

# Revisiting Hospital Ward Design Basics for Sustainable Family Integration

Ibrahim Abubakar Alkali, Abubakar Sarkile Kawuwa, Ibrahim Sani Khalil

**Abstract**—The concept of space and function forms the bedrock for spatial configuration in architectural design. Thus, the effectiveness and functionality of an architectural product depends their cordial relationship. This applies to all buildings especially to a hospital ward setting designed to accommodate various complex and diverse functions. Health care facilities design, especially an inpatient setting, is governed by many regulations and technical requirements. It is also affected by many less defined needs, particularly, response to culture and the need to provide for patient families' presence and participation. The spatial configuration of the hospital ward setting in developing countries has no consideration for the patient's families despite the significant role they play in promoting recovery. Attempts to integrate facilities for patients' families have always been challenging, especially in developing countries like Nigeria, where accommodation for inpatients is predominantly in an open ward system. In addition, the situation is compounded by culture, which significantly dictates healthcare practices in Africa. Therefore, achieving such a hospital ward setting that is patient and family-centered requires careful assessment of family care actions and transaction spaces so as to arrive at an evidence based solution. Therefore, the aim of this study is to identify how hospital ward spaces can be reconfigured to provide for sustainable family integration. In achieving this aim, a qualitative approach using the principles of behavioral mapping was employed in male and female medical wards of the Federal Teaching Hospital (FTH) Gombe, Nigeria. The data obtained was analysed using classical and comparative content analysis. Patients' families have been found to be a critical component of hospital ward design that cannot be undermined. Accordingly, bedsides, open yards, corridors and foyers have been identified as patient families' transaction spaces that require design attention. Arriving at sustainable family integration can be achieved by revisiting the design requirements of the family transaction spaces based on the findings in order to avoid the rowdiness of the wards and uncoordinated sprawl.

**Keywords**—Caregiving, design basics, family integration, hospital ward, sustainability.

## I. INTRODUCTION

HEALTHCARE facilities design, particularly for wards, are governed by many guidelines and technical requirements. In addition, there are so many less defined needs that have to be considered; particularly, response to cultural norms and the need for family integration.

Families are crucial components of hospital ward regimens

Alkali I. A. is with the Department of Architecture, Bayero University Kano PMB 3011, Kano Nigeria (corresponding author, phone: +2347034528366; e-mail: iaalkali.arc@buk.edu.ng).

Kawuwa S. K. is with the Department of Architecture, Abubakar Tafawa Balewa University Bauchi. PMB 241, Bauchi Nigeria. (e-mail: abusarkile@gmail.com).

Khalil I. S. is with the Department of Architecture, Bayero University Kano PMB 3011, Kano Nigeria. (e-mail: sanikhalil@yahoo.com).

in developing countries, especially Nigeria. A hospitalized patient is accompanied by a family member who provides the familial caregiving required throughout the hospitalization period. However, spaces in wards do not into consideration family members accompanying a patient in the role of caregiver, despite the significant role they play in promoting recovery. Achieving a hospital ward setting that is patient and family-centered requires careful review of related ward design basics for an evidence based solution.

## II. LITERATURE REVIEW

### A. The Basics of Hospital ward Design

In a healthcare setting, wards occupy most of the hospital total area [1]. They are considered as the largest component of a hospital setting and one that draws the most research interest [2]. Comparative studies carried out by NHS Estate among six different wards of six different hospitals in UK shows that the total beds area occupies a range of 44.85% to 55.97% of the total hospital area with average of 53.59% [3]. Furthermore, a report by [4] suggested an ideal space configuration for adult inpatient setting as represented in Fig. 1.

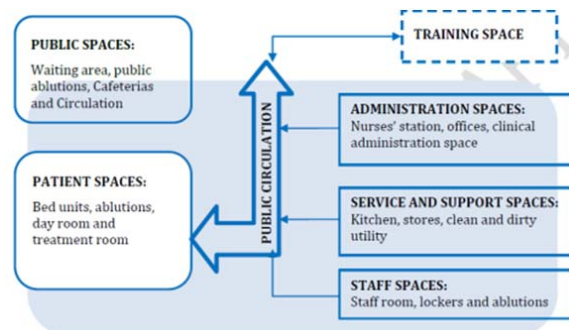


Fig. 1 Ideal ward configuration

Generally, the arrangement of an inpatient unit depends on the particular needs of a project as specified in the health and design briefs for that particular project [1]. However, it is guided by general principles of design, where the location of facilities within the unit is recommended to be a logical process that will optimize the workflow and travel distances for personnel, especially between service, storage areas and the patient's bedside [4].

