

**ANNOTATED BIBLIOGRAPHY**  
**DEMENTIA DESIGN: WAYFINDING AND LAYOUT**  
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## ANNOTATED BIBLIOGRAPHY

### DESIGN FOR DEMENTIA: WAYFINDING AND LAYOUT

A number of interesting journal articles have been published in the past few years with a focus on designing Nursing Homes for residents with dementia with a focus on Wayfinding. Toronto researcher Katherine McGilton provides a useful framework to organize a review of these Wayfinding articles:

1. the design of the physical environment, particularly floor plan layout **(FPL)**
2. the use of behavioral interventions **(BI)**
3. the use of cues and landmarks.**(C&L)**

Where applicable I have indicated the main focus of the following articles using this framework.

- ❖ Brawley, Elizabeth, “**Alzheimer’s disease: designing the physical environment**”, The American Journal of Alzheimer’s Care and Related Disorders & Research, January/February 1992. (USA )  
**(FPL, C&L)**
  - This article discusses the importance of careful design planning to facilitate mental functioning and enable individuals to function more independently. It includes topics such as Sight, Light, Color, Sound, Textures, Odor, Air Quality, Space, Floors, Furniture, Personal objects, Landmarks and Cues. Some quotes follow:
    - **Light:** “The concern is for consistent light sources to eliminate shadows, attention to eliminating glare and focused task lighting.”p.4
    - **Colour:**
      - “The changes in the eye’s lens also affect color perception. The environment slowly takes on a yellowish-brown cast. This change causes great difficulty in distinguishing dark shades from each other and light tones from each other”. P.4
      - “Older people have difficulty distinguishing their room color as different from their neighbours” p.4
      - “Color alone is not a particularly useful cue though color coding corridors, doorways, etc. is a fairly common practice....Contrast, however is a far more important consideration.” p.5
  - **Corridors:**
    - “The length of corridors should be considered. The longer they become, the more cavernous and consequently confusing they become.”p.6

➤ **Landmarks and cues:**

- “A landmark is a conspicuous object and is identifiable from some distance—such as a tree, a grandfather clock or a hanging basket...

A cue may be viewed at close range...name plates, color coding and numbers or signs are all cues.”

- “Lettering for name plates should have  $\frac{3}{4}$ ” high letters...and not above eye level.”p.7

❖ Calkins, Margaret, “**Evidence-based long term care design**” NeuroRehabilitation, 2009. (USA)  
(FLP, C&L)

- A review article focusing on work conducted since 2000. Topics include Household or group size, Building Configuration, residential design, Wayfinding, Lighting, Safety, Outdoor areas, Dining rooms, and Bedrooms. A table is included that offers a definition of various types of Building Configurations. Selected quotes follow:

➤ **Building Configuration:**

- “it is easier to find a location that is easily visible than one that is not visible” .p.148
- “one study has proposed a specific typology for different unit configurations..*hallway based*, meaning that at least 2/3rds of the bedrooms open onto a single or double-loaded corridor space, *open-plan*, meaning at least 2/3rds of the rooms open on to some shared social spaces, and *mixed*, meaning more than 1/3<sup>rd</sup> of the rooms open on to hallway space, and more than 1/3<sup>rd</sup> open on to shared social spaces”p.148 (Van Haitsma 2004) )

➤ **Wayfinding:**

- “Residents who could not identify paths to desired locations exhibited anxiety, confusion, mutism, and even panic.”p.150 (Passini, 2000)
- “Capacity of decision-making is reduced to decisions based on immediate and visually accessible information” p. 150 (Passini, 2000)
- “The typical location of signs...is often not seen by residents whose visual field is low to the ground.” p. 150 (Passini, 2000)
- 

❖ Chang et al, “**Autonomous indoor wayfinding for individuals with cognitive impairments**” , Journal of NeuroEngineering and Rehabilitation, 2010. (C&L)

- This study is a trial of a system composed of passive Radio-frequency Identification tags (RFID) and PDA (personal digital assistant) which display directions as persons approach decision points. This was tested on 6 individuals with intellectual and developmental disabilities, Parkinsons and schizophrenia with positive results for those with mild to moderate forms of impairment.

❖ Cantley, Caroline and Wilson, Robert, **“Put yourself in my place”**, 2002, UK (FPL)

- This study of several British Nursing Homes offers Design recommendations covering group size, amenities, resident rooms, corridors, gardens etc.

“Corridors (should)

- be as attractive and short as possible, and provide cueing features or opportunities,
- benefit from natural light, with appropriate intensity of artificial light, and suitable ventilation
- not contain tempting ‘no-go’ areas, for example, behind locked glazed doors,
- a minimum width of 1500mm
- a variation in width utilising areas created by recessed entrances...
- a sitting area with a view at any outer end to avoid a closed door or cul-de-sac effect
- doors to staff-only areas coloured to blend with adjoining walls.”

“Assisted WC

- this should meet disabled and assisted standards, be in close proximity to the day rooms and clearly identified (Photograph)



