

DEMENTIA TRAINING AUSTRALIA

# ENVIRONMENTAL DESIGN RESOURCES

RICHARD FLEMING  
KIRSTY A BENNETT

February 2017



Dementia Training Australia



DESIGNING FOR PEOPLE  
WITH DEMENTIA

The copyright of the material in this handbook is held by the University of Wollongong (unless otherwise stated) and all rights are reserved. Cover photographs © Cathy Greenblat 2013. All rights reserved.

The authors would like to thank: Terri Preece for her diligent editorial support; Illawarra Retirement Trust for providing support to Prof. Richard Fleming in the development of these Environmental Design Resources; Cathy Greenblat for the cover photographs which illustrate the positive ways people with dementia live their lives.



DEMENTIA  
TRAINING AUSTRALIA  
**ENVIRONMENTAL  
DESIGN RESOURCES**

**RICHARD FLEMING  
KIRSTY A BENNETT**

February 2017



# DEMENTIA TRAINING AUSTRALIA

# ENVIRONMENTAL

# DESIGN RESOURCES

## TABLE OF CONTENTS

### Introduction

### Resource 1: Using the built environment to create comprehensible, manageable and meaningful environments for people with dementia

<b>PART 1</b>	<b>Dementia: its prevalence and impact</b> .....	1
1.1	<b>Introduction</b> .....	2
1.2	<b>People with dementia in residential aged care</b> .....	4
1.3	<b>People with dementia in hospitals</b> .....	5
1.4	<b>People with dementia in the community</b> .....	6
<b>PART 2</b>	<b>A review of the literature on environmental design for people with dementia</b> .....	9
2.1	<b>Unobtrusively reduce risks</b> .....	10
2.1.1	Falls prevention.....	12
2.1.2	Over emphasis on safety.....	13
2.2	<b>Provide a human scale</b> .....	14
2.2.1	Number of places (beds) in the facility.....	14
2.2.2	Physical size of the facility.....	17
2.2.3	Social density.....	17
2.3	<b>Allow people to see and be seen</b> .....	18
2.3.1	Wayfinding.....	19
2.3.2	Benefits for staff.....	19
2.4	<b>Reduce unhelpful stimulation</b> .....	19
2.4.1	Over-stimulating entry doors.....	20
2.4.2	Noise and temperature.....	21
2.5	<b>Optimise helpful stimulation</b> .....	21
2.5.1	Signage.....	22
2.5.2	Using familiar objects.....	23
2.5.3	Contrast.....	24
2.5.4	Good illumination.....	24
2.6	<b>Support movement and engagement</b> .....	27
2.6.1	Access to nature.....	27
2.6.2	The role of staff in facilitating the use of the garden.....	27
2.6.3	Opportunities for engagement.....	28
2.7	<b>Create a familiar place</b> .....	29
2.7.1	Technology.....	29
2.7.2	Cultural differences.....	29

<b>2.8</b>	<b>Provide a variety of places to be alone or with others in the unit</b> .....	29
2.8.1	Single rooms.....	31
2.8.2	Variety of spaces in hospitals.....	31
<b>2.9</b>	<b>Provide a variety of places to be alone or with others in the community</b> .....	31
2.9.1	Links to the community in hospitals.....	32
<b>2.10</b>	<b>Design in response to vision for way of life</b> .....	32
2.10.1	Domestic or homelike environments.....	33
<b>2.11</b>	<b>Summary</b> .....	38
<b>PART 3</b>	<b>References</b> .....	41

**Resource 2: Applying the key design principles in environments for people with dementia**

<b>PART 1</b>	<b>Key Design Principles</b> .....	49
<b>PART 2</b>	<b>Principles not checklist</b> .....	53
<b>PART 3</b>	<b>Assessment Tools</b> .....	57
<b>3.1</b>	<b>Selection of an Assessment Tool</b> .....	58
<b>3.2</b>	<b>Available Assessment Tools</b> .....	60
<b>PART 4</b>	<b>Using the EAT family of tools</b> .....	63
<b>4.1</b>	<b>Consultation</b> .....	64
<b>4.2</b>	<b>Listening</b> .....	65
<b>4.3</b>	<b>Priorities</b> .....	65
<b>PART 5</b>	<b>Stepping through the conversation</b> .....	67
<b>PART 6</b>	<b>Case studies</b> .....	75
<b>6.1</b>	<b>Working on the plans</b> .....	76
	Murray House, Wentworth	
<b>6.2</b>	<b>Working on an existing building</b> .....	82
	Melaleuca Glengowrie Blue Cross	
<b>6.3</b>	<b>Working on an existing building</b> .....	95
	Flametree Illawarra Retirement Trust	
<b>6.4</b>	<b>Working on an existing building</b> .....	106
	Multi Purpose Service Oberon	
<b>6.5</b>	<b>Planning a culturally appropriate place</b> .....	119
	Tjilpiku Pampaku Ngura	
<b>APPENDIX 1</b>	<b>Planning Template</b> .....	127

**Resource 3: Environmental Assessment Tool (EAT) Handbook**

<b>PART 1</b>	<b>Key Design Principles</b> .....	131
<b>PART 2</b>	<b>Environmental Assessment Tool</b> .....	135
<b>PART 3</b>	<b>Using the Spreadsheet</b> .....	139
<b>PART 4</b>	<b>Applying the Principles</b> .....	145
<b>APPENDIX 1</b>	<b>Environmental Assessment Tool</b> .....	185
<b>APPENDIX 2</b>	<b>Planning Template</b> .....	193

**Resource 4: Environmental Assessment Tool - Higher Care (EAT-HC) Handbook**

<b>PART 1</b>	<b>Key Design Principles</b> .....	197
<b>PART 2</b>	<b>Environmental Assessment Tool - Higher Care</b> .....	201
<b>PART 3</b>	<b>Using the Spreadsheet</b> .....	205
<b>PART 4</b>	<b>Applying the Principles</b> .....	211
<b>APPENDIX 1</b>	<b>Environmental Assessment Tool - Higher Care</b> .....	257
<b>APPENDIX 2</b>	<b>Planning Template</b> .....	271

**Resource 5: Dementia Friendly Community - Environmental Assessment Tool (DFC-EAT) Handbook**

<b>PART 1</b>	<b>Key Design Principles</b> .....	275
<b>PART 2</b>	<b>Dementia Friendly Community - Environmental Assessment Tool</b> ..	279
<b>PART 3</b>	<b>Using the Spreadsheet</b> .....	283
<b>APPENDIX 1</b>	<b>Dementia Friendly Community - Environmental Assessment Tool</b> ..	287
<b>APPENDIX 2</b>	<b>Planning Template</b> .....	291

