

DESIGN CONSIDERATIONS FOR PEDESTRIAN CIRCULATION CONTROL IN GENERAL HOSPITALS, ABUJA

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Many hospitals have developed over a number of years in a piecemeal fashion. This has resulted in complex environments made up of long and confusing corridor systems constituting more challenges and frustrating users of the building. The importance of circulation to building use over the years has not made much impact in the design of general hospitals in Nigeria. However, evidence suggests that improving access and people circulation in hospitals can improve staff performance, enhance patients' rate of recovery, reduce the delay time of external service delivery and create a more welcoming environment for visitors. Consequently, the need to design hospital layouts that benefit from the most effective circulation system cannot be over-emphasized. Thus, there remains a need to find more effective connectivity solutions to the problems that continue to occur in complex hospitals. This research aims at highlighting the important design consideration for circulation control in general hospitals in Abuja. The study adopts a qualitative design approach, with the aid of observation schedule and interviews that were used to solicit information at the hospitals. The data obtained was content analyzed and represented using table and charts. The research brought together the emergence of design and knowledge management which sensitizes designers to the varied contextual knowledge levels of connectivity in hospital design in Nigeria. Drawing on findings, the research has proffered prescriptive and evaluative connectivity frameworks to aid the design of effective connectivity systems in Nigerian Hospital.

Key words: Accessibility, Circulation, General Hospital, Wayfinding, Pedestrian.

INTRODUCTION

Evidence suggests that people often blame themselves for lacking the acumen to navigate complex environments (Rooke *et al.*, 2009). However, several scholars (Baskaya *et al.* 2004) shift the blame away from the people, they assert that getting lost is an indication of either a poorly designed environment or connectivity strategies designed to guide people and not inadequacy on the part of the individual. However, the challenges associated with designing for the circulation needs of the different groups of users; the blind, elderly, children, newcomers, foreign visitors, wheelchair users who visit complex environments such as hospitals are immense.

Research has linked the quality of care, patient health and wellbeing with the physical attributes of the healthcare environment (Gesler *et al.*, 2004). It is understandable that supportive built environments with good internal layouts, accessibility, and circulation can create an overall inviting, calming, engaging, and more hygienic and productive healthcare environment for staff, patients and their relatives (Nazarian *et al.*, 2011). Design of a healthcare unit influences the patients' quality of care in many ways. One of the known effects of the hospital layout on care quality is the amount of wasted time because of the unnecessary journeys by the staff. Some studies have investigated the impact of the unit layout on the amount of time spent walking (for example Shepley, (2002); Shepley and Davies, (2003); Sturdavant, (1960); and Trites *et al.*, (1970).

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They demonstrated that time saved walking was translated into more time spent on patient-care activities and interaction with family members in several studies. The major problem associated with hospital has to do with connectivity of spaces, the inter-relationship between spaces and the nearness between activity flows (Idoko, 2014). Accordingly, hospitals are made up of complex system of interrelated functions requiring constant movement of people and goods, thus requiring good circulation. Most times, unresolved pedestrian circulation patterns cause a lot of problem in the hospitals and even lead to accidents such as collision between staff and patients and it also amounted to the staff being worn out before their shift is over (Nazarian *et al.*, 2011).

Therefore, this study intends to address the provision of good and efficient pedestrian circulation control in general hospitals, Abuja.

According to Henning Lensch (2010), 'the specialty of the Hospital of Tomorrow will be a combination of features for the well-being of not only the patients and their relatives, but also the doctors, nurses and all the staff of the hospital as well. In line with the aforementioned reasons, it is therefore important to integrate design considerations with a resolved pedestrian circulation pattern and their relationship be developed in general hospitals in Nigeria

Basic Quality Requirement for a General Hospital

The requirements for general hospitals are Reachability, access and flexibility. According to Olanda (2002), general hospital should be easily reachable by public transport, assessed on the basis of transport frequency and the distance to the stop, and also by taxi, car or bicycle. The site needs to be easily accessible by patients, visitors and staff. Additionally, accessible car parking which involves the appropriate designation and location of both car and multi-purpose vehicle parking bays and the provision of set-down/pick-up bays should be incorporated. The entrance to the emergency department and if necessary the main entrance should be accessible by ambulance. According to the building access handbook 2014, public entrances to a hospital building should comply with minimum dimensions and also be accessible by people with a physical handicap. These entrances should be covered over and provided with good lighting. The main structural design of a hospital should possess a high degree of flexibility. The building structure should be simple to extend at different points and should be able to cope with internal displacement (Olanda, 2002).