- ❖ Davis, Rebecca et al, “**Working Memory, Cues , and Wayfinding in Older Women**”, Journal of Applied Gerontology, 2009. (USA) (C&L, BI)
- This study examines how working memory ability in older women is related to wayfinding performance in the presence of salient (distinctive, prominent) or nonsalient cues. Findings suggest that cue salience is especially important in wayfinding. Quotes follow:
    - “When environments are new, individuals often use simple landmark navigation whereby they travel from one landmark to another. Related to landmark navigation is route navigation, which involves the association of learned turns and directions based on a series of landmarks...they know to expect certain landmarks and paths to occur sequentially among the route.”p.744
    - “Evidence suggests that salient (distinctive) cues are important for place learning necessary to develop a cognitive map, especially in aging.”p.745
    - “To encode a cognitive map, cues must be first attended to, then recognized, and finally selected”. P.748
    - “the best place learning occurred in the salient cue conditions and the worst in the nonsalient cue condition.”p.754
    - “The poor performance of our subjects in the nonsalient cue condition supports the need for more salient cues as an intervention to modify environmental information and improve wayfinding ability.” P.759
    - “In summary, this study showed a positive effect of cue salience on the place-learning performance of older women.” p.762.
- ❖ Day, Kristen et al, “**The Therapeutic Design of Environments for People with Dementia: A Review of the Empirical Research**”, The Gerontologist, Aug. 2000. (USA ) (FPL, C&L)
- This article reviews findings from research on the impacts of design in dementia care settings. Included is a comprehensive summary table of studies and findings prior to 2000. Quotes follow:
  - **Building Organization:**
    - “wayfinding among residents was judged less successful in facilities with low lighting levels in public areas” p.409 (Netten, 1989)
    - “Large signs improved resident orientation, when incorporated with orientation training...signs alone had minimal effect on residents’ orientation”p.410 (Hanley, 1981)

- “When displayed in cases outside resident rooms, personally significant memorabilia were somewhat more likely to help residents find their rooms than were displays without personal significance” p.410 (Namazi, 1991)
- “residents were found to experience greater spatial orientation in facilities designed around L, H, or square shaped corridors, compared with facilities with corridor designs” (Elmstahl, 1997)
- “higher levels of orientation were identified in “cluster” facilities (comprised of small units of resident rooms and associated common spaces), compared with larger scale “communal” facilities (common spaces separated from resident rooms and shared by larger groups of residents” (Netten, 1989)

#### ➤ Toilet Rooms

- “Incontinence is a major problem among people with dementia (Namazi & Johnson, 1991). Design guides emphasize the importance of maintaining independence in toileting whenever possible, such as by making toilets easy to locate and to identify (signage, visible locations, etc.)...Early and moderate stage dementia residents were most likely to locate and use public toilets in response to primary color signage affixed to the floor (responding to residents’ typically downcast gaze) comprising a series of arrows and the word “toilet”...Further, frequency of toilet use increased dramatically when toilets were visibly accessible to residents...In particular, visibility increased toilet use among residents with more advanced dementia.”

#### ❖ “Dementia Care and the Built Environment”, Position Paper 3, June 2004, Alzheimer’s Australia. (FPL)

- This paper by Alzheimer’s Australia discusses design features and design principles in Dementia Care settings, and covers topics such as Domestic size, floor plan, specific spaces, Activity Areas, and Quality of Life. Quotes follow:

#### ➤ Domestic Size and Character:

- “People with dementia are challenged by large, unstructured spaces, with a large or unpredictable number of people sharing the space”
- “‘domestic character’ requires that each room is furnished and decorated to identify its purpose and function in a similar manner to an average home”

- “A design that enables rooms and spaces to be visible and recognisable with minimum effort, thus assisting with orientation and ease in finding the way”.

➤ **Floor Plan:** “A successful floor plan is one that creates opportunities for residents with dementia to succeed and use their retained abilities by maximising ease in finding their way”.p.7

❖ Devlin, Ann and Arneill, Allison, “**Health Care Environments and Patient Outcomes: A Review of the Literature**”, Environment and Behavior, 2003. (USA) (FPL, C&L)

➤ This review of the literature considers the impact of the environment (sound, light, art) and the emergence of specialized building types such as Alzheimer units. It starts with the comment that “architecture lacks a tradition of research”. P.667. It includes discussion on Patient Centred Care and the Ambient Environment, Quotes follow:

➤ **Building for the Elderly:**

- “The environment should have sufficient cues so that people with dementia do not resort to wandering as a consequence of disorientation” (Cohen & Weisman, 1991)
- “Design configurations that include central open areas (like a widened hallway) or open activity areas (Kromm & Kromm, 1985) are popular because these spaces have been shown to reduce disorientation” (Liebowitz et al, 1979).
- “Additions included an orientation board and color-coding for each patient’s door with his or her name and picture also displayed next to the door.” (Benson et al, 1987)

❖ Elmstahl, Solve, et al, “**How should a group living unit for demented elderly be designed to decrease psychiatric symptoms?**”, Alzheimer Disease and Associated Disorders, 1997. (Swedish study) (FPL)

➤ This Swedish study is one of the first to test the effect of specific floor plan layouts; particularly straight, L shaped, H shaped and square designs. Most of the units studied had straight corridors, with only a few representing other layouts. The main conclusion was a recommendation to prefer layouts that facilitated perception. L design with collocated amenities showed less disorientation relative to straight corridor with dispersed amenities. (This may be a result of the L shape creating shorter corridors relative to longer straight corridors)

➤ Quotes follow:

- “The main objectives were to study relationships between the design of group living (GL) units and psychiatric symptoms in demented patients”
- “Fourteen out of 18 units had a corridor-like design (group A), one unit an L-shaped design (group B), and the others a square or H-shaped design (group C)”

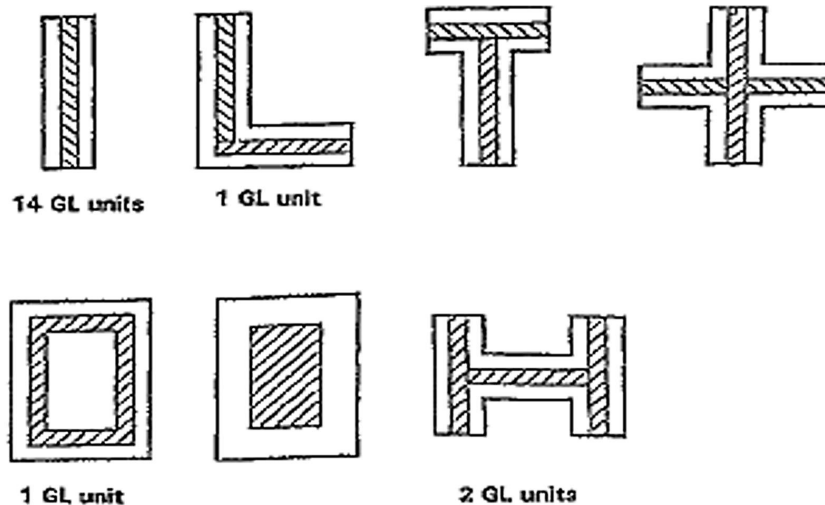


FIG. 1. Floor plans of group living units. Dashed lines, hallways.

