Restorative Spaces, Privacy and Environmental Comfort in Hospital Wards: Architectural Requirements for Informal Caregiver Well-Being

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Abstract
Informal caregivers provide essential support to hospitalised patients in Nigeria, yet hospital wards rarely accommodate their need for rest, privacy and environmental comfort. This article examines the architectural conditions affecting caregiver well-being in three tertiary hospitals in Jos, Nigeria, and identifies priorities for more supportive ward design. Drawing on a convergent mixed-methods study, it analyses questionnaires from 196 informal caregivers, interviews with 12 healthcare professionals, focus group discussions and structured observations at Jos University Teaching Hospital, Bingham University Teaching Hospital and Plateau State Specialist Hospital. 95.9% of respondents reported inadequate sleeping facilities, 88.8% reported privacy deficiencies, 80.6% reported thermal discomfort, 72.4% reported noise exposure, and 66.3% reported inadequate lighting. Sleeping provision was the strongest predictor of caregiver satisfaction ($\beta = .45$, $p < .001$), followed by privacy ($\beta = .32$, $p < .01$) and sanitation ($\beta = .28$, $p < .05$). Overcrowding was associated with emotional stress ($r = .71$, $p < .001$). Findings indicate that caregiver accommodation and environmental quality warrant explicit consideration in healthcare planning. The article recommends accessible rest facilities, adaptable furniture, privacy-sensitive arrangements and climate-responsive environmental improvements, while recognising that causal benefits require post-occupancy evaluation. These changes must preserve clinical access, safety and maintainability.

Keywords: *Informal caregivers, restorative spaces, privacy, environmental comfort, healthcare architecture, caregiver well-being, tertiary hospitals, Nigeria.*

1. Introduction

Hospital architecture has traditionally focused on providing environments that facilitate medical treatment, clinical efficiency and patient recovery. Consequently, healthcare facilities are predominantly planned around patient accommodation, treatment rooms, nursing stations, medical equipment and circulation systems. Although these provisions remain fundamental to healthcare delivery, they do not fully reflect the range of individuals who occupy and depend on hospital environments. In many developing countries, particularly Nigeria, informal caregivers contribute substantially to the daily care of hospitalised patients, yet architectural planning gives

comparatively little consideration to their physical and psychological needs. As a result, the healthcare environment often expects this essential group of users to function without appropriate spatial support. Informal caregivers are family members, relatives, friends or other individuals who provide unpaid assistance to people experiencing illness or functional limitations. Their responsibilities often include feeding, bathing, mobility assistance, personal hygiene, emotional reassurance, communication with healthcare professionals, and procuring medications or essential supplies. These activities require considerable time, physical effort and emotional commitment. Adejoh et al. (2021) showed that informal caregivers in African healthcare settings take on extensive practical and emotional responsibilities, often facing financial and personal difficulties. Similarly, Chukwu et al. (2022) identified inadequate institutional recognition, emotional strain and limited support as important challenges confronting informal caregivers in Nigerian hospitals. The significance of informal caregiving in Nigeria is reinforced by cultural expectations surrounding family responsibility and communal solidarity. Relatives are often expected to accompany hospitalised family members and remain available throughout treatment. Alkali (2019) describes familial caregiving as an established cultural practice associated with hospitalisation, reflecting the importance of kinship obligations within healthcare experiences. Such practices provide valuable emotional and practical support, but they also increase demand for spaces that conventional hospital planning may not adequately accommodate.

In many tertiary hospitals, informal caregivers remain beside patients for prolonged periods without access to suitable seating, sleeping facilities, privacy or basic personal amenities. Where designated accommodation is unavailable, caregivers improvise by occupying corridors, waiting areas, verandas and spaces adjacent to patient beds. These arrangements can contribute to physical discomfort, interrupted rest, congestion and difficulties in clinical circulation. The problem therefore extends beyond individual inconvenience to the wider relationship between hospital functionality and architectural provision. Research in evidence-based healthcare design has established that physical environmental conditions can influence users' experiences and well-being. Ulrich et al. (2008) identified relationships between healthcare environments and outcomes associated with lighting, acoustics, spatial organisation, and other building characteristics. Huisman et al. (2012) similarly demonstrated the importance of environmental factors in shaping the experiences of patients, healthcare personnel and other hospital occupants. These perspectives suggest that healthcare architecture should extend beyond clinical requirements to accommodate the broader human needs associated with hospitalisation.

Restorative spaces are particularly relevant to informal caregivers because caregiving often involves prolonged physical activity, emotional uncertainty and limited opportunities for recovery. Restorative environments provide opportunities for physical rest and psychological relief from demanding circumstances. Kaplan (1995) argued that supportive environments can facilitate recovery from attentional fatigue, while Ulrich (1991) explained how environmental characteristics may influence stress responses. In hospital settings, restorative opportunities may include comfortable seating, suitable sleeping accommodation, quiet spaces, natural lighting and opportunities for temporary withdrawal from stressful conditions. Privacy constitutes another important dimension of caregiver well-being. Hospitalisation frequently involves sensitive medical information, personal care activities and difficult emotional experiences. Caregivers may need opportunities to communicate confidentially with healthcare professionals, discuss family concerns, or temporarily withdraw from crowded environments. Proshansky et al. (1983) established that physical surroundings influence perceptions of personal identity and belonging,

suggesting that inadequate personal space may affect how caregivers experience their position within healthcare institutions.