Understanding Circulation in Hospitals

In architecture, circulation is an architectural planning process. In particular, circulation routes are the pathways people take through and around buildings or urban places. Circulation is often thought of as the 'space between the spaces', having a connective function, but it can be much more than that. (Ching, 2016) It is the communication among differentiated spaces and between the exterior and the interior. It may be achieved by openings alone in the simplest plans, but most buildings require distinct spaces allotted to horizontal and vertical circulation (corridors, lobbies, stairs, ramps, elevators, etc.). These are designed by the procedure of analysis employed for differentiating uses (Idoko, 2014). However, circulation is much more than mere allocation of common space. Its significance lies in the proper integration of the many departments of the hospital so that different -types of traffic traversing the length and breadth of the hospital are separated as much as possible, traffic routes are kept short, and patients and other important functions are protected against intrusion and from the risk of hospital acquired infection.

Pedestrian Circulation:

Every trip begins and ends as a pedestrian trip whether walking to a bus stop or across a parking lot to your car. Any person who is afoot or who is using a wheelchair, or a means of conveyance propelled by human power other than a bicycle" Handicapped Pedestrian as:

"A pedestrian, or person in a wheelchair, who has limited mobility, stamina, agility, reaction time, impaired vision or hearing, or who may have difficulty walking with or without assistive devices"

Understanding the needs and characteristics of pedestrians and factors that affect pedestrian travel is important when designing pedestrian facilities. Pedestrian facilities" are far more extensive than just sidewalks. Sidewalks, trails, curb ramps, traffic calming and control devices, grade separated crossings, wide shoulders and other technology, design features, and strategies intended to encourage pedestrian circulation.

Pedestrian Needs:

In order to successfully design pedestrian facilities, we must recognize that pedestrian needs are wide-ranging, and our design approach must be flexible to meet the diversity of needs. Pedestrian needs are diverse, some of pedestrian needs are safe streets and walking areas, convenience, nearby places to walk, visibility, comfort and shelter, social interaction, attractive and clean environment to mention but a few (Otak I. , 2003).

Pedestrian Facilities:

Pedestrian facilities, which are facilities specifically intended to accommodate people walking, generally include crossings, refuge islands, pedestrian signs and signals, information technology systems (ITS), sidewalks, other walkways, curb ramps, public transit loading zones, grade-separation structures, call boxes, and street furniture (Otak, 1997).

Types of Circulation in Architecture

Horizontal circulation; the design of horizontal circulation system determinates the entire structure and the basic shape of the building. There are four practical requirements of any horizontal circulation system. They are:

1. Any horizontal circulation need to have an adequate proportion and size.
2. Every horizontal circulation need a good circulation plan to determinate the direction.
3. In the horizontal circulation the points of converging traffic must be well express.
4. Changes in levels must be clearly expressed

The importance of the horizontal circulation in architectural planning are very big because this type of circulation permit to the designer create a different access to the building or the cities with the purpose of create a good circulation because if the circulation are very confuse that create a chaos in the building or the cities and create a many problems.

Vertical circulations are those which furnish means for progress from one level to another. The position of any means of vertical circulation is a matter of great importance because such circulations not only control the plans of the various floors they connect but also condition the plan of each floor since they furnish the major approach to it.

The four principal types of vertical circulation are: Ramps, Stairs, Escalator and elevator.

Circulation Elements

The circulation path is the space that links the other spaces of a building or any other interior or exterior spaces (Ammar, 2015). These elements include Approach, Entrance, and configuration of the path, and form of circulation space.

