ARCHITECTURAL RESPONSE TO EMERGENCY CARE IN THE DESIGN OF ABUJA GENERAL HOSPITAL

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DECLARATION

I declare that the work in this thesis entitled **'ARCHITECTURAL RESPONSE TO EMERGENCY CARE IN THE DESIGN OF ABUJA GENERAL HOSPITAL'** has been carried out by me in the department of Architecture. The information derived from the literature has been duly acknowledged in the text and a list of references provided. No part of this thesis was previously presented for another degree or diploma at this or any other institution.

OLOCHE Matthew Oloche _____ _____

Signature Date

CERTIFICATION

This thesis entitled ‘ARCHITECTURAL RESPONSE TO EMERGENCY CARE IN THE DESIGN OF ABUJA GENERAL HOSPITAL’ by Oloche Matthew OLOCHE meets the regulation governing the award of the degree of Masters of Science in Architecture of the Ahmadu Bello University, and is approved for its contribution to knowledge and literary presentation.

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ABSTRACT

Emergency care has been a vital part of Public Health supporting any thriving society for as long as hospital has been in existence. More than 960 years later, such influence is still apparent and is regarded as the front gate demonstrating capacity and capability of medical infrastructure in providing prompt and acute medical relief of threat to health. Such capacity and capability is considered to have immense contribution when delivered efficiently to reduction of needless and preventable deaths in General Hospitals across the broad spectrum of public health and wellness. Contextualizing this situation to the Nigerian Secondary health cannot be over-emphasized.

Four General Hospitals were visited as case studies across the six local government area of the FCT, Abuja to investigate the current trend in Emergency care in General Hospitals. The cases visited included Asokoro, Wuse, Kuje and Kwali General Hospitals. Data from the aforementioned cases were collected via semi structured interviews, unobtrusive observation and supported with literature review to improve validation. The contents from the observation tool were analyzed 'descriptively' and contents from the interview tool analyzed 'interpretatively'. Results were presented descriptively with charts, tables and plates. Result findings revealed key design concepts aiding prompt delivery of emergency care as 'Isolation', 'Decentralization' and 'Centralization' and aided the development of a framework. The framework is applied to General Hospital settings to reduce over dependence on centralized circulation, lack of capacity to care for multiple emergency cases and distant proximity/ non availability of vital units to and in emergency departments.

The framework is developed to assist architects, planners and Hospital management in designs of General Hospitals with improved emergency care in emergency departments with significant benefits to patients, donor agencies, staffs, visitors and Hospital management.

The extent of the application of the framework is demonstrated in a design of an Abuja General Hospital in Lugbe; a fast developing and densely populated suburban settlement on the outskirts of Abuja town. Dense population, close proximity to the town and the airport are important criteria to selection of Lugbe town in order to attract patronage.

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND TO THE STUDY

An Emergency Department (ED) also referred to as 'Accident and Emergency' (A&E) or 'Casualty Department' and is usually a medical treatment facility of a Hospital or Primary health care specialized in the prompt or acute care of patients who present prior without appointment by their own means or by ambulance. In over forty years, the Hospital ED has remarkably transformed into a highly effective setting for urgent and lifesaving care, as well as also a core provider for ambulatory care in significant number of communities (HCS, 2007). Emergency Department is the coming together of extra ordinary range of capabilities operating every hour of every day of the week. But prior to the 1960s, emergency rooms were often underequipped, poorly staffed, poorly supervised and significantly ignored.

The Byzantine Empire is credited to have invented the modern hospital as we have it today. Since its collapse in the 14th century, the architecture of hospital has continued to evolve and Universities developed in Western Europe that could be classed as medical schools. Technology continued to improve as seen remarkably during the industrial revolution that started in Britain in the 18th century, causing widespread changes in the socio- cultural lifestyles of the people. This evolution increased the complexity of Hospital requirement and its ED prompting an upgrade in its Architecture and planning. Architecture is a vital means that connects technology to the socio-cultural lifestyle of its people. Its contribution to the evolution of the hospital and its ED today cannot be over emphasized.

A fundamental requirement of a Hospital is to provide prompt and efficient healthcare service.

Since patient know little about ED principles such as triage priorities, treatment protocols and staff assignment, recent surveys reveal clearly that what patient care most about is 'immediate attention'.

'Immediate attention' is described in the realms of Patient's waiting time. Improved average waiting time leads to higher patient satisfaction. Patient satisfaction is an important measure of healthcare quality because it offers information on the provider's success at meeting the expectations of most relevance to the client. This becomes vital because of the present era of 'Medical consumerism'. Evaluation of patient's satisfaction has become increasingly important to healthcare providers.

The Nigerian Government in its effort to make healthcare available to all, created the three tiers of healthcare namely; The Tertiary tier made up of the University Teaching Hospitals and Federal Medical centres, the Secondary tier, made up of General Hospitals and the Primary tier (Primary health care) (Asuzu, M.C., 2005). These three tiers should enjoy patronage from clients. A good Referral system is designed to link the tiers up (Irwin,1991 in Akande, 2004).

In Nigeria however, Tertiary institutions are unendingly crowded with patients with ailments, accidents or incidences that could and should have been managed in Secondary health facilities (Dahiru, 2009).

A report on Referral system in Nigeria at the University of Ilorin teaching Hospital noted that 80 percent of patients report at the Hospital between 6.00am and 2.00pm at exactly same time as Primary healthcare centers and General Hospitals are open for services. A

sizable amount of these patients seen at the Emergency units were not there due to the emergency nature of their health problems (Osibogun, 1996 in Akande, 2004).

So why do patients by-pass General Hospitals for Tertiary health institutions? The Federal Ministry of Health, 2005 in its report on Problems and Strategies for strengthening the structure of Secondary health institutions in Nigeria notes the following among others as critical issues;

i. Legislation
ii. Structure
iii. Human resource

The report highlights under 'Structure' the following problems;

i. Dilapidated buildings
ii. Uneven distribution of facilities
iii. Inadequate maintenance

Concluding, the report posits one of the important strategy to strengthen the Secondary healthcare structures as;

i. Developing a national standard design of a Secondary Healthcare facility in terms of physical structures to be used by stakeholders.

The goal of an effective emergency system should be to provide universal emergency care; emergency care available to all who need it (Kobusingye, Hyder, Bishai, Hicks, Mock, Joshipura, 2005). In low and middle income countries, Emergency is given low priority in the Health sector with the most common perception that Emergency care is inherently expensive; another myth is equating the role of care provided in

health centres to Ambulances with focus on transport (Kobusingye, et al, 2005). These myths focuses attention on the high technology end of clinical care as opposed to strategies that is simple and effective. Efforts to improve emergency care however need not lead to significantly increased costs.

1.2 STATEMENT OF THE PROBLEM

The world Health Organization describes emergency departments as the basic unit of international Medicine but with often differing fundamental features based on resource limited settings. The patient management in the emergency department of any hospital is a known performer indicator of the standard of healthcare of the facilities.

In Nigeria, General Hospitals which are secondary health institution funded by the State Governments and the FCT in the case of Abuja adopts the traditional concept of healthcare design, which divides Hospital operations into four Departments namely; the Outpatient, Diagnostic and Treatment, Inpatient and Services Departments as illustrated in Figure 1.1. The Diagnostic and Treatment enjoys the most emphasis in Nigerian General Hospitals.

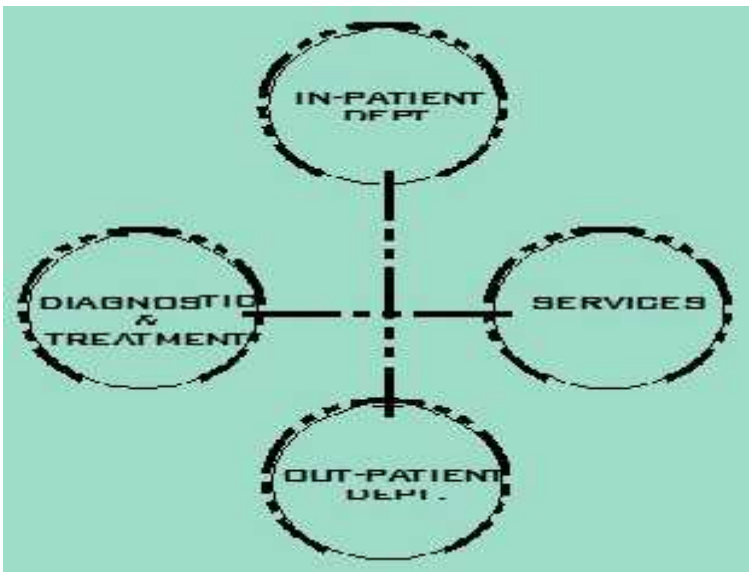


Figure 1.1: Classification of Hospital Operations in Secondary Healthcare facilities

(Source: Author)

The Emergency Department is a unit amongst other units such as the General Clinic, Medical Records, Radiology, and in bigger hospitals includes Cardiology, Neurology, Orthopedic, and Gastroenterology, all of which are located within the Outpatient Department as shown in figure 1.2 below.

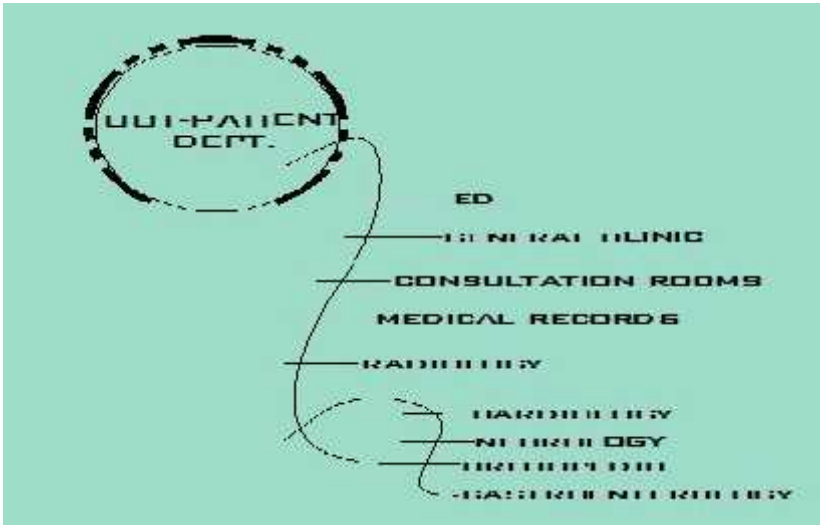


Figure 1.2: Illustration showing units within the out-patient department
(Source: Author)

In an already crowded outpatient department, the emergency Department is not Prioritized and considered only a unit with very little or no emphasis. Therefore, emergency hallways and lobbies are crowded with many vital activities all sharing same services such as ingress/egress, circulation, power, and water. There exist no adequate provision for multiple case emergencies and vital units such as x-ray and blood banks are often separated from the emergency rooms. These, ultimately sums up to reduce quick dispensation of needed emergency, increasing length of time (waiting time) and preventable casualties.

The Nigerian General Hospital ED is weak in emergency response, underutilized, low in capacity and grossly inefficient. The world health organization currently rates Nigeria's healthcare delivery a paltry 187 out of 191 countries (World Bank, 2009).

Therefore this study seeks to assess the architectural response to emergency care in the designs of ED facilities in Nigerian General Hospitals with the aim of developing a framework/ model.

1.3 AIM AND OBJECTIVES

1.3.1 Aim

The aim of this study is to assess the Architectural Response to Emergency care in Emergency Departments to facilitate development of a framework in designs of General Hospitals.

1.3.2 Objectives

The study objectives include:

i. To review the current issues regarding General Hospital designs with particular emphasis on ED.
ii. To determine the extent which architecture can aid prompt effective delivery of Emergency.
iii. To develop a Model/framework that will assist architects particularly in Nigeria in the design of General Hospital with Efficient Emergency Departments.
iv. To demonstrate the suitability of the frameworks in the design of a model General Hospital.

1.4 RESEARCH QUESTIONS

I. What is the current trend of emergency delivery in General Hospitals in Nigeria?
II. To what extent can architecture aid prompt emergencies in General Hospitals in Nigeria?

III. How can the frameworks be applicable in General Hospital setting?

IV. How suitable in General hospital designs is the framework (with particular emphasis to the EDs)?

1.5 SCOPE

The Research emphasis will be on its EDs and will involve the major departments that make up a General Hospital such as the Inpatient, Diagnostics and Treatment, Outpatient and Services Departments.

1.6 JUSTIFICATION

Health systems are designed to provide health services for the sustenance of a healthy population. In order for the health sector to perform excellently, achieving this objective involves participation of the various tiers of the health system (World Health Report, 2000).

For effective emergency, emergency care needs to be thoroughly planned and supported at all tiers – at the national, provincial and community levels. It should take into account the entire spectrum of care, from the occurrence of an acute medical event in the community to the provision of emergency care at the hospital with different resource availability (Kobusingye, et al., 2005).

Therefore, this study will create a model that will assist Architects, Planners and Hospital Administrators in designing and developing General Hospitals with improved and efficient emergency departments. Management, Donor Agencies and patients stand to benefit from higher efficiency, greater production and better quality service.

CHAPTER TWO

LITERATURE REVIEW

The goal of Literature review is to situate the current study within the body of literature and to provide context. This review starts from the origin; the concept of health, which provides a unique insight to the varying meanings of health from the ancient times to the 21st century. The chapter then reviews the current trend of Emergency delivery in the Nigerian context. The Paradigms of patient's satisfaction to emergency care and General Hospitals in Nigeria are subsequently reviewed. The next part of this review takes a detailed review on the Architecture. Starting with the architecture of the Hospital which provides an interesting background to the evolution of architecture for healthcare over centuries and culminating in the concept of Universal Design in modern hospitals. Finally the Architecture concludes with the Emergency department. The chapter ends with a review of similar studies.

2.1 THE CONCEPT OF HEALTH

The world health organization in 1946 defined health as a state of complete physical, mental, social wellbeing and not merely the absence of Disease and infirmity (WHO, 2006). Though this is the most used definition, it however raises questions as it lacks an operational value and because of the issues posed by the use of the word 'complete' (Callahan, 1973; Jalad, O'Grady, 2008). Thus several definition of health have been proposed most notably by Bellieni and Buonocore, it is however universally accepted that health is a general condition of a person's mind and body. Health is linked to quality of life as it is widely recognized that intelligent lifestyle choices of the individual and society are very important to health (WHO, 2011).

Determinants of health posited by the world health organization include income and social status, social support networks, education and literacy, employment/working conditions, social environments, and physical environments among a few others. Organized efforts and informed choices of society, organizations, public and private communities and individuals awareness to the science and prevention of diseases, prolonging life and sustaining health is described as 'public health' (Winslow, 1920). It is posited that public health is critically concerned with threats to the overall health of a community (Childress, Faden, Gaare , 2002). An important aspect of public health is emergencies. Emergency in a broader sense is a situation that poses immediate risk to health, life, property or environment (Merriam- Webster, 2011).

It is a widely recognized fact that good public health contributes to life expectancy. Figure 2.1 below shows the life expectancies of Japan, China and India. The curve of china's life expectancy in figure 2.1 clearly shows that as at 2010, China had the second number of oldest people in the world second only to Japan in Asia (NBS, 2012). The life expectancy among Chinese male stands at 72.38 years and women 77.37 years. The National census results showed that the population of Chinese people 60 years and above accounted for 13.26% of the 1.33 billion populations of Chinese people (NBS, 2012).

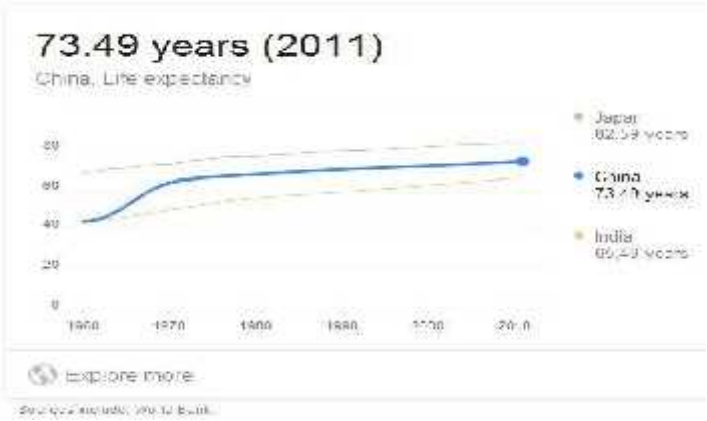


Figure 2.1: China, Life expectancy
(Source: Willy Lam, China Brief, Jamestown Foundation, May 6, 2011)

This according to the census report was attributed to improved health and medicine and rapid economic development. By 2030, China will surpass Japan with the highest population of oldest people in Asia (Wily lam, 2011). The united Nation estimates that by 2050, the Chinese society will enter into a phase of severe agedness (CASS, 2012). Evidences from this statistics reveal that generally the Chinese people live quite long and this is attributed to low birth-rate and improved medical care. Medical care has been a vital part of China and its origin stems from ancient Chinese healthcare and medicine. A brief review of health in ancient Chinese civilization with other ancient civilizations through the Middle Ages and to the 21st century gives a good insight to what health means and its concept.

The ancient Chinese concept of health reaches far beyond the mere absence of symptoms to include the presence of strong vital energy known as 'Qi' (Koln, 2011). A steady Harmonious and active flow of Qi produces harmony in the body and a balance state of being in the human. Personal health is often equated to health in nature and this is asserted to create long life or 'longitivity'. The foundational pillar of all longitivity techniques in the Ancient Chinese culture is known as the art of 'Yang sheng' which proposes a regular lifestyle in moderation. This meant adapting oneself to the seasons and natural environments and excluding excess in any form or shape. This moderation meant observing frameworks for healthy living (Koln, 2011). Summarily, the ancient Chinese understood and welcomed the concept of health that included physical wellbeing, psychological balance and social harmonies as well as extended longitivity.

Ancient Egypt was another civilization that had a strong influence on medieval and modern healthcare. Great Greek physicians like Hippocrates and later Galen all studied at the temple of Amenhotep and all positively acknowledged the important

contribution of Egyptian healthcare on Greek health system. Greek Historian called Herodotus who visited Egypt in 440BC wrote significantly on his observation of Egyptian medical practices. Studies revealed that health in Egypt was greatly influence by providing clean water and sanitation; this was known to significantly reduce healthcare cost. For ages, people had realized the importance of clean water. A tomb from Ancient Egypt dated to 1450 BC depicts an elaborately filtering system. Subsequently, the ancient Greeks and Romans devoted a lot of energy and resource to clean water.

In the middle ages; a period in the history of Europe that lasted from about AD 350 to about 1450, healthcare systems was revealed to be inadequate. Despite the influence from Ancient Egyptians, Greeks and Romans, most notably Greek physicians like Pliny the Elder, Hippocrates (Father of Medicine), Herophilos, Erasistratus and later Galen. Medical knowledge appeared to have stalled and did not develop at the same pace until the 17^{th}/ 18^{th} century and these were acknowledged by later literatures. By the 14^{th} century, universities had developed in Western Europe that could be classified to as Medical Schools, an example of such a university was University of Montpellier in France. Scholars believed that nevertheless, some progress were made as students were encouraged to challenge the principles set by Galen and Hippocrates. Also the Roman Catholic Church dominated and directed what direction the medical world took. This period according to historians was a period where healthcare and medicine took an acute dive into superstition. The underlining concept derived from the Greeks and Romans during medieval era was that the human body was seen as part of the universe. The concept posits four humors or body fluids which had to be balanced to achieve good health.

These four humours or fluids were; Fire – yellow bile, Water – Phlegm, Earth – Black bile, Air – Blood.

Too much of any of the fluids was thought to cause a change in personality.

The population of medieval towns increased, overall, but the hygienic conditions worsened. Medical knowledge was limited despite the efforts of medical practitioners. Summarily, Medieval Europe did not have an adequate health care system.

The 18th century was the period of the industrial revolution, an era that was recognized by dramatic social, economic and technological changes (Lucas and Robert, 2002). This period was defined by rapid transition from an Agrarian to an industrial society. However, despite the technological and socio-economic advancement through mechanization of Agriculture, Factories and Transportation systems, public health conditions deteriorated and sanitary conditions were horrible. The massive explosion of urban growth posed unforeseen sanitary and public health problems. A problem created by over crowded cities as a result of large number of people emigrating from the rural areas. There was rapid spread of diseases such as tuberculosis and cholera, creating Epidemics especially among the poorer class. As concerns grew about the health crises, administrators and reformers began the process of remedying the situation. The Public health act of 1848 was passed based on the result findings of Chadwick's sanitary report (Lucas and Robert, 2002). The government introduced improvement in sanitary and social conditions such as proper sewage, regular garbage collection and creation of parks.

Subsequently the 19th and 20th century marked an increase in public health departments and public health inspectors reinforced the laws. Public health service was financed by taxation. The quality of life witnessed an improvement.

The 21st century was the era of Globalization which affected countries with less developed economies (International Journal for quality in health care, 2005). Globalization in healthcare can be seen in the realm of;

I. Circulation of health professionals
II. Development of Medical curricula in less developed nations adapted to North Americans or Western European Standards
III. Circulation of patients (Medical Tourism).

Though healthcare has been globalized, it cannot be assumed to be same as any other basic good. Notable practitioners argue that linked to healthcare is a complex web of Ethical, Cultural and Human Resource issues. It therefore remains imperative to heed caution in the globalization of healthcare and Professional Medical education.

2.2 CURRENT TREND OF EMERGENCY DELIVERY IN NIGERIA

The organizational structure of the Nigerian health system shares responsibility of health between the three levels of Government; Federal, State and local Government (Adeyemo, 2005; Alvarado, 2006). Adeyemo (2005) notes that this organizational design is created to allow health programs to be adapted to local population needs, raise community integration, mobilize local resources and improve service delivery. Studies however indicate that such delegation of responsibility may not however necessarily influence hospital efficiency (Bradford and Cray Craft, 1996; Linna, 1998; Steinman and Zweifel, 2003).

These three levels should enjoy patronage from clients. A good referral system basically links them (Irvine, 1991 in Akande, 2004). But however in Nigeria, many tertiary health institutions are crowded with patients with ailments that could and should have been managed in secondary health institutions such as General Hospitals while health workers in these hospitals (General Hospitals and Primary health care centers) remain idle (Osibogun, 1996 in Akande, 2004). In the ideal system, the primary health centers should be the first contact with patients. Patients are thereafter referred to higher health institutions by the physician/nurse or health worker if the case warrants (Federal Ministry of Health, 2000). This is the system known as Referral.

Referral is a process by which health workers transfers the responsibility of care temporary or permanently to another health professional or Social worker (Ransome-Kuti, Sorungbe, Oyegbite, 1998 in Akande, 2004). A patient might directly or indirectly present to a Hospital through emergencies or self-referral after which the physician/nurse may refer the patient to other tiers of Healthcare (Akande, 2004).

A report on Referral system in Nigeria at the University of Ilorin teaching Hospital Nigeria, noted that 80 percent of patients report at the Hospital between 6.00am and 2.00pm at exactly same time as Primary healthcare centers and General Hospitals are open for services. A sizable amount of these patients seen at the Emergency units were not there due to the emergency nature of their health problems (Akande, 2004). An insight to reasons patients bypass lower levels of healthcare delivery is documented in the report by the Federal Ministry of Health 2005 on strategies for strengthening the Secondary healthcare delivery service. An extract from the report highlighted a few of the basic problems and strategies to improve the delivery system and is shown in table 2.1.

Table 2.1: Report of the National Task Force on Secondary Health Care.

GOAL	PROBLEMS	STRATEGIES
To improve the Secondary Health Care Delivery System in Nigeria	(1) **LEGISLATION** Due to lack of legislation, all the stakeholders involved in providing	(a) To use National Health Policy & HSR documents as a "basic framework to develop & pass
	the Secondary Health Service have not been performing their roles & responsibilities according to policy guidelines.	National Health Act. (b) The State Bill should be derived from the National Health Policy such that the Secondary Health Care System is given priority attention. (c) Bodies shall be set up for the implementation at both Federal & States levels and collaboration between the two should be encouraged. (d) Collaboration between the bodies responsible for monitoring and evaluation (M & E) at the Federal & States should be encouraged.
	(2) **STRUCTURES** • Most of the buildings are dilapidated • Uneven distribution of facilities • Inadequate maintenance culture • Abandoned projects • Lack of optimal use of facilities	(a) To develop a national standard design of a SHC facility in terms of physical structures to be used by the stackholders. (b) Classification of SHC facilities should determine minimum number of Departments in each faculty. (c) There should be at least one well equipped and functional SHC facility in each LGA in the state, and the location should be based on need; (d) Competent professionals to be involved in the design & building of these facilities; (e) Adequate funds should be provided for the completion &
	(5) **HUMAN RESOURCES** • shortage of skilled staff • lack of continuing education (capacity building) • poor motivation/incentives • wrong distribution	• Recruitment should be based on location & needs of the various Hospitals. • On the job & in service training should be encouraged. • Incentives provided for rural posting; • Salaries & wages should be paid regularly. • Development of and adherence

Source: Federal Ministry of Health (2005).

The issues highlighted in the table of the above suggest some of the problems associated with secondary healthcare facilities. These issues among a few others indicate why patients bypass the General Hospitals for University teaching hospitals or Tertiary health institutions. This is the current trend in the Nigerian Healthcare system.

However, it should also be noted that the Nigerian General Hospital conforms to the traditional concept of healthcare which categorizes the hospitals into four main categories namely; the outpatient, inpatient, diagnostic and treatment, and the auxiliary services (Abiodun, 2010). The emergency department is usually located as a unit in the outpatient department. This arrangement crowds the outpatient department and the department struggles to cope with the increased movement and circulation from other units usually still located in the outpatient department. Such units include; reception, clinics, waiting areas, shops, pharmacy, radiology, cardiology, medical records and neurology. Abiodun (2010) observes that the movement and communication of people, materials and waste are inextricably intertwined. The physical configuration of the hospital and its transportation system are intertwined. It is therefore inferred from studies and critical observation that the Nigerian General hospital also heavily relies on its transportation system to disperse services. This results to inefficiency and subsequently lack of patronage.

2.3 PATIENT'S SATISFACTION TO EMERGENCY CARE

Patient's satisfaction is an important measure of healthcare quality because it provides information on the provider's success in achieving the expectations of most relevance to the client (Donabedian, 1983, Taylor and Cameron, 2000). With the present era of increasing medical consumerism, evaluation of patient's satisfaction has become steadily important for healthcare providers (Sun, Adams, Orav, Rucker, Brennar, Burstin, 2000). Emergency can be seen as a gateway to and marketing machinery for Hospitals.

Patient's satisfaction is complicated by the high volume of patients, time consuming queues, and intricate variation in patient's complaint and wide complexities in acute care (Sun et al, 2000).

However, since patients know little about ED principles such as triage priorities, treatment protocols and staff assignments, recent studies infer that what most patients care most about is 'immediate attention'. And so therefore, patient satisfaction is closely linked to patient's waiting time. But the actual waiting time in the ED is not always the significant predictor of overall patient satisfaction but the perception of the waiting time or the appropriateness of the waiting time seems to be more important to satisfaction (Huang, Lai, Tsai, Weng, Hu and Yang, 2004). Waiting time is perceived to be appropriate if there is an explanation by the ED staff about what the wait is meant for, as well as the expected length of wait (Hall, 1996). This becomes the subjective waiting time. Hall (1996) notes the strong association between subjective waiting time and achieving higher level of satisfaction of overall emergency care has important implications for the ED. Therefore, effective management of patient's waiting time perception would improve patient's satisfaction.

Summarily, Patient's satisfaction is composed of three broad areas. These are; the patients waiting time, the patients flow within the healthcare facility, and the social determinants and public health preparedness of the facility.

2.3.1 Patient waiting time

Emergency department (ED) provides urgent clinical and Para clinical care for patients with injuries from accidents and incidences (Ajami, Ketabi, Yarmohammadan and Bagheria, 2012). The length of stay or patient waiting time is an important indicator of quality of care in EDs. The Canadian institute for health information report describes the

waiting time as the time a patients walks through the doors of an emergency department till the time the patient is discharged or admitted to Hospital (C.I.H.I report, 2008). The report continues by noting that the causes of long wait are complex and often unique to each emergency department. The report concludes that a patient's visit is made up of a series of smaller events or services and is referred to as 'the patients flow'. These services include such things as;

a) Triage – the first nursing assessment of how urgent the patient's Presenting condition is
b) Registration
c) Nursing and Physical assessment
d) Consultations
e) Investigations
f) Treatment

The Study therefore revealed that a delay in any of these events will increase a patient's wait time and will create bottlenecks in the emergency department (CIHI, 2008). These often results to crowding in Hospitals and significantly in its ED.

The concept of crowding has been hard to define scientifically. Documentation are limited to photographs of congested EDs and anecdotes over empirical data. Recently more efforts have been made to document the problem (Derlet et al., 2001).

Research by the Canadian institute for health information also reveals that emergency department wait times are also influenced by happenings outside of the emergency department in the hospital and the community. Such happenings include how quickly in-patient beds are vacated and cleaned in order to transfer a patient who is waiting for admission from the emergency department.

A qualitative Irish study described the problem from the point of view of patients and/or relatives/significant others who had spent 12 hours or more in the ED awaiting admission. Respondents of this study describe an ED that was overcrowded, untidy, lacking in resources and having the resemblance of a disaster zone (Jayaprakash, Sullivan, Bey, Ahmed, Lotfipour, 2009).

The order in which patients are seen and the maximum time that a patient should have to wait to be seen initially by a physician often vary and should be based on the urgency of the patient's health condition (C.I.H.I, 2008). At the health sciences centre, St. Clare's Mercy Hospital in Canada, studies revealed that waiting times can be reduced through better use of existing resource. This is achieved by;

I. The physical layout of the emergency department which may reduce the number of patients which can be seen including where they are seen. Additionally, if equipment and supplies are stored properly and conveniently, the time that staff can spend with patients can be reduced.

II. Hospitals policies such as how x-ray and laboratory department prioritize patients must be reviewed and wherever possible, aligned to meet the needs of the emergency department.

2.3.2 Input and output variables of patients flow model

Patient flow model show the capacity of a healthcare system to effectively and efficiently deliver care and move a patient through the healthcare system (KTA, 2011). Improving patient flow model has become an important aim for healthcare managers worldwide. A summary by the Ottawa hospital notes that patients flow models have emerged as a sophisticated method to facilitate improvements in patient flow.

A patient flow is also a concept reflecting the movement of patients through a series of processes as part of their pathway to healthcare. Patient flow is considered vital to evaluating key components pertinent to hospital performance including queues, redundancies, capacity and demand (Gunal, M.M., 2012).

Gunal, M.M. (2005) describes Patient flow models as attempts to view care processes from the perspective of a unit, department or hospital. According to this guide, the flow models have been promoted as tools to 'support service improvement at specific bottlenecks or constraints in specific clinical areas or across the entire health systems'. The guide concludes that many flow models have emerged incorporating various theoretical frameworks, statistical methodologies and measureable inputs and outputs. The most common flow models are the Specific and Generic Hospital flow models by Fletcher and Worthington.

Fletcher and Worthington devoted an extensive manuscript to the topic of generic vs. specific patient flow models (Fletcher and Worthington, 2009). They noted an important distinction between these models. They opined that the Specific hospital model referred to a model's degree of transferability to a different hospital setting rather than the capacity to model an entire hospital setting as the Generic model proposes. Although the Generic hospital-wide model is desired for its simplicity, it has been argued that the hospital setting is a complex organization requiring a wide range of activities, achieving straightforward goals can be difficult to achieve, therefore, targeting specific bottleneck processes of the department is the most effective and efficient way to improve flow through the hospital and so the Specific hospital model is often preferred (Van Sambeek, Cornelisen, Bakker, Krabbendam, 2010). Van Sambeek, et al. (2010) summarily notes that the specific flow model is supported by the 'theory of Constraints', which argues

that targeting specific 'bottleneck' processes or departments is the most effective and efficient way to improve flow through an organization.

Summarily therefore, the specific hospital model is the more efficient model of the two to tackle flow in emergency department.

2.3.3 Social determinants of health and public health preparedness

Studies identifies the social determinants of health to include education, employment, health access, income, gender and social processes such as social support and social exclusion (Wilkinson, and Pickett, 2006). A social determinant is divided into two, mainly; structural and intermediary determinants. The provision of healthcare facility may be defined as a structural determinant of health while the service provided by the healthcare facility such as emergency that influences health status would be defined as the intermediary determinant of health. This very much is inferred from the works of Wilkinson and Pickett (2006).

The early 21st century witnessed an important shift in national Governments perspective to the role and functions of public health systems (Moore, Mauji, Shiell, Noseworthy, 2007). Moore et al. (2007) therefore opined that public health and emergency preparedness have become central concepts in current restructuring of public health and emergency services.

The core functions of National health public systems have historically included regulatory, surveillance, health protection, health promotion and disaster response activities (National Advisory committee on SARS and Public health learning from SARS, 2003). The journal continues by noting that despite this, yet, the new global environment in which national health public systems for or responds to various types of

public health threats including Trauma, pandemics or terrorism is unsatisfactory. Public health preparedness should be a foundational component of Government's agenda (Sidel, Cohen, Gould, 2001). In General hospitals, emergency preparedness of emergency departments benefits from its workforce competence, organizational capacities and systems operations to improve emergency response.

2.4 GENERAL HOSPITALS IN NIGERIA

A Major General hospital was started in the 1950s, but it was the Bonham Carter report which led to the 1962 Hospital building plan that formally consolidated the concept of the 'District General Hospital' (DGH), and typically served a population of 200,000 to 250,000 people. Some of this DGH were on new found sites, and many of them merged the function of former infirmaries and voluntary Hospitals (Pickard, 2002).

A general hospital is a secondary health care facility and is managed by the State Governments and the FCT in Nigeria. It is set up to deal with many kinds of disease and injury, and normally has an emergency department to deal with immediate and urgent threats to health. A general hospital is a major health care facility in its region, with relatively large number of beds for intensive and often long term care; and specialized facility for surgery, childbirth, bioassay laboratories, and so forth. General hospitals in large cities may be of varying sizes and facilities and may have their own ambulance service (Obed, 2011).

