

# Building Design for People with Dementia: A Case Study of a UK Care Home

## ABSTRACT

**Purpose:** This research studies the impact that building design has upon the quality of life for residents of a care home who have dementia. To present a balanced perspective, carers within the care home also participate in the research.

**Design/ methodology/ approach:** A case study methodological approach was adopted using one care home, ten residents and five staff as a sample frame. During interviews conducted, participants were asked semi-structured questions on how building design features impact upon the quality of life of residents. Questions posed focused upon key design principles that emerged from a detailed review of extant literature.

**Findings:** Building design for people with dementia must consider a complex array of features in order to provide a safe and habitable living space for residents and family members who visit. This living space must also be suitably utilitarian and provide a workable environment for staff. Hence, an appropriate balance between these two competing requirements must be attained and often a tailor made solution is required that fits the individual's level of dementia. Three prominent areas that study participants expressed a desire for were: i) a safe environment; ii) support for wayfinding, orientation and navigation; and iii) access to nature and the outdoors.

**Originality/ value:** The work reports upon the rarely discussed issue of building design for people with dementia and could be utilised by policy makers and construction firms to enhance their knowledge capabilities in this area. The research concludes with direction for future research which should seek to: i) provide more evidence-based research vis-a-vis perception enquiry; and ii) extend this seminal work to a larger sample of care homes or people with dementia living at home.

**KEY WORDS:** Dementia building design, care home, dementia, case study, design guidance, quality of life.

## INTRODUCTION

Dementia is not a natural part of ageing but is caused by diseases of the brain such as Alzheimer's or Parkinson's disease (Hanagasi *et al.*, 2017). There were 850,000 people living with dementia in the UK in 2014 and by 2050 the number is expected to rise to more than 2 million (Alzheimer's Society, 2014). Guidance is available to assist people and families affected by dementia to improve their quality of life, for example, the UK Government published white paper entitled 'Living Well with Dementia: A National Dementia Strategy' (Department of Health, 2012). Through the Prime Minister's challenge on Dementia, the UK government will focus upon three key areas for improvement, one of which is: "*to create dementia friendly communities that understand how to help*" (*ibid*). Mitchell (2012) suggests that there is growing interest in establishing dementia friendly communities, yet Wiersma *et al.*, (2008) report that care home residents often experience a restrictive and confining built environment. A dementia friendly built environment should not only compensate for any disability but also take into consideration the specific personal needs of a person with dementia and their experience within the habitable environment – cumulatively, these considerations can improve an individual's quality of life (Davis *et al.*, 2009).

The questions posed by design audit tools (c.f. Cunningham *et al.*, 2008; Fleming *et al.*, 2003) are traditionally, predominantly based upon evidence accrued from a professional's viewpoint and the quality of care experienced - rarely do they consider the residents' or staff perspective (Orrell *et al.*, 2008; Train *et al.*, 2005). Yet delineation of the specifications that create a dementia friendly built environment should, in part, be based upon the views of care home residents and their carers. This research therefore aims to contribute to the improvement of existing design audit tools by refinements to incorporate tailor-made to resident needs. In satisfying this aim, the objectives are to: conduct a comparative review of the various dementia design guidance documents for care homes; create hybrid guidance that could influence future standards development; highlight knowledge gaps in the scope or content of current dementia guidance; and explore the relationship between dementia design and quality of life

### **DEMENTIA DESIGN GUIDANCE FOR CARE HOMES.**

Various researchers have developed different sets of design principles and assessment tools that evaluate the impact of the built environment upon people with dementia, with a view to ultimately improving their lives. These tools include: the Design for Dementia Audit Tool developed by the University of Stirling (Cunningham *et al.*, 2008; Cunningham, 2009) based upon criteria identified by Marshall (2001) for residential facilities; the Environmental Audit Tool developed by Department of Health (Australia), which comprises 72 items thematically grouped within ten principles (Fleming, 2011); and the Enhancing the Healing Environment (EHE) Environmental Assessment Tool developed in 2013 by the King's Fund, which provides seven design principles to promote wellbeing and independence rather than detailed room by room design. Low *et al.*, (2004) argue that there is no single 'one size fits all' environment suited to every dementia resident; some require more security, others need freedom to move about – some prefer single rooms while others prefer shared rooms. Joseph (2006) suggests that enhancing quality of life by design can improve sleep, support orientation, and reduce aggressive and disruptive behaviour. The provision of quiet environments, implementation of distinguishing colours for labelling rooms and spaces, use of large signs and adoption of simple building configuration can aid with a resident's wayfinding around the built environment (*ibid*). In contrast, Hodges *et al.*, (2006) provide a matrix of variables that seek to create an optimum environment for people with dementia. They (*ibid*) report upon nine design principles crucial for a dementia care environment. However, these principles are qualitative, open to interpretation and are difficult to implement or use as part of a design audit.

When dementia is accompanied by sight loss, designing for the dementia is made more challenging and contradictions in existing guidance further exacerbate matters. Goodman and Watson (2010) suggest that whilst some similarities in current guidance exist, there are also areas of potential conflict. For example, recommendations for: i) curved paths and corridors for people with dementia but straight ones for people with sight loss; and ii) placing multiple objects around an environment for people with dementia to support reminiscence but reducing clutter for people with sight loss (*ibid*). Kwack *et al.*, (2008) argue that straight paths with right angle turns are easier for people with sight loss, rather than looped paths, and Marquardt (2011) argues that continuous looped paths may interfere with wayfinding for people with dementia. Although the extant literature is contradictory in terms of guidance provided, nine common thematic groupings conveniently cluster design considerations, namely to: i) promote a safe environment; ii) optimise levels of stimulation; iii) provide optimum lighting and consider colour contrast; iv) ensure thermal comfort; v) provide a non-institutional scale and environment; vi) support wayfinding, orientation and navigation; vii) provide access to

nature and the outdoors; viii) promote engagement with friends, relatives and staff; and ix) promote privacy, dignity and independence. Each of these considerations is now discussed in greater detail.

