Well-being in memory care facilities: identifying the role of spatial design for social interaction in empirical literature

Farhana Ferdous, Ph.D.

Howard University, Washington, D.C.

ABSTRACT: From the last 40 years, the design of the physical environment in supporting dementia residents has been frequently mentioned in the research literature. The environmental design research literature has outlined the importance of social interaction and social network as one of the therapeutic goals to maintain the quality of life (QoL) for people experiencing dementia. Although several previous studies have conducted the empirical literature review to understand the physical environment and associated QoL in long-term care facilities (LTCF), no single study concentrated on the role of spatial design in social interaction. For elderly people with dementia, changes in their social or physical environment, or manifestations of dementia may have an influence on their social interaction and therefore, it is imperative to understand the factors associated with the physical environment, social interaction and thereby the improved quality of life (QoL). This study aimed to fill this gap and contribute to a better understanding of how 'social interaction', the most important determinants to measure QoL for people experiencing dementia could be influenced under different spatial design and environmental characteristics. This study provides a comprehensive understanding of the published evidence from diversified sectors such as medical and health literature, environmental psychology, architecture, interior design, and evidence-based design literature. By reviewing relevant literature and discussing environmental design factors associated with social interaction as a determinant of QoL, this paper outlines several critical spatial design characteristics and a comprehensive set of spatial design overview for LTCF that shown to affect positive social interaction and QoL of the residents, staff and their caregivers. The summary of this review could influence the future design of care facilities and provide designers the effectiveness or the weaknesses of their design decisions. As an expected outcome, this applied research could enhance the value and professional practice knowledge of memory care design that have a positive ripple effect in the healthcare design industry.

KEYWORDS: Spatial Layout, Social Network, Quality of Life, Physical Environment, Long-Term Care Facility

INTRODUCTION

Dementia is surrounded by stigma associated with memory loss particularly in older adults which results in social isolation. It is also associated with long-term care placement, high health care costs, functional dependency, serious behavioral problems, mortality, and reduced quality of life (QoL). Globally, the number of person with dementia (PwD) is expected to rise to 65.7 million in 2030 and 115.4 million in 2050, and over 90% of all cases are diagnosed over the age of 65 (Carrillo, Thies, & Bain, 2012). Improving QoL has become the focus of dementia care outlined by the Alzheimer's Association (Fazio, Pace, Maslow, Zimmerman, & Kallmyer, 2018) so identifying factors associated with QoL is essential. For elderly PwD, changes in their social or physical environment, or manifestations of dementia may influence their QoL, and it is therefore imperative to understand the relationships between physical environment and social interaction.

A growing number of studies are examining the relationship between the different physical characteristics of spatial design and social interaction, confirming the importance of these factors in memory care facilities for PwD. The environmental design research literature has

established the importance of social interaction and social network as one of the therapeutic goals to maintain QoL in PwD. The objective of this systematic review is to comprehensively outline a set of factors related to the spatial design of LCTF that may influence social interaction and subsequently QoL in PwD. Therefore, this review aimed to fill this gap and contribute to a better understanding of how 'social interaction,' one of the most important determinants of QoL for PwD, could be influenced by different spatial designs and environmental characteristics.

1.0. METHODS

In order to identify spatial design factors potentially influencing social interaction for elderly (i.e. over 65 years of age) PwD, the author conducted a systematic keyword search within major research databases to identify the relevant studies. Seven databases from two distinct disciplines, medical or health literature and evidence-based architecture or design literature, were included in the search strategy. The keywords used to search for relevant articles were categorized into three different domains: spatial design, social interaction, and spatial settings (i.e. care facility). Each search included one keyword from each domain so that results reflected all relevant aspects for the review. A total of 988 articles were initially identified from the database search and a total of 51 full-text items were identified for inclusion in the systematic review (Figure 1).

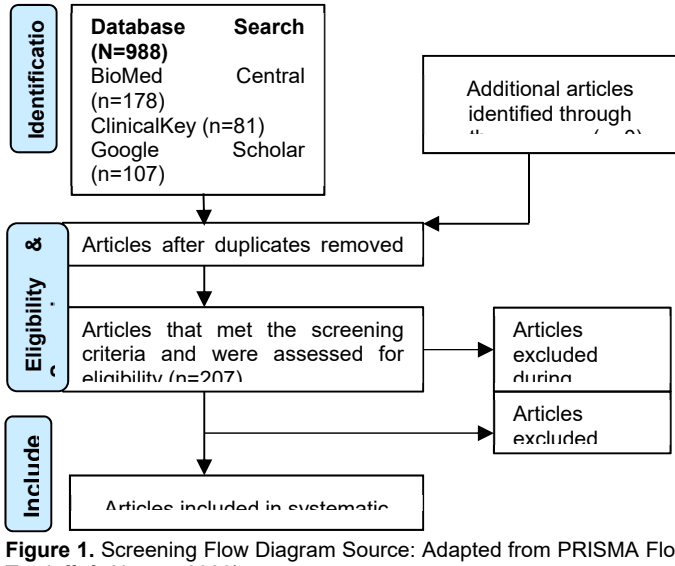

Figure 1. Screening Flow Diagram Source: Adapted from PRISMA Flow Diagram 2009 (Moher, Liberati, Tetzlaff, & Altman, 2009)

All studies included in this review explored factors potentially influencing social interaction in elderly PwD living in LTCF. An Excel spreadsheet was created to evaluate the quality and record key information extracted from each study, including the location of research, research design, study setting, sample age and size, design intervention, inclusion criteria, outcome measures including use of scale or tool, and major findings and results of the study (Supplementary Table 1). This checklist is based on critical appraisal tools from Zaza et al., which also follow the PRISMA 2009 checklist and flow diagram (Zaza, 2000). The articles are also globally distributed and have study settings in many regions including Australia, United States (US), United Kingdom (UK), Scandinavia, Europe, Canada, and different countries of East Asia.