Table 2.2 shows the healthcare facilities located within Geo-political zones in Nigeria. The table shows that Nigeria as at 2007 has 1106 general hospitals spread around the 774 Local Governments in Nigeria (NPC, 2008). The statistic reveals a significantly higher number of General Hospital compared to the Teaching Hospitals summing up

the fact that the General Hospitals targets far more populations of Nigerians. This underlines the importance of the General Hospitals in the Nigerian Healthcare system and to Nigerian population.

Table 2.2: Distribution of Teaching and General Hospitals in Geo-political zones of Nigeria.

Zone	Number of LGAs	Teaching hospital	General hospital
North-East	112	10	95
North- West	186	5	115
North-Central	121	6	97
South-East	95	8	552
South-West	134	10	95
South-South	126	9	152
Nigeria (Total)	774	48	1106

Source: National Population Commission (2008)

In order for a hospital to meet the needs of a target population within the resources available as prescribed by the world health organization, a review of its role and function in the society, its administrative framework and its financing is imperative. These are reviewed below;

2.4.1 Role and function

Hospitals are institutions for healthcare, providing patients with treatment by specialized staff and equipment. Hospitals as healthcare organizations have been defined in varied terms as institutions involved in preventive, curative, ameliorative, palliative or rehabilitative services (Pestonjee, Sharma and Patel, 2005). The World Health Organization defined the hospital as a principle part of the medical and social organization, which provides for the population's complete health care, curative and preventive, and of which the outpatient services extends out into the family in its

environment. It is also referred to as the center for the training of health workers and for bio-social research. The World Health Organization (1994) recommends that hospital functions should meet the needs of target population considering the resources available, and be coordinated with services provided by other health care organizations. It is, therefore, evident that such statement will contain different elements depending on the nation's stage of socioeconomic development.

Traditionally, hospitals are regarded as centers for offering a wide range of curative services, both clinical and diagnostic services. Though these services are important and considered to be core functions, they do not entirely reflect all of hospital functions (Afzali, 2007). This is so if we agree to the World Health Organization's (2000) description of Health as the state of complete physical, mental and social well-being and not merely the absence of disease. Expectedly, the definition of health adopted by providers, government and society has implication for hospital functions across nations.

According to McKee, et al (2000), a Hospital may undertake several functions depending on the kind of Hospital, its role in the Healthcare system, and its relationship with other health care services. The core function of a General Hospital is the prevention, diagnostic and provision of curative services. The role of a general hospital is to serve as a link between the primary health care centres (PHC) and the Tertiary health institutions such as Federal medical centres and University Teaching Hospitals (UTH). General hospitals offer health services that are too complex for PHCs and refer more complex cases above its capacity to the tertiary health institutions. (McKee et al, 2000).

Furthermore, the hospital fills an important societal role in terms of offering social care, medical power, civic pride, political symbol and state legitimacy.

2.4.2 Administrative framework

The administrative framework refers to the organizational structure of the hospital and is the levels of management of the hospital's departments. The organizational structure varies within hospitals with larger hospitals such as University teaching hospitals having complex organization and smaller hospitals like the Primary health care centres having smaller organizational structures. Hospital departments are grouped in order to promote efficiency of the facility and the grouping is done according to similarities of duties. General hospitals provides primarily for the diagnosis and short term treatment of patients for a wide range of diseases and injuries. There are four (4) common category groupings. These are Administrative services (Hospital administrators), Informational services (Document and process information), Therapeutic services (Provision of treatment to patients), Determination of cause of illness or injury and finally support services (Providing support for entire Hospital) (Federal Ministry of Health, 2000).

2.4.3 Financing

Financial resources for health in Nigeria come from a variety of sources largely budgetary allocation from government at all levels (federal, states and local), loans and grants, private sector contribution and out of pocket expenses. Evidences from the distant past indicate that about 60% of health service expenditure in Nigeria occurred outside the public sector on a range of non-profit, traditional and modern practitioner (World Bank, 1994). This appears to be the natural consequences of reduction in government health spending in the late 1980‟s due to the Structural Adjustment Program (SAP) which de-emphasized spending on health and social services (World Health Organization, 2000-2007).

Nigeria's population growth rate is estimated to be 2.38 percent, projecting to a population of 160 million people (National population commission, 2006). It becomes

observable therefore that nation's healthcare demand is massive and extending over time. However resources for healthcare population are limited. The world health organization in its health systems fact sheet in 2006 stated that the Nigerian Healthcare in 2002 had a doctor to a 1000 population ratio of 0.28 and a nurse to a 1000 population of 1.70. However by 2007, the statistic had greatly improved with doctor/1000 population ratio of 3.70 and nurses/1000 population of 9.10 (Labiran, Mafe, Onajola and Lambo, 2008). Despite these developments, notwithstanding, the area of healthcare remains an area of concern because of the problem of scarcity of resources in recent years which have led to technical inefficiency that continues to lead to wastage of available meager resources (Kirigia, Preker, Carrin, Mwikisa and Diarra-Nam, 2006).

The Federal Ministry of Health (2000) acknowledges the annual public sector budgetary allocations to health often cannot equate approved allocation due to bureaucracies and other barriers. Thus, private sector expenditure on health as a percentage of total health expenditures has over the years exceeded government health expenditure. The World Health Organizations' national health account (2006) showed quite an impressive percentage for the private sector as against the public sector. According to the reports, private sector expenditures on health as percentage of total health expenditures equals 74.4 percent (2002); 72.8 percent (2003) 69.6 percent (2004) and 67.6 percent (2005); this trend is implicative that out of pocket expense is remains the major means of payment for the health services in Nigeria with the private health insurance still in infantry stage with only 0.3% of the population covered (Ogunbekun, 2004).

2.5 ARCHITECTURE OF HOSPITALS

Modern hospital buildings are designed to minimize the effort of medical personnel and the possibility of contamination while maximizing the efficiency of the whole system. Its architecture should facilitate and minimize travel time for medical staffs within the

hospital and the transportation of patients within units. The building also should be built to accommodate heavy departments such as radiology and operating rooms, while space for special wirings needed for Medical equipment, plumbing and waste disposal must be allowed for in the design (Annemarie Adams, 2009).

Hospital Architecture has often been criticized. Cor Wagenar, the Dutch Architecture historian described the hospital architecture as hardly functional, producing stress and anxiety instead of making patients feel at home. In order to understand the current design of hospitals, it is important to have a review of the historical evolution of hospital architecture and to explore the universal design strategies employed in Hospital architecture especially the emergency department.

2.5.1 Historical review of the evolution of hospital architecture

In Ancient Greece, temples dedicated to the healer god Asclepius served as the centre for medical advice, prognosis and healing (G, B. Risse, 1990). The Asclepia created carefully designed spaces conducive to healing. Onwards from the Greek to the Romans witnessed the emergence of constructed buildings known as 'Valetudinaria'. These buildings provided care for sick slaves, Gladiators and Soldiers in 100BC. Evidences of these have been verified by later Archaeological studies (Baker Anne, 1998).

In 325AD, the declaration of Christianity as an accepted religion ushered in an expansion of healthcare. The Catholic encyclopedia (2009) revealed construction of hospitals in every Cathedral, Noting that the early ones in Constantinople and Basil in modern day Turkey were known to as 'Basilia' and included houses for Doctors and Nurseries. It also included for various types of patients (Catholic Encyclopedia, 2009). By the 12th century, Constantinople had two well operated Hospitals, staffed by both male and

female doctors. Facilities included systematic treatment procedures and specialized wards for various diseases (Byzantine Medicine).

In the 9th and 10th century, Islamic influence became prominent in hospitals in Baghdad. These hospitals were noted to have employed twenty five staffed Physicians and had separate wards for different conditions (Nagamia, 2003). By 830 AD, Tunisia was under the Aghlabid rule. Nagamia (2003) observed that during this rule, the 'Al- Qairawan' Hospital and mosque were constructed. Its design was simple but elegant, adequately equipped with halls designed into waiting rooms. Mosque and special baths were included as prominent features.

In Medieval Europe, Hospitals were religious communities provided by Monks and Nuns and were referred to as Hotel Dieu 'Hostels of God'. Watson (2006) noted that the hospital became primarily multi-functional with some founded for specific purposes such as Leper Hospitals and as refuge for the poor. He continued by noting that the first example of a community hospital was designed by Antonio Filarete and commissioned by Francesco Sforza in 1456 (Watson, 2006). The community Hospital was among the first examples of Renaissance Architecture in Lombardy and considered the largest undertaken of the 15th century in Milan.

During the 19th century, contributions of Carl Freiherr, Von Rokitansky, and Josef Scoda remarkably influenced the second Viennese Medical School in Vienna. This period witnessed the birth of specialized medicine (Lesky, 1976 in Barbra M. Wall, 2011).

In light of some criticism noted in the hospital design and 'faceless' treatment given to patients, the design required that the architecture needed to evolve, the British Medical

Association through its research notes that good hospital design improves patients recovery time. It notes that Daylight, single sex accommodation, Nature and Hospital gardens, elimination of long corridors are major development in the design of hospitals (British Medical Association, 2011). Other major development is the change from the ward system to the individual room system. The research concludes by noting that although the ward system is very efficient to medical staffs, it proves stressful and detrimental to patient's privacy. However, hospitals charge patients significantly for the private rooms (British Medical Association, 2011).

2.5.2 Universal design for healthcare facilities

Hospital architecture in the face of changing healthcare has needed to become more assessable to the population healthcare facilities such as hospitals serve. This population is made up of people of all abilities, and different cultural, religious and educational backgrounds, hence, the need to have a universal design or 'Universal assess'. Accessibility is one of the pioneering design philosophies known as Universal design (UD) or Universal access (Paul Schyve, 2009). It is described as a concept that, when applied to environments ensure that facilities, products and services are usable by all kinds of users. The term universal design was coined by the Architect Ronald L. Mace to describe the concept of designing products and the built environment to be aesthetically pleasing and usable to the greatest extent possible by everyone regardless of age, ability or status in life (Ronald Mace, 2013). Although Ronald Mace (2013) admits that it was however the work of Selwyn Goldsmith, author of 'Designer of the Disabled (1963)' who pioneered the concept of free access to disabled people, it was not until recently the term gained prominence.

Paul Schyve, MD and Senior Vice president of the Joint commission on accreditation to Healthcare adds that Universal design should complement a patient – centered

approach to care because it is a concept driven by understanding the individual patient's experience of care. Seven principles of Universal Design are adopted from the Centre for Universal design, North Carolina State University. The principles are outlined below and offers designers good guidance to better integrate healthcare facility features that meet the needs of as many users as possible (the Centre for Universal design, North Carolina State University, 1997)

2.5.2.1 Principle 1: Equitable use

The design should be useful and marketable to people of diverse abilities. Guidelines:

i. Provide the same means of use for all users: identical whenever possible; Equivalent when not.
ii. Avoid segregating or stigmatizing any users.
iii. Provisions for privacy, security, and safety should be equally available to all user
iv. Make the design appealing to all users.

2.5.2.2 Principle 2: Flexibility in use

The design accommodates a wide range of individual preferences and abilities.

i. Provide choice in methods of use.
ii. Accommodate right- or left-handed access and use.
iii. Facilitate the user's accuracy and precision.
iv. Provide adaptability to the user's pace.

2.5.2.3 Principle 3: Simple and intuitive use

Use of design is simple and easy to understand regardless of the user's experience, knowledge, or language skills.

i. Eliminate unnecessary complexity.
ii. Be consistent with user expectations and intuition.

iii. Accommodate a wide range of literacy and language skills.

iv. Arrange information consistent with its importance.

v. Provide effective prompting and feedback during and after task completion.

2.5.2.4 Principle 4: Perceptible information

The design effectively communicates necessary information to the user, regardless of ambient conditions or the user's sensory abilities.

i. Use different modes (pictorial, verbal, tactile) for redundant presentation of essential information.

ii. Provide adequate contrast between essential information and its surroundings.

iii. Maximize "legibility" of essential information.

iv. Differentiate elements in ways that can be described (i.e., make it easy to give instructions or directions).

v. Provide compatibility with a variety of techniques or devices used by people with sensory limitations.

2.5.2.5 Principle 5: Tolerance for error

The design minimizes hazards and the adverse consequences of accidental and unintentional actions.

i. Arrange elements to minimize hazards and errors: most used elements, most accessible; hazardous elements eliminated, isolated, or shielded.

ii. Provide warnings of hazards and errors.

iii. Provide fail safe features.

iv. Discourage unconscious action in tasks that require vigilance.

2.5.2.6 Principle 6: low physical effort

The design can be used efficiently and comfortably and with minimum fatigue.

i. Allow user to maintain a neutral body position.
ii. Use reasonable operating forces.
iii. Minimize repetitive actions.
iv. Minimize sustained physical effort.

2.5.2.7 Principle 7: Size and space for approach and use

Appropriate size and space are provided for approach, reach, manipulation and use, regardless of user's body size, posture or mobility.

The universal design guide summarily notes that very importantly, the guides only addresses universally usable designs and designers in practice must integrate other considerations peculiar to their environments such as economy, technology, culture, gender and environmental concerns.

2.6 ARCHITECTURE OF EMERGENCY DEPARTMENT

The Emergency department is a core clinical department of a hospital and the ensuing experiences of patients attending the emergency department significantly influence patient's satisfaction and the public image of the hospital as previously noted (Australasian College of emergency medicine, 2007). The function of the ED is to receive, stabilize and provide emergency management care to patients who provide a wide range of mostly critical, urgent, and semi urgent conditions whether self of otherwise referred. The Austracian College of emergency design guide notes that emergency departments also provide for the reception and management of disaster patients within disaster plan of each region. EDs may require additional specifically designed areas to fulfill special roles, these spaces are for;

a) Management of Pediatric patients
b) Management of major trauma patients
c) Management of psychiatric patient
d) Management of patients following sexual assault
e) Management of infectious patients
f) The extended observation and management of patients
g) The management of prisoners in custody
h) The management of patients affected by chemical, biological, or radioactive incidents
i) Transport and retrieval services
j) Telemedicine

The guide concludes that in addition to clinical areas, emergency departments require facilities for essential functions such as teaching, Research, Administration and Staff amenities. Information which help in planning emergency department include;

1. Annual census and trends
2. Average daily census with peak patient volume
3. Triage categories of patients' presentation
4. Average length of stay
5. Patient mix, for example identifying those who are older than 65 years and pediatric cases.

Other strategies employed in planning of emergency departments as seen in the design of the F.F Thompson Hospital in Canandaigua, New York include;

1. Decentralization
2. Isolation

Decentralization involves treating patient's private areas private, where each has an individual thermostat that can be controlled by the patient of family member. Gone are the cavernous waiting areas, replaced by more intimate spaces scattered throughout the department where family members can wait, eat, or consult with physicians. Equipment are stored in or outside patients room which cut down time staffs takes to deliver services.

Isolation is also on the rise and at F.F Thompson; the ED has an HVAC system separate from the rest of the hospital to prevent highly infectious diseases from spreading. Within the ED, some individual rooms have independent air controlled system.

2.7 REVIEW OF SIMILAR STUDIES

Review of similar studies helps researchers to understand what has been done with the aim of adapting or adopting relevant concepts and/or filling research gaps not explored in these previous studies. Results from these studies are unique to their environment inferring that different environments are likely to create varying results.

Two studies of relevance to this study have been randomly selected and reviewed below.

2.7.1 Wait time in Emergency department processes

Sima Ajami, Saeedah Ketabi, Mohammed and Husain Bagheria (2012) conducted a study on long patient waiting times in EDs at the Ayatolahkashani hospital in Iran.

Waiting times were investigated in emergency department services at the Ayatolahkashani Hospital. The study opined that 'minutes' and 'seconds' were on the rise in most parts of the world and is paramount in the study of ED wait times. (Miller, Ferrin, Messer, 2004 in Sima Ajami et al, 2012). Revealing therefore, that long wait times in healthcare services typically indicates;

i. Weak management

ii. Poor coordination

iii. Inadequate resource

Analytical and cross sectional method of study were and data were collected via forms and observation survey tool from the study population that included Waiting and service times in all stations related to all ED treatment processes over a two week period for 663 number patients.

SPSS analytic software and simulation techniques were applied in analysis of data.

The result findings proposed four methods for improving patient wait times in the Health facilities. These methods are highlighted below;

1. Change of visit-start-time.
2. Focus on patient's flow
3. Grouping scenarios in the following hierarchy
    - Annual volumes
    - In-patient beds
    - Ratio of main ED to fast track beds
    - Process improvements.
4. Improving man power and equipment.

2.7.2 Architectural design and reducing waiting times in Emergency Department.

Mohammed Al-Hussein and Saad Al- Jabouri (2010) investigated the ED waiting time impacts on Medical professionals, access to timely patient care and its contributions to considerable patient safety complications, and factors that affect ED waiting time.

Statistical analysis and a survey of forty-two (42) ED designs was carried out.

The results were as follows;

I. Research methodology 1 revealed statistics of the 42 surveyed ED designs as follows:

- 10 % incorporated Ancillary department components within the ED
- 12% established direct connection between the ED and the other Hospital departments.
- 79% had connections from the ED to the Ancillary departments through a corridor.
- 2% incorporated a pharmacy within the ED.
- 14% of EDs established a specialist to recognize psychiatric patients.

- 79% had connections from the ED to the Ancillary departments through a corridor.
- 2% incorporated a pharmacy within the ED.
- 14% of EDs established a specialist to recognize psychiatric patients.

II. Mohammed Al- Hussein and Saad Al-Jabouri (2010) also proposed a linear pattern in design and circulation in the ED seen in figure 2.2 below.



Figure 2.2: Linear pattern in design and circulation in the ED
(Source: The Facility Guidelines Institute, 2010).

Minimum design code standards in design of sizes of patient rooms is also shown in figure 2.3.

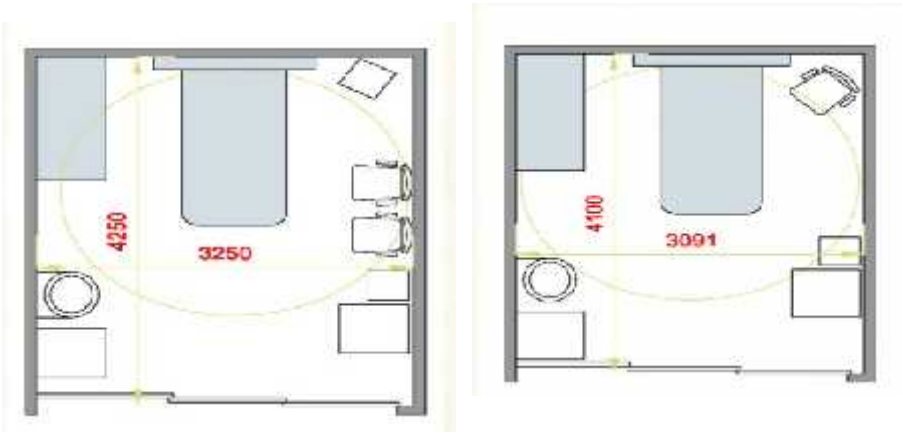


Figure 2.3: Code minimum standard
(Source: The Facility Guidelines Institute, 2010)

Finally the examination room design are illustrated in figure 2.4

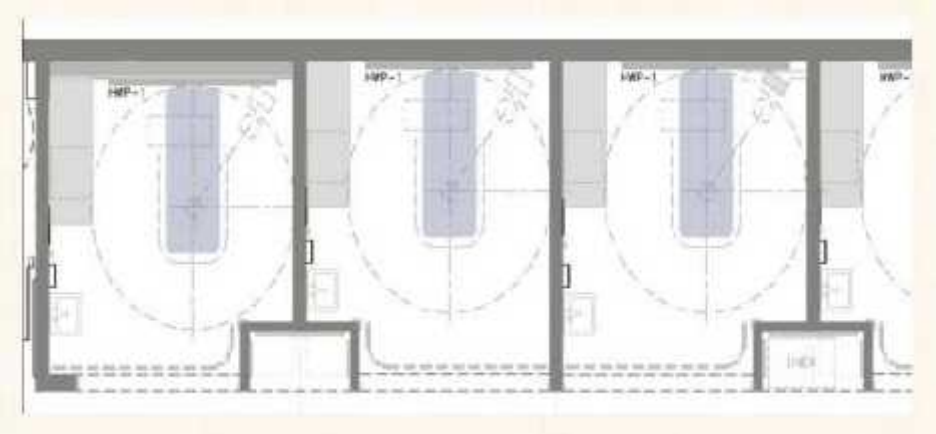


Figure 2.4: Code minimum standard Examination rooms
(Source: The Facility Guidelines Institute, 2010).

The findings of the research on the current practice are as follows:

1. Ancillary departments
    a) Redundant capacity
    b) Insufficient communication
    c) Ineffective services
2. Intensive patient unit (IPU)
    a) Inefficient discharge process
    b) Poor communication and scheduling
    c) Inefficient tracking system to match types of available beds with types of patients for placement.

III. Finally they proposed two design principles. These principles are the funnel design and streamlined design schemes (Mohammed Al-Hussein and Saad Al- Jabouri (2010). These are illustrated on figure 2.5.

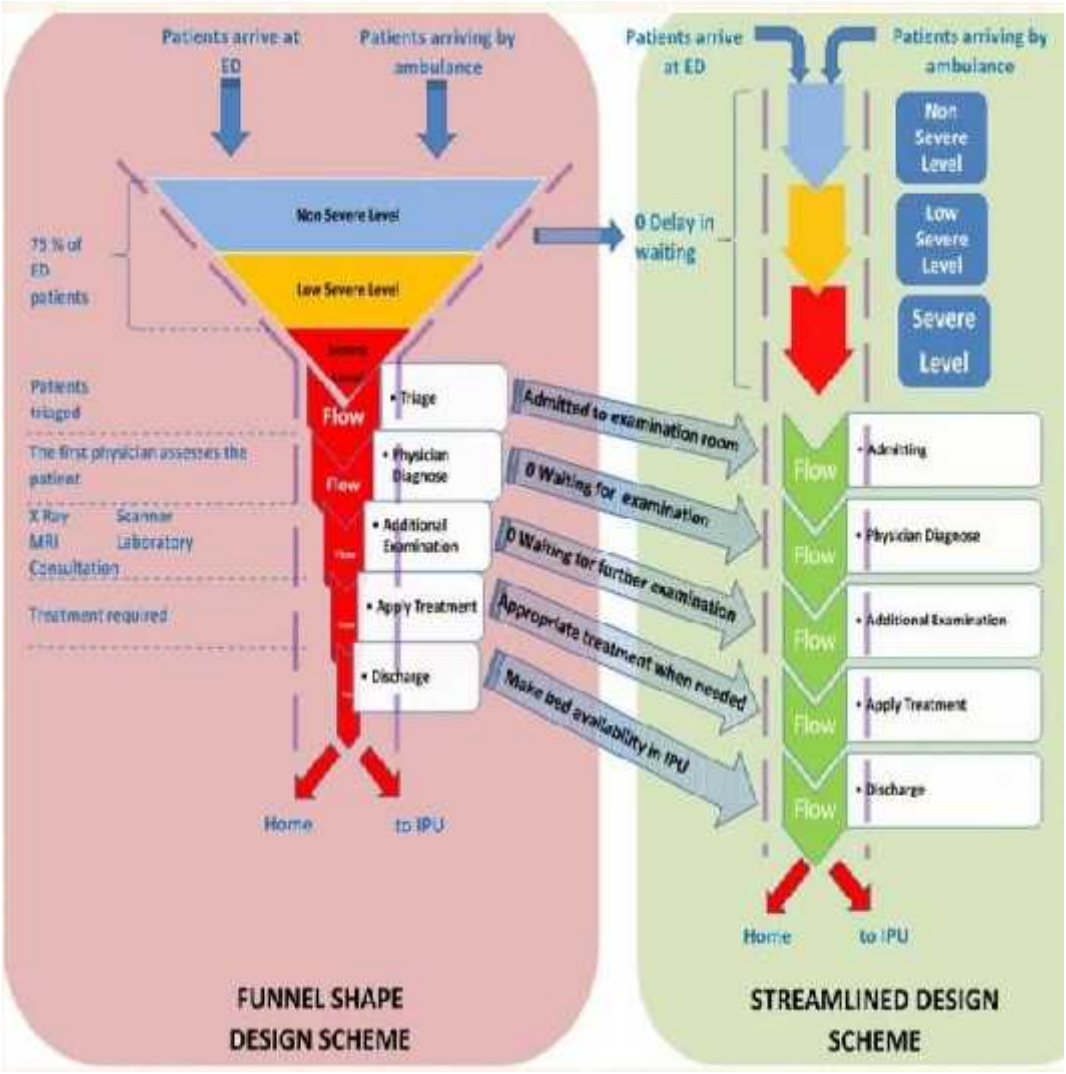


Figure 2.5: ED Process Design Improvement
(Source: Mohammed Al-Hussein et al, 2010).

The following results were achieved;

a. Increased ED capacity

b. Reduction in average patient waiting time c.

Value-added processes

d. Smooth Inter - departmental process flow

A lot of studies on EDs have been focused on waiting times in Healthcare facilities. Results of different studies indicate that waiting times is one of the impressive factors on patient's satisfaction (Sami Ajami et al, 2012). In a research titled "Reasons for patient's

dissatisfaction at the ED" results revealed that 67% of main reasons for patient's dissatisfaction in the ED were Patient waiting time (Choyce and Maitra, 2001).

But, however, little emphasis is been placed on the importance of taking into account the entire spectrum of care from the occurrence of an acute medical event, to the healthcare facility with different resource availability. Kobusingye et al (2005) posited that in order for emergency to be effective, more so in Nigeria, it must be well planned and supported at all levels and the community taking into consideration and context the entire spectrum of care.

The review of literature of the current study is therefore contextualized to the Nigerian Healthcare system, affirming the current trend of Emergency delivery as a product of the method of classification and administration of General Hospitals in Nigeria. Important paradigms that improve patient satisfaction to Emergency care such as Patient waiting time, input and output variable of patient flow model and social determinants of Health and public health preparedness was explored to access the extent of integration to the framework of General Hospital planning and design. The Architectural requirement of the General Hospital ED stated additionally specially designed spaces a Hospital may incorporate depending mostly on its role in the society. Strategies that improve the planning of ED designs were observed and a review of similar studies indicates 'patient wait times' as similar research aim to have been carried out.

2.8 FRAMEWORK

The framework is influence by the review of literature. The framework comprises four models. These are;

i. Patient Satisfaction to emergency care
ii. The Architecture of the Hospital

iii. General Hospital in Nigeria

iv. Architecture of the ED

The framework is illustrated with a 'pulley and gear machine system'. The Oxford English Dictionary defines Pulleys and gears as simple machines employed in a number of ways to lift loads, apply forces and to transmit power. Pulley and gear is an efficient machine setup that solves problems producing higher output or work done when relatively lower force or load is applied. Described below on figure 2.6 by the Pulley and gear system is the framework of the design and development of General Hospitals with improved and efficient ED.

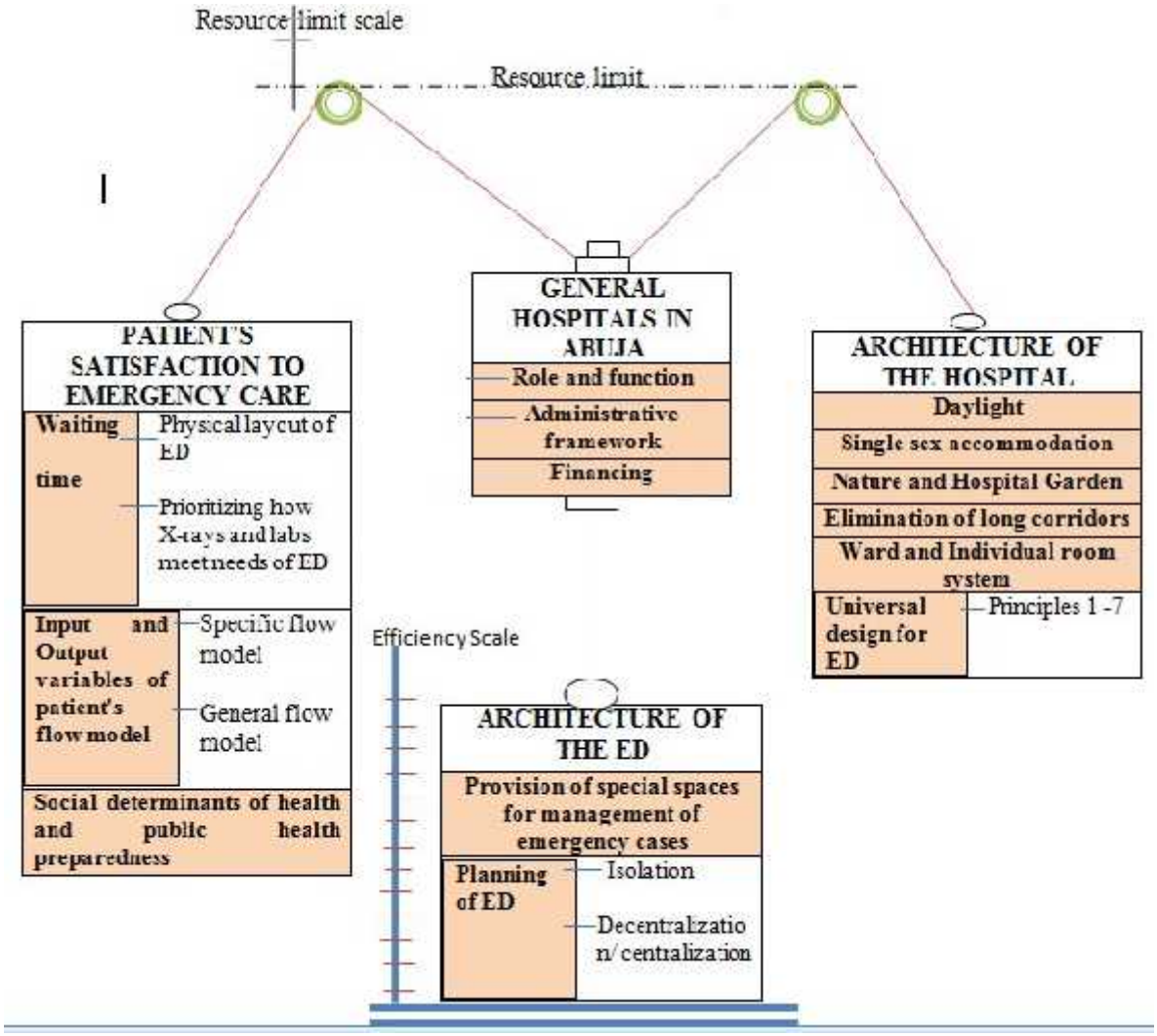


Figure 2.6 Framework for the Design and development of Abuja General Hospital

Each model has sub models referred to as 'Objects'. Achieving or improving objects within a model improves the value of the model.

Therefore, when the objects of the Patient's satisfaction to emergency care model are improved, the value of the aforementioned model increases. Broadening it out therefore, when 'patient satisfaction to Emergency care' is increased, it has a corresponding effect on 'The Architecture of the Hospital' and vice versa. An improvement in Architecture of the Hospital will yield an increased level of patient satisfaction to emergency care. The reverse is affirmative as well. An upgrade in both aforementioned models located on the far left and right of the Machine Pulley and Gear system on figure 2.6 as 'loads' or 'work' will have a corresponding and subsequent increase or improvement of 'The architecture of the ED model' in the context of its 'Objects' listed as; Role and function, Administrative framework and financing located centrally as work done on figure 2.6.

The above mentioned situations subsequently and summarily bear a positive effect and influence on 'The Architecture of the ED model', dragging it up on the machine diagram along its efficiency scale. It is imperative to understand that because emergency care has a social background, and like most social contexts, is uniquely confined to its surroundings. Therefore it has varying resource limit. Application of the framework illustrated on the Pulley and Gear machine system is within the resource limit setting of a Hospital.

Conclusively, within every Hospital resource limit, improving patient's satisfaction and Architecture of the Hospital will yield better General Hospitals in Nigeria with regards particularly to role and function, administrative framework and financing, the result of

which should improve the Architecture of the ED allowing emergency care in General Hospital EDs to have improved efficiency.

Summarizing the review of literature chapter therefore and situating the current study within the body of literature, the concepts of Health was briefly explored from the ancient Chinese healthcare to 21st century healthcare. In providing context, a review of the current trend of emergency care in Nigeria was investigated. The result of the investigation revealed inherent issues plaguing delivery of efficient healthcare. The issues investigated resulted in unsatisfactory patient satisfaction to emergency care as reviewed subsequently under Patient Waiting time, Input and Output variables of patient flow models, and Social determinants of health and public health preparedness. The role and function of General hospitals in Nigeria, its administrative framework and financing is then evaluated to place into context the position General Hospital occupies in the community.

The literature review is capped by evaluating the Architecture of Hospitals and the ED with the goal of studying briefly how the architecture of Hospitals has evolved over time and to the requirements of a modern hospital. A review of similar studies was conducted, a Patient wait time was observed to be the aim of the studies reviewed. And finally, the framework was generated by putting together the variables reviewed in order to produce a guideline for improving the state of emergency care in Nigeria.

CHAPTER THREE

RESEARCH METHODOLOGY

Research methodology is described as a collective term for the structured process of conducting research. This chapter therefore is divided into five (5) parts. The first part is the Research method which describes the study and its characteristics. The second to fifth parts are concerned with how the research is conducted. These parts are Research Instruments, Validity and Reliability of the study, Administration of Research Instruments and the Method of Data Analysis.

3.1 RESEARCH METHOD

This study aims to carry an assessment of how architecture improves efficiency and effectiveness of emergencies in General hospital ED. Emergency is a social phenomenon in healthcare facilities and in the society, to develop an explanation to this phenomenon requires an understanding of the social and cultural life of the people, hospitals serve. Also artificial experiments are not required, as on-going activities in the hospital form natural experiments. Furthermore, assumptions made in this study are at a minimal. (Rebecca Hogue, 2011).

The issues raised in the above paragraph are strong indicators of a qualitative research. As such, the descriptive qualitative/ case study research method is adopted for this study.