Environmental comfort is equally important. Temperature, ventilation, lighting, noise and furniture quality can influence the experience of prolonged hospital occupancy. Dijkstra et al. (2006) demonstrated that physical environmental stimuli can influence psychological responses within healthcare settings. However, much of the available research has concentrated on patients and healthcare personnel, leaving the architectural requirements of informal caregivers relatively underexplored, particularly in resource-constrained African hospitals.

This article addresses that gap by examining restorative spaces, privacy and environmental comfort in three tertiary hospitals in Jos, Plateau State, Nigeria. It investigates the adequacy of existing spatial provisions, examines their relationships with caregiver satisfaction and emotional stress, and identifies architectural requirements that can inform more supportive hospital environments. The study contributes to healthcare design research by recognising informal caregivers as legitimate occupants whose physical and psychological needs should inform hospital planning.

2. Literature Review

2.1 Informal Caregiving and Hospital Ward Design

Informal caregiving represents an important component of healthcare delivery, particularly where family networks provide substantial assistance during illness. Caregivers often take on responsibilities beyond companionship, including physical assistance, emotional support, patient advocacy, and coordination of healthcare-related activities. Adejoh et al. (2021) found that informal caregivers of patients with advanced cancer in Nigeria, Uganda and Zimbabwe experienced substantial burdens associated with prolonged caregiving responsibilities. In Nigerian hospitals, informal caregivers' contributions are closely tied to cultural expectations and the practical demands of healthcare delivery. Chukwu et al. (2022) found that caregivers often face inadequate support and infrastructural challenges while providing essential assistance to hospitalised relatives. Their findings indicate that caregiving experiences are shaped not only by patients' medical conditions but also by institutional arrangements and the environments in which care takes place. The spatial implications of informal caregiving are significant. A caregiver assisting with feeding requires suitable seating and bedside access, while mobility assistance demands adequate circulation space. Overnight attendance creates additional requirements for sleeping facilities, sanitation and personal storage. When hospital design fails to provide these facilities, caregivers frequently adapt spaces intended for other purposes. Such adaptation may involve sleeping in corridors, occupying waiting areas or storing belongings beneath patient beds. Although these practices reflect caregivers' resourcefulness, they may contribute to congestion and interfere with the functional organisation of hospital wards. Caregiver-inclusive design therefore requires an understanding of the activities undertaken by family members and their implications for spatial planning.

2.2 Restorative Spaces and Psychological Well-Being

Restorative environments provide opportunities to recover from physical fatigue, psychological strain, and demanding experiences. Kaplan (1995) explained that certain environmental characteristics support recovery from attentional fatigue, while Ulrich (1984) demonstrated that views of natural surroundings were associated with more favourable outcomes on selected recovery indicators among surgical patients. Stress Reduction Theory further explains how

physical surroundings can influence psychological responses. Ulrich (1991) suggested that supportive environments may reduce stress, whereas uncomfortable or threatening conditions can intensify psychological strain. These ideas are relevant to informal caregivers who frequently experience prolonged vigilance, anxiety and uncertainty during hospitalisation.

Restorative opportunities within hospital wards may include suitable sleeping facilities, comfortable seating, quiet rooms and access to natural light. However, their effectiveness depends on the quality of the surrounding environment. A resting space exposed to excessive noise, heat or overcrowding may provide limited relief. The relationship between restorative environments and nature has also received attention. Kellert et al. (2008) emphasised the importance of incorporating natural elements into built environments, while Al Khatib et al. (2024) identified potential benefits of biophilic design for healthcare users. Nevertheless, restorative design in resource-constrained hospitals should prioritise accessible, functional, and maintainable provisions over elaborate architectural features.

2.3 Sleeping Facilities and Physical Comfort

Adequate sleeping accommodation is a fundamental requirement for individuals remaining in hospitals overnight. However, informal caregivers are often expected to make their own arrangements, using chairs, benches, mats, or the floor. Such practices may expose caregivers to physical discomfort, interrupted sleep and unsuitable environmental conditions. Healthcare research has examined sleep-related environmental challenges. Xie et al. (2009) identified noise as a key concern affecting sleep in intensive care settings, while Basner and McGuire (2018) reviewed evidence linking environmental noise to sleep-related outcomes. Although these studies did not specifically investigate Nigerian informal caregivers, they establish the importance of providing suitable acoustic conditions in rest environments. Caregiving also involves physical demands that should be considered. Prolonged sitting on unsuitable furniture, repeated bending and interrupted sleep can contribute to discomfort and fatigue. Research on family support in Nigeria further demonstrates the significance of caregiving responsibilities within everyday family life (Ebimgbo et al., 2022). Architectural responses may include dedicated caregiver rest rooms, foldable sleeping furniture and ergonomically designed seating. However, these provisions must be integrated into ward planning without compromising clinical access, infection prevention or emergency circulation.