RESULTS

After careful examination of the 51 studies included in this systematic review and synthesis (Supplementary Table 1), four major spatial design features that could directly or indirectly influence social interaction in PwD were identified and are outlined below. The results from

this synthesis have been categorized into those four features, although there is understandably substantial overlap between many of these factors.

1. The Physical Environment/Setting of the Facility

When considering the physical environment of care facilities, unit size, scale, and other environmental characteristics are considered principal design elements. Although residents of care facilities value the care services most (Digby & Bloomer, 2012), the importance of the physical environment is simultaneously identified as a leading factor in potentially influencing social interaction. Spatial design features such as ambience in the environment, the use of familiar objects, furniture type and arrangement, inclusion of kitchen and residential scaled dining room, white noise, connection to nature, access to outdoor areas, privacy, use of bright light, color, temperature, wayfinding, use of smaller spaces or landmarks with simple decision making points, and, above all, homeliness can significantly impact a patient's mood and behavior which can further influence social interaction and QoL (Barnes, 2002; Calkins, 2009; Digby & Bloomer, 2012; Fleming & Purandare, 2010; Mitchell et al., 2003; Werezak & Morgan, 2003).

Almost every study focusing on the physical environment and design guidelines for dementia care settings recommended more home-like character, which includes furniture, family pictures, a cozy living room with a sofa or armchair, and a small-scale dining layout next to the kitchen (Barnes, 2002; Boer et al., 2015; Calkins, 2009; S. Lee, Chaudhury, & Hung, 2016a, 2016b; Smit, Willemse, Lange, & Pot, 2014). In a longitudinal study conducted in Canada, Lee et al. concluded that residents in small-scale, home-like facilities experience more positive effects on mental health and behavior compared to residents living in a traditional large-scale unit (i.e. LCTF). Small-scale green care farm or home-like care environments can provide an added benefit for residents due to the close proximity to nature. Residents living at green care farms are significantly more active, more often participating in domestic activities and outdoor/nature-related activities, and significantly less often engaged in passive or purposeless activities than the residents of a traditional nursing home.

Physical environment of dining room as mealtime intervention is another significant factor in improving behavioral and psychological symptoms of dementia and several studies considered music, food service, dining environment, and group conversation as the most important determinants of improving social interaction during mealtime (Chaudhury, Hung, & Badger, 2013; Whear et al., 2014). A supportive dining environment can foster functional ability, maximize orientation, provide a sense of safety and security, create familiarity, homeliness, provide optimal sensory stimulation, provide opportunities for social interaction, support privacy and personal control (Chaudhury et al., 2013; Chaudhury, Hung, Rust, & Wu, 2017).

Dementia-friendly outdoor design features more specifically garden is also important aspect in designing care facilities. Views of the garden and large windows allowing natural daylight allowed residents to complete activities of daily living efficiently (Nordin et al., 2017). Environmental factors such as outdoor public space may moderate the relationship between education level and sense of coherence. More educated residents who stay in LTCF with outdoor public space may have a stronger sense of coherence than those who stay in LTCF without outdoor public space (Jueng, Tsai, & Chen, 2016). When designing the outdoor environment, bright colors such as yellow can be disruptive or agitating to the homeliness of the environment; instead, landmarks could be used as wayfinding cues, and street lighting that illuminates the pavement edge without creating glare or changes in texture or identifiable color of paving can be used to avoid potential hazards (Mitchell et al., 2003).

2. Accessibility, Legibility, and Layout

Accessibility, legibility and layout are strong determinants of social interaction that can enhance residents' well-being and independence and are highly influenced by both organizational factors and environmental design aspects (Moyle, Fetherstonhaugh, Greben, Beattie, & AusQo, 2015; Nordin et al., 2017). Design of both the indoor and outdoor environment influence the residents' activities and interactions. An architecturally legible

environment, or an environment where the function of each room is evident through the size, proportion, materiality, and furnishings is important for designing any LTCF (Marquardt & Schmieg, 2009). The floor plan design of a nursing home, in particular, has a significant influence on residents' spatial orientation and wayfinding (Calkins, 2009; Marquardt, 2011). Architectural design guidelines suggest various strategies to enhance orientation, including improvements for wayfinding by using signage and by choosing a supportive organization of the building (Hoof, Kort, Waarde, & Blom, 2010; Marquardt, 2011).

Privacy, sense of belonging, and furniture layout to initiate communication are important determinants of social interaction (Barnes, 2002; Marquardt & Schmieg, 2009; Torrington, 2006). The strongest evidence supports the positive benefits of private bedrooms on outcomes such as the satisfaction of families and staff, residents' QoL, and reduced neuro-disability (Calkins, 2009). Ideally, bedrooms should be located close to the community space to allow for social interaction but with substantial privacy for the resident. Although economically reasonable and to some extent beneficial for social interaction, shared bedrooms are not popular in care facilities due to noise, spread of diseases, and lack of privacy. Design recommendations also include home-like decorations, adequate lighting, and furniture should be arranged in a conversational pattern to stimulate social interaction between the physical and social environments.