Wayfinding

Wayfinding is a person's spatial behavior or orientation. Spatial orientation is the static relationship to space or the environment. The concept of spatial orientation is the predecessor of wayfinding. This relationship requires the user to form an overall mental image of the layout of the place. This image is referred to as the cognitive map of the setting (Huelet, 2007). Wayfinding, can be translated into a cognitive process of three tasks: cognitive mapping or information gathering, decision making and decision executing or the behavior of navigating space (Malkin, 2002). The legible elements of wayfinding include paths, edges, districts, nodes, and landmarks (Colette Miller and David Lewis, 1999). Paths denote walkways, both horizontal and vertical. The walls and boundaries of a space are edges. Districts can be explained as a region into which one must go inside; they contain identifiable characteristics that allow the space to be recognized as separate (Lynch, 1960).

RESEARCH METHODOLOGY

This study adopts a qualitative research method in which primary data was obtained by observation and detailed study of the selected hospitals and also by interviews with staffs and patients. Secondary data was obtained from text books, journals, and internet sources. A deliberate sampling technique was adopted. The data collected was analyzed by simple descriptive statistics presented in tables and charts. The research was conducted in Abuja Municipal area council using purposeful sampling method.

Table 1.0 Name of Selected hospital

S/n	Name of Hospital
1	Wuse District Hospital
2	Asokoro general Hospital
3	Gwarimpa District Hospital
4	Garki General Hospital
5	Maitama District Hospital
6	National Hospital

DISCUSSIONS OF RESULTS

Vertical Circulation

Table 2.0 shows that 58% of the studied population made use of stairs with width of about 1.5m to 1.8m. This shows that the width of stairs should be wide enough to allow people to negotiate them comfortably by holding the handrails or by being assisted. The width of staircase should reflect the amount of pedestrian traffic. Ramps are provided wherever stairs obstruct the free passage of pedestrians, mainly wheelchair users and people with mobility problems. In table 3.0 and figure 1.0, it can be observed that the width of ramps should be wide enough to so that people can use both handrail if they so wish and 67% of the sample size made use of ramps of about 1:10 slope ratio. The adoption of ramps in hospital designs enhances connectivity between various floor levels. It facilitates the egress of wheelchair users.

Table 2.0 Width of Staircase

S/n	NAMES OF HOSPITALS	1.2m to 0.9m	1.2m to 1.5m	1.5m to 1.8m	Above 1.8m
1	ASOKORO DISTRICT HOSPITAL			✓	
2	GARKI GENERAL HOSPITAL		✓		
3	GWARINPA HOSPITAL				✓
4	MAITAMA HOSPITAL			✓	
5	NATIONAL HOSPITAL				✓
6	WUSE HOSPITAL			✓	
		-	1	3	2

Source: Author's fieldwork, 2017

Table 3.0 Width of Ramps

NAMES OF HOSPITALS	Less than 900mm	900mm to 1200mm	1500mm to 1800mm	Above 1800m
1 ASOKORO DISTRICT HOSPITAL			✓	
2 GARKI GENERAL HOSPITAL				✓
3 GWARINPA HOSPITAL		✓		
4 MAITAMA HOSPITAL			✓	
5 NATIONAL HOSPITAL			✓	
6 WUSE HOSPITAL			✓	
	-	1	4	1

Source: Author's fieldwork, 2017

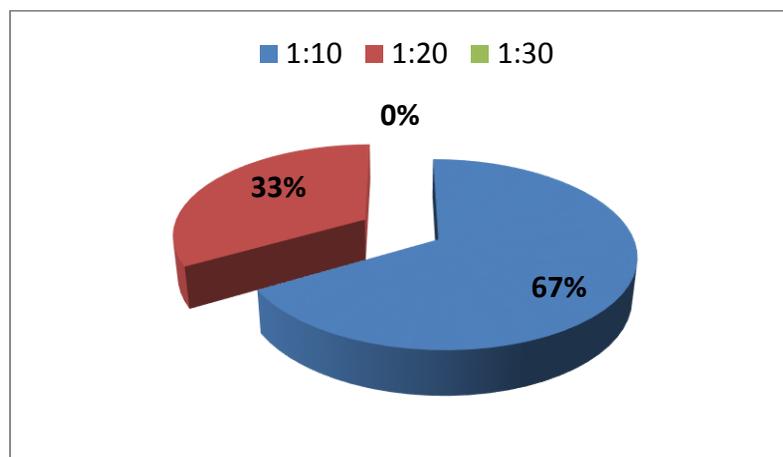


Figure 1.0: Slope of ramps

Source: Authors' fieldwork (2017)