2.4 Privacy, Dignity and Environmental Perception

Privacy is an important component of human dignity and emotional comfort. Within hospital environments, it involves visual separation during personal care, acoustic confidentiality during sensitive discussions and opportunities for temporary withdrawal from social interaction. Informal caregivers frequently participate in activities requiring discretion, including assisting with bathing, communicating with healthcare professionals and managing emotionally difficult circumstances. In overcrowded wards, these activities may occur without adequate protection from unwanted observation or interruption. Andrade et al. (2012) emphasised the importance of users' perceptions in evaluating hospital environmental quality. Their findings suggest that architectural adequacy should be assessed through both physical provisions and occupants' experiences. Environmental Perception Theory provides an additional explanation. Proshansky (1978) argued that physical settings influence self-identity, while Proshansky et al. (1983) further developed the relationship between place identity and environmental experience. For informal caregivers, the absence of

designated personal spaces may contribute to feelings of exclusion or limited institutional recognition. Privacy-sensitive design should therefore incorporate suitable bedside screens, confidential consultation rooms and quiet areas. These provisions must balance personal dignity with clinical visibility, ventilation and emergency access.

2.5 Ventilation, Thermal Comfort and Lighting

Environmental comfort influences how individuals experience indoor spaces over prolonged periods. Thermal conditions, ventilation, lighting, and air movement are particularly important in hospital wards, where high occupancy may increase discomfort. The World Health Organisation (2009) emphasised that ventilation in healthcare facilities requires careful integration of building design, engineering systems and infection-control requirements. Natural ventilation may offer advantages where appropriate, but its effectiveness depends on climate, window arrangements, and building configuration. In Nigerian hospitals, passive strategies such as shading, well-placed windows, and appropriate roof construction may improve thermal comfort. However, these measures should respond to actual environmental conditions and clinical requirements. Lighting is another important factor. Joseph (2006) reviewed evidence on lighting and healthcare outcomes, while Devlin and Arneill (2003) identified lighting as a characteristic that influences the hospital experience. Caregivers require adequate illumination for feeding, mobility assistance and other activities, particularly at night. Conversely, excessive or poorly controlled lighting may interrupt rest. Appropriate lighting design should therefore provide suitable ambient illumination, localised task lighting and controls that accommodate both caregiving activities and restorative needs.

2.6 Acoustic Comfort and Social Support

Hospital wards contain noise from conversations, equipment, patient activities and clinical movement. Excessive noise can disrupt rest, concentration and communication. Xie et al. (2009) highlighted the importance of noise management in healthcare, while Basner and McGuire (2018) described environmental noise's broader effects on sleep. Ward design should address acoustics through spatial zoning, sound-absorbing materials, and separating quiet areas from high-activity spaces. Social support is equally relevant. Cohen and Wills (1985) found that supportive relationships may promote well-being and help people manage stress. Lazarus and Folkman (1984) highlighted coping processes in understanding responses to stress. In hospitals, lounges, private consultation rooms and quiet areas can support families by enabling emotional communication, practical assistance and personal recovery. The literature therefore supports an integrated approach that treats restorative spaces, privacy and environmental comfort as interconnected architectural requirements, not isolated facilities.

3. Methodology

The study employed a convergent mixed-methods research design combining quantitative surveys, qualitative interviews, focus group discussions and structured architectural observations. Creswell (2014) and Creswell and Plano Clark (2018) explain that mixed-methods approaches are appropriate where research problems require both measurable evidence and detailed understanding of participants' experiences. The investigation was conducted in Jos, Plateau State, Nigeria, across Jos University Teaching Hospital, Bingham University Teaching Hospital and Plateau State Specialist Hospital. These institutions represent federal, faith-based and state-owned tertiary healthcare facilities, respectively. Their selection provided an opportunity to examine caregiver

experiences across different institutional environments. The research focused on medical wards, where informal caregivers often provide prolonged assistance to hospitalised patients.

The principal study population comprised informal caregivers providing unpaid support to hospitalised patients. In total, 196 caregivers completed a structured questionnaire. Semi-structured interviews with 12 healthcare professionals explored institutional perspectives on caregiver presence, spatial deficiencies and ward operations. The broader research also included eight building-industry professionals, including architects and engineers. This article focuses on findings relevant to restorative spaces, privacy and environmental comfort, interpreted within the three investigated hospitals rather than as representative of all Nigerian healthcare facilities.

Data were collected through structured questionnaires, semi-structured interviews, focus groups, and architectural observation checklists. Questionnaires assessed sleeping facilities, seating, privacy, sanitation, thermal conditions, lighting, noise, and caregiver satisfaction. Healthcare professionals discussed accommodation, overcrowding, circulation, and communication challenges. Focus groups documented caregivers' experiences, including improvised sleeping arrangements, discomfort, and limited privacy. Architectural observations assessed ward layouts and the use of bedside areas, corridors, waiting spaces, and support facilities, including overnight areas.

Quantitative data were analysed using descriptive statistics, correlation and multiple regression. Descriptive analysis established the prevalence of reported deficiencies, while inferential analysis examined relationships between spatial conditions and caregiver outcomes. Qualitative findings were interpreted thematically, consistent with the analytical principles described by Braun and Clarke (2006). Evidence from the different methods was compared to strengthen interpretation.

The study reported ethical approval and institutional permission. Participation was voluntary, confidentiality was maintained, and no confidential patient clinical records were examined. The research was observational and cross-sectional. Consequently, the identified statistical relationships should not be interpreted as evidence of causation.

