress and anxiety will be particularly obvious. Even in the sixth week after childbirth, they will experience a deeper level of anxiety, pressure and helplessness (Rasminsky, 2018). Then, as a designer of maternity space, when I make use of the USS solution to redefine the users, I have to take the “changes” of new mothers into consideration. The first step is to remove the mask of “patients”. They should not be treated just as “patients” by doctors and nurses, who may not even be regarded as by themselves. Instead, they come to the hospital that can also be understood as a service-oriented organization, for the purpose of obtaining a reliable and safe environment to give birth to a new family member . (Wagenaar et al., 2019).

Cross Levels Connection

As the above mentioned, doctors-nurses-family, constitute the first level. As for the pregnant women themselves, there are many connections with people on the non-first levels. Such connections play an important role in responding to psychological demands and adapting to changes in the physical environment and at the psychological and emotive level. I try to break the fixed hierarchical relationship, with pregnant women and children as the core characters, to explore the interactive connections with other people on other levels.

3.2 **Interaction between Users and corresponding space requirements**

There are at least 4 kinds of interactions between users that need to be noted and intervened by humanized design, which are (figure 3.2) :

1, Mother & Child -Father / Families

2, Mother & Child - Doctor - Nurse / Midwife

3, Mother & Child - Visitors / Friends

4, Mother & Child - Mother & Child from other families

The Interaction Line - 1, is the most important relationship for Mother & Child. As the new mother’s partner, the father, or the homo-sex partner, he or she is the most important supporter during the giant change of her life from a physical and psychological point of view. Therefore, we should consider providing the space for the partner or other important family members to accompany the mother-to-be during the period of labor, delivery and postnatal, responding to the needs of Interaction Line - 1. In addition, the ward should be designed as an extension of “Home”, providing a theoretical basis for the companion space of the partner and family members and slowing down the psychological gap of pregnant women caused by changes in the physical environment (Wagenaar et al., 2019).

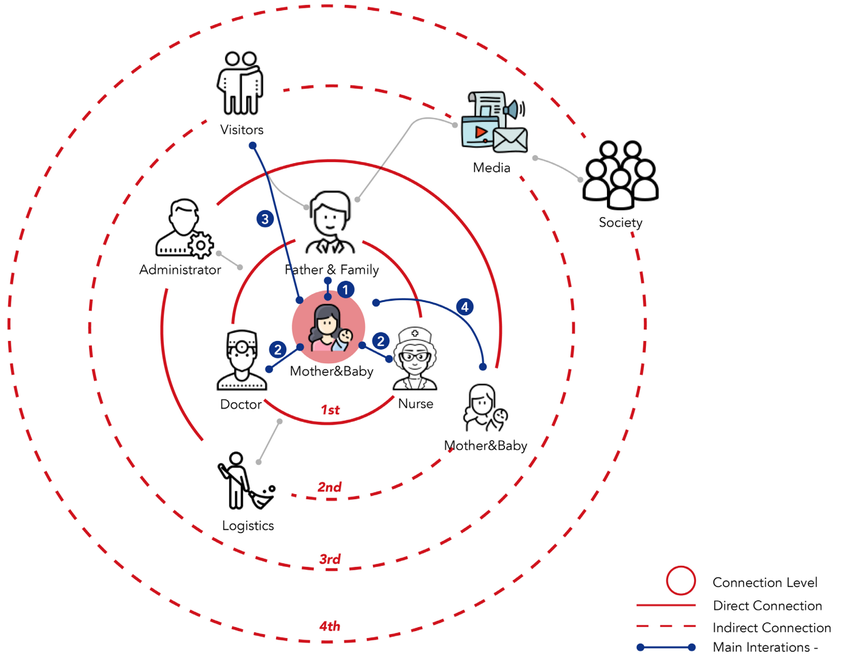


figure 3.2
Cross Level Connection

The Interaction Line - 2 is a technical interaction between the Mother & Child, Doctor and Nurse / Midwife. The interactive activities between the doctor and the pregnant women happen mostly in the labor room. In this space, the doctor, namely an Obstetrician, assists and observes the uterine dilation of the pregnant woman before her delivery and makes the decision of the next procedure (iHFG 157, 2016). Outpatient is also an important space for the technical interaction line, in the space the doctor plays a role of "Consultants", providing education, consultation and supporting services for the pregnant woman and her families during the whole process of childbirth (AHIA, 2016). In the operating room, the obstetrician carries out the cesarean section or deals with the complications of the pregnant women transferred from the delivery room; while in ICU, different kinds of facilities and equipment will be used by doctors and nurses to monitor the physical changes of newborn who are in a serious condition at any time. The midwives focus on assisting pregnant women in the delivery room, while the nurse is not only in the delivery room, but also focuses on providing nursing services for new mothers during their postpartum recovery (iHFG 157, 2016). This tripartite interactive line constructs the first-level relationship ring at the technical level, which is also a guarantee for the basic operation of the maternity department.

In the Interaction Line - 3, the possibility of a visit by a friend of the new mother should be considered. . Her social activities may gradually decrease because of the long-term staying at home during the period of pregnancy and childbirth. Meanwhile, her social image may also change, especially when she moves into the maternity department and experiences the time of labor, delivery, and postnatal recovery. In fact, as for the humanized consideration and intervention, we should pay attention to the image change that possibly occurs in pregnant women (Bighetti & Valle, 2008). Once mentioned that adolescents in need of chemotherapy can easily fall into a state of self-isolation and depression due to the image changes caused by hair loss during hospitalization. Similarly, the new mothers may also experience hair loss during the six weeks postpartum and also haggard skin and mental weakness due to the lack of sleep (Rasminsky, 2018). If the size of the ward is large enough, it is reasonable to set an area of meeting or living area inside the ward to host the visitors. In this area, visitors can enter and interact with the new mother and her newborn instead of breaking into other private spaces.

The Interaction Line - 4 describes the interactive relationship between the expectant mother and the other expectant mothers from different families but with the same purpose. Because they come from different families, the independent and family-centralized ward are the extension of their respective "Home", which means they live close door to door with the same purpose to stay in a common community - maternity department. Therefore, this kind of interaction between strangers leads to a new neighborhood intersection and story because of the common purpose. There are many opportunities or events to promote such neighborhood relationships, such as the educational causes for the process of childbirth, some leisure talks on the tables in the area of living inside the hospital. During these meetings, the new mothers and their family members are able to share and exchange their experiences and encourage each other in this special period. Therefore, as a response to the needs of Interaction Line - 4, we should consider providing sufficient public areas and reasonable transportation connections to develop the benign neighborhood relationships among the users.

Chapter 04
Strategy - Space

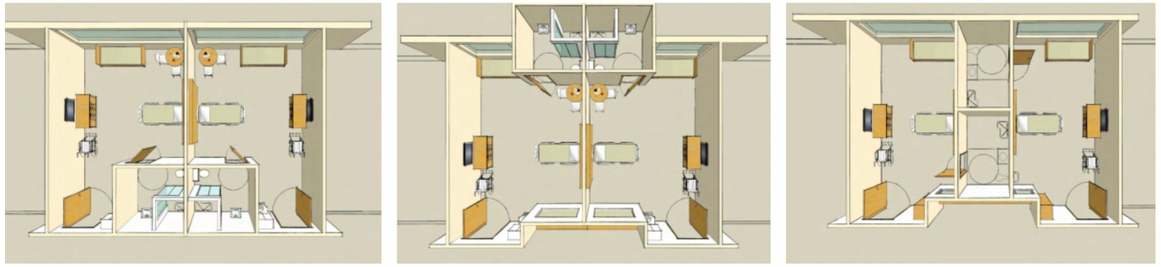
4.1 Typology Design and Growth of General Inpatient - Reduction and Redefinition

4.1.1 From Rectangle to Hexagon

Before introducing humanized interventions into the space design of marthernity, the necessary step is to use the general ward as the research object. Because the general ward is a space where the patients stay in the hospital for a period of time, which can be as short as half a day and as long as half a year. During this period, the patient will be in a passive state of life, such as being cared for, being treated, being observed and frequently dealing with doctors, nurses and other patients and their daily social status will also change due to hospitalization, which is different from daily life. The difference in living habits and emotions caused by the changes in daily life have to arouse the attention of designers. Therefore, the redesign of the ward can be used as a very practical breakthrough for the humanized design of the medical space.

In general, the form of the hospital room is in the shape of a rectangle. One of the short sides is used for natural lighting; in a better condition, a balcony can be set to connect to this side to provide a space for users to get in touch with the first line of natural landscape. The other short side is used as the entrance of the room that connects the corridors. The distribution of the bathroom affects the internal layout of the room and the connection relationship between the rooms. There are basically three types which can be identified as Type A, Type B and Type C (figure 4.1). The advantage of Type A is that it can ensure a better view to nature through the shortside, but because the bathroom occupies the other short side, the sight control of the nurse station in the corridor will be affected. Type B is the opposite of Type A, which can effectively ensure the sight control of the nurse workstation on the ward, but the view of landscape is affected. In type C, the bathrooms are used as the connecting space between the two adjacent rooms, which can simultaneously ensure the positive effects of both short sides (Del Nord and Peretti, 2011).

figure 4.1
Conventional Rectangular Ward - TYPE A,B and C
(Del Nord and Peretti, 2011)



Then, in this topic, the conventional rectangular room is not a direction that needs in-depth research, because it has developed sufficiently. By using the USS method, I tried to use the 3-steps spatial method mentioned in the previous chapter to analyze and study the new form of the inpatient room.

Step 01

The first step is to deconstruct the conventional general hospital and extract the ordinary rectangular room as an independent type space for research (figure 4.2). As shown in the figure, the overall layout is a single or double room, mainly including beds, control bars, cabinets and workstations. The specific measures are detailed in Chapter 1.2.3.

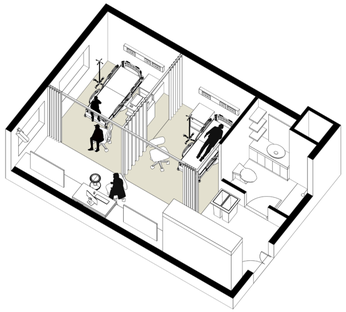


figure 4.2
Conventional Inpatient Room
(Del Nord and Peretti, 2011)

Step 02

The second step is the reduction and redefinition of the room. Firstly, we remove all the facilities and furniture from the room, returning it to an empty space without anything inside but with only a short side facing the external nature and a short side connecting with other spaces (figure 4.3). At this moment, we can think of 2 arguments about this empty space :

1. What is the essence of the room
2. What do the users appeal for when they stay in this space

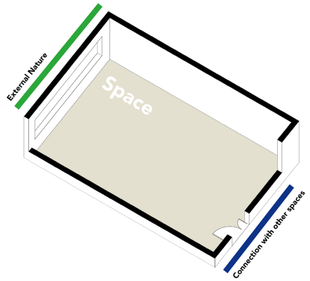


figure 4.2
Conventional Inpatient Room
(Del Nord and Peretti, 2011)

Regarding the first one, my understanding is that the essence of the ward returning to empty space is an enclosed space that can separate people from the wild, giving them a secure sense of being protected and providing an area where they can do anything under a well private condition. At this point, the hospital room is essentially a room which is not different from others in the world. In this empty space, there is no more facility or furniture inside, only windows and doors to connect the outside world, at this moment, we can let go of the stereotype of the so-called “room” ,and the psychological burden of patients entering the room, to imagine any possibility that may happen inside this empty space in the future freely (figure 4.4).

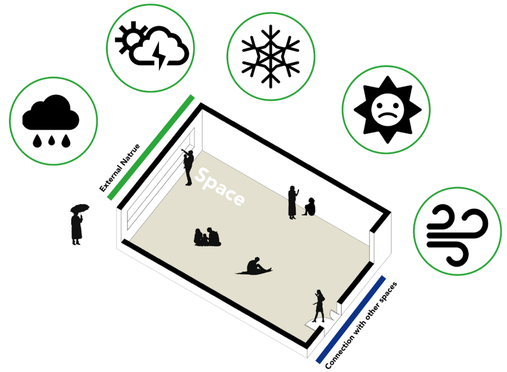


figure 4.4
Protection against the External Nature

For the second argument, the focus needs to be the users. Inevitably, the users of the ward are naturally those who need physical and mental treatment and recovery within a period of time. Since after moving into the hospital ward, the patient will experience changes of the social circle and living environment physically and psychologically, we must take these changes as an important consideration point to talk about the second argument. The first is the change in the living environment. The patient is more inclined to expect that this change is as small as possible, because in general people have a strong dependence on their long-term residence. This dependence comes from a sense of familiarity with the daily life state, which is controllable and stable, bringing them a sense of security (Dovey 1985). Therefore, patients are more inclined to continue their familiarity at home in a new and unfamiliar hospital environment. The smaller the physical environment changes, the better it is. The closer the home environment is, the better it is. Thus, the corresponding strategy is to design this blank space as another temporary “Home” or an extended area of “Home”.

In addition, patients experience changes in their social circles and living status, so that they will be in a passive state for a long time. They need to re-adjust their mentality to adapt to the relationship with doctors, nurses and other patients. This kind of change is inevitable and requires patients to adapt again. This re-adjustment of interpersonal relationships can be understood as the reconstruction of the “new neighborhood relations” of newly moved patients. The reconstruction of good interpersonal relations is naturally the appeal of any “new residents” who move in.

What’s more, based on the positioning of the extended space of “home”, users also have the desire to have easier access to natural landscapes and better natural lighting, which is a human instinct, and natural factors also have a positive effect on the therapeutic process. The environmental psychologists in their research mentioned that the environmental factors that were beneficial to early human survival were enclosed woods, nearby gurgling water, sufficient natural light, etc. (Kaplan, 1987).

After clarifying what the essential space is and taking the above appeals of patients into consideration and having corresponding countermeasures, what we should do on the next level is to introduce medical equipment quietly and redesign the space according to the technical requirements of the inpatient ward. During the process, humanized intervention will be realized (figure 4.5).

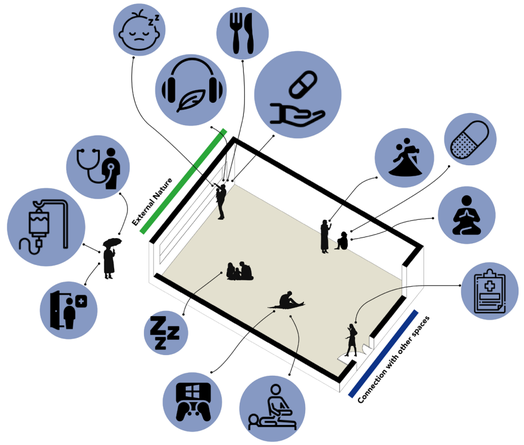


figure 4.5
Free Appeals of the Users

Step 02

The third step is deformation. After talking about the two arguments in step 02, then, when I face an empty rectangular box, the next step I will think about is how the box itself can be changed. It is possible to get rid of the conventional rectangular form. In my design, the hexagonal form is the alternative form to replace the rectangle box (figure 4.6). Because of its uniqueness, the hexagonal form has the following spatial advantages:

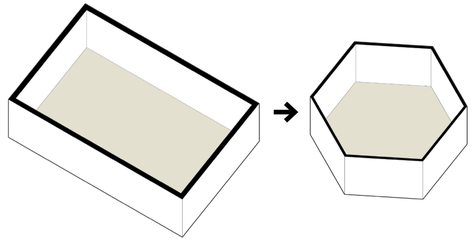


figure 4.6
From cuboid to hexagon

1. The hexagonal space can ensure that at least one surface is completely facing the outdoor natural landscape and getting the natural lighting. In some cases, it can even reach two surfaces. At the same time, it can ensure that at least one surface meets the requirements of sight control to the interior environment from the nurse station or corridor (figure 4.7);

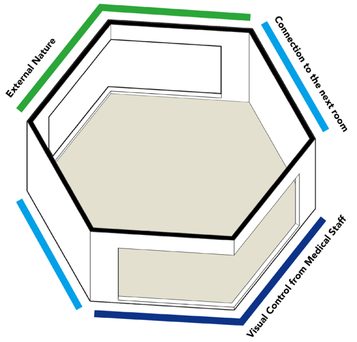


figure 4.7
Different sides of hexagons

2. The room units can be prefabricated and can be assembled and disassembled seamlessly because of its hexagonal feature, which means these units can fit together without any gaps. The number can be increased or decreased according to the actual situation without destroying the logic of the hexagonal assembly. What’s more, the seamless assembly feature allows less materials to build a larger space (figure 4.8);

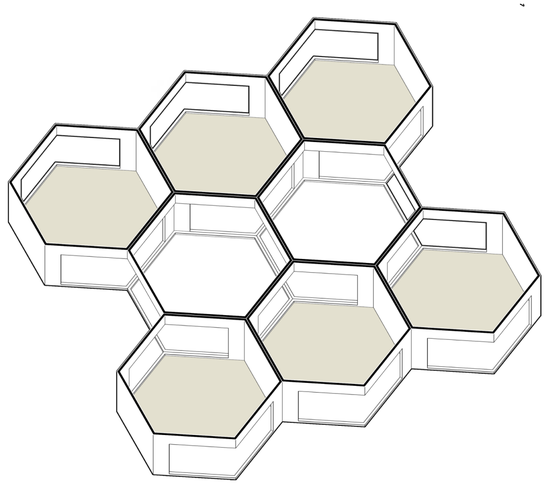


figure 4.8
Seamless stitching of hexagons

3. According to the characteristics of hexagons, the gap space between adjacent hexagons can be used as balconies, bathrooms and “soft elements”, the flexible areas for resting, greening, waiting, and semi-private communication. The gap space will not obstruct the view to the outside and natural lighting (figure 4.9);

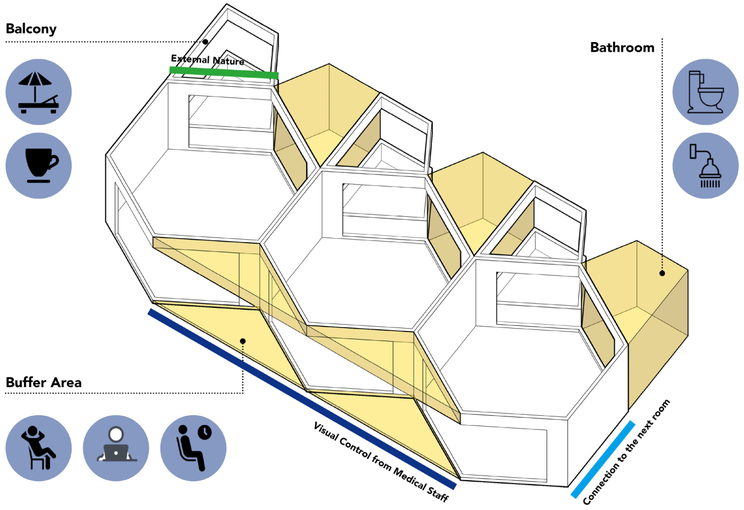


figure 4.9
Gap Space between adjacent Hexagons

4. Due to the flexibility of prefabrication, the unit space can be transformed into non-hospital room uses according to actual needs, such as aisles, medical staff workstations and public spaces;

5. Hexagonal space provides six corners in the room. People always like to stay close to the corners to gain an instinctive sense of security. For example, research has found that diners usually prefer to find tables in the corners rather than in the center of the restaurant (McAndrew , 2020). In an ideal situation, there are usually at least two beds in the room, one is a hospital bed for the patient, usually surrounded by a 1.2m wide buffer area; the other bed is offered to the family member for night-staying. In the six-corner space, there are more options for arrangement of the beds.

Admittedly, hexagons also have some disadvantages:

1. All the spatial organization and layout are limited to the hexagonal prefabricated units and the logic of assembly between the units, thus the degree of freedom is limited;

2. The prefabricated hexagonal space is not necessarily suitable for other types of medical space, especially for large areas. Therefore, the compatibility between the area of the room and other space types needs to be considered.

4.1.2 The typology design and the development of Hexagonal Rooms

Basic configuration of general hospital room

The basic configuration of a general hospital room should include a hospital bed and the control bar, workstation, storage cabinets and bathroom. Besides, in humanized design interventions, we need to consider the importance of family companionship, so a companion bed or sofa should not be ignored and in better condition, tables for study and dining and balconies should be taken into consideration (figure 4.10).

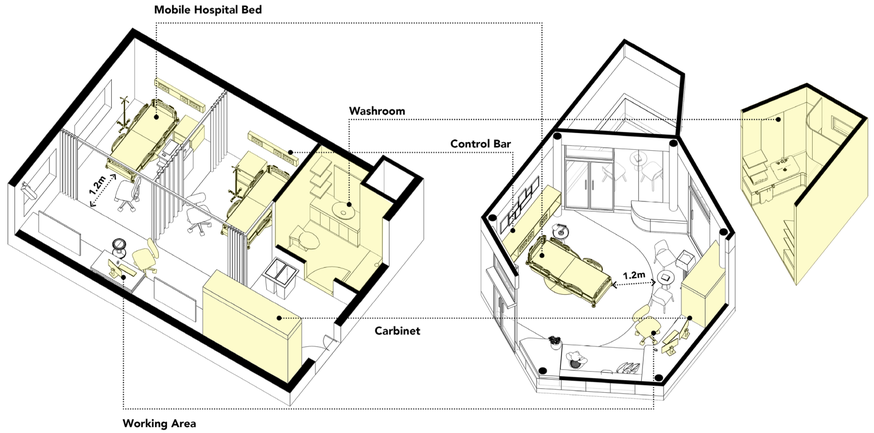


figure 4.10
Basic configuration of the ward ,from cuboid to hexagon

The extended space of “Home”

There are two ways to explain the meaning of extended space of “Home”. The first is that the decoration of the interior environment and the choices of furniture should be designed like the style of “Home”, on the premise of the assurance of basic medical facilities (figure 4.11). Second, in a deeper sense, the room is designed with the family as the unit rather than the individual patient as the unit. Like other types of medical spaces, the room design needs to consider the importance of “contextual factors”, that is, the context of “family”. Engel’s idea is that when designers consider the patient’s environment, they should not only think about the patient himself, but also keep in mind that such an individual is connected to a system, which means the interconnection between the patient and its family should not be ignored (Engel, 1977). Therefore, the room is not simply an independent room for the patient himself, but a family unit, which is the extended space of the patient’s home in the hospital.