Horizontal Circulation

The first phase of the circulation system of a building is the path that we use to approach the entrance. As shown in Table 4.0, 83% of the studied population made use of frontal approach. This enhances easy access to various department of the hospital. The location of the entrance, relative to the space entered, will determine the configuration of the path within the space and the pattern of the activities within the space.

Table 4.0 Building approach

	NAMES OF HOSPITALS	Frontal approach	Oblique approach	Spiral approach
1	ASOKORO DISTRICT HOSPITAL	✓		
2	GARKI GENERAL OSPITAL	✓		
3	GWARINPA HOSPITAL	✓		
4	MAITAMA HOSPITAL		✓	
5	NATIONAL HOSPITAL	✓		
6	WUSE HOSPITAL	✓		
		5	1	-

Source: Author’s fieldwork, 2017

Table 5.0 Type of building entrance

	NAMES OF HOSPITALS	Flush entrances	Projected entrances	Recessed Entrances
1	ASOKORO DISTRICT HOSPITAL			✓
2	GARKI GENERAL OSPITAL			
3	GWARINPA HOSPITAL		✓	
4	MAITAMA HOSPITAL			✓
5	NATIONAL HOSPITAL		✓	✓
6	WUSE HOSPITAL			✓
		-	1	4

Source: Author’s fieldwork, 2017

Rigid handrails support the weight of a person leaning on them to prevent or arrest a fall. As shown in figure 2.0, 38% of handrails were provided in staircases while they were not adequately provided in other circulation elements to control and aid safety of pedestrian movement. Vertically Ramps should support 95% of continuous handrails on stairways, ramps and landings help people to negotiate changes in direction.

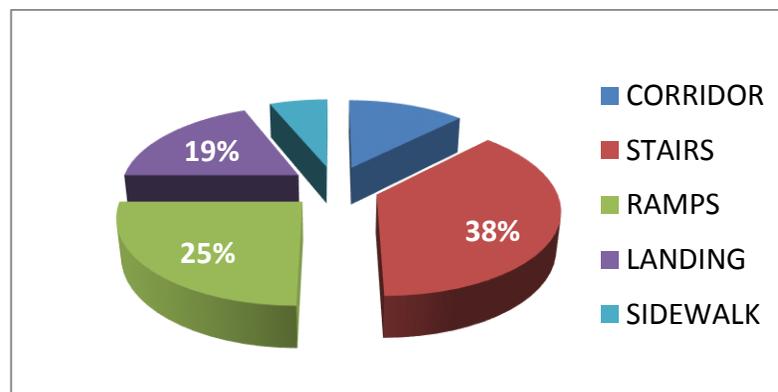


Figure 2.0: Provision of handrails in various circulation elements.

Source: Authors’ fieldwork (2017)

Corridors connect spaces and in emergencies, form part of escape routes. The type of traffic expected to pass through a corridor will influence the size of the corridor and the decision to provide double- or single-leaf doors. In figure 3.0, 53% of the studied population made use of width of corridors above 2.4m. This width allows for varying users to pass in between the defined passing spaces and for the positioning of a 1m door set for access/egress. The recommended minimum clear corridor width for general traffic, where there is a low volume of traffic and passing spaces are provided, should be between 1.2m to 1.5m. It is preferred that passageways be no less than 1 220 mm wide to allow an ambulant person to pass a person in a wheelchair. A minimum clear width of 1 500 mm is necessary to allow two persons in wheelchairs to pass one another.