4. Results and Discussion

4.1 Existing Restorative and Environmental Conditions

The findings revealed widespread deficiencies in the physical environments available to informal caregivers. Inadequate sleeping facilities were the most frequently reported deficiency (95.9%), followed by overcrowding (93.9%), inadequate privacy (88.8%), dissatisfaction with seating (86.7%), and poor sanitation (84.7%). Environmental conditions were also problematic, with 80.6% of respondents reporting thermal discomfort, 72.4% experiencing noise exposure, and 66.3% indicating inadequate lighting. Figure 1 illustrates the prevalence of spatial and environmental deficiencies experienced by informal caregivers in the selected tertiary hospital wards. The findings show that informal caregivers face multiple challenges that limit their opportunities for rest, privacy, and environmental comfort. The prominence of sleeping and privacy deficiencies suggests that restorative accommodation and personal dignity should receive particular attention in caregiver-inclusive hospital design.

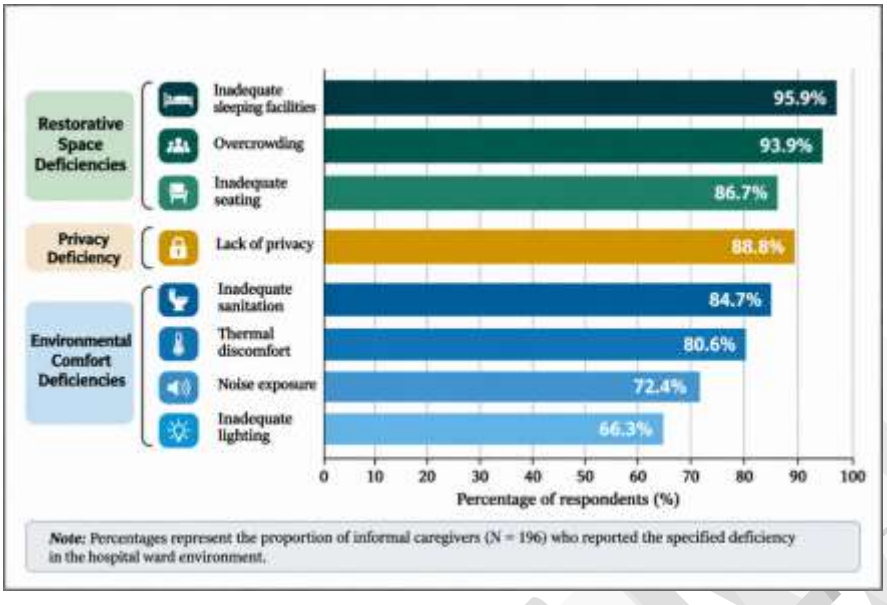

Figure 1 Prevalence of Restorative, Privacy and Environmental Comfort Deficiencies Among Informal Caregivers

The overall caregiver satisfaction score was low, with a mean of 1.7 and a standard deviation of 0.8 on a five-point scale. This indicates generally unfavourable assessments of the existing hospital environment. Architectural observations supported these findings, revealing that caregivers frequently occupied corridors, waiting areas and spaces beside patient beds because suitable accommodation was unavailable. The prevalence of these deficiencies suggests that caregivers experienced multiple forms of environmental discomfort simultaneously.

4.2 Resting and Sleeping Facilities

Sleeping provision emerged as the most frequently reported deficiency. Observations documented caregivers sleeping on mats, benches, cardboard sheets, wrappers and other improvised materials. The survey also found that 89.3% of caregivers slept on floors, benches, or improvised surfaces. These arrangements were often located in corridors or beside patient beds, exposing caregivers to disturbance and creating circulation difficulties. Multiple regression analysis identified sleeping provision as the strongest reported predictor of caregiver satisfaction ($\beta = .45$, $p < .001$). The result suggests that sleeping accommodation played an important role in caregivers' assessments of the hospital environment. However, the association does not establish that introducing new sleeping facilities would independently produce equivalent improvements in satisfaction. Figure 2 presents a schematic representation of the spatial constraints affecting informal caregivers within the investigated hospital wards. The illustration highlights the occupation of corridors and bedside areas for sleeping, sitting and storing personal belongings in the absence of designated caregiver facilities. These improvised arrangements demonstrate how essential caregiving activities extend beyond the spaces originally allocated for patient accommodation and clinical operations. The resulting overlap between resting, circulation and care-related activities contributes to congestion, limits privacy and restricts opportunities for physical recovery. The schematic underscores the need for hospital ward planning that recognises

informal caregivers as regular users and accommodates their spatial requirements without compromising clinical accessibility and patient safety.