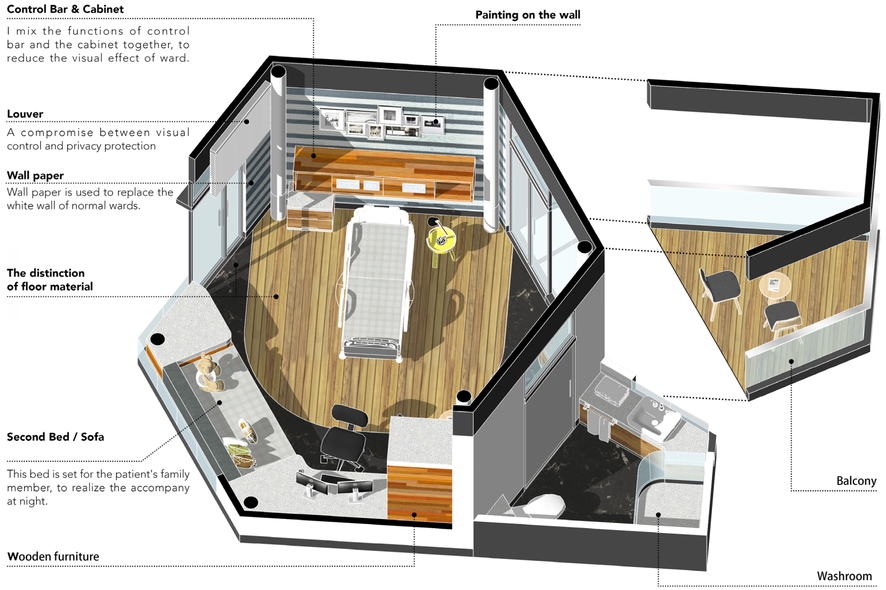


figure 4.11
How the room is designed like a “Home”

In the design, like the home, a single patient room can be divided into three main areas (figure 4.12), namely the “bedroom”, which includes the bed with 1.2m wide barrier-free area (iHFG 110, 2017); the “Living room”, an semi-public area for communicating with family members and friends; the “studio”, an area for reading the data and communicating with medical staffs (figure 4.13).

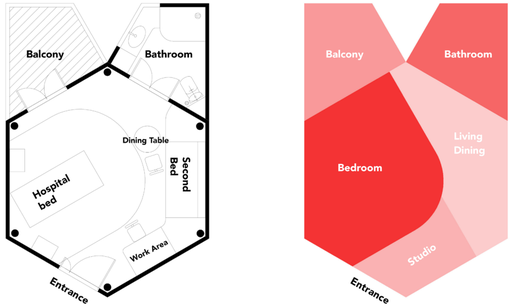


figure 4.12
Patient’s Room - Home

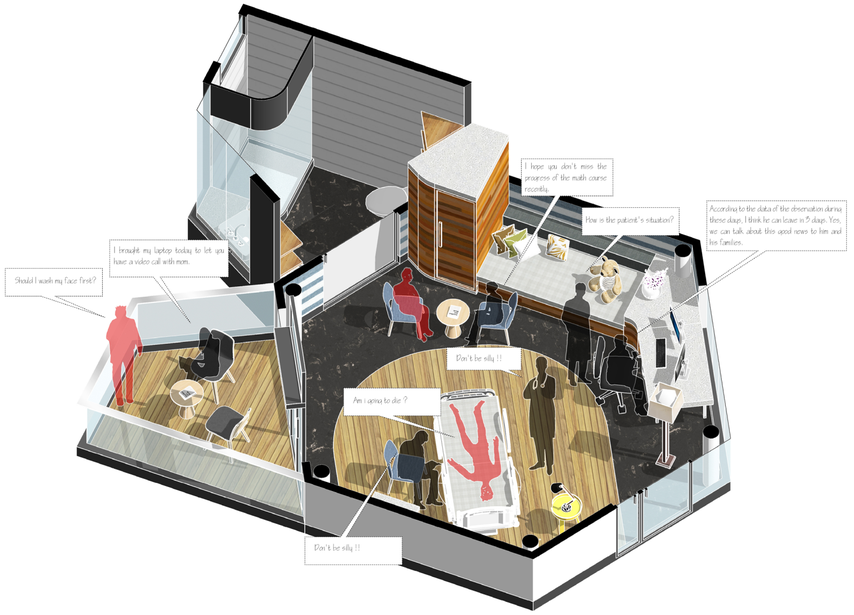


figure 4.13
Communication of Users in Different zones

The above spaces need sufficient size and environmental conditions to accommodate the activities that reflects the same level and cross-levels connections among the patient, medical staff and the family members, such as the patient having lunch with its family member together by sharing with the same dining table, the night-staying of the father sleeping on the sofa bed to accompany with his mother, the father sitting by the patient's bed to tell story to his son or daughter at night, friends sitting together for the coffee and chats on the balcony, etc.

In addition, we should also consider other sources of stress that affect patients, such as noise and odor. In view of the existence of noise, carpets can be set on the floor of the room and sound-absorbing materials can be used on the walls and ceiling; the location of the rooms should be far away from the equipment rooms with noise sources; the noise environment below 51.7db is conducive to the quality of patient's sleeping (Del Nord and Peretti, 2011). On the contrary, natural sounds have a calming effect and do good to the recovery of patients (Ulrich, 2004). Therefore, the room can be introduced with controllable equipment that simulates natural sounds like running water, rain, chirping of birds and insects. Regarding the odor, the medical space including the room is always filled with the smell of disinfectant and chemicals, which has a negative effect on the patient's physical and psychological recovery (Liang, 2018).

There should be at least two ways to solve the odor problem. The first is to make use of natural or mechanical ventilation. It should be noted here that the exchange airflow between doors and windows should not directly face the bedridden patient (Del Nord and Peretti, 2011). The second is to use alternative odor, such as natural and fresh aromatherapy such as wood lacquer, fragrant grass, etc.

There is another interpretation to realize the humanized intervention on the design of rooms. In professor Liang's research, he proposed some constructive suggestions in the aspect of 4 categories that he divided from the patients' perspective, which are vision, auditory, olfactory and tactile (Liang, 2018) (table 4.1).

table 4.1
Perceived space comfort strategy (Liang, 2018)

Perceived space comfort strategy	
Visual comfort	Avoid white element, consider system of warm and cold color according to specific design circumstance.
Auditory comfort	Reduce the associated noise, while playing light, comfortable music according to the environment.
Olfactory comfort	Reduce the smell of disinfectants and chemicals, and plant plants to enhance the hospital aroma.
Tactile comfort	Give the object to be touched with warm personality characteristics, enhance the patient's tactile experience.

Inpatient Types

On the premise of meeting the technical requirements, according to the difference of bedside layouts, directions of visual control and the combination forms, I designed five types of single rooms that can be assembled (figure 4.14).

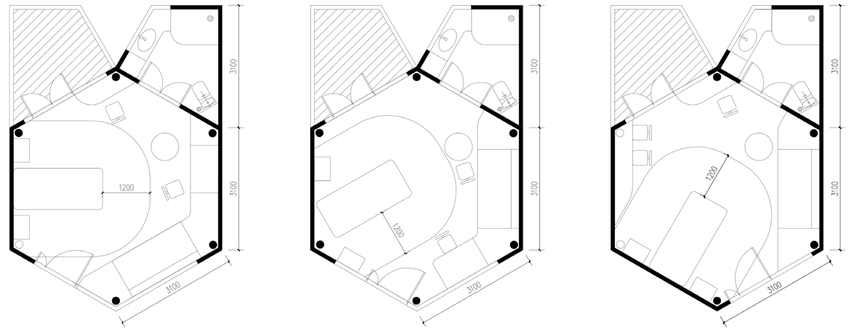
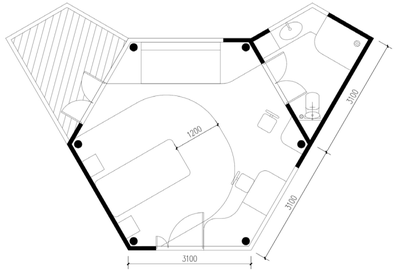
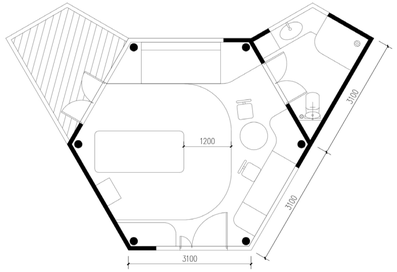


figure 4.14-1
Single Inpatient Rooms - Type A



B- 1



B- 2

figure 4.14-2
Single Inpatient Rooms - TypeB

Multi-person room design

Considering the differentiated consumption of patients, the design of multi-person rooms is obviously more economical. In the concept of humanization, the questions we face are how to ensure the relative privacy of patients in multiple inpatient rooms and if there is enough space to accommodate the patient's family members.

On the premise that the structure remains unchanged, the original hexagonal single room can be expanded into a larger pentagon form and this way of expansion has no effect on the corridor (figure 4.15). The pentagonal form of space is large enough to accommodate two hospital beds with barrier-free buffer areas of 1.2m width. This solution is to ensure that two patients can be accommodated in an upgraded single room, but it is difficult to accommodate the patient's family members, which is actually similar to the conventional double room layout (figure 4.16).

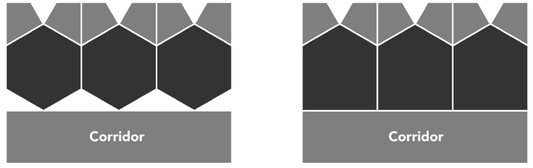
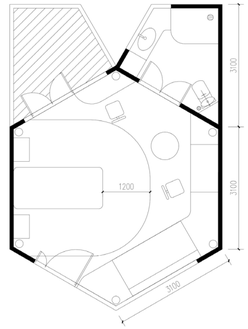
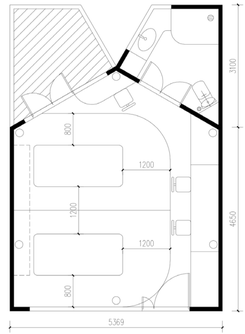


figure 4.15
From hexagon to pentagon



A - 1



A - 4

figure 4.16
From Single ward to Double ward

So, how to make a more humane design?

To make a more humanized design one answer is the use of "Tent", which means a circle that expands from the hospital bed as the centre point. This circle is a private space for the patient and should also accommodate a movable folding bed for one family member. One "Tent" represents one family unit. There are 3 tents to be positioned in the same space which is a combination of two hexagonal rooms, making it feasible that the relatively private space and family companionship could happen in a multi-person room. The practice has proved that the combined space can accommodate 3 tents (figure 4.17). An obvious feature of this design method is that the tent and the ground are two independent systems (figure 4.18). On the one hand, the tent is in a suspended form, and its covering is a stretchable curtain. On the other hand, the ground is divided into different kinds of functional zones and the 1.2m width barrier-free buffer zones of each hospital bed have been included. Since the tent is suspended and movable, the two are independent one from the other. In this case, the tent can also be understood as the "bedroom" where the patient lives with the family member. Outside the tent there is a semi-public area, that is, the "living room", which serves as a place for communication between patients and family members (figure 4.19).

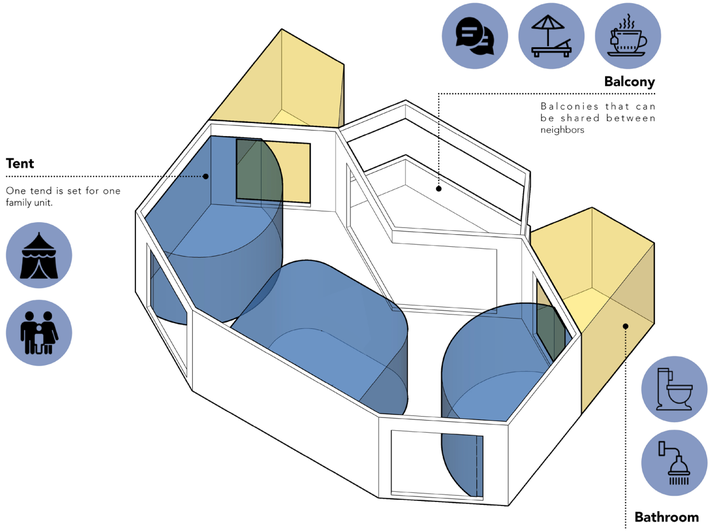


figure 4.17
Tent - Family unit

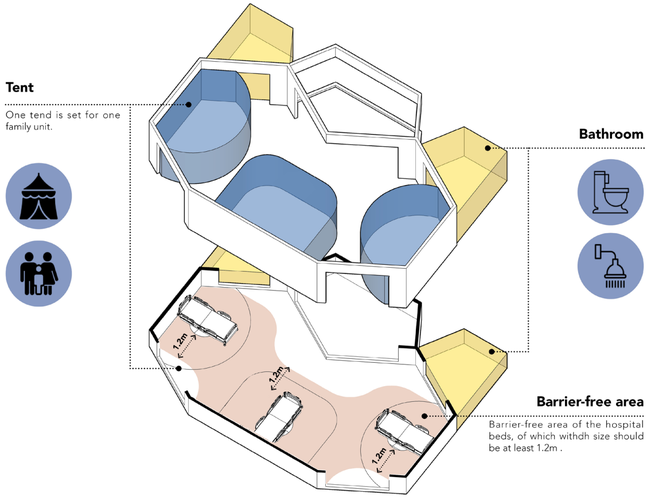


figure 4.18
Two independent systems

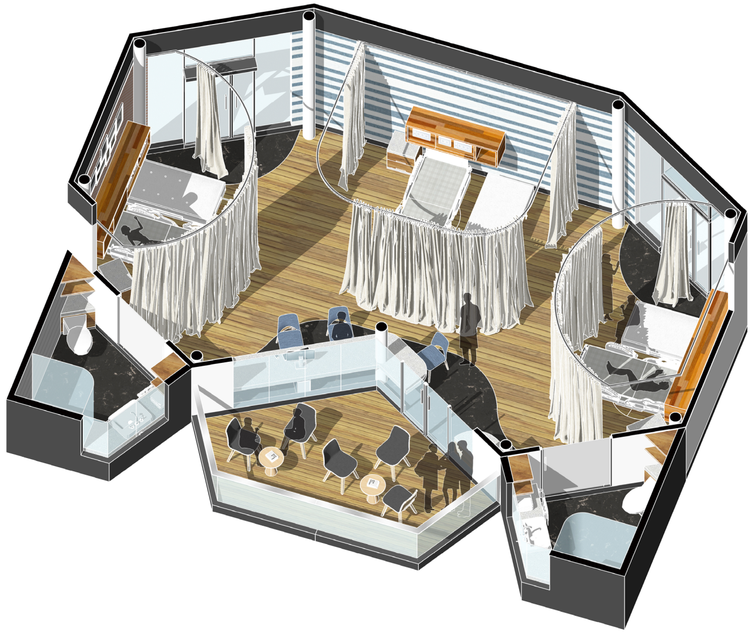


figure 4.19
Multi-person general room

Configuration of the inpatient department

In the inpatient department, in addition to single and multiple rooms, other functional areas are needed to support the operation of the whole department, which are listed as follows (iHFG 110, 2017):

1. The reception area, which is usually located at the node or entrance.

2. Support areas, such as the pantry, hand washing basin, cleaning room, storage room for clean and dirt, equipment storage room, etc.

3. Staff room, including administrative office, handover, resting, locker and gowing, etc.

4. Shared spaces, such as public toilets, living areas, gyms, public kitchens, etc.

The combination and growth of fabricated hexagonal spaces

The rooms and other functional areas constitute a complete inpatient department through a reasonable organization. In order to achieve this feasibility, let us start with a single cell and focus on the growth process from a single cell to the entire complex organization. The growth steps are as follows:

Step 1.1, according to the characteristics of the hexagonal room, the room forms a primary ring, the central part is the public area and one of the hexagonal cells connects the center and external as the entrance (figure 4.20).

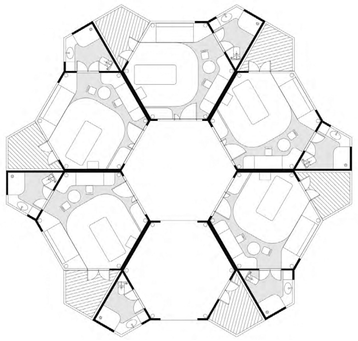
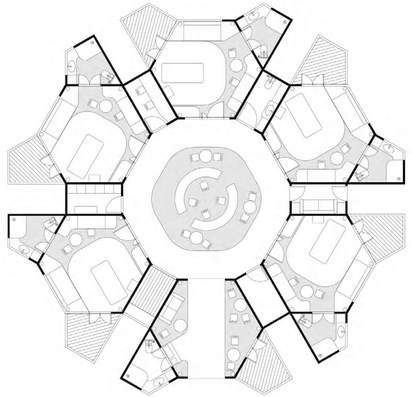


figure 4.20 Step 1.1

Step 1.2, the primary ring is upgraded. During this process, I design a rectangle unit with different kinds of functions, namely the “supporting space”, to be inserted between the adjacent hexagonal cells.

Therefore, besides some supporting rooms that are collectively distributed, these supporting rectangle spaces between the hexagonal units, can be connective elements to form an expanded ring (figure 4.21). The exact function of the supporting space should be depended on the actual demand of the inpatient department, which includes hand-washing basin area, toilet, office, handover, gowing and locker, resting, balcony, public kitchen, storage of equipment, storage of cleaning, storage of dirt, etc (figure 4.22). After the enlargement of the ring, the central area will also be expanded, accommodating a working station for doctors and nurses and the circular corridor with a width of at least 1.5 meter. This kind of working station with a centralized position helps to strengthen the quality and duration of medical staffs’ visual control over all the departments (Morelli, 2007).

figure 4.21 Step 1.2



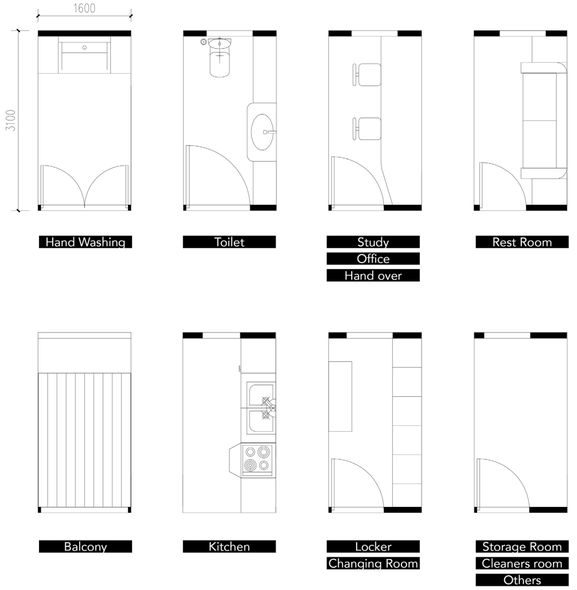


figure 4.22
The functions of the supporting spaces

Step 1.3, since a nurse workstation is able to serve 6-14 beds (Morelli, 2007), the upgraded ring of step 1.2 can be elongated and expanded to form a double corridor layout. The part between the double corridors can be set up with auxiliary function areas. Two rings are positioned at the head parts of the layout, one of which is set with a working station, while the other can be the public area, such as the living area (figure 4.23).

At the same time, the head part is divided into two rings. One end is the center of the nurse workstation, and the other end is the public area, such as the living area.

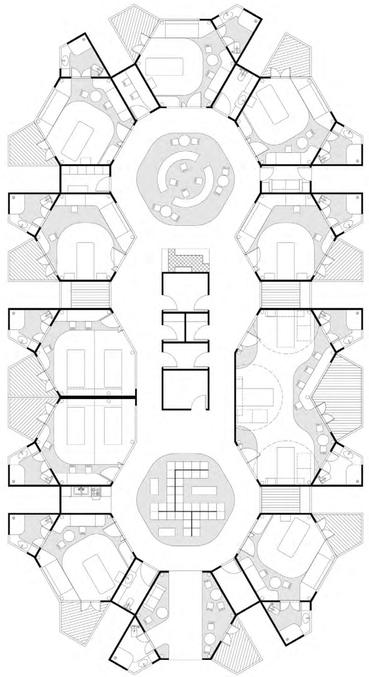


figure 4.23 Step 1.3

Step 1.4, the long strip layout is further elongated, forming a pattern with nurse workstations at the two ends, which manage 16-14 beds respectively (figure 4.24). The distance between two working stations is 38.6 meters, which means the nurses only need approximately 30 seconds to walk from the working station to the middle part of the layout (TranSafety, 1997).