3. Social Environment and Network

Frequent social interaction is associated with higher QoL, and research clearly describes the importance of social interaction and positive mood in promoting QoL. In one study, dementia residents with higher QoL were more engaged in active and expressive social activities and less engaged in passive/purposeless activities compared to PwD with lower QoL (Beerens et al., 2016). By looking at 1704 interactions over the course of 143 hours, Abbott et al. highlighted five factors to characterize interaction: 1) location of interaction, 2) context of interaction (e.g. social, care-related, or re-direction), 3) type of interaction (verbal or non-verbal and with whom), 4) frequency and duration of the interaction, and 5) quality of interaction (Abbott et al., 2017). The results found that interactions were brief, verbal, and social in nature and occurred in public areas. Casual living and activity areas in close proximity to bedrooms or kitchens enhanced the social environment and integration through both design and staff involvement. The socio-human environment was perceived to be more important than the physical environment. Specialized physical design features can be useful for maintaining the QoL to reduce disruptive behaviors. In 2012, Garcia developed a mnemonic – C.A.R.E.F.U.L. (Consistency, Approach, Ratio of staff to residents, Environmental Design, Flexibility, Understanding, Level of Noise) – as a design recommendation tool for the social environment, identifying design elements from the physical and social environment that hinder or improve the disruptive behaviors and QoL of residents in LTCF (Garcia et al., 2012).

It is evident that frequent social interaction is associated with higher QoL, reminiscence, leisure, expression, and vocational occupation had the greatest potential to enhance well-being. A 20-year prospective cohort study on social activity, cognitive decline, and dementia risk identified that people who engage in solitary activities, such as travelling, gardening, doing odd jobs, word finds, knitting and sewing, watching movies also have increased engagement in social, physical, or intellectual pursuits that result in decreased risk of dementia (Marioni et al., 2015). Social environment factors such as staff roles, resident group size, and physical factors such as a non-institutional character of the environment, nursing station location, adequate seating, and informal social interaction in care facilities are important determinants (Campo & Chaudhury, 2011). One meta-analysis shows that people with less social participation, less frequent social contact, and more feelings of loneliness have an increased risk of developing dementia. Although the results were not statistically significant, low satisfaction with social network seems to be associated with incidence of dementia (Kuiper et al., 2015).

4. Staff-Resident Ratio, Empowerment and Care Philosophy

A supportive work environment is very important for staff interaction, and quality staff interaction plays an important role in promoting the psychological well-being of PwD in any psycho-geriatric setting (K. H. Lee, Boltz, Lee, & Algase, 2017). Evidence from the literature review supports that appropriately designed physical settings play an important role in creating a PCC approach for the residents. PCC focuses on independence, selfhood or having an individual identity, well-being, and abilities of residents to feel supported, valued, and socially confident within their surrounding environment. Dementia and Alzheimer's disease changes a person's ability to think, act and interact with the surrounding social environments, and a PCC approach may reinstate the confidence of the residents. Sociability is an embodied dimension of selfhood (the state of having an individual identity) in person-centered dementia care, and both sociability and selfhood in dementia are equally important in comparison to other factors. In a qualitative descriptive study using in-depth semi-structured interviews, participants described that the care received was more important than the physical environment, but participants also valued homeliness and privacy (Digby & Bloomer, 2012). Chaudhury et al. identified the role of the physical environment in supporting person-centered dining, and the evidence indicates that well-designed physical settings can play an important role in creating a person-centered dining environment to support the best possible mealtime experience (Chaudhury et al., 2013).

Across all studies, continuous and spontaneous staff collaborations were key activities in supporting quality care. Staff interaction during the older adults' transitions were influenced by three main themes: i) the significance of formal and informal organizational activities and interactions, ii) interpersonal relationships and cultures of care, and iii) professional hierarchy and different scopes of practice (Eika, Dale, Espnes, & Hvalvik, 2015). Low ratio of staff to residents and disturbing noise were identified as two of the most important factors influencing behavior and QoL of residents (Garcia et al., 2012). Staff were catalysts for the psychosocial climate, and when present or engaged, they could create a climate interpreted by the residents as homely, which supported patient well-being. When staff were absent, the climate quickly became anxious, and this was associated with patient ill-being (Edvardsson, Sandman, & Rasmussen, 2012). Empowerment and collective decision making enhances social interaction, QoL, and well-being among older adults (Knight, Haslam, & Haslam, 2010). Empowered residents feel more engaged with their environment and the people around them, and they are generally happier and have better health. In an observational longitudinal study of 176 residents in a nursing care home, the study findings suggest the provision of autonomy for residents, letting them make their own choices and encouraging social interaction and participation in activities (Boer et al., 2015). By creating a more home-like dining atmosphere, one study of pre- and post-renovation of physical environment of the dining room has suggested five notable themes from the renovations: (a) autonomy and personal control, (b) comfort from a home-like environment, (c) conducive to social interaction, (d) increased personal support, and (e) effective teamwork among residents (Chaudhury et al., 2017).

DISCUSSION AND CONCLUSIONS

It is evident that one in eight baby boomers will be diagnosed with dementia of the Alzheimer's type once they are 65 years old. In 2016, the first baby boomers turned 70, and it is projected that by 2031 nearly one in two baby boomers over age 80 will be diagnosed (Bredfeldt, 2015). Dementia of the Alzheimer's type is a disease that does not have any cure or prevention, so the focus of care should be to improve social interaction and thereby QoL, and this may be done through environmental design. The objective of this literature review was to provide guidelines for designing better memory care facilities by highlighting the spatial design features for better QoL. The study identified that both physical and social environment are equally important aspects in maintaining positive social interaction between peers and caregivers. The design recommendation to create opportunity for social interaction includes spatial configuration of the physical layout such as visually legible and physically interactive spaces, small-scale home like setting, physical environment of the dining room, ambient features of the indoor environment, therapeutic garden or outdoor environment, exposure to natural settings, home-like décor with personalized features, spatial orientation, navigation and

wayfinding, furniture layout and seating arrangements, approach to care philosophy to empower the residents through autonomy, privacy, and increased staff-resident ratio to initiate positive social network.