- **Promote a safe environment.** A safe environment is paramount for care-home residents with dementia, for example by providing unobtrusive safety features such as hidden exits (Zeisel *et al.*, 2003). However, Torrington (2007) reveals a negative relationship between quality of life and buildings that through prioritising health and safety create an institutionalised environment. The Mental Capacity Act 2005, a legislative instrument that includes guidance on the Deprivation of Liberty Safeguards, details a set of checks that seek to ensure that any care which restricts a person's liberty is in their best interests.
- **Optimise levels of stimulation.** An optimised balance of sensory stimulation should be sought for people with dementia, particularly from sources of noise and light which should be neither excessive nor too minimal (Miller 1999). Helpful stimulation can also derive from meaningful stimuli activities which are categorised as 'lifestyle activities'; these include artistic ventures, outdoor pursuits, domestic activities, reminiscence with family and friends and individual and social activities (such as music, dance and theatre) (Grealy *et al.*, 2004).
- **Provide optimum lighting and consider colour contrast.** The significance of appropriate lighting is emphasised as an important means of supporting patient independence (Kelly *et al.*, 2011, Marquardt, 2011 and McNair *et al.*, 2010). Van Hoof *et al.*, (2010) highlight that improved lighting increases safety, whereas poor lighting presents unnecessary environmental hazards in care homes. The use of strong contrasting colours should also be considered as it can draw attention to areas used by residents, for example, doors and doorframes that colour contrast with corridor walls (Kelly *et al.*, 2011).
- **Ensure thermal comfort.** Thermal comfort is crucial to a person with dementia because they may be unable to give an adequate reaction to the thermal environment, seek to wear additional clothing, ask for help or complain (Aminoff, 2007). It is however important to stress that cognitive impairment is not caused by inappropriate environmental design, but that problem behaviour may be exacerbated by them (Aminoff, 2007). The challenge is who should maintain thermal conditions and what protection is provided to guard against temperature extremes in hot summers or cold winters (Van Hoof *et al.*, 2010a).
- **Provide a non-institutional scale and environment.** Torrington (2006) proffers that successful spaces are those that carry unambiguous meaning but often the size of the space in a care home can conflict with the domestic space encountered at home – such changes can be confusing for residents. Moreover, furniture and fittings chosen for 'homeliness' may look inappropriate in a large space and may further exacerbate confusion felt by residents. Therefore, careful consideration must be given to how the size of a space impacts upon the meaning of that space for people with dementia.
- **Support wayfinding, orientation and navigation.** Passini *et al.*, (2000) state that a decline in 'wayfinding' (i.e. how people orient themselves in the physical environment), can have a negative psychological impact by causing confusion, agitation or aggression in those with cognitive impairment. Although architectural layout and signage play an important role, literature also identifies other design features and techniques that aid orientation, such as feature walls, distinctive murals, pictures, distinctive furniture and the use of bright or contrasting colours to locate certain areas of space.

- **Provide access to nature and the outdoors.** Consideration should be given to encouraging people with dementia to enjoy contact with nature and undertake some everyday activities in the outdoor world, despite dementia being conventionally regarded as a condition needing indoor confinement (Blackman *et al.*, 2003). Such opportunity preserves the quality of life and care for people with dementia. Yet outdoor access is often denied to people with dementia (Natural England, 2016) either via restricted exits or locked doors – either way, residents are *de facto* detained (Griffith, 2016).
- **Promote engagement with friends, relatives and staff.** Fleming and Bowles (1987) state that facilities should be placed close to the patient’s community of origin because the identity of a person who has lost their recent memories can be more easily supported by familiar sights and visits from friends and relatives. This view is supported by Chiarelli *et al.*, (2005) although no empirical investigations of the advantages cited have been clinically proven.
- **Promote privacy, dignity and independence.** Dementia can significantly impact upon privacy, dignity and independence, all of which are key quality of life indicators. Cognitive and physical abilities differ during the different stages of dementia (refer to Table 1) and must be considered in order to inform design requirements. As the effects of dementia increase, the person can become more disoriented, less independent and the ability to perform self-care activities may decrease, providing a greater design challenge.

<Insert Table 1 about here>

Using a componential synthesis of extant guidance literature on dementia design for care homes, a hybrid matrix was created that provides reference guidance for designers and engineers (Table 2). A componential analysis is a manual qualitative technique that assigns the meaning of a word(s) or other linguistic unit(s) to discrete semantic components. In this instance, the tabulation identifies the aforementioned nine design principles and cross-references them to the design features requiring consideration when building or retrofitting a care home for people living with dementia. Incorporation of these principles and features into a design will enable the development of an improved dementia friendly environment. These nine categories therefore provided the basis for ensuing analysis and discussion.

<Insert Table 2 about here>

## RESEARCH APPROACH

An inductive methodological approach (Saunders *et al.*, 2007) was adopted to generate new theories regarding dementia design, using the perceptions of people with dementia and the carers who support them. Specifically, a care home in Salisbury, UK provided a case study setting and an opportunity sampling frame. The lead researcher works as a development project surveyor for a property development company specialising in the construction of care homes, in particular those providing care for older residents who often have dementia. Participant action research (PAR) was implemented using practice-based skills, knowledge and competence accrued during the lead researcher’s six year employment in this role. Pärn and Edwards (2017) suggest that although PAR has many progenitors, it can be broadly classed as collective self-experimentation amongst participants that is augmented by evidential reasoning (participation), fact-finding (action) and learning (research).

## Ethical Approval

Given the vulnerable status of people with dementia, a strict two stage ethical process was adopted. During the first stage, the lead researcher sought ethical approval from the host higher education institution before commencing any research. This involved completing an ethical pro-forma checklist approved by the Head of Research (Built Environment). During the second stage (and prior to conducting the interviews), local ethics processes were followed as required by the care home management team. Care home management granted consent provided the following conditions were met, namely that: the process was fully supervised by a qualified care home manager at all times; information about the research would be made freely available to all staff, people with dementia and carers; the care home manager could veto any decision as to whether a person with dementia should participate in the questionnaire. In addition, all participants were assured of strict anonymity and confidentiality and that they had the right to withdraw from the process at any stage (Wiles *et al.*, 2008). Finally, prior to commencing each interview, the participant's permission was requested to record the interview and reassurance given that the recording would not be disclosed, divulged or misused (deliberately or otherwise) in any way or form (Oliver, 2010).

### **Sample Frame and Data Collection**

A hybrid opportunity-snowballing sample was conducted by inviting care home residents and carers to participate in the research. This approach was convenient but also overcame the major obstacles of recruiting participants and gaining their trust, whilst simultaneously establishing a good level of rapport via a shared interest in (and commitment to) the topic under investigation (Bryman, 2016). Such an approach is, however, open to bias being introduced and so future work should seek to expand the scope of this initial study to cover a larger (and more diverse) sampling frame of care home residents and staff.

Primary 'qualitative' data was collected using a semi-structured data collection instrument and sought to elicit first-hand information on the thoughts, lived experiences and opinions of dementia residents via face-to-face interviews. The qualitative data collection process sought to secure a close involvement with participants and a deeper/ more meaningful feedback on their care home built environment and its impact upon their quality of life. Prior to conducting the interviews, the interview schedule was pre-tested with the care home manager to: test the adequacy of the research instrument; assess the feasibility of a (full-scale) interview; assess whether the research protocol was realistic and workable; and establish whether the sampling frame and technique would be effective (Bell, 2010). The interview process was refined following constructive comments received from the manager who then selected residents with sufficient cognitive ability to be able to contribute to the survey.

For the main survey, interview questions were developed based upon findings from an extensive literature review that sought to identify the key design considerations impacting upon people with dementia (c.f. Klenke, 2008). Ten semi structured interviews were conducted during March 2017 and they were digitally recorded to allow them to be transcribed for analysis (c.f. Bryman, 2016). To preserve anonymity, the participants' names were replaced with a corresponding letter (A –J). The purpose of the research was explained to each participant at the start of the interview and assurance given that data collected would be used for academic research purposes only. Every effort was made to not ask any leading or intrusive questions and when necessary, participants were asked to clarify, or elaborate on, their responses to questions posed to ensure that what had been recorded was unambiguous and could be readily interpreted. At the end of the set questions, each participant was given an opportunity to provide additional comments as a means of capturing any further viewpoints and/or suggestions.