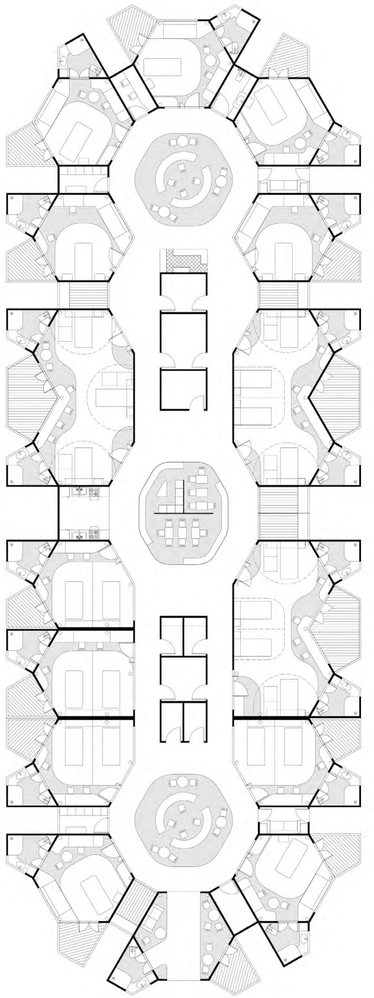


figure 4.23 Step 1.4

Step 2.1, the upgraded version of step 1.2 constructs a triangular relationship and a core tube is set in the central part used as the vertical transportation connecting to the other floors , growing up to become a primary complex of the inpatient department (figure 4.25). Due to the limitation of the length of wings and the scale of the tube, the number of floors is limited to 2. During a pandemic, this type of layout can be used as temporary medical tents to be assembled in an opening ground or inside a large exhibition hall.

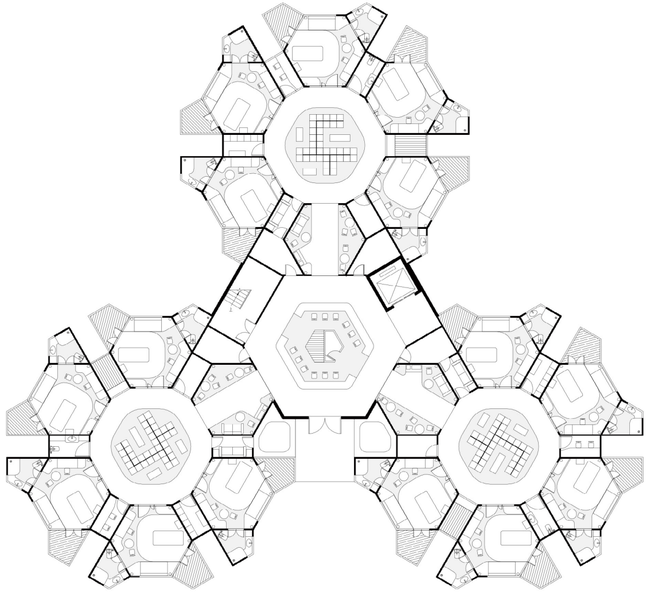


figure 4.25 Step 2.1

Step 2.2, in this step there is an extended version based on the triangle form on step 1.2, by using the wing of step 1.3, that is, on the premise that each nurse station can be responsible for 6-14 beds (figure 4.26).

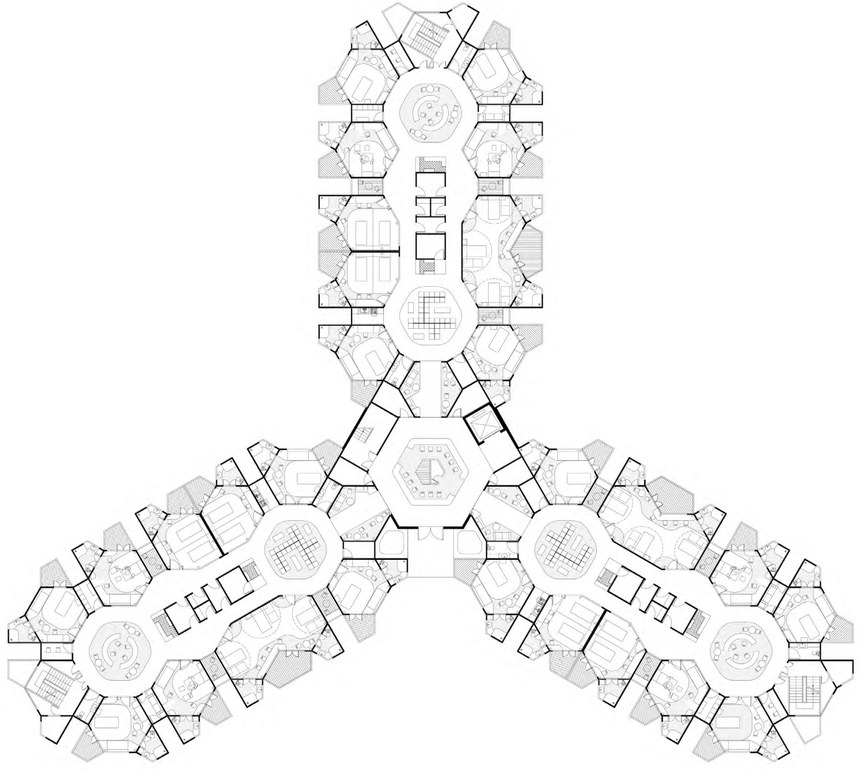


figure 4.26 Step 2.2

Step 2.3, at this stage, the triangle form is further extended, by using the longer wing of step 1.4, to develop into a larger complex of inpatients (figure 4.27). At this time, the number of building floors is no longer limited to 2, so there are higher requirements for the core tube to develop the inpatient department to high-rise buildings.

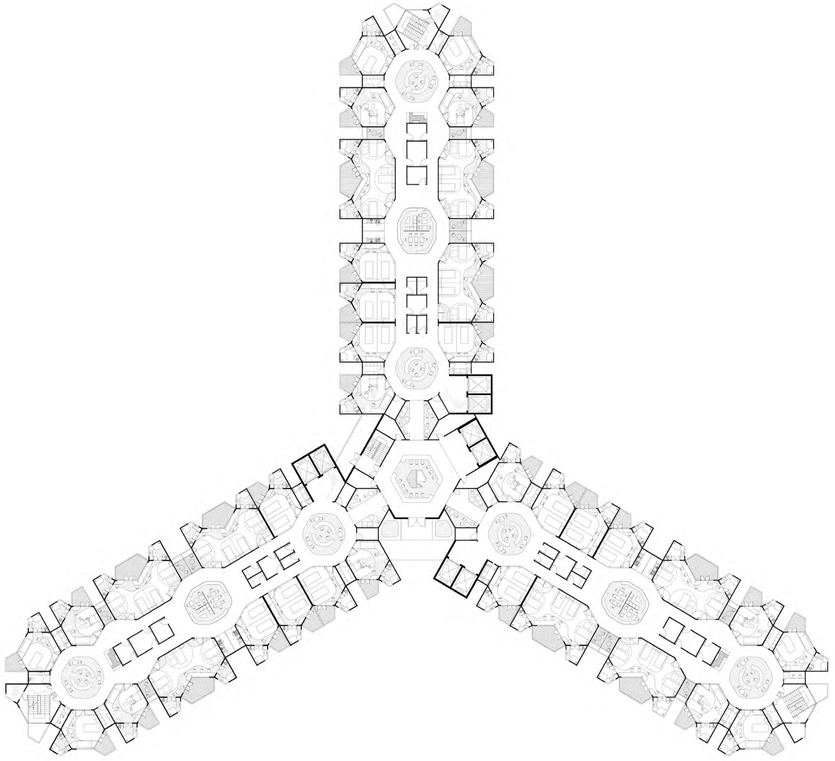


figure 4.27 Step 2.3

Step 2.4, regarding the problem mentioned on the last step, it is necessary to upgrade the core tube to meet the needs of increasing wards and floors (figure 4.28).

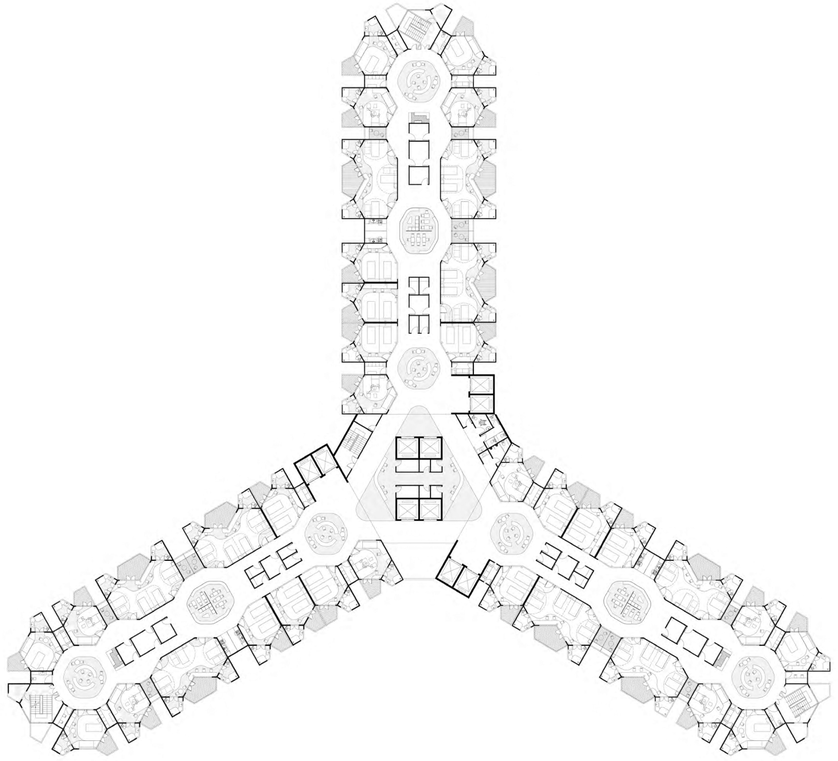


figure 4.28 Step 2.4

Step 3.1, Different from the form development mentioned on step 2, this is another type of combination, that is , two additional branches will grow up on the head of each wing to develop more wards (figure 4.29).

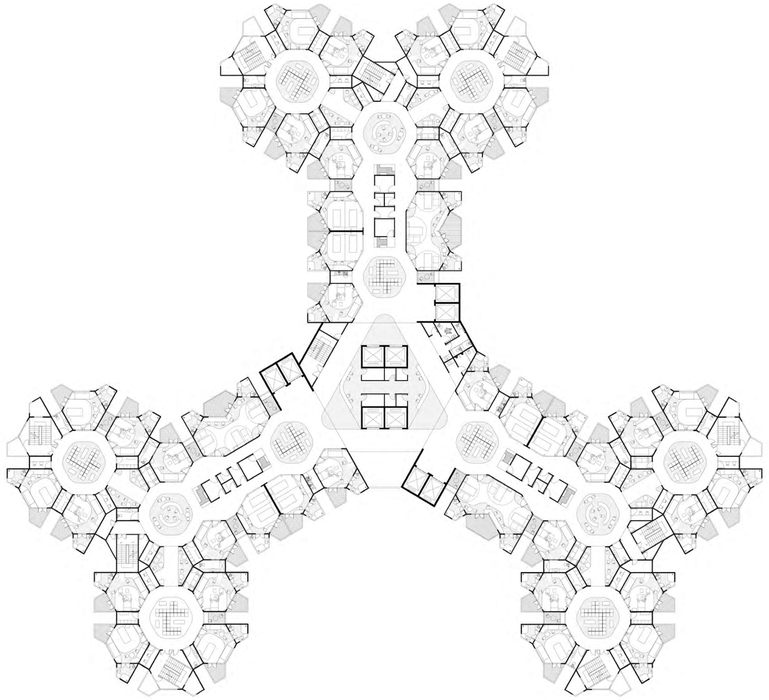


figure 4.29 Step 3.1

Step 3.2, the branches on the head will be expanded and elongated to be used as other independent departments. At this stage, the inpatient department has been developed into a multi-function complex from a simple ring of step 1 (figure 4.30).

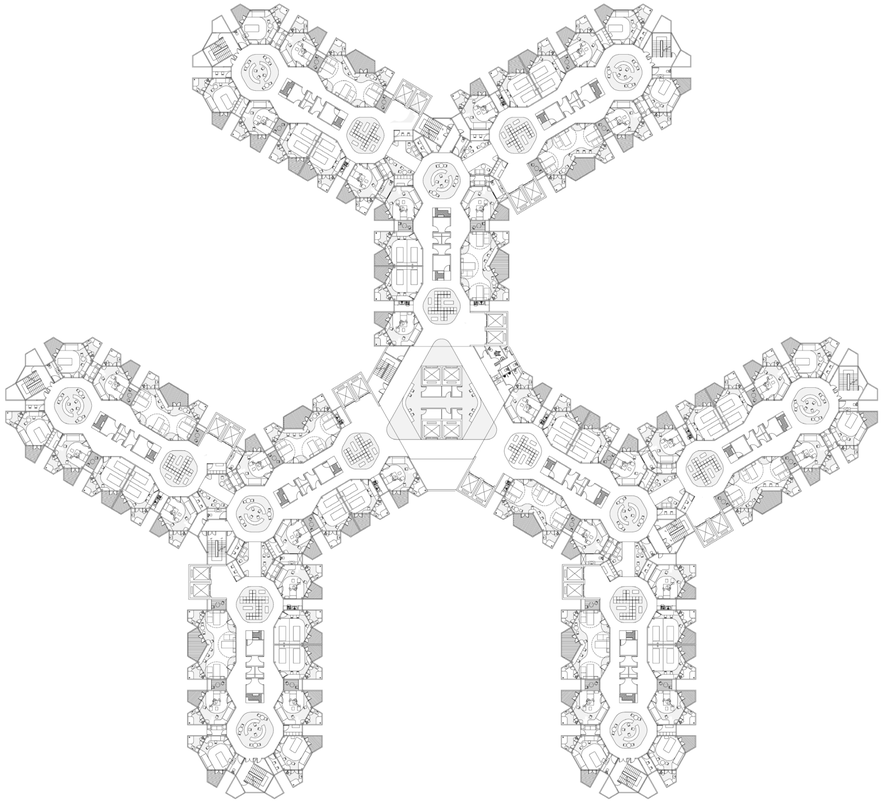


figure 4.30 Step 3.2

4.2 **Design of Maternity Ward Upgrade on Hexagonal General Inpatient**

Typology Design of Function Room of Maternity Department

The design of Maternity is the key research object in the field of humanized intervention of medical space. During this process, the function rooms of the maternity department will be upgraded and transformed from the hexagonal general inpatient rooms, with the introduction of specific facilities for obstetrics and gynecology. In addition, the upgrading process in this chapter is to verify the feasibility and compatibility of hexagonal cells for obstetrics and gynecology.

Before the design of the function rooms, it is necessary to sort out the basic process of a woman giving birth to a child. Vaginal delivery is the most common delivery method (Memon & Handa, 2013), which generally includes 4 stages. The first stage is the labor period, which is divided into 2 parts, the first part is the latent stage and the second part is the active one; the second stage is delivery of newborn; the third one is placental delivery; the fourth stage is postnatal recovery (Labor and birth | womenshealth.gov, 2010). The specific functional rooms of the maternity department often include the following categories (Labor and birth | womenshealth.gov, 2010): 1. Labor room; 2.Delivery room; 3. Operating room; 4. Postnatal recovery room; 5. SRM room, namely a single room for the whole process of maternity (Wagenaar et al., 2019) ; 6. Other functional rooms. According to the information from the U.S. Department of Health & Human Services, among these rooms, the active phase of the first stage will be carried out in the labor room, the second and third stages will be carried out in the delivery room or operating room; the fourth stage will start in the inpatient room. In addition to vaginal delivery, there is a caesarean section as an alternative solution to giving birth a child, which is performed in the operating room and requires a longer postnatal recovery time (Labor and birth | womenshealth.gov, 2010). The brief relationship between maternity stages and the corresponding spatial area is shown in figure 4.31.

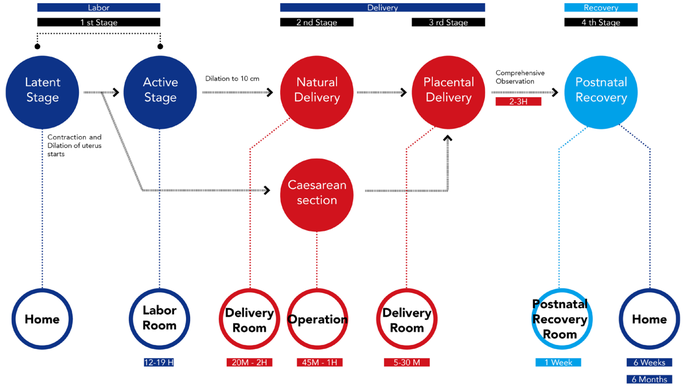


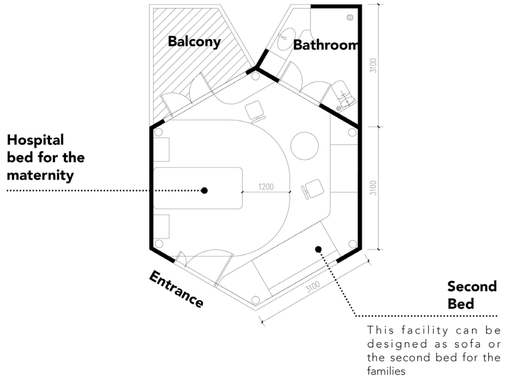
figure 4.31
General Process of Maternity
(Labor and birth | womenshealth.gov, 2010)

figure 4.32 Labor room

Labor

Before giving birth, pregnant women will go through the latency period and the active period of the first stage of labor. During the latent period, most pregnant women stay at home. In order to adapt to the active period, they can take appropriate walks and other relaxing activities (Labor and birth | womenshealth.gov, 2010). During this period, the uterus begins to expand and irregular contractions occur until the opening of the uterus exceeds 6 cm (Brusie, 2020). When pregnant women enter the active period, they will be transported to labor rooms or in the inpatient room of the hospital to have prenatal preparation.

Pregnant women usually spend 12 to 19 hours in the first stage of labor (Labor and birth | womenshealth.gov, 2010). Therefore, considering the possibility that some pregnant women move to the hospital from the latent period, the configuration of the labor room is basically similar to that of an general room (figure 4.32), that is, a hospital bed for the pregnant women, the storage cabinet for delivery packages , cabinet for clothes, and a bed or sofa for the family member, for this reason in many cases they can stay directly in the inpatient room waiting for the moment of the delivery.



This long period of labor is tough for pregnant women. On the one hand, the body suffers from the pain, nausea and vomiting caused by frequent contractions (Birth | Encyclopedia.com, 2018). On the other hand, the psychological stress and anxiety caused by the unknown feeling of the outcome should not be ignored. Therefore, in addition to designing the inpatient room or the labor room as the extension of “Home”, we also need to pay attention to the communication activities between users and the impact on the core role - the pregnant woman. For example, family members, especially the partner of the pregnant woman, always accompany her throughout the tough period of frequent contractions and uterine dilation. Doctors and nurses, as reliable professionals, will come in regularly to check the prenatal process, assist in the dilation,

reduce the physical pain of pregnant women through a combination of drugs and non-drugs (Bryant and Borders, 2019) and predict the next decision making (Labor and birth | womenshealth.gov, 2010). In addition, according to the recommendations of the American College of Obstetricians and Gynecologists (ACOG), Daula, as a non-medical professional, provides one-on-one emotional support and relaxation guidance activities for pregnant women, which has a positive effect on the results of pregnant women's delivery and their mental health (Bryant and Borders, 2019).

Delivery

When a pregnant woman's uterine orifice dilates to 10 cm, the uterine contraction will slow down to about three to five minutes interval (Birth | Encyclopedia.com, 2018), and then the fetus is ready to be born and the second stage of labor begins.

During the child's delivery the midwife provides the guidance and massage assistance to the pregnant woman. Doctors will carry out delivery interventions when necessary. The role of the family is to hold the pregnant woman's hand, always accompany her by the bedside, and provide psychological encouragement and support.

Therefore, as a response to the above situation, for the design of the delivery room, we must first reserve enough barrier-free space around the hospital bed to ensure the placement of delivery equipment and the operation space for medical staff. Because the entire delivery process generally lasts no more than 2 hours, there is no need to set up a bed for pregnant women's partners or other family members for the night stays. In addition, unlike the labor room, the delivery room should clarify the distinction between cleansing and dirt due to the dirt from childbirth. It is necessary to set up a special outlet to connect with an independent dirt channel. At the same time, all personnel need to go through a buffer space for cleaning their hands, changing clothes and shoes before entering the delivery room (figure 4.33).

On the non-technical level, the extension of "Home" design is a key intervention to the interior of the delivery room, and as what I suggested in 4.1.2 on the design of general rooms, more humanized interventions should be carried out from the sense of smell and hearing to alleviate the psychological burden of pregnant women during childbirth. For example, setting up aromatherapy to replace the smell of disinfectant; playing relaxed and lively music, such as jazz music or simulating natural sounds, which is good for pregnant women, and reduces the work pressure of medical staff at the same time .

Similar with the labor room, the delivery room is usually separated from the postnatal recovery area to ensure a quieter environment that is conducive to prenatal activities (iHFG 157, 2016).

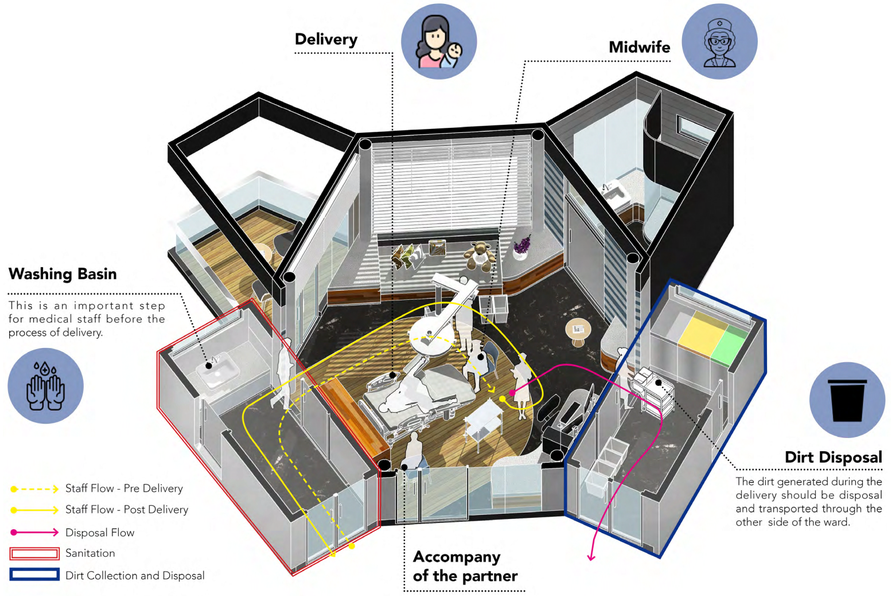


figure 4.33 Delivery room

Operating

Caesarean section is generally performed in the operating room of the maternity department. With the advancement of medical technology in terms of safety, more and more people choose cesarean section to avoid physical pain caused by vaginal delivery. For example, up to one-third of women choose to have a C-section (Hamilton et al., 2013).

