



CONTEMPORARY TRENDS IN PEDIATRIC HOSPITAL DESIGN: A REVIEW OF SELECTED CASE STUDY IN NIGERIA AND THE UK.

Ntoko Nzelle Queency¹, Tonye Dagogo Pepple²

¹MSc Student, Department of Architecture, Rivers State University, Nigeria
E-mail: nzellequeency@gmail.com

²Lecturer, Department of Architecture, Rivers State University, Nigeria
E-mail: tdpeppleassociates@gmail.com

KeyWords

patient protection, family-centered treatment, child-focused design, dynamic matrix.

ABSTRACT

The development boom at children's hospitals is apparent and shows no signs of slowing down. Advances in the treatment of common and rare childhood disorders, as well as associated technological advances, as well as the emphasis on patient security, patient loyalty, and family-centered treatment, are all contributing to the pressure to update, improve, or substitute pediatric healthcare facilities. Almost all of the world's top 25 children's hospitals, according to News & World Report, have recently expanded, are under construction, or are in the planning phases of a major project. Despite this rush of activity, most managers and direct care providers involved in facility building do not have as much information as they would want about the prospects and patterns. A dynamic matrix of health, academic, financial, and political options frequently determines how a facility prioritizes expansion potential, and it is obviously affected by the quantity of knowledge accessible to individuals involved in the planning and design process. This study considers the resources available to today's initiatives and how they will alter the views of patients, families, physicians, and staff members in inpatient institutions in the future. Many of the options mentioned are too new to give substantial data-driven verification of cost, effectiveness, or consequences, but I have supplied such information when feasible.

Introduction

Every hospital attempts to provide the greatest care and the safest environment possible, while also supporting the patients, friends, physicians, and caregivers who serve, dwell, and recover in that facility. Any hospital takes these goals a step further, aiming to be "the most convenient workplace," "the greatest hospital," or "the most wired hospital." Regardless of your own goals, you face the same difficulty as any other hospital: you must prioritize everything on the list of prospective, expected, and necessary improvements, convey the priority, and select the targets to go ahead and implement. Whether it's a new children's hospital, a pediatric clinic, or an outpatient facility, pediatric treatment facility projects have their own set of difficulties and solutions to consider. Designers and architects are entrusted with adding the appropriate layouts, goods, colors, aesthetics, and waiting room designs to assist soothe nerves and lessen stress associated with a young patient's visit to the doctor or hospital. Children's hospitals are distinguished by a greater emphasis on psychosocial support

for children and their families. Some children and adolescents must spend extended amounts of time in hospitals, so having access to play and instructional personnel may be a crucial component of their treatment. Trips to local botanical gardens, zoos, and public libraries, for example, can be arranged through local partnerships.

2. Relevant Literature Review

A healthcare facility, according to the World Health Organization (WHO), is an institution that is comprised of a well-structured hospital and other professional staff, inpatient departments, and other nursing-related services that is open 24 hours a day, seven days a week. In response to a patient's condition caused by chronic infections, ailments, and accidents, the hospital offers a wide range of basic and terminal treatment employing innovative diagnostic and curative operations. The hospital prioritizes research, education, and administration of their services and personnel in order to satisfy the demands of their patients' recovery, health safety, and satisfaction. This has become the drive for these healthcare institutions to collaborate with other economic and technical community sectors in order to optimize the available resources required to increase patient health security. Historical study highlights six major eras that have witnessed the growth of hospital design, ranging from the medieval period to the Virtual health scope (Shepley and Song, 2014). It was also determined that one of the factors driving the creation of these hospital designs was the need for solitude by elite persons throughout their therapeutic procedures, which resulted in a demand for a single room occupancy (Samah et al., 2013)