It can be categorically stated that there is no universally accepted superior form of an inpatient unit. In all cases however, the final decision is determined by the operational policies, physical constraints of the site and local service

needs [5]. This informs the need for this study to develop a hospital ward design framework that suits Nigerian operational policies, and local needs which include familial caregiving. Furthermore, other design considerations necessary in achieving functional ward layout consists of privacy, observation, proximity to sanitary facilities, safety, calming atmosphere and social support among others [6]. Social support provided by family and friends is considered as one of the essential requirements, for the fact that family members contribute in achieving better patient satisfaction, and which consequently, reflects on the healing process [7].

The concern of this study therefore is the need to configure the inpatient setting, so as to provide a sustainable way of integrating family care actions.

### B. Hospital Ward Spatial Outline

Another aspect in this study worth of consideration is the spatial implication for each ward accommodation and the associated overall area. There was an extensive study carried out by [8] with a view to establishing a clear evidence-based minimum space requirement around the bed. This was based on categories of direct activities taking place around the bed as described in their earlier publication [9]. Such activities were identified to be clinical treatment and care, personal care and maintenance and support activities [1]. There are five zones within which these activities take place by the bedside, whether in a single bed room or multi-bed room. They are core bed space, bed-head services, sanitary facilities, clinical support and family support [10]. However, in Nigerian hospitals, the space around the bed does not provide for the family support [11].

The result shows the need for a minimum clear space of 3.6 m by 3.7 m for each in-patient bed. This space has been

established to adequately accommodate most activities taking place by the bedside. The space as well is enough to include the use of equipment and the maneuvering of wheelchairs and mobile hoists, even though the space does not include space for storage and clinical support. When this space allowance was applied to single-bed rooms and 4-bed bays, it was found that the ideal area suitable for single-bed room is 23.5 m<sup>2</sup> (3.6 m x 3.7 m clear space with 4.5 m<sup>2</sup> for the toilet and shower and up to 3 m<sup>2</sup> for clinical and storage facilities [12]. When this minimum clear space for beds is applied in a four-bed room and the area required for clinical, sanitary services and storage facilities for each bed is added, the total area exceeds 93.5 m<sup>2</sup>. However, the minimum clear space around the bed was preserved and the clear space overlapped with access circulation. Consequently, a room of 70 m<sup>2</sup> area is achieved as illustrated in Fig. 2. These evidence-based deductions were used in designing several scenarios of wards and subsequently later compared to each other. In conclusion, it was established that, the space required for 50% single/50% four-bed rooms can be used in accommodating 100% single rooms with a little modification to the schedule of accommodation. Conversely, the cost of space allowance per bed of 100% single rooms accommodated within the 50% single room is negligible [8]. The computation of cumulative ward area according to [6] was based on the area required for a single bed, and it can be deducted by adding up the area required for the bed, the services area per bed and the circulation area per bed.

In a similar study in South Africa, ergonomic studies have established that most activities carried out at the bedside can be accommodated within the dimensions 3.45 m width and 4.10 m depth, as shown in Fig. 2.