One important objective of this review was to identify gaps in knowledge in the existing research literature to give directions for future research. There is a strong need for evidence-based design solutions to accommodate the personal, social and psychological needs of the residents, staff, caregivers, and family members. There was very little research addressing the importance and key design features of the spatial configuration and ambient environment as they are proportionately related to the physiological and psychological health and well-being of the immediate users. Effective layout of the facility, clean air, cross ventilation, reduced glare, indirect natural light, soothing sound, white noise, aromatherapy, visual paintings are a few areas of concern that need further research specifically in long-term care settings for cognitively impaired people. Among the reviewed literature, many studies had small sample sizes, without describing the quality assessment, cross verification or triangulation in study design, insufficient inclusion criteria and control of the environment or settings, these all are considered as limitations in this synthesis study. Moreover, this article only addressed “people with dementia” in long-term memory care settings as opposed to healthy older adults or other forms of cognitive impairment for older adults in different settings such as a home or residential care, end of life, hospice care; thus, generalizability is limited. By highlighting the design intervention guidelines, this systematic review could be used as a resource for all LTCF administrators and healthcare design professionals and researchers to understand the gaps and opportunities in designing future care facilities to provide a positive social environment for PwD.

REFERENCES

Abbott, K. M., Sefcik, J. S., & Van Haitsma, K. (2017). Measuring social integration among residents in a dementia special care unit versus traditional nursing home: A pilot study. Dementia (London), 16(3), 388-403. doi:10.1177/1471301215594950

Barnes, S. (2002). The design of caring environments and the quality of life of older people. Ageing & Society, 22, 775-789. doi:10.1017/S0144686X02008899

Beerens, H. C., de Boer, B., Zwakhalen, S. M., Tan, F. E., Ruwaard, D., Hamers, J. P., & Verbeek, H. (2016). The association between aspects of daily life and quality of life of people with dementia living in long-term care facilities: a momentary assessment study. Int Psychogeriatr, 28(8), 1323-1331. doi:10.1017/S1041610216000466

Boer, B., Hamers, J. P., Beerens, H. C., Zwakhalen, S. M., Tan, F. E., & Verbeek, H. (2015). Living at the farm, innovative nursing home care for people with dementia - study protocol of an observational longitudinal study. BMC Geriatr, 15(144). doi:10.1186/s12877-015-0141-x

Bredfeldt, C. e. a. (2015). The projected impact of the baby boomers on the trajectory of and spending on Alzheimer's disease. Alzheimer's & Dementia: The Journal of the Alzheimer's Association, 11(7), 618.

Calkins, M. P. (2009). Evidence-based long term care design. NeuroRehabilitation, 25(3), 145-154. doi:10.3233/NRE-2009-0512

Campo, M., & Chaudhury, H. (2011). Informal social interaction among residents with dementia in special care units: Exploring the role of the physical and social environments. Dementia, 11(3), 401-423. doi:10.1177/1471301211421189

Carrillo, M. C., Thies, W., & Bain, L. J. (2012). The Global Impact of Alzheimer’s Disease. In H. Hampel & M. C. Carrillo (Eds.), Alzheimer's Disease - Modernizing Concept, Biological Diagnosis and Therapy (Vol. 28, pp. 1–14): Basel, Karger.

Chaudhury, H., Hung, L., & Badger, M. (2013). The role of physical environment in supporting person-centered dining in long-term care: a review of the literature. Am J Alzheimers Dis Other Demen, 28(5), 491-500. doi:10.1177/1533317513488923

Chaudhury, H., Hung, L., Rust, T., & Wu, S. (2017). Do physical environmental changes make a difference? Supporting person-centered care at mealtimes in nursing homes. Dementia (London), 16(7), 878-896. doi:10.1177/1471301215622839

Digby, R., & Bloomer, M. J. (2012). People with dementia and the hospital environment: the view of patients and family carers. Int J Older People Nurs, 9(1), 34-43. doi:10.1111/opn.12014

Edvardsson, D., Sandman, P. O., & Rasmussen, B. (2012). Forecasting the ward climate: a study from a dementia care unit. J Clin Nurs, 21(7-8), 1136-1114. doi:10.1111/j.1365-2702.2011.03720.x

Eika, M., Dale, B., Espnes, G. A., & Hvalvik, S. (2015). Nursing staff interactions during the older residents' transition into long-term care facility in a nursing home in rural Norway: an ethnographic study. BMC Health Serv Res, 15, 125. doi:10.1186/s12913-015-0818-z

Fazio, S., Pace, D., Maslow, K., Zimmerman, S., & Kallmyer, B. (2018). Alzheimer's Association Dementia Care Practice Recommendations. THE GERONTOLOGIST, 58(S1), S1–S9. doi:10.1093/geront/gnx182

Fleming, R., & Purandare, N. (2010). Long-term care for people with dementia: environmental design guidelines. Int Psychogeriatr, 22(7), 1084-1096. doi:10.1017/S1041610210000438

Garcia, L. J., Hebert, M., Kozak, J., Senecal, I., Slaughter, S. E., Aminzadeh, F., . . . Eliasziw, M. (2012). Perceptions of family and staff on the role of the environment in long-term care homes for people with dementia. Int Psychogeriatr, 24(5), 753-765. doi:10.1017/S1041610211002675

Hoof, V. J., Kort, H. S. M., Waarde, H. V., & Blom, M. M. (2010). Environmental Interventions and the Design of Homes for Older Adults With Dementia: An Overview. American Journal of Alzheimer's Disease & Other Dementias, 25(3), 202-232. doi:10.1177/1533317509358885

Jueng, R. N., Tsai, D. C., & Chen, I. J. (2016). Sense of Coherence among Older Adult Residents of Long-Term Care Facilities in Taiwan: A Cross-Sectional Analysis. PLoS One, 11(1). doi:10.1371/journal.pone.0146912