## **ANALYSIS AND RESULTS**

Table 3 presents a frequency tabulation to report upon which themes emerged most frequently during interview. Notably, the most prevalent themes were to: ‘promote a safe environment’, ‘provide access to nature and the outdoors’ and ‘support wayfinding, orientation and navigation’. From a population of 56 residents, ten residents (an almost 18% response rate) were deemed fit enough to make a valid contribution to the case study. Five staff also contributed to the study.

<Table 3 about here>

### **Safe Environment**

A physical survey of the care home revealed that the building contained numerous locked doors throughout, thus restricting opportunities for walking, exploring and generally engaging with the internal/external environment. For example, a locked door to the garden from the corridor that adjoined a large foyer area prevented ease of access to the garden. Staff were concerned that the building must offer safety and security for the residents, however residents articulated the feeling of being controlled and needing to ask permission to go outside. Several residents expressed concerns about their restricted access. Resident B said:

*“The closed doors are locked because there is something dangerous behind and we are not allowed there for a reason”.*

Similarly, resident E said:

*“I don’t understand why the doors in the corridors are locked; we are told they are locked for our safety but it makes me anxious.”*

This finding concurs with the research conducted by Torrington (2007) and The Enhancing Healing Environment Assessment Tool which states that window restrictors and locked doors lead people with dementia to frustration.

Chalfont and Rodiek (2005) advocate a move away from design intended for control towards creating environments that encourage engagement in everyday activities. Others propose less obtrusive design measures to control safety, such as using colour to camouflage exits and safety features; Calkins and Brush (2002) and Kelly *et al.*, (2011) argue that colour can improve safety and emphasise important aspects of design such as orientation cues, stair edges and step-level changes.

### **Levels of Stimulation**

In striving to achieve the correct balance of patient stimulation, consideration should be given to both minimising unhelpful stimuli and optimising helpful stimuli. For example, Thorpe *et al.*, (2000) suggest that increasing levels of illumination (beyond that which is usually considered to be normal) can improve sleep patterns and reduce behavioural disturbance. Conversely, unhelpful stimuli (that can contribute to resident anxiety) highlighted in this study include: i) a sense of frustration with audible alarms; and ii) overcrowding in public spaces, such as dining or lounge areas. An individual’s tolerance levels are inextricably linked to the level of dementia – more severe cases (i.e. clinical dementia rating (CDR) CDR-3) would appear to be more sensitive to these unhelpful stimuli.

Stimulation from lifestyle activities is important, ranging from the simple provision of views onto the outside world to organising resident activities and providing areas within the building that allow residents to engage with the community. The introduction of multi-sensory stimulation and group activities has been shown to improve mood and behaviour (Sloane *et al.*, 2007). This technique was evident during the case study and staff regularly organised music and game activities for a number of residents but entry and participation was based upon the level of dementia experienced.

### **Lighting and Color Contrast**

Previous research suggests that natural light has beneficial properties for residents, for example by improving health and wellbeing (Bossen *et al.*, 2010). Torrington (2007) reports that windows presenting views onto nature have a therapeutic effect, enhancing well-being and life satisfaction, and concludes that a view to the outside is important, not only for its restorative quality, but also as a means of enhancing control over the environment. For this study, responses on lighting were positive, albeit they were restricted to natural and automatic lighting. Staff commented that throughout the care home good use had been made of glass panels and natural light. The glass panels located in the dining and lounge areas, for example, allow natural light to diffuse into the inner areas of the building but also allow staff to discreetly monitor residents. Resident D said:

*“The views are fantastic from my bedroom and make me feel relaxed, it takes me away from my condition, I suffer from Parkinson’s disease which is getting worse day by day. I like sitting and enjoying the sunshine through my window and watching the views.”*

The same resident also commented that:

*“The light automatically illuminates when I enter the ensuite which is useful during the night.”*

However, Van Hoof *et al.*, (2010b) report upon strong evidence that automatic lights switching on can cause distress to people with dementia. This research largely supports their stance as some staff commented that residents in the later stages of dementia get confused with automatic lights that switch on and off without manual operation. Again, such findings support the notion that design for residents with dementia should be tailor-made to individual requirements. De Lepeleire *et al.*, (2007) argue that current lighting standards provide insufficient data/ guidelines for people with dementia.

The impact of colour contrast (particularly on the entrances to residents’ rooms) is reported upon by Kelly *et al.*, (2011). The survey results support this impact and reveal that the use of strong contrasting colours, such as between doors and door frames, helps draw attention to areas used by residents; conversely, non-resident rooms are disguised by painting doors the same colour as the adjacent walls. In contrast, Goodman and Watson (2010) highlight that a sudden change in contrast at floor level can act as a barrier that discourages residents’ free movement.

Effective colour contrast encompasses more than whether something is just a contrasting colour because people with dementia and sight loss often lose some colour vision (Fleming, 2011). Furthermore, the terminology ‘colour contrast’ is defined differently in various



technical documents thus creating some confusion. For example, Approved Document Part M (HM Government, 2010 and 2013) uses the terms ‘contrasting visually’ and ‘visual perception’; BS8300 (BSI, 2010) uses ‘light reflectance values (LRV)’, ‘visual contrast’ or ‘contrasting colours’; and designers use ‘contrasting colour scheme’ to define a colour scheme with a strong accent colour.

### **Thermal Comfort**

The indoor climate provides comfort for residents but can also act as an alternative to medication in managing behavioural problems because people with dementia respond on a ‘sensory’ vis-à-vis ‘intellectual’ level (Tilly and Read, 2009). They can express their discomfort through certain behaviour that is considered problematic for both family and professional carers. If cognition allows, thermostats give residents the opportunity to regulate the temperature within their environment. Residents interviewed felt that they needed guidance on how to regulate room temperature and that in the summer, the heating was on and the building became unbearable and too warm. Interestingly, little attention has been given to how advanced technology can optimise temperature control within the care home. Yet, Marshall *et al.*, (1997) and Gitlin (2007) identify that technology can be used to reduce temperature induced problem behaviour such as irritability and anxiety.

### **Non - Institutional Scale and Environment**

Residents reported upon a general lack of real connection with the care home. For example, some residents said the care home did not feel like ‘home’, mainly because of the scale of the building or the overall size of interconnecting rooms and corridors. Other residents felt that the corridors resembled a hotel or hospital layout and as a consequence, they preferred to stay close to their rooms for a sense of security and familiarity. Such opinions suggest that living in an unfamiliar place can be stressful and increase the feeling of confusion. Staff member B commented upon a specific patient and said:

*“He wouldn’t want to go somewhere that he didn’t know... if he was just close to his room he’d be alright but he wouldn’t want to be on his own somewhere he’s not familiar with, he’d get worked up.”*

A position paper by Alzheimer’s Australia (2004) on ‘Dementia Care and the Built Environment’ suggests that care settings for people with dementia should have a domestic size and character (e.g. small-scale clusters within large care homes and successful floor plans that facilitate wayfinding). This guidance was confirmed by resident D who said:

*“I like the assisted ensuite to my bedroom because it feels like home and is useful with my physical condition disability, having everything close and in a small area.”*

### **Wayfinding and Navigation**

In the care home surveyed, architectural layout and signage were the principle navigational aids employed with very few other visual design features being used to help make the corridors distinctive and/ or help divide long corridors into more manageable routes for residents. Consequently, resident A stated that:

*“I struggle to find my way around and tend to stay in familiar surroundings. I get anxious walking too far; the corridors are too long.”*



Marquardt (2011) identifies the need for further studies to examine the effect of the architectural floor plan upon wayfinding and the subsequent effect(s) upon an individual's wellbeing. Residents experiencing the later stages of dementia found some corridor designs (such as T-junctions) very daunting, causing both anxiety and confusion. Resident H said:

*“the corridors are too long - I forget which way to go sometimes.”*

Residents commented that visual cues can help with orientation, especially around large and unfamiliar buildings. One resident found that the use of a wall calendar provided a reminder of what day it was, while another resident found that curved walls leading into a café naturally steered them to the café and other social areas such as the cinema and hairdressers. Nolan *et al.*, 2002 proffer that placing familiar items (such as photographs and significant memorabilia) in memory boxes by the outside door of a person's bedroom can increase the ability of the person with dementia to find their way to their bedrooms.