There are two main occasions that pregnant women appear in the operating room. The first is because of a planned caesarean section, which means that pregnant women who do not want to have a vaginal delivery can make an appointment with the medical staff in advance to have the caesarean section service. In this case, the pregnant woman can stay at home during the latent period of the first stage of labor, then go to the hospital to prepare for the operation to start their second stage.

The second occasion is because of unplanned caesarean section, which is divided into two possibilities, namely the stagnation of delivery during the active phase of the first stage of labor and the one during the second stage, the delivery process (Caughey, Cahill, Guise and Rouse, 2014).

We still need to consider questions from the perspective of the central role - the pregnant woman, what difficulties she will face in this space, and then make a response by designing. In the process of a caesarean section, thanks to the application of local anesthesia or general anesthesia, the mother can avoid physical pain during the operation. Between these two solutions, the local anesthesia is a better choice, which can ensure that the mother can witness the birth of her own child in a state of being awake and pain-free (Hawkins et al., 1997). Therefore, the new mother will face less physical pain, but more psychological stress, anxiety and expectation during the C-section. Similar to or even stronger than the mentality of the first stage of labor, when facing the ongoing major events in her life, the woman has a stronger design that the important partner should stay around her for the accompaniment and support through this tough period. It is necessary to mention that family-centered caesarean section is an effective way to respond to maternal emotions and promote good results. In 2008, there was a study called “Natural Caesarean Section”. This study emphasized the intervention of more natural elements in the cold operating room, such as low light or even natural light and keeping the operating room away from mechanical noise sources, etc (Smith, Plaat and Fisk, 2008). In addition, based on the family-centered concept, the partner is allowed to accompany the woman on the bedside and observe the entire birth process and the location of the newborn should be within the reach of the mother (Lavigne et al., 2015).

The design strategies that respond to the requirements of the users and activities mentioned above in the operating room are listed as below:

1. Sufficient barrier-free buffer zone around the bed should satisfy the placement of delivery equipment and the normal operation of medical staff;

2. Consideration of mobile furniture that allow family members, especially the partner to stay and accompany the parturient;

3. Adopt of natural light or low light;

4. Sound management, the location of the operating room should be far away from the noise source, and replaced by applications that simulate natural sounds or light music, jazz, etc.;

5. Extension of “Home”;

6. Clean and dirty diversion, requiring special an outlet to contact with the external independent dirt channel, all the personnels need to enter the sterilized buffer space for hand cleaning, changing clothes and shoes to enter the operating room;

7. Considering that the whole process of the caesarean section lasts from 45 minutes to one hour, there is no need to set the sofa beds and other non-essential furniture for the family member to stay overnight. The design of the operation space is shown in the figure (figure 4.34).

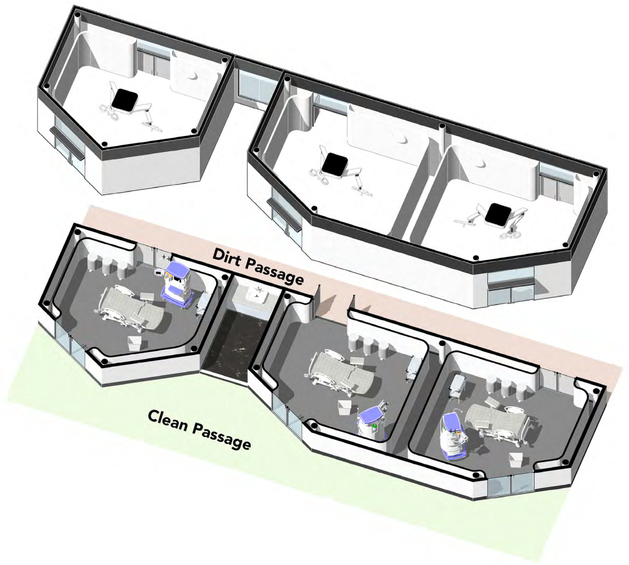


figure 4.34 Operation

Postnatal Recovery Room

After the completion of the second and third stages, that is, the time when the baby is born from the mother and the placenta has been discharged, the fourth stage is immediately followed. There will be a comprehensive observation lasting 2 to 3 hours after delivery (Davis, 2021). When it is confirmed that the mother and the child are in a safe state, they will be transferred to the postnatal recovery room, which is also regarded as the inpatient room for the next stage. The postnatal recovery period refers to the six weeks after delivery (Rasminsky, 2018), and some studies have shown that it can even be extended to six months (Romano et al., 2010). If the woman and the baby don’t have any health problems, they need to stay in the hospital just a few days, which is not exceeding one week after the delivery, then they can go home. The timeline of postnatal recovery is shown as in figure 4.35 (Rasminsky, 2018).

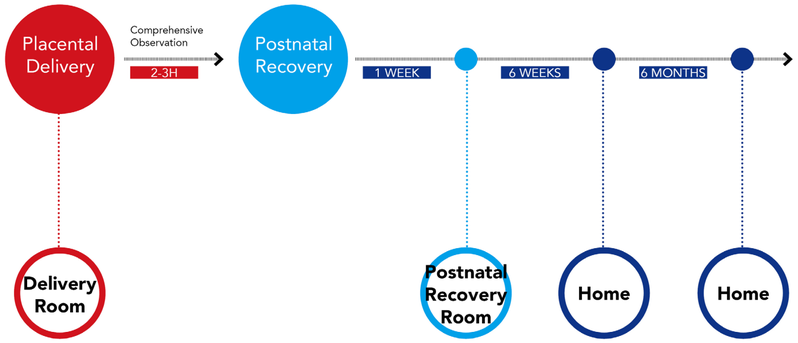


figure 4.35
Timeline of Postnatal Recovery (Rasminsky, 2018)

n response to the nodes of the timeline, the postnatal recovery rooms can be used in the 3 or 4 days after delivery as a short-term service space. In terms of space types, there are family-centric single rooms and multi-person rooms. In both situations, I have considered the combined design of the postpartum recovery area and the newborn care area. For the new mother and her family, in addition to the conditioning and recovery of the mother's own physical and mental state during the postpartum recovery period, another equally important thing is the connection with the newborn, especially the connection between mother and child. For this connection, the most direct way is to let the mother and her partner or other family member to stay in the same room with the baby and to encourage them to participate in the process of the nursing care (Wagenaar et al., 2019).

The single postnatal recovery room is an upgrade of the ordinary hexagonal single inpatient room mentioned in the previous chapter (figure 4.36). In addition to the basic facilities of the general room, a cradle with its barrier free area for the baby should be introduced (figure 4.37). The multi-person one is an upgrade from the general multi room (figure 4.38). The advantage of this solution is that it can not only ensure direct contact between mother and child, but also create an intimate and mutually supportive relationship between the neighbors even though they don't know each other before.

Whether it is a single inpatient room or a multi-person one, we cannot ignore the importance of the companionship, encouragement and support from the father or family members around the new mother and her baby in the same space during the period that she experiences physical and psychological pain and of the slow recovery. What's more, we should encourage the interaction between mother and child in the same room. Finally, the mutual help of neighbors may also lead a good story to happen, of course, provided that they don't mind living in the same room.

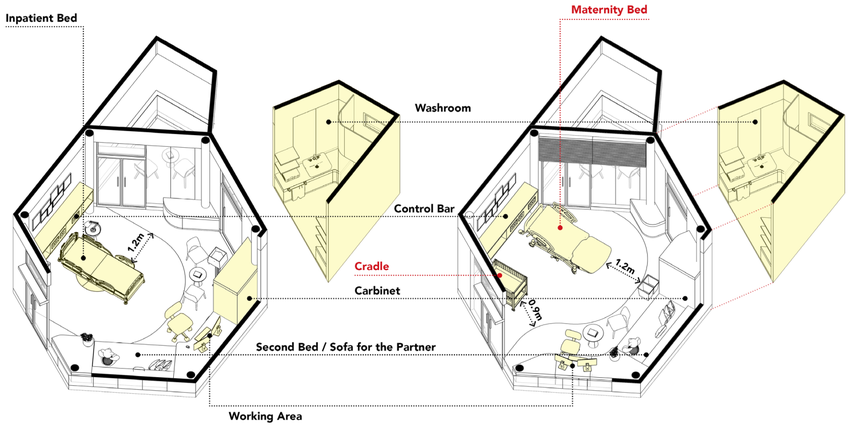


figure 4.36
Inpatient Recovery Room

figure 4.37
Inpatient Recovery Room

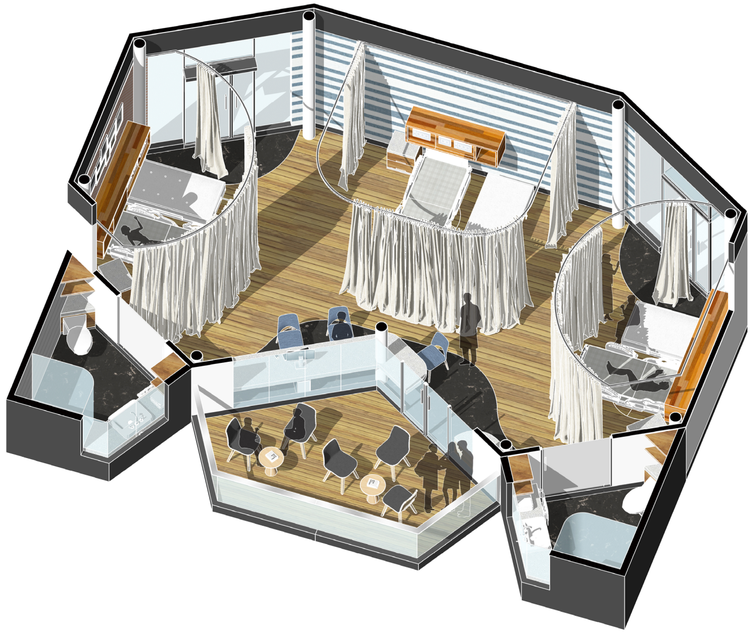


figure 4.38
Postnatal Recovery Room

Neonatal Care

In general, in addition to the new-born care area combined with the postpartum recovery room as mentioned in the previous section, the neonatal care rooms include the multi general neonatal care (MGNC) (figure 4.39), the multi special neonatal care (MSNC) and the Neonatal - ICU (NICU) (figure 4.40). For the MGNC, in order to strengthen the connection with families, this area should be set up adjacent to inpatient recovery rooms (iHFG 157, 2016). The multi-special care room (MSNC) and NICU should be set up in the same area, with a direct connection with the medical staff's area (iHFG 157, 2016). The reasonable comprehensive structure should be like this :

1 The postnatal recovery rooms (MPR) and multi general neonatal care (MGNC) should be in the same area or be combined together;

2 The postnatal recovery rooms (MPR) should be connected conveniently to multi special care room (MSNC) and NICU;

3 The multi special care room (MSNC) and NICU should be connected directly to the area of medical staff.

The comprehensive relationship among the rooms mentioned above is shown in figure 4.41.

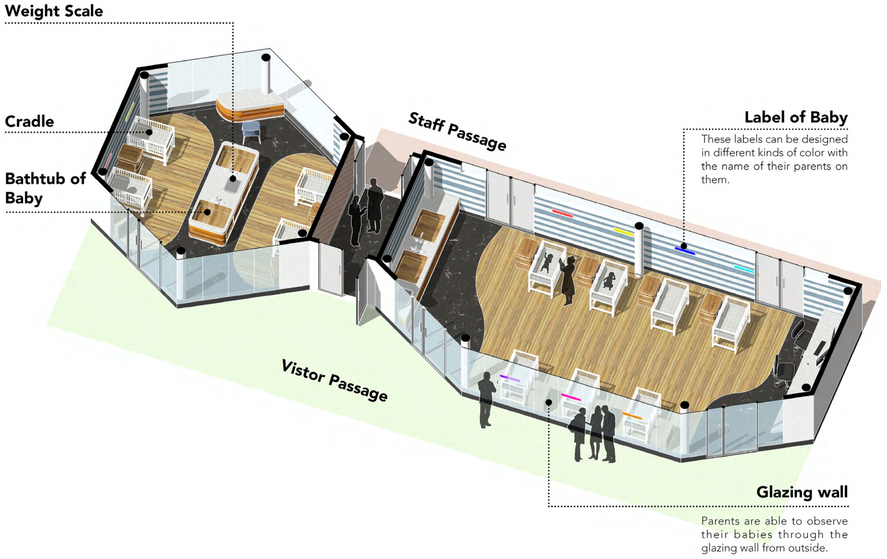


figure 4.39
General Neonatal Care

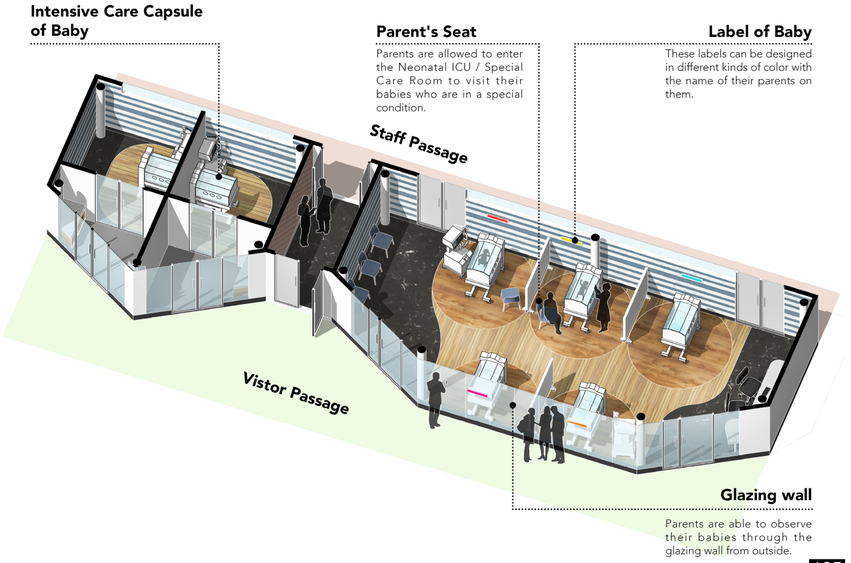


figure 4.40
Special Neonatal Care & Neonatal-ICU

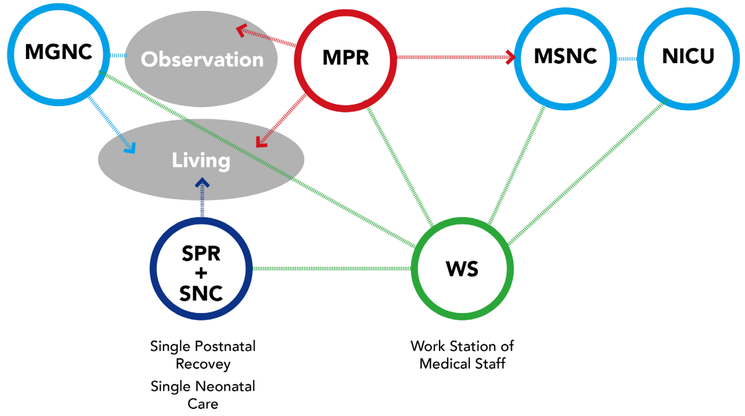


figure 4.41
General Connection among the Postnatal Recovery, Neonatal Care and Workstation

SRM

The SRM , namely Single Room, means a suite for only one pregnant woman to experience the whole process of childbirth, which is one of the solutions of humanized intervention in the medical space of maternity. Wischer proposed in his book that in the process of designing the space of obstetrics and gynecology, instead of the linear layout of each function leading to the lengthening of the space and the extension of the traffic flow, it is better to put all the functional spaces in a single space (Wischer, Riethmüller and Daschner, 2007) and this solution can reduce the times of transfers and transfers of pregnant women during delivery (Wagenaar et al., 2019)(figure 4.42) . The advantage of SRM is that it embodies the family-centered thinking and puts it into practice: let pregnant women stay in the extended area of the Home from admission to discharge with the companion of family members, avoiding interaction with other strangers during the whole process. In SRM, there is even an illusion that medical staff are coming to her home to provide the service. However, this experience does not include being sent to the operating room due to complications during delivery (Wagenaar et al., 2019). There is one disadvantage of the SRM room, that is, since each room is designed for a family unit and integrates the functions of labor, delivery, postnatal recovery and newborn caring, it may result in a larger demand area than ordinary wards and more corresponding medical facilities. This will lead to underutilization of some equipment and indirect cost waste (Wagenaar et al., 2019), which will eventually be paid by consumers. Therefore, we need to appropriately control the number of SRMs and their relationship with other shared spaces to control the cost of the hospital. The deeper reason is that we also need to consider the rationality of the existence of shared spaces, that is, the feasibility of neighborhood interaction.

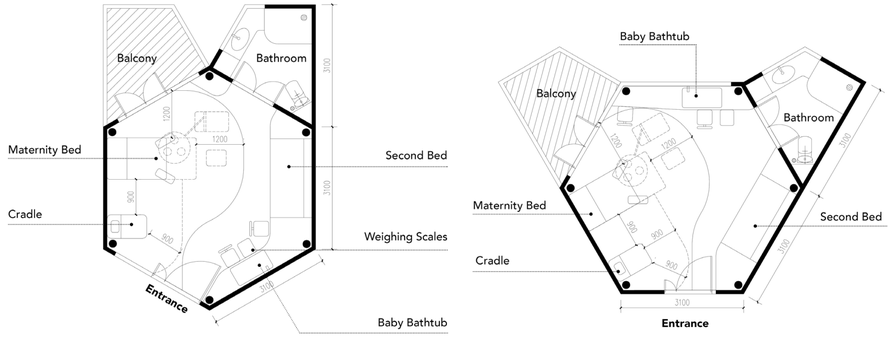


figure 4.42 SRM

Configuration of other functions in maternity department

In the maternity department, in addition to the above-mentioned specific functional spaces, there are other functional spaces to support the normal operation of the entire department, which are mainly listed as follows (iHFG 157, 2016):

1, The reception, located at the entrance of the labor, delivery and postnatal recovery or at the intersection of different areas.

2, Support, such as the pantry, hand washing basin, cleaning room, storage room for clean and dirt, equipment storage room, etc.

3, Staff room, including administrative office, handover, resting, locker and gowing, etc.

4, Shared spaces, such as public toilets, living areas, gyms, public kitchens, etc.

4.3 **Spatial organization and flow of users in Maternity Department**

During last section 4.2.2, I have expressed the design of the specific functional spaces and the corresponding possible activities that occur in it, so in this chapter, I will try to organize the above functions to make them into a complex according to the basic working flow of maternity, or in perspective of a woman who experiences a change of her life in maternity department. In this process, humanized intervention also needs to be taken into consideration.

4.3.1 Functional Distribution and Organization of Maternity Department

For a complex of the maternity department, the relationship and flow of each function in its structure can be understood from the perspectives of the pregnant women and of specific divisions and workflow.

The perspective of pregnant women

From entering the hospital to leaving, a pregnant woman goes through a basic flow like this: home - labor - delivery (may be transferred to the operating room during the period) - postnatal recovery + newborn care - home; or home - cesarean section - postnatal recovery + newborn care - home (figure 4.43). In the sequence of the pregnant woman's experience, there are corresponding specific functional spaces on each step to meet the needs of users. There are some different combinations due to different working ideas.