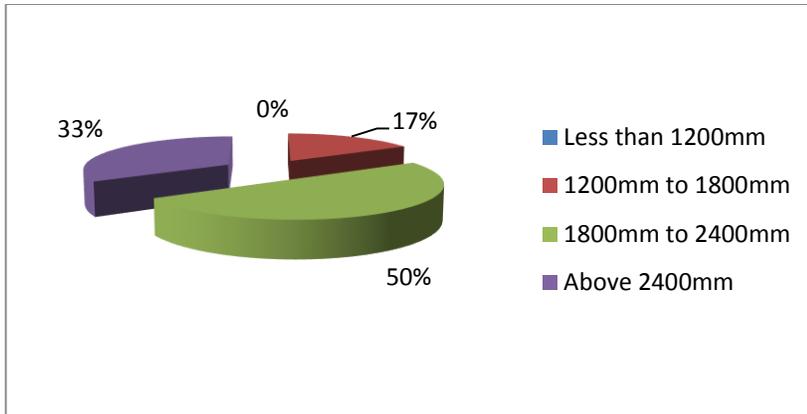


Figure 3.0: Width of Corridor
Source: Authors' fieldwork (2017)

Sidewalks function as integral components of circulation features where pedestrians can experience safety, comfort, accessibility, and efficient mobility. Sidewalks and walkways increase pedestrian safety by separating pedestrians from vehicle traffic. In figure 4.0, 57% of the studied population made use of sidewalks of above 1.8m width. This shows that sidewalks should be wide enough to allow two users to pass each other.

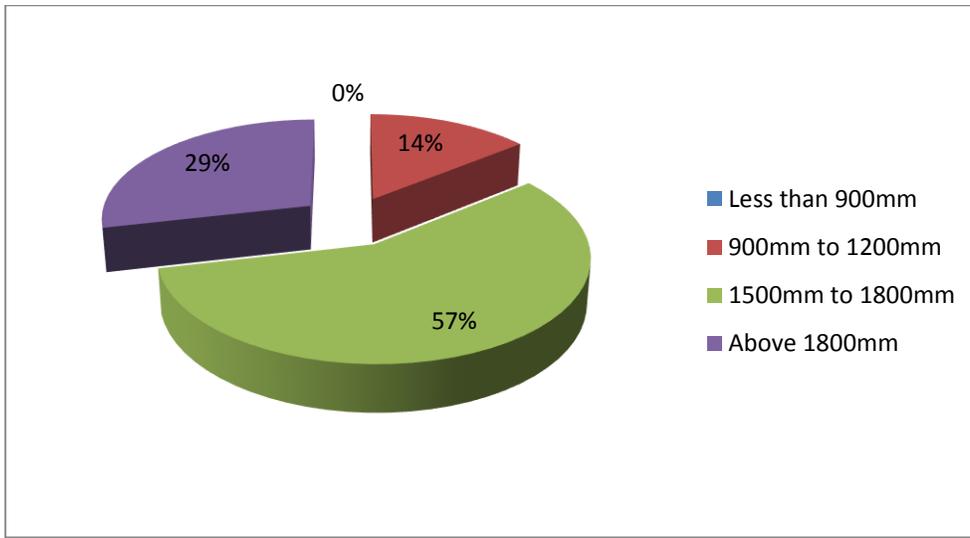


Figure 4.0: Width of Sidewalk
Source: Authors' fieldwork (2017)

Wayfinding is the formation of a cognitive map through interpretation of key elements by a person. A person's general view of the city is punctuated by specific directional concerns. As shown in figure 5.0, wayfinding features were not adequately incorporated in the studied population. The nature of a path's configuration influences the organizational pattern of the spaces it links. Pedestrians require a greater volume of space than their bodily dimensions, and greater freedom of choice along the path. Crossing of the paths is always a point of decision-making for the person approaching it. Figure 6.0 shows that 39% of the studied population made use of linear path. The movement path is always linear. This shows that linear path is the primary organizing element for a series of spaces. 23% made use of grid configuration of path which consists of two sets of parallel paths that intersect at regular intervals creating square or rectangular spaces due to its simplicity in connectivity.