Nolan (*ibid*) examines wayfinding from the perspective of the person with dementia, finding that contrasting colour is an important navigational measure that is relatively low cost but has potential high impact. Indeed, residents and carers identified that contrasting colour was used as a wayfinding cue to enable them to locate toilets. Resident E said:

*“The colour of the toilet doors are different, this helps me find the toilet and bathroom.”*

### **Access to Nature and the Outdoors**

Contact with nature and outside activity are importantly recognised as having a notable impact upon the lives of residents, particularly in terms of better quality of sleep and increased appetite following the outdoor access (c.f. Chalfont, 2008; Duggan *et al.*, 2008; Brimelow and Lyons, 2009). However, the study revealed that residents living in the care home had limited or no independent access to outside spaces. As resident B notes:

*“We are not allowed in the garden or on the balconies because of our safety.”*

While resident I said:

*“I don't bother going in the gardens, they are too large and complicated.”*

This view was inadvertently substantiated by a staff member A who commented that *a.n. other* resident was not diagnosed with dementia and being fully *compos mentis* was allowed the freedom to explore outside when required. These findings suggest that despite overwhelming evidence to support the beneficial impact of outdoor access upon quality of life, in practice this access is often denied to people with dementia (Natural England, 2016; Griffith, 2016).

Responses obtained from participants also suggest that declining memory, confusion, disorientation and anxiety are all interlinked. These factors can impact upon the use of the outdoor environment by limiting the areas that residents can access and enjoy (both outside and inside the building). Staff member B suggested that as the disease progresses to the later stages, residents forget about the idea of going outside or prefer the familiar surroundings of their room. This view was somewhat contradicted by resident C who said:

*“I can’t go out when I want. I feel frustrated and lonely, I try to go out and the alarms go off, which causes me a headache and stress.”*

This discourse with residents and staff suggests that both the internal and external design should be person centered and must accommodate all stages of dementia (including non-diagnosed) to avoid deprivation of liberty and augment quality of life.

### **Promote engagement with the community, friends, relatives and staff**

The importance of a community to the well-being of people with dementia is an emerging field of research (Keady *et al.*, 2012). The care home surveyed sought to provide opportunities for residents to engage with their environment via the provision of facilities and activities such as a hairdressing salon, cinema, activities room and kitchen servery areas used by residents for cooking and baking. Resident D said:

*“I like the café and hairdressers in the home because I see people from outside the home visiting.”*

Resident E concurred and added:

*“I like sitting in the reception people-watching and talking to people from outside the care home because it is quite boring here.”*

Utilising space effectively and efficiently helps people with dementia to remain engaged in everyday life in a meaningful way (Davis *et al.*, 2009). Residents stressed the importance of having their own private space but also a place to go where it is quiet and peaceful to talk with relatives.

### **Privacy, Dignity and Independence**

Cunningham (2009) emphasises the need to facilitate home likeness, autonomy and privacy in residents’ rooms. Most residents interviewed expressed the desire to have private space, not just to preserve their dignity but also for resting when required. Although mood and behaviour may change as dementia progresses, the individual remains an important and valuable person that deserves to be treated with respect (Barnes, 2006).

The dementia friendly care home should afford residents with opportunities to maintain their independence by using familiar designs, furniture, fittings and colours, and also provisions for personalisation of the environment using personal and familiar objects, (Calkins and Brush, 2003). It was also felt that the care home environment should include good visual access with circular routes to encourage mobility, further supporting the feeling of independence, a view substantiated by Calkins *et al.*, (2002). Resident D said:

*“I am grateful because I can go to the cafe, hairdressers or shop, which are all on the 1st floor, in my wheel chair with independence using the lift”*

In addition, staff thought that Wi Fi technology provided opportunity for therapeutic and meaningful activities for residents whilst quiet sitting rooms at the end of corridors provided privacy for reading or spending time with relatives. Cumulatively, these views expressed support for the concept that purposefully designed areas of space (such as dining areas and communal rooms) provide flexibility and choice - feeling independent can be just as important as actual independence.

## DISCUSSION

Three prevalent themes emerged from the analysis: ‘promoting a safe environment’, ‘supporting wayfinding, orientation and navigation’ and ‘providing access to nature and the outdoors.’ Access to the outdoor environment was highly valued by residents for the exercise and emotional benefits it provides. Conversely, residents referred to the negative effects on emotional well-being of restricted access to the gardens and balconies, and described their feelings of ‘isolation.’ Outdoor space and easy access to this space has been stressed in associated literature (Chalfont, 2008; Duggan *et al.*, 2008) and identified as key areas where improvements in accessibility should be made (Brimelow and Lyons, 2009). The results also identified that the higher dependency residents required greater encouragement and staff intervention to facilitate access to the outdoors. However, this was considered challenging due to insufficient staff working on the premises. In line with recent previous research (Hoe *et al.*, 2006), this current research illustrates that people with dementia can often provide information about their needs and what they consider to be met and unmet. Even when a resident cannot express their needs verbally, staff should look out for nonverbal cues (e.g. physical discomfort or behavioural traits such as frustration, boredom and/or anxiety).

There was evidence that stringent health and safety requirements for the environment negatively affect the quality of life of less dependent residents. Safety was the only theme that had a negative association with quality of life. Exits that were well camouflaged and had silent electronic locks rather than alarms tended to create less agitation and did deter residents from wanting to go outside. Edgerton *et al.*, (2010) suggest that unobtrusive and disguised exits and safety features can reduce ‘exit attempts’ and agitation by people with dementia. However, recommendations should be given for careful consideration to the ethical and safety implications of disguising entrances and exits. People’s right of free movement should be recognised and attempts made to understand why a person is repeatedly trying to leave the care home – pragmatic solutions should also be sought which address the root causes of this desire. Nevertheless, for safety reasons there might be some instances where disguising access may be deemed necessary. Residents articulated the feeling they had of being controlled and needing to ask or ‘*be allowed*’, to use space, and go outside. Residents mentioned ‘*sitting there*’, ‘*learning what was possible*’ as part of their experience of care home life. This reflects the restrictions on use of space (locked doors for example) that can promote or control what living in a place can feel like and relates to the finding of Torrington (2007) that buildings that prioritise health and safety have a negative relationship on quality of life.