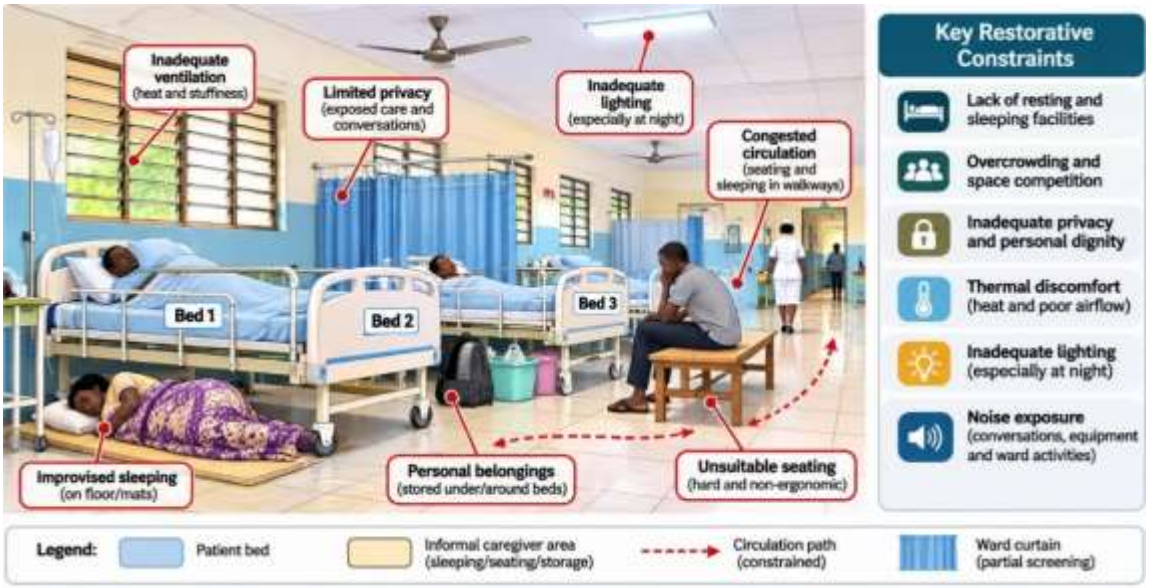

Figure 2. Schematic representation of the existing ward spatial conditions, showing improvised sleeping arrangements, limited privacy and circulation constraints affecting informal caregivers.

4.3 Privacy and Personal Dignity

88.8% of respondents reported privacy deficiencies. Caregivers often struggled to discuss sensitive medical matters privately or to withdraw temporarily from crowded surroundings. Qualitative findings described discomfort arising from conversations being overheard by unrelated occupants. Limited privacy also affected personal care activities and opportunities for emotional reflection. Regression analysis identified privacy as a significant predictor of caregiver satisfaction ($\beta = .32$, $p < .01$). The results indicate that privacy should be recognised as an important architectural requirement for informal caregivers, not a provision intended exclusively for patients.

4.4 Thermal, Lighting and Acoustic Conditions

Thermal discomfort affected 80.6% of respondents. Architectural observations identified excessive heat and inadequate airflow, particularly during periods of high occupancy. Several wards relied substantially on natural ventilation, but available openings did not consistently provide satisfactory environmental conditions. 66.3% of caregivers reported inadequate lighting, particularly affecting nighttime activities. 72.4% reported noise exposure, with disturbances associated with conversations, equipment, patient activities, and movement. These findings suggest that environmental discomfort reduced opportunities for satisfactory rest and contributed to unfavourable experiences of prolonged hospital occupancy.

4.5 Seating, Overcrowding and Emotional Stress

86.7% of caregivers reported dissatisfaction with seating arrangements. Observations revealed extensive reliance on hard benches, plastic chairs and improvised surfaces that provided limited

ergonomic support. Overcrowding affected 93.9% of respondents and was strongly associated with emotional stress ($r = .71$, $p < .001$). The study also found that 91.8% of caregivers believed improved spatial provisions would enhance their caregiving effectiveness, while 89.8% perceived that caregiver-inclusive improvements could benefit patient outcomes. These responses reflect expectations rather than directly measured improvements in caregiving performance or clinical recovery. Collectively, the results identify sleeping accommodation, privacy, environmental comfort, and spatial organisation as key priorities for caregiver-inclusive hospital design. Table 1 reports significant spatial predictors of informal caregiver satisfaction from multiple regression analysis. Sleeping provision showed the strongest association ($\beta = 0.45$, $p < .001$), followed by privacy ($\beta = 0.32$, $p < .01$) and sanitation ($\beta = 0.28$, $p < .05$). These results highlight the importance of restorative accommodation, personal dignity, and hygiene facilities in hospital environments. While they do not establish causation, they support prioritising sleeping facilities, privacy, and sanitation in caregiver-inclusive architecture.

Table 1.
Significant spatial predictors of informal caregiver satisfaction

Spatial predictor	Standardised coefficient (β)	Significance	Interpretation
Sleeping provision	0.45	$p < .001$	Strongest reported predictor
Privacy	0.32	$p < .01$	Significant association with satisfaction
Sanitation	0.28	$p < .05$	Significant association with satisfaction

Source: Authors' field survey and regression analysis (2025).
Note: These are the significant predictors reported in the study. The article does not provide the complete regression model, confidence intervals, or model diagnostics.

The findings demonstrate a substantial mismatch between informal caregivers' responsibilities and the physical provisions available to support them. The exceptionally high proportion reporting inadequate sleeping facilities indicates that caregiver accommodation is a recurring architectural concern, not an occasional inconvenience. This finding aligns with Chukwu et al. (2022), who identified limited institutional support and inadequate amenities among the challenges facing Nigerian informal caregivers. It also complements Adejoh et al. (2021), whose investigation demonstrated the personal burdens associated with prolonged caregiving.