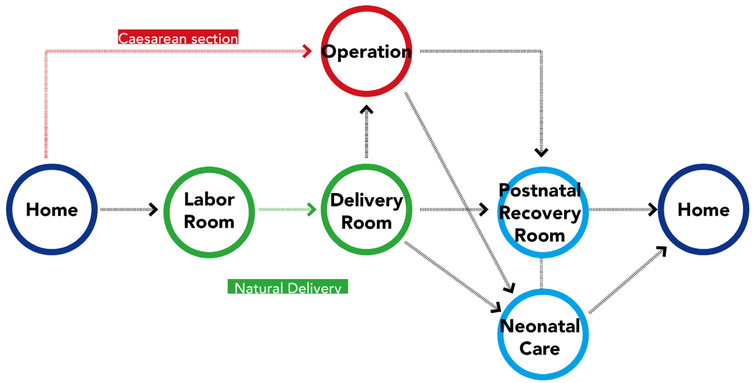
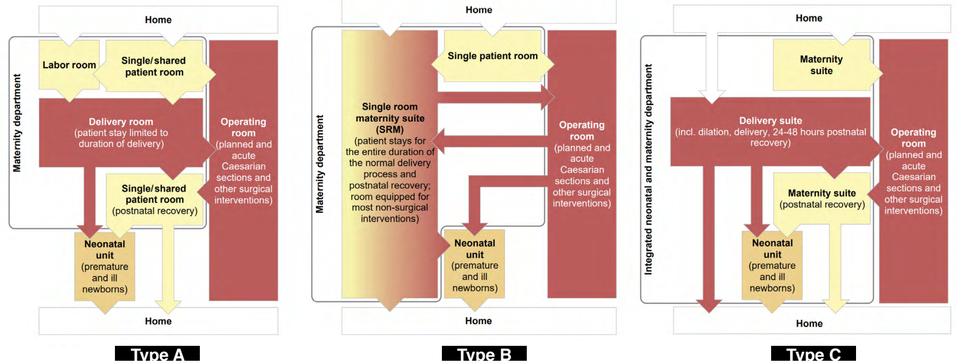


figure 4.43
Flowchart in perspective of pregnant women

Guru Manja, Colette Niemeijer and Cor Wagenaar mentioned three typical experience processes centered on pregnant women (figure 4.44), which are, Type A, a series connection of single fragmented functions; Type B, SRM-model; Type C, a compromised solution between Type A and Type B (Wagenaar et al., 2019). Under the structure of type A, each specific function space is independent and fragmented, and organized into a complex through linear connection. The advantage of this method is that it can ensure the unity of functions of each space and the specific equipment does not need to be transferred to other spaces according to different situations. But the shortcoming is also obvious, that is, pregnant women spend more time on the transfer of different functional spaces, which may bring more negative effects to pregnant women in terms of privacy and pain (Wagenaar et al., 2019). As for type B, within this framework, various fragmented functional spaces are integrated and summarized into 3 main suits, which are SRM, operating and neonatal care. Among them, SRM integrates the functions of labor, delivery and postnatal recovery, which is a multi-functional space with a family as a unit. The neonatal care suite integrates functions such as general care (MGNC), special care (MSNC) and NICU. The operating suite is used to help pregnant women who have complications during delivery or who make an appointment for a caesarean delivery. The advantage of this type is that it reflects the family-centric consideration of humanity. The disadvantage is that too many SRM settings will result in low utilization space and equipment with high budgets for corresponding costs (Wagenaar et al., 2019). The last one is type C, which combines the advantages of the first two types. In my opinion, it is based on a compromise between the A and B, that is, the limited integration of fragmental functional spaces and then reorganization. For example, the delivery suite integrates delivery and short-term postpartum recovery for clinical examination and observation and it is still separated from the postnatal recovery rooms. The key point of this method is that women have options to choose different specific spaces for their actual conditions. In this design of the spatial organization of the maternity department, I will optimize it based on type C to create a new type to Deepen the humanized design of medical space.

figure 4.44
Experience processes centered on pregnant women - TYPE A , B and C - Case study



The perspective of function divisions and workflow

In this perspective the maternity department can be divided into the following main sections: delivery, labor - postnatal recovery, newborn care and staff support. iHFG highlighted three organization types in its design manual for obstetrics and gynecology (iHFG 157, 2016). Type D (figure 4.45), the feature of this type is that the new-born nursing care is divided into two categories, one is the general new-born nursing area, which is in the same area of postnatal recovery ward; the other is special new-born nursing + NICU that directly connect with the medical staff area. Type E (figure 4.46), the difference from type D is that the newborn area is divided into general care of the general newborn and special one , and an independent NICU, which has direct contact with the adult ICU. Since there is no insertion of the general newborn care area, the general ward can be directly used as the labor-postnatal recovery ward, which has functional flexibility and provides the possibility of turning into other types of wards in the future. The disadvantage is that this approach cuts off the intimate connection between mother and child. At the same time, similar to Type D, the medical staff area has direct contact with the newborn nursing area, NICU, and adult ICU area. Type F (figure 4.47), this type combines the advantages of the first two types. Like Type E, the separation between the labor - postpartum recovery and the newborn care ensures the flexibility of the ward, but at the same time, similar to Type D, It can also directly contact the new nursing area. From this perspective, I will optimize the organization based on type F, so as to conceive a more complete and humanized spatial organization.

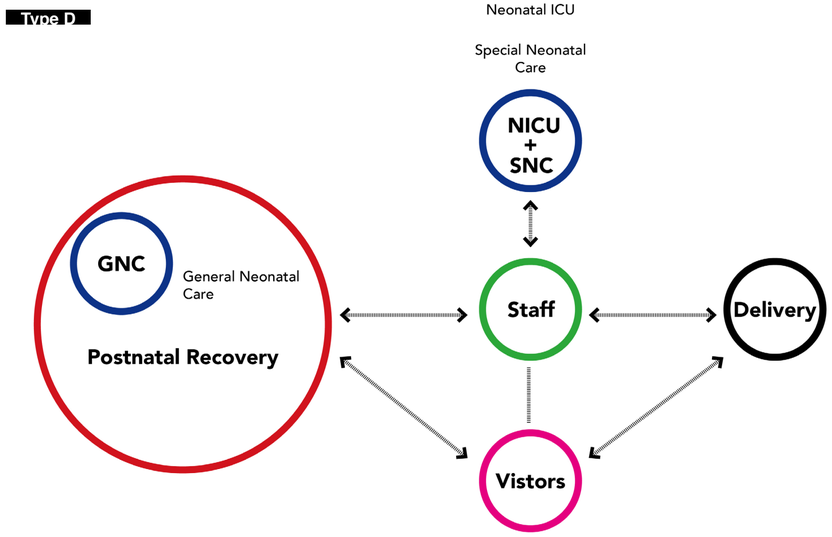


figure 4.45
Function divisions and organization - TYPE D - Case study

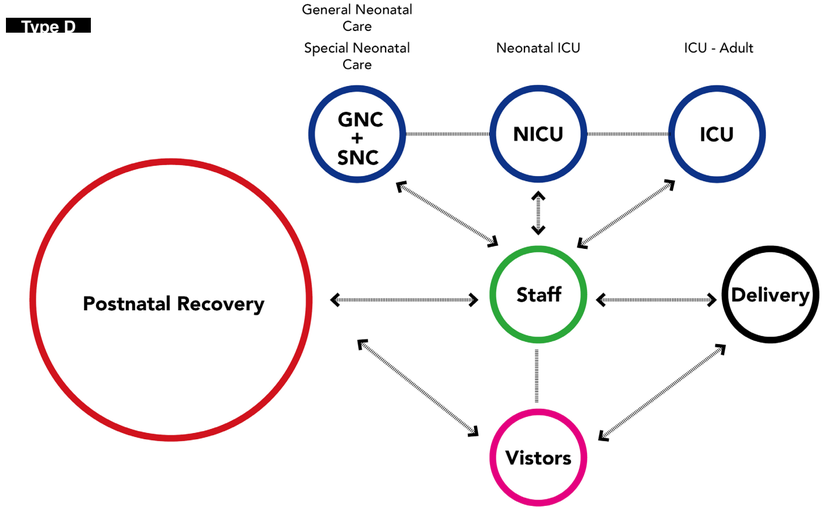


figure 4.46
Function divisions and organization - TYPE E - Case study

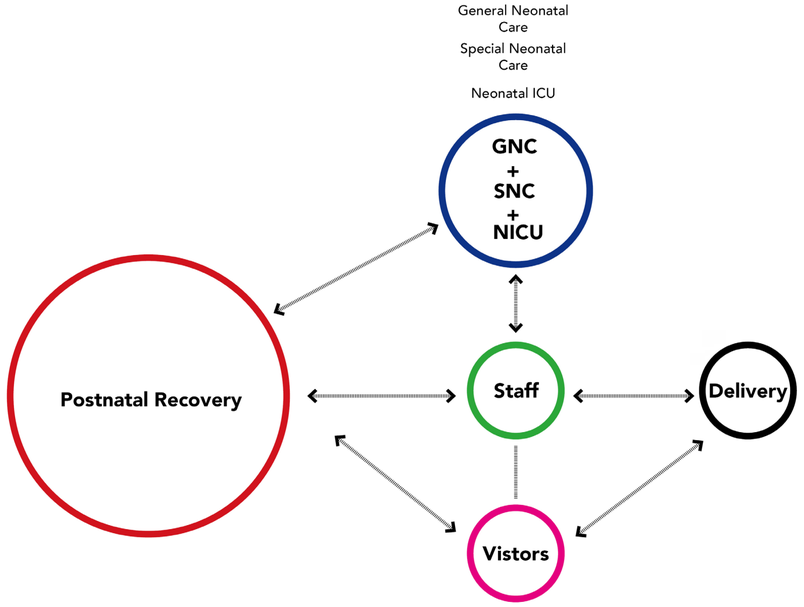


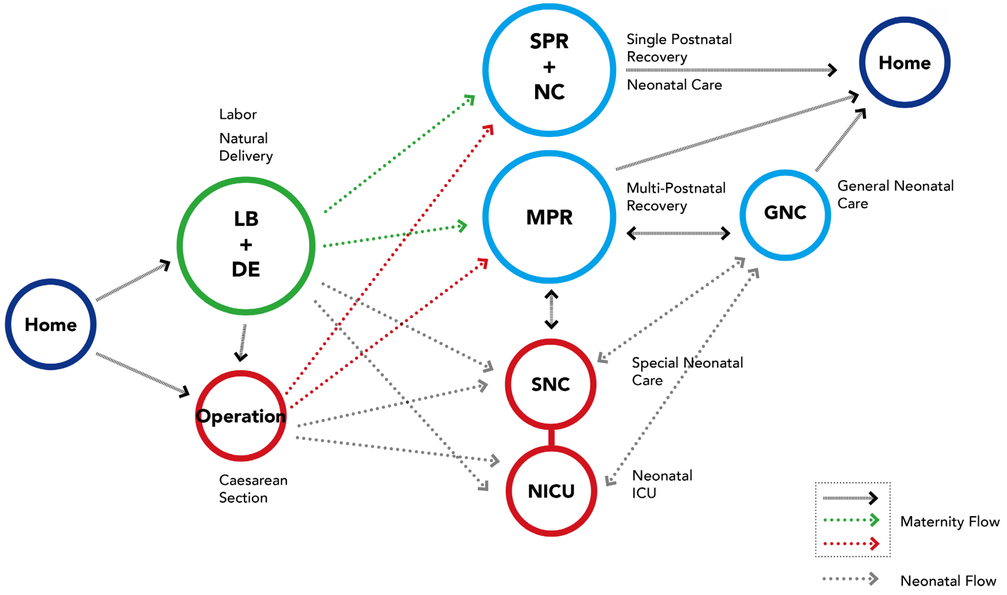
figure 4.47
Function divisions and organization - TYPE F - Case study

4.3.2 The Application and organization of Hexagonal standard

According to the hexagonal characteristics, such prefabricated modules can be grown to develop a variety of organizational forms. After being endowed with the function of maternity, the hexagonal organization can be shaped into a specific form that conforms to the logic of this function on the analysis of the above two perspectives.

From the perspective of pregnant women, as described in section 4.3.1, the integration of partial function is a compromise between reducing the time cost of transferring of the pregnant woman and controlling the cost of construction. In this design, I integrated the labor and delivery together. In this space, pregnant women can experience from the active period of the first stage of labor (if they are very expanded, otherwise they can spend some time first in the room where they will stay after the delivery) to the short-term observation stage after delivery without being transferred during the change of stages. After the placental delivery at the end of the third stage of labor, the postpartum recovery area is used to undertake the activities after the birth of a child; the other spaces are the operation area and the NICU area which are set to deal with accidents during natural delivery or caesarean section. The summary analysis is shown in Figure 4.48.

figure 4.48
Flowchart in perspective of pregnant women - Design



From the perspective of specific divisions and workflow, the maternity department can be divided into three groups: 1. Labor & Delivery - General Neonatal Care (GNC); 2. Operation - NICU & Special Neonatal Care (SNC); 3. Postnatal Recovery area. These three parts surround the core tube and are laid out in the form of a Three-pointed star (figure 4.49). The group of Labor & Delivery - General Neonatal Care (GNC) can reduce the traffic time of pregnant women when the stages change and at the same time strengthen the connection between mother and baby. The group of Operation - NICU & Special Neonatal Care (SNC) integrates functions that require medical techniques, and it also facilitates the layout of clean and dirty. The last group is the Postnatal Recovery area ,as an independent zone, it is similar to the structure of a general ward with its flexibility in space use. The advantage of the three-pointed star layout is that the three wings are distributed equidistantly around the core tube, which facilitates the convenient connection with each other. For example, when the emergency occurs during the delivery process, the woman can be sent to the operation area in a short time; after the delivery, she can be sent to the postpartum recovery area from the natural delivery or operation to establish close contact with the newborn.

The analysis of functions and traffic flow is shown as Figure 4.50.

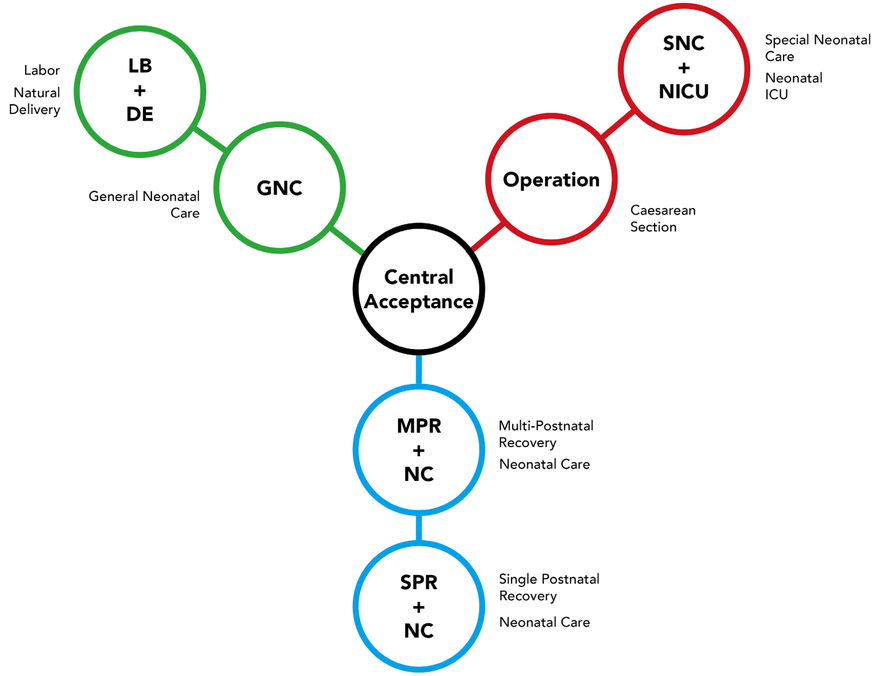


figure 4.49
Function divisions and organization - Design

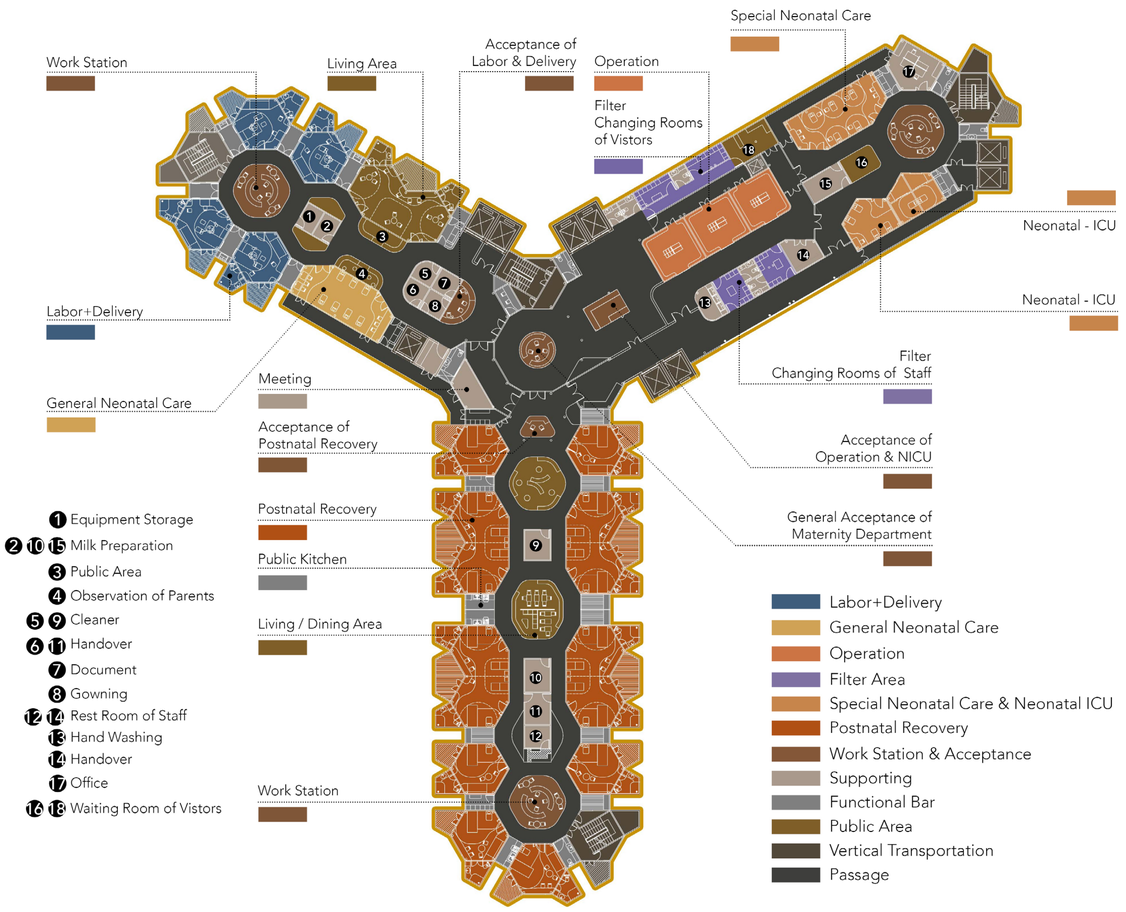


figure 4.50-1
Function Distribution of Maternity Floor - Design

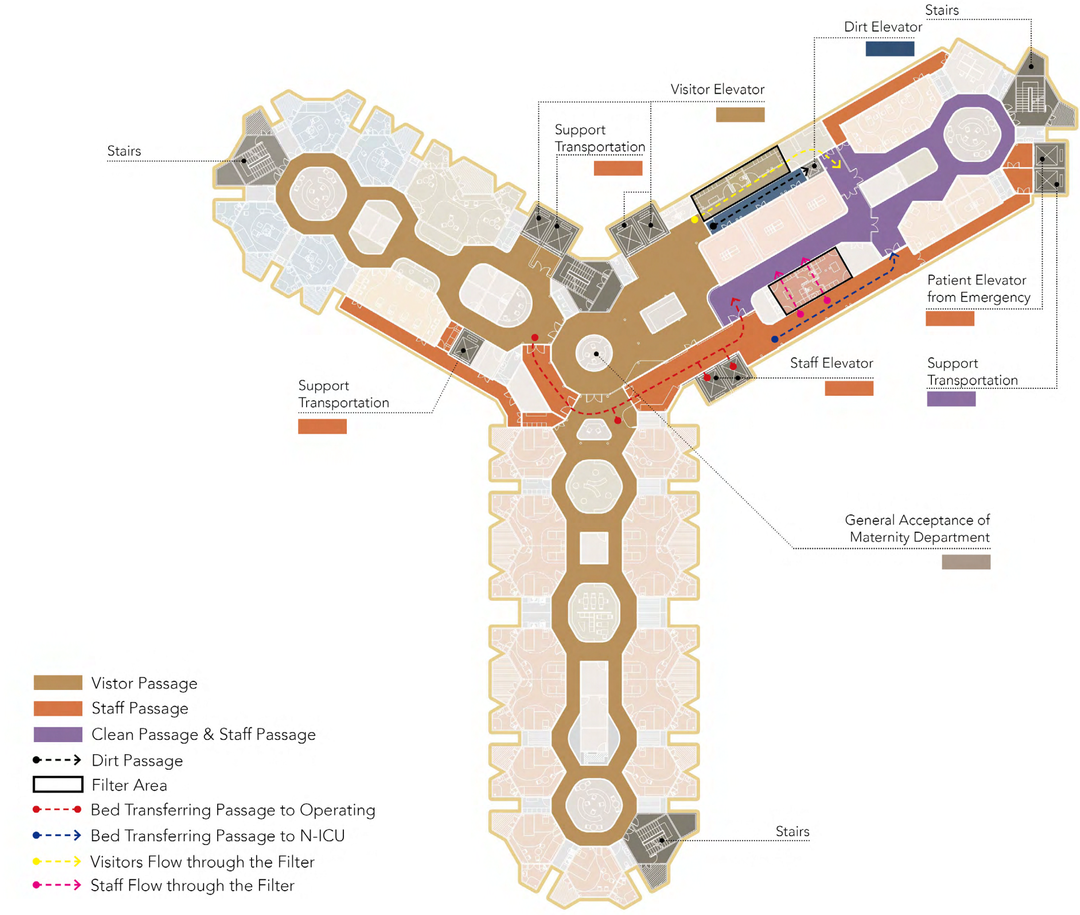


figure 4.50-2
Traffic Flow of Maternity Floor-Design

4.3.3 The Detailed Design Responding to Requirement of Interaction of Users

Labor & Delivery - General Neonatal Care (GNC)

The labor & delivery is arranged around the central workstation, facilitating the visual control of the nurses and doctors on duty. Since this area involves delivery activities, the bar between the hexagonal modules can be used to distinguish clean and dirt, that is, medical staff have to enter the hand washing space before entering the delivery area. Meanwhile, after the fourth stage of labor, when the placenta of women is discharged, the dirt can be collected and processed through another collection space.

The general neonatal care is closely linked to labor & delivery. This layout is to facilitate the establishment of close contact between the newborn and the mother and her family at the first time, and to avoid the possibility of the newborn being misidentified. Since parents are not allowed to enter the neonatal care room and have the direct appeal to contact with their babies, it is necessary to design and set up the parent observation area in front of the nursing room and separate it with a glaze wall. At the same time, in order to provide the possibility of intimate contact between the parents and the baby , the baby can be sent to the living room to meet with them in a short time (figure 4.51).