**Resource 6: Indigenous Aged Care Design Guide**

<b>PART 1</b>	<b>INTRODUCTION AND BACKGROUND</b> .....	295
	<b>Who will use the Guide?</b> .....	296
	<b>Planning a residential aged care facility</b> .....	297
	<b>Creating an Enabling Environment - Accessibility</b> .....	297
	<b>Why this is a design guide and not an operational manual</b> .....	297
	<b>How the operation of the facility will influence design</b> .....	298
	<b>Role of staff</b> .....	298
	<b>Staff needs vs resident needs</b> .....	298
	<b>Staff areas</b> .....	299
	<b>Compliance</b> .....	299

- PART 2 HOW TO USE THE GUIDE** .....301
  - The 10 Key Design Principles**.....301
  - The Indigenous Environmental Assessment Tool** .....306
  - Building Services Survey Sheets** .....311
  
- PART 3 THE 10 DESIGN PRINCIPLES IN DETAIL**.....313
  - 1 Unobtrusively Reducing Risk** .....313
  - 2 Focusing on the Small Scale** .....339
  - 3 Seeing and Being Seen** .....345
  - 4 Hiding Unimportant Things**.....363
  - 5 Emphasising Important Things**.....373
  - 6 Moving About and Engaging** .....385
  - 7 Creating a Recognisable and Meaningful Place**.....399
  - 8 Choosing to be on Your Own or With Others**.....407
  - 9 Being Part of the Community** .....417
  - 10 Doing What You Want to Do** .....421
  
- APPENDIX 1 Indigenous Environmental Assessment Tool (sheets to be copied)**.....441
- APPENDIX 2 Staff and support areas**.....457
- APPENDIX 3 Electrical Safety**.....466



# INTRODUCTION

The goal of this collection of resources is to support those who wish to improve environments for people with dementia. The resources introduce the reader to a systematic way of looking at the built environment and provide a number of tools that guide the user to an understanding of what needs to be changed, and how the change might be accomplished.

To create a supportive environment for people living with dementia, the environment and philosophy of care / operation philosophy need to complement each other. Despite the best efforts of staff, the physical environment sets a limit to what can be achieved in the support of people with dementia – particularly people who are mobile. A good environment can, almost by itself, reduce confusion and agitation, improve wayfinding and encourage social interaction. On the other hand, a poor environment increases confusion and behaviour that causes distress to people with dementia and others and will eventually reduce staff to a state of helplessness, in which they feel that nothing can be done. The effects of a well-designed environment on people with dementia are summarised in Table 1 below.

**Table 1: Effects of a well-designed environment on people with dementia**

Improvements in:-	Reductions in:-
<ul style="list-style-type: none"> <li>• Wayfinding</li> <li>• Eating behaviour</li> <li>• Motor functions</li> <li>• Activities of daily living</li> <li>• Self-help skills</li> <li>• Mobility</li> <li>• Pleasure</li> <li>• Use of toilet</li> <li>• Vitality</li> <li>• Interaction between staff and residents/patients</li> <li>• Independence in dressing</li> <li>• Ease of supervision</li> <li>• Likelihood of residents/patients making friends with one another</li> <li>• Quality of life</li> </ul>	<ul style="list-style-type: none"> <li>• Agitation</li> <li>• Anxiety</li> <li>• Conflict</li> <li>• Confusion</li> <li>• Depression</li> <li>• Dyspraxia</li> <li>• Emotional disturbance</li> <li>• Number of falls</li> <li>• Restlessness</li> <li>• Stress associated with bathing</li> <li>• Amount of physical help required</li> <li>• Time spent by staff locating and monitoring patients/residents</li> <li>• Number of attempts to leave</li> <li>• Doses of antibiotics and psychotropic drugs</li> <li>• Wandering into other people's spaces</li> </ul>

The first resource reviews the context in which the environments are operating and the literature on the design of aged and health care buildings used by people with dementia. It is intended to inform the reader about aspects of design that have proven to be effective in assisting people with dementia, and to help the reader to assess the strength of the evidence so that decisions on the modification of environments can be based on the best available evidence.

The second resource is an introduction to the use of assessment tools to identify the strengths and weaknesses of the environment. This is intended to help the reader select an appropriate tool and to apply it to inform decisions on modifying the environment.

The third, fourth and fifth resources are environmental assessment tools that have been developed for various purposes; specifically the assessment of environments where most people are mobile, higher care environments where people may or may not be mobile, and public and commercial buildings.

The sixth resource is an aged care design guide for Indigenous people.

# **USING THE BUILT ENVIRONMENT TO CREATE COMPREHENSIBLE MANAGEABLE AND MEANINGFUL ENVIRONMENTS**

## **FOR PEOPLE WITH DEMENTIA**

**RICHARD FLEMING  
KIRSTY A BENNETT**

### **RESOURCE 1**

**Environmental  
Design Resources**

**February 2017**



Dementia Training Australia



**DESIGNING FOR PEOPLE  
WITH DEMENTIA**

The copyright of the material in this handbook is held by the University of Wollongong (unless otherwise stated) and all rights are reserved. Cover photographs © Cathy Greenblat 2013. All rights reserved.

The authors would like to thank: Terri Preece for her diligent editorial support; Illawarra Retirement Trust for providing support to Prof. Richard Fleming in the development of these Environmental Design Resources; Cathy Greenblat for the cover photographs which illustrate the positive ways people with dementia live their lives.



# **USING THE BUILT ENVIRONMENT TO CREATE COMPREHENSIBLE MANAGEABLE AND MEANINGFUL ENVIRONMENTS FOR PEOPLE WITH DEMENTIA**

**RICHARD FLEMING  
KIRSTY A BENNETT**

## **RESOURCE 1**

**Environmental Design Resources**

February 2017

This resource is No 1 in a set of six Environmental Design Resources.