The architectural implications matter because caregivers often remain close to patients for extended periods. Where sleeping facilities are unavailable, they occupy corridors and other unsuitable spaces, potentially disrupting clinical circulation and exposing them to environmental disturbance. Restorative accommodation should therefore form part of hospital planning. Depending on available space, this may involve designated resting rooms, caregiver lounges, foldable sleeping facilities or adaptable furniture. However, restorative quality cannot be achieved by providing additional furniture alone. Kaplan (1995) and Ulrich (1991) emphasised the significance of supportive environmental characteristics in psychological restoration. Sleeping facilities should therefore be coordinated with ventilation, lighting, acoustic comfort and privacy. The findings suggest that caregivers should be recognised as legitimate hospital occupants whose

needs can be anticipated during architectural planning rather than addressed through improvised arrangements. The strong link between privacy and caregiver satisfaction highlights the importance of personal dignity in hospital environments. Caregivers frequently receive sensitive information, assist with intimate patient-care activities and experience emotionally demanding circumstances. Where privacy is inadequate, these activities occur in crowded environments where communication and personal expression may be constrained. The findings align with the environmental perception perspectives of Proshansky et al. (1983), who showed that physical settings influence people's relationships with their surroundings.

The absence of designated caregiver spaces may communicate limited institutional recognition of their needs. Privacy-sensitive architecture should therefore provide flexible bedside screening, confidential consultation rooms and quiet areas. Such provisions can support personal dignity without necessarily separating caregivers from patients. However, privacy arrangements must remain compatible with clinical observation, ventilation and emergency accessibility. The objective is to balance dignity, proximity, and functional requirements. Respondents reported thermal discomfort, inadequate lighting, and noise exposure. Taken together, these findings suggest that caregiver experiences are shaped by multiple environmental conditions rather than individual deficiencies alone. Dijkstra et al. (2006) demonstrated that physical environmental stimuli can influence psychological responses, while Huisman et al. (2012) identified environmental quality as an important consideration in healthcare settings.

The present findings indicate that architectural improvements should be integrated into design. Comfortable seating may provide limited relief where a ward remains excessively hot, while sleeping accommodation may offer inadequate restoration when located in a noisy environment. Address thermal conditions through suitable shading, ventilation, building orientation, and maintenance. The World Health Organisation (2009) emphasised that ventilation interventions must also remain compatible with infection-control requirements. Lighting improvements should support essential caregiving activities while reducing unnecessary nighttime disturbance. Acoustic management should similarly minimise avoidable noise without interfering with clinical communication. These measures are particularly relevant to resource-constrained hospitals where carefully selected environmental improvements may be more achievable than extensive reconstruction. The strong association between overcrowding and emotional stress indicates that congestion is a key consideration for caregiver well-being. Although the observational findings cannot establish causation, the relationship suggests that spatial density deserves greater attention in hospital planning. Overcrowding also creates practical difficulties. When caregivers occupy corridors to sleep and wait, circulation becomes restricted, potentially affecting healthcare personnel and emergency movement. Ulrich et al. (2008) emphasised the importance of spatial organisation in evidence-based healthcare design.

These findings extend this concern by showing how inadequate caregiver accommodation contributes to competing spatial demands. Appropriate resting areas, organised storage, ergonomic seating and sufficient bedside clearance may help redistribute activities more effectively. However, severe overcrowding may require institutional responses beyond furniture rearrangement. The findings suggest incorporating caregiver-inclusive design into healthcare facility planning in Nigeria. Hospital environments should be assessed according to actual occupancy patterns, including the prolonged presence of informal caregivers. Architectural interventions should remain practical, context-sensitive and maintainable. Immediate improvements may include suitable seating, privacy screens, lighting controls and better organisation of available spaces. Medium-

term interventions may include designated caregiver lounges, rest areas and environmental upgrades. Figure 3 illustrates an integrated architectural approach to improving restorative spaces, privacy and environmental comfort for informal caregivers. The framework links the study's principal deficiencies with proposed design interventions and their intended benefits.