A qualitative research is concerned with developing explanations of social phenomena. It answers questions which begins with why, how, in what way? (Beverly Hancock, 2002). Descriptive qualitative/ case study research methods therefore are descriptions of certain specific situations via interviews, observations, document reviews with the

sole objective of investigating implementation, and challenges of programs (The SERVE centre at the University of North Carolina at Greensboro, 2008).

In effect, Beverly Hancock (2002) opines that most qualitative researches have emphasis on;

i. Focus on natural setting
ii. Interest in meanings, perspectives and understandings
iii. Emphasis on process
iv. Concern with inductive analysis and grounded theory

Summarily, qualitative research is carried out when the studies seeks to understand meanings, look at, describe and understand experience, ideas, beliefs and values and interchangeable such as these.

3.2 RESEARCH INSTRUMENT

The research instruments used for data collection in this research include Interviews and observation. Interviews are common research instruments for qualitative researches which involves direct interaction with people. Observation as a research instruments complements interviews because sometimes not all data collected from interviews may be valid. Observation therefore may serve as a technique to verify or nullify some information provided in face to face interview. Finally Dana Lynn Driscoll (2010) notes that observation provides valuable background information about the environment where a research project is been undertaken.

3.2.1 Interview

This is a method of data collection which involves preparing a list of interview schedule and logically relevant questions to ask the interviewee. It is grouped into three main

categories namely: structured, semi-structured and unstructured interview (Neville, 2007).

The research objective I of this study is to review the current issues regarding General Hospital designs with more emphasis on the ED. The research question for this objective is; what is the current trend of emergency delivery in the Nigerian General Hospital? To answer the question in order to achieve the objective, the interview method is selected as a research instrument for collection of field data.

As earlier noted, interview schedules are grouped into three; the structured, semi structured and unstructured interview. For qualitative research, the semi structured and unstructured are preferred (Beverly Hancock, 2002). Hancock observed that if the interview schedules are too tightly structured as with the case with structured interviews, the phenomena under investigation might not be fully explored in depth or breadth. However, with semi structured interviews, Hancock (2002) opined that it tended to work well when the interviewer has already identified a number of aspects of the phenomena he wants to be sure of addressing. The interviewer therefore can decide in advance what area to cover leaving the schedule open and receptive to unexpected information from the interviewee. This is particularly important when time available for each interview is limited and the interviewer wants to be sure 'key issues' will be covered.

Semi structured interviews also sometimes referred to as Focused interview involves a sequence of open ended questions based on the research area of the research topic (Beverly Hancock, 2002). Semi-structured interviews allow for new thoughts to be brought up during the interview. Nigel Newton (2010) summarily posits that this interview method mentioned above requires the interviewer to have a framework of

themes to be explored. Therefore, the semi structured interview would be scheduled for use in data collection on the field for this study (For Schedule of interview, see Appendix A).

3.2.2 Observation

Observation as a research instrument has led to important scientific discoveries in human History; a prime example been Charles Darwin's Theory of Evolution (Dana Lynn Driscoll, 2010). There are two kinds of observations; Participant Observation which is the common method within Ethnographic research, Sociology and Anthropology and in this kind of observation, the researcher interacts with participants and become part of the community. The other type is the Unobtrusive Observation and with this type, the researcher does not interact with participants but rather record their behavior and observes situations of interest in that capacity.

Bias in observation is of ethical concern. Dana L. Driscoll (2010) posits that the researcher should be aware of the difference between "observations" (recording exactly what is seen) and "interpretation" (making assumptions and judgment about what is seen). The common method used to avoid bias is "Double entry notebook". This is a log entry that separates facts from feelings. A sample of a Double entry notebook is shown in figure 3.1.

Observations	Thoughts
The student sits in the dining hall. As he eats his piece of pizza, which drips oil, he says to a friend, "This pizza is good."	It seems like the student really enjoys the high-calorie content pizza.
I observed cash register #1 for 15 minutes. During that time 22 students paid for meals. Of those 22 students, 15 grabbed a candy bar or granola bar. 3 of the 22 students had a piece of fruit on their plate.	Fruit is less accessible than candy bars (it is further back in the dining court). Is this why more students are reaching for candy bars?

Figure 3.1: Two sample entries from a double-entry notebook
(Dana L. Driscoll, 2010).

Dana L. Driscoll (2010) observes that research types that involve public areas such as shopping malls, restaurants and even Hospitals are viewed 'public' and the users may not understandably expect privacy and so, it is generally accepted to observe without participant consent. This study proposes the unobtrusive observation method for data collection (See Appendix B for Observation Checklist).

Unobtrusive observation as a research instrument would be conducted to answer Research Question III on how the framework developed from this study would be applied in a General Hospital setting in order to achieve the Research objective III.

3.3 VALIDITY AND RELIABILITY

For any study to be acceptable as scientific or empirical, the research instrument must exhibit an appreciable measure of Validity and Reliability (Olaofe, 2010). Noting that by validity, the research instrument should be able to measure as adequately as possible, the variables indicated to be measured. And by reliability, the consistency of the research instrument in measuring the variables.

Triangulation is typically a strategy for improving the Validity and Reliability of research and evaluation of findings. Patton (2002) in Golafshani (2003) advocates the use of triangulation stating that "triangulation strengthens the study by combining methods".

A paradigm in qualitative research is Constructivism which views knowledge as socially constructed and may vary depending on the circumstances (Golafshani, 2003). Golafshani (2003) observes that constructivism values multiple realities that people have in their minds. Therefore, to acquire valid and reliable multiple and diverse realities, multiple methods of searching or gathering data are in order. This calls for the use of

triangulation in the constructivism paradigm (Golafshani, 2003). Rebecca Hogue (2011) adds that in qualitative research using the constructivist world view, where there is not a single truth; rather all truth is relative and constructed by the individual or society, triangulation refers to finding and documenting different perspective.

Therefore, engaging multiple methods such as Observation, interviews or recordings will lead to more valid, reliable and diverse construction of realities (Patton, 2002). Golafshani (2003) summarily suggests that Triangulation involves multiple methods of data collection and data analysis but does not advocates a fixed method for all researches, instead, methods selected in Triangulation to test Validity and Reliability of a study depends on the criterion of the research.

Methods chosen to improve Validity and Reliability of this study include Observations, Interviews and Data review.

3.4 ADMINISTRATION OF RESEARCH INSTRUMENT

Interviewers have a choice of either taking notes of responses during the interview or to tape recording the interview. Tape recording is often preferable for a number of reasons. The first is that, the interviewer can concentrate on listening and responding to the interviewee and in so, not distracted by writing down what is said. The second reason is, tape recording ensures that the whole interview is captured and provides entire data for analysis. And finally, interviewees may feel uncomfortable if the interviewer starts to scribble; they may wonder why what they have just said is of particular interest.

A typical tape recorder is small, unobtrusive and provides good quality recording. An inbuilt microphone makes the participants less self-conscious. An auto reverse facility

ensures that the tape will automatically 'start over'. This makes the tape recorder ideal for this research.

The data collected with the tape recorder was transcribed. Transcribing is a method of producing a written version of the interview. Transcribing is a time consuming process and is not required for every interview subsequently. Therefore, a technique used for transcription was 'Tape Analysis'. With tape analysis, useful notes are taken from the playback of the tape recorded interview. These notes enables the researcher get familiar with key messages which will be useful for subsequent interviews.

The procedure adopted for this research is the 'constant comparative analyses'. It is a process whereby data collection and data analysis occur on an on-going basis. The interviews are semi structured. The first interview is conducted, transcribed and analyzed as soon as possible before the next interview. Interesting findings from the analyzed data are incorporated into the next interview schedules. This process is repeated for each interview. With this procedure, it is imperative to note that the later interviews in this research might have little modifications as the interview schedule might be continuously informed and revised by informants making it slightly different from the initial interviews.

3.5 METHOD OF DATA ANALYSIS

Analysis of data in a research involves summing the mass of data collated and presenting the findings in such ways that communicates the most important features (Hancock, 2012).

As earlier noted, data from field interviews was transcribed using a procedure known as constant comparative analyses. In order to identify and label items of data which

appear in the text of the transcript so that all ensuring items of data in one interview can be compared with data collected from subsequent interviews. Constant comparative analysis involves classing of data for the purposes of classification, summarization and tabulation (Hancock, 2012).

With Content analysis, the contents were analyzed on two levels. The basic level of analysis was descriptive. This is the analysis where data is analyzed based on exactly what was said, with nothing read into it and nothing assumed of it. This level of analysis would be used for data from the observation so as to represent the data as they are. The second level of analysis was “Interpretative” or sometimes referred to as “latent level of analysis”. This technique was used to analyze data from the interviews and is concerned with what was meant, inferred or implied by response or result (Hancock, 2002). The results were presented descriptively with charts, photographs and tables.

CHAPTER FOUR

FINDINGS AND DISCUSSIONS

This study has four research questions that achieve the objectives. The chapter is segmented into three research questions; research questions one to three is documented below with research question four in the next chapters. Four case studies were visited and findings documented. These cases include the General Hospitals at Asokoro, Kuje, Wuse and Kwalli districts in the FCT, Abuja. The research questions posed by this study were investigated in all four cases.

4.1 RESEARCH QUESTION ONE

The research question one of this study is; what is the current trend of emergency delivery in General Hospitals in Nigeria.

4.1.1 Findings from Interview schedule

Interviews were conducted by the researcher to the Hospital Managing Directors or ED administrators in Asokoro, Kuje, Wuse, and Kwalli General Hospitals. A brief introduction on the four case studies followed by the findings from the interview is documented below.

4.1.1.1 Selected Hospital for Case Studies

Asokoro General Hospital was officially commissioned on December 3rd 2001 by the then Head of State; General Olusegun Obasanjo. It is a secondary health facility initially designed to accommodate sixty (60) beds but over the years has expanded its capacity to 117 beds; the hospital is made up of three floors and is in a functional state.

Kuje General Hospital was upgraded to a secondary health facility in 2004. The Hospital is a single floor 39 bed capacity medical facility located at the outskirts of Kuje LGA in Abuja serving 28 communities in the FCT.

Wuse General Hospital was commissioned a secondary health facility in 1991. The hospital has two floors has a capacity of 122 beds. The hospital is located strategically centre of Wuse with close proximity to the market and motor park. Immediate environs the hospital serves include Wuse II, Central area, Gwagwa, Nyanya, etc.

Finally, Kwali General Hospital is a one floor thirty six (36) bed capacity secondary health facility located on the outskirts of Kwali LGA in the FCT and is a prototype design of the Kuje General Hospital. The Hospital was constructed by the then minister of the FCT, Rtd, Lt. General J.T Useni but started operations on September 2003. It was commissioned as a full-fledged Secondary health care facility by the former Minister of FCT, Mallam Nasir El-Rufai on April 2005. The Hospital serves 13 communities.

4.1.1.2 Findings

Description of Efficiency in General Hospital ED:

The Hospital MDs described the efficiency of the ED at Asokoro, Kuje, Wuse and Kwali General Hospital as Insufficient in capacity and capabilities. The state of resource usage as over stretched and the health management experience described as generally poor.

Factors affecting the performance of efficient ED:

The ED size is small relative to the number of patients that present. The Hospital has no space for expansion. This situation is highlighted by doctors willing to introduce newer units in both the ED and the Hospital at Asokoro but are limited by space.

The ED has no doctor situated in the ED despite the round-the-clock times patients present. This is highlighted most in the cases at Kuje and Kwali Hospitals. The numbers of doctors are few and calls are made to the doctors available who may also as at same time of call be busy in other units of the hospital. Succinctly therefore, the Factors that affect the performance of efficient Emergency were described as;

1. Lack of Adequate space
2. Lack of man management personnel

As discussed in the above paragraph, the numbers of doctors are few compared to the number of patients available. This is also same with all other medical personnel which importantly include nurses. These are described to be 'not sufficient'. A qualitative study on how many patient doctors should manage posits that numerical management of patients varies with location but if patients are too large, the excess demand results in never- ending and ever expanding delay in services (Murray, Davies, Boushon, 2007).

Variables reflecting resource usage:

Beds are required to be cleaned and sanitized once a patient is discharged. However this is sometimes not the case as time required to sanitize the beds before admission of new patients to that bed is simply not there due to the overwhelming number of patients who present. This causes crowding. 'Crowding' in hospital can be seen as a relation between the patient needs and the services available, a situation usually characterized by a larger amount of patient needs compared to the services available. The result of which, stretches the facilities to extents not designed for and which ultimately may result to breakdown.

Summarily in all four case studies, the following variables were described:

a. Doctors – Not sufficient
b. Beds – Not sufficient
c. Nurses – Not sufficient
d. Outpatient department – Crowded
e. In-Patient department – Crowded
f. Service – In built bore hole and two functional Generators
g. ED size and layout – too small

The results above showed the designs in use to be crowded and the medical personnel in-sufficient.

Current trend of emergency delivery:

The current trend of the Hospital EDs is to receive, stabilize and provide emergency management services. But due to the weak capabilities of the General hospitals ED as highlighted in the paragraph, quite often, patients are referred to tertiary health institutions.

The current trend of emergency care delivery in addition to the ED layout and size does not allow for expansion and management of multiple emergency cases. Vital departments that complement the ED are located at considerable distance away from the ED.

Suggestions for improving Emergencies:

Summarily suggestions opined by the MDs to improving emergency care were expansion and re-development of the ED and Hospital layout, and providing more medical personnel to improve the capabilities and capacity of the Hospital in order carry out efficient emergency care delivery.

4.2 RESEARCH QUESTION TWO

The research question two of this study is; to what extent can architecture aid prompt effective delivery of emergencies?

Physical observation was carried out in the working hours of Asokoro, Kuje, Wuse and Kwali hospitals and the following observations were noted.

4.2.1 Findings at Asokoro General Hospital

4.2.1.1 Isolation

Isolation is a design concept that improves the efficiency of the ED by treating it as a private area separating its services from that of the whole Hospital. The following were observed. The ED at Asokoro General Hospital had no waiting area but metal seats along the lobby 2.0m wide is alternative used by the families of the patients as waiting space. The ED had its own entrance with an Ambulance bay as shown on plate 4.1. The bay is the major waiting area for the ED.



Plate 4.1 Ambulance bay and ED entrance
(Source: Author's field work)

The ED also had a secondary door inside that opens into the lobby that connects the waiting area. There exist no overflow waiting area but however, metal seats were provided along lobby ways as shown in plate 4.2 below.



Plate 4.2 Emergency lobby with metal seats
(Source: Author's field work)

The ED had an independent air controlled system relying heavily on split systems air conditioners with virtually no openings except the door connecting the GOPD, the entrance door and a window which are mostly shut. The ED had an independent HAVC system and a 300KVA Generator that provides alternative backup power.

Table 4.1 illustrates the extent of use of Isolation in the ED. Each item/ unit present is allocated a tick and a mark and absence is indicated with an X and no mark.

Table 4.1 Extent of Isolation in the ED

ISOLATION			
a.	Waiting room	X	---
	Over flow waiting room	X	---
c.	Independent air controlled system	✓	1
d.	Independent HAVC system	✓	1
			2

LEGEND	
✓	PRESENT
X	ABSENT

(Source: Author's field work)

4.2.2 Findings at Kuje General Hospital

Physical observation was carried out in the working hours of the hospitals and the following observations were noted.

4.2.2.1 Isolation

The ED shared waiting with the GOPD via the entrance lobby. The access door to the ED was is on the left from the entrance opening into the GOPD as shown in fig. 4.1.

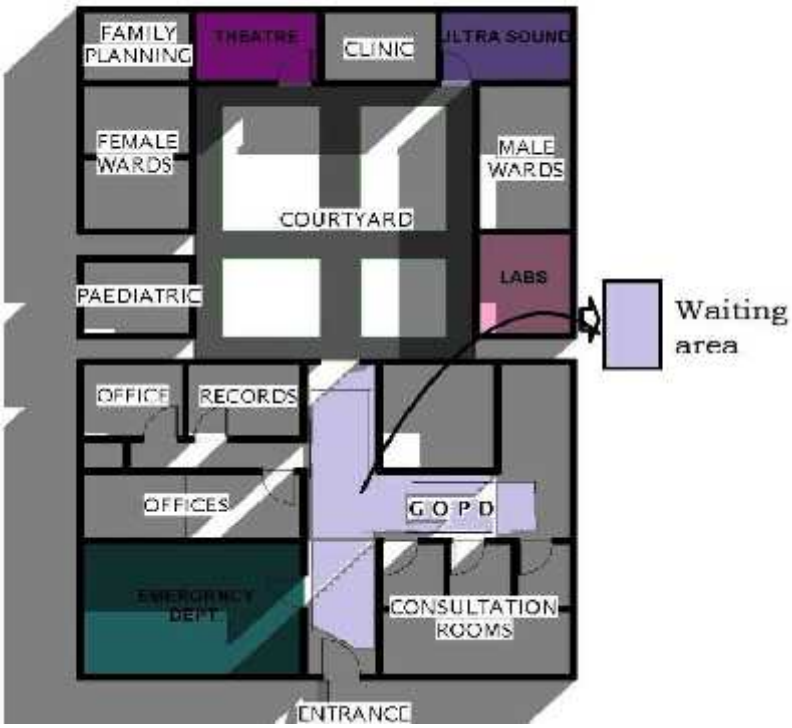


Figure 4.1 ED Location (Kuje)
(Source: Author's field work)

There exist no overflow waiting area and the GOPD waiting area also served the ED as shown in plate 4.3. Also there is no provision for independent air controlled and HVAC systems.



Plate 4.3 waiting area (Kuje)
(Source: Author's field work)

Table 4.2 below illustrates the extent of use of Isolation in the ED. Each item/ unit present is allocated a tick and a mark and absence is indicated with an X and no mark.

Table 4.2 Extent of Isolation in the ED

ISOLATION			
a.	Waiting room	X	---
b.	Over flow waiting room	X	---
c.	Independent air controlled system	X	---
d.	Independent HAVC system	X	---

LEGEND	
✓	PRESENT
X	ABSENT

0

(Source: Author's field work)

4.2.3 Findings at Wuse General Hospital

Physical observation was carried out in the working hours of the hospitals and the following observations were noted.

4.2.3.1 Isolation

The ED shares its waiting area with the consultation rooms via a wide lobby 2m wide in the GOPD as shown on plate 4.4.



Plate 4.4 lobby way and the ED
(Source: Author's field work)

There exist one functional main entrance door that opens to the approach used for all entries for both the ED and GOPD as shown in plate 4.5.



Plate 4.5 Main access door
(Source: Author's field work)

There also is no provision for over flow waiting spaces. The ED had no independent air controlled systems. The ED was ventilated with a window and a door that opens into the GOPD as illustrated in figure. 4.2.

The HAVC system of the ED was not independent but connected with that of the whole hospital. However, the ED had a Generator that provides back-up power.

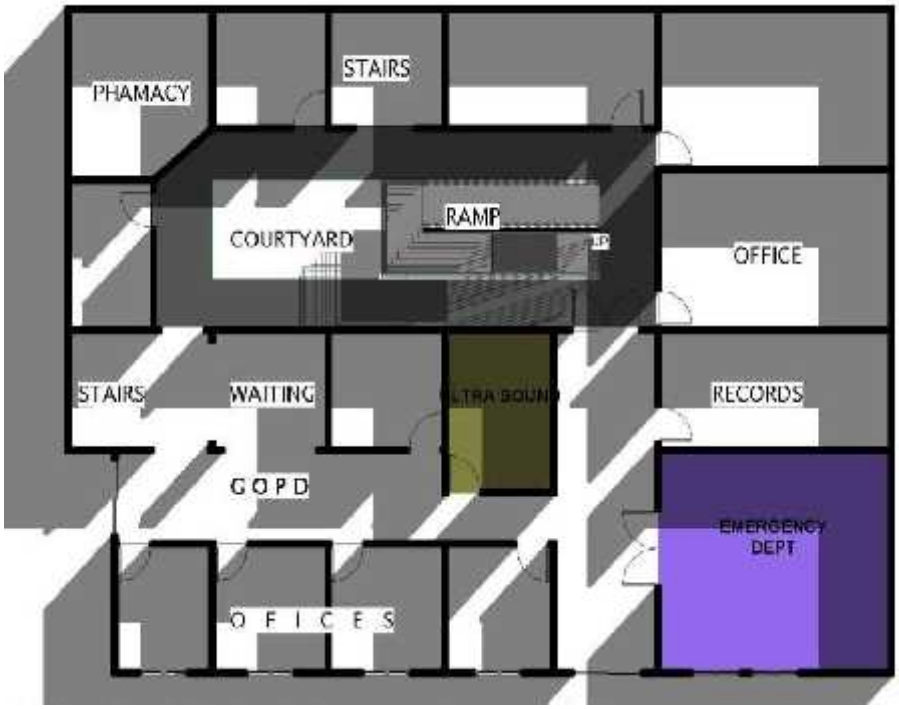


Figure 4.2 Location of ED showing its access door and window
(Source: Author's field work)

Table 4.3 below illustrates the extent of use of Isolation in the ED. Each item/ unit present is allocated a tick and a mark and absence is indicated with an X and no mark.

Table 4.3 Extent of Isolation in the ED

¤ ISOLATION			
a.	Waiting room	X	---
b.	Over flow waiting room	X	---
c.	Independent air controlled system	X	---
d.	Independent HAVC system	X	---

LEGEND	
✓	PRESENT
X	ABSENT

0

(Source: Author's field work)

4.2.4 Findings at Kwali General Hospital

4.2.4.1 Isolation

The ED and the GOPD shared same waiting area via the entrance lobby. The ED was located on the left from the entrance opening into the GOPD as seen in plate 4.6. There exists no overflow waiting area.



Plate 4.6 Position of the ED from the entrance door
(Source: Author's field work)

Waiting area is shared with the GOPD as shown in plate 4.7 below. The Hospital had no independent air controlled and independent HVAC systems. A Generator however in urgent cases supplies back-up power to the ED.



Plate 4.7 Waiting area that serves the ED and GOPD
(Source: Author's field work)

Table 4.4 below illustrates the extent of use of Isolation in the ED. Each item/ unit is allocated a tick and a mark.

Table 4.4 Extent of Isolation in the ED

ISOLATION			
a.	Waiting room	X	---
b.	Over flow waiting room	X	---
c.	Independent air controlled system	X	---
d.	Independent HAVC system	X	---

LEGEND	
✓	PRESENT
X	ABSENT

0

(Source: Author's field work)

4.3 RESEARCH QUESTION THREE

The research question two of this study is; how can frameworks be applicable in General Hospital setting?

From the review of literature, it is observed that the General Hospital in Nigeria heavily relies on its transport system to provide services. The Architecture of modern hospital should facilitate and minimize travel time for medical staffs, patients, goods and equipment. In order for frameworks to be applicable, the architecture should provide by design, improved travel time. An observation was carried out and the variables investigated.

4.3.1 Findings at Asokoro General Hospital

4.3.1.1 Units located in the Outpatient

The outpatient department contained spaces for medical records, General clinics, labs, and consultation rooms and nurses' station.

4.3.1.2 Location of the ED with relation to vital departments

The ED is located left of the main entrance. It has two doors; the main door opens to the approach and the secondary door opens into the lobby that connects the G.O.P.D. the X-ray unit is located on the extreme right corner at the Hospital's rare from the entrance as shown in Fig 4.3.

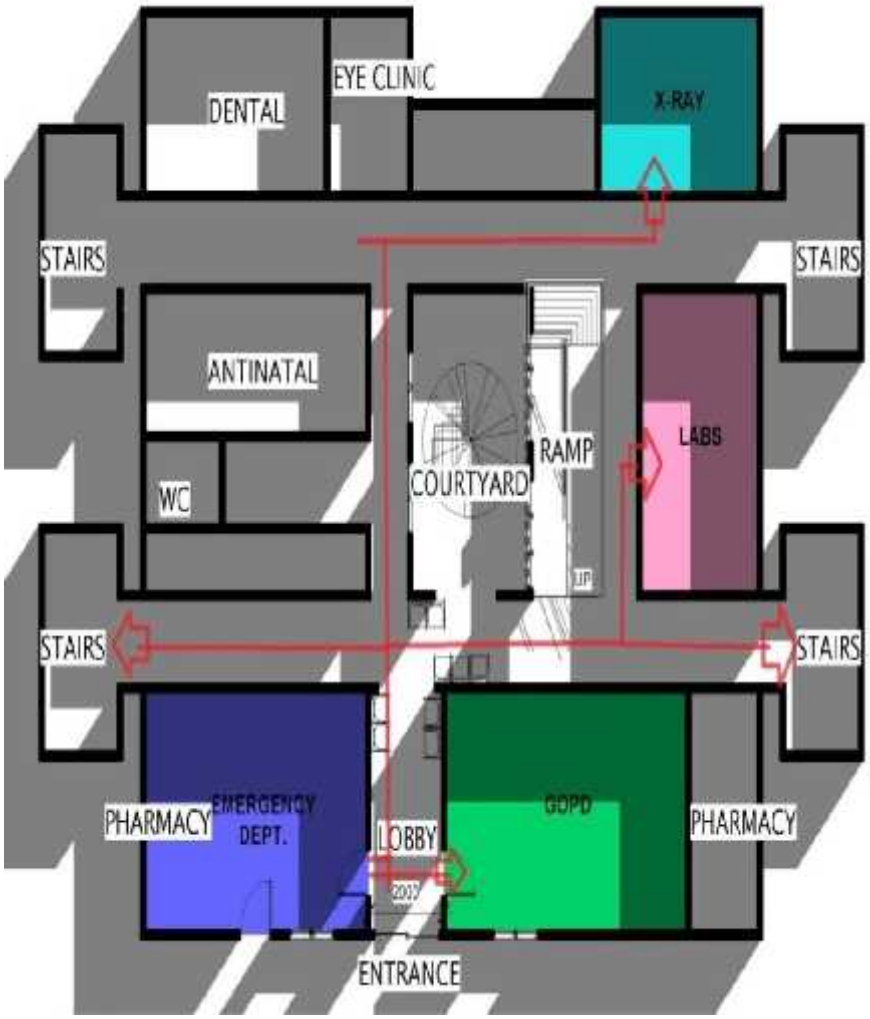


Figure 4.3 ED and Vital Departments
(Source: Author's field work)

The Operating theatre is located on the second floor while the Intensive care unit (ICU) is also positioned on the second floor as shown in fig. 4.4.

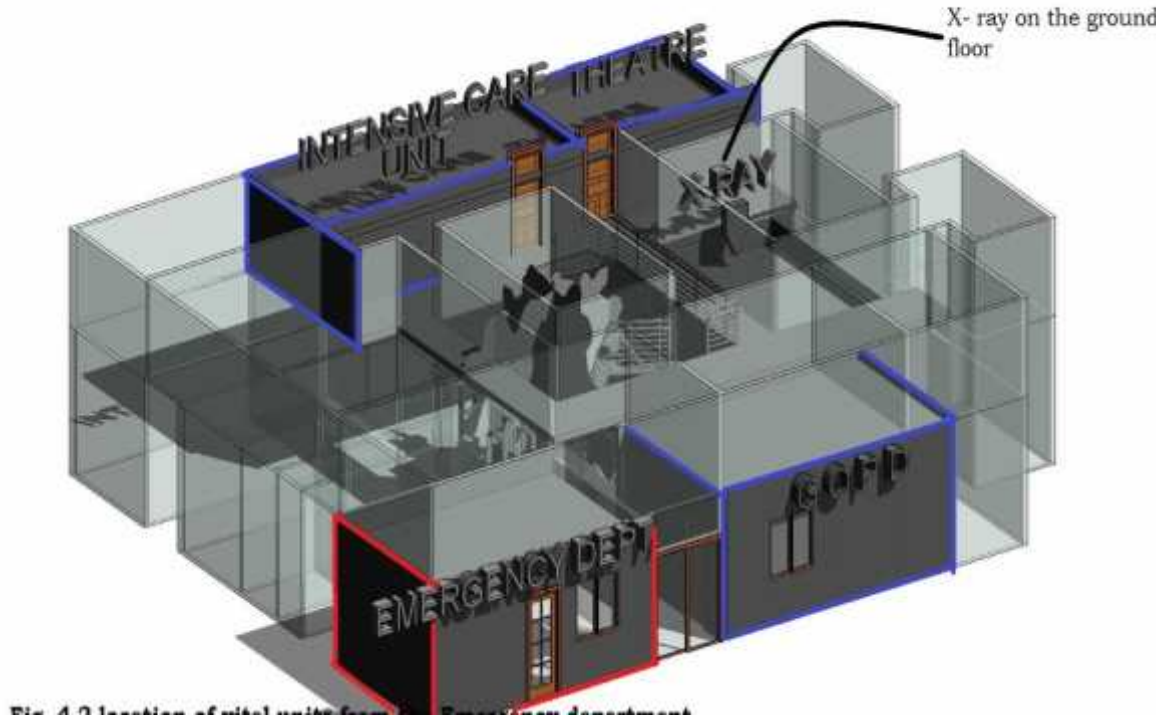


Figure 4.4 Location of vital units from the ED
(Source: Author's field work)

4.3.1.3 Special spaces

Special spaces included within the ED were spaces for extended observation. Other special spaces were located outside the ED. And theses spaces include Units for Pediatric patients, Major trauma, and Psychiatric, Chemical and Biological incidence.

4.3.2 Findings at Kuje General Hospital

4.3.2.1 Units located in the outpatient department

The outpatient department contained medical records, General clinics, labs, consultation rooms and compound offices.

4.3.2.2 Location of the ED with relation to vital departments

The ED is located left of the main entrance as shown in plate 4.8 with no door opening directly to the outside.

The ED shares same waiting as consultation rooms. The operating theatre is located at the rare end as shown in figure 4.5. The hospital has no x-ray unit, blood bank or ICU.

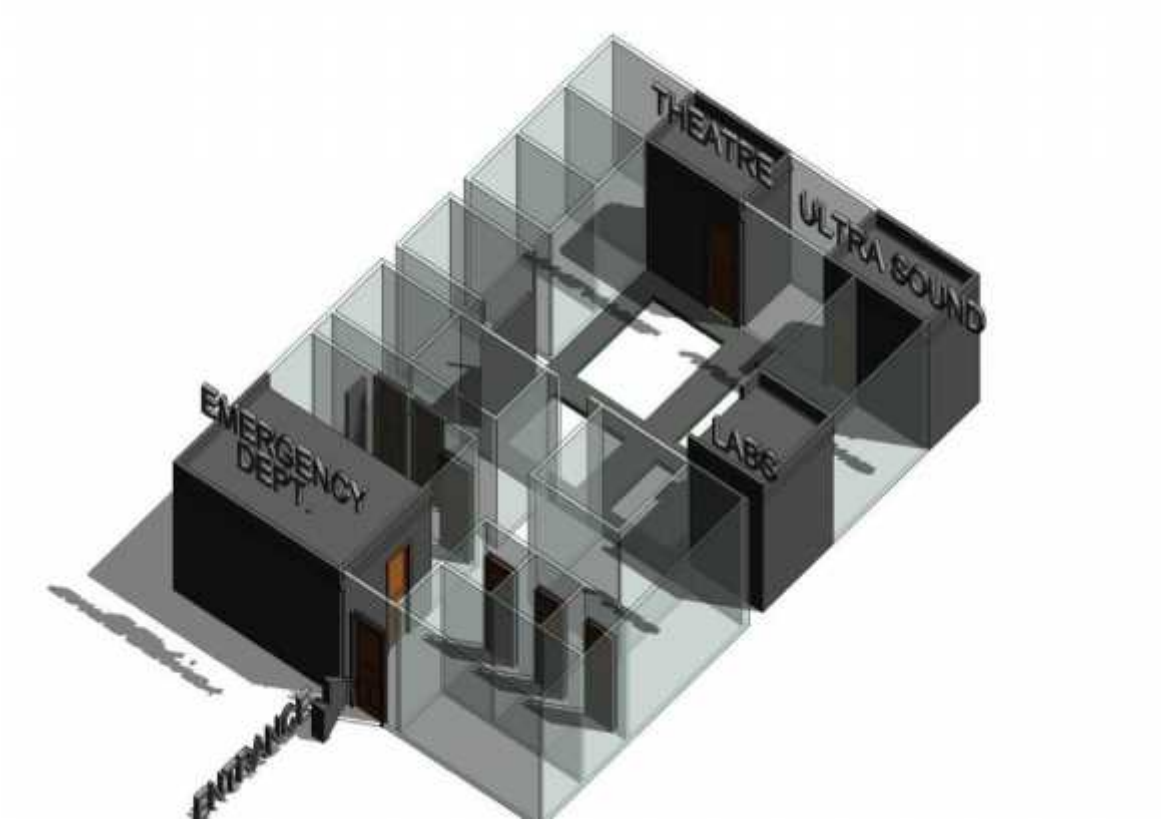


Figure 4.5 Location of ED and Vital Department
(Source: Author's field work)

4.3.2.3 Special units

There exists no special unit in the ED. But the hospital has a pediatric ward.

4.3.3 Findings at Wuse General Hospital

4.3.3.1 Units located in the Outpatient department

The outpatient department contained Medical records, General clinics, consultation rooms and compound offices.

4.3.3.2 Location of the ED with relation to vital departments

The ED is located right of the Hospital main entrance with the access door opening into the GOPD waiting and entrance lobby. The Ultra sound scanning unit has close

proximity to the ED. The ICU and operating theatres are located on the second floor as shown in figure. 4.6.