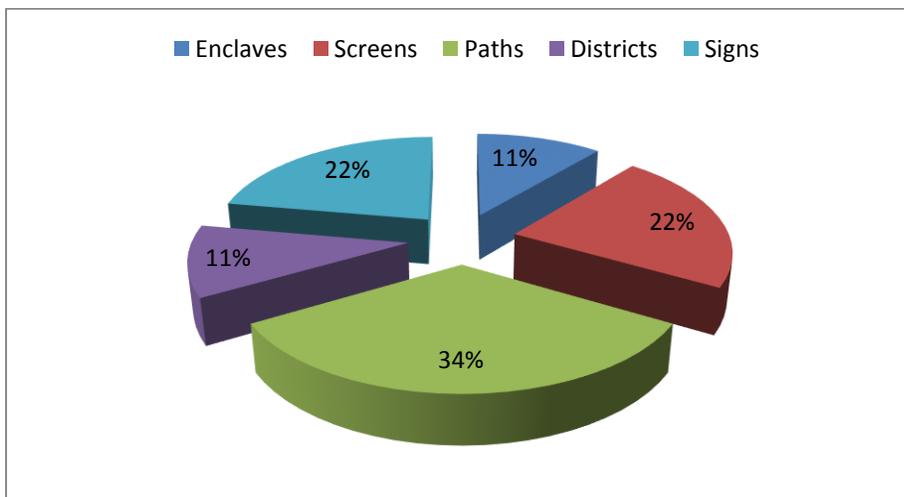


Figure 5.0: Availability of wayfinding features Source: Authors' fieldwork (2017)

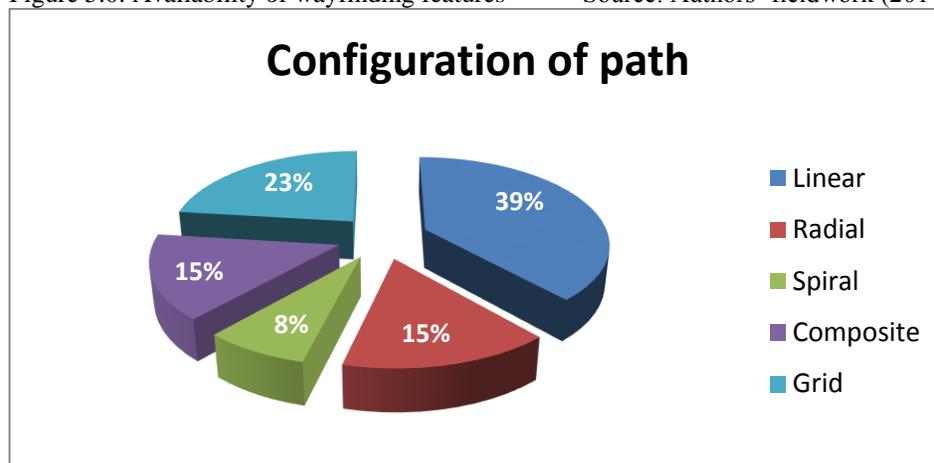


Figure 6.0: Configuration of Path Source: Authors' fieldwork (2017)

CONCLUSION

Circulation routes are very crucial spaces in hospital design. It has been established that it does not only assist staff, patients and visitors in way finding within hospitals, but protects them from risks, provide the shortest routes for them to traverse. In addition it aids movement around; helps control traffic within hospitals and also facilitate the healing process by the use of certain design features and elements. The primary users of a health facility are the patients, the health facility staff and the visitors should be considered before any decision is made. Heavy traffic is bound in some departments like the out patients department while in others is less, as it is restricted to some category of people like the delivery suite.

Generally, circulation routes should be direct and kept as short as possible and should have separate entrances for the different departments, people, supplies and short, direct and un-conflicting circulation routes in this facility cannot be over emphasized. In a study involving hundreds of hospital plans, experts observed a large number of bad schematics. In almost every one of them, they could trace the trouble to failure to heed the basic principles of circulation.

Finally, it should be noted that the whole planning guideline of a hospital centers mainly on patients' care and inter-departmental relationship; therefore caution should be taken in the integration of these departments in order to create an architecture that would not only facilitate the recovery of patient and enhance staff efficiency, but also enhance the cityscape and make provision for effective circulation. It is also necessary to provide a separate entrance for doctors to minimize unnecessary enquiries from patients and their relations.

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