# DEMENTIA TRAINING AUSTRALIA

# ENVIRONMENTAL

# DESIGN RESOURCES

## TABLE OF CONTENTS

### Introduction

### Resource 1: Using the built environment to create comprehensible, manageable and meaningful environments for people with dementia

<b>PART 1</b>	<b>Dementia: its prevalence and impact</b> .....	1
1.1	Introduction.....	2
1.2	People with dementia in residential aged care.....	4
1.3	People with dementia in hospitals.....	5
1.4	People with dementia in the community.....	6
<b>PART 2</b>	<b>A review of the literature on environmental design for people with dementia</b> .....	9
2.1	<b>Unobtrusively reduce risks</b> .....	10
2.1.1	Falls prevention.....	12
2.1.2	Over emphasis on safety.....	13
2.2	<b>Provide a human scale</b> .....	14
2.2.1	Number of places (beds) in the facility.....	14
2.2.2	Physical size of the facility.....	17
2.2.3	Social density.....	17
2.3	<b>Allow people to see and be seen</b> .....	18
2.3.1	Wayfinding.....	19
2.3.2	Benefits for staff.....	19
2.4	<b>Reduce unhelpful stimulation</b> .....	19
2.4.1	Over-stimulating entry doors.....	20
2.4.2	Noise and temperature.....	21
2.5	<b>Optimise helpful stimulation</b> .....	21
2.5.1	Signage.....	22
2.5.2	Using familiar objects.....	23
2.5.3	Contrast.....	24
2.5.4	Good illumination.....	24
2.6	<b>Support movement and engagement</b> .....	27
2.6.1	Access to nature.....	27
2.6.2	The role of staff in facilitating the use of the garden.....	27
2.6.3	Opportunities for engagement.....	28
2.7	<b>Create a familiar place</b> .....	29
2.7.1	Technology.....	29
2.7.2	Cultural differences.....	29

<b>2.8</b>	<b>Provide a variety of places to be alone or with others in the unit</b> .....	29
2.8.1	Single rooms.....	31
2.8.2	Variety of spaces in hospitals.....	31
<b>2.9</b>	<b>Provide a variety of places to be alone or with others in the community</b> .....	31
2.9.1	Links to the community in hospitals.....	32
<b>2.10</b>	<b>Design in response to vision for way of life</b> .....	32
2.10.1	Domestic or homelike environments.....	33
<b>2.11</b>	<b>Summary</b> .....	38
<b>PART 3</b>	<b>References</b> .....	41

**Resource 2: Applying the key design principles in environments for people with dementia**

<b>PART 1</b>	<b>Key Design Principles</b> .....	49
<b>PART 2</b>	<b>Principles not checklist</b> .....	53
<b>PART 3</b>	<b>Assessment Tools</b> .....	57
3.1	<b>Selection of an Assessment Tool</b> .....	58
3.2	<b>Available Assessment Tools</b> .....	60
<b>PART 4</b>	<b>Using the EAT family of tools</b> .....	63
4.1	<b>Consultation</b> .....	64
4.2	<b>Listening</b> .....	65
4.3	<b>Priorities</b> .....	65
<b>PART 5</b>	<b>Stepping through the conversation</b> .....	67
<b>PART 6</b>	<b>Case studies</b> .....	75
6.1	<b>Working on the plans</b> ..... Murray House, Wentworth	76
6.2	<b>Working on an existing building</b> ..... Melaleuca Glengowrie Blue Cross	82
6.3	<b>Working on an existing building</b> ..... Flametree Illawarra Retirement Trust	95
6.4	<b>Working on an existing building</b> ..... Multi Purpose Service Oberon	106
6.5	<b>Planning a culturally appropriate place</b> ..... Tjilpiku Pampaku Ngura	119
<b>APPENDIX 1</b>	<b>Planning Template</b> .....	127



**Resource 3: Environmental Assessment Tool (EAT) Handbook**

<b>PART 1</b>	<b>Key Design Principles</b> .....	131
<b>PART 2</b>	<b>Environmental Assessment Tool</b> .....	135
<b>PART 3</b>	<b>Using the Spreadsheet</b> .....	139
<b>PART 4</b>	<b>Applying the Principles</b> .....	145
<b>APPENDIX 1</b>	<b>Environmental Assessment Tool</b> .....	185
<b>APPENDIX 2</b>	<b>Planning Template</b> .....	193

**Resource 4: Environmental Assessment Tool - Higher Care (EAT-HC) Handbook**

<b>PART 1</b>	<b>Key Design Principles</b> .....	197
<b>PART 2</b>	<b>Environmental Assessment Tool - Higher Care</b> .....	201
<b>PART 3</b>	<b>Using the Spreadsheet</b> .....	205
<b>PART 4</b>	<b>Applying the Principles</b> .....	211
<b>APPENDIX 1</b>	<b>Environmental Assessment Tool - Higher Care</b> .....	257
<b>APPENDIX 2</b>	<b>Planning Template</b> .....	271

**Resource 5: Dementia Friendly Community - Environmental Assessment Tool (DFC-EAT) Handbook**

<b>PART 1</b>	<b>Key Design Principles</b> .....	275
<b>PART 2</b>	<b>Dementia Friendly Community - Environmental Assessment Tool</b> ..	279
<b>PART 3</b>	<b>Using the Spreadsheet</b> .....	283
<b>APPENDIX 1</b>	<b>Dementia Friendly Community - Environmental Assessment Tool</b> ..	287
<b>APPENDIX 2</b>	<b>Planning Template</b> .....	291

**Resource 6: Indigenous Aged Care Design Guide**

<b>PART 1</b>	<b>INTRODUCTION AND BACKGROUND</b> .....	295
	<b>Who will use the Guide?</b> .....	296
	<b>Planning a residential aged care facility</b> .....	297
	<b>Creating an Enabling Environment - Accessibility</b> .....	297
	<b>Why this is a design guide and not an operational manual</b> .....	297
	<b>How the operation of the facility will influence design</b> .....	298
	<b>Role of staff</b> .....	298
	<b>Staff needs vs resident needs</b> .....	298
	<b>Staff areas</b> .....	299
	<b>Compliance</b> .....	299

- PART 2 HOW TO USE THE GUIDE .....301**
  - The 10 Key Design Principles.....301
  - The Indigenous Environmental Assessment Tool .....306
  - Building Services Survey Sheets .....311
  
- PART 3 THE 10 DESIGN PRINCIPLES IN DETAIL.....313**
  - 1 Unobtrusively Reducing Risk .....313**
  - 2 Focusing on the Small Scale .....339**
  - 3 Seeing and Being Seen .....345**
  - 4 Hiding Unimportant Things .....363**
  - 5 Emphasising Important Things .....373**
  - 6 Moving About and Engaging .....385**
  - 7 Creating a Recognisable and Meaningful Place.....399**
  - 8 Choosing to be on Your Own or With Others.....407**
  - 9 Being Part of the Community .....417**
  - 10 Doing What You Want to Do .....421**
  
- APPENDIX 1 Indigenous Environmental Assessment Tool  
(sheets to be copied).....441**
- APPENDIX 2 Staff and support areas .....457**
- APPENDIX 3 Electrical Safety .....466**

## **RESOURCE 1**

**Using the built environment to create comprehensible, manageable and meaningful environments for people with dementia**

# **PART 1** **DEMENTIA: ITS PREVALENCE AND IMPACT**

# PART 1

## DEMENTIA: ITS PREVALENCE AND IMPACT

### 1.1 Introduction

Dementia is an umbrella term for a large number of disorders that affect thinking and memory. Alzheimer's Disease is the most common form and accounts for between 50 and 70 per cent of dementias. The second most common form of dementia, resulting from small strokes, is Vascular Dementia. Other types of dementia include Lewy Body Dementia and Frontotemporal dementia.