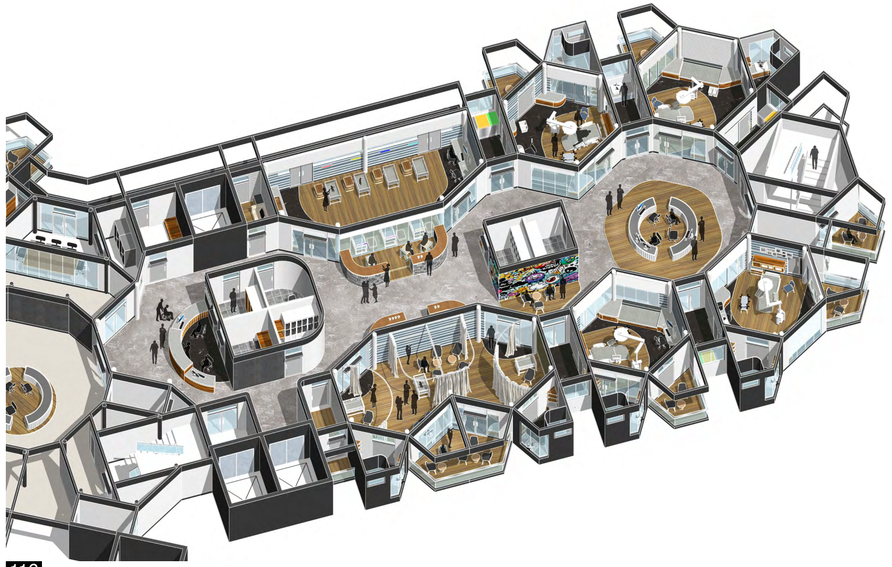


figure 4.51
Labor & Delivery - General Neonatal Care

Let us return to the interactions between the users of the maternity department mentioned in section 3.2, which are namely 1, Mother & Child -Father / Families; 2, Mother & Child - Doctor - Nurse / Midwife; 3, Mother & Child - Visitors / Friends; 4, Mother & Child - Mother & Child with other families. These requirements from the above interactions between users can be responded to in this design. For Interaction 1, family members are able to accompany the pregnant women from labor to delivery and stay together in the parents' observation area to watch their babies or establish close contact in the living room. For Interaction 2, doctors, nurses and midwives will accompany the pregnant woman to assist her in giving birth. In the neonatal care room, the nurse will act as the connection between the parents and the newborn in the room and the temporary and professional caregiver.

For interactions 3 and 4, it is more likely to occur in the living room, where mothers, family members or visitors from different families can share the joy of the birth of a newborn and exchange experiences in parenting together (figure 4.52).

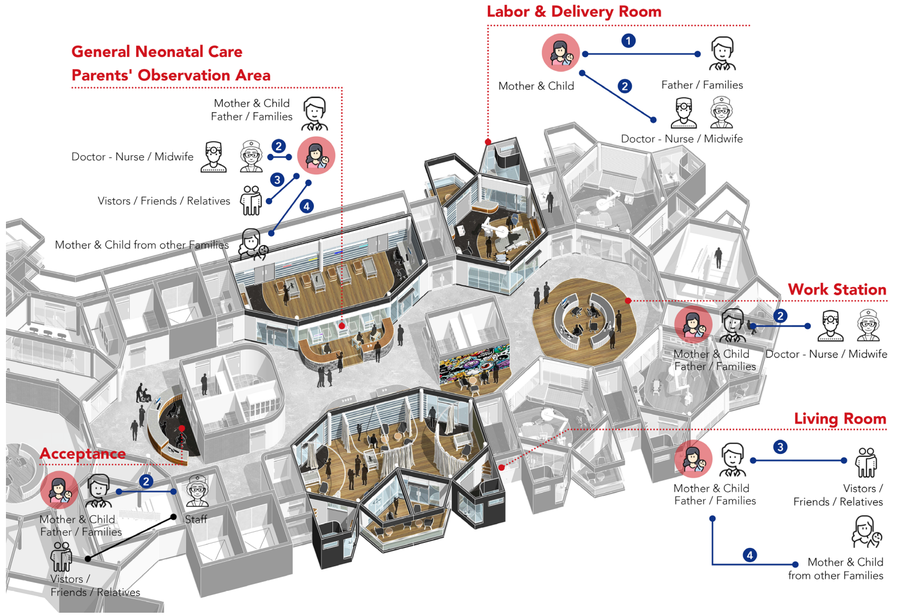


figure 4.52
Interactions between the users in Labor & Delivery - General Neonatal Care

Operation - NICU & Special Neonatal Care

The operating area mainly carries the caesarean section activities and responds to emergencies coming from the adjacent delivery room. Because of the strict requirement of cleaning and dirt separation, it is necessary to design a filter and an independent dirt channel with a specific lift to transport the dirt. When the pregnant woman is transported to the operating area from the other area, she does not need to pass through the filter area, but the patient bed needs to be replaced to let her enter the cleaning operating room in the shortest straight path. The family members or other visitors and medical staff need to enter the filter area, by putting on protective clothing and changing shoes, before entering the operation area. The NICU and Special Neonatal care areas are closely connected to the operating room. The purpose of this layout is to ensure that the patient is transported in both directions in a short time between the operation and NICU & SNC. Parents also have permission to enter this area to visit newborns who are in serious conditions. After passing through the filter area, they can go inside the NICU-SNC area in the guest hall. The detailed design of this area is shown as figure 4.53.

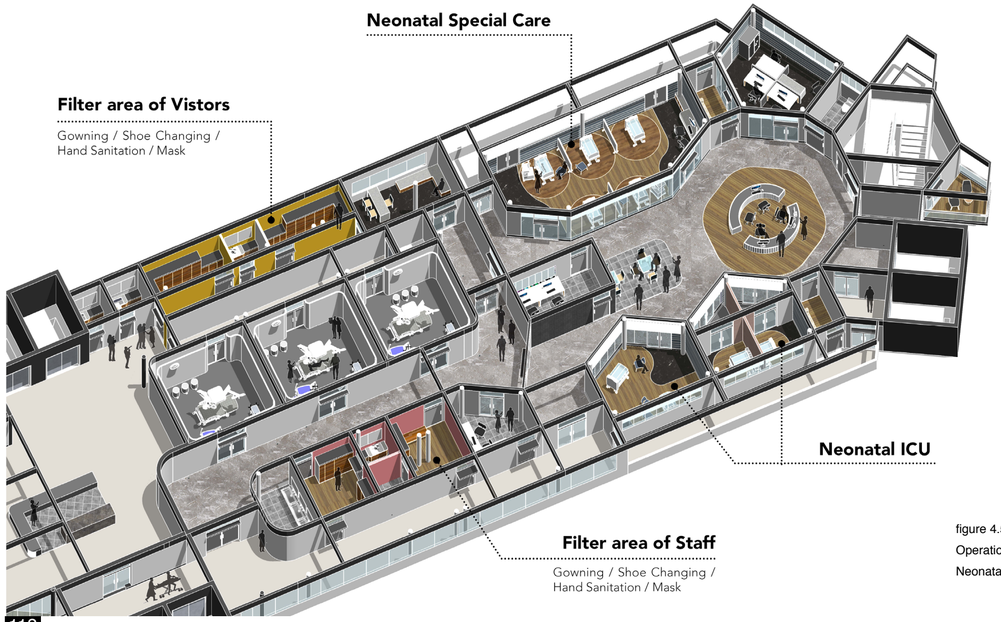


figure 4.53
Operation - Neonatal ICU - Special Neonatal Care

Postnatal Recovery area

The postnatal recovery area is the place where new mothers stay for a few days or one week when they go through the fourth stage of labor. This is an upgraded design of the general room that was mentioned in Chapter 4.1.2, that is, under the premise of realizing the companionship of adult family members, the cradle is added to achieve intimate contact between the parent and the baby. In this area, the rooms are arranged in a double corridor layout and the bar between the hexagonal modules can be used as the public spaces such as balcony, kitchen, to promote neighborhood relations. Taking the kitchen as an example, family members can use the communal kitchen to cook to continue the habit at home. At the same time, in the middle of the area, there are living and dining spaces to promote communication between neighbors (figure 4.54).

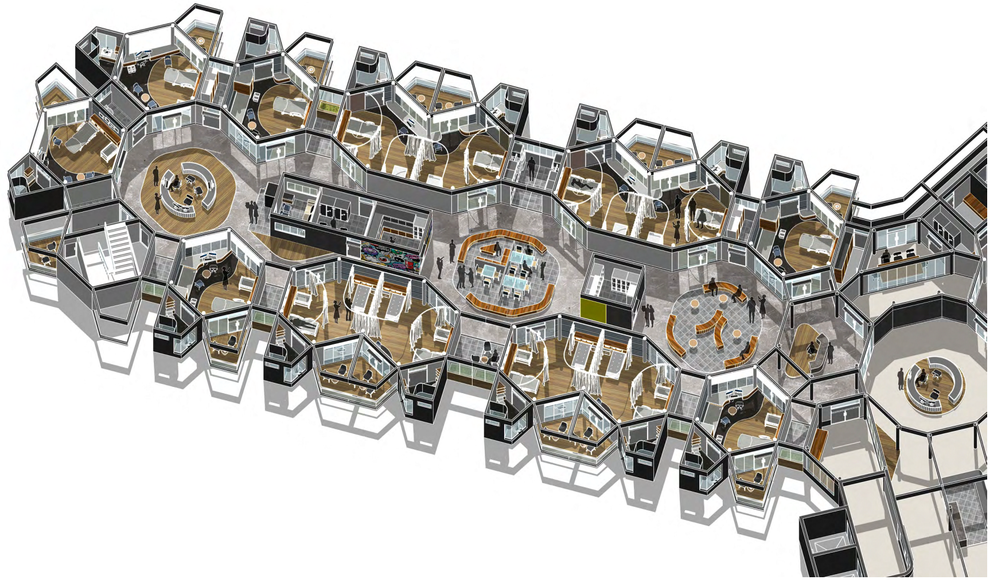


figure 4.54
Postnatal Recovery

For the interaction between users, interaction 1 and 2 will occur in hexagonal single or multi-person rooms, while interactions 3 and 4 are more likely to occur in public areas, such as kitchens and living halls. In the multi-person postnatal recovery room, interaction 4 may show good neighborhood relations (figure 4.55).

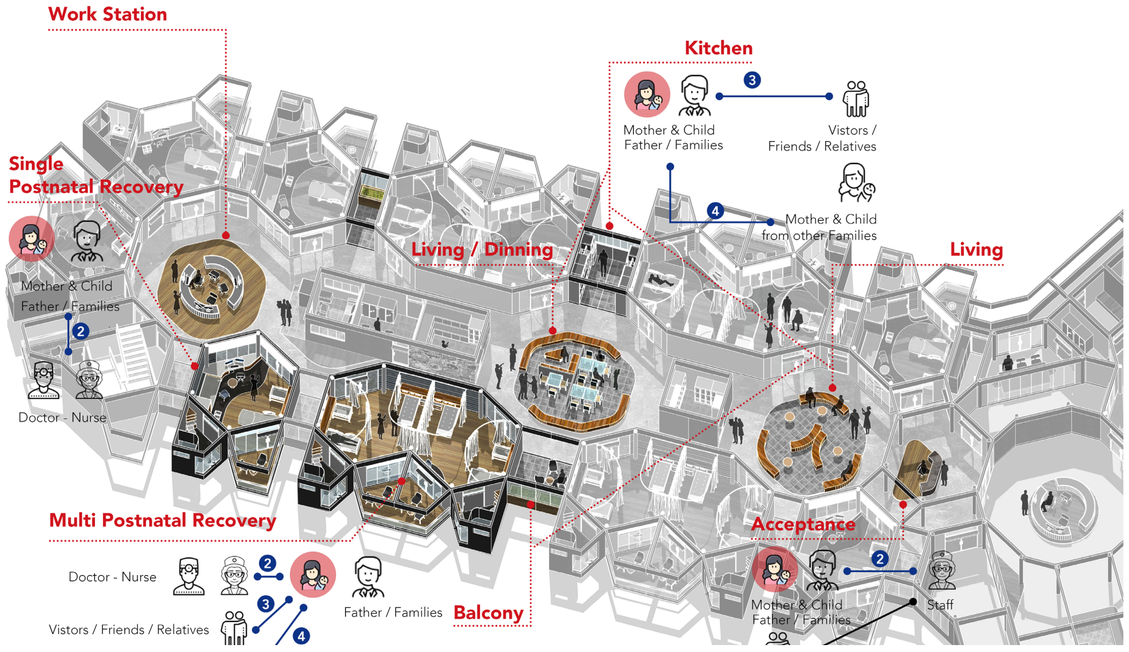


figure 4.55
Interactions between the users in Postnatal Recovery

4.3.4 Ground floor design and connection with maternity floor

Global function distribution

Because of the typological design of space, I pay more attention to the possibility of assembility in units of hexagonal modules in various types of functional applications including the maternity department. However, if the maternity floor needs to be applied to a real project, it must be effectively connected with other functional floors to be integrated into a complex and become a potential hospital project. Among them, the ground floor is indispensable because it is the key space that connects the internal and external environments of the hospital. Based on the three-pointed star form organized by hexagons, the ground floor is composed of the main entrance hall, the outpatient & emergency, administrative office and commercial street that are located in three swings (figure 4.56).

In this layout, the outpatient and emergency departments must be emphasized on the ground floor in order to have direct contact with the external. Pregnant women in emergency situations come from the outside, can be diagnosed, treated and be arranged for the next medical decisions in a short time. The entrance lobby in the central location is the core space for the hospital to connect with the external world. Through this space, patients and their families can reach the upper destination floors and departments through general acceptance. Among the other branches, the administrative office provides strong support to the daily operations and running of the hospital, while the commercial street is placed on the ground floor in order to allow the medical building to be more closely integrated into the local community, as a buffer space for medical institutions and the city.

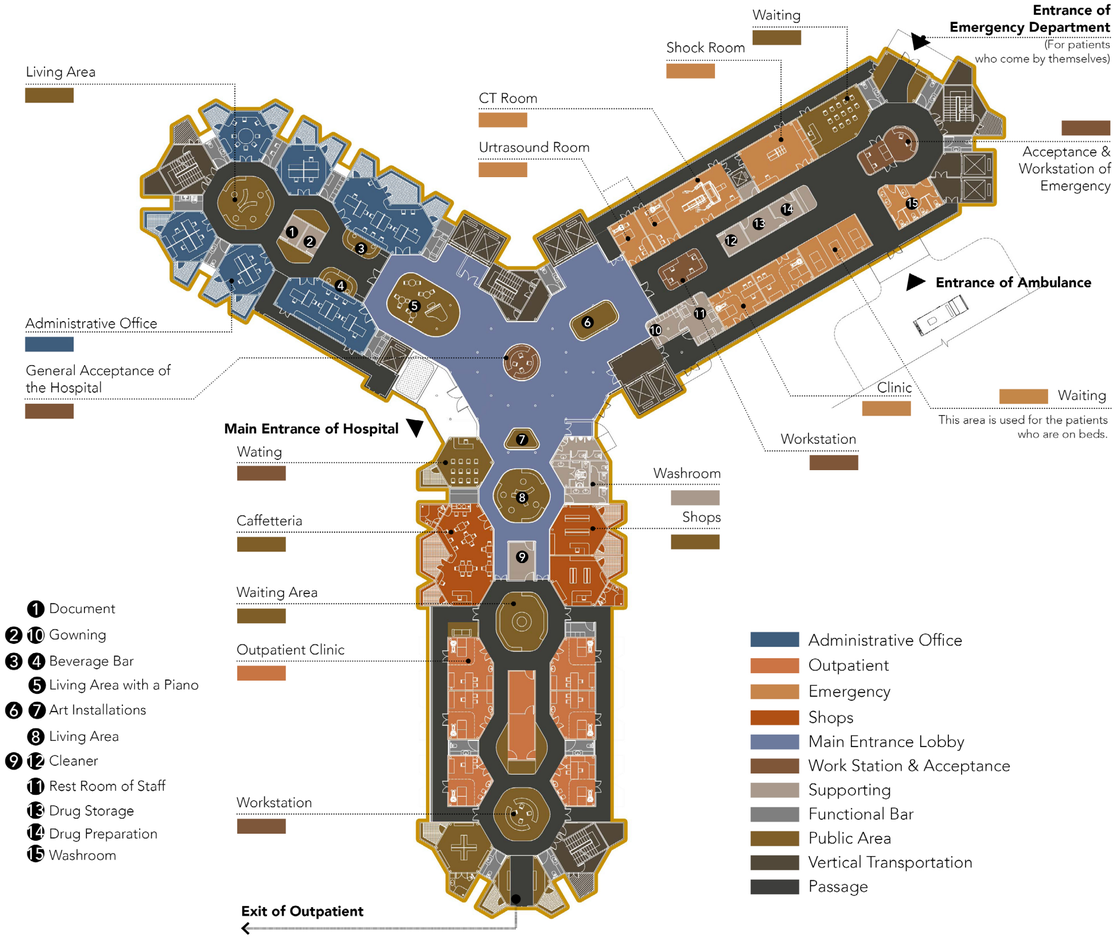


figure 4.56-1
Function Distribution of Ground Floor - Design

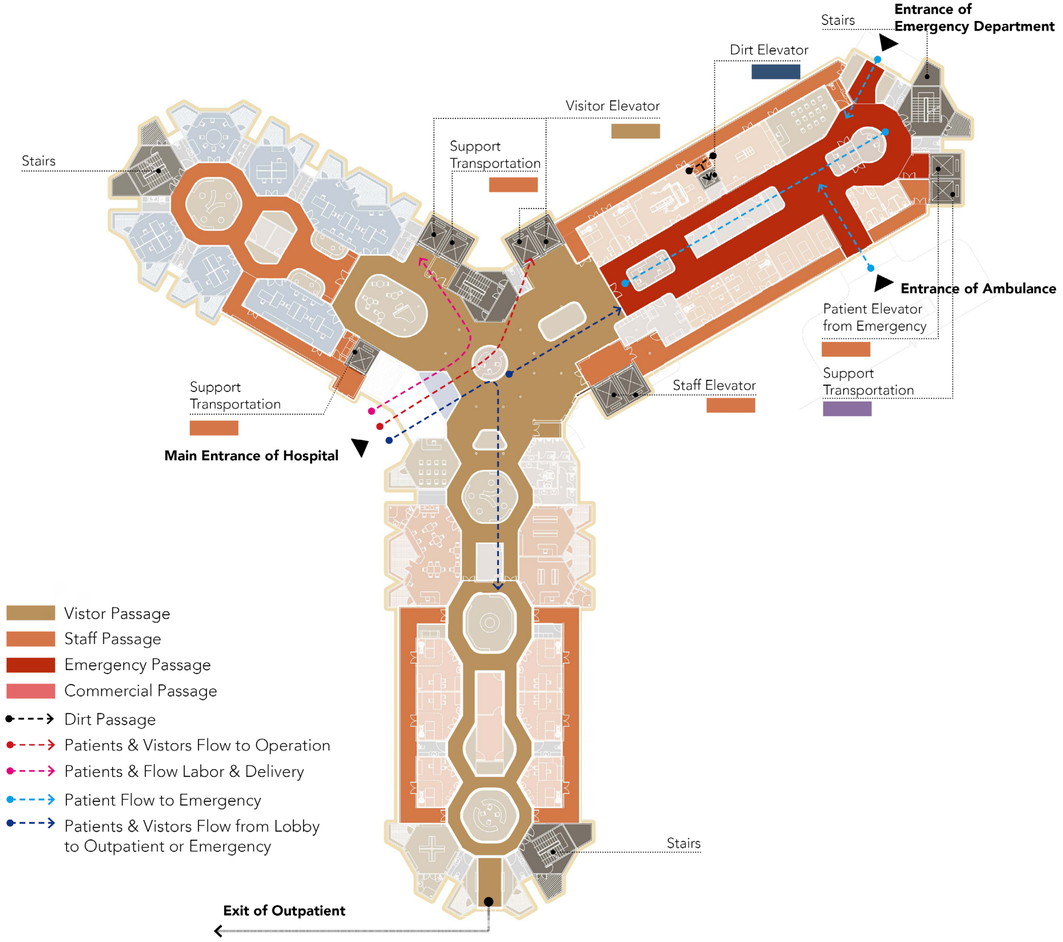


figure 4.56-2
Traffic Flow of Ground Floor - Design

Main Entrance Hall

The main entrance hall is the core space connecting the internal and external environments of the hospital. This space should be equipped with basic elements such as general reception, waiting area, the vertical transportation connection, registration, pharmacy and public waiting. In addition, art installations can be introduced to create a “non-hospital” atmosphere. For this intervention, we can find a good answer in Ann & Robert H. Lurie Children’s Hospital in Chicago, USA (Wagenaar et al., 2019). The designer introduced the theme of the ocean in the lobby of the hospital. The top of the space is hung with sculptures of whales and the coffee bar is shaped like a boat (figure 4.57). The intervention of such art installations can reduce the psychological pressure that patients face after entering the medical space.

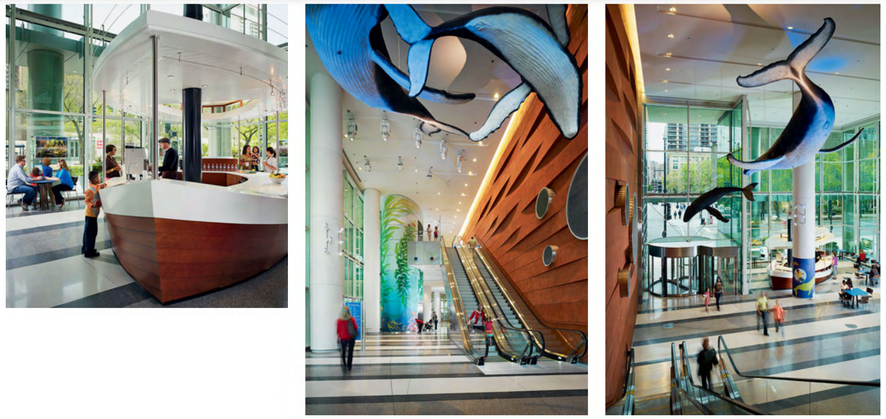


figure 4.57
View of lobby of Ann & Robert H. Lurie Children’s Hospital

In addition, in most public places in Europe, such as railway stations, airports, shopping malls, etc., it is a very common phenomenon that a public piano is set for more than decoration. The important reason is that the existence of public pianos is to stimulate people’s participation of activating and claiming the ownerships of their urban landscape (About | Street Pianos, 2021). As one of the public service institutions in society, the hospital can also offer the public piano that enhances users’ right to participate in playing music, no matter who they are, patients, family members, medical staff or cleaners. At the same time, the musical atmosphere brought by the player can immerse the relaxed atmosphere of a “non-hospital”.