Knight, C., Haslam, S. A., & Haslam, C. (2010). In home or at home? How collective decision making in a new care facility enhances social interaction and wellbeing amongst older adults. Ageing and Society, 30(08), 1393-1418. doi:10.1017/s0144686x10000656

Kuiper, J. S., Zuidersma, M., Oude Voshaar, R. C., Zuidema, S. U., van den Heuvel, E. R., Stolk, R. P., & Smidt, N. (2015). Social relationships and risk of dementia: A systematic review and meta-analysis of longitudinal cohort studies. Ageing Res Rev, 22, 39-57. doi:10.1016/j.arr.2015.04.006

Lee, K. H., Boltz, M., Lee, H., & Algase, D. L. (2017). Does Social Interaction Matter Psychological Well-Being in Persons With Dementia? Am J Alzheimers Dis Other Demen, 32(4), 207-212. doi:10.1177/1533317517704301

Lee, S., Chaudhury, H., & Hung, L. (2016a). Effects of Physical Environment on Health and Behaviors of Residents With Dementia in Long-Term Care Facilities: A Longitudinal Study. Res Gerontol Nurs, 9(2), 81-91. doi:10.3928/19404921-20150709-01

Lee, S., Chaudhury, H., & Hung, L. (2016b). Exploring staff perceptions on the role of physical environment in dementia care setting. Dementia (London), 15(4), 743-755. doi:10.1177/1471301214536910

Marioni, R. E., Proust-Lima, C., Amieva, H., Brayne, C., Matthews, F. E., Dartigues, J. F., & Jacqmin-Gadda, H. (2015). Social activity, cognitive decline and dementia risk: a 20-year prospective cohort study. BMC Public Health, 15, 1089. doi:10.1186/s12889-015-2426-6

Marquardt, G. (2011). Wayfinding for People With Dementia: A Review of the Role of Architectural Design. HEALTH ENVIRONMENTS RESEARCH & DESIGN JOURNAL, 4(2), 75-90.

Marquardt, G., & Schmieg, P. (2009). Dementia Friendly Architecture: Environments that facilitate wayfinding in nursing homes. American Journal of Alzheimer's Disease & Other Dementias, 24(4), 333-340.

Mitchell, L., Burton, E., Raman, S., Blackman, T., Jenks, M., & Williams, K. (2003). Making the outside World Dementia-Friendly: Design Issues and Considerations. Environment and Planning B: Planning and Design, 30(4), 605-632. doi:10.1068/b29100

Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. . PLoS Med, 6(6). doi:doi:10.1371/journal.pmed1000097

Moyle, W., Fetherstonhaugh, D., Greben, M., Beattie, E., & AusQo, L. g. (2015). Influencers on quality of life as reported by people living with dementia in long-term care: a descriptive exploratory approach. BMC Geriatr, 15, 50. doi:10.1186/s12877-015-0050-z

Nordin, S., McKee, K., Wallinder, M., von Koch, L., Wijk, H., & Elf, M. (2017). The physical environment, activity and interaction in residential care facilities for older people: a comparative case study. Scand J Caring Sci, 31(4), 727-738. doi:10.1111/scs.12391

Smit, D., Willemse, B., Lange, J. d., & Pot, A. M. (2014). Wellbeing-enhancing occupation and organizational and environmental contributors in long-term dementia care facilities: an explorative study. Int Psychogeriatr, 26(1), 69-80. doi:10.1017/S1041610213001397

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 Aging: Policy, practice and research, 7(1), 34-48.

Werezak, L. J., & Morgan, D. G. (2003). Creating a therapeutic psychological environment in dementia care: A preliminary framework. Journal of Gerontological Nursing, 29(12), 18-25.

Whear, R., Abbott, R., Thompson-Coon, J., Bethel, A., Rogers, M., Hemsley, A., . . . Stein, K. (2014). Effectiveness of mealtime interventions on behavior symptoms of people with dementia living in care homes: a systematic review. J Am Med Dir Assoc, 15(3), 185-193. doi:10.1016/j.jamda.2013.10.016

Zaza, S. e. a. (2000). Data collection instrument and procedure for systematic reviews in the guide to community preventive services1. American Journal of Preventive Medicine, 18(1), 44 - 74.