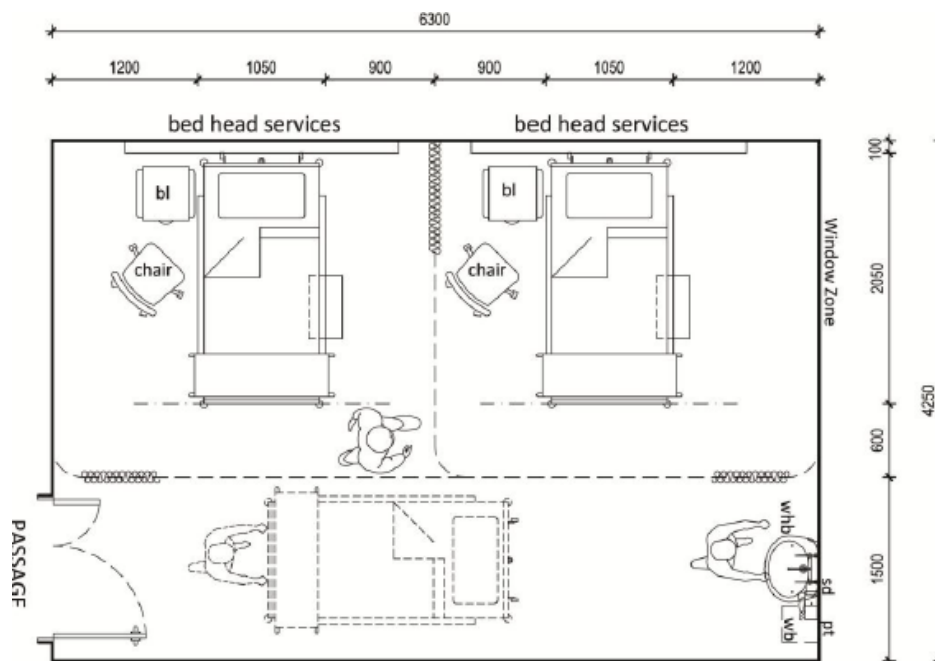


Fig. 2 The Ideal Bed space requirements

This represents the clear bed space excluding space for fixed storage. The ward provision should be in either single, double or four bed units per 32-bed ward unit in a District or Regional hospital. However, the tertiary hospital requirements are outlined by the clinical brief. The interior arrangement preferable is for the beds to be placed on opposite sides of the room. The recommended approximate minimum space requirement for 1-bed unit is 15 m<sup>2</sup>, for a 2-bed unit, 27 m<sup>2</sup>, while a 4-bed unit is 44 m<sup>2</sup> for the majority of the rooms, and finally, a 6-bed unit of 65 m<sup>2</sup> [4].

### *C. Hospital Ward Configuration*

The configuration of hospital wards are mostly in the form of single-bed rooms, multi-bed rooms or both. The established standards differ based on countries' healthcare policies and programs. While Scotland are adopting the 100% single rooms [3], [12], in the US, the norm is for two-bed rooms while in the UK until recently, it is for 4-bed to 6-bed bays [13]. However, there is wide debate on the provision of single-bed rooms and multi-bed bays.

The field of healthcare research and practice has witnessed a long standing debate on the use of single-bed rooms and multiple occupancy rooms in acute care environments. This was propelled by the need to provide nurses' observation at the expense of patients' privacy [1], as has typically been portrayed in Nightingale ward type that was dominant in Britain since 1861 [14]. A few years after, the debate became elaborate with expanded healthcare research on issues involving infection control, staff travel distance, falls, therapeutic environments, social space for patient, space for family members, patients' preferences, patients' privacy, patients' satisfaction, construction and operation cost and noise level in hospitals [1], [15]–[19]. This has drawn serious attention among researchers. For instance, in a review carried out by [13], 222 literatures were found addressing various aspects of the use of single and multi-bed. Evidently, the findings from the analysis suggest that almost all healthcare challenges can be addressed by use of single-bed rooms. This finding surprisingly, was supported by subsequent studies in this regards. The most prominent among them is the one conducted by [8], which suggested the need for increasing single-bedroom provision in acute hospitals for the benefits they provide to patients, staff and the NHS Trust. One of major benefits is the provision for social support by family and friends in single room [9].

There are studies that reported mixed reactions on patients' preferences for single-bed rooms and multi-bed rooms. For instance, in a finding from a study [20], most of the patients showed preference for single-bed rooms for the fact that this type of rooms provided for their family's overnight accommodation and a better level of privacy among others. Similarly, a study carried out by British Market Research Bureau (BMRB) International in UK, 818 people interviewed in a telephone survey about their preferences for type of hospital accommodation, expressed their preferences for single-bed rooms. The subsequent survey with 823 people, showed preference for a single-bed room for the fact that it

allowed for overnight stay of family and privacy [21]. In another study, 77 nurse responses when interviewed in a study [13] is as well consistent with previous findings that favored the single bed room against double-bed room.