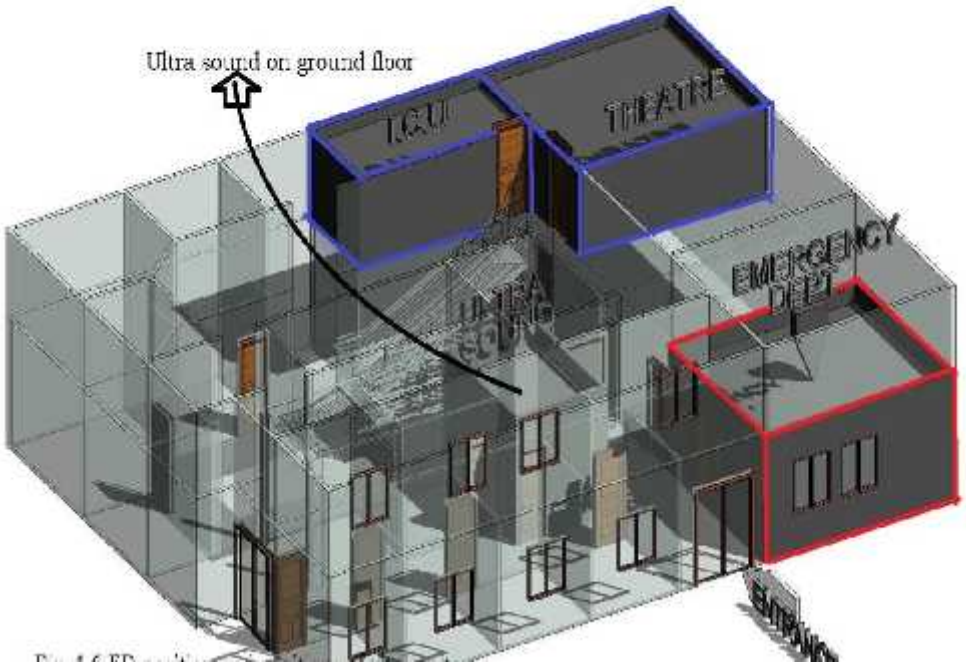


Figure 4.6 ED Position and Vital Departments
(Source: Author's field work)

4.3.3.3 Special spaces

The ED provided spaces for extended observations and a mini theatre

4.3.4 Findings at Kwali General Hospital

4.3.4.1 Units located in the outpatient department

The outpatient department contained medical records, General clinics, labs, consultation rooms and compound offices.

4.3.4.2 Location of the ED with relation to vital departments

The ED is located left of the main entrance with no door opening directly to the outside. It shares same waiting as consultation rooms. The operating theatre is located

at the back of the facility as shown in fig. 4.7. The hospital has no x-ray unit, blood bank or ICU.

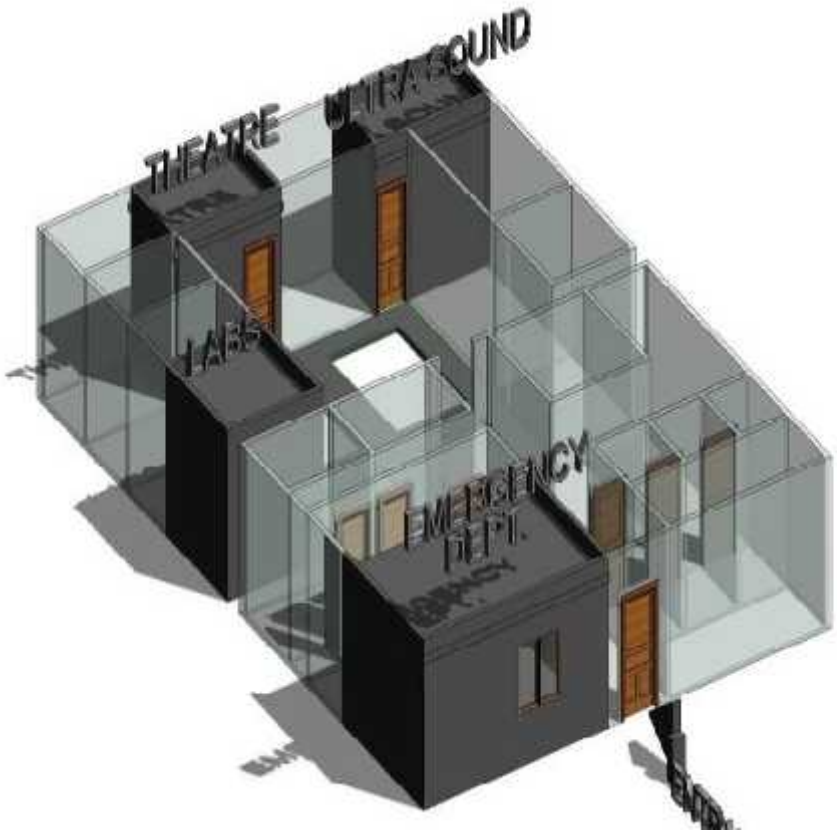


Figure 4.7 ED Position and Vital Departments
(Source: Author's field work)

4.3.4.3 Special units

There exists no special unit in the ED. But the hospital has a pediatric ward.

4.4 DISCUSSION

Findings from the review of literature reveal Patient's satisfaction as an important indicator of the quality of healthcare offered in a health care facility. Patient satisfaction is enhanced by providing effective architecture. It is summarily inferred that in every resource limited setting, improving Patient satisfaction and the architecture of the Hospital will produce efficient Hospital designs that complements prompt service

delivery. Resource limit is concerned with the capabilities of the setting of the hospital with regards to finance, role and function, administrative framework, personnel and natural resource.

To review current issues regarding General Hospital designs with particular emphasis of the ED, as stated as my first research objective, it is observed from the field work and supported by data from review of literature that the function of the ED is to receive, stabilize and provide emergency care management to patients with varying degree of conditions from accident and incidences. Emergency is a known performer indicator of the quality of health care provided by a health facility. In order for the ED to provide good emergency care service, it becomes imperative to address the social health determinants and public health preparedness, patient's waiting time and provide a functional patient flow model in the ED to achieve patient satisfaction.

The interview schedule administered to the respondents of the General Hospitals revealed striking and parallel results. Factors affecting the performance of the ED in all case studies were unanimously described as lack of adequate functional space and medical personnel as shown on table 4.5.

Table 4.5 Summary of findings

	Comments						
	Doctors	Nurses	Beds	Outpatient	Inpatient	Services	ED layout
Asokoro	I	I	I	C	C	C	C
Kuje	I	I	I	C	C	C	C
Wuse	I	I	I	C	C	C	C
Kwali	I	I	I	C	C	C	C

(Source: Author's field work)

LEGEND

C – Crowded

I – Insufficient

These factors are considerably glaring in Kuje and Kwali General Hospital where the ED served as treatment room for all cases and only one Doctor serving intermittently both the GOPD and ED.

Lack of adequate functional space and Medical personnel ensures that the ED is weak in Emergency response necessitating that most patients are often referred to tertiary health facilities. Kuje and Kwali case studies had no X-ray and ICU providing majorly more of first aid with cleaning and dressing of injuries in Emergency cases.

This trend discussed in the above paragraph mitigates expanding the scope of care provided and managing successfully multiple emergency cases in the Health care facility. The respondents again unanimously posited summarily as their opinions to reversing the current trend to be expanding the capacity of the ED and strengthening the capabilities of the services provided.

In achieving the second research objective which is to determine the extent which Architecture can aid prompt effective delivery of emergency, Decentralization/centralization and isolation concepts are adopted.

Decentralization/centralization and Isolation are key concepts of the architecture of hospitals, along with ED location with relation to vital units that complements effective management of emergency cases in the hospital. Other variables include Doctors, Nurses, Beds, Outpatient, Inpatient, services and ED layout.

The variables described above were investigated in all four (4) of the case studies visited.

Isolation in healthcare refers to measures taken to prevent contagious diseases from being spread from or to patients, staffs or spaces (Lawrence, J. and May, D., 2007). Isolation in ED design refers to separating the services of the ED from that of the Hospital. These services include; water, power, circulation and movement, waiting area and HAVC. The aim of which is to discourage sharing of these services and the result of which guarantees to greater extent, uninterrupted flow of activities, reduce crowding and cut down waiting times. The extent of isolation in ED design should vary depending on resource availability of the Hospital setting.

The concept of Isolation is rarely considered in current designs of General Hospitals. With Isolation, waiting areas, HAVC systems and sometimes air controlled systems of the ED are separated from that of the hospital. This is important to prevent diseases spreading from the outside or to the outside. Also isolating power for electricity, circulation and water ensures quick and efficient workings of the ED.

The four case studies visited had very little consideration in design for Isolation. The Asokoro General hospital was the only case that considered two of the four variables of Isolation investigated. Kuje, Wuse and Kwali case studies considered none of the variables. The variables investigated were independent waiting rooms, overflow waiting rooms, independent air controlled systems and independent HAVC systems as shown in table 4.6.

Table 4.6 Summary of findings

Isolation				
a. Waiting area	X	X	X	X
b. Overflow waiting area	X	X	X	X
c. Independent air controlled system	✓	X	X	X
d. Independent HAVC system	✓	X	X	X
TOTAL	2	0	0	0
	Asokoro	Kuje	Wuse	Kwali

LEGEND	
✓	PRESENT
X	ABSENT

(Source: Author's field work)

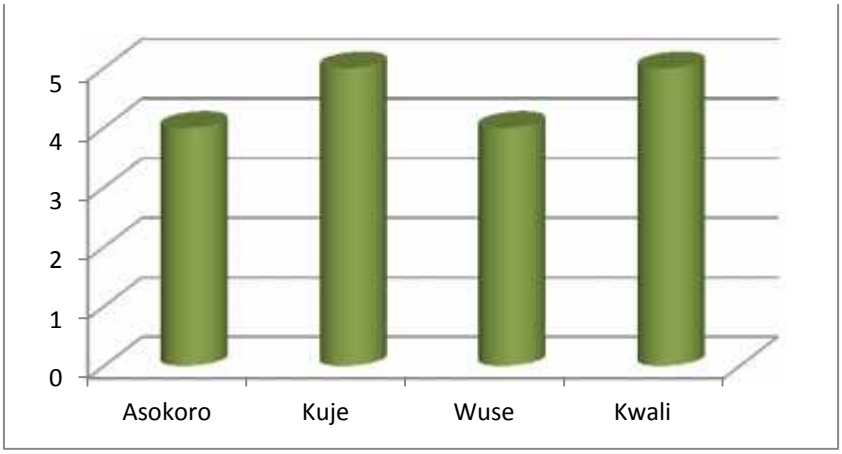
Research objective three which is to develop a framework that will assist architects particularly in Nigeria in designs of General Hospitals with efficient ED of which the research question is how can this framework be applied in General Hospital setting. The framework is developed from the review of literature and is applied to reduce and improve travel time, provide the architecture that aids prompt delivery of emergency and facilitate an effective trend to emergency care delivery in healthcare facilities.

Findings from case studies showed units located within the Outpatient for all case studies to include medical records, General clinic, labs, Compound offices and Consultation rooms. The current ED design and layout locates the ED within the Outpatient department. Observations noted from field works and supported by literatures reviewed indicates that the more the units within the Outpatient, the greater the likelihood of crowding. This is so because the waiting areas, movement and

circulation, lobbies are all shared by all of the units. This scenario often more than not clogs quick emergency care delivery.

Asokoro General Hospital along with Wuse had slightly less units in the Outpatient as shown in Table 4.7.

Table 4.7 Summary of findings



(Source: Author's field work)

Asokoro General Hospital had its own entrance door from the outside. The other Hospitals all had their entrances from the GOPD.

In order for Emergency to be efficient and effective, it requires quick access to vital units such as X-rays, blood banks, labs and scanning. ED layout and design with quick access to these units will notably have shorter patient waiting time which considerably reduces preventable deaths, and as stated earlier Decentralization and isolation are imperative. With Decentralization, the ED is made to have all vital units located within while with Decentralization, the ED is divided into smaller bits and located in close proximity to units and departments that require emergencies in its operations. Such units may include Labor, Delivery and theatres. In application of the framework, both concepts should be

used concurrently in designs of ED. The extent of adoption of Centralization/ Decentralization improves waiting time reduces travel time and decreases preventable deaths in Hospitals. Its usage should depend of the resource availability of the Hospital.

The ED of the case studies had none of such vital units mentioned earlier within. Asokoro General Hospital was the only exception as its ED had a Mini theatre. In all four case studies, the distances between vital units and the ED was significantly long.

Location of Special spaces within the ED was hardly considered with only Asokoro General Hospital having a special space for extended observation of emergency cases.

CHAPTER FIVE

CONCLUSION

Patient's satisfaction to Emergency care is observed from the review of literature to be an important measure of healthcare quality because it provides an insight to a healthcare's success at meeting the expectation of most relevance to the client; 'Immediate attention'.

In assessing the architectural contribution in ED to facilitate developing a framework in designs of General hospitals, a review of current issues regarding General Hospital designs with particular emphasis on ED reveals resource usage to be far over stretched and health management experience poor.

In determining the extent to which architecture can aid prompt effective delivery of emergency, key concepts in designs were singled out as pertinent to improving the workings of the ED. These concepts include Isolation, Decentralization and Centralization.

How can frameworks be applicable in General hospital designs revealed that architectural designs of Hospitals should minimize travel time. In countries with relatively lower technological setting such as Nigeria, Hospitals depends heavily on its transportation network to deliver services. Frameworks are therefore applied to reduce travel time by assessing the number of units located in the outpatient department and the location of the ED with relation to vital units and creation of special spaces.

The suitability of the framework is demonstrated by design in Chapter six (Design report).

CHAPTER SIX

DESIGN REPORT

The design report gives a detailed account of the development of the proposed design. The report typically begins with the Brief that provides context for the development of the design. Its noteworthy to state that the framework developed is influenced by the Research findings. The framework is applied in the evolution of the design. This starts with the analysis of the site selection criteria, site characteristics, zoning, design case studies and pre-design studies. Continuing, the problem statement is next giving insight to the design concept that follows. The chapter terminates with the Research design. The Research design formulates a Site development plan from which the design floor plans and elevations are provided from.

6.1 BRIEF

The Nigerian Government and specifically the FCT administration in its unrelenting effort to providing affordable and quality healthcare to the population seeks to site a model General Hospital in Lugbe district of the FCT.

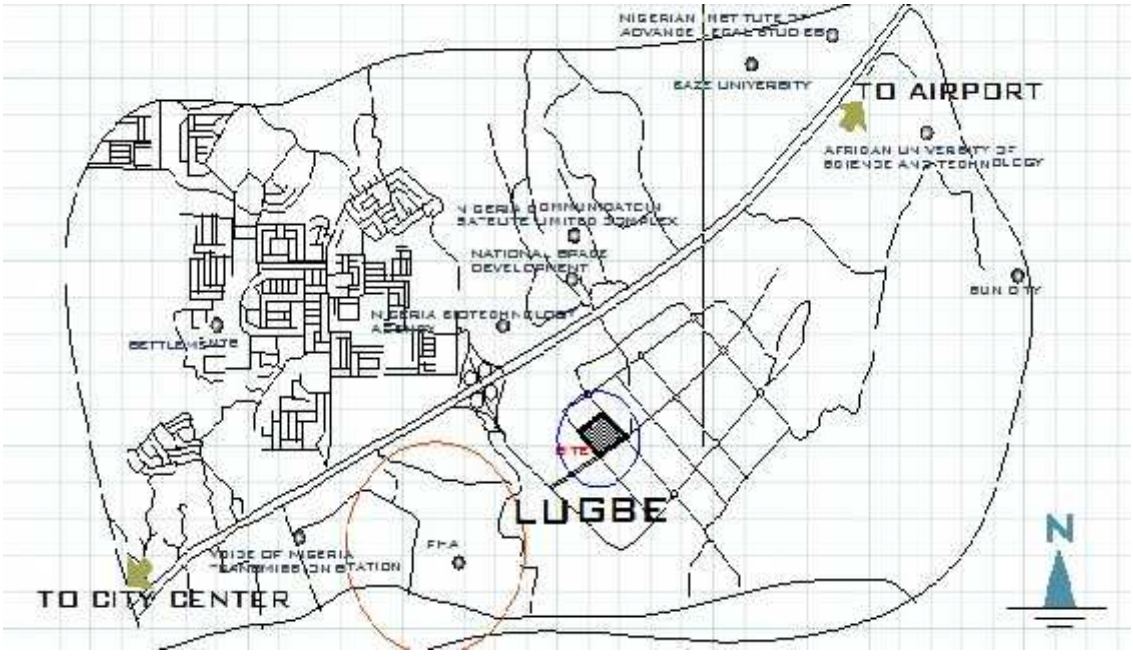


Figure 6.1 Map of lugbe, FCT, Abuja

Lugbe district is zoned in the AMAC local government council, which is one of the six local government councils of the FCT. The district is densely populated with a high heterogeneous population working class urban dwellers. As one of the fastest growing urban spur in the FCT of over 500,000 people according to the federal capital territory authority (FCTA). This along with its strategic location and reference from important institutions, no existing Government medical facility of befitting capacity provides a unique incentive for citing the proposed General Hospital.

6.1.1 Proposed Design of a Model General Hospital, Lugbe, Abuja.

The design consists of a 300 in-patient bed hospital with its operation classified into five major departments. These Departments include; Administration, In-Patient, Services, Diagnostic and Treatment and the Out-patient department.

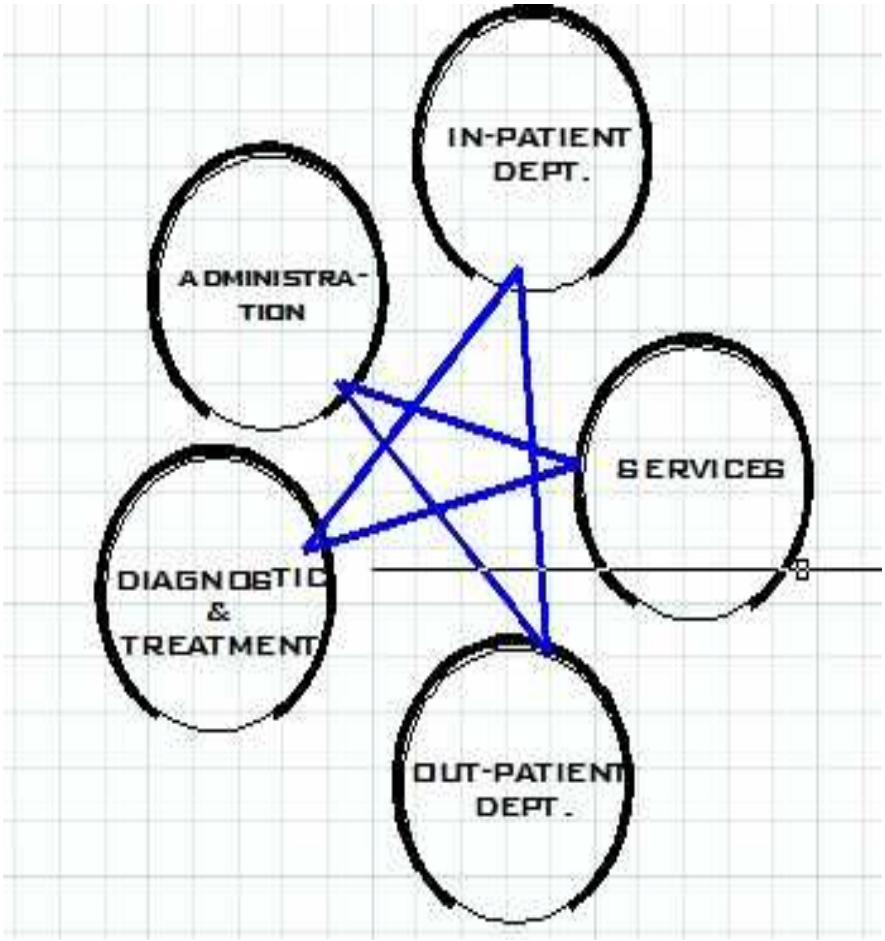


Figure 6.2 Major departments of the proposed General Hospital

6.2 SITE SELECTION CRITERIA

Site selection was carried out to select the site from the available three that improves the effectiveness of Hospital operations and Patronage. Three sites were located and tagged H1, H2 and H3. The sites are shown on plate 6.1 below.

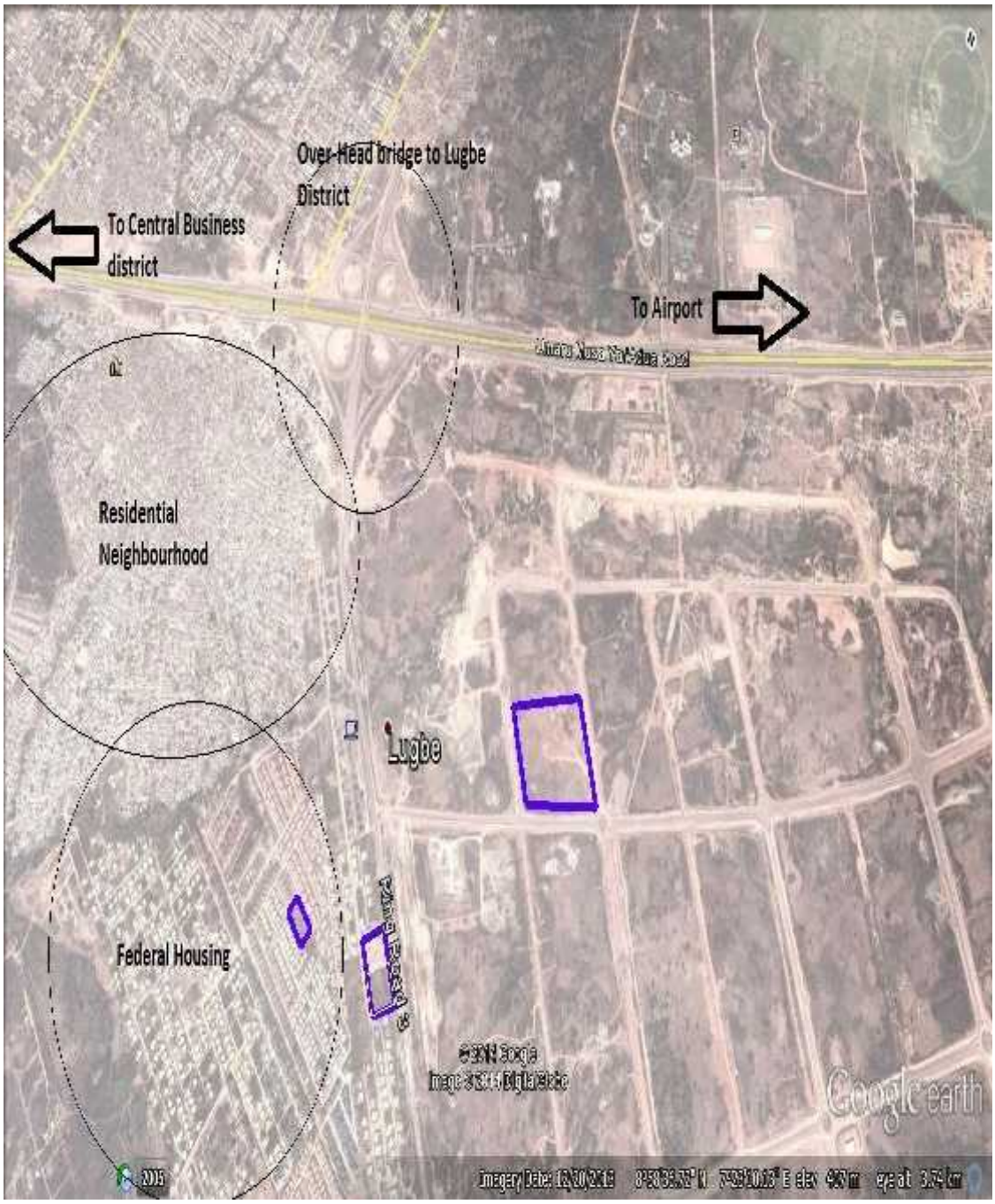


Plate 6.1 Map showing selected site in Lugbe district

In selecting the site, five criteria were used to examine and rank the three chosen sites. The site that scored the highest aggregate score was selected for the proposed design. The criteria chosen were; Size, Access road, Proximity to residences, Proximity to major Institutions and Topography, Each criterion was allocated a colored enveloping box. The green boxes illustrates a 'pass' and a tick that equals one mark and the red boxes illustrates a 'fail' and no mark. Table 6.1 below shows the ranking scale and score diagram for the examined sites.

Table 6.1 Ranking Scale

NO.	NAME	H1	H2	H3
1.	**SITE DIMENSION**	4183 Sqm	13, 588 Sqm	65, 149 Sqm
2.	**ACCESS ROADS**	**3 No.** Entry/ exit	**3 no.** Access roads provides opportunity for vehicular & pedestrian circulation	**2 no.** Entry / exit
3.	**SIZE**	Considerably small, difficult for future expansion	Large site. Suitable for future expansion	Relatively Large
4.	**PROXIMITY TO RESIDENCES**	**60 m** Relatively too close. Risk of noise and abuse of privacy	**500 m** Walkable distance to residences. Good proximity.	**900 m** Relatively furthest from Residences
5.	**PROXIMITY TO INSTITUTIONS**	Nigerian communication ltd. (3.14 km) Central Business District (17.12km) Voice of Nigeria transmission (2.5km)	Same as H1	Same as H1
6.	**TOPOGRAPHY**	Gentle slope	Gentle slope	Gentle slope
	RANK	**3 / 6**	**6 / 6** ★	**5 / 6**

Table 6.1 Ranking scale for site selection

Table 6.1 above illustrates distinctively site tagged H2 having had the most number of the green boxes symbolizing the most ‘passes’ to have scored the highest aggregate score. Site H2 is thereby. based on the aforementioned criteria and having scored the highest aggregate in the evaluation is therefore selected for the design of the proposed General Hospital, Lugbe.

The dimension of the selected site H2 is shown on Figure 6.3.

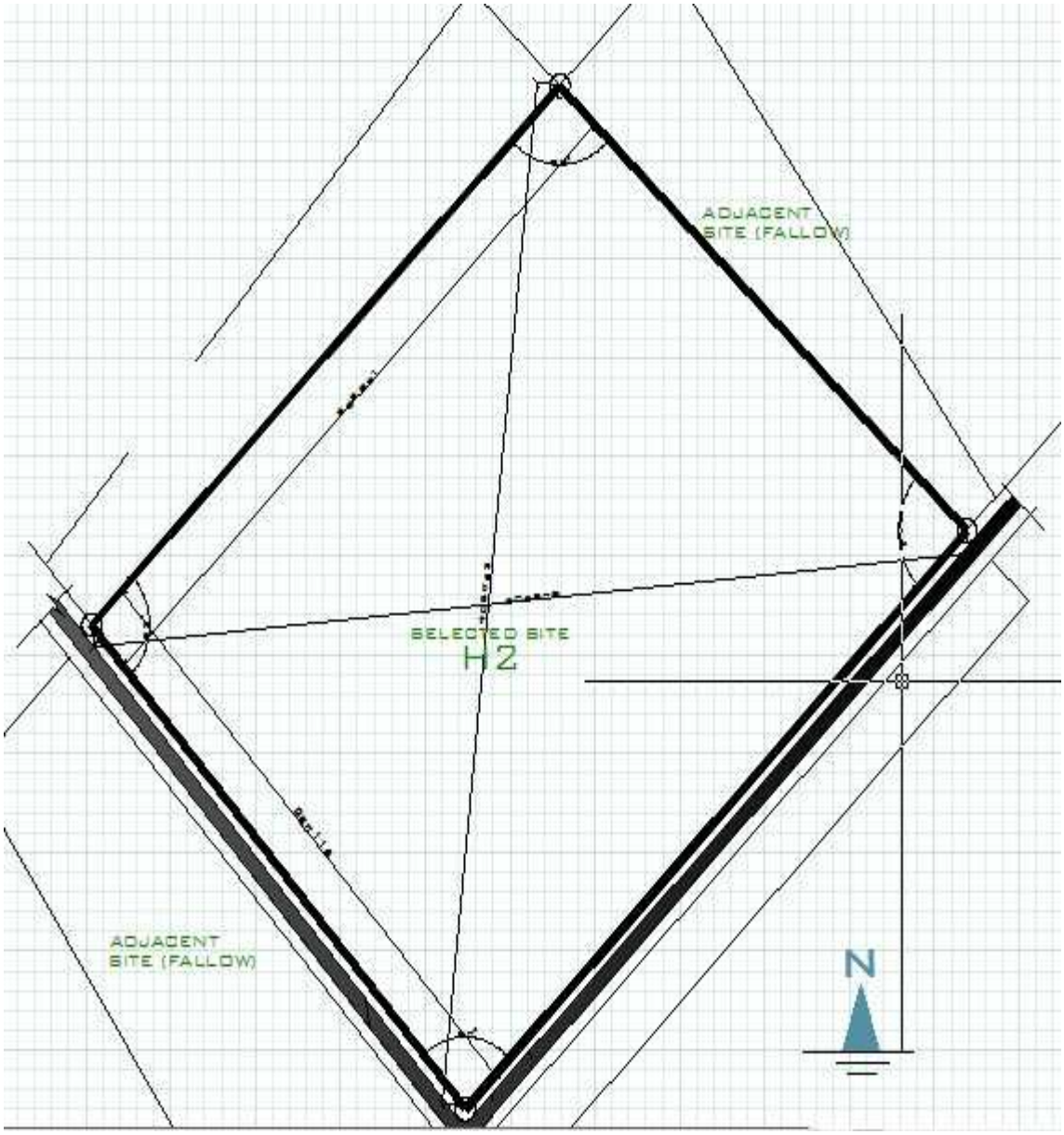


Figure 6.3 Dimension of the selected site H2

Below is the location map of the selected site on figure 6.4.

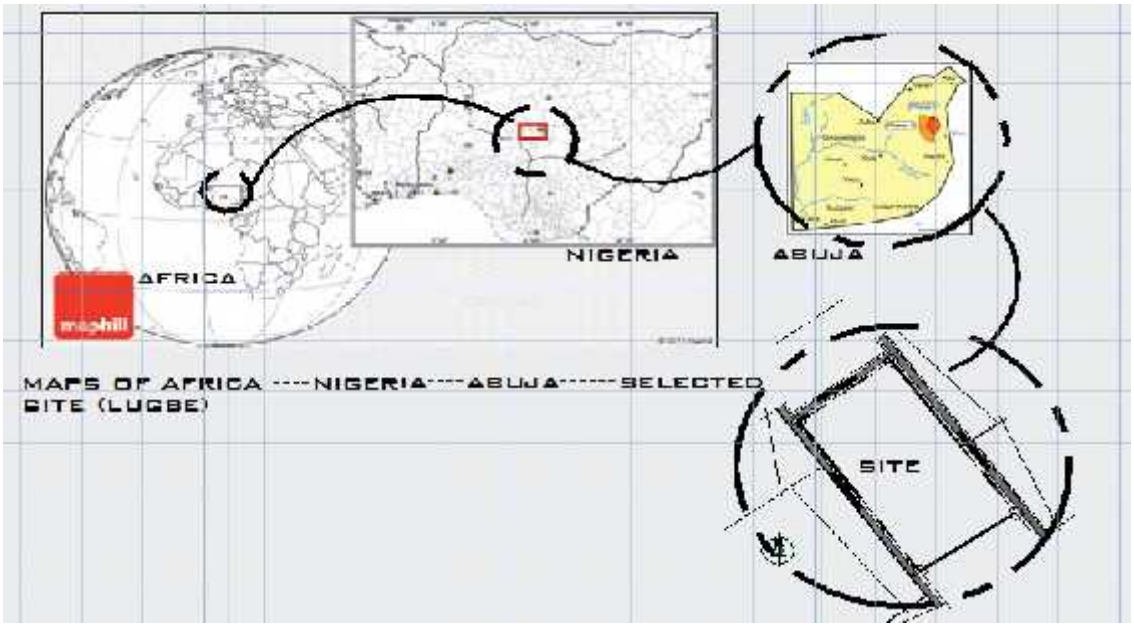


Figure 6.4 Location map

6.3 SITE ZONING

Site zoning is based on accessibility from the entry point. The entry point is chosen as the side of the site is the most convenient access to the road. This was selected to be the north eastern side of the site as shown on figure 6.6. The zones are classified into five. These zones are further described below.

i. Outer zone: These are areas immediately assessable to the public. They include;

- Emergency
- Outpatient department
- Administration

ii. Second zone: This includes areas that receive workload from the outer zone.

- Labs
- Pharmacy

iii. Inner zone: These are areas that require asepsis to perform the prescribed services.

- Surgical unit
- Nursery
- Intensive Care
- Delivery theatre (Maternity)

iv. Deep zone: Areas that provide nursery care and management of patients.

- In-Patient department

v. Service zone: These are areas that provide support to Hospital activities.

- Maintenance unit
- Dietary
- House keeping
- Mortuary

The zoning of the aforementioned zones are shown on figure 6.5.