Few wayfinding cues for navigation were apparent. Instead, residents relied upon the architectural layout and signage as a way of orientating themselves around the building. For some residents, long narrow corridors and T-junctions were found to be daunting and confusing, creating a homogeneous view where areas look the same in different directions. It is recommended that decision points are reduced or made distinct from one another to help prevent residents becoming lost and confused or exhibiting problematic behavioural traits, such as anxiety. However, some residents spoke of being able to find their bedrooms using wayfinding cues (such as a name on the door); other residents mentioned a wall calendar that was used as a landmark for orientation. Nolan *et al.*, (2012) demonstrate that placing items (photographs and significant memorabilia) in memory boxes outside each person’s bedroom door increases the ability of people with dementia to find their way to their bedrooms (by 45%). Their study (*ibid*) is significant as it illustrates a relatively simple way of maximising

the usability of the building for residents, and thereby increasing their independence. One explanation for the results presented here may be that the design features discussed relieve residents' cognitive stress, thus reducing their anxiety. Another is that by providing residents with greater control over their own lives, they become empowered and this reduces their tendency to withdraw and become depressed or anxious.

## CONCLUSION

This research demonstrates that a care home's design features can either improve or reduce residents' quality of life. However, the quality of building design alone will not lead to improved quality of life *per se* unless appropriate staff intervention and a therapeutic and domestic-looking environment is provided. When designing a building for people with dementia, a complex array of features must be considered to provide a safe and habitable living space for residents and family members who visit but one that is also suitably utilitarian and provides a workable environment for staff. An optimised balance between these two competing requirements must be attained and often a tailor made solution is required that fits the individual's level of dementia. Importantly, a 'one size fits all' approach to building design must not be adopted. Three prominent areas that study participants expressed a desire for were to provide: i) a systematic approach to developing a 'therapeutic garden' to encourage residents to venture outdoors and perhaps reduce the perceived safety controls needed to restrict access; ii) increased integration of assistive technology and further exploration on how it can support quality of life - further work in this respect could also explore how technology can promote autonomy, social participation and improve safety; and iii) greater use of contrasting colour, decoration, memorabilia, objects, murals and artwork to provide information about the function of an area. This can assist with successful wayfinding and the creation of landmarks.

The research presented is limited in terms of sample size and a larger sample (stratified by type and size of care home) would increase the significance of findings and allow cross comparison of a greater number of variables – including those pertinent to the environment, individual and care home facility. Further studies are recommended to assess the positive and negative effects of the architectural layout on wayfinding for people with dementia. A comparative analysis between different care home settings could allow the best design features to emerge as a means of developing hybrid design guidance for future developments. Architects and engineers should be involved in this process of resident and carer feedback as such will ultimately impact upon future building designs. Future research should also explore the individual needs of residents who have the variations of cognitive and functional abilities experienced during the different stages of dementia – such differences should inform the design requirements to better consider resident care and quality of life. Overall, a person-centred perspective should therefore be adopted whereby the needs of the individual are prioritised – after all, it is a *'care home.'*

## REFERENCES

- Alzheimer's Society (2014) Dementia Diagnosis Rates, Interactive Dementia Diagnosis Map for the UK, Alzheimer's Society, London, UK. Available via: [http://alzheimers.org.uk/site/scripts/documents\\_info.php?documentID=2165](http://alzheimers.org.uk/site/scripts/documents_info.php?documentID=2165) [Accessed: June, 17].
- Alzheimer's Australia (2004) Dementia Care and the Built Environment, Position Paper 3. Available via: [www.alzheimers.org.au/upload/Design.pdf](http://www.alzheimers.org.au/upload/Design.pdf) [Accessed: June, 2017].
- Aminoff, B. Z. (2007) Measurement of Suffering in End-Stage Alzheimer's Disease, Tel Aviv, Israel: Dyonon Publishers. ISBN: 9657077370
- Barnes, S. (2006) Space, Choice and Control, and Quality of Life in Care Settings for Older People, *Environment and Behaviour*, Vol. 38, No. 5, pp. 589–604. DOI: <https://doi.org/10.1177/0013916505281578>
- Bell, J. (2010) *Doing Your Research Project. A Guide For First Time Researchers In Education, Health And Social Science*, 5<sup>th</sup> Ed., Open University Press: Berkshire. ISBN-13: 978-0335215041
- Blackman, T., Mitchell, L., Burton, E., Jenks, M., Parsons, M., Raman, S., and Williams, K. (2003) The Accessibility of Public Spaces for People with Dementia: A New Priority for the 'Open City', *Disability and Society*, Vol. 18, No. 3, pp. 357–371. DOI: <http://dx.doi.org/10.1080/0968759032000052914>
- Bossen, A. (2010) The Importance of Getting Back to Nature for People with Dementia, *Journal of Gerontological Nursing*, Vol. 36, No. 2, pp. 17-22. DOI: 10.3928/00989134-20100111-01
- Brimelow, S. and Lyons, D. (2009) *Remember, I'm Still Me: Care Commission and Mental Welfare Commission Joint Report on the Quality of Care for People with Dementia Living in Care Homes in Scotland*. Care Commission, Edinburgh: Mental Welfare Commission. Available via: [http://www.carecommission.com/images/stories/documents/publications/reviewsofqualitycare/remember\\_im\\_still\\_me\\_-\\_may\\_09.pdf](http://www.carecommission.com/images/stories/documents/publications/reviewsofqualitycare/remember_im_still_me_-_may_09.pdf) [Accessed: June, 2017].
- British Standard Institute (BSI) (2010) BS 8300: 2009 + A1 2010 Design of Buildings and Their Approaches to Meet the Needs of Disabled People – Code Of Practice. British Standards Institute: London.
- Bryman, A. (2016) *Social Research Methods*, 5<sup>th</sup> Ed. Oxford: Oxford University Press. ISBN: 9780199689453
- Calkins, M.P. and Brush, J.A. (2002) Designing for Dining: The Secret of Happier Mealtimes, *Journal of Dementia Care*, Vol. 10, No. 2, pp. 24-26.
- Calkins, M. and Brush, J. (2003) Designing for Dining. *Alzheimer's Care Quarterly*, Vol. 4, No. 1, pp. 73–76. Available via: [http://journals.lww.com/actjournalonline/Citation/2003/01000/Designing\\_for\\_Dining.1.aspx](http://journals.lww.com/actjournalonline/Citation/2003/01000/Designing_for_Dining.1.aspx) [Accessed: June, 2017].
- Chalfont, G. (2008) *Design for Nature in Dementia Care*. London: Jessica Kingsley. ISBN: 978-1-84642-676-6
- Chalfont, G. and Rodiek, S. (2005) Building Edge: An Ecological Approach to Research and Design of Environments for People with Dementia. *Alzheimer's Care Quarterly*, Special Issue – Environmental Innovations in Care, Vol. 6, No. 4, pp. 341–348. Available via: [http://www.chalfontdesign.com/media/Building\\_Edge\\_pdf.pdf](http://www.chalfontdesign.com/media/Building_Edge_pdf.pdf) [Accessed: June, 2017].
- Chiarelli, P., Bower, W., Wilson, A., Attia, J. and Sibbritt, D. (2005) Estimating the Prevalence of Urinary and Faecal Incontinence in Australia: Systematic Review. *Australasian Journal On Ageing*, Vol. 24, No. 1, pp. 19–27. DOI: 10.1111/J.1741-6612.2005.00063.X