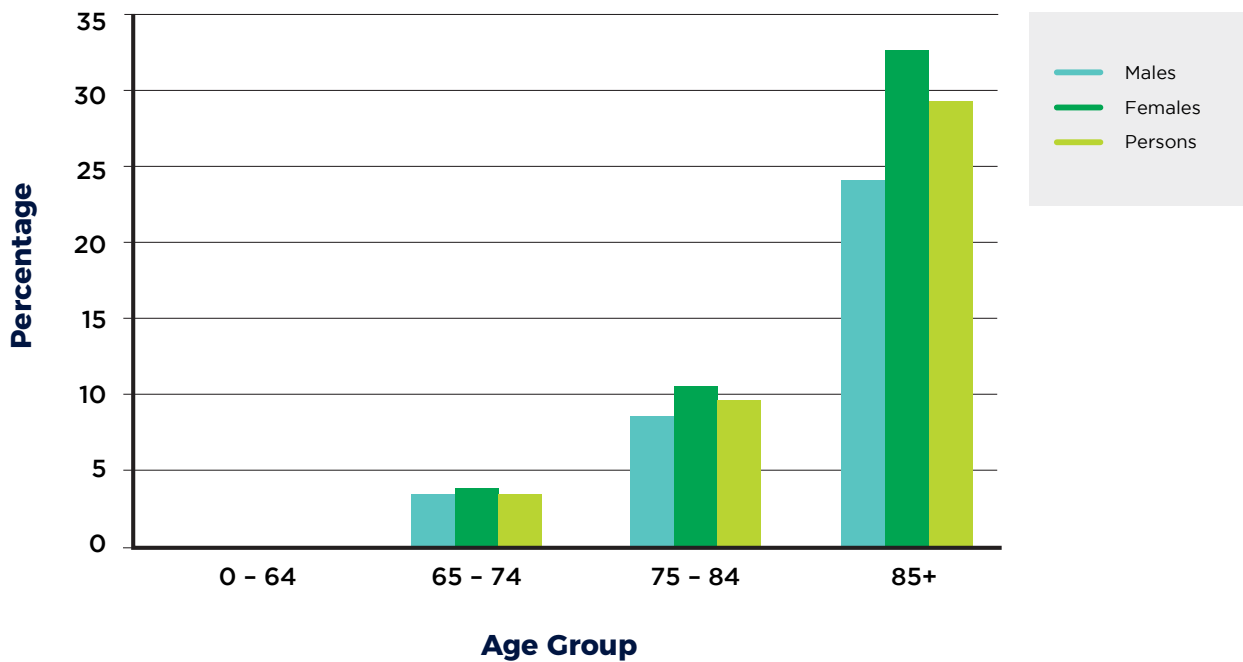
The most common symptoms of dementia are:-

- Progressive and frequent memory loss
- Confusion
- Personality change
- Apathy and withdrawal
- Loss of ability to perform everyday tasks

Some people with dementia also behave in ways which are often experienced by their carers, professional and family, as challenging or disturbed. These behaviours have been the focus of a great deal of attention in the scientific literature, where they have been described as Behavioural and Psychological Symptoms of Dementia (BPSD). While the levels of cognitive impairment and the problems with activities of daily living increase as the dementia progresses, the prevalence of behavioural and psychological symptoms (with the exception of passivity) tends to peak in the middle stages (Lövhelm, Sandman et al. 2008). It is very important to understand that these symptoms may be due to the circumstances of the person with dementia rather than the dementia itself. Indeed there is considerable controversy over the use of the term BPSD as it tends to imply a medical, or disease, origin for behaviour that may be better understood as a way of communicating unmet needs (Keady and Jones 2010).

Dementia is predominantly a condition found in older people with its prevalence increasing steadily as age advances. It has been estimated that the prevalence doubles every 5.1 years after the age of 65 (Jorm, Korten et al. 1987) as illustrated in Figure 1. The median survival from initial diagnosis has been estimated as 4.2 years for men and 5.7 years for women (Larson, Marie-Florence et al. 2004). However, this is likely to change as services improve and diagnosis takes place earlier.

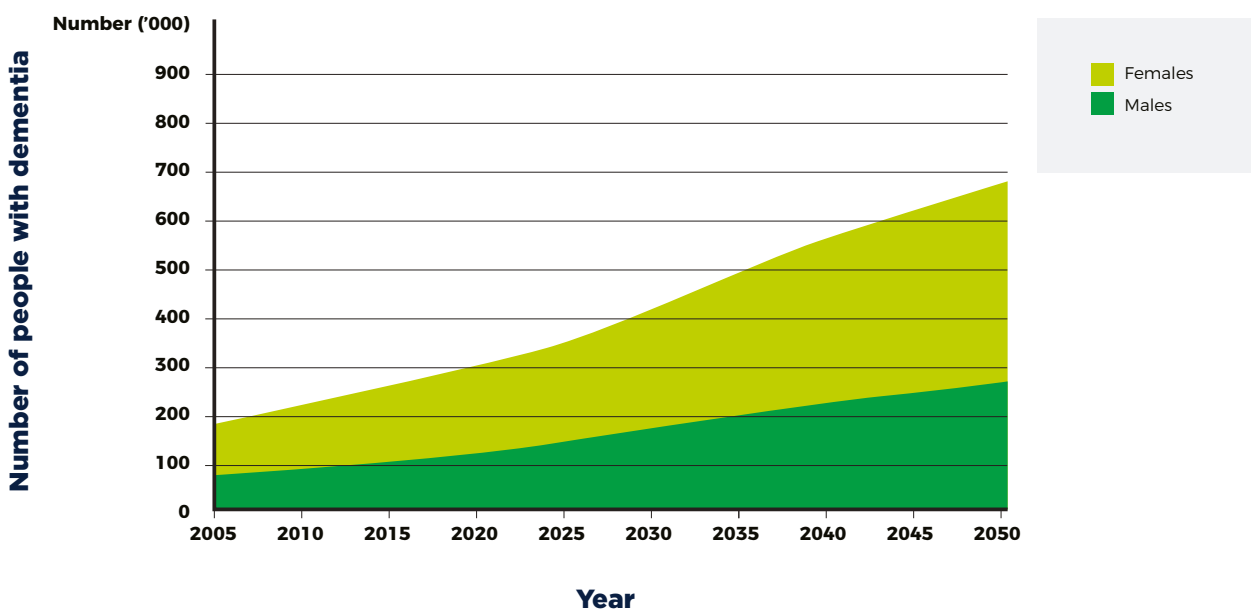
**Figure 1: Percentage of older people with dementia**



