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Reducing Agitation in Dementia Patients: A role for environmental design

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Abstract: The need to increase the purpose built dementia care homes raises the profile of environmental building design considerations and how they relate to reducing agitation in dementia patients. Critical to the increasing population with dementia, is a need to change the social perceptions of mental health facilities as linked to the design of asylums and prison architecture. The availability of facilities that educate, rehabilitate and provides therapeutic and healing environments is a need for both patients and their carers. Literature suggests that well designed environments for a small group of patients in a home like environment influences dementia patients’ behavioural attitude and aid in retention of physical abilities to move within the spaces and reduces agitation levels. (Lawton, 2001, and Nagari, 2016). This is a preliminary review of research published between 2010-2017 linking the impact of building design decisions to environmental effects on dementia patient behaviours in care homes. It is argued that in the pursuit for decreasing energy consumption by design and building fabric specifications of these homes, more research and a deeper understanding of environmental health related guidelines need to be considered before the building is built. A central role for building performance evaluation and modelling needs to be included in the design approval process that necessitates further research on ranges of daylight, lighting, thermal comfort and acoustic levels to be achieved. This research reviews literature relating the quality of life of dementia patients to the quality of the designed space and the environment it creates.

Keywords: Dementia, building environment, agitation

Introduction

The World Health Organization defines ‘dementia’ as a syndrome leading to a set of symptoms that lead to deterioration in memory, difficulties with thinking and problem-solving, verbal communication and the ability to perform daily tasks. These changes are often incremental at the beginning till they reach a stage where patients need to be hospitalized or taken into care homes. A person with dementia may also experience changes in their mood or behaviour leading to agitation and pain (Cohen-Mansfied et al. 2015). The Alzheimer’s society (2015) estimates that there were about 850,000 people in the UK with dementia with an estimated growth to 2 million by 2051. It mainly affects people over the age of 65, where one in 14 people in this age group have dementia. The proportion of people doubles for every five years gap and one in six people over the age of 80 will be diagnosed with the disease. There are more than 42,000 people in the UK under 65 with dementia. It is estimated that the cost of care for dementia patients costs the country £26.2 billion annually (enough to pay for energy bills for every household in the country).

Dementia is diagnosed when the brain cells are damaged. Alzheimer’s disease is the most commonly diagnosed form, but other forms such as Vascular dementia following a...
series of strokes leading to reduction of oxygen supply to the brain. Dementia with Lewy bodies also linked to Parkinson disease and leads to difficulty with movement. Frontotemporal dementia (including Pick’s disease). Mixed dementia where a patient can be diagnosed with different types of dementia. The specific symptoms that someone with dementia experiences will depend on the parts of the brain that are damaged and the disease that is causing the dementia.

Understanding the disease; informing the building production:

The complexity of designing buildings that reduce agitation in dementia patients stems from the fact that these buildings are a mixture of investment opportunities for developers, workplace for carers, a home for the patients and a place where families trust that their loved ones are comfortable and catered for.

The overall complexity of designing buildings for a specific patients with Dementia (PWD) as a user group with highly specialized care needs; requires an interdisciplinary dialogue between various building specialists. This is complicated by the need of specialists to capture all these building design demands in a single building production that encompasses the often contradicting stakeholders demand on the building design, construction and in use processes. For example; a cost effective design that facilitates collective care in wards but also allows for isolation, or/ and issues of cost of care and allowing comfortable indoor environments compared to the cost of continuous provision of energy in these buildings. In this paper there is a focus on the relationship between the specific nature of this disease and factors that directly affect the design of its environments for patients. van Hoof et al (2013) identifies 15 aspects that should be taken into consideration when designing for PWDs. The HBN 0802, Dementia friendly health and social care environments (2015) states twelve principles that need to be taken into consideration when designing buildings. These principles include many aspects relating to how patients might feel in the building, how buildings can express certain values or religious believes. Other essential parts of these models inform the programmatic resolution of design elements in plan and their relationships to facilitate way finding, justice in providing privacy, and maximum and sustained autonomy for users with lesser cognitive abilities. Building performance evaluation offers a unique opportunity to test the performance of buildings for specific user groups before the building is built. The Factors that are of pertinence to this research and the role environmental design and its assessment through building performance simulation can be deducted as:

- Neurodegenerative factors that maybe reduced through building design are:
  - day-to-day memory – for example, difficulty recalling events that happened recently, leading to the need to create a homelike environment
  - concentrating, planning or organising – for example, difficulties making decisions, solving problems or carrying out a sequence of tasks, such as finding a toilet and washing up
  - Disability in communicating verbally to convey unmet needs expressed though agitated behaviours or what maybe interpreted as inappropriate sexual behaviour such as feeling thermally uncomfortable, over stimulated by glare or noise levels in the space leading to taking off clothes in public (van Hoof etal 2010)
  - visuospatial skills – for example, problems judging distances (such as on stairs) and seeing objects in three dimensions, shadows from lighting fixtures being perceived as holes on the ground, or two variations between two flooring materials being perceived as a step.
orientation – becoming confused about where they are and time of the day relating to wandering behaviours and sundown syndrome, needing clearer landmarks and cues for triggering memory of how to use the space.

Table 1: factors for holistic design considerations in Dementia Friendly care homes and facilities

<table>
<thead>
<tr>
<th>HBN 0802</th>
<th>van Hoof et al (2013)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principle 1 provide a safe environment</td>
<td>Numerical how patients understand numbers and symbols in various spaces</td>
</tr>
<tr>
<td>P2 optimum levels of stimulation</td>
<td>Spatial referring: to how patients can navigate the buildings and understand its various parts</td>
</tr>
<tr>
<td>P3 Optimum level of lighting and contrast</td>
<td>Physical: referring to indoor environmental conditions of heat and ventilation</td>
</tr>
<tr>
<td>Cognitive impairment principles</td>
<td>Logical analytical referring to differences between PWDs and healthy individuals in their ability to analyse their environments and how to move in between</td>
</tr>
<tr>
<td>P4 provide a non institutional scale and environment</td>
<td></td>
</tr>
<tr>
<td>P5 support orientation</td>
<td></td>
</tr>
<tr>
<td>P6 Support way finding</td>
<td>Formative: how patients can autonomously control their daily lives</td>
</tr>
<tr>
<td>P7 provide access to nature and outdoors</td>
<td>Biotic how patients have access to sensory experiences in the building and outside</td>
</tr>
<tr>
<td>P8 Promote engagement with friends</td>
<td>Social: referring to facilitating interaction between patients, other patients, carers and family</td>
</tr>
<tr>
<td>P9 promote good visibility and visual access</td>
<td>Sensitive: how patients can see and perceive reality of their various environments compared to a health adult</td>
</tr>
<tr>
<td>P10 Promote privacy and dignity</td>
<td>Juridical supporting privacy and varying needs for isolation at times</td>
</tr>
<tr>
<td>P11 promote meaningful physical activity</td>
<td>Creedal supporting religious symbolism and activities among other activities</td>
</tr>
<tr>
<td>P12 support hydration</td>
<td>Informatory: referring to their lingual ability to communicate meanings of symbols, emotions and words</td>
</tr>
<tr>
<td></td>
<td>Ethical: how the whole building design should facilitate care and support a healing environment, using technologies to detect patients behaviours such as agitation or wandering</td>
</tr>
<tr>
<td></td>
<td>Esthetical referring to how the building interior and exterior architecture is appreciated by PWD</td>
</tr>
<tr>
<td></td>
<td>Economic: how can health care costs be minimized without compromise to quality</td>
</tr>
</tbody>
</table>

HBN 0802, Dementia friendly health and social care environments (2015) states twelve principles that need to be taken into consideration when designing buildings, the ones that are most related to environmental design and can indeed be tested through building
performance simulation are P3 and P9, while P2 (optimum level of stimulation) is also linked to reducing thermal and acoustic stressors and should be tested by building performance simulation at design phase. Van Hoof et al (2013) model refers to these environmental stressors highlighting their impact on cognitive abilities and their role in cognitive deterioration if not considered earlier in the design stage.

The impact of the building design on particular dementia patients’ behaviours is assessed by a number of measures that are used in research and medical trials to test the impact of the environment on dementia patients, it is noted that these measures are used by proxy as caregivers are asked to use the ratings to respond to factors affecting patients with dementia. Such as Alzheimer’s Disease related quality of life ADRQL scale that contains 40 items divided into social interaction, awareness of self, feelings and mood, enjoyment of activities and response to surroundings. The Neuropsychiatric Inventory (NPI) used to quantify the severity and frequency of 12 neuropsychiatric symptoms related to dementia, namely delusions, hallucinations, agitation and aggression, dysphoria, anxiety, dysphoria, euphoria, apathy, disinhibition, aberrant motor behaviour, sleep and appetite disorders. And the Hopkins Homelike environmental Rating Scale

van Hoof (2010) report 36 behavioural disorders based on a literature review in Dementia patients. Five of these behavioural disorders were identified as directly related to building design as identified by literature reviews of more than 250 research outputs collectively found till 2010 namely: Disorientation, impaired sense of time, impaired wayfinding, agitation, sundowning and aggression. Nagari and Hamza (2016) also reported a potential link between daylight availability linked to the façade design and orientation and an increase in aggression incidents in a care home that was monitored in 2015.