The design of the entrance lobby also needs to meet the requirements of clear information of wayfinding. In this regard, the design of the paving plays an important role, by means of dynamic lines to guide the traffic flows for different destinations. In summary, the detailed design of the main entrance hall and the analysis of traffic flows are shown in Figure 4.58

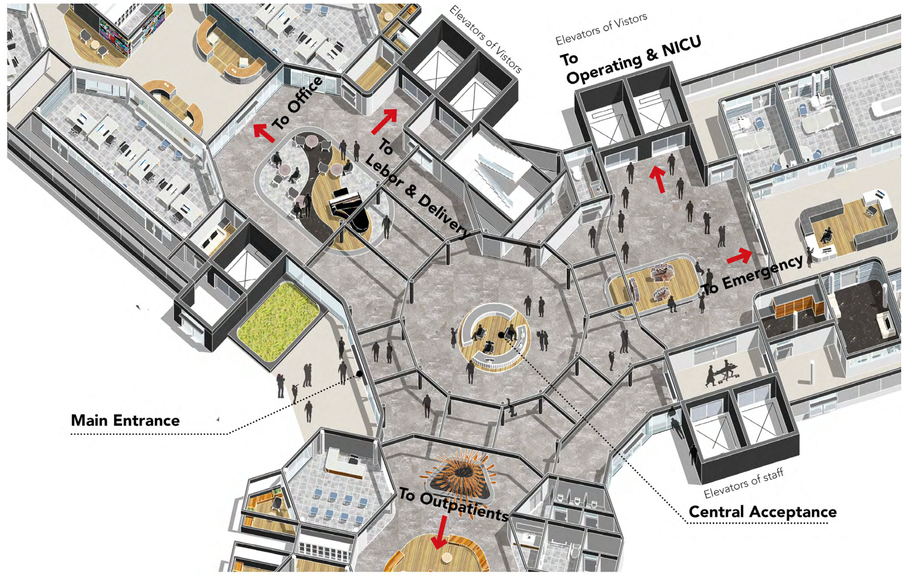


figure 4.58
Main Entrance Hall

Emergency

The emergency department is a place where a series of medical activities centered on pregnant women can be realized in a short period of time, so it is necessary to be set on the ground floor. This is a place for a set of processes, with a requirement of the distinction of traffic flow, the corresponding facilities brought by the priority of patients and rapid intervention measures (Wagenaar et al., 2019).

This means that we need to consider two important points when designing the emergency department. One is that the department itself should ensure complete functions to reduce the transferring cost of patients to achieve complete medical procedures; the other is traffic flow and the nodes should be effective and convenient to connect the external and other medical departments.

For the first point, the functional modules of this emergency department should include reception, waiting area, outpatient room, operating room and radiology area, such as CT room and ultrasound room.

For the second point, this department needs to configure three main entrances, namely: 1. Access to patients who are guided by other medical departments through entering the entrance lobby; 2. Entrance to the emergency department for those who arrive by self-driving or public transportation; 3. Dedicated entrance for ambulances. For this third entrance, I reserved enough buffer space for the replacement of hospital beds and considered the possibility of quickly reaching the internal operation of the emergency department and the Operation & ICU area on other floors.

In summary, the detailed design and traffic flow analysis of the emergency department are shown in Figure 4.59.

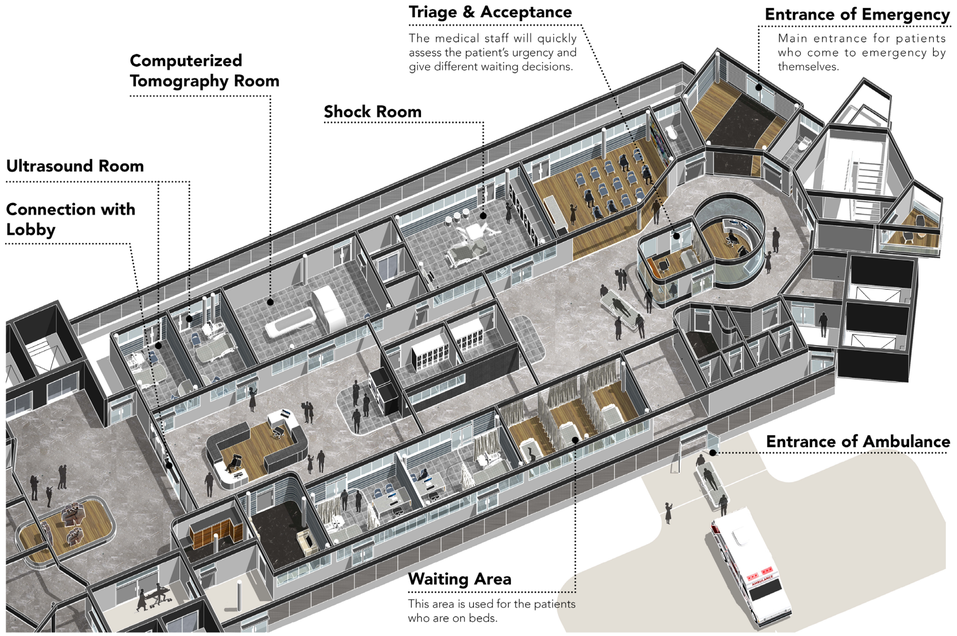


figure 4.59 Emergency

Administrative Office

The administrative system is an important supporting power for the daily operation and management of the hospital. Due to the visual demand for natural light and large-area landscape, office space can also be applied in hexagonal modules and can be implemented in a variety of possible forms, such as conventional office decks or round tables for meetings.

For office space, I paid more attention to measures aimed at employees' mental health and stress relief. Therefore, like other departments on the ground floor, each hexagonal office module is deployed with a small garden, which serves as an outdoor extension of the office or resting area. At the same time, it is also equipped with a living space, which serves as a place for a staff break.

In summary, the detailed design and traffic flow analysis of the administrative office are shown in Figure 4.60.

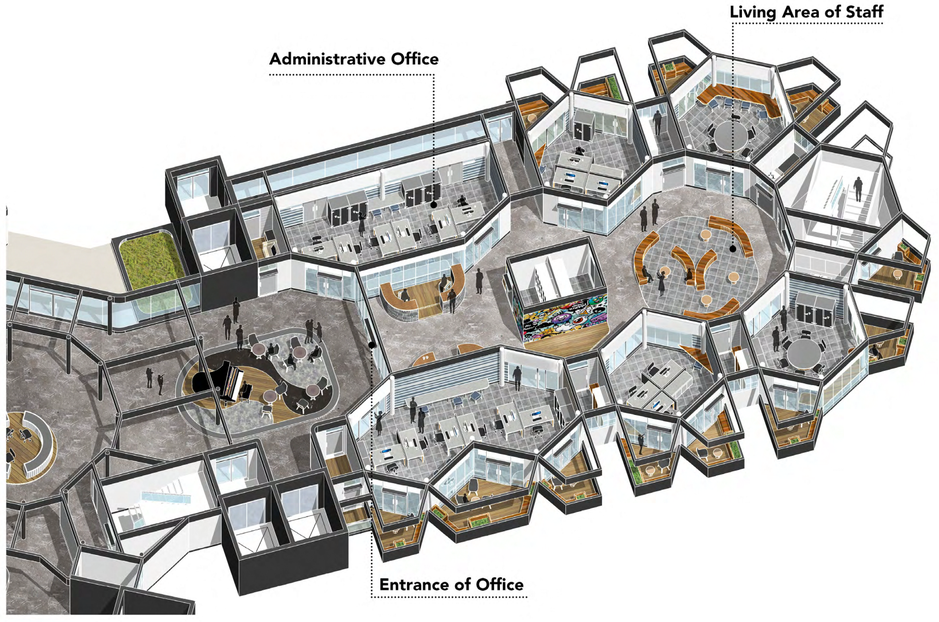
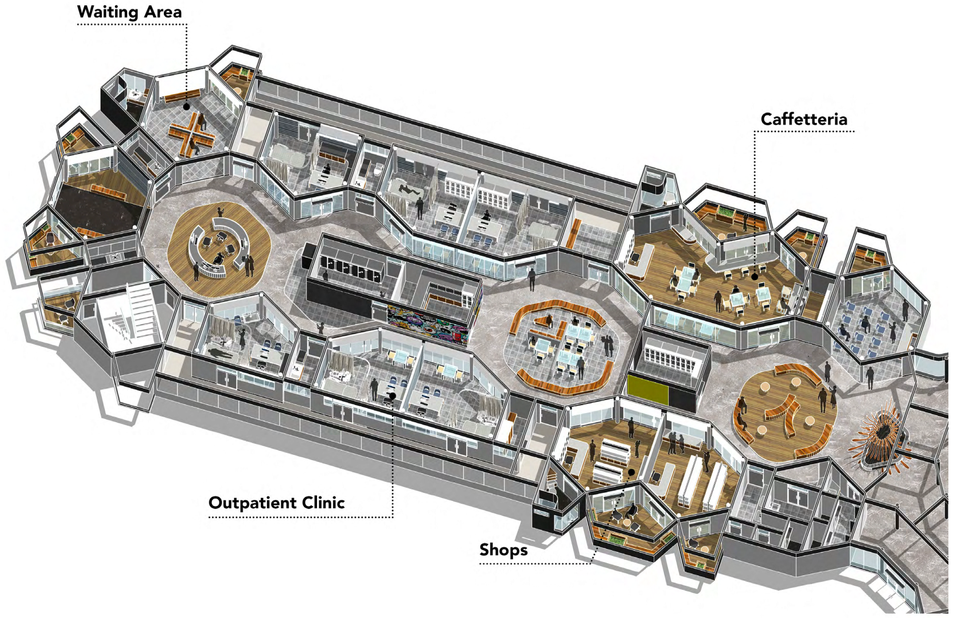


figure 4.60 Administrative Office

Outpatient

There is an independent entrance for the outpatient clinic for convenience of patient's experience of diagnosis and treatment during the daytime without accessing other parts of the hospital. Meanwhile, the outpatient area is closely connected to the main entrance hall, which allows patients to be guided to this space in a short time after making an appointment for registration in the lobby. In terms of the configuration of facilities, in addition to the basic measures such as office desk, computer and other digital equipment, changing rooms, wash basins, etc. that were mentioned in section 1.2.3.2, it is also necessary to consider gynecological beds and ultrasound systems for detecting fetal heartbeat equipment and other targeted measures on gynecological functions to be introduced (Del Nord and Peretti, 2011). In addition to the outpatient clinic, it is necessary to provide a waiting space for pregnant women and their families, as well as a specific reception. What's more, a clear distinction should be made between the traffic flows of medical staff and patients, with relatively independent medical staff entrances, as well as corresponding restrooms and changing rooms for staff. In summary, the detailed design and traffic flow analysis of the outpatient department are shown in Figure 4.61 .

figure 4.61
Outpatient and Commercial Area



Commercial Area

The commercial street is one of the solutions to integrate medical institutions with the surrounding neighborhoods and it is also a "non-hospital" design strategy. Located in London, the ground floor of the Cancer Centre at Guy's was designed as commercialized blocks to be integrated into the local community (figure 4.62) (Wagenaar et al., 2019). In the concrete design process, I put the commercial area with outpatient clinics in the same wing, so as to connect the outpatients and main entrance lobby. For commercial formats, we need to pay more attention to shops related to pregnant women and infants, as well as catering and coffee.

In summary, the detailed design and traffic flows analysis of the commercial street are shown in figure 4.61.

figure 4.62
Ground Floor plan of Cancer Centre at Guy's in London

Connection with maternity floor and the others

In addition to the necessity of the basic functional departments on the ground floor, the maternity department should also be connected with other expandable spaces to form a complex of obstetrics and gynecology themes, or combine with other departments to form a general hospital. Vertically, we can also consider many functional departments related to maternity, such as psychological assistance departments for pregnant women, professional guidance and educational areas, internship bases in cooperation with medical schools and the recuperation center, etc.

What's more, due to the prefabrication and flexible assembly characteristics of the hexagonal modules, as the number of building floors increases, we can decrease the area of the higher floors, thereby creating more elevated outdoor spaces, so as to create more opportunities for users to contact with the external nature.

In summary, the comprehensive exploded diagram and traffic flow analysis are shown in figure 4.63.

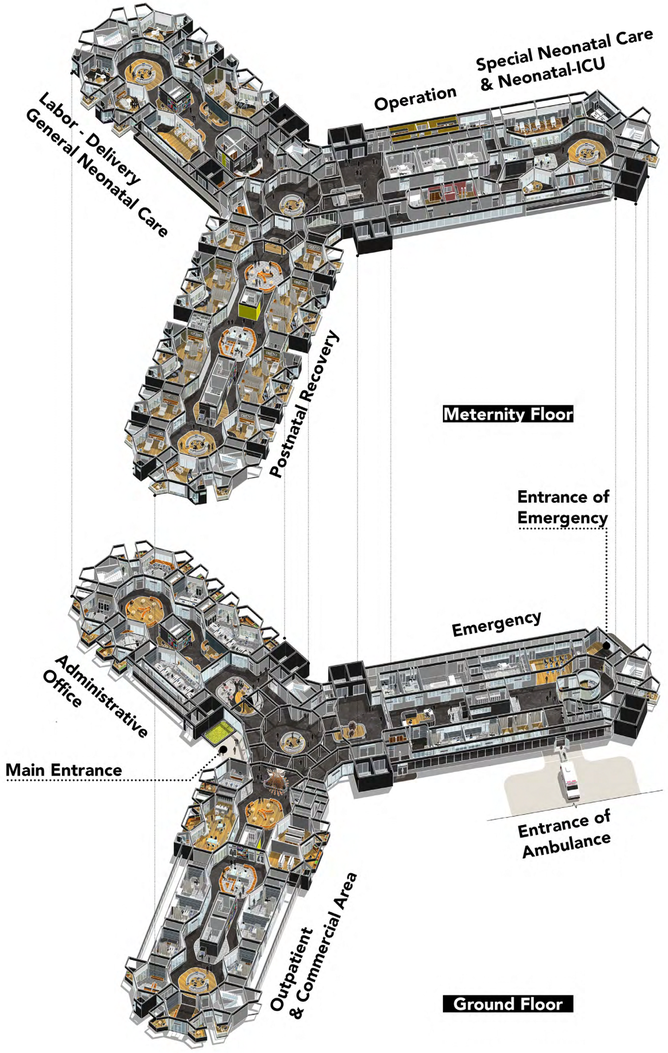


figure 4.63-1

Explode view - Function distribution

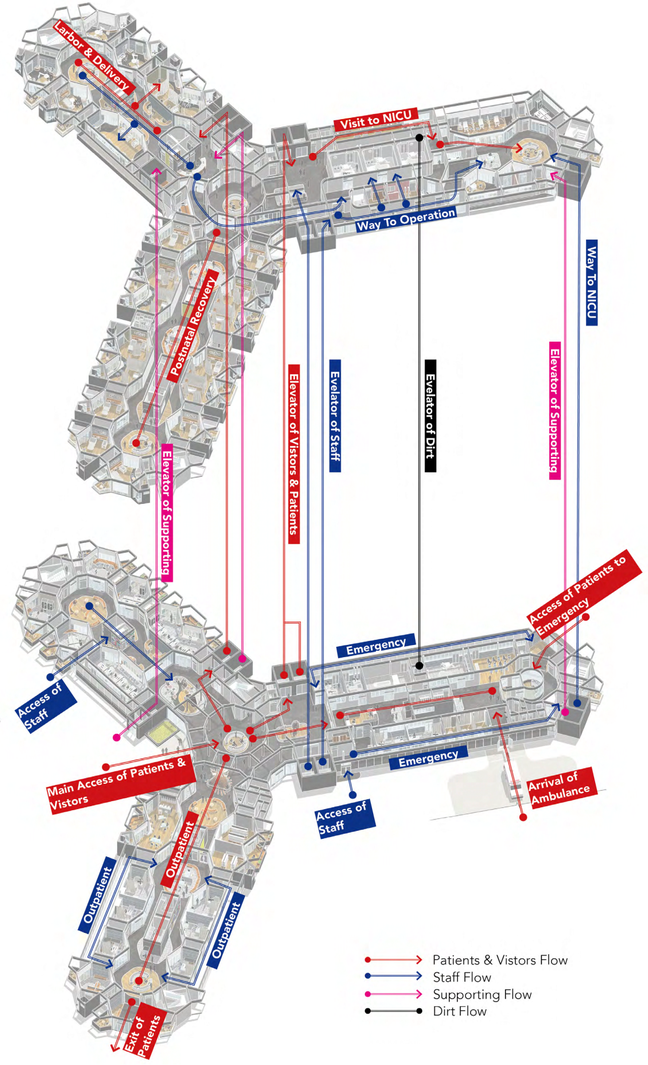
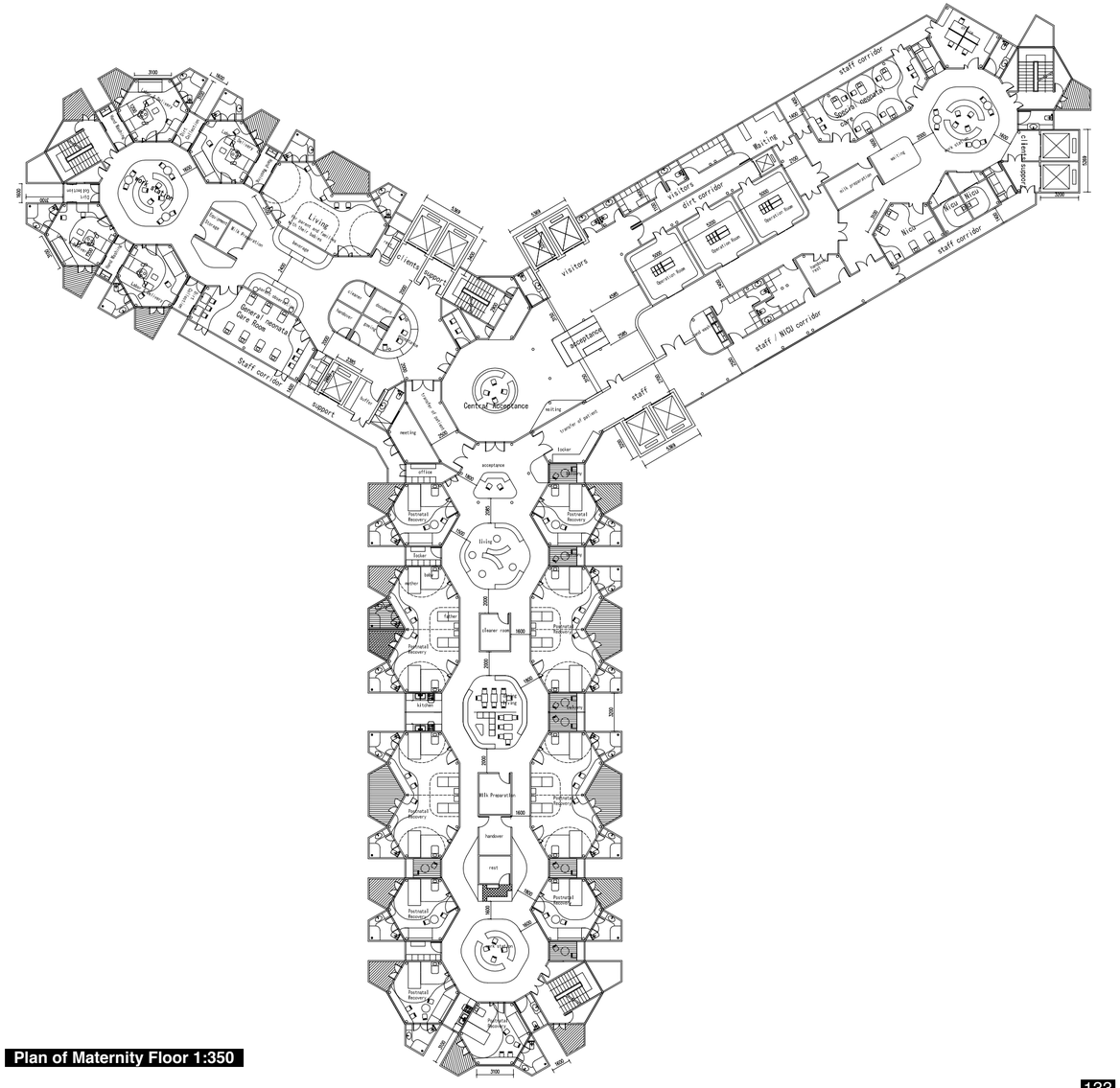


figure 4.63-2

Explode view - Traffic flow organization

4.3.5 Technical Drawing

Plan of Ground Floor 1:350

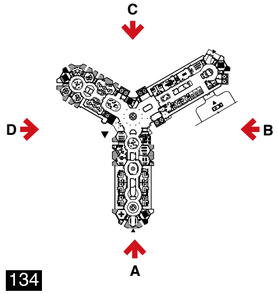


Plan of Maternity Floor 1:350

4.3.6 Elevation

Elevation A

Elevation B



Elevation C

Elevation D

Chapter 05
Strategy - Story

The purpose of this chapter is to reflect the potential benign relationship between users and space by explaining a short story about a pregnant woman in the hospital. This “Story” is based on the obstetrics and gynecology department in the above chapters, as the physical background of the story.

In this story, the users include a main fictional character named Emily and her relatives. As I explained in the introduction to the USS system concept in Chapter 2, the space cannot determine people’s activities and behaviors, but through humanized intervention, it can guide and induce positive interactions and environmental impact on the users physically and mentally.