- Cunningham, C., Marshall, M., McManus, M., Pollock, R. and Tullis, A. (2008) Design for People with Dementia: Audit Tool, University of Stirling, Dementia Services Development Centre, Stirling. Available via: <http://dementia.stir.ac.uk/design> [Accessed: June, 2017].
- Cunningham, C. (2009) Auditing Design for Dementia, *Journal of Dementia Care*, Vol. 17, No. 3, pp. 31-32.
- Davis, S., Byers, S., Nay, R., and Koch, S. (2009) Guiding Design of Dementia Friendly Environments in Residential Care Settings: Considering the Living Experiences. *Dementia*, Vol. 8, No. 2, pp. 185–203. DOI: <https://doi.org/10.1177/1471301209103250>
- De Lepeleire, J., Bouwen, A., De Coninck, L. and Buntinx, F. (2007) Insufficient Lighting in Nursing Homes, *Journal of the American Medical Directors Association* Vol. 8, No. 5, pp. 314–7. DOI: 10.1016/j.jamda.2007.01.003
- Dementia Care Central (2017) Clinical Dementia Rating (CDR) Available Via: <https://www.dementiacarecentral.com/aboutdementia/facts/stages/> [Accessed: June, 2017]
- Department of Health (2015) Health and Building Note 08-02. Dementia Friendly Health And Social Environments. Available via: [https://artshealthnetwork.ca/ahnc/hbn\\_08-02.pdf](https://artshealthnetwork.ca/ahnc/hbn_08-02.pdf) [Accessed: June, 2017].
- Duggan, S., Blackman, T., Martyr, A., and Van Schaik, P. (2008) The Impact of Early Dementia on Outdoor Life: A ‘Shrinking World’? *Dementia*, Vol. 7, No. 2, pp. 191–204. DOI: <https://doi.org/10.1177/1471301208091158>
- Edgerton, E. A. and Richie, L. (2010) Improving Physical Environments for Dementia Care: Making Minimal Changes for Maximum Effect, *Annals of Long Term Care*, Vol. 18, No. 5, pp. 43-45. Available via: <http://www.managedhealthcareconnect.com/content/improving-physical-environments-dementia-care-making-minimal-changes-maximum-effect> [Accessed: June, 2017].
- Fleming, R. and Bowles, J. (1987) Units for the Confused and Disturbed Elderly: Development, Design, Programming and Evaluation, *Australian Journal on Ageing*, Vol. 6, pp. 25–28. DOI: 10.1111/j.1741-6612.1987.tb01001.x
- Fleming, R. (2011) An Environmental Audit Tool Suitable for Use in Homelike Facilities for People with Dementia, *Australasian Journal on Ageing*, Vol. 30, pp. 108–112. DOI: 10.1111/j.1741-6612.2010.00444.x
- Fleming, R., Forbes, I. and Bennett, K. (2003) Adapting the Ward for People with Dementia. New South Wales: Department of Health. ISBN: 0958022259
- Geerdinck, L. M., Zande, B.V.D., Talen, A., Erp, T.V. and Schlangen, L.J.M. (2009) Comfortable Lighting for Seniors: The Effect of Illuminance and Color Temperature on the Visual Acuity in Later Life., *Proceedings Lux Europa, Istanbul*, Abstract No. 306. Available via: [https://www.researchgate.net/profile/Luc\\_Schlangen/publication/279873706\\_WORKPLACE\\_ILLUMINATION\\_EFFECTS\\_ON\\_ACUITY\\_COGNITIVE\\_PERFORMANCE\\_AND\\_WELL-BEING\\_IN\\_OLDER\\_AND\\_YOUNG\\_PEOPLE/links/559cfda408ae24062d485647/WORKPLACE-ILLUMINATION-EFFECTS-ON-ACUITY-COGNITIVE-PERFORMANCE-AND-WELL-BEING-IN-OLDER-AND-YOUNG-PEOPLE.pdf](https://www.researchgate.net/profile/Luc_Schlangen/publication/279873706_WORKPLACE_ILLUMINATION_EFFECTS_ON_ACUITY_COGNITIVE_PERFORMANCE_AND_WELL-BEING_IN_OLDER_AND_YOUNG_PEOPLE/links/559cfda408ae24062d485647/WORKPLACE-ILLUMINATION-EFFECTS-ON-ACUITY-COGNITIVE-PERFORMANCE-AND-WELL-BEING-IN-OLDER-AND-YOUNG-PEOPLE.pdf) [Accessed: June, 2017].
- Gitlin L. (2007) Guidelines for Environmental Adaptations and Safety at Home, *Alzheimer’s Care Today*, Vol. 8, No. 3, pp. 278–81. DOI: 10.1097/01.ALCAT.0000281876.32850.d5

- Grealy, J., McMullen, H. and Grealy, J. (2004) *Everyday Dementia Care: A Practical Photographic Guide Including Environmental Management*. Melbourne: Big Kidz. ISBN-10: 1405134283
- Griffith, R. (2016) Identifying a Deprivation of Liberty, *British Journal of Community Nursing*, Vol. 21, No. 1, pp. 52–54. DOI: <https://doi.org/10.12968/bjcn.2016.21.1.52>
- Goodman, C. And Watson, L. (2010) *A Comparative Review of Design Guidance for People with Dementia and Design Guidance for People with Sight Loss*. A Report Prepared by Habinteg Housing Association for Thomas Pocklington Trust. Available via: [file:///C:/Users/David/Downloads/Dementia-and-sight-loss\\_summary.pdf%20\(1\).pdf](file:///C:/Users/David/Downloads/Dementia-and-sight-loss_summary.pdf%20(1).pdf) [Accessed: June, 2017].
- Hanagasi, H.A., Tufekcioglu, Z. and Emre, M. (2017) Dementia in Parkinson's Disease, *Journal Of The Neurological Sciences*, Vol. 374, pp. 26–31. DOI: <http://Dx.Doi.Org/10.1016/J.Jns.2017.01.012>
- HM Government. (2010) *The Building Regulations; Access to and Use of Buildings*. Available via: [http://www.planningportal.gov.uk/uploads/br/BR\\_PDF\\_ADM\\_2004.pdf](http://www.planningportal.gov.uk/uploads/br/BR_PDF_ADM_2004.pdf) [Accessed: June, 2017].
- HM Government (2013) Part M of the Building Regulations (updated 2013). Available via: <http://www.planningportal.gov.uk/buildingregulations/approveddocuments/partm/approved> [Accessed: June, 2017].
- Hodges, L., Bridge, C. and Chaudhary, K. (2006) *Dementia Design Guidelines: Home and Community Care Capital Works Program, The Home Modification Information Clearinghouse, The University of New South Wales, Sydney*. ISBN: 1864875631
- Hoe J., Hancock G., Livingston G. and Orrell M. (2006) Quality of Life of People with Dementia in Residential Care Homes, *British Journal of Psychiatry*, Vol. 188, pp. 460-464. DOI: 10.1192/bjp.bp.104.007658
- Joseph, A. (2006) *Health Promotion by Design in Long Term Care Settings*. Concord, CA: The Centre for Health Design. Available via: [https://www.healthdesign.org/system/files/Joseph\\_Health%20Promotion%20by%20Design%20in%20LTC%20Settings.pdf](https://www.healthdesign.org/system/files/Joseph_Health%20Promotion%20by%20Design%20in%20LTC%20Settings.pdf) [Accessed: June, 2017].
- Kelly, F., Innes, A., Dincarslan, O. (2011) Improving Care Home Design for People with Dementia, *Journal of Care Services Management*, Vol. 5, No. 3, pp. 147-155. DOI: <http://dx.doi.org/10.1179/175016811X13020827976726>
- Keady, J., Campbell, S., Barnes, H., Ward, R., Li, X., Swarbrick, C. and Elvish, R. (2012) Neighbourhoods and Dementia in the Health and Social Care Context: A Realist Review of the Literature and Implications For UK Policy Development. *Reviews in Clinical Gerontology*, Vol. 22, pp. 150–163. DOI: 10.1017/S0959259811000268
- Klenke, K. (2008) *Qualitative Research in the Study of Leadership*. Bradford, UK: Emerald Group Publishing. ISBN: 0080464106
- Kwack, H., Relf, P.D. and Rudolph, J. (2004) Adapting Garden Activities for Overcoming Difficulties of Individuals with Dementia and Physical Limitations, *Activities, Adaptation & Aging*, Vol. 29, No. 1, pp. 1-13. DOI: 10.1300/J016v29n01\_01
- Low, L., Draper, B. and Brodaty, H. (2004) The Relationship Between Self-Destructive Behaviour and Nursing Home Environment, *Aging and Mental Health*, Vol. 8, No. 1, pp. 29–33. DOI: <http://dx.doi.org/10.1080/13607860310001613301>
- Marquardt, G. (2011) Wayfinding for People with Dementia: A Review of the Role of Architectural Design. *Herd*, Vol. 4, No. 2, pp. 75-90. DOI: 10.1177/193758671100400207
- Marshall, M. (2001) Environment: How it Helps to See Dementia as a Disability, *Care Homes and Dementia: Journal of Dementia Care*, Vol. 6, no. 1, pp. 15-17. Available