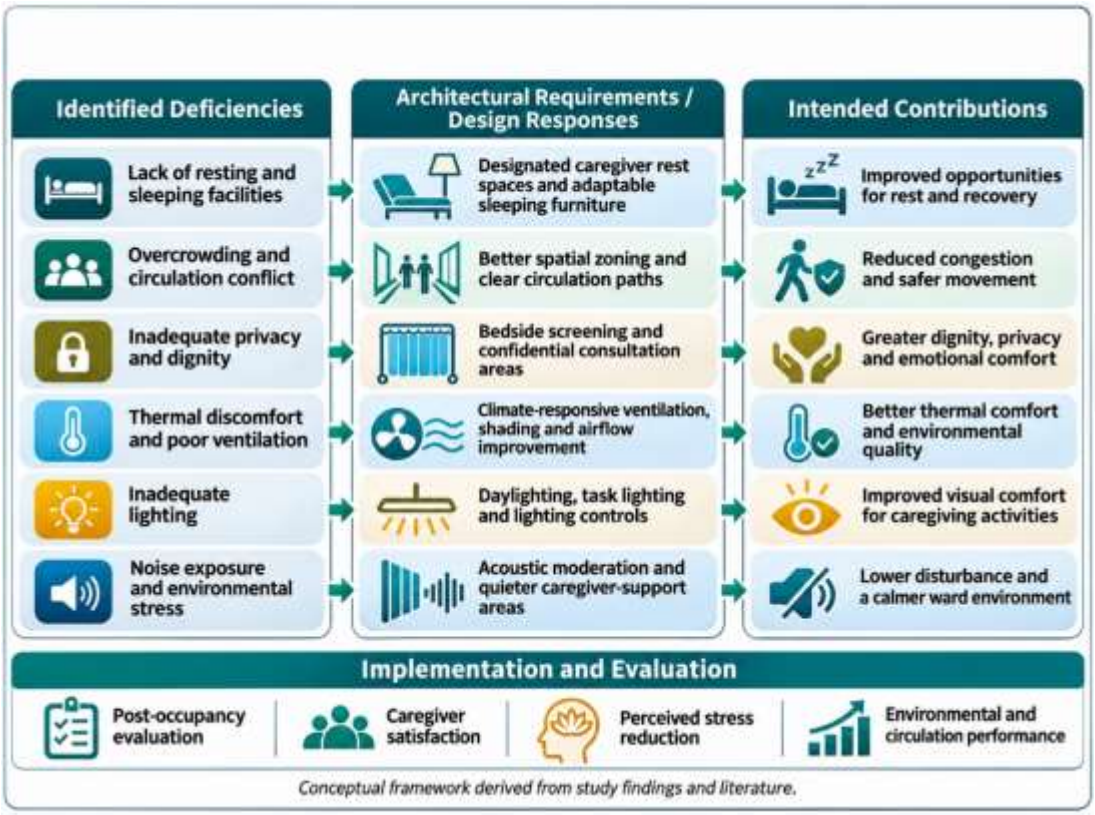

Figure 3 Integrated architectural requirements for restorative spaces, privacy and environmental comfort in caregiver-inclusive hospital wards.

Long-term planning should incorporate caregiver support facilities into hospital development standards and infrastructure programmes. The findings also emphasise the need for collaboration among architects, engineers, healthcare professionals, facility managers and caregivers. Such collaboration can help ensure that proposed interventions address the lived experiences of hospital users while remaining compatible with clinical operations.

6. Conclusion and Recommendations

6.1 Conclusion

This study examined restorative spaces, privacy and environmental comfort as architectural requirements for informal caregiver well-being in three tertiary hospitals in Jos, Nigeria. The findings revealed substantial deficiencies in sleeping accommodation, seating, privacy, sanitation, thermal conditions, lighting and acoustic comfort. Sleeping provision emerged as the strongest predictor of caregiver satisfaction, followed by privacy and sanitation. Overcrowding was also strongly associated with emotional stress.

These findings reveal a mismatch between the essential responsibilities informal caregivers perform and the physical environments available to support them. Although caregivers contribute substantially to patient assistance, their needs are not consistently incorporated into hospital ward planning. The study concludes that restorative accommodation, privacy and environmental comfort should be recognised as important components of caregiver-inclusive healthcare architecture. Providing them requires an integrated approach that considers spatial organisation, environmental quality, clinical operations, and institutional resources. Nevertheless, the observational nature of the investigation prevents causal conclusions concerning the effectiveness of proposed interventions. Further evaluation is required to determine whether architectural improvements produce measurable changes in caregiver well-being.

6.2 Recommendations

Tertiary hospitals should provide designated resting and sleeping facilities for informal caregivers who stay with patients for extended periods. These spaces should be accessible, comfortable and appropriately separated from major sources of disturbance, without compromising proximity to patients. Enhance privacy through suitable bedside screening, confidential consultation areas, and quiet rooms. These facilities should enable caregivers to communicate privately, maintain personal dignity, and manage emotionally demanding experiences while remaining accessible to clinical staff. Table 2 summarises the key architectural interventions proposed to improve informal caregiver well-being in tertiary hospital wards. The recommendations address restorative accommodation, privacy, thermal comfort, lighting, acoustics, ergonomic seating, circulation and supporting facilities. Each intervention addresses deficiencies identified through the questionnaire survey, interviews and architectural observations.

Table 2
Proposed architectural interventions for caregiver-inclusive hospital wards

Architectural requirement	Recommended design intervention	Intended contribution
Restorative accommodation	Designated rest rooms and adaptable sleeping furniture	Better opportunities for physical rest
Privacy	Bedside screens and confidential consultation areas	Greater dignity and communication privacy
Thermal comfort	Shading, appropriate ventilation and climate-responsive building design	Reduced thermal discomfort
Lighting	Daylighting, task lighting and suitable controls	Improved visual comfort and reduced nighttime disturbance
Acoustic comfort	Sound-absorbing finishes and separation of quiet areas	Reduced unnecessary noise exposure
Ergonomic comfort	Supportive, durable caregiver seating	Reduced discomfort during prolonged sitting
Circulation	Appropriate bedside clearance and designated caregiver zones	Reduced spatial conflicts
Environmental support	Accessible sanitation and secure storage	Improved convenience and personal hygiene

Environmental comfort should be improved through climate-responsive architectural strategies, including appropriate ventilation, effective shading, suitable lighting controls and acoustic management. These measures should reflect local environmental conditions, infection-control requirements and institutional maintenance capacities. Hospital ward planning should incorporate ergonomic seating, with attention to bedside clearance and circulation. Where space is limited, adaptable furniture may provide practical alternatives, provided its use remains compatible with clinical operations and safety requirements. Hospital administrators should undertake regular spatial assessments to identify deficiencies affecting caregiver accommodation, environmental comfort and ward functionality. These assessments should guide phased refurbishment programmes, beginning with the most urgent requirements. Finally, further research should evaluate completed caregiver-supportive interventions through post-occupancy studies that incorporate objective measurements of environmental conditions, caregiver satisfaction, sleep quality, and perceived stress. Such investigations would provide stronger evidence for developing architectural standards appropriate for Nigerian tertiary hospitals.