Despite the overwhelming responses favoring single bed rooms, some studies revealed situations where multi-bed bays were preferred over single bed rooms by patients. For example, in a study [22], four bed bays were preferred by most of the oncology patients interviewed identifying need for company and avoiding isolation as the main reason. In a later study, special investigation as a part of a wider scale conducted by [21] investigating patients' preference for single- or multi-bed rooms, 473 patients at Poole general hospital in the UK were interviewed out of which 106 (22%) were moved to a new accommodation opened during their stay. The results show that 54% of the patients preferred multi-bed rooms, while 43% showed preference for single bed room and the remaining were adamant. Main reason identified for this preference different from that of earlier studies, which is need for company.

Summarily, notwithstanding the inconsistent opinion on the topic of single-bed rooms versus multi-bed bays, the trend is favoring the need for shifting to single-bed rooms provision even though circumstantially the need for multi-bed bays provision should not be undermined [23]. The inability for multi-bed bays to provide for patient's family who provide the emotional and psychological support a patient requires, has negative effect on the patients' experience and satisfaction in hospital settings [24]–[26]. Therefore, providing a better level of patients' privacy and accommodating family and friends has been repeatedly seen among the main purposes for the shift towards single-bed rooms.

For the majority of developing countries, especially Nigeria where family involvement is paramount [11], this movement to single rooms will remain a mirage. Public hospitals have inpatient accommodation that is mostly of open ward setting commonly known as pavilion ward type. This has been an adoption of the British early wards with little or no modification [27]. Therefore, to achieve a hospital ward setting that provides for family presence and participation, there is need for a revisit to the hospital ward design basics so as to arrive at an ideal ward setting that will accommodate the peculiar nature of the family care actions. This can be achieved through the study of the space activity relationship.

### III. RESEARCH METHODOLOGY

In examining the space activity relationship, the principles of behavioral mapping method of inquiry was found to be an ideal strategy to be employed. It is a process of recording location-based observations of human behavior by use of annotation of maps, plans, videos and photographs, either manually or digitally [28]. It is direct observation and systematic recording of peoples' activities, behaviors, characteristics and movements in time and space [28]. It is a non-intrusive, direct observational method used in understanding the behavioral dynamics of a built environment [24]. It has been found useful in identifying environmental

affordances and particular design practices for the fact that it records the precise location of people and their activities on floor plans instead of categorized locations. Adequate observations reveal significant information on people's spatial interactions and preferences that are essential in architectural design. Even though, this method is popular in the study of children's outdoor activities [24], [28]. However, it has also been used in different healthcare environments, including research on the use of gardens in a pediatric hospital [29] (Ismail, 2006), school children in a playground and a study on resident behavior at a nursing station of a senior facility [30]. Male and Female Surgical wards of Federal Teaching Hospital Gombe were used for the study. After obtaining the ethical clearance from the hospital management, the study was conducted in five rounds. It was limited to five rounds when the data obtained in the fifth round was not different from the first four rounds. This indicates data saturation [31]. Each round cumulatively consisted of three shifts of 12 hours in both male and female wards of the hospital. The observation was scheduled in three phases of eight hours over three consecutive days in a male ward for each round. To observe similarities and differences and as a pair wise comparison [32], a similar schedule was repeated in the female ward. Furthermore, the routine in subsequent rounds was repeated after two weeks from the preceding round when the researcher assumes that most of the patients previously observed might have been discharged. A total of 30 sessions were conducted in the two wards. The morning sessions were intended to observe the early morning, pre-ward rounds and ward round activities while the afternoon sessions were meant to capture the post ward round activities, meals and other related activities, whereas the night sessions were to observe the

overnight activities.

#### IV. RESULTS AND DISCUSSION

Classical and comparative content analysis was used in analyzing the data. Emerging patterns were observed and subsequently categorized into relevant themes. The results show that in the course of carrying out the caregiving to their hospitalized patients, families are found to be using several spaces that are not originally configured to accommodate (Table I). Such transaction spaces are found to be both inside the ward and outside. The majority of the activities are found to be done by the bedside. Similarly, some activities were found to be carried out in other spaces within the hospital ward such as corridors, verandas and foyers. Furthermore, tree shades and camps were also found to be among family transaction spaces.