Source: Australian Institute of Health and Welfare (AIHW) (2012). Dementia in Australia. Canberra, Table 2.1

Mainly as the result of people living longer, the proportion of older people in Australia is increasing. As 1 in 10 people over 65 and 3 in 10 people over 85 have dementia, the number of people with dementia in Australia is increasing as the population ages. Figure 2 illustrates the estimates that 342,800 Australians had dementia in 2015 and that the number of people with dementia will reach almost 400,000 by 2020, and around 900,000 by 2050.

**Figure 2 : Estimated number of people with dementia, by sex, 2005-2050**



Source: Australian Institute of Health and Welfare (AIHW); Dementia in Australia, catalogue No. AGE 70, 2012, p.18.

This phenomenon is often referred to in the popular press as an ‘epidemic’ of dementia. This is somewhat misleading as dementia is not an infectious disease. The increasing number of people with dementia is due to the increasing number of older people, rather than an increase in prevalence. The use of the word epidemic is unhelpful as it fosters a sense of fear. This may be an obstacle to the development of plans that will enable people with dementia to access the services and resources they need to lead a full life without being stigmatised.

## 1.2 People with dementia in residential aged care

More than 112,000 people with dementia are living in residential aged care in Australia and the demand for places is increasing at 4% per year (AIHW 2012). This means that if we wish to continue providing residential care for people with dementia at the current rate, we need to build almost 400 new places per month. Every developed and developing country in the world is facing the same issue.

Information on whether people have a diagnosis of dementia in residential aged care facilities (RACF) is collected through the Aged Care Funding Instrument (ACFI) which is completed on all Australian Government subsidised RACF residents in Australia. The ACFI provides information on care needs in three domains: Activities of daily living (ADL), Behaviour (BEH) characteristics, and Complex Health Care needs. The AIHW report (AIHW 2012) provides a detailed comparison of the care needs of residents with and without dementia. Residents with dementia are more likely than those without dementia to have been rated with higher care needs in the ADL and the BEH domains, but not in the CHC domain (AIHW 2012). Just over half (52%) of permanent residents with dementia had a ‘high’ rating in the ‘ADL domain’ compared with about a third (32%) of those without dementia. At the other end of the scale, 19% of those with dementia had a rating of ‘low’ or ‘nil’; this compares with 41% of those without dementia. About 62% of residents with dementia had the highest possible rating in the ‘Behaviour characteristics’ domain. This is almost three times higher than the proportion of other residents given this rating (22%). Relatively few (3%) of those with dementia had a rating of ‘nil’ for this domain, while 21% of those without dementia did so (Fig 3.7, AIHW 2012).

The AIHW report breaks down the Behavioural characteristics into the categories of problematic verbal, physical behaviour and wandering. More than half (55%) of residents with dementia exhibited problematic verbal behaviour twice a day or more, at least 6 days a week. Problematic verbal behaviour is considered to be: verbal refusal of care, being verbally disruptive, having paranoid ideation that disturbs others, and inappropriate verbal sexual advances. An additional 14% of residents with dementia exhibited such behaviour once a day at least 6 days a week (A3.14, AIHW 2012). By comparison, 35% of those without dementia exhibited problematic verbal behaviour twice a day or more, at least 6 days a week.

Half of all residents with dementia exhibited problematic physical behaviour (that is, physically threatening or harmful behaviour, socially inappropriate physical behaviour and constant physical agitation) twice a day or more, at least 6 days a week. This is twice the proportion of those without dementia exhibiting such behaviours with the same level of frequency.

In terms of wandering behaviour, the ACFI provides information on

repeated attempts to enter areas where his/her presence is 'unwelcome' or 'inappropriate', and interfering with or disturbing other people or their belongings while wandering. About one quarter (27%) of residents with dementia displayed this behaviour twice a day or more, at least 6 days a week, compared with 8% of residents without dementia.

Given the emerging understanding of BPSD as a means of communicating unmet needs, the high prevalence of disturbed behaviour must raise concerns about the nature and quality of care being provided to people with dementia in residential aged care. As the literature review which follows will demonstrate, the built environment provides an effective way of facilitating the meeting of needs. It is therefore very important that staff, managers, architects, designers and policy makers understand the importance of getting the built environment right. If they don't there will be many more dysfunctional buildings built, residents will not enjoy the quality of life that can be made available to them, and staff will continue to struggle to deliver high quality care.

### 1.3 People with dementia in hospitals

People with dementia are major users of hospital services, largely due to the fact that dementia commonly occurs in older people and older people are likely to have health conditions that require medical attention. Common reasons for hospitalisation of people with dementia include hip fractures and other injuries, lower respiratory tract infections, urinary tract infections and delirium (Draper, Karmel et al. 2011).

The design of hospitals and the focus on the treatment of physical conditions can pose risks to the person with dementia. People with dementia can find it hard to understand what they are required to do to enable treatment or to communicate their needs. The often noisy and unfamiliar hospital environment can exacerbate these problems by causing confusion and distress, leading to disruptive behaviour that is difficult for staff to manage. As a result, providing treatment to people with dementia in a busy hospital ward can be challenging and sometimes leads to unintended consequence such as physical and cognitive functional decline, under-nutrition, skin tears and fall-related injuries (Harrington 1998; Bergsland 2002; Marshall 2005; Draper, Karmel et al. 2011).

The complex needs of people with dementia and the difficulties with communication and cooperation with treatment can lead to a delay in their recovery and longer lengths of stay, increasing the risk of complications and impairing the patient's physical and mental state (Draper, Karmel et al. 2011). In New South Wales people with dementia stay in hospital almost twice as long as those without dementia, averaging 16.4 days of care compared with 8.9 days for other patients (Draper, Karmel et al. 2011; AIHW 2013). Looking at Australia as a whole, the average length of stay of people with a principle diagnosis of dementia who are admitted overnight is 22 days against the average for all hospitalisations involving an overnight stay of 6 days (AIHW 2012).