References

Adejoh, S. O., Boele, F., Akeju, D., Dandadzi, A., Nabirye, E., Namisango, E., Namukwaya, E., Ebenso, B., Nkhoma, K., & Allsop, M. J. (2021). The role, impact, and support of informal caregivers in the delivery of palliative care for patients with advanced cancer: A multi-country qualitative study. *Palliative Medicine, 35*(3), 552–562. https://doi.org/10.1177/0269216320974925

Al Khatib, I., Samara, F., & Ndiaye, M. (2024). A systematic review of the impact of therapeutic biophilic design on the health and wellbeing of patients and care providers in healthcare service settings. *Frontiers in Built Environment, 10*, Article 1467692. https://doi.org/10.3389/fbuil.2024.1467692

Alkali, I. A. (2019). Familial caregiving of hospitalised patients: A sustainable cultural etiquette. *European Journal of Sustainable Development, 8*(1), 365–374. https://doi.org/10.14207/ejsd.2019.v8n1p365

Andrade, C., Lima, M. L., Fornara, F., & Bonaiuto, M. (2012). Users' views of hospital environmental quality: Validation of the Perceived Hospital Environment Quality Indicators (PHEQIs). *Journal of Environmental Psychology, 32*(2), 97–111. https://doi.org/10.1016/j.jenvp.2011.12.001

Basner, M., & McGuire, S. (2018). WHO environmental noise guidelines for the European Region: A systematic review on environmental noise and effects on sleep. *International Journal of Environmental Research and Public Health, 15*(3), Article 519. https://doi.org/10.3390/ijerph15030519

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Chukwu, N., Agwu, P., Ajibo, H., & Aronu, N. (2022). Challenges faced by informal caregivers of patients in a Nigerian hospital and implications for social work. *Journal of Social Work, 22*(5), 1189–1206. https://doi.org/10.1177/14680173221077371

Cohen, S., & Wills, T. A. (1985). Stress, social support, and the buffering hypothesis. *Psychological Bulletin, 98*(2), 310–357. https://doi.org/10.1037/0033-2909.98.2.310

Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). SAGE Publications.

Creswell, J. W., & Plano Clark, V. L. (2018). *Designing and conducting mixed methods research* (3rd ed.). SAGE Publications.

Devlin, A. S., & Arneill, A. B. (2003). Health care environments and patient outcomes: A review of the literature. *Environment and Behaviour, 35*(5), 665–694. https://doi.org/10.1177/0013916503255102

Dijkstra, K., Pieterse, M. E., & Pruyn, A. (2006). Physical environmental stimuli that turn healthcare facilities into healing environments through psychologically mediated effects: Systematic review. *Journal of Advanced Nursing, 56*(2), 166–181. https://doi.org/10.1111/j.1365-2648.2006.03990.x

Ebimgbo, S. O., Atama, C. S., Igboeli, E. E., Obi-Keguna, C. N., & Odo, C. O. (2022). Community versus family support in caregiving of older adults: Implications for social work practitioners in South-East Nigeria. *Community, Work & Family, 25*(2), 152–173. https://doi.org/10.1080/13668803.2021.1926222

Huisman, E. R. C. M., Morales, E., van Hoof, J., & Kort, H. S. M. (2012). Healing environment: A review of the impact of physical environmental factors on users. *Building and Environment, 58*, 70–80. https://doi.org/10.1016/j.buildenv.2012.06.016

Joseph, A. (2006). *The impact of light on outcomes in healthcare settings*. The Centre for Health Design.

Kaplan, S. (1995). The restorative benefits of nature: Toward an integrative framework. *Journal of Environmental Psychology, 15*(3), 169–182. https://doi.org/10.1016/0272-4944(95)90001-2

Kellert, S. R., Heerwagen, J. H., & Mador, M. L. (Eds.). (2008). *Biophilic design: The theory, science, and practice of bringing buildings to life*. John Wiley & Sons.

Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. Springer Publishing Company.

Proshansky, H. M. (1978). The city and self-identity. *Environment and Behaviour, 10*(2), 147–169. https://doi.org/10.1177/0013916578102002

Proshansky, H. M., Fabian, A. K., & Kaminoff, R. (1983). Place identity: Physical world socialisation of the self. *Journal of Environmental Psychology, 3*(1), 57–83. https://doi.org/10.1016/S0272-4944(83)80021-8

Ulrich, R. S. (1984). View through a window may influence recovery from surgery. *Science, 224*(4647), 420–421. https://doi.org/10.1126/science.6143402

Ulrich, R. S. (1991). Effects of interior design on wellness: Theory and recent scientific research. *Journal of Health Care Interior Design, 3*, 97–109.

Ulrich, R. S., Zimring, C., Zhu, X., DuBose, J., Seo, H. B., Choi, Y. S., Quan, X., & Joseph, A. (2008). A review of the research literature on evidence-based healthcare design. *HERD: Health Environments Research & Design Journal, 1*(3), 61–125. https://doi.org/10.1177/193758670800100306

World Health Organisation. (2009). *Natural ventilation for infection control in health-care settings*. World Health Organisation.

World Health Organisation. (2018). *Environmental noise guidelines for the European Region*. WHO Regional Office for Europe.

Xie, H., Kang, J., & Mills, G. H. (2009). Clinical review: The impact of noise on patients' sleep and the effectiveness of noise reduction strategies in intensive care units. *Critical Care, 13*, Article 208. https://doi.org/10.1186/cc7154