### ➤ Results

- “Disorientation was less pronounced in the L-shaped and the H-shaped and square-shaped Group Living units, in which kitchen, dining room, and activity room were located together” p.52. (note: collocating amenities helps orientation)
- “Even though orientation devices and symbols are used, this study shows that the architectural design seems to influence ability to orient.”p.52

❖ Fleming, Richard et al, “**Adapting the Ward for people with dementia**”, 2003, NSW, Aust. (FPL, C&L)

- This Australian manual published by the NSW department of Health includes an excellent audit tool with some good wayfinding points. The document recommends that the environment designed for dementia residents should be safe and secure, be small (groups of maximum 14), be simple and provide good visual access, reduce unwanted stimulation, highlight helpful stimuli, provide for planned wandering, provide opportunities for privacy and community, provide links to the community, and be familiar and domestic. Quotes follow:



- **Environment should Be simple, with good visual access:** “The simplest environment is one in which the patient can see everywhere they want to go to from wherever they are. This principle limits the inclusion of corridors in the design and results in staff being able to see the patients almost all the time.”p.16

“A maze of endless corridors and myriad identical rooms as is typically found in traditional hospitals and nursing homes may cause confusion and disorientation in people with dementia”. P.95

- **Multiple cues:** “Where a door, toilet seat, bench, etc. is clearly for use by patients it must be given contrasting colour to the wall. Where the door (staff use, cleaner’s room, etc) is not for patients’ access make sure it is the same colour as the wall.” Use written signs and pictorial images. Use redundant cueing. Provide good lighting. P.99

Fleming, Richard and Purandare, Nitin, “**Long-term care for people with dementia: environmental design guidelines**” International Psychogeriatrics, 2010.

- This literature review covers 1980 to 2010 and concludes that there is a consensus on guiding principles for the design of long term environments for people with dementia. In particular the paper looks at the list developed by Professor Mary Marshall of the University of Stirling Scotland in 2001. There is an extensive table of studies with their outcomes. Support was found for Marshall’s principles, particularly that residents should be able to see the features that are most important to them from the location(s) where they spend most of their time. Marshall’s principles are that residential facilities for people with dementia should:

- be small in size
- control stimuli, especially noise
- enhance visual access, i.e. ensure that the resident can see what they need to see from wherever they spend most of their time
- include unobtrusive safety features
- have rooms for different functions with furniture and fittings familiar to the age and generation of the residents
- have single rooms big enough for a reasonable amount of personal belongings
- be domestic and home-like
- have scope for ordinary activities (unit kitchens, washing lines, garden sheds)
- provide a safe outside space
- provide good signage and multiple cues where possible, e.g. sight, smell, sound
- use objects rather than colour for orientation.

- ❖ Goffi, Federica, “**aD2 now: mind-body architecture**”, Carlton University, 2011. (Cda) (FPL, C&L)
  - Twelve design proposals are presented to illustrate mind-body architecture applied to a renovation of a dementia care facility, Cumber Lodge in Toronto. Architecture and Social Work students collaborate. A good research based discussion of current design principles for dementia care. Quotes follow related to Wayfinding:
    - **Path: Circulation and Navigation:**
      - Walking rather than wandering: “creating paths with clear destination points that infuse a walk with reason” (Zeisel, 2010)
      - “Patients walk with much more decision and direction when the destination is visible”
      - Sequence design: “clear views of objects that are used in the task at hand (like seeing toothpaste, a toothbrush and a towel) allows patients to focus on what action is next in sequence.”
      - “Esther Sternberg talks about tension and anxiety in people when they are faced with dead-ends and labyrinthine turns.”
      - “Zeisel and Sternberg both point out the importance of aiding cognitive mapping of spaces by means of natural multisensory cues or landmarks placed in areas where decisions must be made, reducing a chance for disorientation.”
      - “Having distinct ‘feeling’ and physical appearance of different spaces within facilities is critical for way finding” p.21
- ❖ Hodges, Lisa et al, “**Dementia Design Guidelines**”, University of Sydney, 2006. (Australia) (C&L)
  - This paper reviews literature and develops design guidelines for Adult Day Programs for dementia. The paper notes that design principles for dementia are derived for the most part from expert opinion rather than scientific methodology. Nine principles are identified with one in particular relevant to wayfinding: “Highlight helpful stimuli and provide orientation cues”: quotes follow:

➤ **Spaces, access points, pathways:**

- “a sign posted above a door is unlikely to be seen, however, a sign closer to the floor will have a greater chance of being in the eye line of the person with dementia” (Namazi and Johnson, 1991) p.15
- “Brawley (1997) notes that the colour of a room or hallway is not as effective at creating this distinction between areas as object cues are. She notes that a grandfather clock in one room and a wall hanging in another are examples of effective landmarks.” P.15
- “Other strategies to highlight positive stimuli include aids to recognition, such as photos and familiar objects, and increasing the level of illumination.” (Brawley, 1997) p.15
- “People with dementia have a particularly strong deficit in discriminating between certain hues...Therefore, using contrasting colours on the opposite sides of the colour wheel will highlight the presence of helpful stimuli, such as grabrails.” P.16