Methodology

A set of criteria was designed for inclusion of research

1. The literature survey looked into relevant research undertaken since 2010-2017 using various data bases namely sciencedirect, Pubmed and googlescholar. The keywords used were Dementia combined with care homes, energy consumption, behaviour and environment.

2. Evaluated an intervention utilising the physical environment with an impact on dementia patients’ behaviour

3. Incorporated a control group, cross sectional or survey design of case study buildings specifically designed for dementia care or incorporated specialized wards in elderly care homes.

4. Research relating to interior design and fittings was excluded such as studies relating to positioning of furnishings, home likeness, paintings and plants.

As the positive relationship between these design elements and reduced agitation and wandering in patients was extensively reviewed by Fleming et al (2009). A review of the empirical literature on the design of physical environments for people with dementia found a direct link between Environmental determinants of quality of life in nursing home residents with severe dementia.
Healing or agitating environments?

Finding the relationship between our current state of knowledge of environmental influences and relationships whether directly or indirectly between architectural design of these care facilities and the agitation levels of dementia patients highlighted the need for a framework for design and design quality analysis. Brahman et al (2014) draws attention to the importance of relating the senses in the diagnosis and management of dementia. Associations between dementia and impairments in hearing, vision, olfaction and (to a lesser degree) taste have been identified.

Hearing impairment has been shown to precede cognitive decline, but it is not clear if the hearing loss is an early marker of dementia or a modifiable risk factor.

Olfactory impairment is seen in many neurodegenerative conditions, but it has been shown that those with dementia have particular difficulties with the recognition and identification of odours rather than the detection, suggesting a link to impairment of higher cognitive function. Olfactory impairment has been shown to be predictive of conversion from mild cognitive impairment to Alzheimer’s disease with 85.2% sensitivity. As cognitive function deteriorates, the world is experienced at a sensory level, with reduced ability to integrate the sensory experiences to understand the context. Thus, people with dementia are very sensitive to sensory experiences and their environment needs to be managed carefully to make it understandable, comfortable, and (if possible) therapeutic. Light can be used to stabilise the circadian rhythm, which may be disturbed in dementia.

Identifying sources and indications of discomfort maybe directly related to factors such as quality and quantity of nursing, or the medical state of the patients. Cohen-Mansfield et al (2015) defining discomfort and pain in Dementia patients as related to medical and non-medical factors using the Sources of Discomfort scale (SODS). It is the environmental sources of this scale that links with frameworks in Table 1.

1) Physical (i) Hunger/thirst: the desire to consume food without prompting
   (ii) Rash/fungus: seeming to try to scratch a body part, excessive touching of clothing.
   (iii) Constipation: examined from medical records
   (iv) Sleepiness or tiredness: seeming to be excessively sleepy or tired
   (v) Feeling uncomfortable: noted from subjective responses of patients about how they feel
   (vi) Bathroom: resident asking to go to the bathroom.

2) Body positioning and movement
   (i) Seating: observations of how patients were moving in the seat, head lying unsupported, leg dangling, leg stuck in the wheelchair or another piece of furniture, other body parts looking uncomfortable using the reasonable person test, and sitting in the same place without movement for over two hours.
   (ii) Restraints: resident restrained
   (iii) Furniture positioning: furniture standing in the way of the resident. Providing a non-institutional feel and provide a friendly environment for engagement with carers family and friends. Support orientation between spaces.

3) Environmental sources

Of particular importance to the role of the architect and building performance modelling is the environmental sources of discomfort and how they can be mitigated by user-centric design. The opportunities to simulate the environmental performance of these care facilities by using specialized building performance modelling should not be missed.
(i) User centric approaches to building programme and functional positioning of rooms and linking corridor spaces to help promote privacy, dignity and independence as long as possible.