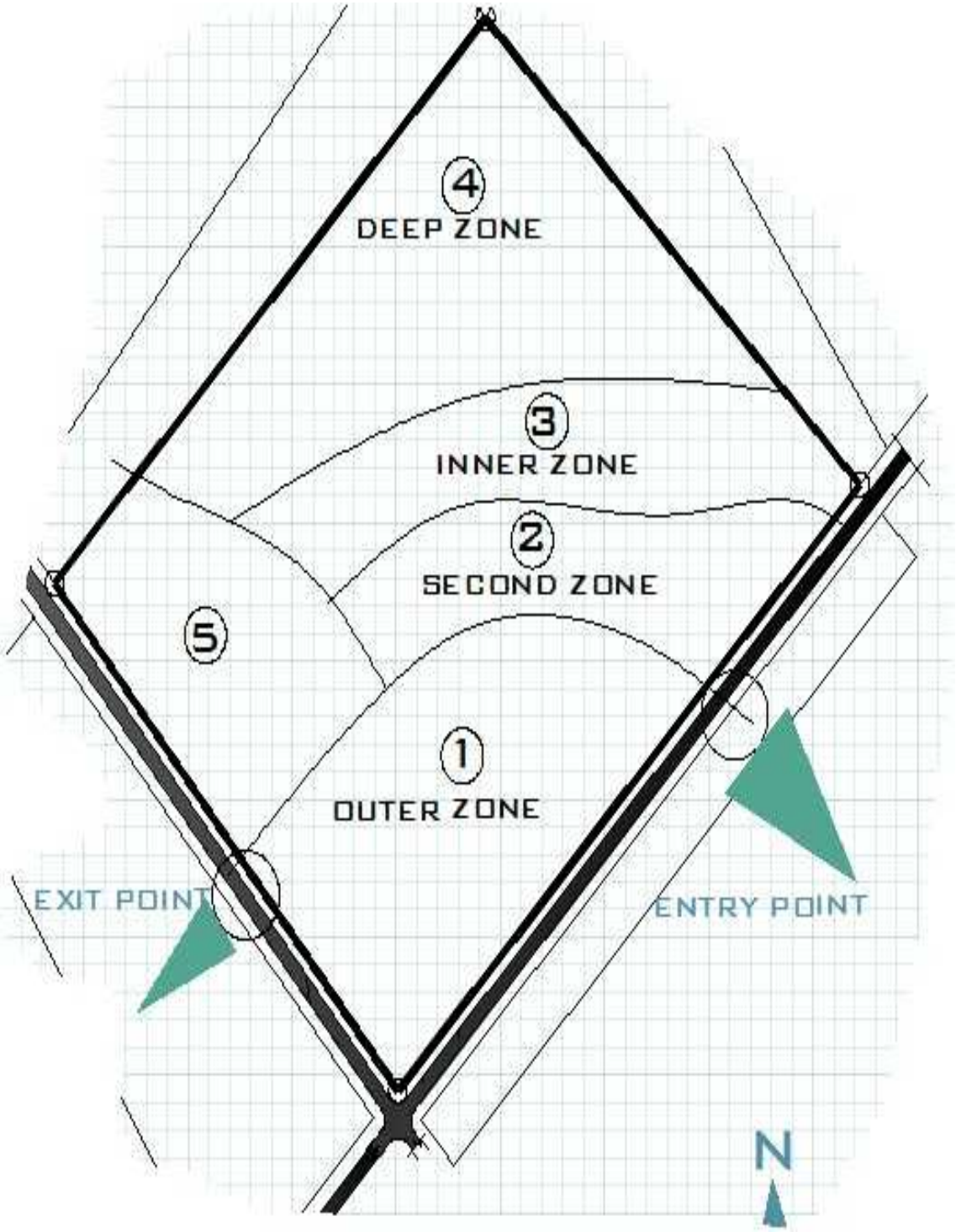


Figure 6.5 Site zoning

6.4 SITE CHARACTERISTIC ANALYSIS

The site slopes gently towards the east. which was noted for drainage at the south eastern and south western ends of the site. These ends also has the access roads, hence the roads provides convenient means to for drainage from the site.

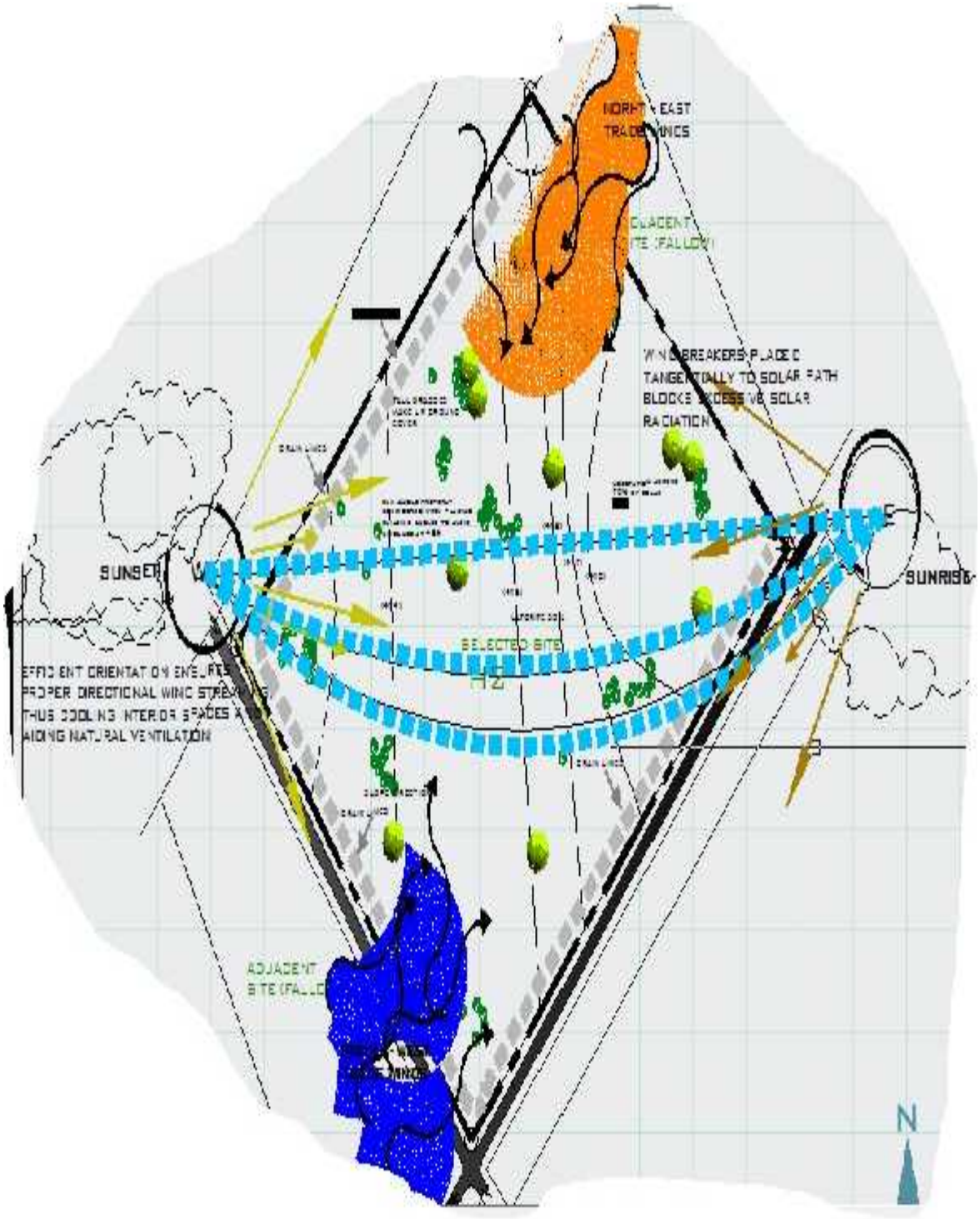


Figure 6.6 Site Characteristic analyses

Annual peak temperatures range between 30º-33ºc, humidity ranges between 40-60%. This high solar radiation necessitates use of vegetation and trees at the East

and South direction to block the solar path of sunrise and sunset. These are illustrated on figure 6.6. The soil cover is lateritic.

6.5 AIM AND OBJECTIVE

The aim of the study is to assess the architectural response to emergency care in Emergency departments to facilitate development of a framework in designs of General Hospitals.

The design Objective is to demonstrate the suitability of the framework developed in the design of the Model General Hospital.

Before demonstrating the suitability of the framework, case studies were carried out and the findings were applied in the design of the model General hospital to demonstrate the suitability of the framework. The Case studies and research findings are discussed in the next titles 6.4 and 6.5 respectively.

6.6 CASE STUDIES

Four cases were selected. These cases are;

1. Asokoro General Hospital- Abuja Municipal area council (AMAC).
2. Wuse General Hospital - AMAC
3. Kuje General Hospital (Prototype design)- Kuje Area Council.
4. Kwali General Hospital (Prototype design) - Kwali Area Council

In all, four General Hospitals were selected in three area councils of the FCT.

6.6.1 Case Study One (Asokoro General Hospital)

Asokoro General Hospital is a 117 bed capacity secondary health care officially commissioned in 2001.



Plate 6.2 Asokoro General Hospital Site Plan
(Source: Google images,
2014)



Plate 6.3 Position of Ambulance bay of the Emergency department

To improve the working of the Emergency department, a designated ambulance entry is provided as shown on plate 6.3 above. The Emergency (ED) is located foremost from the entry gate of the site and provided with its own bay as illustrated on plate 6.3.

The plan concept incorporates a central core that has a courtyard, ramp, circulation convergence and divergence as seen on figure 6.7.

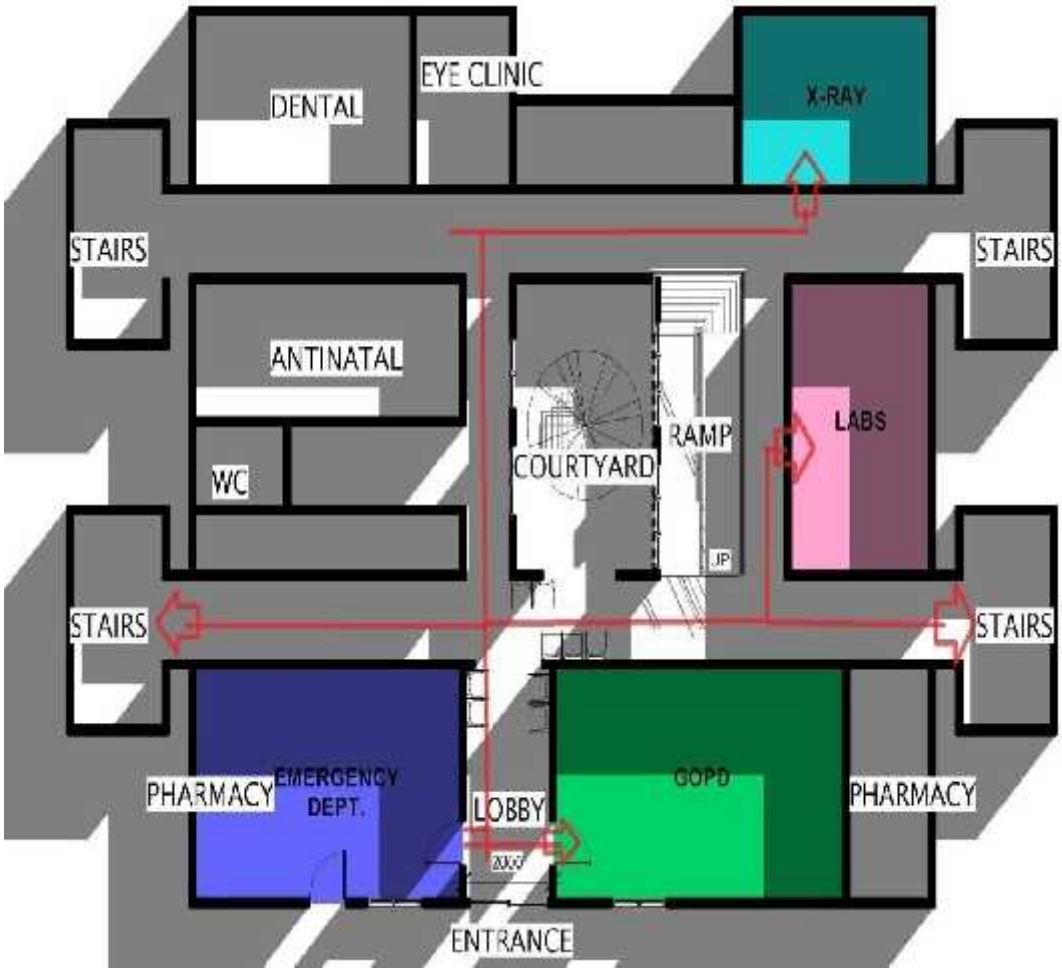


Figure 6.7 Ground floor plan Asokoro General Hospital

Figure 6.8 illustrates the planning of the ED, vital units such as labs, x-rays and blood banks are located away from the ED.

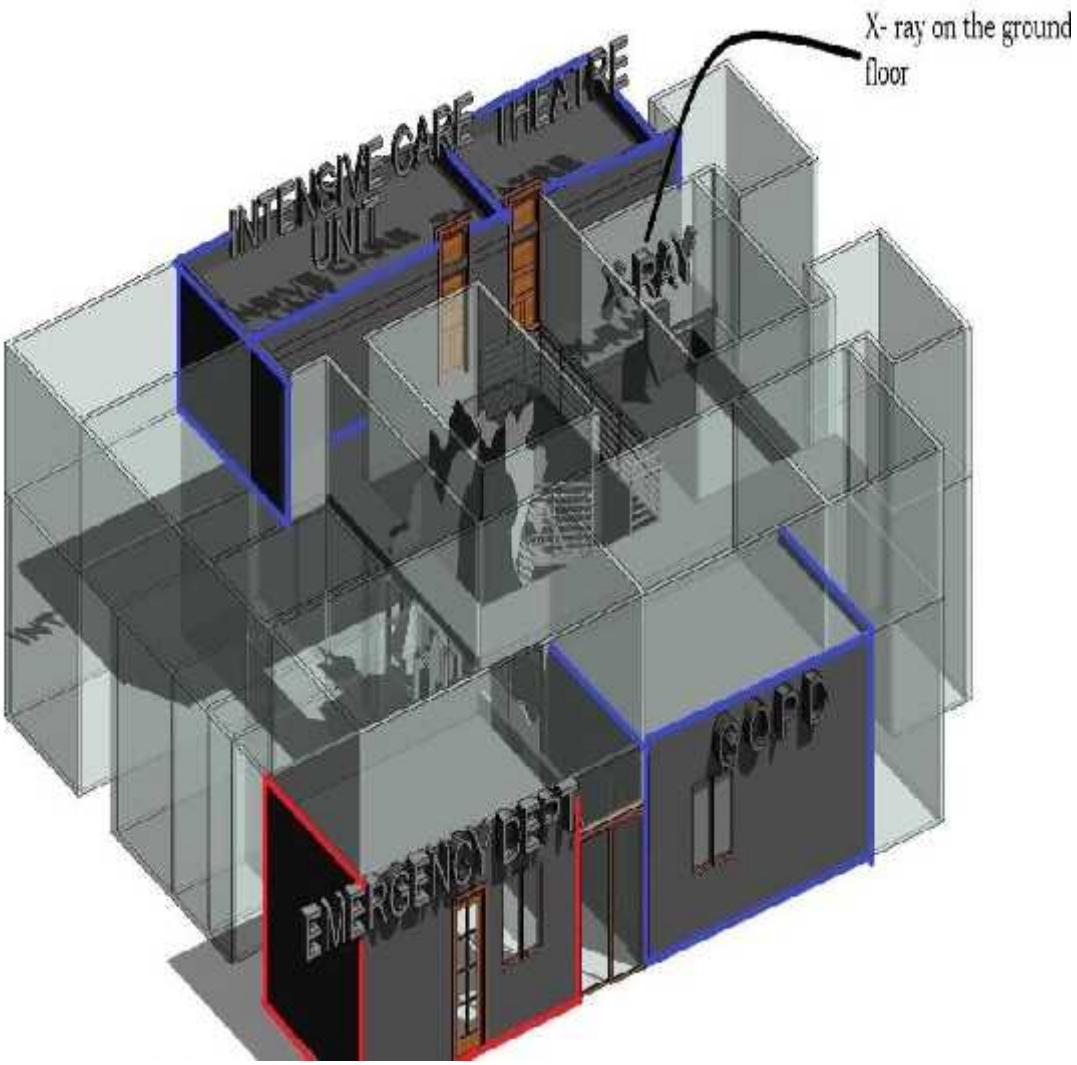


Figure 6.8 location of the ED to vital departments

6.6.2 Case Study Two (Wuse General Hospital)

Wuse General Hospital was commissioned in 1991. The capacity of this hospital is 122 beds.



Plate 6.4 Site plan, Wuse General Hospital
(Source: Google images, 2014)

The marked circle on plate 6.4 shows the entrance to the hospital. This also is the entrance for emergency entry into and out of the Hospital. The plan of the hospital shows a single entrance with a wide lobby space. The ED is located left from the entrance and is accessed via same lobby as seen on figure 6.9

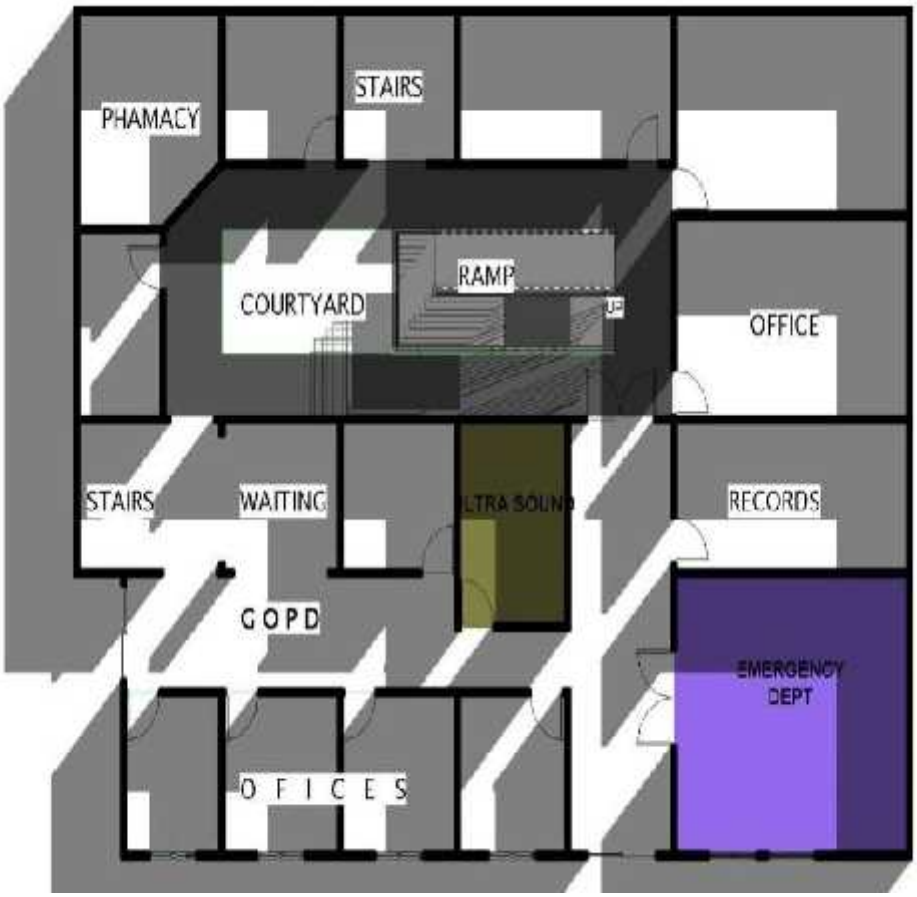


Figure 6.9 Ground floor Wuse General Hospital

In assessing the planning of the ED, it is observed and as illustrated on figure 6.10, important units responsible for the efficient functioning of emergency such as the Operating theatre, ICU, marked in blue in the figure below were located a floor higher than the ED. The significant distance between the ED and these departments were noted.

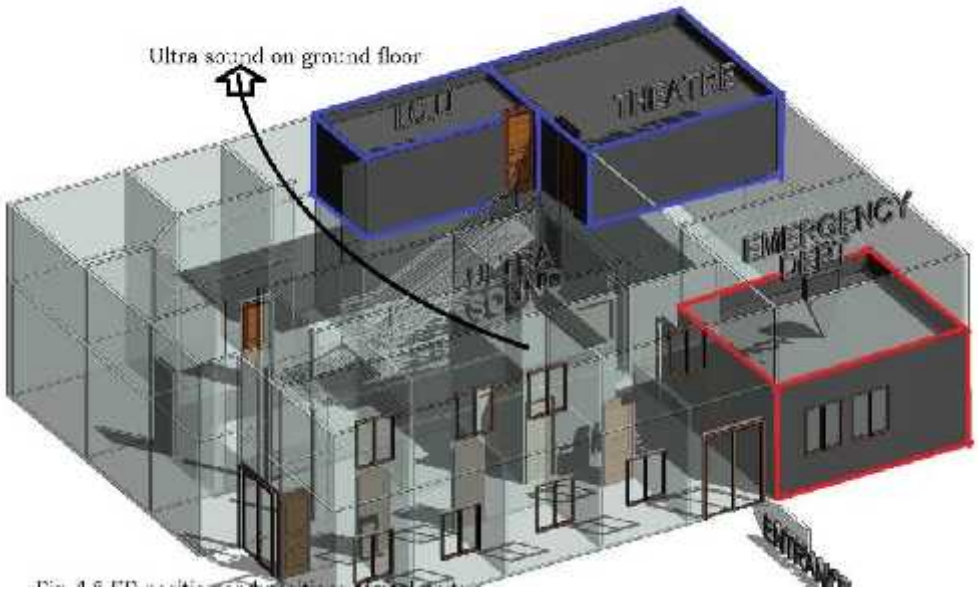


Figure 6.10 Location of the ED to vital departments

6.6.3 Case Study Three and Case Study Four (Kuje and Kwali General Hospitals)



Plate 6.5 Site Plan of Kuje General Hospital

Kuje General Hospital is located on the outskirts of Kuje LGA and was upgraded to a general hospital in 2004. The Hospital is a 39 Bed capacity secondary health care facility serving 28 communities. The hospital contains a single entrance and exit illustrated on plate 6.5. The planning system shows the ED positioned on the left sharing same lobby as the entrance of the hospital. The extensive lobby connects to the courtyard as shown on figure 6.11. The courtyard serves as the divergence of traffic coming from the entrance lobby.

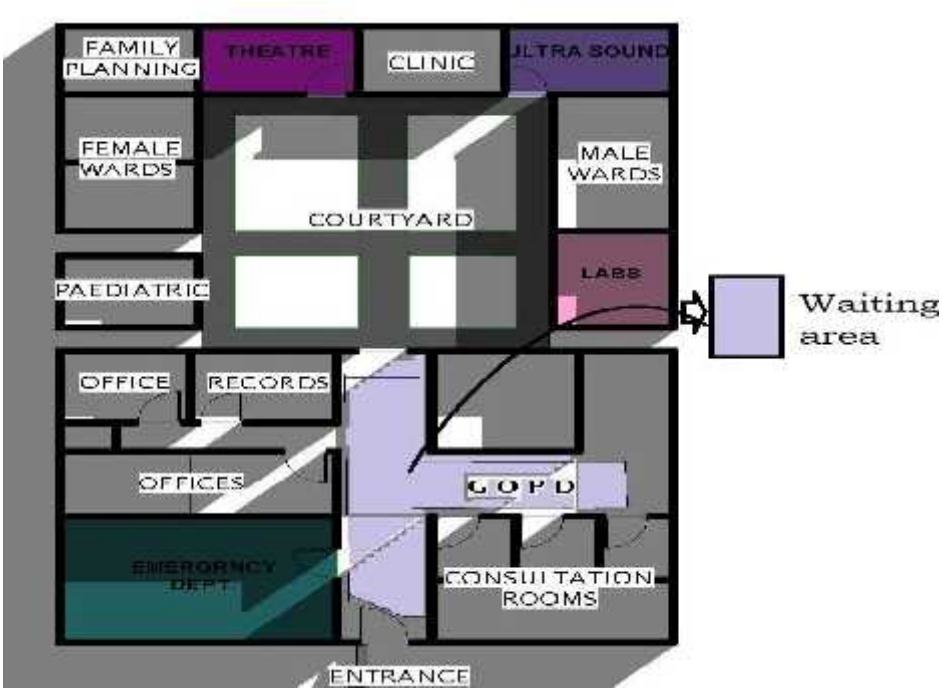


Figure 6.11 Ground floor plan, Kuge General Hospital

The colored marked spaces represent the units of more importance to the ED. As shown in the previous case studies, there exist significant distance from the ED to these units. This was noted.

Kwali General Hospital is a prototype design of Kuje General Hospital above. The hospital is located on the outskirts of Kwali General Hospital, was commissioned in 2005. The capacity is 39 bed and serves 13 communities.

In summarizing the four cases, a functional flow chart is generated. This flow chart on figure 6.12 shows the functional arrangement of the 5 broad hospital departments. This arrangement is termed the 'Traditional or Existing model' and represents the current design of secondary healthcare facilities in the FCT.

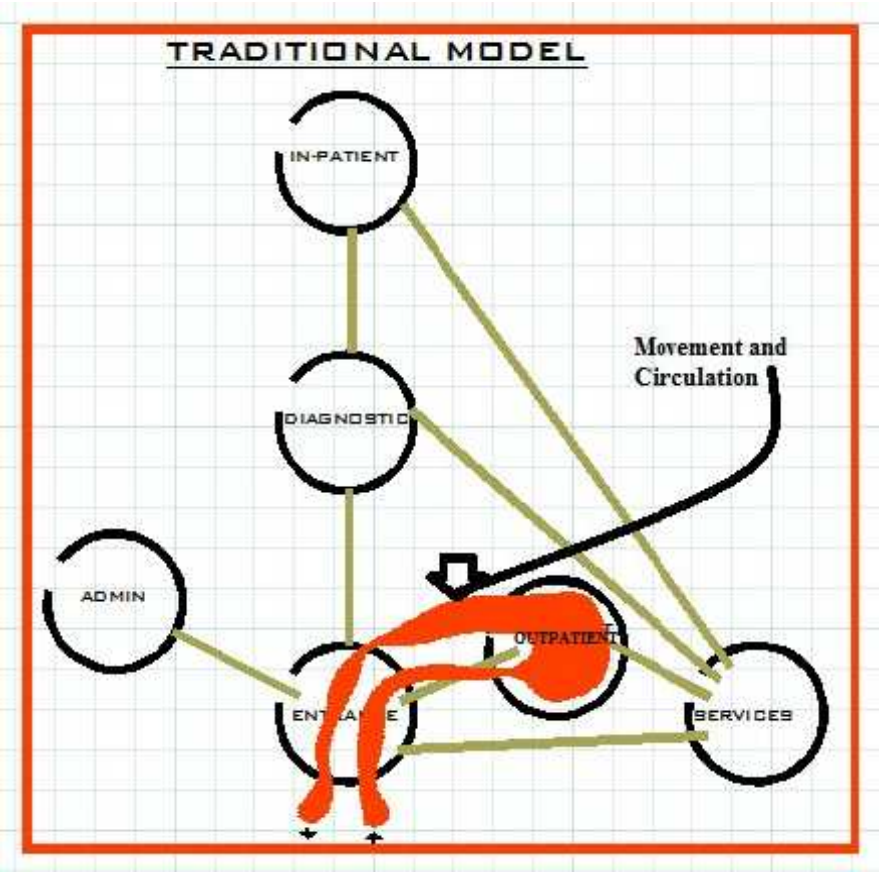


Figure 6.12 Flow chart of the Traditional model of Cases studied

The entrance is the first point of contact and usually contains a large lobby room that connects all the hospital. As previously mentioned in the problem statement, because this arrangement classifies the ED as a unit within the Outpatient, it was observed that movement and circulation (hatched in orange color) from the Outpatient which also hosts the ED, Diagnostics and Treatment, Administration, In-patient and services all have to access, converge or diverge in the entrance lobby. This mitigates efficient flow and movement slowing down any emergency required.

6.7 RESEARCH PRE-DESIGN

General Hospitals are complex building types comprising of a wide range of functional units. The functional units are grouped into five broad departments and these are listed below.

1. Outpatient Department
2. In-patient Department
3. Diagnostic and Treatment Department
4. Services Department
5. Administration

These Departments are inextricably intertwined with movement and communication of people, material and waste illustrated in figure 6.13.

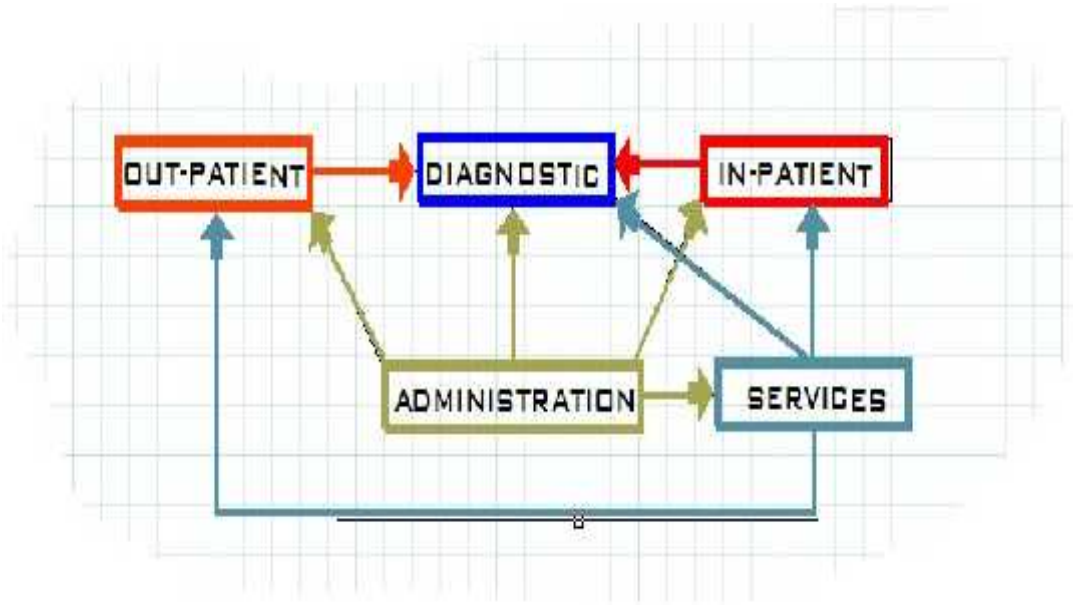


Figure 6.13 Functional relationships of the five broad departments

These intertwined departments are grouped into three zones. This is illustrated in figure 6.14. These zones include; The Clinical zone, the Support zone and the Nursing zone. The reason for these zones is to simplify further the evaluation of these departments.

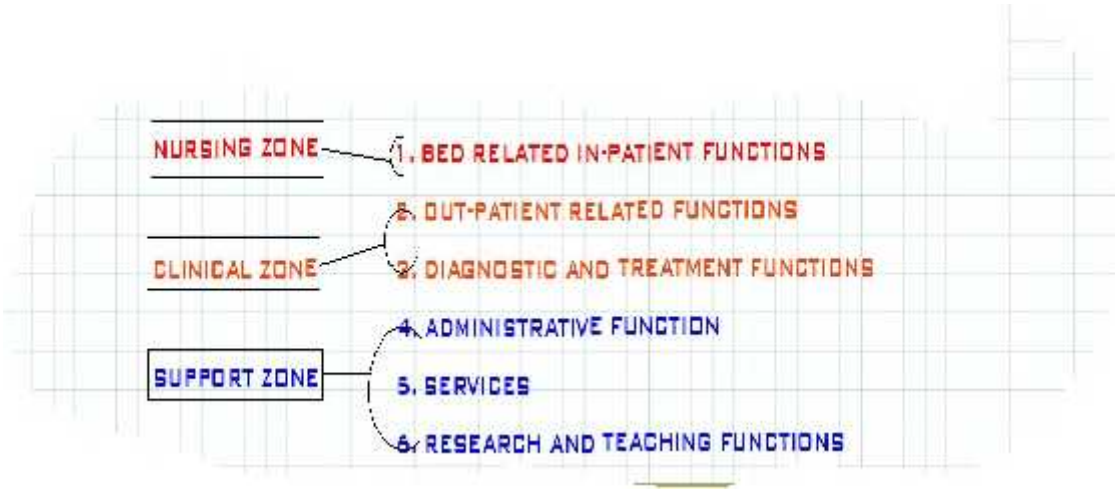


Figure 6.14 Clinical zones

Having simplified the departments into zones, figure 6.15 evaluates the clinical relationship between the zones. This evaluation shows the support zone sandwiched by the Clinical zone (Outpatient) and the Nursing zone (In-patient). Traffic from the In-patient and the Outpatient in the hospital goes through the support zone before discharging.

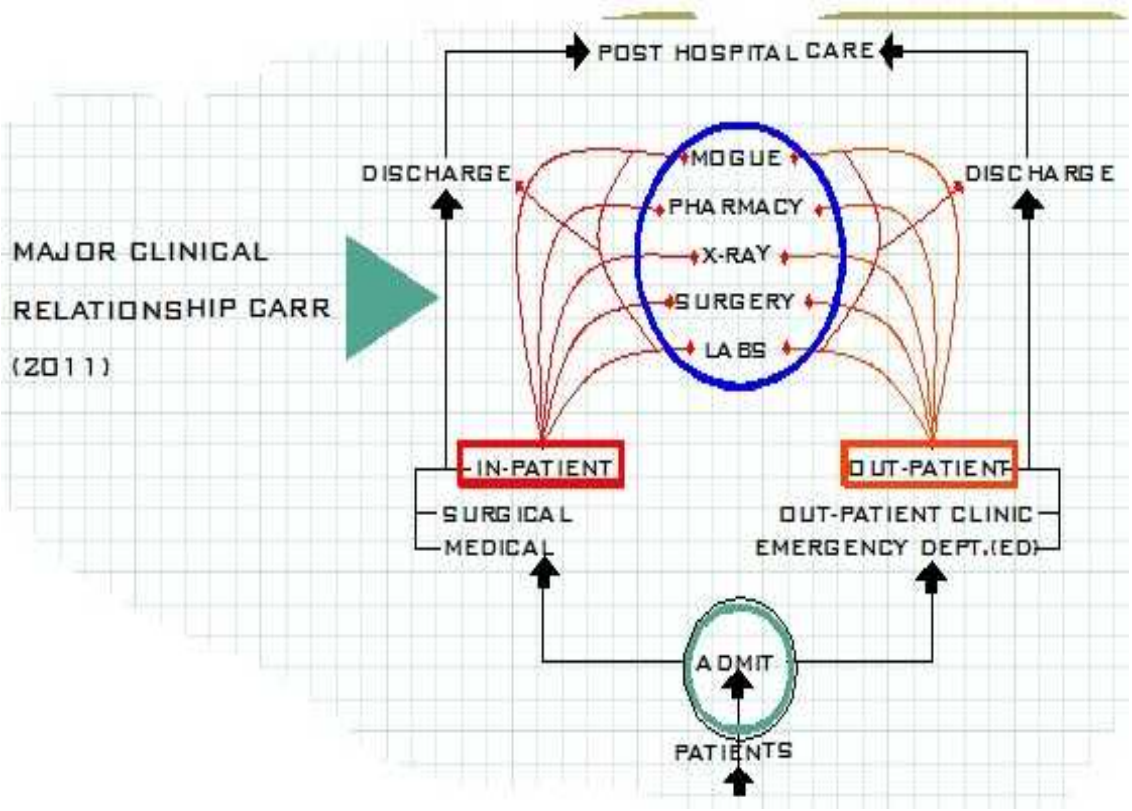


Figure 6.15 Major clinical relationships

6.8 PROBLEM STATEMENT

The traditional concept of healthcare design basically divides hospital operations into the five aforementioned departments already described to be inextricably linked. This concept definitively classifies the ED as a unit in a crowded Outpatient department as illustrated in figure 6.16.