➤ Hodges includes a good check list for her principles. The one for cueing stimuli follows:

- Minimum 30% luminance contrast between floors and walls under both natural and artificial lighting conditions.
- Minimum 30% luminance contrast between step and edge of step under both natural and artificial lighting conditions.
- Minimum 30% luminance contrast between any switches to be used and wall under both natural and artificial lighting conditions.
- Minimum 30% luminance contrast between toilets and the surrounding floor and walls under both natural and artificial lighting conditions.
- Minimum 30% luminance contrast between the sink and wall under both natural and artificial lighting conditions.
- Minimum 30% luminance contrast between the table surface and plate under both natural and artificial lighting conditions.
- Indirect cueing:
  - Multiple modes of signage indicating the location of the toilet (eg, picture of toilet and the word as well).
  - Multiple modes of signage indicating the location of the dining room (eg, picture of knife and fork and the word as well).
  - Multiple modes of signage indicating the location of the activities along the wandering path (eg, picture of a tool shed/aviary/fountain/etc and the word as well).
  - Signs placed at appropriate level (downcast gaze).

❖ Innes, Anthea et al, “**Care home design for people with dementia: What do people with dementia and their family carers value?**”, *Aging & Mental Health*, July 2011. (UK) (C&L)

- This report uses focus groups in Ireland and Scotland to discuss features of a building that carers and residents take into account when selecting a care home. Outside space and wayfinding aids were identified as positive features. Wayfinding pertinent quotes follow:
- “VanDorp’s (2002) study in which identifying items (photographs and significant memorabilia) were placed in memory boxes outside the door of each participant’s room showed that the ability of participants to find their way to their rooms increased by 45%.”p.549
- “Torrington (2006) argues that successful spaces are those that carry unambiguous meaning.”p.549
- “Wayfinding, ensuites and outside space were the three features that received most discussion in all six homes where the focus groups took place.”p.553
- “In addition to not being able to find the toilets, residents spoke of not being able to find their bedrooms and quiet places to be alone. Equally, other residents spoke of being able to find their bedrooms and of the wayfinding cues that enabled them to do so (name on door, next door to another landmark in the building.”p.553
- “People with dementia and their family carers recognize design features that are important to them. The most important design features relate to wayfinding cues and outside space.”p.554.

❖ Joseph, Anjali, “**Health Promotion by Design in Long-Term Care Settings**”, *The Center for Health Design*, 2006. (USA) (FPL, C&L)

- This literature review found that several studies show that the physical environment such as the unit layout, supportive features and finishes, reduced noise, and access to outdoor spaces may be linked to better outcomes, including better orientation and wayfinding and quality of life. Wayfinding quotes follow:
- **Support orientation and wayfinding:** “Characteristics of residential institutions that contribute to confusion and disorientation include:
  - Monotony of architectural composition and lack of reference points (Passini, Pigot, Rainville, & Tetreault, 2000)
  - Long corridors with many doors (Rule, et al., 1992)
  - Lack of windows or lack of access to windows (Rule, et al., 1992)

- Ad hoc signage (Rule, et al., 1992). P.4
  - “attention should be paid to locating culturally relevant landmarks in key locations to support wayfinding and orientation.” p.4
  - “Day and colleagues (2000) identified the following factors as being related to higher levels of orientation:
    - Quiet environments.
    - Use of room numbers and distinguishing colors for resident rooms and doors.
    - Large signs or location maps supported by orientation training for residents (jMcGilton, Rivera, & Dawson, 2003)
    - Simple building configuration aided by explicit environmental information (Residents experienced greater spatial orientation in facilities designed around L-, H-, or square shaped corridors, compared with facilities with corridor designs).” p.4
- ❖ Kessels, Roy et al, “**Landmark Recognition in Alzheimer’s Dementia**”, PLoS ONE, 2011. (NL) (C&L)
- This study tested memory of objects placed at decision points on a route by dementia residents. One conclusion was that object information that is relevant for navigation may be processed in an automatic way. Interestingly highly attended landmarks were remembered worse than less attended landmarks.
    - “In spatial navigation, landmark recognition is crucial. Specifically, memory for objects placed at decision points on a route is relevant.
    - Our findings indicate that AD patients with MTL damage have implicit memory for object information relevant for navigation.” p.1
- ❖ Marquardt, Gesine, and Schmiege, Peter , “**Dementia-friendly architecture: Environments that facilitate wayfinding in nursing homes.**” American Journal of Alzheimer’s Disease & Other Dementias, 2009. (German study) (FPL)
- This groundbreaking study analysed the architectural characteristics of 30 German nursing homes in terms of their impact on residents’ wayfinding abilities. This study clearly identified the features of nursing homes’ floor plans that best provide good orientation for dementia residents. “The significant factors included a small number of residents per living area, the

straight layout of the circulation system without any changes in direction, and the provision of only 1 living/dining room.”

➤ **3 major typologies (p.334 – 335):**

- Straight circulation system
- Layouts that featured one shift in direction (eg. L-shaped circulation systems)
- Continuous paths around an inside courtyard
- A fourth variation was a straight circulation system with an “intermediate element” dividing a corridor (such as a common room)

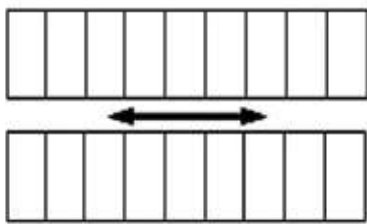


Figure 1. Straight circulation system (str).

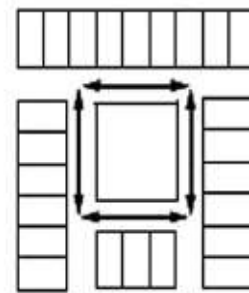


Figure 3. Continuous path around an inside courtyard (cp).