The average costs of hospital care for people with dementia are higher than for people without dementia. In 2006/7 the average cost per admission of people with a principal diagnosis of dementia was \$13,434 per episode compared with \$5,010 for people without dementia, a difference of \$8,424. In other words, the average cost of hospitalisation for a person with a principle diagnosis of dementia is almost 2.7 times more than for a person without

dementia. The total cost of care for people with dementia in New South Wales public hospitals was estimated to be \$462.9 million, of which 35% (\$162.5 million) is estimated to be additional costs that might be associated with a patient's dementia status (AIHW 2013).

While the causes of the complications and increased length of stay are multifactorial and benefit from multifactorial responses (Harris, McBride et al. 2002; Naue and Kroll 2011; Sabat, Johnson et al. 2011), it is becoming increasingly accepted that the modification of the built environment (or preferably, the original design of the built environment) has an important place in responding to this unsatisfactory situation:

“Improved hospital design and dementia-friendly environments are needed to meet the specific needs of people with dementia. Poorly designed hospital wards contribute to greater confusion and stress for the patient, as well as an increased risk of falls and adverse events.

... I just believe though that no matter how much education (of staff)—although that helps and it will have an impact—and in certain places and depending on the patient, will help—but the environment has the ultimate impact, and if it's not a suitable environment for these types of patients and there's unsuitable mix, and the quantity of these people you're putting together is quite a lot—I think even with the education that it can still be very, very challenging and difficult to manage them safely and effectively. (Nurse Unit Manager, HDS site hospital)”

(AIHW 2013) Page 74.

## 1.4 People with dementia in the community

Approximately 70% of people with dementia live in the community and there is a great deal of effort being put into the development of services that will enable them to stay there (Elliott). However, we do not yet know much about their needs, particularly the 11.9% of people with dementia who live by themselves (AIHW 2012). We do know that people with dementia in the community, and/or their carers, are reluctant to access respite care (Phillipson, Magee et al. 2013) and that both respite and day care have unintended negative consequences, such as accelerating the progression to a nursing home (Vandepitte, Van Den Noortgate et al. 2016). It is possible that improving the design of respite and day care facilities may lead to an increase in their acceptability to consumers and an improvement in the outcomes from their service.

Recently there has been a recognition that delivering services in the home, or providing access to day or respite care is not all that is needed. These services, indeed even the way in which we regard the provision of services, need to be seen through the lens of creating a Dementia Friendly Community (Alzheimer's Australia 2014). There is an emerging body of literature on the design of dementia friendly communities. This work has been led by Mitchell and Burton and their colleagues (Mitchell, Burton et al. 2003; Mitchell, Burton et al. 2004; Mitchell and Burton 2010; Burton 2012). Their work has resulted in a clear statement of the desirable aspects of the streetscape of a dementia friendly community described in relation to six principles (Mitchell and Burton 2010):

### **Familiarity**

Familiar surroundings enable people to recognise and understand their surroundings, which helps to prevent and alleviate spatial disorientation and confusion and to aid short-term memory



**Legibility**

People can understand where they are and identify which way they need to go, helping to prevent and alleviate spatial disorientation, confusion and anxiety

**Distinctiveness**

People's attention and concentration are captured by the distinctiveness of the various parts of the neighbourhood, which aids orientation and wayfinding

**Accessibility**

People are able to reach, enter, use and move around the places and spaces they need or wish to visit, regardless of any physical, sensory or cognitive impairment

**Comfort**

People feel at ease and are able to visit, use and enjoy places and spaces of their choice without physical or psychological discomfort

**Safety**

People are able to use, enjoy and move around the neighbourhood without fear of coming to harm

The research on the built environmental aspects of dementia friendly communities has sparked some innovative methods. Van Schaik (Van Schaik, Martyr et al. 2008), using virtual environments, showed that: navigability, legibility, safety and environmental attractiveness are the key elements for successful way-finding and enjoyment of outdoor spaces. A key message from his research was that real town centres offer relatively few obstacles for people with mild to moderate dementia, and that sometimes relatively straightforward changes, such as improvements to signage, could lead to measurable differences in wayfinding and thereby improve quality of life and wellbeing.

A review of the literature by John Keady and his colleagues (Keady, Campbell et al. 2012) highlights the advantages of involving the person with dementia in evaluating the environments, for example, by undertaking accompanied walks (Mitchell, Burton et al. 2004). This strategy has revealed valuable insights into the sensory experience of getting out and about for people with dementia. The research found that noise, smells and a multitude of visual stimuli had an influence on how participants negotiated journeys around their neighbourhood. The sense of a journey to a destination and the ability of that destination to support the desired activity is captured in a very practical way in the work of Boex and Boex (Boex and Boex 2012). They introduced the idea of 'touch points' that can be used to map the physical journey taken by a person with dementia. The first touch point in a typical journey may be the car park, followed by the entrance to the building, then the entry space (perhaps a waiting room), corridors (or aisles in a supermarket) and finally the work area (the counter in a bank, the interior of a library the shelves in a supermarket).

While the research on the contribution the built environment can make to a dementia friendly community is at a very early stage it has, in conjunction with the research from residential and health care environments, resulted

in the development of some tools to assist us to understand the strengths and weaknesses of our existing environments and design better ones for the future (Burton, Mitchell et al. 2004; Fleming and Bennett 2015).

## **RESOURCE 1**

**Using the built environment to create comprehensible, manageable and meaningful environments for people with dementia**

# **PART 2** **A REVIEW OF THE LITERATURE ON ENVIRONMENTAL DESIGN FOR PEOPLE WITH DEMENTIA**

## PART 2

# A REVIEW OF THE LITERATURE ON ENVIRONMENTAL DESIGN FOR PEOPLE WITH DEMENTIA

There has been a substantial amount of research on the effects of aspects of the built environment on people with dementia. It has usually been aimed at identifying how the environment can be designed, or modified, to reduce the difficulties experienced by the person with dementia who is in either residential care or hospital.

The following review of the literature is an extension of a review first published in 2008 (Fleming, Crookes et al. 2008) and updated in 2010 (Fleming and Purandare 2010). The extension has been informed by recent systematic reviews (Marquardt, Bueter et al. 2014; Joseph, Choi et al. 2015), including a review focussed on the design of hospitals (Dobrohotoff and Llewellyn-Jones 2011). In order to maintain readability and keep the review to a reasonable length, the strength of the evidence to be found in the papers referenced here is not reported in a systematic way. Readers who wish to be able to assess the strength of the evidence behind the papers are invited to look at the systematic reviews (Fleming and Purandare 2010; Marquardt, Bueter et al. 2014; Joseph, Choi et al. 2015). However, this review does not shy away from the difficulties inherent in conducting research on the impact of the built environment. The problems with trying to tease out the effects of particular modifications against the background of other changes are highlighted frequently. Nevertheless, it is apparent that the accumulation of evidence is providing us with more confidence in our understanding of the elements that are critical to the provision of an environment that supports people with dementia.