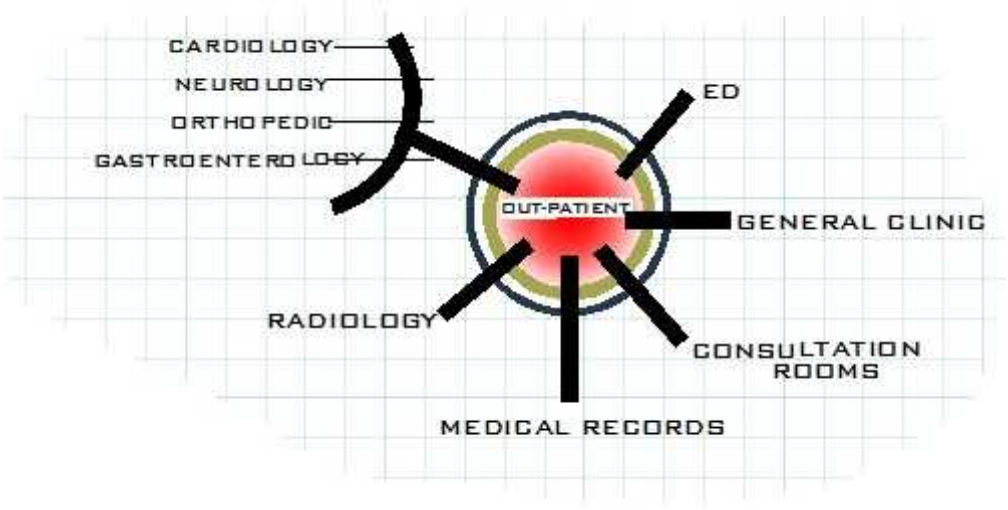


Figure 6.16 Functional units within the Outpatient Department

Therefore,

1. Emergency lobbies are continuously crowded with shared facilities for ingress/ egress, circulation, power and water.
2. No provision for multiple case emergency treatment and management
3. Vital units such as X-ray, Pharmacy, Blood banks are often separated and located significantly off the ED.

Conclusively, these reasons reduce quick dispensation of;

a. Needed emergency

b. Increasing length of time

c. and preventable casualties

6.9 DESIGN CONCEPT

The design concept seeks to provide a design that can overcome the challenges or problems mentioned in the problem stated above. In applying the framework therefore, two rather opposite concepts are applied to complement each other, offering the required solution; the concept of Decentralization and the concept of Centralization. Decentralization was applied operationally to provide control and Centralization applied physically in the planning of the ED function with its merits been; Participation, Diversity, Efficiency, and Conflict resolution The combination of both concepts produces an hybrid termed 'Centralization and Decentralization' as noted in figure 6.17.

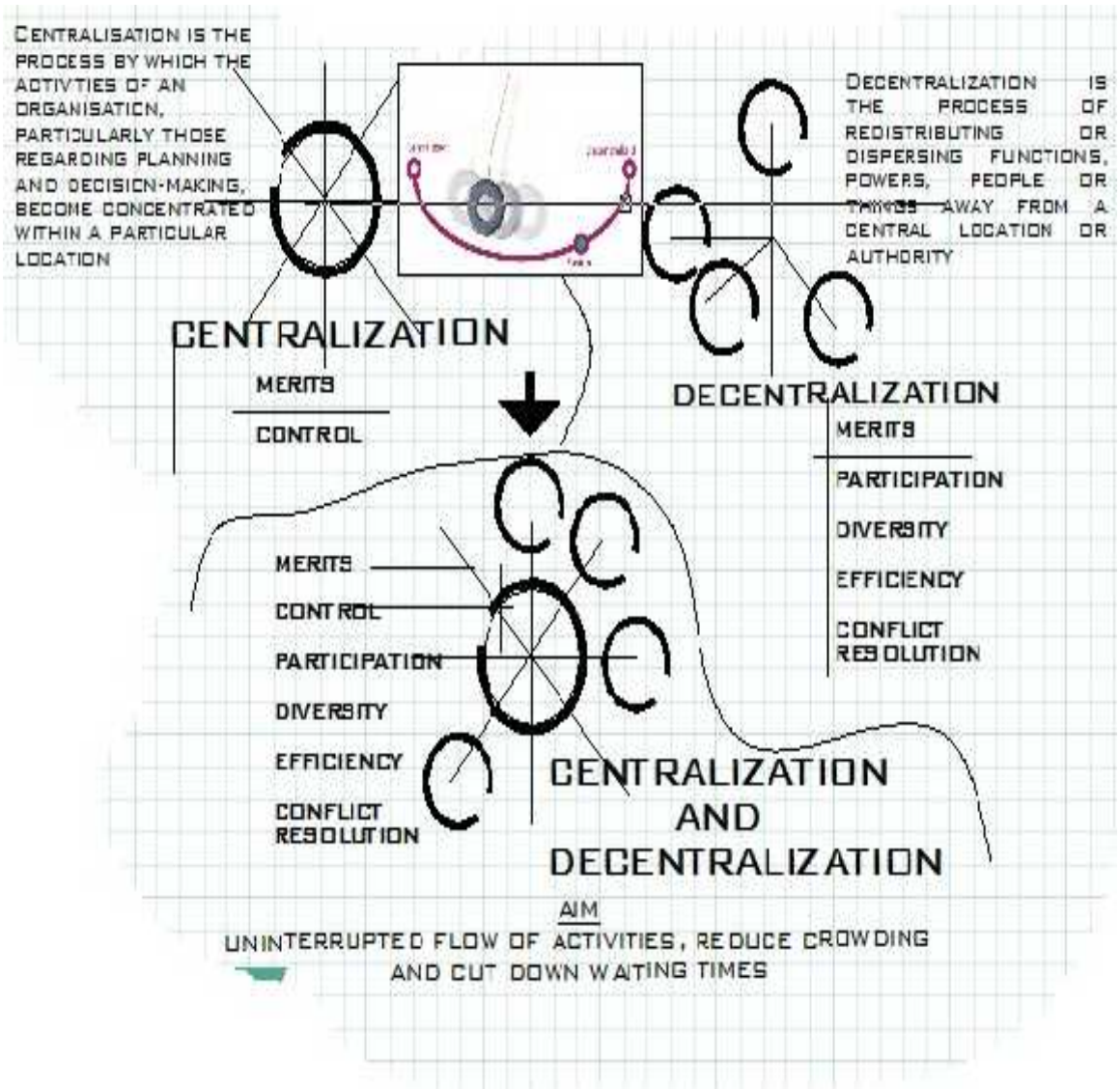


Figure 6.17 Centralization and Decentralization concept

6.10 RESEARCH DESIGN

The application of the above stated concepts births a new design of ED that is Centralized in planning and Decentralized in operations. The figure 6.18 below shows the ED separated from the Outpatient and connected to the other departments.

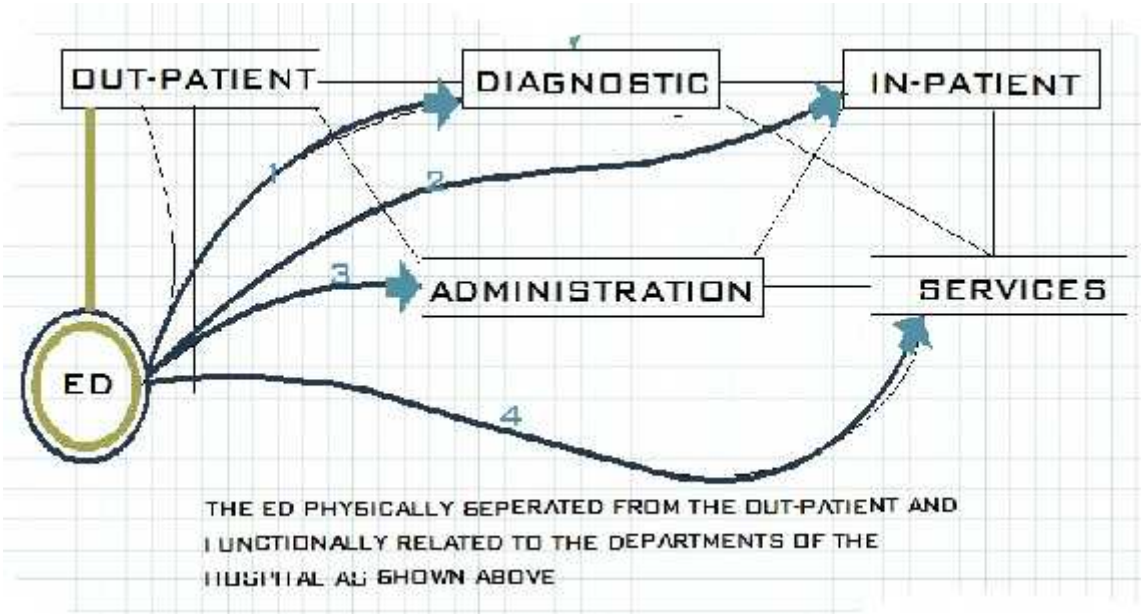


Figure 6.18 Separation of the ED from the Outpatient

Having previously provided a site zoning in title 6.4 above, and analyzed the site characteristic in 6.5, the site development plan was proposed. In producing the site development plan, a branched central spine architectural planning concept was adopted. This planning concept emphasizes a main central aisle that transports most of the circulation of humans, waste and material to and from the hospital units. The hospital units are placed on either sides of the spine.

Because the planning concept encourages as many open ends as possible, up scaling and external flexibility are the most important advantages to this concept. In Nigeria, with the ever exponentially increasing population growth in relation to available social amenities and especially in Hospital planning, Up scaling and external flexibility

should be a key component in Hospital designs. The Site Development Plan is shown in figure 6.19.

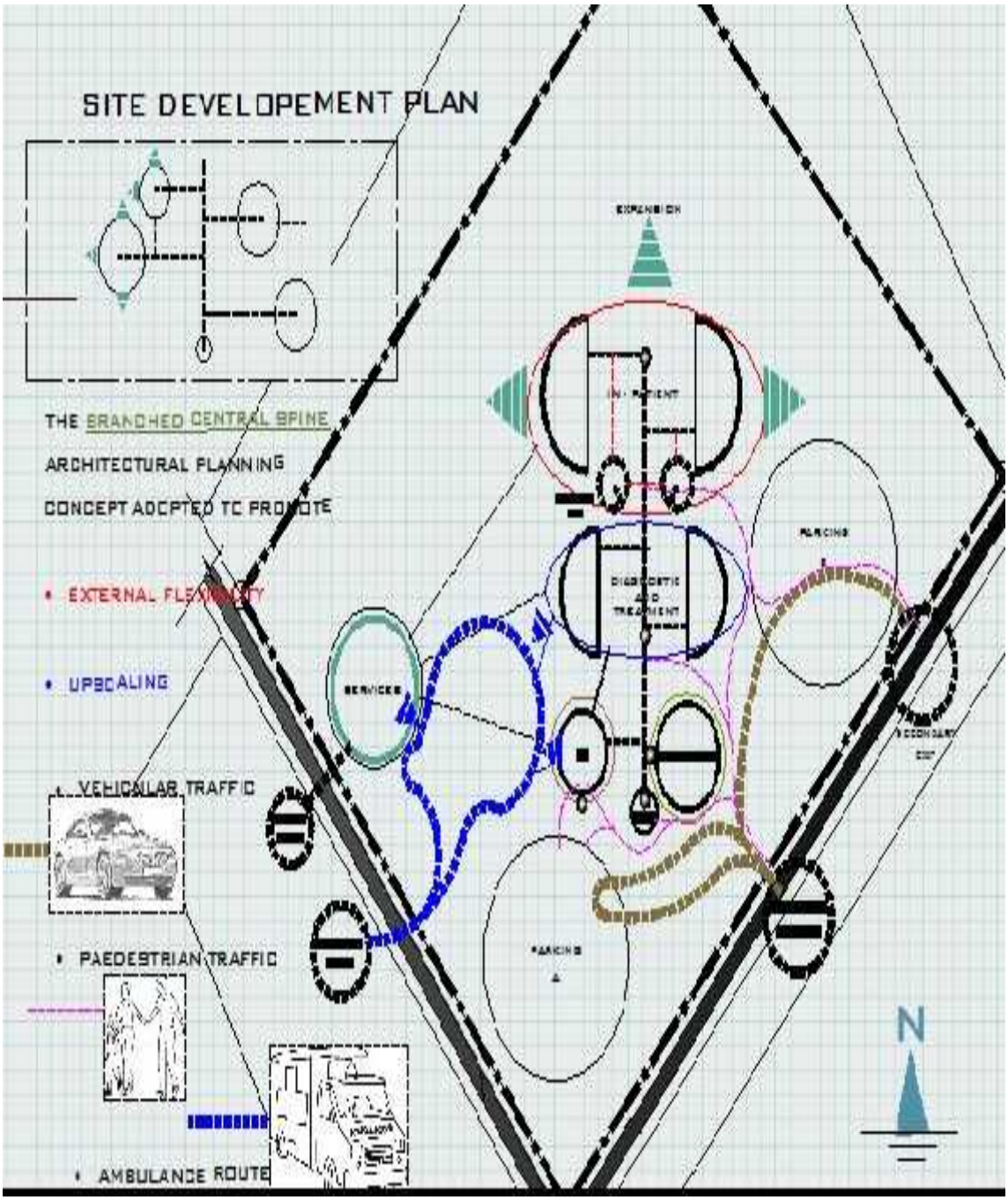


Figure 6.19 Site Development Plan

The site development plan was used as a guide to design the site plan shown on figure 6.20. The site zoning was used in the physical determination of the positions of the units shown the site plan. The closest units to the entrance of the site as observed in the study,

noted in the zoning and demonstrated in the site plan are the departments patients should contact first. These are the Outpatient department and the Emergency Department (ED).

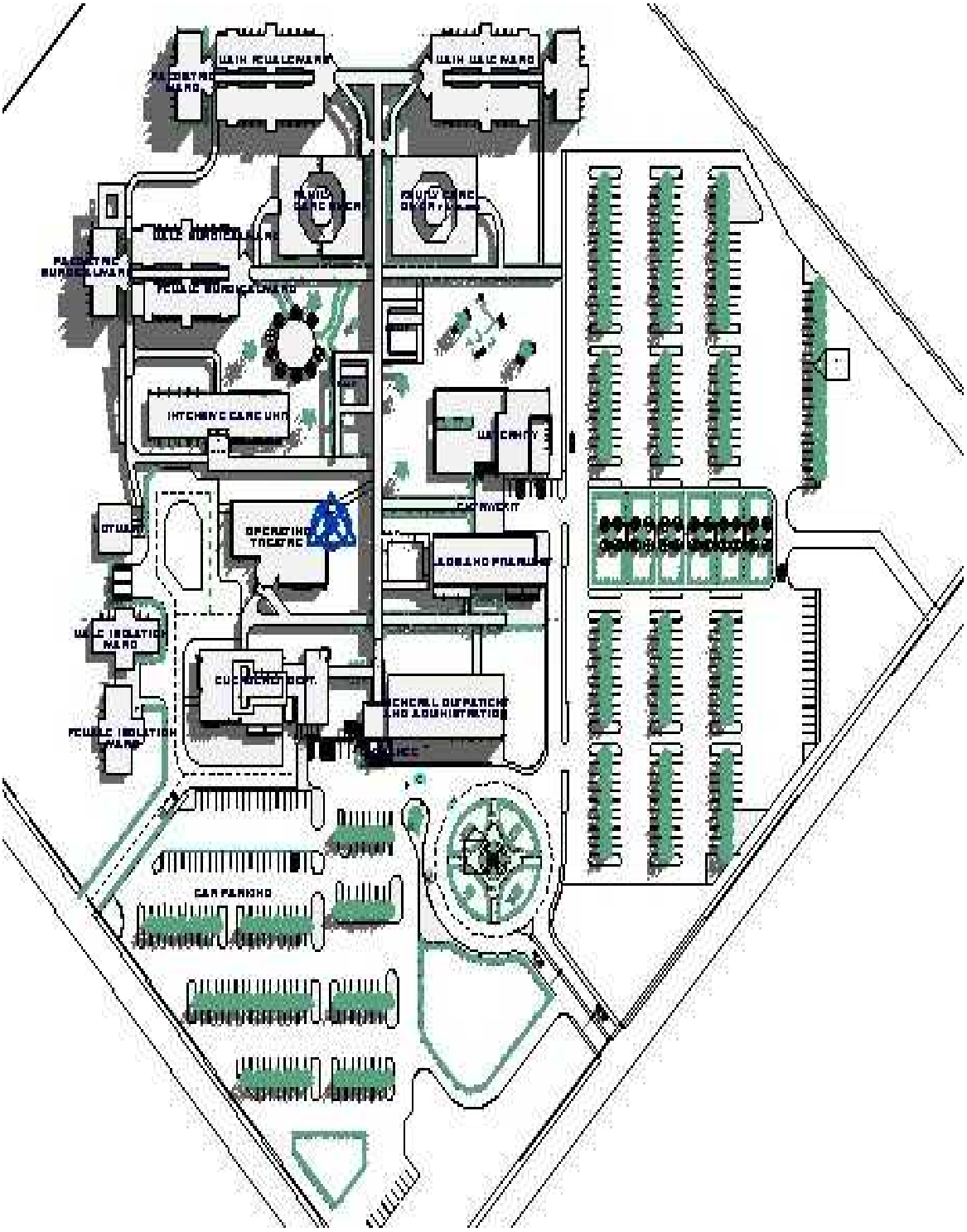


Figure 6.20 Site Plan, Proposed General Hospital, Lugbe

The parking is separated into two; The Outpatient parking located south of the plan and is directly assessable to the ED and the In-patient parking located east of the site plan. The Inpatient wards are located furthest north. The support zones which include Operating theatre, labs, Pharmacy and maternity are sandwiched between the Outpatient and Emergency south and In-patient ward north and services west of the site plan.

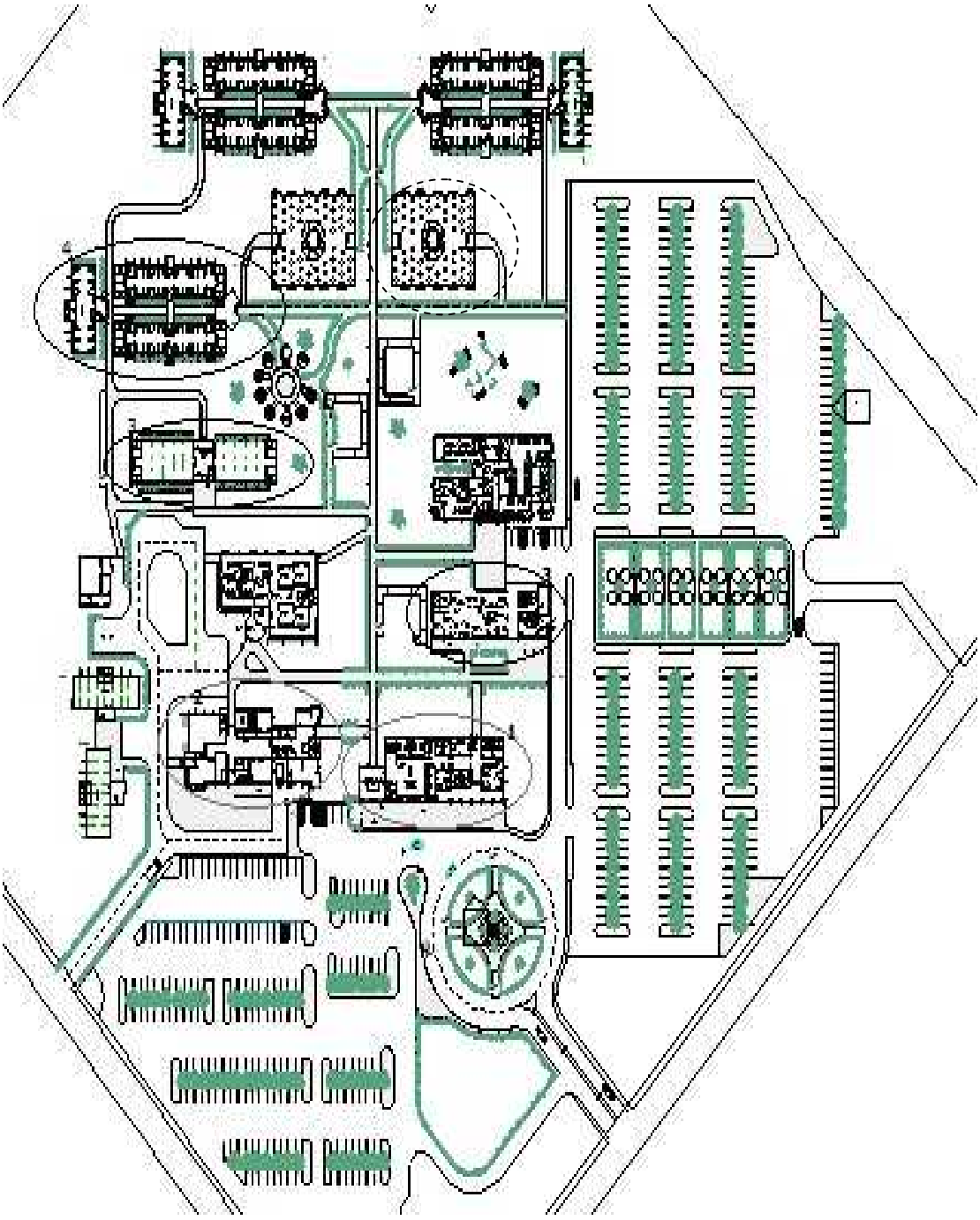


Figure 6.21 Plans on Site, Proposed General Hospital, Lugbe

The plans are placed on the site and demonstrated on figure 6.21 above. Sections of the site were highlighted with the grey circle, labeled and blown up to show a more detailed view of the plans. Highlighted circle labeled 1 represents the Out-patient Department, label 2 for the ED; label 3 for Maternity and ICU, and 4 represents the Main male and female In-patient wards. The black dotted circles represent the Family care givers pavilions. Four number pavilions were provided.

The blown out plan of the Outpatient department below on figure 6.22 has its emphasis on free flow of movement, which also is flexible. Its main entrance is connected from the main hospital entrance. Immediately entering into the Outpatient main waiting lounge, an access stairs is easily visible and accessible. The Outpatient clinics are also provided in this area. The movement flow guides patients next to the Diagnostics or consultation rooms then depending on if the patient is to exit or move on to treatment, the movement is north (treatment and exit) or south (main exit).

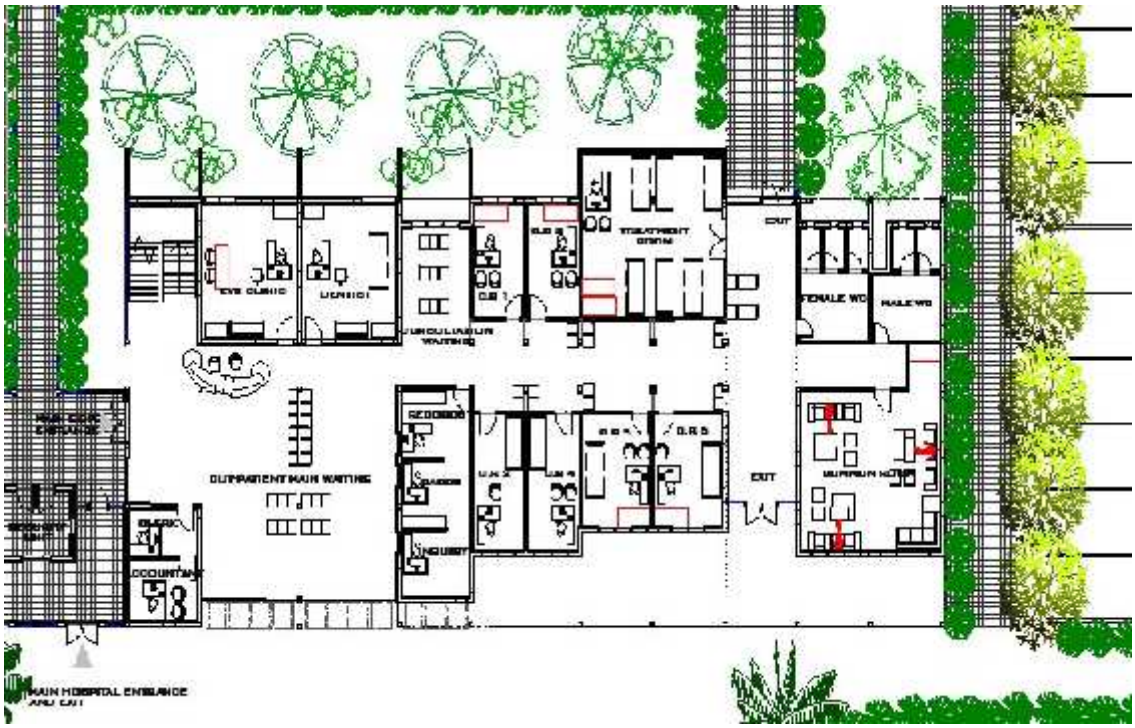


Figure 6.22 Blowouts 1 (Outpatient Department)



Figure 6.23 Approach Elevation, Outpatient Department

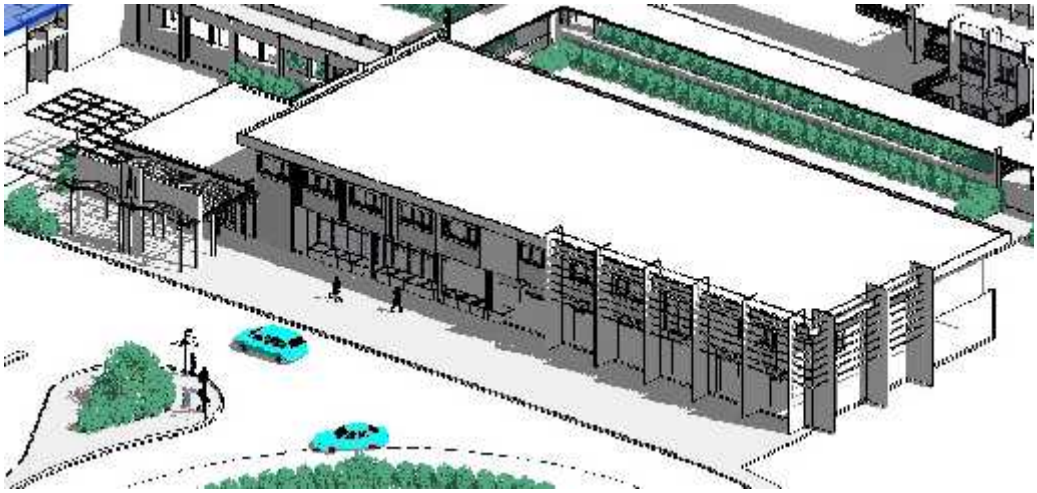


Figure 6.24 3D, Outpatient Department

Figure 6.23 and 6.24 are views, illustrating the form designed to be simple. The use of rhythm for window placement, horizontal and vertical planes are explored and demonstrated.

Blowout 3 details the Main In-patient wards. Forty (40) numbers is provided for Male, forty (40) numbers for females and twenty four (24) numbers for children. The wards consist of a total two floors. The Ground floor is shown on figure 6.25 and a 3D view is shown on 6.26. The plan also emphasizes quick movement or flow. A 2m walk way is provided between each block. Toilets and Bathrooms are located at the ends of the

block. A patient toilet/bathroom ratio of 1:5 is adopted from the Australian model of 1:8. In Nigeria, an unhealthy maintenance culture of no proper replacement of toilet features necessitated the adoption of 1:5 in order to decrease the pressure on the toilet features.

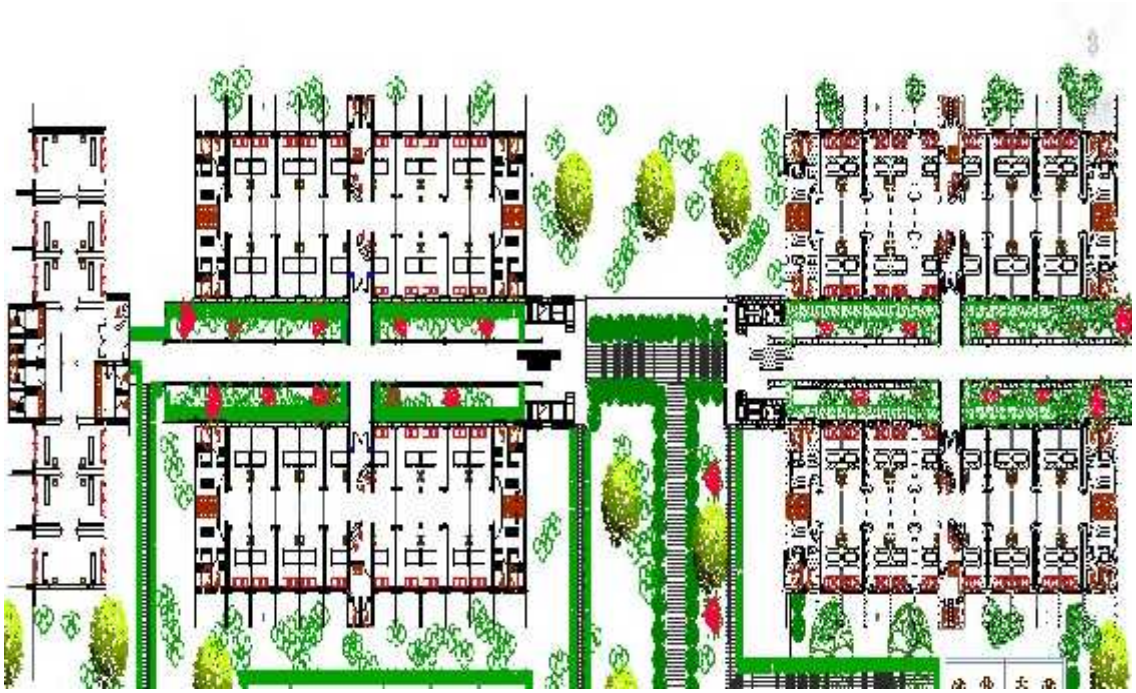


Figure 6.25 Blowout 3 (Ground floor, Main In-patient wards)

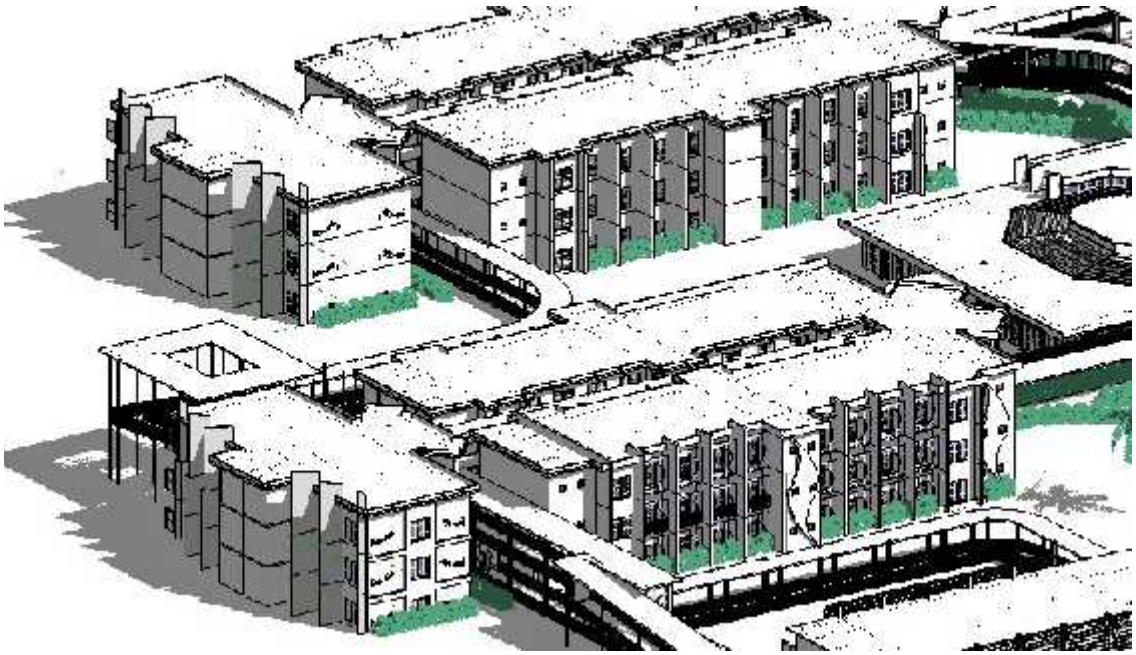


Figure 6.26 showing In-patient wards.24 3D

In space allocation per person in the wards, the design adopted the reviewed Australian model that sought to increase the floor area per person. In this design model, the adopted area per person is 3.1m by 3.6m. This area is sufficient to accommodate one patient, a bed side chair, 2 maximum number caregiver beds, a clinical work top and circulation. These are demonstrated on figure 6.27, 6.28 and 6.29.

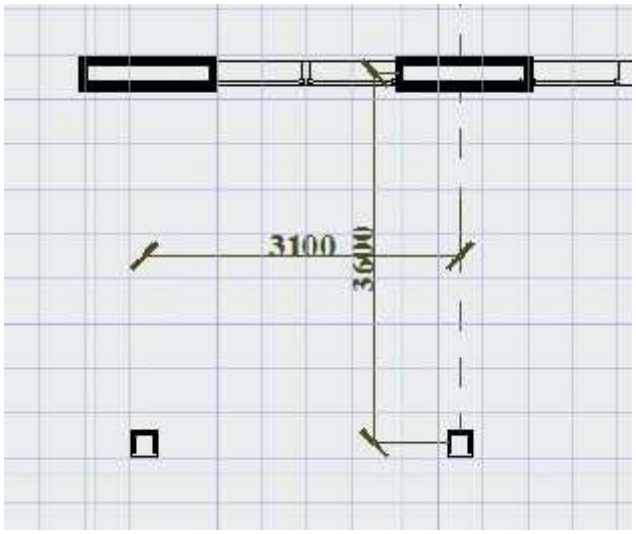


Figure 6.27 Space area per patient

Figure 6.28 and 6.29 below demonstrates how the space is managed. The figure shows two care giver beds which can be tucked into a wardrobe. The simple technology involves the beds been folded out at night time and this beds are tucked backed in at daytime as the case warrants.