2.1. Brief History of the Pediatric and Maternity Hospital

The Hôpital des Enfants Malades, or Hospital for Sick Children in English, is widely regarded as the first pediatric hospital in the Western world, having opened in 1802 in Paris. The hospital is well-known for solely caring for patients under the age of 15 years. The establishment of pediatric care clinics in France paved the way for their expansion to other nations throughout Europe. In the nineteenth century, other pediatric hospitals were established in Germany, Russia, Austria, Poland, and England. In 1855, the first hospital for children in the United States was established in Philadelphia. In the 1600s, the Enfants-Trouvés, or Hospital for Found-Children in English, was established in Paris, France. This was the first step in a gradual transition to distinct facilities for the treatment of sick children, apart from adults in hospitals. George Frederic Still was an influential English physician who specialized in children. He produced the treatise *Common Disorders and Diseases of Children*, which guided the practice of many subsequent pediatricians.

2.2. The Pediatric and Maternity Hospital Design Features

Privacy, closeness, and navigation are some of the design characteristics of the hospital physical facility studied in this study. The following are the reviews of these features:

2.2.1 *Play and learning areas*

Play space, as well as instructional space, are essential; they are frequently shared with other activities so that a home-like atmosphere is avoided to promote the natural healing process. This becomes one of the design thesis' principles. This will lead to the development of a CHILD-FOCUSED DESIGN. Indoor and outdoor play spaces will be available. Play space, as well as instructional space, are essential; they are frequently shared with other activities so that a home-like atmosphere is avoided to promote the natural healing process. This becomes one of the design thesis' principles. This will lead to the development of a CHILD-FOCUSED DESIGN. Indoor and outdoor play spaces will be available.

i) Indoor Play Areas Large open floor areas with indoor game amenities will be included in the indoor play

space.

ii) **Outdoor Play Areas** Well-landscaped areas with play equipment will be included in the outdoor spaces. These play spaces generally contain at least one adult-sized seat or bench.

(iii) **Classrooms/Learning Environments** Classrooms are essential in the pediatric ward to allow children to continue their formal education. The incorporation of such a place into the design provides the hospital a more comprehensive and welcoming environment for the children.

2.2.2 *Children and Colour*

The three main colors of red, blue, and green are commonly used in color schemes for children's facilities. These colors, carefully chosen, can be utilized to paint the wards, reception, and other spaces as needed. The combination of colors from the color wheel or chart can be used to make the selection.

Red: Red is considered as a friendly and energetic color that best boosts children's enthusiasm. It might be utilized in a children's playroom with a yellow, orange, or purple color scheme. It should never be used in a child's room.

Green: Green is the color of attention and intellect, it is peaceful in a neutral, good sense, and it is the most restful to the eye. It fosters emotions of well-being and harmony, as well as nature, security, stability, and balance. It is ideally suited for usage in children's learning environments (libraries and classrooms)

Blue: The correct shade of blue is best employed in the hospital's greeting area. It lowers body temperature, reduces the heart rate, and relieves headaches, migraines, and muscular cramps. Because of its relaxing and calming properties, it might be used in a child's bedroom or bathroom.

Yellow: This color energizes, inspires creativity, and stimulates the brain. It dispels thoughts of depression or oppression and replaces them with sensations of warmth and joy. Because of its cheerful and inviting character, it is one of the most acceptable colors for a child's play area. It encourages children's socializing. It should not be utilized in bedrooms since it is not a relaxing color.

2.2.3 *Anthropometrics/Scale:*

The appliances and services utilized in all of the places, such as seats, play goods, tables, cupboards, and bathroom equipment, should be anthropometrically appropriate for the kid.

2.2.4 *Edge Treatment:*

Sharp and rough edges are typically rounded to minimize injury, such as in play areas and classrooms.

3. Methodology

Using the typical case study technique of data gathering, this study intends to analyze and classify the architecture trends of pediatric and maternity facilities in most areas of Nigeria. The Limi Children's Healthcare in Abuja was chosen to assess the hospital facility design available in Nigeria. The noteworthy Alder Hey Children's Hospital in Liverpool, London, was chosen for its outstanding facility design, which allows for efficient people circulation and movement.