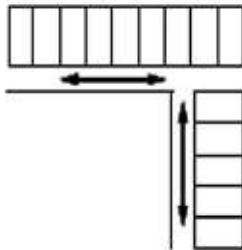


Figure 2. L-shaped circulation system with a change in direction (cd).

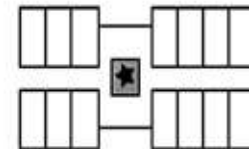


Figure 4. “Intermediate Element” dividing a corridor.

➤ **Results:**

- “The number of residents and the size of the living area constitute the most significant factor on a resident’s orientation. ...orientation indices decline as the number of residents per living area increases.” p.335
- “In straight circulation systems, residents were able to find their way better than in any layout that featured a shift in direction...Within the straight circulation systems, orientation

was further enhanced if the whole corridor could be overseen from any point of the living unit". p.335

- having only one live-in kitchen (dining/amenity) as a supportive design feature can be a memorable reference point and can serve as an "intermediate element" to divide long corridors and at places where direction changes. P.338
- "If it is accessed from the live-in kitchen (central living area), the outdoor space seems to be better located by the residents"p.337
- "Concerning the layout of the circulation system, the importance of a direct visual access to all places relevant to the residents becomes evident."p.338

❖ Marquardt, Gesine, "**Wayfinding for people with dementia**", **Health Environments Research & Design**", 2011. (German) (FPL, C&L)

- This paper provides an excellent overview of the literature on architectural wayfinding design for people with dementia in nursing homes. Two aspects were identified: the design of the floor plan and environmental cues. Only five studies were identified that specifically pertain to floor plan design. These and other environmental interventions are summarized in Table 2. Quotes:
- **Overview:**
  - "The design of the physical environment plays a major role in supporting the wayfinding abilities of people with dementia. The floor plan design of a nursing home in particular has a significant influence on residents' spatial orientation and wayfinding."p.75
  - "The process of finding one's way includes knowing where you are, knowing your destination, knowing (and following) the best route to the destination, recognizing the destination upon arrival, and finding the way back. (Brush & Calkins, 2008) p.77
  - "Environmental interventions that promote wayfinding can be implemented on two levels: the design of the floor plan typology and environmental cues, which comprise signage, furnishings, lighting, colors, etc."p.79

**Table 2. Interventions for Residents' Orientation: Features of Floor Plan Typology and Environmental Design**

| Intervention Level   | Design features that...   |   |
|----------------------|---|---|
|                      | support residents' orientation  | interfere with residents' orientation   |
| Building structure   | <ul style="list-style-type: none"> <li>• <i>Small scale</i> (Marquardt &amp; Schmieg, 2009; Netten, 1989)</li> <li>• <i>Direct visual access to relevant places</i> (Marquardt &amp; Schmieg, 2009; Passini et al., 1998; 2000)</li> <li>• <i>Simple decision/reference points, serving as spatial anchor points</i> (Elmstahl et al., 1997; Marquardt &amp; Schmieg, 2009; Netten, 1989; Passini et al., 1998; 2000)</li> <li>• <i>Places with different and also legible function and meaning</i> (Marquardt &amp; Schmieg, 2009; Netten, 1989; Passini et al., 1998; 2000)</li> <li>• <i>Spatial proximity of kitchen, dining, and activity rooms</i> (Elmstahl et al., 1997)</li> </ul> | <ul style="list-style-type: none"> <li>• <i>Long corridors</i> (Elmstahl, Annerstedt, &amp; Ahlund, 1997; Netten, 1989)</li> <li>• <i>Changes of direction in the circulation system</i> (Marquardt &amp; Schmieg, 2009)</li> <li>• <i>Repetitive elements</i> (Marquardt &amp; Schmieg, 2009; Netten, 1989)</li> </ul> |
| Environmental design | <ul style="list-style-type: none"> <li>• <i>Signage (pictograms, resident's name, portrait photograph, photographic labels)</i> (Gross et al., 2004; Namazi &amp; Johnson, 1991; Nolan, Mathews, &amp; Harrison, 2001; Nolan, Mathews, Truesdell-Todd, &amp; VanDorp, 2002; Passini et al., 1998; 2000)</li> <li>• <i>Personal items on doors</i> (Namazi, Rosner &amp; Rechlin, 1991)</li> </ul>   | <ul style="list-style-type: none"> <li>• <i>Information clutter</i> (Passini et al., 1998)</li> </ul>   |

➤ **Design of Supportive Floor Plans:**

- Netten in 1989 studied six group homes and 7 more traditional communal homes where all residents in the facility traveled to one central dining room. Results showed that residents who had longer routes had more difficulty finding their way.
- “Elmstahl et al (1997) investigated psychiatric symptoms in people with dementia after admission to group living units with three different floor plan designs: 14 with a corridor-like design, one with an L-shaped design, and three with a square or H-shaped design...Residents in the L-shaped floor plan had less disorientation than the others at the 6-month follow-up. ..The spatial proximity of the kitchen, dining room, and activity room in the L-, H- and square-shaped units was also identified as a supportive feature.”P.81



- Passini et al (1998;2000), “conducted two studies exploring wayfinding abilities of people with Alzheimer’s disease...both studies showed that most participants were incapable of developing an overall plan to solve a wayfinding task and made their decisions on explicit architectural information.”p.81
- Passini found that the most important information for wayfinding was:
  - the identification of reference points and places
  - direct visual access to the common room
  - simple circulation routes
  - small-scale settings. P.82
- Marquardt and Schmiege (2009) identified three major typologies: straight circulation systems; layouts that featured one shift in direction (L-shaped circulation systems); and continuous paths around an inside courtyard. ..In straight circulation systems, residents were able to find their way better than in any layout that featured a shift in direction, such as L-shapes. Numerous shifts in direction, such as continuous paths around an inside courtyard, interfered further with residents’ wayfinding abilities...Well-supplied eat-in kitchens with large dining tables were found to have great importance for residents as spatial anchor points.”p.83