The family transaction spaces so identified are spaces whose basic configuration has no provision for familial caregiving activities. The use of bedside by patient families for many of their activities in addition to the basic function of such space has rendered the space insufficient and results in distortion of purpose. Similarly, some of the familial caregiving activities are carried out in spaces they are not designed for. For instance, the use of foyers and corridors for religious functions, social interactions among others is a negotiation of spaces they are not designed for. This cannot be disconnected with the fact that such functions are not part of the initial design brief of the hospital. In addition, families are found to be using tree shades and improvised patient relative's camp for other activities.

TABLE I  
FAMILY TRANSACTION SPACES

Emerging Themes/Patterns	Categories	Bedside	Foyer	Camp	Others
Congregational prayer	Spiritual	■	■	■	Tree Shade
Individual prayer		■	■	■	Tree Shade
EOL supplication		■			
Meditation		■			
Counseling		■			
Social interaction	Family	■	■	■	Tree Shade
Keeping patient in company	Solidarity	■	■		Tree Shade
Interpretation	Domestic care	■			
Feeding		■	■		
Laundering				■	
Cooking				■	
Receiving visitors	Physical Support	■	■		
Admission procedures		■	■		
Transfer		■			
Escort		■			
Turning bedridden	Clinical participation	■			
Bed bath		■			
Assigned Tasks		■			
Procurement of drugs		■			
Vigilance		■			

### A. Implication for Study

Considering the vital role played by patient families in caregiving, empirically, the study has demonstrated that patient families are crucial components of hospital ward regimens that cannot be undermined. Similarly, lack of ideal space for them to conveniently perform their role has rendered the ward rowdy with activities negotiating spaces they were not designed to accommodate. Their integration will conform to the principles of patient and family centered care.

### V.CONCLUSION

Success and sustainability of every design depends on how best the functions relate with the accommodating space and amongst themselves. Since family presence and participation in care has formed a vital function of a hospital ward, adequate provision must be made to sustain for an ideal family conscious inpatient setting. To achieve this, there is need for a revisit to the design basics of the family transaction spaces of the hospital ward. This will allow for a review in terms of size and functional requirements that will conveniently and harmoniously provide for the patient family.

### ACKNOWLEDGMENT

The Authors would like to acknowledge and appreciate the financial support by Bayero University Kano and Tertiary Education Trust Fund (TETFUND), Nigeria.