3.1 Alder Hey Children Hospital, Liverpool, London.

Alder Hey Children's Hospital and NHS Foundation Trust is located in West Derby, Liverpool, England. It is one

of the largest children's hospitals in the United Kingdom, as well as one of several specialist hospitals in the Liverpool City Region, including the Royal Liverpool University Hospital, Liverpool Women's Hospital, Liverpool Heart and Chest Hospital, the Walton Centre, Mersey Provincial Burns and Plastic Surgery Unit, and Clatterbridge Cancer Centre. The new building's steep, undulating contour has made it easily identifiable, even from a distance: a strong identity that stands in purposeful contrast to the usual concept of a hospital and the institutional aspect of the current Alder Hey, which it replaces.

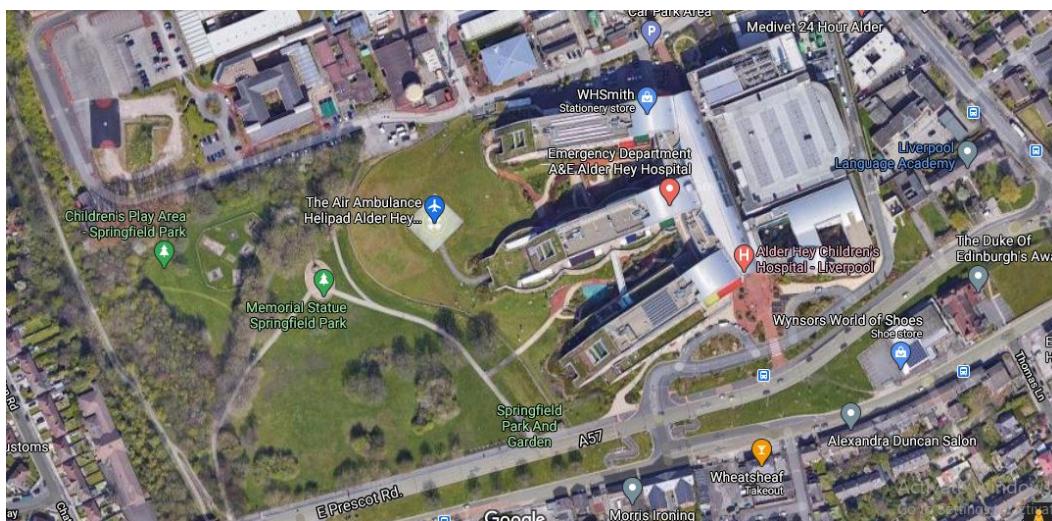


Fig 1: Location of Alder Hey Children hospital

Source: Google map

3.2 The Limi Children's hospital, Abuja, Nigeria.



*Fig 2: Exterior of Limi Children's hospital
(Source: Limi Hospital website)*

Limi Children's Hospital is a recognized pediatric, neonatology, and adolescent medicine speciality hospital. The hospital depends on a wealth of healthcare experience as well as a corporate patient-centered work culture that distinguishes and characterizes each Limi Hospital service location. The Limi Children's Hospital has established itself as Abuja's pioneer designated pediatric specialist healthcare in a unique style that emphasizes health promotion and illness prevention as a vital aspect of our unique approach.



*Fig 2: Location of Limi Children's hospital
Source: Google maps*

4. Current Trends in Pediatric Hospital Design

We intend to be able to discern between those that will be recognized as phenomena and those that will be advantageous enough to become tomorrow's quality of care when we evaluate the five most common patterns in facility development projects at children's hospitals.

The following are the five major themes in today's children's hospital replacement or redevelopment projects:

1. Adaptability
2. Patient Security
3. Beneficial Healing Environment
4. Technology Integration

5. Disaster Preparedness and Security

4.1 *Designing for flexibility*

Without a question, the patient room is the section of a hospital that has seen the largest advancements in the recent decade. The waiting room is experiencing new issues as patients live for days rather than weeks, nursing ratios need less face time between caregiver and patient, and most parents wish to be with their kid 24 hours a day. For many hospitals, increasing the adaptability of these rooms is crucial in order to fulfill occupancy rate requirements and maintain good patient throughput. Moving from semi-private to private patient rooms is the most obvious way to boost bed flexibility and occupancy rate.