- via: <http://www.careinfo.org/how-it-helps-to-see-dementia-as-a-disability/> [Accessed, June, 2017]
- Marshall, M., Judd, S. and Phippen, P. (1997) *Design for Dementia*, Hawker Publications: London. ISBN: 1-874790-35-3
- Miller C (1999) *Nursing Care of Older Adults: Theory and Practice*. 3rd Ed. Lippincott, Williams and Wilkins, Philadelphia PA. ISBN: 0397550863
- McNair, D., Cunningham, C., Pollock, R. and McGuire, B. (2010) *Light and Lighting Design for People with Dementia*, Stirling: University of Stirling, Dementia Services Development Centre. ISBN-10: 1857692500
- Mitchell, L. (2012) *Breaking New Ground: the Quest for Dementia Friendly Communities*, Housing LIN Viewpoint No. 25. Available via: [www.housinglin.org.uk/library/Resources/Housing/Support\\_materials/Viewpoints/Viewpoint25\\_Dementia\\_Friendly\\_Communities](http://www.housinglin.org.uk/library/Resources/Housing/Support_materials/Viewpoints/Viewpoint25_Dementia_Friendly_Communities) [Accessed: June, 2017].
- Montgomery, P. and Dennis, J. (2002) Bright Light Therapy for Sleep Problems in Adults Aged 60+. *Cochrane Database of Systematic Reviews*, No. 2, Art No: CD003403. DOI: 10.1002/14651858.CD003403.
- Natural England (2016) *Is it Nice Outside? – Consulting People Living with Dementia and Their Carers about Engaging with the Natural Environment*. Available via: [Http://Www.Gov.Uk/Natural-England](http://Www.Gov.Uk/Natural-England) [Accessed: June, 2017].
- Nolan, B., Mathews, M., Truesdell-Todd, G. and Vandorp, A. (2012) Evaluation of the Effect of Orientation Cues on Wayfinding in Persons with Dementia. *Alzheimer's Care Quarterly*, Vol. 3, No. 1, pp. 46–49. Available via: [http://journals.lww.com/actjournalonline/Abstract/2002/03010/Evaluation\\_of\\_the\\_Effect\\_of\\_Orientation\\_Cues\\_on.10.aspx](http://journals.lww.com/actjournalonline/Abstract/2002/03010/Evaluation_of_the_Effect_of_Orientation_Cues_on.10.aspx) [Accessed: June, 2017]
- Oliver, P. (2010) *The Student's Guide to Research Ethics*. 2nd Ed. Berkshire: Mcgraw-Hill International. ISBN-10: 0335227333
- Orrell, M., Hancock, G.A., Liyanage, K.C.G., Woods, B., Challis, D. and Hoe, J. (2008) The Needs of People with Dementia in Care Homes: The Perspectives of Users, Staff and Family Caregivers. *International Psychogeriatrics*, Vol. 20, pp. 941–951. DOI: 10.1017/S1041610208007266
- Pärn, E.A. And Edwards, D.J. (2017) Conceptualizing The FINDD Toolkit: A Case Study Of BIM/ FM Integration, Automation In Construction, Vol. 80, pp. 11-21. DOI: [Http://Dx.Doi.Org/10.1016/J.Autcon.2017.03.015](http://Dx.Doi.Org/10.1016/J.Autcon.2017.03.015)
- Passini, R., Pigot, H., Rainville, C. and Tétreault, M.H. (2000) Wayfinding in a Nursing Home for Advanced Dementia of the Alzheimer's Type, *Environment and Behaviour*, Vol. 32, No. 5, pp. 684–710. DOI: <https://doi.org/10.1177/00139160021972748>
- Saunders, M., Lewis, P. and Thornhill, A. (2007) *Research Methods for Business Students*, 4<sup>th</sup> Ed. Harlow: Pearson Education Limited. ISBN-10: 0273716867
- Sloane, P.D., Williams, C.S., Mitchell, M., Preisser, J.S., Wood, W., Barrick, A.L., Hickman, S.E., Gill, K.S., Connell, B.R., Edinger, J. and Zimmerman, S. (2007) High-intensity Environmental Light in Dementia: Effect on Sleep and Activity, *Journal of the American Medical Association*, 55, 1524–1533. Available via: [http://www.medscape.com/viewarticle/565782\\_1](http://www.medscape.com/viewarticle/565782_1) [Accessed: June, 2017].
- Thorpe, L., Middleton, J. and Russell, G. (2000) Bright Light Therapy for Demented Nursing Home Patients with Behavioural Disturbance, *American Journal Of Alzheimer's Disease And Other Dementias*, Vol. 15, No. 1, pp. 18-26. DOI: <https://doi.org/10.1177/153331750001500109>
- Tilly, J. and Reed, P. (2009) Literature Review, *Intervention Research on Caring for People with Dementia in Assisted Living and Nursing Homes*, *Alzheimer's Care Today* Vol. 9, No. 1, pp. 24–32. DOI: 10.1097/01.ALCAT.0000309012.39716.78