(ii) Wayfinding with colour contrasts as cues and avoiding bland unstimulating environments

*Providing optimum levels of Lighting*: is there a link between insufficient lighting and agitation?, and its evidence to ‘sun-downing’ syndrome, or evidence of over stimulation due to higher levels of lighting. Is the creation of shadows from daylight design or artificial lighting a problem? Providing good visibility but without over stimulation

(ii) *Thermal comfort*: complaints of being hot or cold

(iv) Acoustical comfort: noise levels and quietness: another resident is bothering the resident

(v) olfactory comfort; presence of adequate natural ventilation, odours from sensory gardens

Cleanliness management systems would contribute to this perception but were excluded from the analysis.

(Vi) ease and secure access to the outside spaces and natural environments

Research highlighted that environmental stressors are also exacerbated by the level of control the patients and their carers may have on the environment of the care home. Walker et al (2016) argue that in the six care home environment they monitored, this degree of agency and control is curtailed to some degree and bounded for individual residents. Instead, agency and control are distributed to the different ‘non-resident actors’ within the home, as PWD may not be able to control the settings and end up merely playing with the thermostat. across the range of staff there could be deliberate delimitations of responsibility that introduce both technical and human ‘intermediaries’ between the subjects of comfort and the setting of ambient temperatures in the rooms they were occupying. Care staff sometimes felt unable to make adjustments to the heating systems, even where they were formally able to, because of their lack of understanding of how the heating system worked and lack of confidence in their ability to exercise control over it correctly – particularly where an unfamiliar technology such as underfloor heating was involved. Mendes at al (2013) attributed the increase in Fungal concentrations frequently exceeding reference levels (>500 colony-forming units [CFU]/m³) to the quality of the building fabric but also to the lack of individual control over the environment.

Van Hoof et al (2010) warn that Some sensory technology that may be useful in theory, such as lights that turn on by motion sensor to guide people to the bathroom at night, may be confusing and distressing to some people with dementia. Therefore, a careful balance must be struck to use technology appropriately to maintain a comfortable and understandable environment and to keep patients safe without negatively affecting their quality of life.

Van Hoof et al (2010) based on an extensive literature review of It is hypothesised that high-intensity lighting, with illuminance levels of well over 1,000 lx, may play a role in the management of dementia. Bright light treatment with the use of light boxes is applied to entrain the biological clock, to modify behavioural symptoms, and improve cognitive functions, by exposing people with dementia to high levels of light. The results of bright light therapy on managing sleep, behavioural, mood, and cognitive disturbances show preliminary positive signs, but there is a lack of adequate evidence obtained via randomised controlled trials to allow for a widespread implementation in the field. Van Hoof (2010) reviewed more
than 140 key research journals and guidelines in an attempt to identify the key factors that relate between the senses and building design factors in houses for Dementia patients and care homes. Concluding that understanding lighting is well established and should be between 300-1000 Lux depending on function of the space, this was also supported by the Building Health notes in the UK. (2015). However, post occupancy evaluation of case study care home in Galicia in Spain (Rodriguez and Hamza (2016) and one detailed study in the UK (Nagari and Hamza, 2016) found that daylight levels were not really achieved in care homes and were below the levels anticipated.

Linking building design and agitation behaviours in Patients with Dementia highlights the missed opportunities of not mandating the use of Dynamic building performance simulation modelling and the urgent need to understand indices of building performance based on a specific and scientific knowledge of thermal and visual comfort indices for PWD.

Conclusions

Performance modelling to reduce energy demand in supporting the design of mental health facilities with special emphasis on dementia care. Age UK and various NHS publications acknowledge the impact of the built environment as a healing accelerator. The bulk of research acknowledges the impact of sensory, cognitive and physical impairment that healthcare buildings can create if not designed fit for their purpose. Although BREEAM H for sustainable buildings and the use of complex softwares for Building Information Modelling (BIM) is mandatory for all large public centrally procured projects to optimize the construction processes, the ‘Building and Urban Environmental Performance Simulations’ have not been included in the early design assessments. The current attempts by the NHS to collect patients’ feedback related to cleanliness and safety of facilities (PLACE), can give some guidance to building design but not enough for creating critically needed sensory and performative buildings for healthcare.

The reviewed research found that, albeit, the advances in understanding the link between a faster cognitive deterioration due to the built care home environments, the critical question of how can we integrate a better understanding of generic design guidelines (Health Building Notes HBN 08-02, 2015) for dementia and social care environments into applicable and measurable design parameters for architects and urban planners for existing and new buildings still remains unanswered.

References

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