This would improve patient happiness (semi-private patient rooms are the primary source of patient dissatisfaction), enhance HIPAA compliance, and maybe reduce hospital-acquired illnesses. There is also a lot of evidence that private rooms (rather than semi-private rooms) reduce noise, allow for more undisturbed sleep, and result in shorter average lengths of stay for some patients. Private rooms, by dividing the caregiver zone, the patient zone, and the family zone, can allow for a more effective and pleasant arrangement. Allowing for three unique zones offers for opportunities to reflect on and enhance the environment for the people of each zone by incorporating design characteristics that suit the potential demands of each community.

The patient zone can include views of nature, customizable room temperature and brightness, and clear and real-time access to media alternatives (music, TV, internet, video). The patient bed should be positioned near the restroom (which has been demonstrated to reduce falls) and at an angle that provides seclusion from the public hallway. A hand washing sink, a small location to set things or write, access to the workstation (if wired), and bedside supplies are all required in the caregiver area. In most situations, the family zone includes seating and sleeping places, phone lines or laptop ports, and, in rare cases, a single television in addition to the patient's television. Personalization areas, such as picture frames and displays, artwork, or particular household products, are growing more popular. Overall, there is a strong motivation to improve patient room conditions and technological capacity, and the current standard for private pediatric patient rooms is 340-400 sq. ft., up from 150-180 sq. ft. barely a decade ago. As a result of research and the desire to improve patient safety and performance, the arrangement of patient areas, or unit structure, is also evolving. Decentralization of nursing units has progressed from a practice to a doctrine.

Some hospitals are decentralizing nursing tasks including supply control, monitoring, and nurse-to-nurse communication to the point where no nursing stations are planned for in new facilities. Instead, they are implementing "team workspaces," which are described as adaptable areas that any caregiver may use to accomplish paperwork, electronically submit documents, answer to emails, and so on. To do this, several hospitals are implementing "charting alcoves," which include a computer workstation or counter for online recordkeeping as well as windows onto two neighboring patient quarters. Others have chosen in-room charting sites, which may be readily put in the caregiver area or next to the patient's bed. Both models often include some kind of in-room supply management structure.