Research (Author/ Year), Location of the Research	Research Design	Design Intervention and Inclusion Criteria	Major Findings/ Results of the Research	Keywords
Rooij, Luijk, Declercq & Schols (2011); Belgium and Netherlands	Quasi-experimental design with a longitudinal comparative study with 179 residents	Environmental characteristics	Determinants of QOL: Positive self-image, Restless behavior, Feeling at home, Caregiver relationship, Social interaction, Negative/ positive effect.	Small-scale home-like settings, Social interaction, QoL
Boer, Hamers, Beerens, Zwakhalen, et.al. (2015); Netherlands	Observational longitudinal study with 176 residents in nursing care home environments.	Four types of nursing home care (1) large-scale (2) small-scale (3) stand-alone (4) green care farm.	Care involves the provision of autonomy for residents, letting them make their own choices and encouraging social interaction and participation in activities.	Activity, Physical environment, Social environment, Psychological well-being, Small-scale
Eika, Dale, Espnes & Hvalvik (2015); Norway	Ethnographic study with periodic participant observations and interviews with 10 older adults	Interventions: continuous assessment, reminiscence, role supplementation, healthy environment	The continuous and spontaneous staff collaborations were key activities in supporting quality care in the transition period.	Spontaneous staff collaborations and interaction
Moyle, Fetherstonhugh, Greben, Beattie & AusQol group (2015); Australia	Descriptive exploratory qualitative research design. 12 residents: 9 women and 3 men	Inclusion criteria (1) older adults over 65 (2) living for 3 months, (3) with dementia. Intervention: QoL and the Importance of social interaction.	The findings highlight the importance of understanding individual resident needs and consideration of the complexity of living in a large group.	The importance of social interaction, Improved QoL
Kuiper, Zuidersma, Voshaar, Zuidema, et.al. (2015); Netherlands	19 Longitudinal Cohort Study. Systematic review and meta-analysis with PRISMA guidelines	Association between various social relationship factors and incident dementia.	This meta-analysis shows that people with less social participation/ social contact and more feelings of loneliness have an increased risk to develop dementia.	Social relation, Interaction, Increased risk of dementia
Chenoweth, King, Jeon, Brodaty, et.al. (2009); Australia (Sydney)	Cluster randomized controlled trial. 15 care sites with 289 residents.	Cleanliness, familiarity, lighting, maintenance, noise, safety, and stimulation in nursing homes	Person-centered care and dementia-care mapping both seem to reduce agitation in PwD in residential care.	PCC and DCM, Reduced agitation, Severity in dementia
Samus, Johnston, Black, Hess, et.al. (2014); USA (Maryland)	18-month care coordination intervention, randomized controlled trial. Total 303 dementia residents	Inclusion criteria: cognitive disorder, community-living, English-speaking, and having a study partner available.	The intervention group had a significant improvement in the self-reported QoL relative to control participants.	Home-based dementia care, Improve self-reported QoL
Mitchelle, Long, Braithwaite & Brodaty (2016); Australia	9 peer-reviewed articles	Dementia residents	Higher-status nurses were found to have multiple formal and informal communication ties across all groups, which enabled them to act as bridges between groups.	Social network as interventions, Improved care services
Malderen, Mets & Gcrus (2013); Belgium	Systematic review. 35 articles	Older adults over the age of 65 years	Self-contained dwellings for a small number of residents and a dining area that represents a family style could enhance the QoL.	QoL Determinate, Physical environment
Whear, Abbott, Thompson-Coon, et.al. (2014); UK	11 peer-reviewed articles	Dining room environment interventions	PwD display more agitated behaviors when they fee anxious. Mealtime interventions improve behavioral symptoms in elderly PwD living in residential care.	Mealtime interventions, Improved behavioral symptoms, Small-scale residential care
Whear, Thompson-Coon, Bethel, Abbott, et.al. (2014); UK	17 Systematic review articles. 9 quantitative study articles, 7 qualitative articles, and 1 mixed-method.	Garden with continuous wandering paths, scented- nontoxic plants, viewing platforms, grass, concrete, raised beds of flower	Promising impacts on levels of agitation in care home residents with dementia who spend time in a garden.	Therapeutic garden, Agitation, Improved QoL
Jing, Willis, Feng (2016); China	Literature Review with 56 articles.	Factors influencing QoL: Physical, Psychological, Emotional, Social, Religious, Environmental	Gathering with family, friends or neighbors were associated with a higher level of QoL. Having a single room and a window could improve the level of QoL.	Social factor, Physical Environment, QoL indicator

Barnes (2002); UK	Literature Review	Layout, wayfinding, special environments, sensory environments, privacy, space, and autonomy	The home-like environment with well-articulated entrances, ample light, staircases, and landmarks are best for care environment.	Home-like environment, QoL
Casey, Low, Jeon & Brodaty (2016); Australia (Sydney)	Cross-sectional, multiple - method design. 36 residents ages 63 to 94	Residents' positive and negative relationship networks in the nursing home.	Findings highlight Nursing Home residents' isolation and lack of engagement.	Social engagement, Experiences of support, QoL
Fleming & Purandares (2018); UK (Manchester)	A Literature review of 57 articles	Size of the care home, an optimum level of stimulation, unobtrusive safety features, social environment	Design features: safety and security of the residents, a variety of spaces with differing ambience, size and function, single, personalize room for each resident.	Social environment, Homeliness, Physical activities, and Outside space
Geboy (2009); USA	Systematic review of design principles	Design principles are general "rules of thumb" within a PCC context	The paper spoke on ten design principles for elder and dementia care staff.	Improve social interaction, Design guidelines
Hoof, Kort, Waarde & Blom (2010); Netherlands	Literature review and supplementary focus group sessions	Environmental interventions (1) safety and security at home (2) perception, orientation, and memory.	Falls and carpet design, signage, wayfinding, easy access, lighting, grab bars, guard rails, non-slip floor covering as design intervention.	Improved social interaction, Design intervention, Design guidelines
Hoof, Kort, Duijnstee, Rutten et.al. (2010); Netherlands	A Literature review of the integrated design of the indoor environment	An overview of the indoor environmental parameters, integrated design and implementation of relevant building systems.	Results are presented as indicators of the basic value, functional value and economic value, as well as a synthesis of building-related solutions.	Indoor environment, Social relationship
Mcgilton, Rivera & Dawson (2003); Canada (Ontario)	Randomized controlled trial. Four nursing home units in a geriatric center, 32 residents (mean age of 86 years)	The effect of the intervention on the residents' spatial orientation and agitation.	The residents demonstrated an increased ability to find their way to the dining room one week after the intervention and showed a decline in level of agitation.	Wayfinding, Dining room, Residents' agitation
Mitchell, Burton, Raman, Blackman, Williams (2003); UK	Literature review	Design guidelines for the outdoor environment: familiar, legible, distinctive, accessible, comfortable, safe.	Small-scale street blocks with Architectural facades, open spaces, short streets with good visual access, a variety of materials, colors and street furniture.	Outdoor Environments
Marquardt (2011); Germany	Literature review	Therapeutic Physical Environment: Legibility, Familiarity, Autonomy, Sensory Stimulation, and Social Interaction	The floor plan design, decorating with personal items, corridors, natural light, natural views has a significant influence on residents' spatial orientation and wayfinding.	Social Interaction, Therapeutic Physical Environment
Parker, Barnes, McKee, Morgan, et.al. (2004); UK (Sheffield, Yorkshire)	Cross-sectional, multiple - method design. 38 Care Homes (11 small, 14 medium, 13 large)	Access to the indoor/outdoor environment, privacy, personalization, choice, safety, comfort to measure building domains.	QoL is a multi-dimensional construct that includes social relationships. A positive association between the physical environment and QoL.	QoL, Multi-dimensional construct, Social relationships
Torrington (2006); UK (Sheffield)	Cross-sectional, multiple - method design. 38 Care Homes	To identify the effects of building design on residents' well-being.	Overall well-being score was larger in small homes. Physical environment should be designed to support activity by providing good physical support.	Well-being score, Small-scale home
Chaudhury, Hung & Badger (2013); Canada (Vancouver)	Literature review. 22 journal articles, including 12 intervention studies	Inclusion criteria: (1) empirical research; (2) the physical environment of the dining rooms (3) published in English from 1990 or later.	Supportive dining environment can foster (1) functional ability, (2) orientation, (3) a sense of safety/security, (4) familiarity, (5) sensory stimulation, (6) social interaction, and (7) privacy, personal control.	Person-centered care, Dining experience, Role of Physical Environment
Chaudhury, Hung, Rist & Wu (2017); Canada (Vancouver)	Pre-post renovation ethnographic observations. Two care units of a large long-term care facility	Physical environmental interventions: adding an open kitchenette and creating a home-like dining atmosphere	Five themes are notable: (a) autonomy, (b) comfort of a home-like environment, (c) social interaction, (d) personal support, (e) effective teamwork.	Autonomy, Environmental interventions, Comfort, Home-like environment, Social interaction,
Jueng, Tsai & Chen (2015); Taiwan	104 LTCF residents. Face-to-face interviews and cross-sectional analysis using sense of coherence (SOC) scale (Chinese version)	Room type, natural windows, outdoor public space	Long-term care facility residents in Taiwan had a relatively low sense of coherence scores compared to their counterparts in Western countries.	Higher education level, Higher activities of daily living scores, More LTCF staff, Sense of coherence