### REFERENCES

- [1] C. R. Alalouch, 'Hospital ward design: implications for space and privacy', Thesis, Heriot-Watt University, 2009.
- [2] R. Dixon, H. Goodman, and T. Noakes, *Health Service Buildings. The Architects' Handbook.*, Q. Pickard.Eds. Great Britain: Blackwell, 2002.
- [3] NHS Estates, 'In-patient care Scottish Health Planning Note 04-01: Adult in-patient facilities'. Health Facilities Scotland property and capital planning, 2010.
- [4] IUSS, 'IUSS Health Facility Guide\_ Adult in patient accommodation'. Department of Health, Republic of south Africa, 2013.
- [5] A. Cox and P. Groves, *Hospital and Healthcare Facilities. A Design and Development Guide.* Published by London: Butterworths. Oxford: Butterworth-Heinaman, 1990.
- [6] R. Glanville and A. Howard, *Hospitals. Metric Handbook-Planning and Design Data*, 2nd ed. Great Britain: Architectural Press, 1999.
- [7] K. Gupta, S. K. Gupta, S. Kant, R. Chandrashekhar, and S. Satpathy, *Modern Trends in Planning and Designing of Hospitals: Principles and Practice.* Jaypee Brothers Publishers, 2007.
- [8] NHS Estates, 'Ward layouts with single rooms and space for flexibility'. TSO, 01-May-2005.
- [9] NHS Estates, 'Hospital Ward Configuration Determinants Influencing Single Room provision', A Report for NHS Estates, England by the. EU Health Property Network, Nov. 2004.
- [10] NHS Estates; Department of Health, 'Ward layouts with single rooms and space for flexibility', Jul. 2005.
- [11] I. A. Alkali, M. H. H. Ahmad, and I. Said, *The challenges of Nigerian hospital ward setting in providing for family participation*, vol. 584–586. 2014.
- [12] N. E. D. of Health, 'Ward layouts with single rooms and space for flexibility', 15-Jul-2005. (Online). Available: [http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH\\_4119152](http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_4119152). (Accessed: 30-Oct-2012).
- [13] H. Chaudhury, A. Mahmood, and M. Valente, 'The Use of Single Patient Rooms versus Multiple Occupancy Rooms in Acute Care Environments', Simon Fraser University, Jan. 2005.
- [14] J. D. Thompson and G. Goldin, *The Hospital: Social and Architectural History.* New Haven and London: Yale University press, 1975.
- [15] L. H. Aiken *et al.*, 'Patient safety, satisfaction, and quality of hospital care: cross sectional surveys of nurses and patients in 12 countries in Europe and the United States', *BMJ*, vol. 344, Mar. 2012.
- [16] P. Åstedt-Kurki, M. Paunonen, and K. Lehti, 'Family members' experiences of their role in a hospital: a pilot study', *Journal of Advanced Nursing*, vol. 25, no. 5, pp. 908–914, 1997.
- [17] M. S. Datton, 'The Therapeutic Benefits of Design', in *Proceedings of the 2nd International Conference on Health and Design (DCHP, 2000)*, Stockholm, Sweden, 2000, pp. 225–238.
- [18] H. Li, B. J. Stewart, M. A. Imle, P. G. Archbold, and L. Felver, 'Families and hospitalized elders: A typology of family care actions', *Research in Nursing & Health*, vol. 23, no. 1, pp. 3–16, 2000.
- [19] S. Rao, 'Designing Hospital for better Infection Control: an Experience', *Medical Journal of Armed forces Institute*, vol. 60, no. 1, pp. 40–43, 2004.
- [20] S. Kirk, 'Patient preferences for a single or shared room in a hospice', *Nursing Times*, vol. 28, no. 5, pp. 39–41, 2002.
- [21] M. Phiri, 'One Patient One Room – Theory & Practice: An evaluation of The Leeds Nuffield Hospital', School of Architecture, University of Sheffield, UK, Jul. 2003.
- [22] N. J. F. Pease and I. G. Finlay, 'Do patients and their relatives prefer single cubicles or shared wards?', *Palliat Med*, vol. 16, no. 5, pp. 445–446, Sep. 2002.
- [23] Scottish Executive, 'Single Room Provision within Scotland', Health Department England, Beardmore Hotel Clydebank, Jan. 2005.
- [24] Y.-S. Choi and S. J. Bosch, 'Environmental affordances: designing for family presence and involvement in patient care', *HERD*, vol. 6, no. 4, pp. 53–75, 2013.
- [25] D. D. Harris, M. M. Shepley, R. D. White, K. J. S. Kolberg, and J. W. Harrell, 'The impact of single family room design on patients and caregivers: executive summary', *Journal of Perinatology*, vol. 26, pp. S38–S48, 2006.
- [26] R. Ulrich, Q. Xiaobo, Z. Craig, J. Anjali, and C. Ruchi, 'Role of the Physical Environment in the Hospital of the 21st Century'. Sep-2004.
- [27] U. M. Wali, 'Sustaining natural ventilation: The design of general hospital Deba.', Ahmadu Bello University, Zaria, Nigeria, 1999.
- [28] N. G. Chosco, R. C. Moor, and M. Z. Islam, 'Behavior Mapping: A Method for Linking Preschool Physical Activity and Outdoor Design', *Medicine and Science in Sports and Exercise*, pp. 513–519, 2010.
- [29] I. Said, 'Garden Restorative Environment for Children in Malaysian Hospitals', PhD, Universiti Teknologi Malaysia, Skudai, Johor, 2006.
- [30] M. M. Shepley, 'Family Behavior in a Single-Family Room NICU', American Institute of Architects, AIA Report on University Research 5.
- [31] M. Q. Patton, *Qualitative Research & Evaluation Methods: Integrating Theory and Practice.* SAGE Publications, 2014.
- [32] S. Elo, M. Kääriäinen, O. Kanste, T. Pölkki, K. Utriainen, and H. Kyngäs, 'Qualitative Content Analysis A Focus on Trustworthiness', *SAGE Open*, vol. 4, no. 1, p. 2158244014522633, Sep. 2014.