➤ **Interpretation of the Studies’ Results:**

- Difference between Elmstahl and Marquardt regarding whether floor plans designed as straight corridors interfere with residents’ wayfinding abilities may be due to the length of corridors, lighting intensity, architectural differentiation, views to the outside and other sensory stimulation.
- all of the studies identified the importance of good visual access. (particularly to one central common room). This can be attributed to the overall decline in spatial orientation: i.e the lack of a cognitive map or ability to see a route in one’s mind’s eye. Residents must orient themselves from one decision point to the next. P.85 – 86 (they cannot see or visualize around corners)
- If a change in direction is necessary, then a meaningful reference point should be incorporated: e.g. placing an eat-in kitchen or dining room at the point where direction changes in the circulation system. P.88

- ❖ Marquardt, Gesine et al, **“Association of Spatial Layout of the Home and ADL Abilities among older adults with dementia”**, Am. J. Alzheimers Disease and other Dementias, 2011. (German) **(FPL, C&L)**
  - This study investigated the relationship between architectural space layout legibility and activities of daily living among people with dementia.
    - “These results imply that enclosed rooms with a clearly legible meaning and function might be better memorized and associated with the spatial layout of the home resulting in better basic ADL performance.”p.51
    - “This means that residents who live in a home that features a high proportion of open spaces, such as circulation areas and interconnected rooms, and fewer enclosed rooms with a clearly legible meaning and function were more dependent on others with their basic activities of daily living, such as eating, dressing, using the bathroom.”p.55
    - “Options could include separating the circulation area from the living or dining room by using different flooring, rendering them very distinct from another. Using articulate colors, lighting, and, maybe decorations, might also contribute to a clearer legibility of the meaning and the function of rooms.”p.55
  
- ❖ Marquardt, Gesine, **“A Descriptive Study of Home modifications for People with Dementia and Barriers to Implementation”**, Journal of Housing for the Elderly, 2011.
  - This study describes home environmental features, safety issues and health-related modifications in community dwellings. Main physical barriers were steps inside and outside the home. Main modifications pertained to physical limitations; fewer were made to support cognitive deficits. Main barrier to the implementation of modifications was scepticism about their usefulness and financial constraints.
  
- ❖ McGilton, Katherine S. et al, **“Can we help persons with dementia find their way in a new environment”**, Aging & Mental Health, 2003. ( Toronto study) **(BI)**
  - The objective of this Canadian study was to conduct a randomized controlled trial to examine the effects of a wayfinding intervention on residents’ ability to find their way in a new environment. The study used a behaviour training technique involving rehearsal with a backward training protocol. Results indicated that residents demonstrated increased ability to find their way to the dining room.

- McGilton identified three main areas of research that describe Interventions to minimize spatial disorientation. These concepts are quite useful to organize the literature:
  - The design of the physical environment
  - The use of behavioural interventions
  - Use of landmarks “p.364

She found only two previous studies on behavioural interventions. Quotes related to her study follow:

➤ **Model:**

- “An intervention that focuses on using landmarks as environmental cues, and providing the residents’ opportunities to learn and/or relearn a routine sets of behaviors, may remediate difficulties in spatial disorientation”p.364 (rehearsals of wayfinding)

➤ **Procedure:**

- The interventionists spent 30 minutes, three times a week, for four weeks, conducting the backward chaining protocol with each of the participating residents.p.366p

➤ **Results:**

- “Residents who received the ‘way-finding intervention demonstrated a increased ability to find their way to the dining room....The drop in the agitation scores was greater for those in the experimental than the control group.”p.366-7
- “Residents who received the ‘way-finding’ intervention did not demonstrate or show an increased ability to find their way to the bedroom. (return trip)

❖ Namazi, K., et al, “**Long-term memory cuing to reduce visuo-spatial disorientation in Alzheimer’s disease patients in a special care unit**”, The American Journal of Alzheimer’s Care and Related Disorders and Research, 1991. (USA study) **(C&L)**

- This study examined whether prominently displayed memorabilia of long term significance to each resident would serve as orientation cues to help identify his or her bedroom. The results indicate that four out of 10 residents were more successful in locating their rooms with significant memorabilia items than with nonsignificant ones. Quotes follow:
  - “two display conditions were set up to test the ability of AD patients to locate their rooms: condition one, the test condition displayed what family members considered significant

items while the control condition displayed the nonsignificant items in the display cases of unoccupied rooms.

- “Results minimally show that irrespective of disease severity, cuing orientations are helpful mechanisms to support the remaining ability of AD patients to be more independent.”p.14
- “The data suggest that the further back in time the reference point, the greater the likelihood of eliciting recall. The most reliable cues, despite individual variation in content, were those linked to the residents’ own childhood years (e.g. photos from childhood years, objects from the home in which they grew up).”p.14.

❖ Namazi, Kevan and DiNatale, Beth, “**Environmental effects on incontinence problems in Alzheimer’s disease patients**”, *The American Journal of Alzheimer’s Care and Related Disorders & Research*, 1991. (USA study) **(C&L)**

- This study examined the differences in toilet use under concealed and visible conditions to determine whether visibility of the toilet is a supportive cue for AD patients. The results indicated that utilization of toilets increased when toilets were visible. Quotes follow:
  - “The study group experienced an open curtain condition when the toilet was highly visible. The control group’s curtains were secured so that the toilet was concealed from view.”p.18
  - “The results of this study indicate that the frequency of toilet use was increased when toilets were visually accessible to the residents.”p.18
  - “The increase in clean-up calls provided graphic evidence to the staff that concealed toilets were the direct cause of an increased work load.”p.20
  - “Individuals with AD may be unable to interpret what the eye sees, and therefore might be unaware of what is on the other side of a closed door. Curtains or dividers that separate the toilet area from the bedroom can offer flexibility...consideration should be given to removal of the bathroom door if it will increase direct visual accessibility of the toilet.”p.20-21.