4.2 *Patient safety in design*

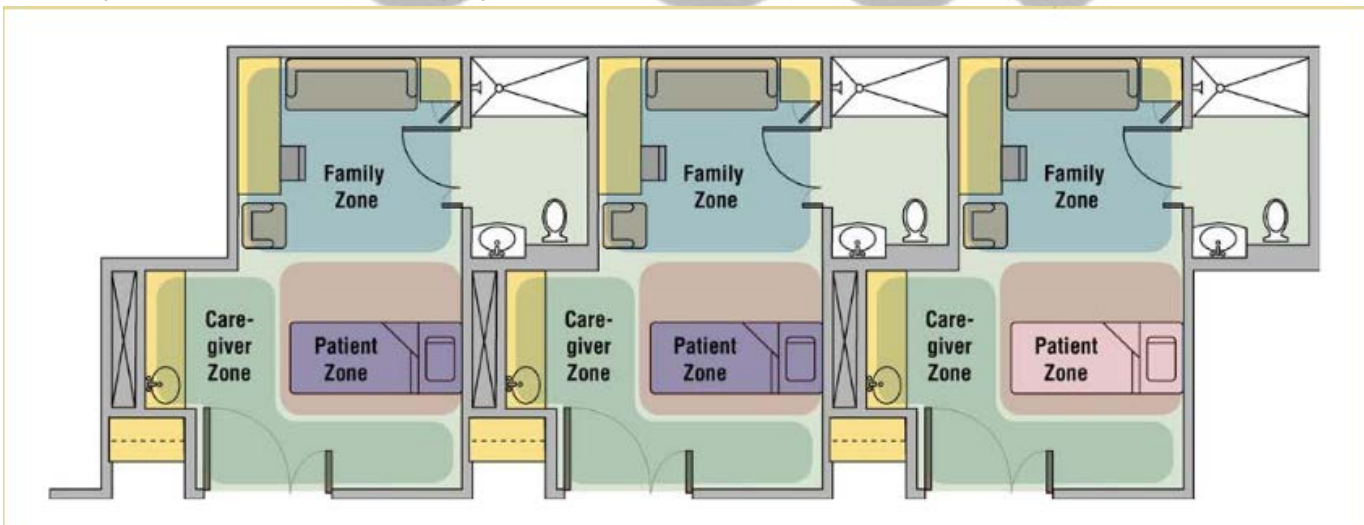
In terms of integrating technology to eliminate medical mistakes in the patient room and the institution, significant progress has been made. The average patient mortality rate at "connected" hospitals is 7.2 percent lower than the rate at non-wired hospitals, according to a 2017 Hospitals & Health Networks / American Hospital Association survey of the 100 "most wired" hospitals in the United States. While the specific link was allegedly unclear at the time, the study sparked controversy by revealing a significant difference across hospitals that made a significant upfront investment in an enhanced way to IT and those that did not. Early applications of technologies at the bedside of the emergency room included bar coded patient recognition bracelets that can be checked to ensure matches with customized, automatic prescription, lab, and equipment bar code labeling taken to the patient.



Proposed Private NICU, Dell Children's Medical Center of Central, Austin, TX

The RFID (Radio Frequency Identification) transformation is already ongoing, allowing hospitals to monitor the condition and specific location of patients, workers, and key equipment. RFID tags are employed, and tag scanners can identify them from up to 600 feet away in the structure. Until previously, hospitals mostly utilized RFID to track supply and service inventory, but the usage of the tags for pharmaceuticals and patients is expanding. CPOE (Computerized Physician Order Entry) software and electronic medical records (EMRs) are two of the most often utilized methods for influencing health care and minimizing medical mistakes (Electronic Medical Records). The most effective "wired" hospitals would employ these in tandem to connect the devices to the payment system and other critical computerized systems.

One of today's most commonly reported standards for designing for patient safety is the uniform, same-handed, equal patient room. Unlike traditional mirror-image spaces, which employ a single plumbing, stack to service two adjoining patient rooms, resulting in shared wall headwalls, this alternative uses two separate plumbing stacks to serve two neighboring patient rooms. Total hospital room standardization means standardizing the placement of the patient, the furniture and equipment, and the location of drugs, even down to the inventory of each drawer of the supply closet.



There is also a scarcity of data from children's hospitals to support the claim that comparable rooms reduce medical errors, albeit this is due to a dearth of units in use now rather than a lack of testing commitment. Both health services experts and health care system designers believe that if this configuration choice is widely adopted and data with larger sample sizes and a variety of different acuity levels and healthcare styles can be produced, there will be extensive proof that this element not only matters, but has a significant direct effect on patient outcome measures.