The findings from the literature have been organised around ten principles of design. This will assist the reader to understand the structure and the content of the assessment tools provided in the later sections. Quotations are provided to give the reader a flavour of the research. It is important to recognise that the language in some of these includes terms that would no longer be used.

A list of acronyms is provided at the end of this review.

## 2.1 Unobtrusively reduce risks

*People with dementia require an internal and external environment that is safe and easy to move around if they are to continue to pursue their way of life and make the most of their abilities. Potential risks such as steps must be removed. All safety features must be unobtrusive as obvious safety features, such as fences or locked doors, can lead to frustration, agitation and anger or apathy and depression.*

One of the most common problems associated with caring for people with dementia is that of keeping them safe from the danger of wandering away and perhaps getting lost or run over (Rosewarne, Opie et al. 1997). The most obvious response to this issue is to provide a secure perimeter, preferably one that allows for safe movement and access to an outside area.

Positive effects have been found when unobtrusive means are used to provide a secure perimeter:

“Depression was negatively correlated with another environmental factor exit design. Residents in facilities whose exits were well camouflaged and had silent electronic locks rather than alarms tended to be less depressed. A hypothesis to explain this correlation is that residents try to elope less in such settings and that caregivers - tending to consider such environments safer - afford residents greater independence of movement. Residents who experience this greater freedom, and hence have less conflict about trying to leave the SCU, feel a greater sense of control and empowerment, leading in turn to less depression. Until further research is carried out measuring personal state-of-mind variables that might be implicated in such a process, this explanation remains only a hypothesis” (Zeisel, Silverstein et al. 2003).

This feature is mentioned as one of the central characteristics of the special nursing home unit evaluated by Wells and Jorme (Wells and Jorm 1987) which found that residents did as well as those cared for at home.

Security features are also central to the group living facilities developed in Sweden and Italy (Annerstedt 1993; Bianchetti, Benvenuti et al. 1997). However, none of these studies attempts to define clearly what is meant by ‘security’ or to quantify its provision.

Annerstedt clarified the purpose of providing a safe environment as enabling the resident to have the opportunity to focus on the identity preserving features of group living (GL):

“The safety provided in GL makes environmental barriers easy to overcome. Energy can be used to extend the territory and the demented can benefit from everyday activities, the accessibility of cues in social life and the external memory aids built into the setting” (Annerstedt 1997).

There is no attempt, however, to quantify or fully describe the safety and security features.

The provision of hidden or subtle locks on doors may have some beneficial effects (Zeisel, Silverstein et al. 2003) but it does raise the question ‘Wouldn’t it be better if residents could go through the door and be safe?’ This question was answered elegantly (Namazi and Johnson 1992a) in a study involving 22 residents with probable Alzheimer’s disease who were observed for 30 minutes after trying outside doors leading to a safe area. In one situation, the doors were locked and in the other open. While the authors make no attempt to calculate the significance of the results, it is clear that there was a dramatic, positive difference in agitation, aggression and wandering following an encounter with an open door compared with a locked door.

There is a suggestion that establishing a secure perimeter may have the unwanted side effect of restraining people with dementia who, while confused, are not likely to leave. In a cross sectional study of 11 nursing homes, Low found that harmful behaviours, particularly risk taking and passive self harm, were associated with greater security features and an increased number of special design features for frail residents and residents with dementia (Low, Draper et al. 2004). This supported the hypothesis that an emphasis on safety can have unwanted side effects. This view was also supported by a study carried out in the UK (Torrington 2006).

“Safety and health was the only domain in the DICE study that had a

negative association with the quality of life scores. The low dependency group of residents had lower scores for enjoyment of activities and ability to control the environment in buildings with higher scores for safety and health. Large buildings had consistently high scores in this area with median scores of 79% as against 66% and 65% for small and medium homes”.

A small study (Chafetz 1991) comparing decline in a special care unit and a mainstream nursing home provided information on two safety features, the securing of exits and the securing of drawers and cupboards. (These were the major environmental changes made in establishing the special care unit.) Results of the study suggest that these interventions had no significant effect on the rate of cognitive decline or the presence of behavioural disturbance.

### 2.1.1 FALLS PREVENTION

The prevention of falls is another key safety concern (Pynoos 1991; Scandura 1995; Morgan 1999.). People with dementia are eight times more likely to experience a fall than those of the same age without dementia (Allan, Ballard et al. 2009). The provision of care in a specialised behavioural management area has been shown to reduce falls (Gonski and Moon 2012). A significant reduction in injuries associated with falls has been achieved by providing furniture that puts the person with dementia closer to the ground through the use of bean bag chairs, futons and mattresses placed on the floor (Scandura 1995). This approach is in direct contrast to the practice of putting up bed rails, which simply ensure that if a fall does take place, it occurs from a greater height than normal.

In extreme circumstances carers sometimes feel driven to the use of physical restraints to safeguard residents and patients. Physical restraint is defined as

“the intentional restriction of a resident’s voluntary movement or behaviour by the use of a device, or removal of mobility aids, or physical force” (Department of Health and Ageing 2012, p. 24). Examples of physical restraint include lap belts, bed rails, posey restraints or similar, chairs with tables attached, and chairs or mattresses that are difficult to get out of such as tip back chairs, water chairs, bean bags and curved edge mattresses.

Even in extreme cases there are limits to the use of restraints

“Devices that are categorised as extreme restraint and should at no time be used in residential aged care are: posey criss-cross vest, leg or ankle restraint, manacles/shackles, soft wrist/hand restraints”. (DoHA 2012, p.25)

The research literature does not support the effectiveness of this approach. Engberg et al. (2008) found that physical restraint use has negative consequences that include lower cognitive performance, poorer performance of activities of daily living and higher walking dependence. The inappropriateness of physical restraint is corroborated in a study involving 2000 patients which suggests that the physical restraint of cognitively impaired patients does not reduce the risk of falls (Kwok, Bai et al. 2012). This lends weight to the point of view expressed by advocates for a genuinely person-centred approach to the care of people with dementia, e.g. Al Powers who states

“With a restraint free approach, the use of any restraint must always be the last resort after exhausting all reasonable alternative management options. Stopping a resident without their consent from doing what

they appear to want to do, or are doing, is restraint. Any device that may stop a resident getting out of a bed or a chair and/or stops their free movement is restraint. Restraint is any aversive practice, device or action that interferes with any person's ability to make a decision or which restricts their free movement. The application of restraint, for ANY reason, is an imposition on an individual's rights and dignity and, in some cases, may subject the person to an increased risk of physical and/or psychological harm. The inappropriate use of restraint may constitute assault, battery, false imprisonment or negligence. Staff need to identify, in a proactive approach with management, how to prevent situations that may lead to a perceived need for restraint." (<http://changingaging.org/author/powerup/>).