❖ Netten, Ann, “**The effect of design of residential homes in creating dependency among confused elderly residents**” *International Journal of Geriatric Psychiatry*, vol. 4, 1989 (UK study) **(FPL, C&L)**

- This UK study of 13 homes is one of the first that looked into the design of nursing homes and residents' ability to find their way around. The study compared group homes to larger 'communally designed' nursing homes which frequently had long corridors. Netten concluded that group homes provide a more favourable design especially for physically frail demented elderly people. Quotes follow:
  - "The more doors there were on average in a corridor (a feature that generally indicated longer corridors) the more confusing a communal home...The more exit points on the route the more likely residents were to get lost."p.151
  - "If a corridor is too long they may forget where they are going by the time the next decision point is reached."p.152
  - "an unhelpful design would result when there were a lot of 'meaningless' decisions. In communal homes this would occur when there were few identifiable 'zones' and long corridors with lots of doors. In group homes this might occur when there were many short corridors within the group sections, forming a 'maze' effect."p.152
  - The most important aids to people finding their way around would appear to be the level of lighting and 'meaningful decisions' (landmarks). P.153

❖ Nolan, Beth et al, **"Using external memory aids to increase room finding by older adults with dementia"**, American Journal of Alzheimer's Disease and other Dementias, 2001. (US study) **(C&L)**

- This study examined the impact of placing two external memory aids in memory boxes outside participants' bedrooms. Results showed that a combination of a portrait-type photograph of the participant as a young adult and a sign stating the resident's name increased room finding by over 50%. Nolan notes that "This intervention involved no training or prompting from nursing staff" p.254.

❖ Nolan, Beth et al, **"Evaluation of the Effect of Orientation Cues on Wayfinding in Persons with Dementia"**, Alzheimer's Care Quarterly, 2002. (USA study) **(C&L)**

- This study, similar to her 2001 research, looked at the impact of placing a portrait-like photograph and personal memorabilia in a display case outside each participant's room. All participants showed improvement with a mean increased room finding of 45%.

- ❖ Parke, Belinda, “**Physical Design Dimension of an Elder Friendly Hospital**”, University of Victoria, Centre on Aging, Canada, 2007.
  - This paper is a literature review conducted to examine the physical design elements of a hospital’s built environment to inform the design of a new Acute Care Hospital patient building in Victoria, BC. One area discussed is how a gerontologically sensitive hospital compensates for the older person’s declining capacities. Included in this is wayfinding. One of the evidenced-based principles developed is “Wayfinding and signage with appropriate contrasting color, lettering size and font type, and other orientation cues, and “Color coding of landmarks for easy identification or as a barrier for out of bound areas depending on older patient profile. P.15-16.
  
- ❖ Parke, Belinda, and Friesen, Kathleen, “**Code Plus, Physical Design Components for an Elder Friendly Hospital**”, Fraser Health, BC.
  - This paper involved a literature review and input from users and experts. It includes a discussion of physiological changes in older persons, physical design recommendations, and a Physical Environment Design Assessment Tool.
    - Key among the recommendations is Wayfinding and Signage with emphasis on colour coding, colour contrast, maps, graphics and large fonts.
  
- ❖ Passini, Romedi et al, “**Wayfinding and Dementia: Some research findings and a new look at design**”, Journal of Architectural and Planning Research, 1998. (Canada study) **(C&L)**
  - This paper is another ground breaking study related to physical design and wayfinding for people with dementia (DAT). It observes fourteen patients and a control group as they try to reach a dental clinic in a large hospital from the closest bus stop. Results showed that most dementia patients were incapable of developing an overall plan to solve the wayfinding task and incapable of producing decisions involving memory. They were better able to make decisions based on information of explicit architectural nature. Quotes follow:
    - “The most striking result is probably DAT subjects’ difficulties for the return trip.” P.4
    - “Wayfinding design involves two distinct aspects: spatial organization and environmental communication...
    - Spatial organization... in settings catering to DAT patients should be simple. The setting, ideally, should not be large, and the solutions to the wayfinding problems posed by the spatial configuration should not necessitate decisions based on memory and decisions

based on inference. ..Patients should be able to proceed from one decision point to the next as they walk along without having to plan for future decisions.”p.6

- “Environmental communication is a major ingredient to wayfinding design...Entrances to buildings should be well-articulated and should not need to be signed...people also enter identifiable zones in the building...one may, for example, identify a recreation zone, a medical zone, an in-patients and out-patients zone. Entrances to these zones could also be created and each zone entrance could be given its appropriate display and meaning.p.6
- “A final major item in architectural communication is landmarks used as reference points. In a well-articulated environment, entrances, destination zones, and even the elements of the circulation system such as stairs or elevators can serve as reference points.”p.7
- “One of the major recommendations emerging from this research is to clean up information clutter on circulation routes.”p.7

❖ Passini, Romedi et al, “**Wayfinding in a Nursing Home for advanced dementia of the Alzheimer’s Type**”, Environment and Behavior, 2000. (Canada study) (C&L)

- The aim of this study was to generate design criteria for wayfinding for people with dementia. Staff of a typical nursing home were interviewed and residents were observed undertaking four wayfinding tasks: from their rooms to the living room; from the living room to the cafeteria (using elevator); from the cafeteria to the recreation room; from the recreation room back to their own rooms (using elevator) Quotes follow.
  - “Problems are evident when having to find their rooms and when having to distinguish one wing of the layout from the other.”p.693
  - “When lost, patients exhibit a variety of behaviors expressing anxiety, confusion, and even panic.”p.694
  - “The task of returning to their personal rooms... are among the least successful”p.694
  - “Monotony in architectural composition leading to repetitive environments, even if they are simple, render wayfinding more difficult. Labyrinths are disorienting because of their repeated sameness.”p.695-6