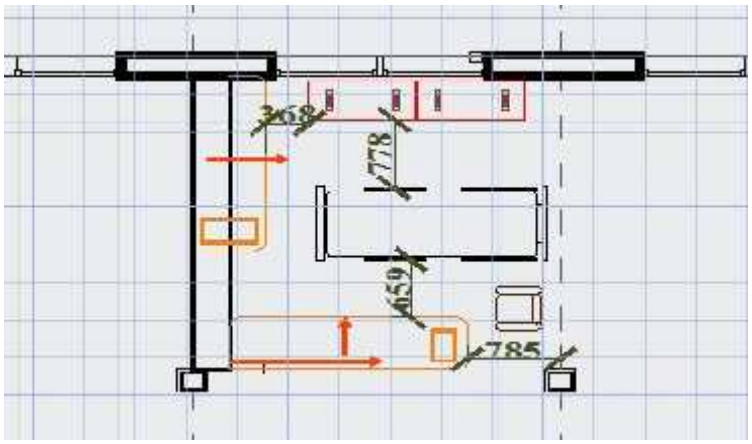


Figure 6.28 Space area showing tucked out care giver beds

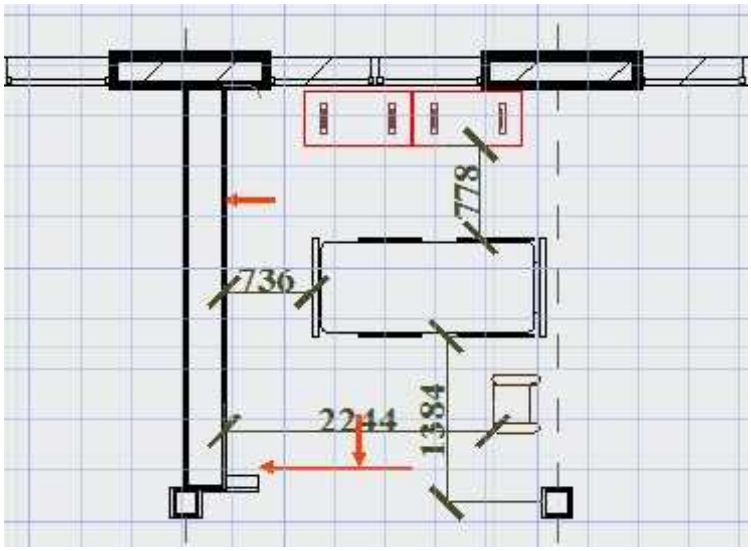


Figure 6.29 Space area showing tucked in care giver beds

Blow up 4 represents the Emergency department. Movement and flow of operations is very sensitive to the emergency department. Every second is of importance and more often than not is the difference between success and failure. Therefore, A flow scheme is developed illustrated on Fig. 6.30.

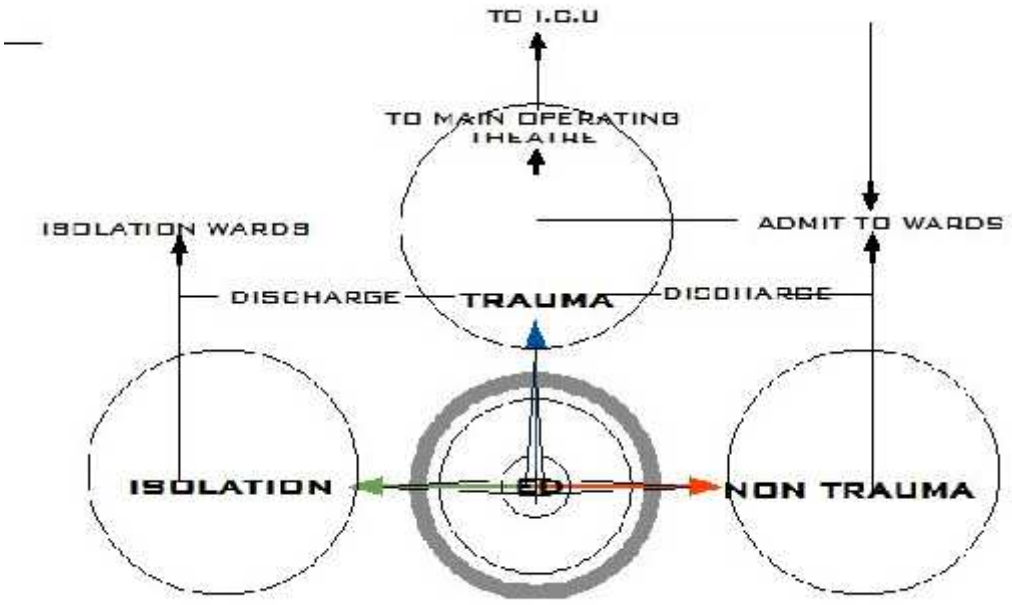


Figure 6.30 Emergency department flow scheme

In the analysis in the figure shown above, all emergencies are divided into three. These are Trauma (Accidents and incidences resulting to physical injuries), Non trauma (nonphysical injuries; poisons, snake bites, etc) and Isolation (Transmittable diseases; Ebola, laser fever, etc).

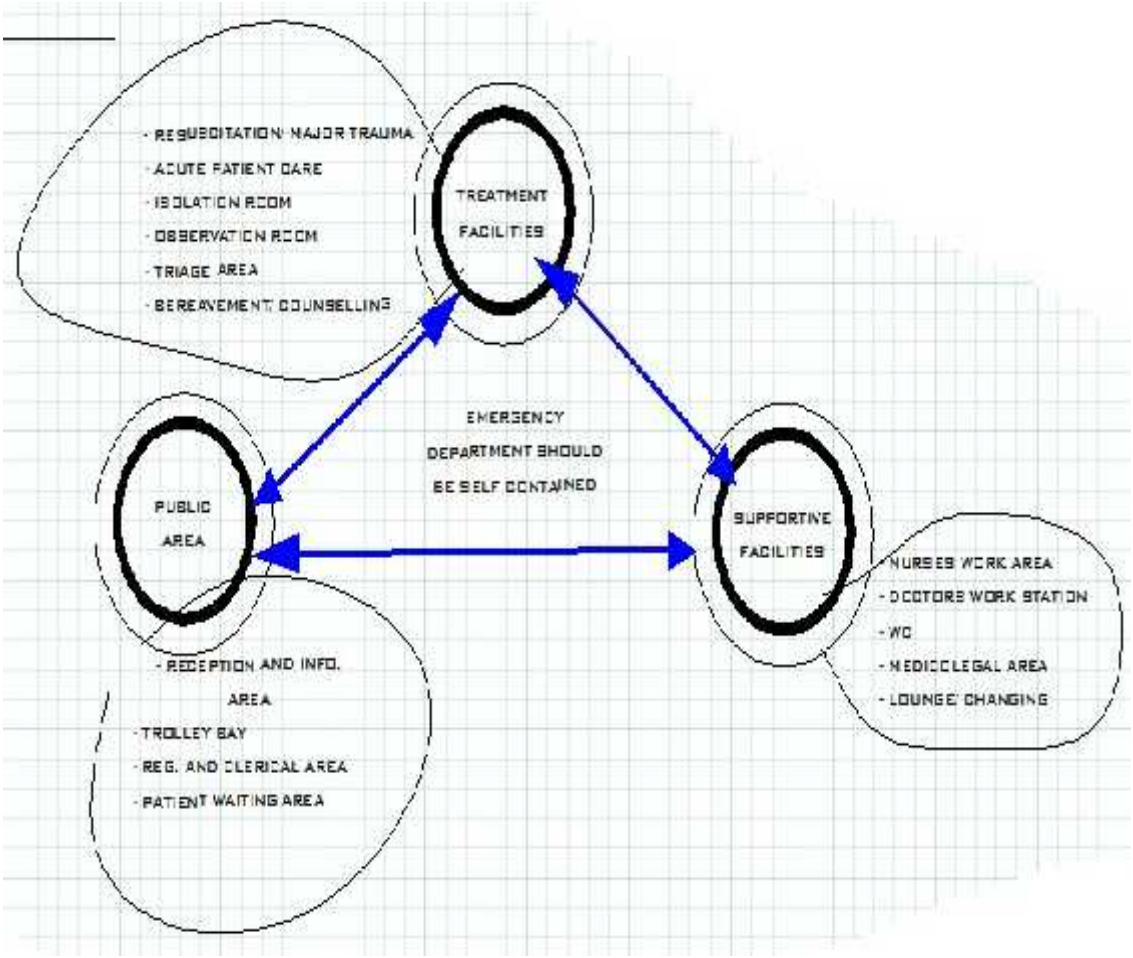


Figure 6.31 Framework of the Emergency Department

The ED framework guides the planning of the design. Functional requirements are divided into three (3) groups. These groups are illustrated in Fig. 6.29 a above and stated below.

- Treatment areas
- Public areas
- Supportive facilities

The essence of this planning concept is to prevent the intertwining of patient circulation to these spaces.

Below is the floor plan of the ED. (Fig. 6.32). The floor plan is guided by the framework which is graphically illustrated on fig. 6.30a and 6.30 b.



Figure 6.32 Ground floor, ED



Figure 6.33a circulation flow, ED

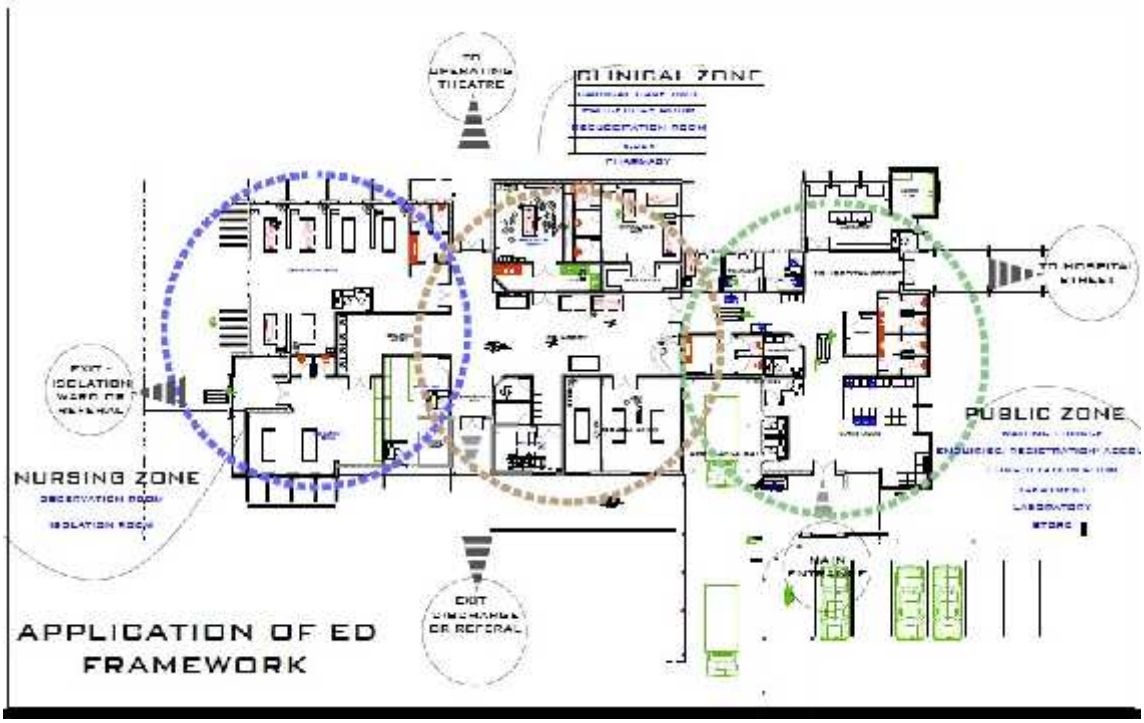


Figure 6.33b Zoning, ED

Very imperative to the design, and as observed in the study, certain key units of the Hospital that enables the ED to function efficiently are separated and located away from the ED. And in Hospitals where they are planned close by, they are operationally planned for the entire hospitals and have no plans to receive and service abrupt and unexpected cases that an ED would normally present. However, on recommendations of the findings of this study, the design of the proposed ED provides these important units within the ED. These units as seen in figure 6.33 above are; An account section, X-ray room ,a Pharmacy, a blood bank in the ED lab (See Architectural Drawings on Appendix C; Design). These are shown in figure 6.33 b.

Figure 33c is the elevations and graphic 3d of the ED. All external walls are rendered with 13-16mm plaster, windows are side hung aluminum casing and in the x- ray wall, the aluminum casing window, 1.5 mm lead strip is placed within the glass to prevent radiation from the x- ray machines. 3Ds on Fig. 6.33d provides graphical resolutions of the architecture of the proposed hospital.



Figure 6.33c ED Elevation

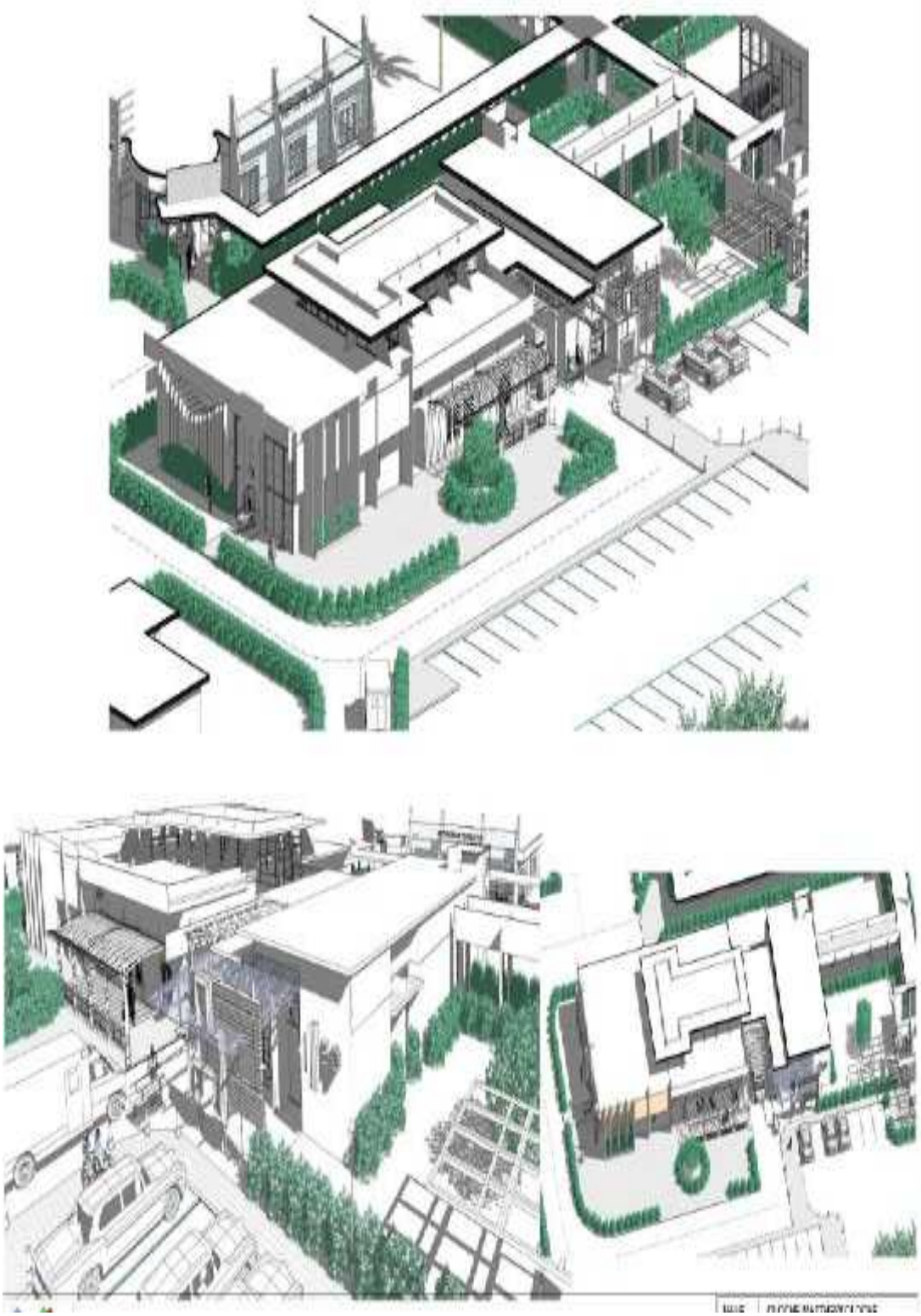


Figure 6.33d 3Ds of the ED

Hardware finish is specified for durability, easy cleaning, fire protection, privacy and strength of material. ED section on Fig. 6.33e shows specific floor, wall and ceiling finishes

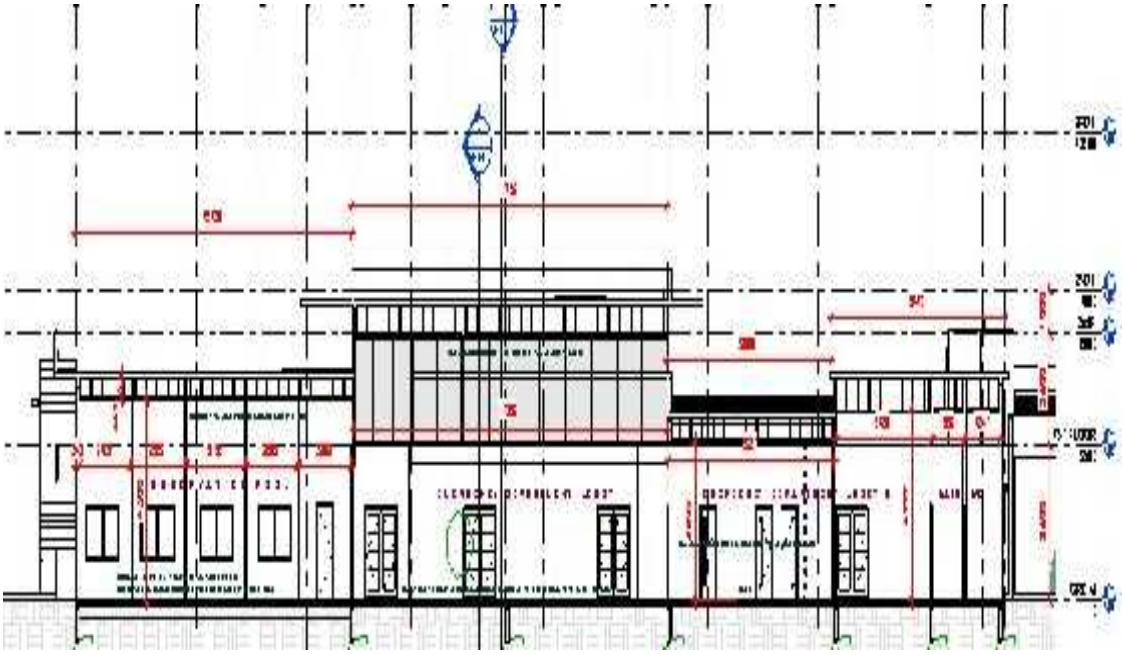


Figure 6.33e ED section

Room and corridor partitions is designed for a single layer of 16mm fire rated gypsum wallboard (dry wall) on each side

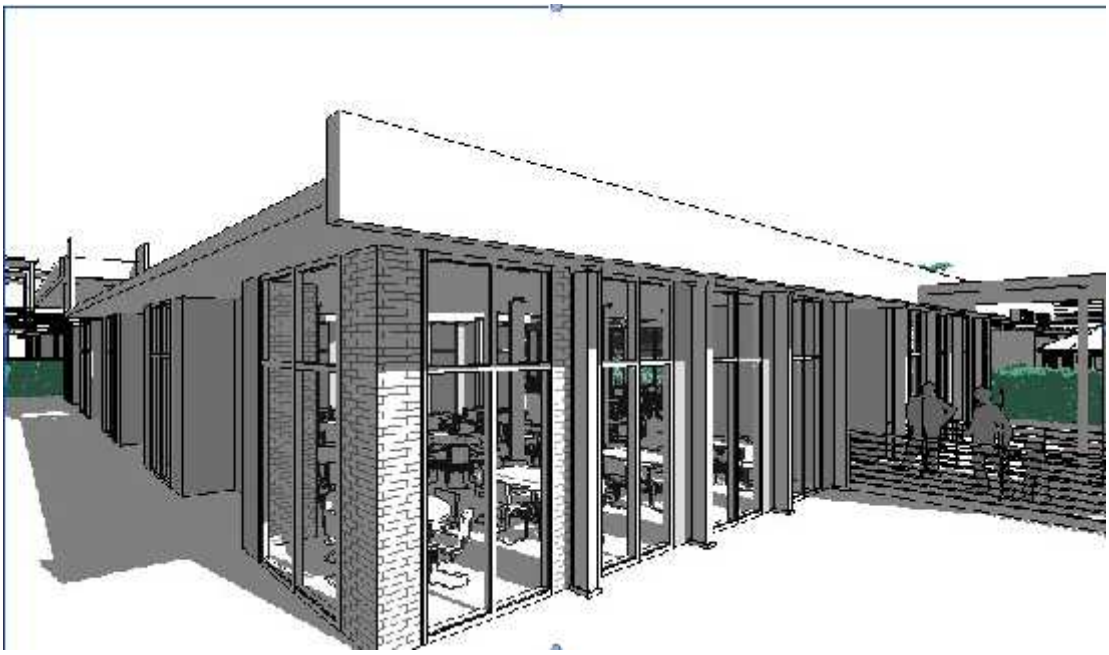


Figure 6.34 3D showing the ED and Family care giver pavilion from the Site entrance

Finally, the black dotted circle on the plan on site in figure 6.22 on page 103 represents the family care givers zone. This zone is provided to accommodate large numbers of visiting family members and friends. As is customary to Nigerian customs, an ailing patient is unendingly visited by large numbers of family and friends at a time. Figure 6.35 shows the plan of the family care giver zone. The space contains round tables for six. This number can be increased if the case demands. Retail outlets for snacks and drinks are provided in the middle of the pavilion.

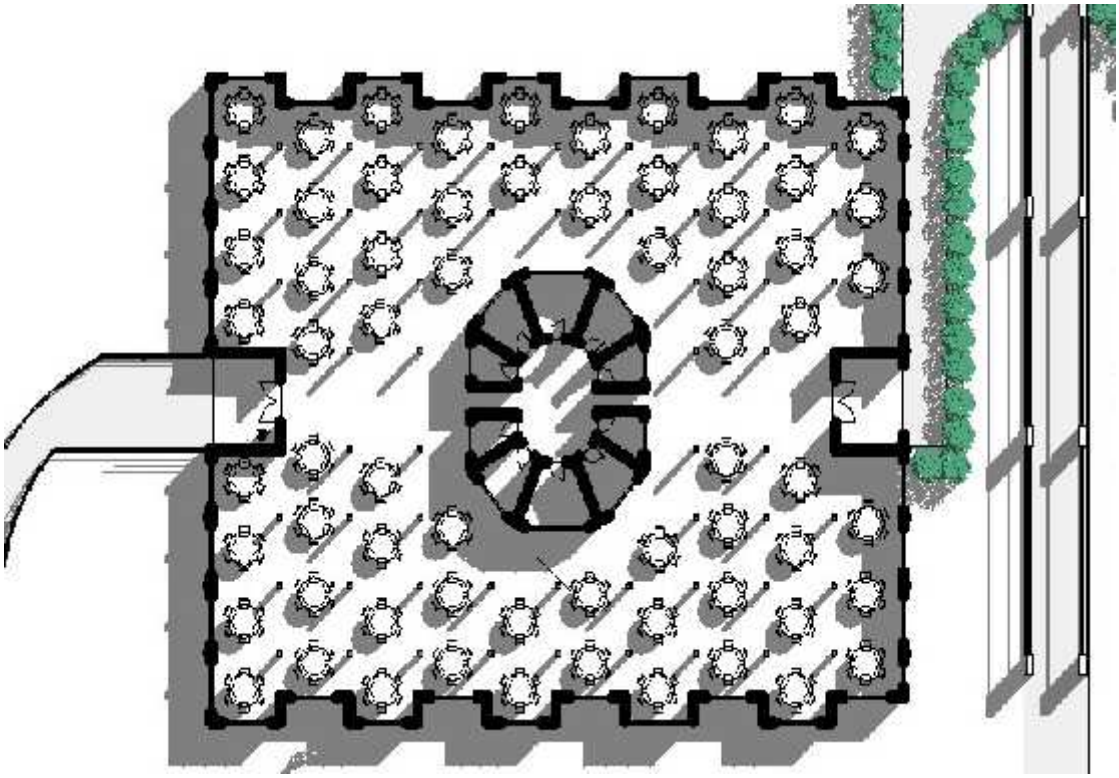


Figure 6.35 Plan, Family care givers Pavilion

The design of the Pavilion emphasizes openness to explore and enjoy the wonderful environment as family members and friends relax. The claddings are glazed bronze tinted movable panes to help protect from glare and rain. Steel trusses are bolted to steel stanchions and placed at 6m centres. The design of the pavilion is shown below on figure 6.36.

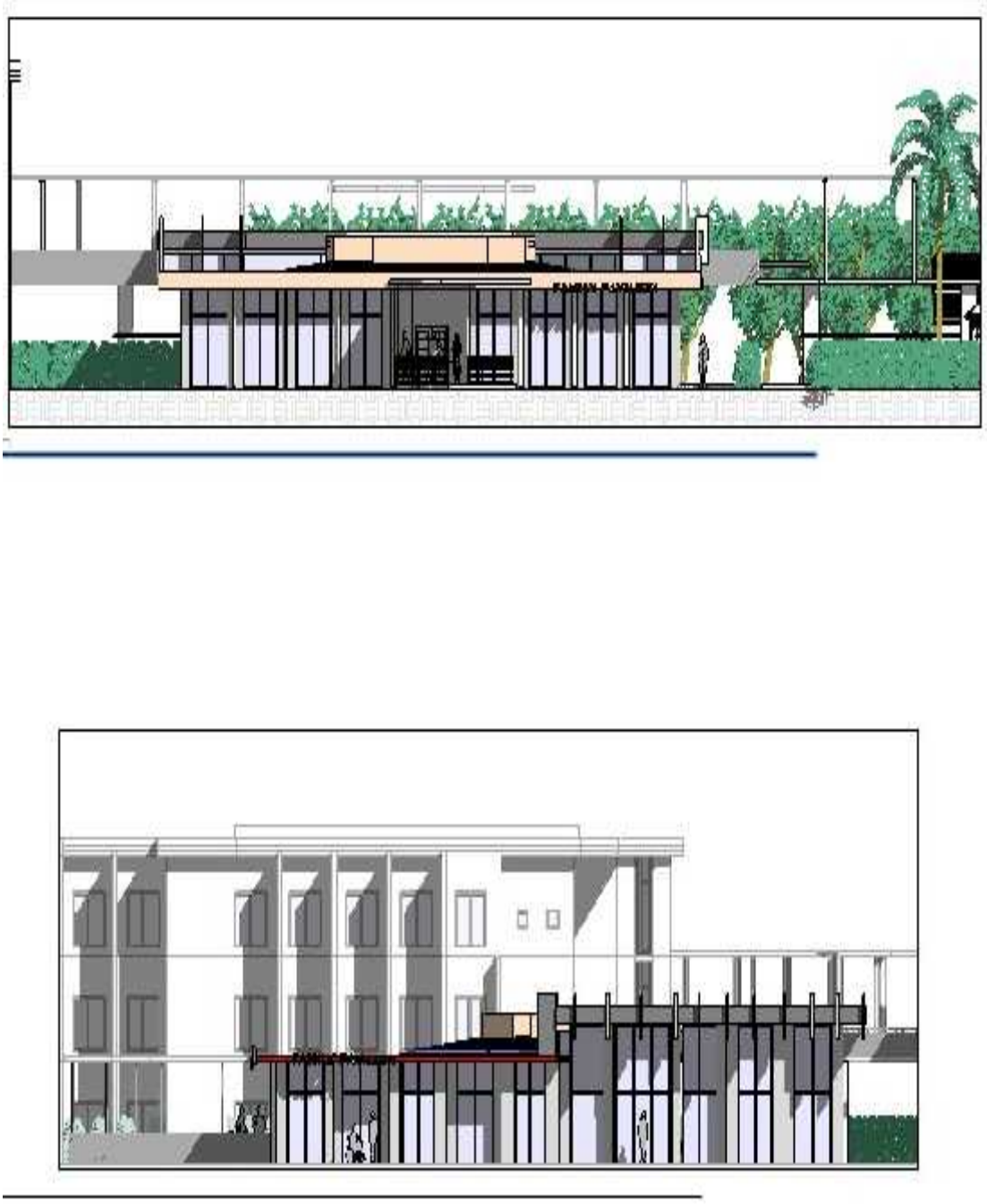


Figure 6.36 Elevations of the family care giver pavilion

In summary, a graphic comparism of the existing or current (Traditional Model) Hospital design is done with the proposed model and shown in figure 6.37.

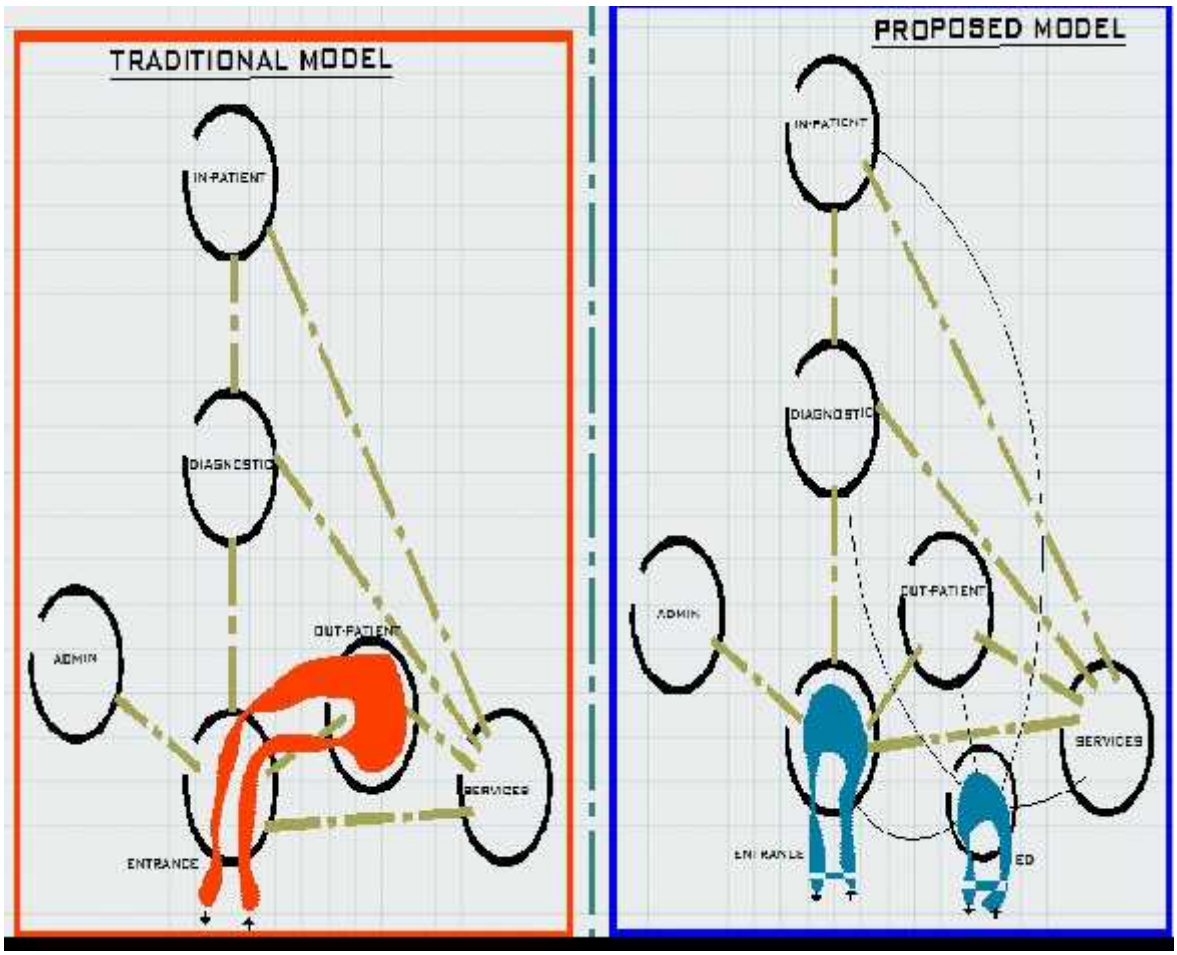


Figure 6.37 Comparism of the traditional model with the proposed model

The figure 6.34 shows the proposed model with the ED isolated from the Outpatient in order to separate the crisscross of traffic between the ED and the other units of the Outpatient department. The proposed model also shows the ED connected to the remaining department from its almost exclusive access.

Concluding the design report, the framework recommended Isolation, Decentralization and Centralization as key concepts used to improve the operational efficiency and effectiveness of the state of emergencies in the Emergency department of Abuja General Hospitals. The Design demonstrated the application of the aforementioned framework by isolating the ED from the Outpatient, Decentralizing important units to the ED by providing X-ray and Pharmacy within the ED aside the main X-ray and

Pharmacy department of the Hospitals and finally, Centralizing the ED having been isolated in such that its services is accessible to and from the remaining departments of the General Hospital.

The Equipment specification for the ED is shown on figure 6.38, others are in the appendix (See Appendix C, x, xi, xiii). Shown in the figures 6.39, 6.40 and 6.41 are the Approach elevation and Site 3Ds respectively, and are products of the research findings, framework, and site development plan.