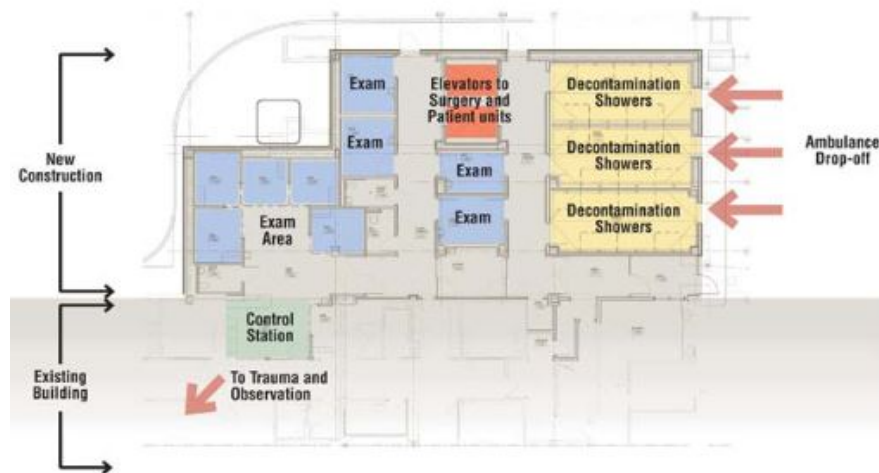
4.3 Optimal Healing Environments

The proof that design matters is beginning to transform the healthcare experience for everyone who steps foot in a hospital. Many architectural issues impacting the patient room have already been examined, and others will be discussed further here. They demonstrate that healing environments are no longer limited to the greatest spas and opulent VIP hospital rooms. The relationship between the therapeutic environment and patient progress, staff morale, and everyone's enjoyment is recorded for each new Project.

The finest future patient care facilities will be operationally and aesthetically balanced, family-centered, and provide constructive diversions such as water features, relaxing music, amusing noises, and access to art as well as indoor and outdoor therapeutic gardens. Both of these factors are related with shorter hospital stays, increased patient retention, and better quality of life for hospital patients. Choosing materials that reduce noise has shown comparable results, as well as extra benefits such as lower blood pressure and better sleep. Natural light is also important in creating an ideal therapeutic environment, since it has been shown that integrating natural light into a facility leads in higher efficiency, improved physical health, reduced absenteeism, and increased work satisfaction for hospital employees.

Hospitals continue to learn from the customer service excellence seen in premier hotel organizations. Amenity-rich lobbies and public spaces are quickly becoming core elements in new hospital development, including hotel-style registration desks, receptionist customer service staff and navigation assistants, education community meeting space, resource centers with libraries, collaboration and business necessities, and quiet places for respite.

4.4 Security and disaster preparedness



The amount of disaster preparedness and mass-casualty readiness that a hospital must accomplish is highly reliant on the hazards that it faces in its immediate surroundings, surrounding community, and region as a whole. Children's hospitals in big cities, as well as major academic referral institutions, must invest extensively in building a culture of readiness and an emergency management strategy for any natural or man-made crisis. Despite the widespread public awareness of the importance of this degree of preparation, most children's hospitals are more concerned with day-to-day security, and rightly so. Institutions building new or replacement facilities can also design the facility with a safer orientation in mind, such as requiring key cards for access to diagnostic and treatment areas or patient units, limiting non-essential traffic to public areas, positioning concierge and customer service desks with visual access to elevators and key corridors, separating public traffic from hospital personnel, equipment, and patient traffic, and requiring key cards for access to diagnostic and treatment areas or patient units. Rethinking elevator utilization in catastrophes is a fresh subject that might have a substantial influence on hospital architecture.



4.5 Technology Integration

In a word, the Modern Hospital age has come, as has the digital divide. Those "early integrators" are up and running and on to the next big thing, while the great majority of hospitals and health systems are still contemplating whether the time has come to make the significant commitment to a fully automated, digital, wireless, and paperless hospital. In a word, the Modern Hospital age has come, as has the digital divide. Those "early integrators" are fully operational and on to the next big thing, while the vast majority of hospitals and health systems are still debating whether the time has come to make the significant investment in a fully automated, digital, wireless, and transparent hospital.

Some hospitals have implemented "e-ICUs," which offer monitoring systems of ICU patients through camera systems and screens showing vital signs, diagnosis, advancement, and doctors' notes, by nurses and doctors located in a room of monitors on- or off-site, for those concerned about the decentralization of nursing practice and its potential impact on the ability to track patients centrally. e-ICUs are not designed to replace direct care-takers, but rather to provide the assistance of another set of eyes.