- Torrington, J. (2007) Evaluating Quality of Life in Residential Care Buildings. *Building Research and Information*, Vol. 35, No. 5, pp. 514–528. DOI: <http://dx.doi.org/10.1080/09613210701318102>
- Torrington, J. (2006) What has Architecture got to do with Dementia Care: Explorations of the Relationship Between Quality of Life and Building Design in two EQUAL Projects, *Quality in Ageing and Older Adults*, Vol. 7, No. 1, pp. 34–48. DOI: <https://doi.org/10.1108/14717794200600006>
- Train, G., Nurock, S., Kitchen, G., Manela, M. and Livingston, G. (2005) A Qualitative Study of the Views of Residents with Dementia, their Relatives and Staff about Work Practice in Long-term Care Settings, *International Psychogeriatrics*, Vol. 17, pp. 237–251. DOI: 10.1017/S1041610205001729
- Van Hoof, J., Kort, H., Hensen, J., Duijnste, J. and Rutten, P. (2010a) Thermal Comfort and the Integrated Design of Homes for Older People With Dementia, *Building and Environment*, Vol. 45, No. 2, pp. 358-370. DOI: <https://doi.org/10.1016/j.buildenv.2009.06.013>
- Van Hoof, J., Kort, H., Van Waarde, H. and Blom, M.M. (2010b) Environmental Interventions and the Design of Homes for Older Adults with Dementia: An Overview, *American Journal of Alzheimer's Disease and Other Dementias*, Vol. 25, No. 3, pp. 202-232. DOI: 10.1177/1533317509358885
- Wiersma, E. and Pedlar, A. (2008) The Nature of Relationships in Alternative Dementia Care Environments, *Canadian Journal on Aging*, Vol. 27, No.1, pp. 101–108. DOI: 10.3138/cja.27.1.101.
- Wiles, R., Crow, G., Heath, S. and Charles, V. (2008) The Management of Confidentiality and Anonymity in Social Research, *International Journal of Social Research Methodology*, Vol. 11, No. 5., pp. 417-428. DOI: <http://dx.doi.org/10.1080/13645570701622231>
- Zeisel, J., Silverstein, N.M., Hyde, J., Levkoff, S., Powell Lawton, M. and Holmes, W. (2003) Environmental Correlates to Behavioral Health Outcomes in Alzheimer's Special Care Units, *The Gerontologist*, Vol. 43, No. 5 pp. 697-711. DOI: 10.1093/geront/43.5.697

**Table 1** - Clinical Dementia Rating (CDR) Scale

<b>Stage</b>	<b>Condition</b>	<b>Description</b>
CDR-0	No dementia	
CDR-0.5	Mild	Memory problems are slight but consistent; some difficulties with time and problem solving; daily life slightly impaired.
CDR-1	Mild	Memory loss moderate, especially for recent events, and interferes with daily activities. Moderate difficulty with solving problems; cannot function independently at community affairs; difficulty with daily activities and hobbies, especially complex ones.
CDR-2	Moderate	More profound memory loss, only retaining highly learned material; disoriented with respect to time and place; lacking good judgement and difficulty handling problems; little or no independent function at home; can only do simple chores and has few interests.
CDR-3	Severe	Severe memory loss; not oriented with respect to time or place; no judgement or problem solving abilities; cannot participate in community affairs outside the home; requires help with all tasks of daily living and requires help with most personal care. Often incontinent.

**NB:** note that dementia can also impair the person’s wellbeing in terms of their physical, sensory and cognitive ability.

Source: Dementia Care Central (2017).

**Table 2 - Hybrid Matrix of Design Features Could Increase Patient Quality of Life**

HYBRID DESIGN GUIDANCE (MATRIX)			DEMENTIA FRIENDLY DESIGN FEATURES													Dementia related category	Synthesis based on the literature review:  Authors/research		
			A	B	C	D	E	G	H	I	J	K	L	M	N			O	
			Acoustics	Artwork	Ceilings	Colour	Decoration	Doors	Fixtures	Flooring	Furniture and fittings	Lighting	Reminiscence hardware and software	Signage	Walls	Windows and transparent panels			
DEMENTIA FRIENDLY DESIGN PRINCIPLES	1	Promote a safe environment				X		X	X	X	X	X		X	X	X	Physical	Torrington (2007); Chalfont <i>et al.</i> , (2005); Bossen (2010); Kwack <i>et al.</i> , (2005); Goodman <i>et al.</i> , (2010); and Lawrence <i>et al.</i> , (2009).	
	2	Optimise levels of stimulation	X	X	X		X			X		X	X		X		Sensory	Miller (1999).	
	3	Provide optimum lighting and consider colour contrast			X	X	X	X	X	X	X	X			X	X	X	Sensory	De Lepeleire <i>et al.</i> , (2007); Geerdinck <i>et al.</i> , (2009); Van Hoof <i>et al.</i> , (2010); Miller (1999); Montgomery <i>et al.</i> , (2002); BSI (2010); and HM Government (2010; 2013).
	4	Ensure thermal comfort			X			X		X	X					X	X	Physical and sensory	Aminoff (2007); and Gitlin <i>et al.</i> , (2007).
	5	Provide a non-institutional scale and environment	x	X	X	X	X		X	X	X					X		Cognitive	Torrington (2006).
	6	Support wayfinding, orientation and navigation	X	X	X	X	X	X	X	X			X	X		X	X	Cognitive	Bossen (2010); Marquardt (2011); and Passini <i>et al.</i> , (2000).
	7	Provide access to nature and the outdoors						X	X									Cognitive	Natural England (2016); Griffith, (2016); Blackman <i>et al.</i> , (2003); Chalfont (2008); Duggan <i>et al.</i> , (2008); Brimelow <i>et al.</i> , (2009) and Bossen (2010).
	8	Promote engagement with friends, relatives and staff		X			X	X	X		X							Cognitive	Chiarelli <i>et al.</i> , (2005).
	9	Promote privacy, dignity and independence			X	X	X	X	X		X	X	X	X			X	Physical/ cognitive and sensory	Barnes (2006); Cunningham (2009); Calkins <i>et al.</i> , (2003).

**Table 3** – Emergent Themes and their Frequency

Item	Questions	Themes/ Feedback that Emerged	Perception	Frequency (no.)
1	*Promote a safe environment.	Restricted access – doors and windows.	Mixed	12
2	Optimise levels of stimulation.	Noise stimuli.	Negative	6
		Meaningful lifestyle activities.	Positive	1
3	Provide optimum lighting and consider colour contrast.	Natural light sources.	Positive	2
		Automatic sensor lights.	Mixed	4
		Colour contrast defining resident areas.	Positive	2
4	Ensure thermal comfort.	Adjustable temperature per room.	Positive	4
		Adjustable/ natural ventilation.	Positive	4
5	Provide a non-institutional scale and environment.	Large scale institutional space.	Negative	9
6	*Support wayfinding, orientation and navigation.	Architectural layout and signage.	Mixed	7
		Visual orientation cues.	Mixed	10
		Contrasting colours for space identification.	Positive	7
7	*Provide access to nature and the outdoors.	Controlled access to outside areas.	Negative	9
		Staff numbers to facilitate access.	Negative	4
		Outdoor access for exercise and recreation.	Positive	9
8	Promote engagement with friends, relatives and staff.	Access to areas of engagement.	Positive	8
9	Promote privacy, dignity and independence.	Resident private space	Positive	3
		Design techniques for independence.	Positive	4

NB: \* Denotes three themes that elicited the most prominent feedback/ discussion.