The biggest difference between this chapter and the others is that, compared with the above-mentioned rational analysis and methods, the story is more inclined to use perceptual ways to reflect the possible plots in the medical space intervened by humanized design. At the same time, the description of the story can provide a future reference for triggering people-oriented thinking through the activation of spatial scenes, rather than rigid drawings.

The induction of characters

Emily

Emily is the protagonist of this story. She was a newly married woman who became pregnant on an unexpected occasion.

Adonis

Adonis is Emily’s husband. His idea was that no matter what decision Emily made, he would support it.

Gerald

The baby of Emily and Adonis, always yelled out at night and affected the sleep quality of adults.

Anna & Aron

This couple are new friends who Emily met in the maternity department. Their child is called Spring, who happens to have the same birthday as Gerald. During the postpartum recovery period, they lived in the same room with Emily.

Unexpectation

Emily was a 25 years old woman who had a marriage with Adonis recently. But since both of them started a new form of life for a short time, they still did not prepare to have a new member into their family in consideration of free and relaxed days. However, unexpectedly, Emily got pregnant by being informed of that when she met with the doctor one day. (figure 5.1)

figure 5.1
New marriage

On the train

In one afternoon, Emily and her husband were on the way to a town by train to visit her mother. On the train, she saw a mid-age man hugging a little girl about two years old. Then he put the girl on the small table in front of him, using a piece of paper as an origami toy to play with her. The child became happy and stood on the edge of the table to jump into her father's arm and then he put her back on the table. Such action was repeated again and again, which seems boring but the little girl was very happy to play with her dad in this way. At that moment, Emily and Adonis looked at each other with smiles. (figure 5.2)

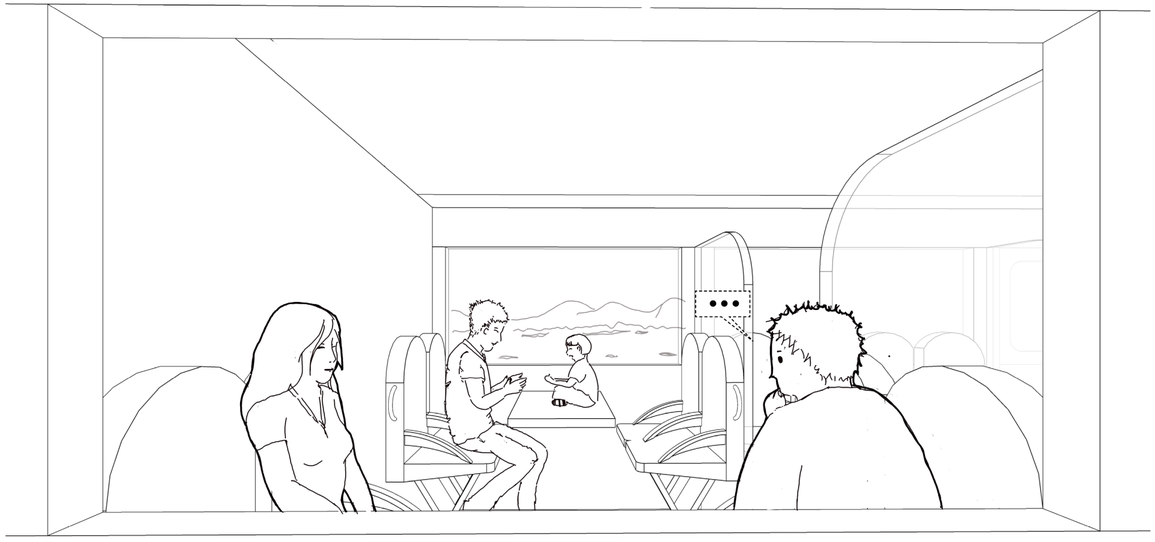


figure 5.2
On the train

A journey away from home

Time flies so fast, Emily felt changes in her body, when she had a check as usual in hospital, the doctor told her: “ Congratulations, your active period has come, you can consider moving to hospital for the preparation.” With the help of her husband, Emily packed her luggage with a long list of labor and they went to the maternity hospital together. When Adonis entered the lobby on the ground floor to handle the procedures, Emily was given priority to go to the labor room. While Adonis was going through the registration, he looked around the lobby and was surprised. He felt that the atmosphere inside was more like the hotel where they were going on vacation. After finishing the registration, he dragged his suitcase and took the elevator dedicated to the patients of the maternity floor, going straight to the Labor & Delivery area.

Emily and her husband met in a hexagonal room. Emily said that she had never seen a room like this before, which looks more like a hotel. At this moment, with a sound of knocking on the door, the doctor and nurse came in. The doctor was dressed smart casual with a smile on his face, introducing a woman to Emily, “Hello, Emily. I am happy that you are here with your husband. This is Mrs Ambra, she has deep experience on delivery and is skilled at that. She can help you to go through the entire process, if you have any confusion, never mind and don’t hesitate to ask her for help.” (figure 5.3)

figure 5.3
A journey away from home

Labor

In this “hotel room”, during the labor period, Emily’s husband has been with her all the time. According to what Ambra told them, it would take 2 or 3 hours of labor before delivery. Emily faintly felt the pain on her abdomen caused by contractions. With intricate emotions like nervousness, anxiety and expectation, Emily got off the bed and went to the balcony to watch the scenery outside. Adonis ried to reduce his wife’s emotional stress by distracting her attention. He found that the room was provided with a music player that can be connected to his mobile phone by bluetooth. At this time, the jazz music playlist was played inside the room, such as Bobby Hutcherson’s Bouquet. As they couldn’t drink, they ordered two lemonades on the balcony table and they chatted relaxedly with the summer breeze, thinking about the future days when the baby would join in. (figure 5.4)

figure 5.4

The Key hour

With the advent of the second stage of labor, Emily felt more and more intense and regular contractions. The doctor and the midwife walked through the hand-washing area and came into the delivery room. The husband pulled down the blinds of the room and kept the other side to let the natural light in. The doctor checked the dilation of the uterine orifice and he told Emily and her husband, “The baby is coming out soon, let’s work together to let the new life come out.”

It was quiet outside at midnight. Moonlight came in through the French windows, while the interior was brightly lit. Emily held her husband’s hand tightly. Under the guidance of the midwife on the side, Emily breathes rhythmically and uses the power of the abdomen to push the fetus. Fortunately the cry of a baby rang throughout the delivery room.

Emily cried with joy and breathed a sigh of relief. During the next 20 minutes of removal of the placenta, the baby’s hand was tied with a pinky tag with the name of Emily and then was taken away for a bath and examination by the nurse. 20 minutes later, the clean baby was returned back to the arms of Emily. The husband was so happy that he hugged the baby incoherently. (figure 5.5)

figure 5.5
The key hour

“What is his name?”

After a brief meeting between the baby and his parents, he was taken to the general neonatal care room next door. In this room, the baby saw his peers in his life for the first time and there was a bar across the graze wall, where the new parents were sitting. After moving into the postnatal recovery room, Emily insisted on seeing her baby a few more times.

In front of the neonatal care room, Emily and her husband were quietly observing their children. At this time, another couple came over to talk. They greeted them with a smile, and said, “Hello! We are the parents of the child with that green tap 3, my name is Anna and he is Aron. I am glad to meet you and your child!” Emily replied, “Hi, I am Emily and he is Adonis, our children are in the 4th position with blue tap, I am happy that they are neighbors. By the way, what is the name of your baby?”. Anna said, “We gave our little princess a name, April. You know, April is the spring season when everything is resurrected. We hope she will grow up happily with hope, so what is your child’s name?”. Perhaps because of the impact of this life change suddenly, Emily had not prepared to name their baby with her husband. She asked Adonis: “What do you think?”. Adonis replied: “How about Gerald? It means being brave like his mother, thanks to her being so brave for giving birth to this kid”. Emily smiled and said: “Why are you so sweet today”. (figure 5.6)

figure 5.6
“What is his name?”

Days of postnatal recovery

Emily spent a few days in the postnatal recovery room with the child and husband. When they were checking in, Adonis planned to select the single room for themselves, after all, the privacy is better guaranteed. Emily agreed with her husband, therefore, on that day of giving birth, after several hours of observation of medical staff and being confirmed as in a safe condition, Emily was guided to move into a single postnatal recovery room with Adonis and happened to see Anna's family. When they met again, they seemed to be old friends who had known each other for a long time. During the week-long hospitalization, they were not alone at all, because they supported and encouraged each other.

Since there is a public kitchen next door, one day Adonis decided to compete in cooking skills with Aron. In fact, Adonis's cooking skills were very bad. For this reason, he spent at least two days studying the French goulash tutorial in front of the computer. On the day of the final, Emily was angry for three hours because of the excessive salt and overcooking of the beef stew. In the end, Adonis ordered a sushi takeaway, which calmed Emily's anger a little bit since it didn't taste bad. (figure 5.7-1,2)

figure 5.7-1
Cooking Competition

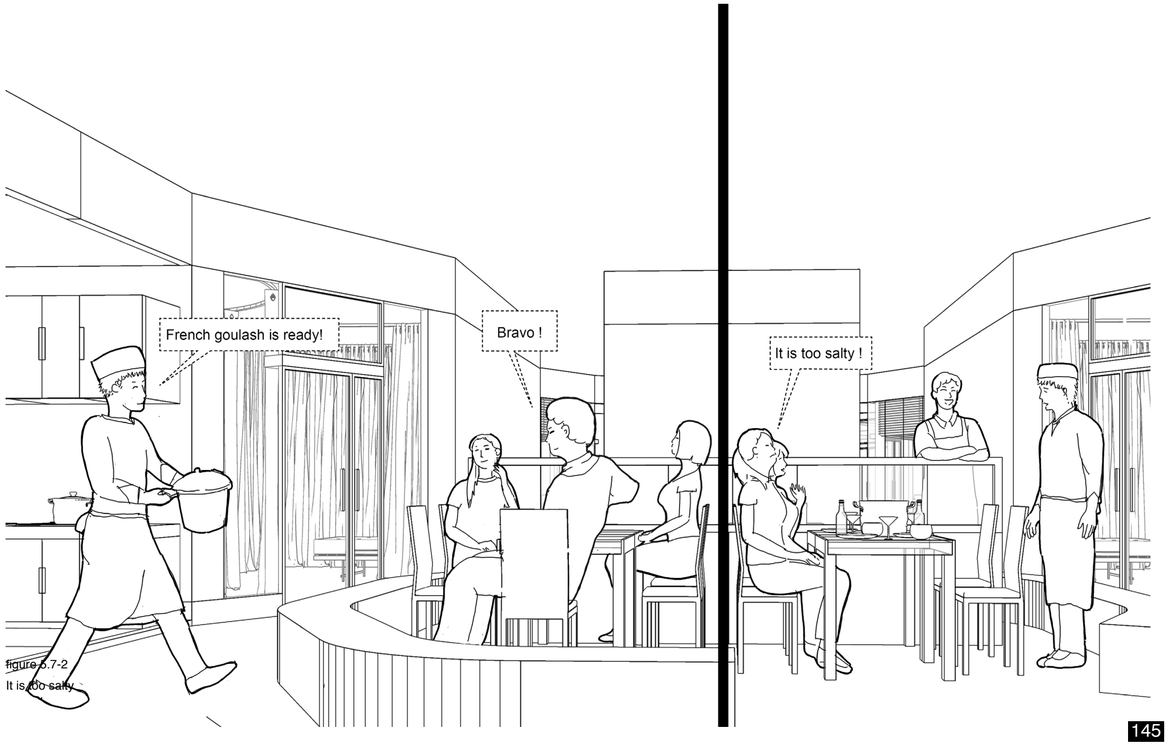


figure 5.7-2
It is too salty

Sometimes the baby's crying will disturb the sleep quality of the two families. Adonis has to wake up in the middle of the night to help with Emily's breastfeeding, or do chores such as changing diapers. Facts have proved that the noise reduction headphones in the room are quite practical for other families. Sometimes, in order to avoid disturbing others at mid-night, Adonis would take the baby to the balcony and close the door, while sitting and watching the scenery outside. (figure 5.8)

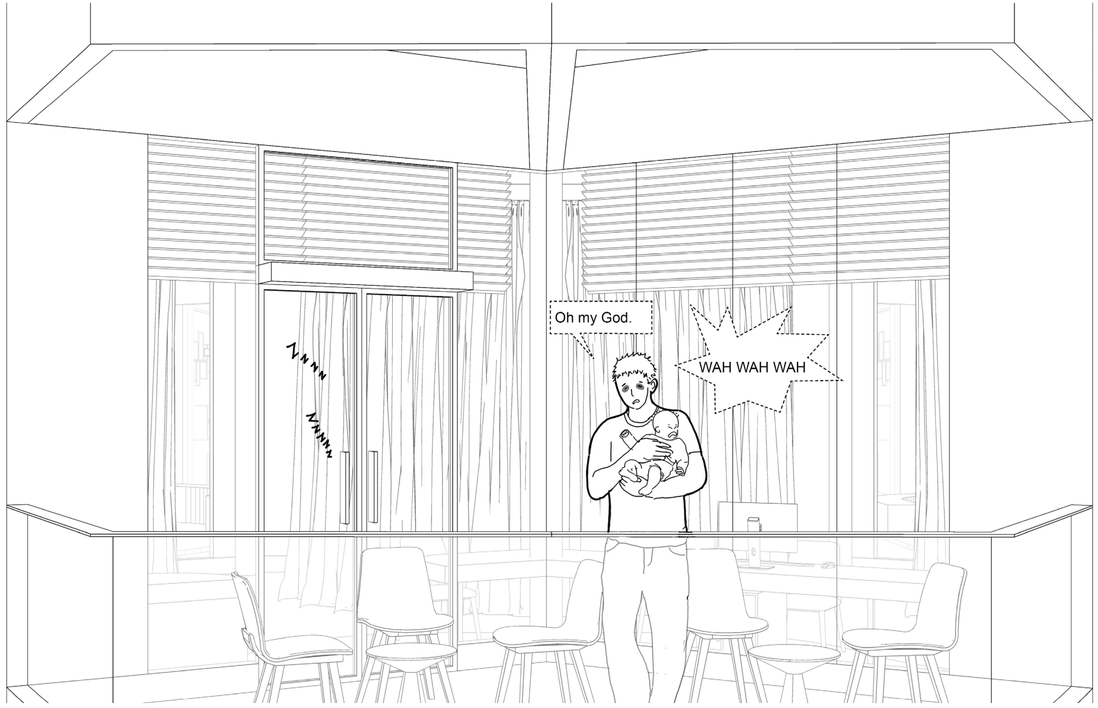


figure 5.8
Baby's crying at midnight

One day, Emily's colleagues were going to visit them in the hospital. Before her arrival, Emily was alone in the toilet, looking at her haggard face in the mirror under the soft light, lamenting the changes brought to her by her pregnancy and the birth of her baby since those 6 months. To this end, with the help of soft lighting, Emily drew light makeup and put on beautiful clothes, ready to meet her old friends. In the living room of the recovery area, Emily saw her friends. They were happy that Emily always kept a nice state. Then they also talked about the trivial things that happened when Emlily was not in the company and laughed relaxedly. (figure 5.9)

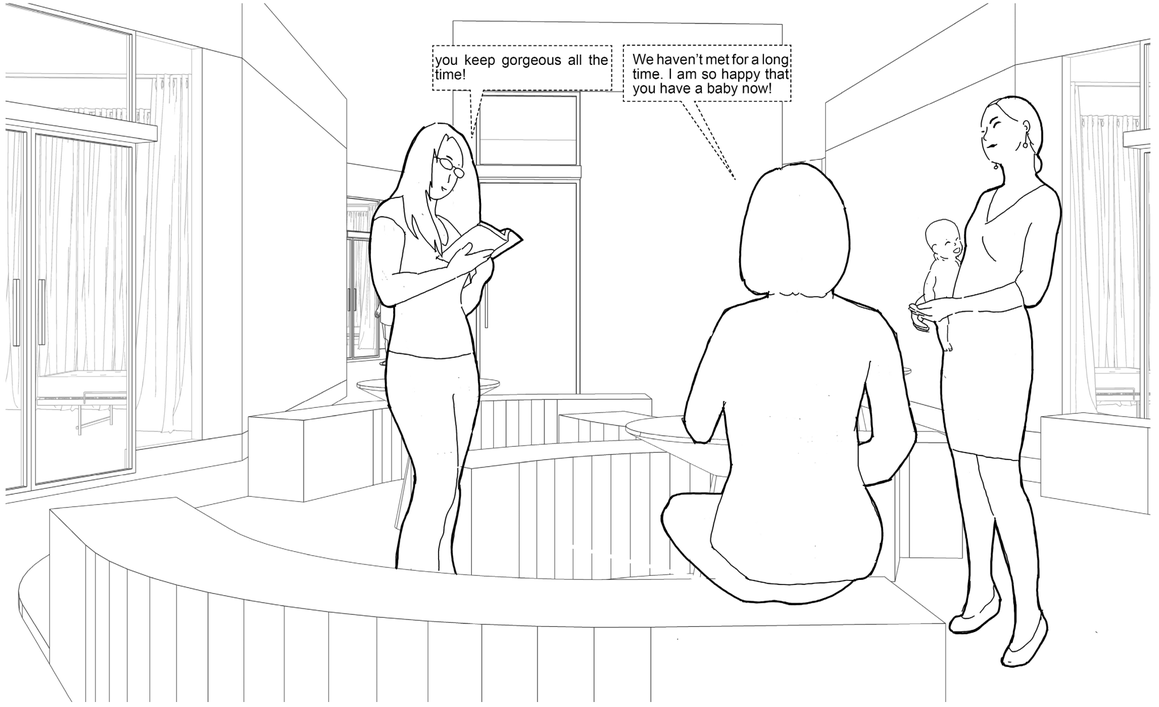


figure 5.9
Friends' visiting

Returning Home

After a few days of postnatal recovery, Emily and Adonis planned to bid farewell to Anna's family and go home to continue the recuperation for half a year.

When they parted, they hugged each other and gave each other little toys.

They still remember that on that day 3 week ago, at sunset, they dragged their suitcases to start a journey of giving birth and now they are still dragging their suitcases, with a noisy but interesting baby, Gerald, on the way to home. (figure 5.10)

figure 5.10
Returning home

Conclusion

The most important purpose of this research is to realize humanized intervention in the healthcare space by proposing the USS approach. From a simple community clinic to a large general hospital comparable to an urban complex, the User - Space - Story system can be effectively applied, and it provides a possibility and feasibility for the direction of humanized design.

In this process of depiction, analysis and design strategy on the healthcare space, the basic research flow is concluded as follows:

1. According to the classification, analysis and summary of the existing medical space, there are 9 basic medical space types tracted, namely ward, outpatient, workstation, reception, waiting, living area, meeting, connective space and outdoors. At the same time, I took the Jiangnan hospital in Chongqing, China as a case study, and used it as a research object to learn and understand the internal connections between different departments and the traffic flow of this complex. The purpose of this part is to show how an existing medical complex can be established on the different kinds of function distribution with effective organization.

2. After summarizing the basic cognition of the hospital in the previous section, I proposed the USS system, namely User - Space - Story, as a means of humanized intervention. In the process of interpreting this concept, on the one hand, I sorted out the interrelationship between the three elements, that is, the two of them have corresponding needs and influences with each other. On the other hand, I interpret and upgrade these three elements separately to provide basis and feasibility for the design strategy.

3. The next step is to provide feasibility for the implementation of the concept. The specific strategies are shown as follows:

3.1. The definition of users, especially patients, which is the target group of humanized intervention. I try to get rid of the social masks that users have had, letting them return to ordinary people with emotions. And then in levels of the physical and psychological, I can stand in their position to understand the appeals of them when they are faced with medical staff, other partners, during the medical activities.

3.2 The design of space is a process of responding to users. With the general knowledge of the functions and the traffic organization of medical space mentioned above, I took the inpatient room as the research object, by reducing it into a pure box without anything inside. Meanwhile, I transform the form of the box from an ordinary cuboid to a hexagon. The box is deformed according to its geometric characteristics, to be upgraded into a new type of future potential medical space as a kind of humanized intervention solution. The hexagons can grow seamlessly because of the characteristics and develop into different forms according to the actual situations. Due to the flexibility of prefabricated components, I try to apply it to the maternity department, that is, take this department as a case, to conduct feasibility operations and inspections of the humanized design based on the USS system.

3.3. The interpretation of the story is a response to the above-mentioned interrelationship between users and space. I conceived the story of a newlywed pregnant woman, Emily, who went to the obstetrics and gynecology hospital with her partner in an uneasy mood. In the maternity department I designed, Emily experienced a major change of her role in her life. I tried my best to keep her in an environment that didn't change much, that is, a home-like environment, where she calmly transformed from a girl to a mother.

The topic of this research gave me an opportunity to learn and understand the knowledge of medical architecture. I enjoyed the process of communicating with my professor and co-supervisor. In addition to the basic medical architecture knowledge, I also learned two points that are important to me. First, I found that through this research, hexagonal space has its unique advantages and great feasibility in prefabricated buildings; second, I think the "people" is always the most important factor in the design process. It is meaningful that the space should be designed to respond to the needs of people so that a better story could happen.

Finally, I have to admit that since this is the method of the USS system that I have proposed for the first time, it is not surprising that there are many deficiencies and lack of details in this research. For example, although the hexagonal module has its flexibility, its unique form also limits the possibilities of other spatial forms and functions, and the corresponding story may not happen. However, as a method that can be used to study the subject of humanization design, it is absolutely not the only way. It is a unique possibility among thousands of solutions. I hope the USS solution can have a position to be developed continually in the field of healthcare space in the future. Its significance is to provide designers and stakeholders with a more imaginative space for discussion rather than as an absolute standard for a certain design, thereby contributing to the people-oriented philosophy.

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