Phoenix Children's Hospital Phoenix, AZ

The e-ICU has two-way communication capacity, allowing it to reply to patient requests and ask questions of the patient, as well as determine whether the direct care nurse has to be taken away from her work to attend to this patient urgently. Early feedback indicates that both patients and doctors are pleased with this additional layer of care. Perhaps the greatest significant improvement in healthcare science is yet to come. It is critical to have shelled or "warm" areas that can be modified to support new appliances or systems in the future. While these sorts of rooms may initially increase project expenses, the long-term benefits are significant.

4. Conclusions and Recommendations

This study identified design patterns of world-class pediatric and maternity hospitals in Nigeria and the United Kingdom in order to boost the productivity of the hospital's medical and therapeutic services. The Alder Hey

Children's Hospital in the United Kingdom was chosen as the hospital from a developed country. Flexibility, patient safety, healing environments, technological integration, security, and catastrophe readiness are the design elements explored from the exceptional facility. The Limi Children's Hospital was investigated in order to determine the design qualities that are available in tropical climates. It has been discovered that discrepancies in tropical hospital designs can be corrected using the outcomes of famous and well-developed institutions.

As a result, it is critical for healthcare designers to evaluate the implications of facility layouts on the performance of medical services and patient happiness. An adaptive design can help reduce medical mistakes by improving access to emergency and routine medical activities. Furthermore, the easy circulation and mobility of patients, workers, visitors, and other medical equipment throughout the institution will make a healthcare center successful in all of its services.

References

- [1] A,Eagle (2015) Holistic health care that caters to children of every age.
- [2] Aydın, Dicle & Yıldız, Esra & Büyükşahin, Süheyla. (2017). Sustainable Hospital Design for Sustainable Development.
- [3] H. Poor, "A Hypertext History of Multiuser Dimensions," *MUD History*, <http://www.ccs.neu.edu/home/pb/mud-history.html>. 1986. (URL link *include year)
- [4] B, Sawyerr (2010) Pediatric centre – a new design approach
- [5] Bossink, B.A.G. (2004) Managing Drivers of Innovation in Construction Networks, *Journal of Construction Engineering and Management*, ASCE, 130(3), 337-345C. J. Kaufman, Rocky Mountain Research Laboratories, Boulder, Colo., personal communication, 1992. (Personal communication)
- [6] Clare Cooper Marcus and Carolyn Francis (1998). *People Places: Design Guidelines for Urban Open Spaces*, John Wiley and Sons, Inc. (pg 260)
- [7] Depart of Health (2004). *The NHS Improvement Plan Putting People at Heart of Public Services*, London, UK: HMSO.
- [8] Frampton, Gilpin, Charmel P Jossey-Bass. (2003) *Putting Patients First: Designing and Practicing Patient-Centered Care*
- [9] Karlsberger.(2005) *Current Trends in Pediatric Hospital Design: Are they right for your organization?*
- [10] Limi Children's Hospital (2020) Limi Children's hospital, <https://limichildrenshospital.com/about/#>
- [11] Reiling J, Hughes RG, Murphy MR. (2008) *The Impact of Facility Design on Patient Safety*. In: Hughes RG, editor. *Patient Safety and Quality: An Evidence-Based Handbook for Nurses*. Rockville (MD): Agency for Healthcare Research and Quality (US); Apr. Chapter 28. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK2633/>
- [12] Steinke, C. (2015). *Assessing the physical service setting: A look at emergency departments*. *Health Environment Research and Design Journal*, 8, 31–42.
- [13] Wang, Z., Downs, B., Farrell, A., Cook, K., Hourihan, P., & McCreery, S. (2013). *Role of a service corridor in ICU noise control, staff stress, and staff satisfaction: Environmental research of an academic medical center*. *Health Environments Research & Design*, 6, 80–94.
- [14] World Health Organization (2015) *Standards for improving the quality of care for children and young adolescents in health facilities*. Geneva; License: CC BY-NC-SA 3.0 IGO