- “The setting should be designed so that it offers visual access to its major spaces and functions, so that patients who have lost their cognitive mapping abilities can obtain the information to make their wayfinding decisions.”p.697
- “Reference points are distinctive elements in the environment that are remembered or recognized. They have a major function in wayfinding and special orientation. They act as anchor points...The characteristics of a reference point are essentially to be distinctive from other elements by form, by function, and if possible also by meaning. (to the resident)”p.698
- “With respect to Alzheimer’s, wayfinding problems should be simplified by creating small-scaled settings with simple but not monotonous circulation routes that allow for a variety of experiences.”p.706
- “Given the patients’ sequential style of wayfinding, information to allow for recognition of places and reference points is particularly important.”p.707

❖ Pinet, Celine, “**Distance and the Use of Social Space by Nursing Home Residents**”, Journal of Interior Design, 1999. (FPL)

- This study focuses on how far and under what circumstances nursing home residents walk to access social spaces within the home. A particular result was that the shorter the distance the greater the use of social spaces. Quotes follow:
  - “Social spaces closest to residents’ bedrooms were used significantly more often by residents than spaces that were farther away.”p.6
  - “In nursing homes such as those sampled, a space 20 feet away would be used five times as often as a space 100 feet away.”p.12

❖ Provdencher, Veronique et al, “**Errorless-based techniques can improve route finding in early Alzheimer’s disease: a case study**”, American Journal of Alzheimer’s Disease & Other Dementias, 2008. (Canada study) (BI)

- This study looked at using error-less based techniques to help patients learn routes. A 77 year old woman with dementia was helped to learn routes using an errorless-based technique. Training involved systematically correcting the participant just before going the wrong way, then the participant was asked to go backward a short distance from the target location and then to advance forward to the target location. Distance was increased on subsequent trials



until the whole route could be completed forward. Analyses showed significant improvement only for the routes learned with errorless-based techniques.

❖ Sheehan, Bart et al, **“Outdoor wayfinding in dementia”**, Dementia, 2006

- This study is a controlled observation of outdoor wayfinding performance of people with dementia. It examines which features of the outdoor environment are used in wayfinding: i.e. landmarks. It found that people with dementia performed worse on wayfinding, particularly on the return home part of outings.

❖ **Stirling University Virtual Care Home** <http://dementia.stir.ac.uk/virtualhome> (UK graphics) (C&L)

- This interactive website illustrates many useful cues.



❖ Timlin, Gregor and Rysenbry, Nic, **“Design for Dementia”**, Helen Hamlyn Centre for Design, 2010. (UK) (C&L)

➤ This paper discusses ways to improve Dining and Bedroom environments for Care Homes. There is a good discussion of open plan multi-purpose amenity area vs single function rooms:

- “In open plan, multi-use areas it is very difficult to offer effective information about what activity is taking place...residents can become confused...noise levels and visual stimuli cannot be controlled....every room should communicate to residents using non-verbal messages that take advantage of all their remaining senses”p.39.
- “creating rooms full of the objects that are typical of such spaces will visually remind residents what each area is used for offering the best chance for them to orientate themselves within the environment. Good orientation allows people to find places on their own and reduces their dependency on staff having to remind them of their destination.”p.39

➤ There are also good ideas to differentiate bedroom entrances:

- “The point at which access is usually made into private rooms, however, tends to be generic with different characteristics such as nametags, memory boxes and door treatments repeated for each bedroom. This repetition can be confusing and disorienting for residents who have mobility or memory problems, affecting their ability to navigate their environment.”p.76
- “One way to improve way finding is to create ‘landmarks’ in certain places throughout the hallway. Personalising this area on a case-by-case basis...Such personalization techniques go part of the way to developing unique street like entrances to private rooms within the care ...The transition from public to private space in care homes can be informed by the visual elements of commonly understood entrance areas. Mailboxes, trip-proof doormats and proper entrance lighting are relevant here.”p.76
- “The door currently marks biggest boundary between private and communal space. But it can be improved by creating a language reminiscent of ‘front doors’, so that residents understand that this is not a door to another room, but a door to another home. This can be done by using old-style doors in a different style to internal doors within the care facility.”p.77

❖ Van Hoof, J. et al, “**Environmental Interventions and the Design of Homes for Older Adults with Dementia**”, American Journal of Alzheimer’s Disease & Other Dementias, 2010. (NL)  
(C&L)

- This article uses a literature review and focus groups to provide an overview of existing design principles and environmental interventions for persons with dementia living in their own home. It has a good overview table of Design Principles which includes several references to wayfinding such as promoting recollection, serving as a cue to memory, supporting reality orientation, be familiar, and be legible (furniture, fixtures, fittings).
  - “The creation of safe and secure, simple, well-structured, and familiar environments that provide cues and privacy to residents. Such environments should allow residents to see everything in the dwelling, provide a décor that would have been familiar to the residents in their early adulthood” p.207
- There is also a table on Environmental Interventions to Support Toileting:
  - “Visual cues: Red light at restroom door; colored line on floor leading to restroom. Put (picture) sign on the door, Leave access door open to enhance visibility, remove toilet lid, colored toilet seat.”p.208
- Table 9 has Environmental Interventions to Improve Safety and includes Wandering:
  - Remove doors or keep them open
  - Accentuate doors of bedroom, bathroom
  - Simplify the environment, keep familiar objects in the same place.p.220-222

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**PUBLICATIONS:**

“Are facility design standards short-changing LTC residents?” Canadian Nursing Home, Oct., 2008

“Advantages of ‘Small House’ designs in dementia care” Canadian Nursing Home, March 2012

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