Chaudhury, Cooke, Cowie & Razaghi (2017); Canada	Literature Review. 103 full-text, 94 empirical studies, 9 reviews, published after 2000.	Home-like Character, Sensory Stimulation, Unit Size, Spatial Layout, and Orientation Cues, Small-scale dining area	The influence of unit size, spatial layout, home-like character, sensory stimulation, social spaces, dining, bathing and outdoor spaces on residents' behaviors	Environmental characteristics, Social spaces, Social interaction
Young Lee, Chaundhury & Hung (2016); Canada	Longitudinal study. traditional large-scale setting and small-scale, home-like setting	N/A	Smal-scale facilities have positive effects on health and behavior of residents in long-term care facilities.	Small-scale home, Social interaction, QoL
Forsund & Ytrehus (2016); Norway	Qualitative study with interview and observation in Specialized care units (SCU)	Family pictures in individual rooms, decorating the room in a home-like style. The common area needs to be home-like.	The individual room is an important feature in maintaining spousal contact and interaction throughout all phases of dementia, including the final phase.	Privacy, Relationship with spouse
Calkins (2009); USA (Ohio)	Literature review	Household, Building configuration, Non-institutional design, Wayfinding, Safety, Outdoor areas, Dining rooms, Bedrooms	The positive benefits of private bedrooms on outcomes such as the satisfaction of residents, families, and staff, QoL, preference and reduced neuro-disability.	Private bedrooms, Satisfaction of residents
Smit, Willemse, Lange & Pot (2014); Netherlands	Explorative Study. 57 residents in 10 dementia care facilities	Home-like décor and furniture arrangement	LTCF with more home-like atmosphere supported social interaction through the environment and had no central activity program is preferable.	Furniture arrangement, Stimulated social interaction
Nordin, McKee, Wallinder, Koch, et.al. (2017); Sweden	Comparative Case Study with mixed-method, convergent analysis. 54 residents, 25 staff members, 4 relatives.	Open plans, automatic doors, smooth flooring, safety devices, and elevators in buildings	Private accessible apartments, safety, and dining areas showed high environmental quality, whereas the overall layout had lower quality.	Residents' activities, Interaction, Relationship
Werezak & Morgan (2003);	Literature Review	Social, physical and psychological environment	The psychosocial environment involving social interaction are critical to high-quality institutional dementia care.	Psychosocial environment, Social interaction
Rooij, Luijkx, Schaafsma, et.al. (2012); Netherlands	Quasi-experimental, longitudinal research design. 179 residents with dementia	Traditional versus small-scale long-term care settings	Residents in small-scale settings had higher mean scores on 'social relations', then residents in traditional settings.	Small-scale settings, Social relations, Positive affect, QoL
Beerens, Boer, Zwakhalen, Tan, et.al. (2016); Netherlands	An observational study with 115 participants. Mean age was 84 years old	Social interaction to promote good QoL	PwD with higher QoL were more engaged in active, expressive, social activities and less passive/purposeless activities than PwD with lower QoL	Social interaction and QoL
Kontos (2011); Canada (Southern Ontario)	Ethnographic study. 79 residents (11 men and 68 women) in Orthodox Jewish LTCF	Inclusion criteria: cognitive impairment; and two times more women than men.	Empathy, social etiquette, the power of gesture are major aspects of selfhood.	Sociability, Selfhood and Person-centered dementia care
Abbott, Sefcik, Haitsma, (2017); USA	Observation Study using 29 residents with medical charts and visitor logs	Interaction: 1) Location, 2) context, 3) type 4) quantity and 5) quality of interaction	Interaction were brief, verbal and social in nature, and occurred in public areas.	Activities areas, Close proximity, Social environment
Boer, Hamers, Zwakhalen, et.al. (2017); Netherlands	Longitudinal observation study. 115 nursing home residents. Mean age of 82 years.	To investigates whether residents of green care farms are more engaged in (physical) activities and social interaction than are residents of other nursing homes.	Residents living at green care farms are more active, significantly more often participated in domestic activities, outdoor/nature-related activities and significantly less often engaged in passive/purposeless activities.	Green care farms, Engaged in domestic activities, Interaction
Edvardsson, Sandman, Rasmussen (2011); Sweden	Grounded theory design, Interview & Observation in a psycho-geriatric hospital unit with 24 residents.	'Sharing place and moment', 'sharing place but not moment' and 'sharing neither place nor moment'	Staff presence and absence emerged as the core concept influencing the psychosocial climate and the well-being of people in dementia in a psycho-geriatric setting.	Staff presence, Psychosocial climate
Smit, Willemse, Lange, Pot (2014); Netherlands	The explorative study using 8th edition of Dementia Care Mapping (DCM) with 57 residents in 10 dementia care facilities	Home-like environment	Reminiscence, leisure, expression, and vocational occupation had the greatest potential to enhance well-being.	Small-scale home, Social interaction, QoL
Garcia, Hébert, Kozak, et.al. (2012); Canada	Qualitative research, nominal focus groups with family and staff members. The mean 83 years with moderate to severe dementia.	To reduce disruptive behaviors and facilitate QoL or encourage disruptive behaviors and impede the QoL of residents.	Social/human environments were perceived to be more important than physical environments. A mnemonic – C.A.R.E.F.U.L. – was developed.	Social/human environments, Physical environments