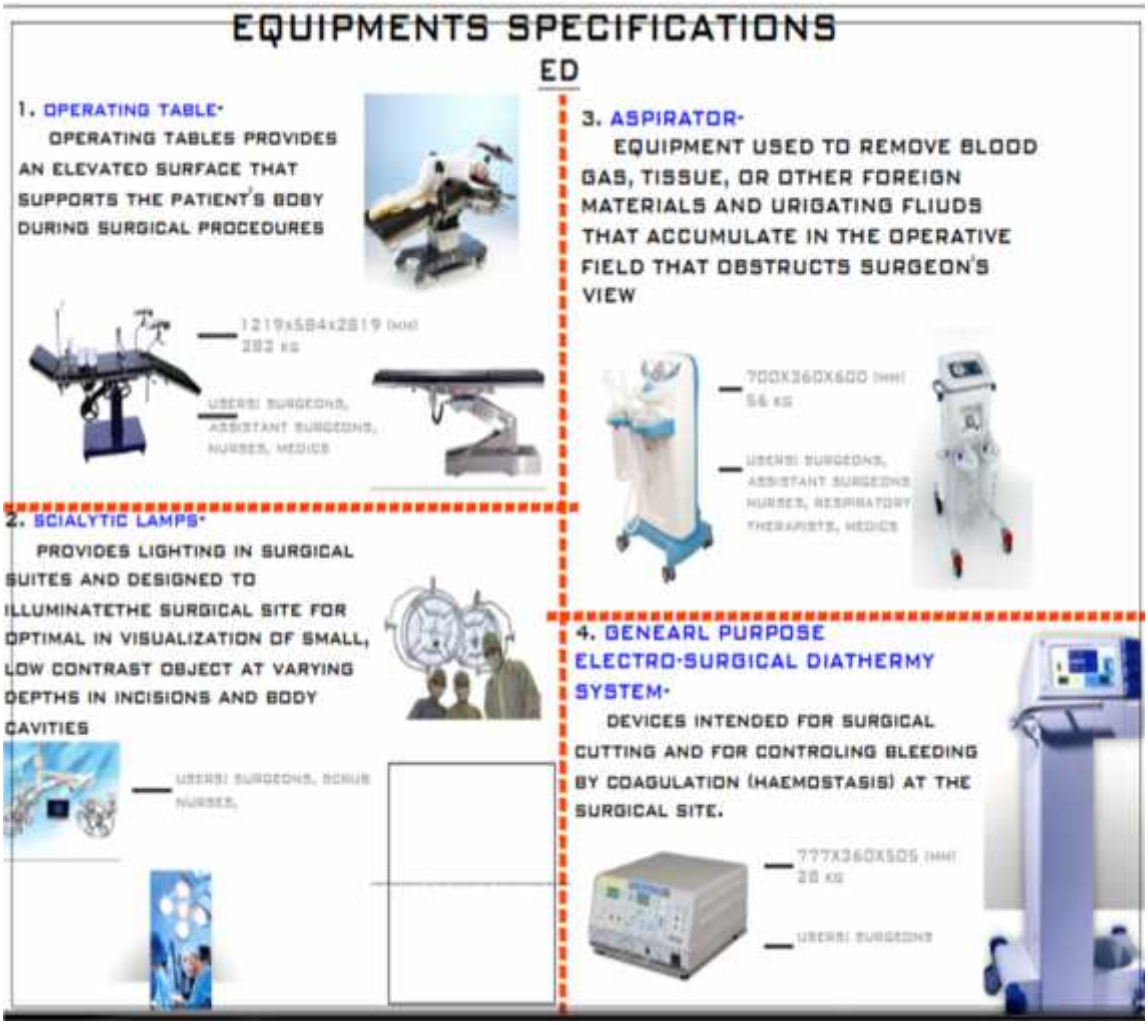


Figure 6.38 Equipment Specification Layout



Figure 6.39 Site elevations (Approach and left view)

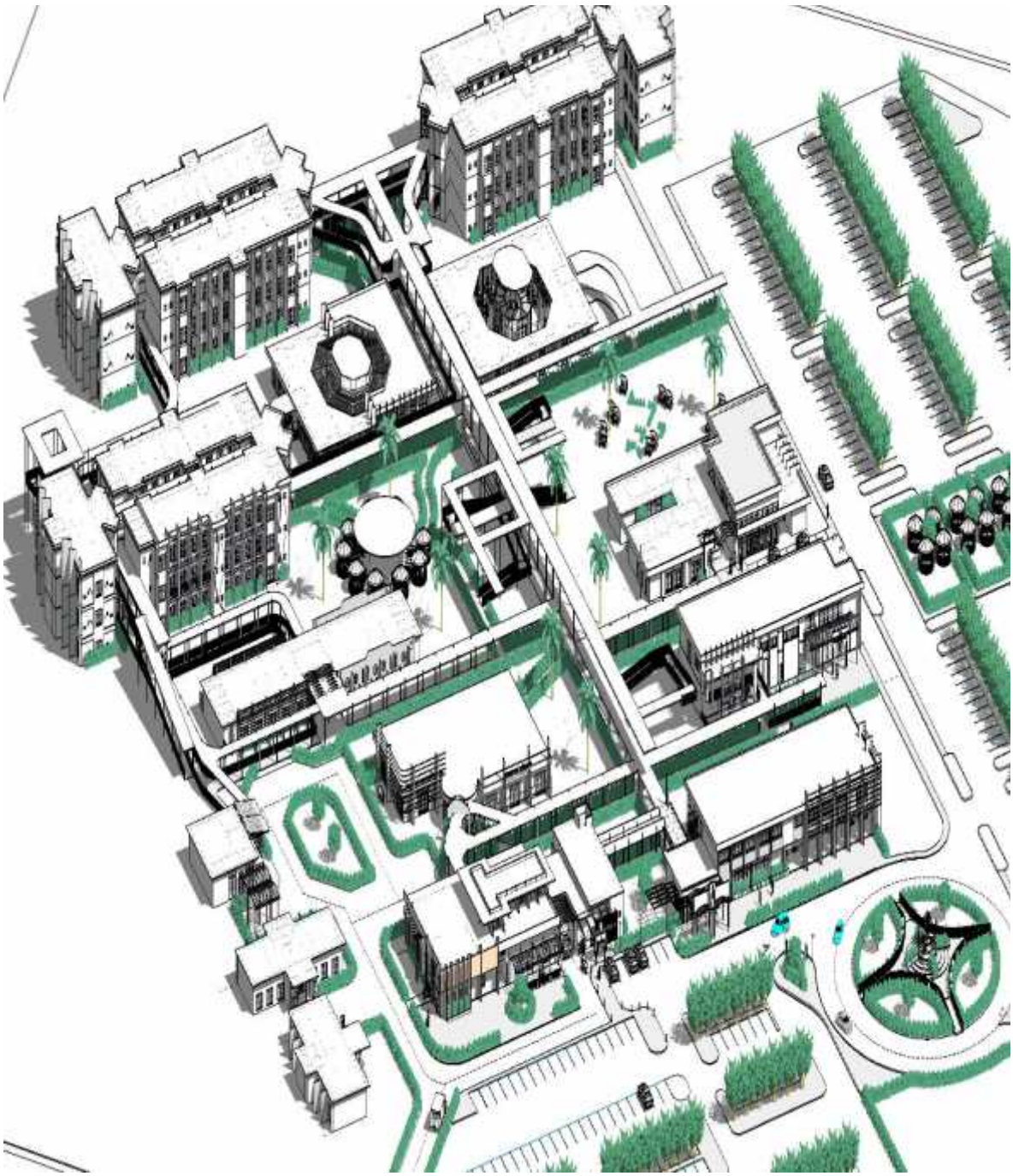


Figure 6.40 Site 3D (South East)

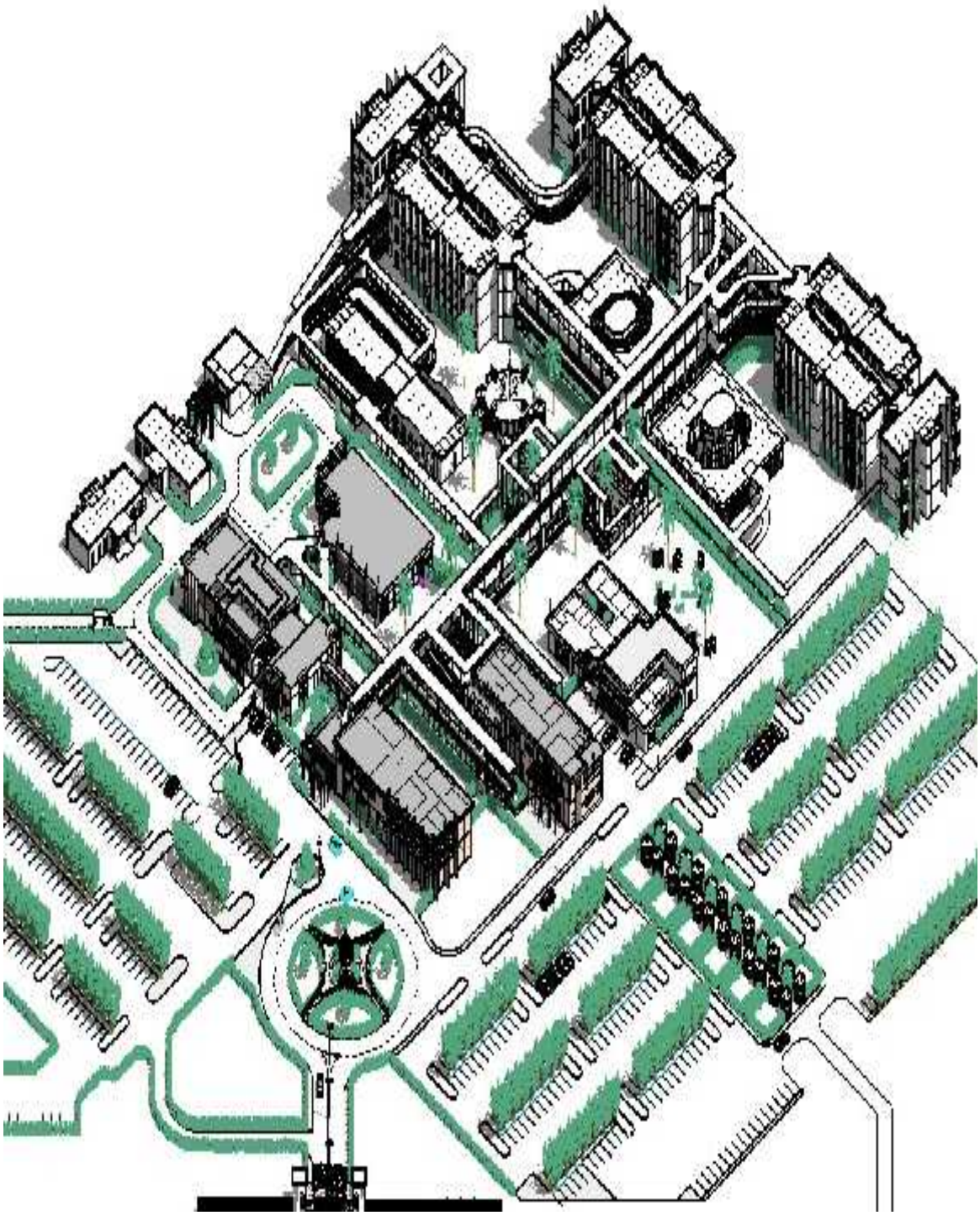


Figure 6.41 Site 3D (South West)

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APPENDIX A

CHECKMARKS FOR OBSERVATION SURVEY

The checkmarks to be used to achieve Research objective III; to develop a model/framework that will assist Architects in Nigeria in Designs of General Hospitals with efficient EDs. The parameters listed in the checklist below are arrived at from the Data review of the second chapter (Literature review).

SECTION A: In this section, abbreviations PR – Present and AB – Absent are used to fill in the Gaps.

1. ISOLATION

		Remarks
a. Waiting rooms	_____	……
b. Overflow waiting room	_____	…….
c. Independent Air controlled system	_____	…….
d. Independent HAVC system	_____	……..

2. UNITS LOCATED IN THE OUTPATIENT

		Remarks
a. Radiology		
b. Gastroenterogy	_____	……..
c. Medical records	_____	…….
d. Cardiology		……..
e. Orthopaedic		…….
f. General clinics	_____	…….
g. Shops		…….
h. Labs		……..

3. SPECIAL SPACES Remarks

a. Paediatric patients _____ ……

b. Major trauma _____ ……

c. Psychiatric patients _____ ……

d. Sexual Assault _____ ……

e. Extended observation and management of patient _____ ……

f. Prisoners in Custody _____ ……

g. Chemical, Biological and Radiological incidence _____ ……

APPENDIX B

INTERVIEW QUESTIONS

Interview questions for ED administrator. The goal of this interview is to unravel current issues regarding General hospital designs with particular emphasis on EDs.

1. How in your opinion would you describe efficiency in General hospital EDs?
2. Evaluate the performance of Hospital managers and Administrators at the Hospital level in the state in terms of
    a) Resource usage
    b) Health management experience
3. In your opinion, what are the factors affecting the performance of efficient emergencies in general hospital EDs?
4. How do you think the following variables reasonably reflect the key resource used and activities in existing EDs
    a) Doctors

b) Beds

c) Nurses

d) Outpatient department

e) Inpatient department

f) Services

g) ED size and layout

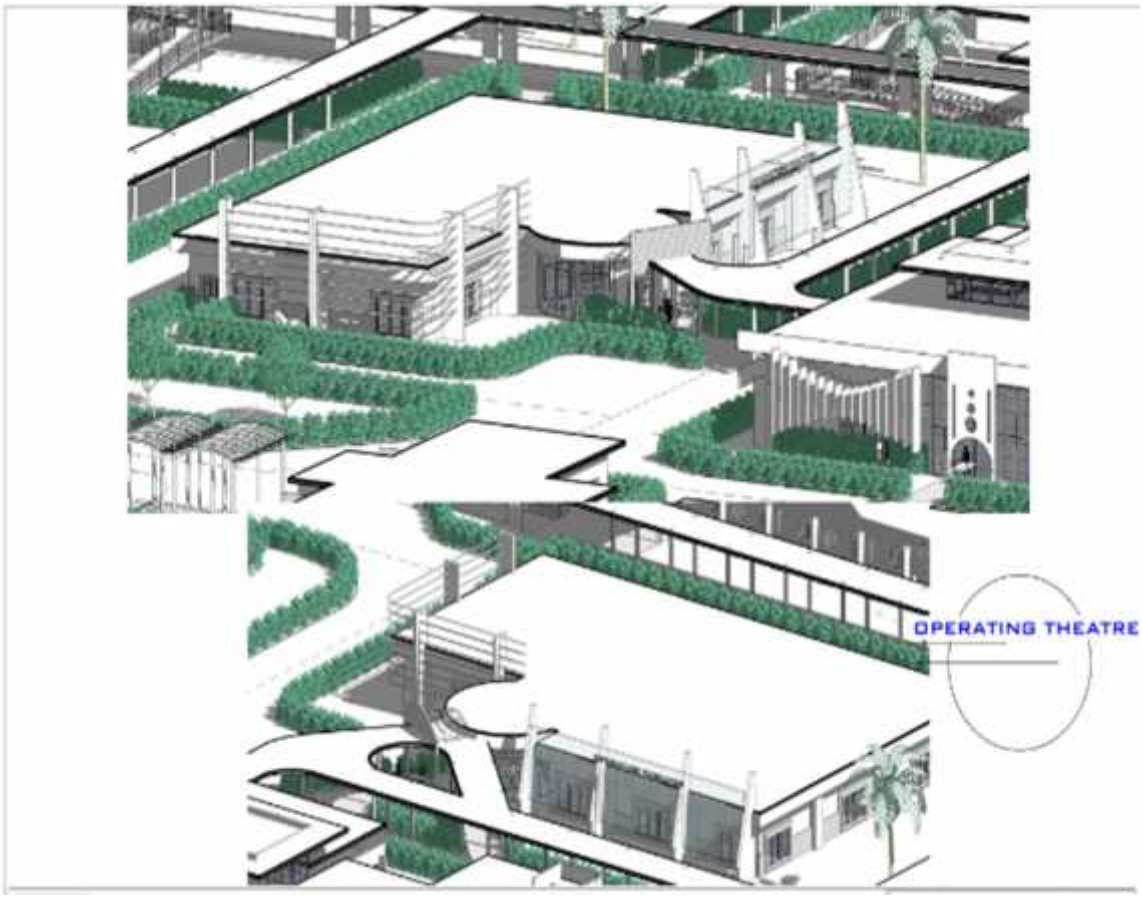
5. What is the current trend of emergency in your hospital?
6. Does the current trend identified in 6 above allow for expansion and treatment of multiple emergency cases?
7. What suggestions do you have for improving the way emergencies are treated in General hospitals in the FCT?

APPENDIX C

DESIGN



Appendix i: Approach and left view Elevation of Operating Theatre complex



Appendix ii: 3D of Operating Theatre complex



Appendix iii: Approach and right view of Lab and Pharmacy



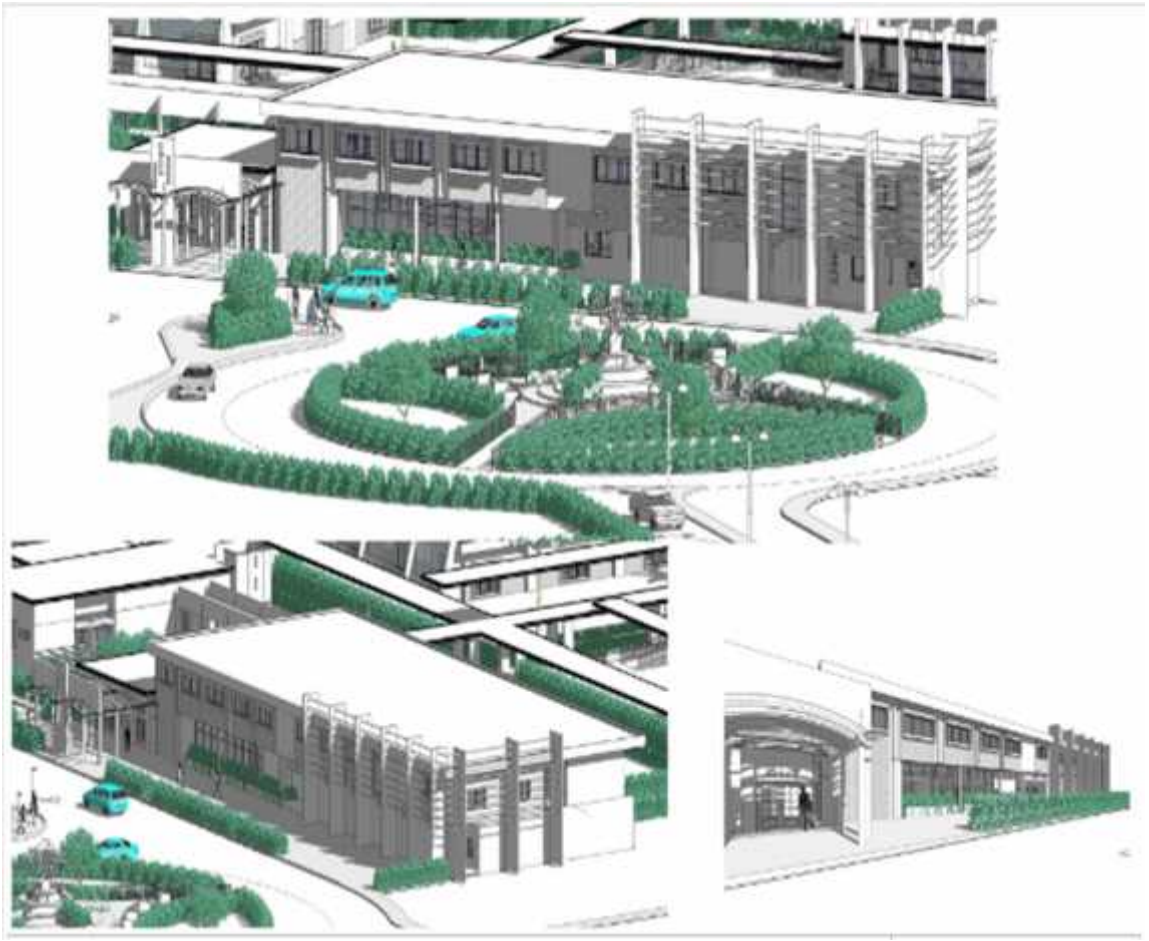
Appendix iv: 3D views of Lab and Pharmacy



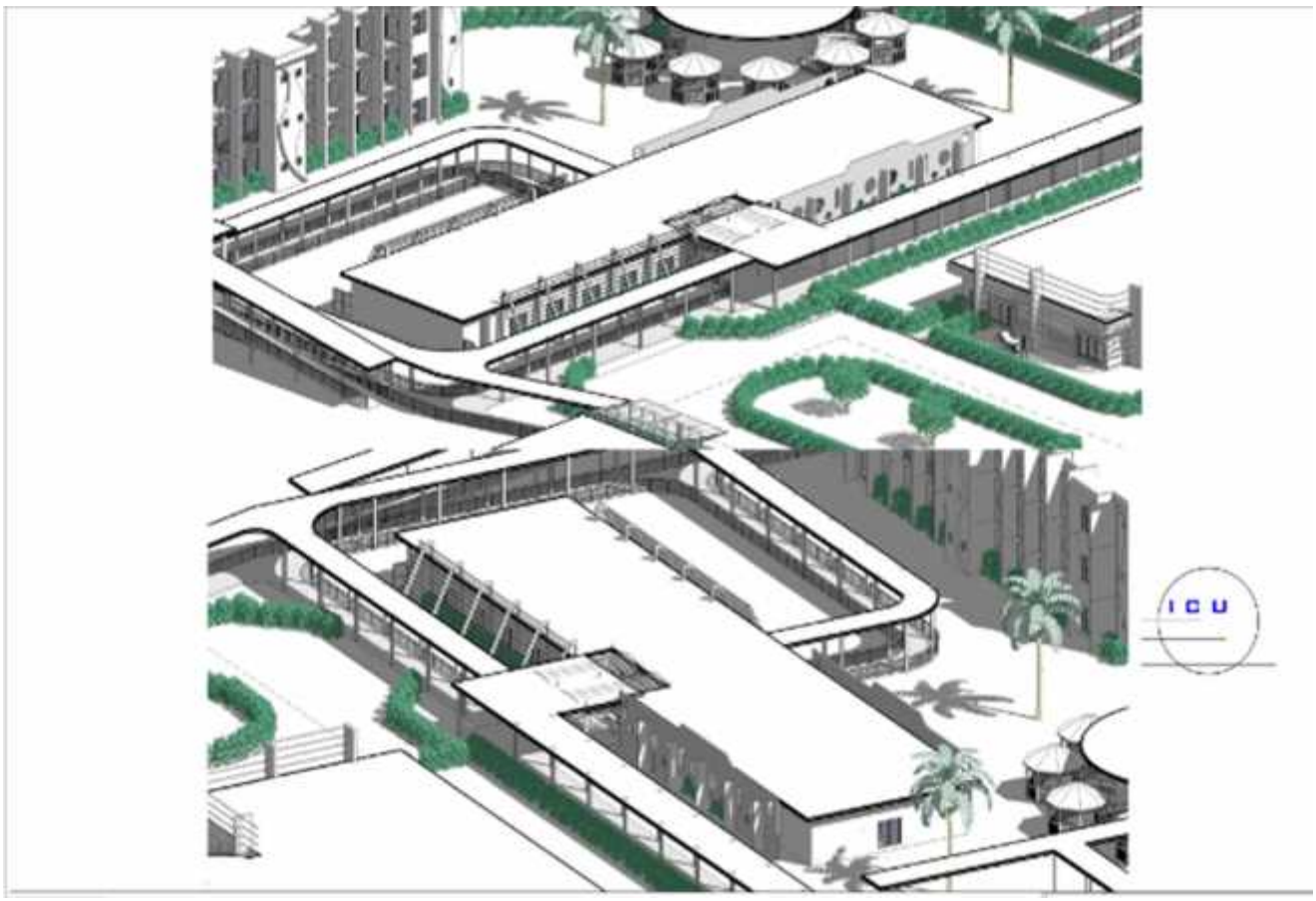
Appendix v: Approach and right view of Maternity Department



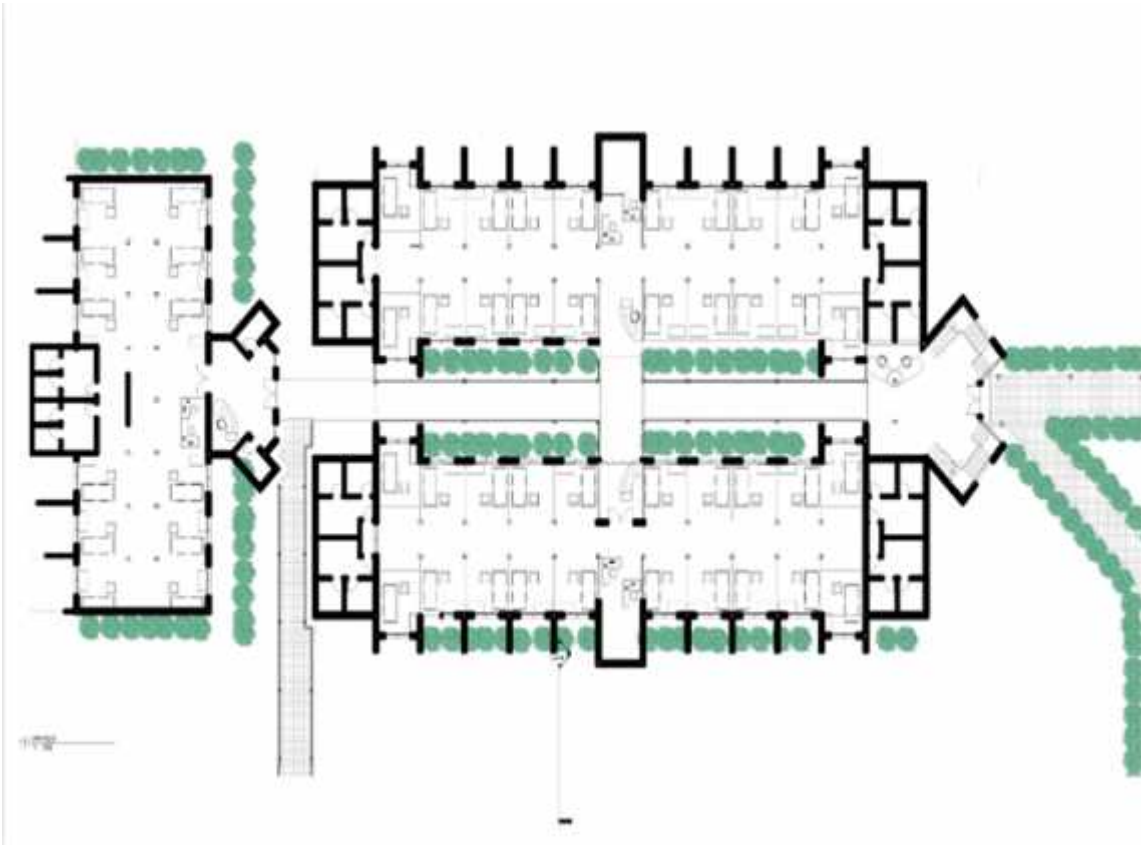
Appendix vi: 3D views of Maternity Department



Appendix vii: 3D views of Outpatient Department



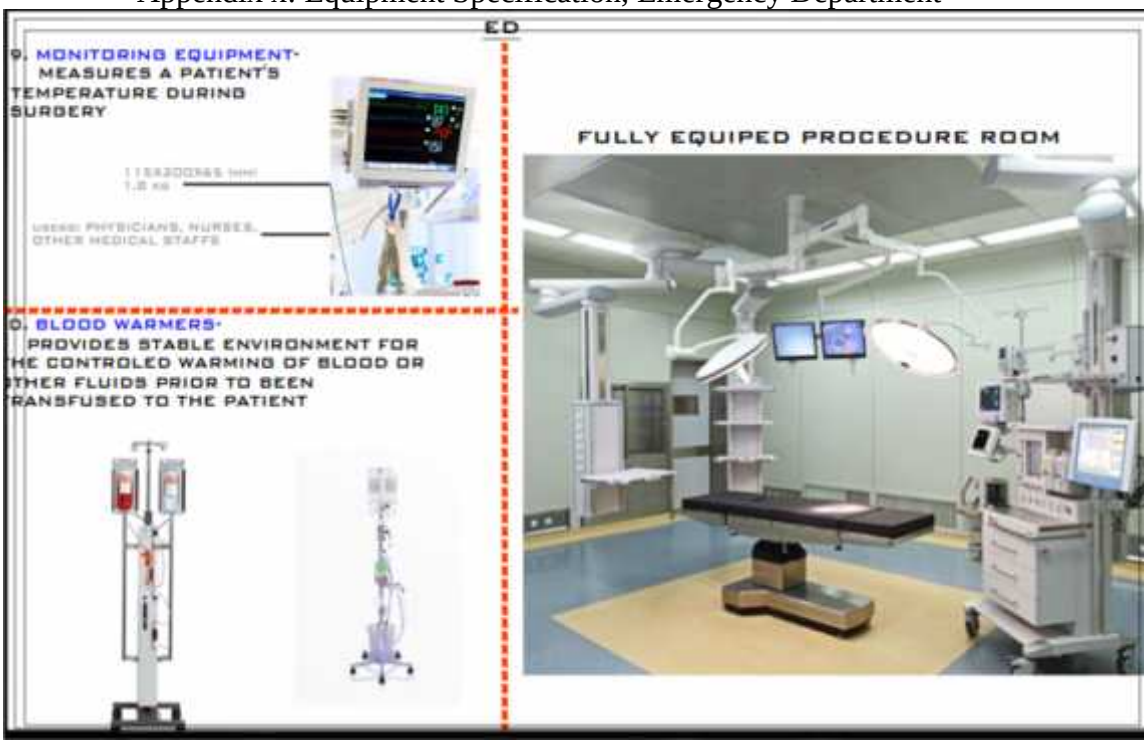
Appendix viii: 3D views of Intensive care unit



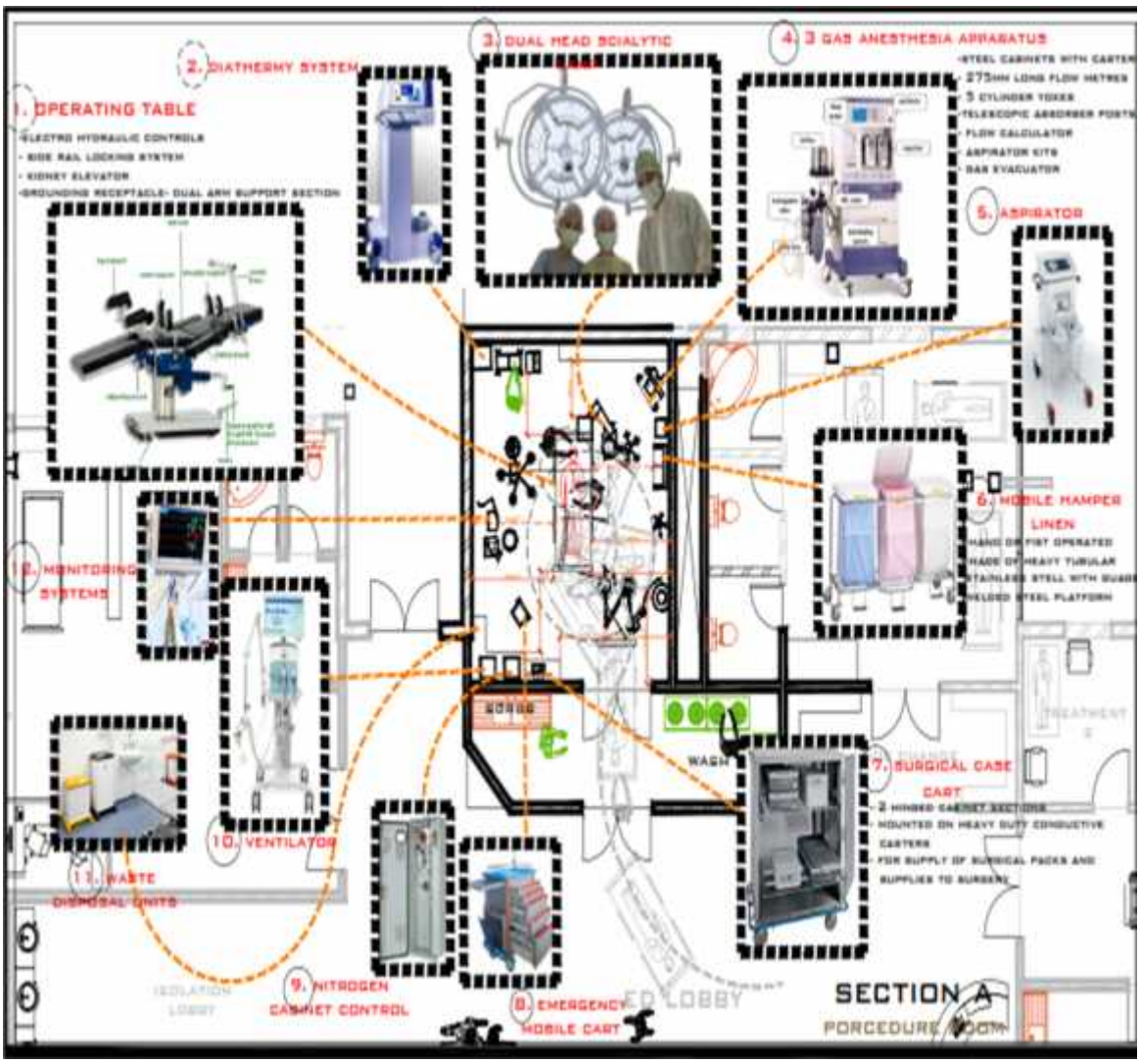
Appendix ix: Ground floor plan, Main Wards



Appendix x: Equipment Specification, Emergency Department



Appendix xi: Equipment Specification, Emergency Department



Appendix xiii: Equipment Specification Layout of the Procedure room in the Emergency Department