Lee, Boltz, Algase (2017); USA (Michigan and Pennsylvania)	Multisite descriptive study. 110 persons with dementia in 17 nursing homes and 6 assisted living facilities.	Psychological well-being, Social interaction and the quality of interaction	Quality of residents' relationship, verbal and nonverbal interaction showed a significant relationship with positive and negative emotional expressions.	Quality staff interaction, Psychological well-being
Digby R. & Bloomer M.J. (2012); Australia	Qualitative descriptive study, in-depth semi-structured interviews.	Care environments that priorities non-institutional design features	The homeliness, privacy and care received was more important than the physical environment.	Physical environment and Resident care
Nordin, McKee, Wallinder, Wijk, Elf (2017); Sweden	A mixed-method, convergent analysis in two residential care facilities.	Relationships between the physical environment and activities.	The physical environment, care philosophy and culture of care play major roles in the daily lives of the residents.	Design of the physical environment, Residents' activities, Interaction
Campo, Chaudhury (2011); Canada (Vancouver, B.C.)	The ethnographic study, observations & interviews. 43 Residents	Informal social interaction (1) physical (2) organizational (3) individuals and (4) social environments	Design recommendations include seating areas in the hallways, visual access, home-like decorations, furniture, adequate lighting, reduced ambient noise.	Physical environment and Social environment
Marioni, Proust-Lima, Amieva, (2015); (Europe, France)	A longitudinal study in 20-years follow up prospective cohort study	N/A	Increased engagement in social, physical, or intellectual pursuits was related to a decreased risk of dementia.	Increased engagement, Socio-physical-intellectual pursuits,
Lee, Chaudhury, Hung (2016); Canada (Vancouver, B. C.)	Mixed-method research that includes environmental assessments, comparisons, qualitative fieldwork & group interviews.	Staff perceptions on the role of the physical environment.	Small-scale home-like setting with comfort, familiarity, and organized space gives more resources to improve the QoL for residents and work environment for staff.	Small-scale, home-like setting, Social interaction, QoL, Supportive work environment, Stuff
Knight,Haslam, Haslam (2010); UK (Southwest England)	The longitudinal experiment includes a questionnaire and observational measures.	Residents' behavior, QoL and use of social space	Empowering residents to make collective decisions about the de´cor that has a positive impact on their: (a) identification, (b) well-being, (c) social interaction	Empowerment, Collective decision making, Social interaction, QoL and well-being, Older adults
Marquardt, Ing, Johnston, et.al. (2011); USA	Cross-sectional data from a larger randomized controlled trial.	Spatial Layout of the Home and space syntax variables intelligibility and convexity.	Higher convexity was associated with the worse performance of basic activities of daily living (ADL), Intelligibility was not associated with ADLs.	Legible, Meaningful function of space, Memory care
Marquardt, Schmieg (2009); Germany	Empiric-qualitative exploration. 30 German nursing homes with 450 residents	Five types of circulation system: 1) Straight 2) L-shaped 3) Continuous path 4) "Intermediate Element" 5) Corridor ending.	Social Interaction privacy, belonging and communication are important determinants. Access to the outdoor area or should be located in a central area within the living area.	Residents' orientation, Physical environment, Architecturally legible, Meaningful function
Andersson, Paulsson, Malmqvist, Lindahl (2015); Sweden (Gothenburg)	Explorative observation study in dementia and somatic disorders. Total 199 residents (aged from 73 to 102 years) in five facilities.	The common spaces contain multi-purpose common spaces with integrated kitchens, dining rooms, and sitting rooms.	The degree of use of common spaces differs between the somatic and dementia units. Common spaces were used more continuously on dementia units, and residents on somatic units spend more time alone in their apartments.	Common spaces, Dementia units, Legible, Supportive design