The benefits of preventing falls by rearranging furniture, removing objects that may precipitate falls, maintaining step surfaces, removing loose carpets, providing grab bars, improving lighting, repositioning beds, adjusting bed and chair heights, repairing roller walkers and removing obstacles have been identified (Kallin, Jensen et al. 2004).

A review of the literature on people with dementia falling in hospitals concluded that multi-faceted approaches are required to reduce falls, and that there is insufficient evidence to support dependence on any single approach, such as the use of restraints or modifications to the environment (Oliver, Connelly et al. 2007). This view is supported in a thorough review of the use of restrictive devices to minimise the risk of falling in people with dementia (Capezuti 2004).

## 2.1.2 OVER EMPHASIS ON SAFETY

There is some evidence of an over emphasis on safety in healthcare facilities providing care to people with dementia in Britain (Parker, Barnes et al. 2004) and Australia (Moyle, Borbasi et al. 2011). Sometimes this is caused by giving priority to the safety of other patients. If an inpatient unit is likely to be used by people with dementia who may harm themselves or others, then access to a segregated area may be required (Remen 1992). It is suggested that these areas include more space (at least 30 square meters per patient) (O'Brien and Cole 2003), a garden, a quiet area, a seclusion suite, activity and games room as well as a specific model of care (Remen 1992; Thomas, Jones et al. 2006; Zieschang, Dutzi et al. 2010).

Even in these areas though, the issue of whether the doors should be locked is under debate (Dobrohotoff and Llewellyn-Jones 2011). The prevalence of locked psychiatric units in the U.K. and Sweden ranges from 25-73% (Bowers, Crowhurst et al. 2002; Haglund, Von Knorring et al. 2006). Gudeman (Gudeman 2005) stated that acute psychiatric units in general hospitals are locked because of community perception that the patients are dangerous, for the convenience of staff, and because of stigma and hospital-wide resistance. His opinion is that when units are unlocked few disasters occur and patients are less stigmatised and better able to integrate into the community. There is evidence that staff of psychiatric facilities find there are more disadvantages than advantages in having locked doors (Haglund et al. 2005, Haglund, von Knorring et al. 2006). A study carried out in 100 UK psychiatric acute admission wards showed that while a significant proportion were locked at all times, there was an extremely large variation in the approach to safety. It is argued that this was due to the tension between the nurses' desire to foster dignity and freedom, and the need to provide

security (Bowers, Crowhurst et al. 2002). There is little, if any, literature on the effect of locked doors on outcomes, such as prevention of harm, use of psychopharmacology or staffing levels.

## 2.2 Provide a human scale

*The scale of a building can affect the behaviour and feelings of a person with dementia. The experience of scale is influenced by three key factors; the number of people that the person encounters, the overall size of the building and the size of the individual components (such as doors, rooms and corridors). A person should not be intimidated by the size of the surroundings or confronted with a multitude of interactions and choices. Rather the scale should encourage a sense of wellbeing and enhance the competence of a person.*

Size may be defined in terms of the number of places (often referred to as beds) per facility or by the area available per person. In the residential aged care field the development of special care units for people with dementia has been influenced by the view that larger facilities increase agitation and are confusing for residents (Sloan 1998; Isaksson, Åström et al. 2009; Hagglund and Hagglund 2010) and high quality care is easier to provide in small groups (Annerstedt 1993; Reimer, Slaughter et al. 2004). However, small size in residential aged care is almost always accompanied by particular approaches to the delivery of care, such as providing a homelike environment (Verbeek, Zwakhalen et al. 2012). The variation in models of care may contribute to the contradictory findings on this topic.

The contradictory nature of the evidence can be illustrated by looking at the results of investigations that included evaluation of the effect of scale on behavioural disturbance. Support for a reduction in behavioural disturbance has been reported in some studies (Proctor, Brook et al. 1985; Annerstedt 1997; Cutler and Kane 2009). However, an increase in behavioural disturbance has been found in others (Kihlgren 1992; Sloane, Mitchell et al. 1998), and in complete contrast no effect in behavioural disturbance has been found in yet other studies (Dean, Briggs et al. 1993; Suzuki, Kanamori et al. 2008; te Boekhorst, Depla et al. 2009; Verbeek, Zwakhalen et al. 2012). The difficulties of coming to a conclusion on this apparently simple question are illustrated in the following descriptions of key papers.

### 2.2.1 NUMBER OF PLACES (BEDS) IN THE FACILITY

The effects of having fewer beds in a facility was investigated by comparing a Special Care Facility (SCF) with 'traditional institutional facilities (Reimer, Slaughter et al. 2004).

"The SCF, which received a new-construction design award from the Society for the Advancement of Gerontological Environments, featured a decreased density of residents, with 10 people living in each of six separate and self-contained semi-attached bungalows..."

The comparison showed that SCF residents experienced

"Less decline in activities of daily living, more sustained interest in the environment, and less negative affect than residents in the traditional institutional facilities. There were no differences between groups in concentration, memory, orientation, depression, or social withdrawal".

However the SCF also had



“... enhanced staffing ratios, which enable the integration of personal care, leisure, and rehabilitation activity into the role of the staff caregiver (rather than an expert model of episodic therapist intervention); and a biodiverse environment (e.g. multigenerational, live-in pets, plants). The physical environment and daily activities were arranged like a typical home, with residents able to help in the kitchen, sweep the floor, sit by the fireplace, or go outside into a small enclosed garden area”

and there was no way to evaluate the separate impact of these interventions. A study which controlled for most of these factors (Zeisel, Silverstein et al. 2003) showed that there may be a benefit in resulted in a positive finding for having larger facilities:

“The larger the facility - the more residents there are in the SCU - the lower the social withdrawal scores tend to be”.

A comparison of residents of small group living facilities and residents of traditional nursing homes (Annerstedt 1993) showed that smaller unit size makes it easier for residents and staff to work together as a group. Smaller unit size is associated with higher levels of competence and job satisfaction. However, the additional staff training provided in the smaller units was not controlled for. The study also reported better motor functions, slightly improved or maintained activities of daily living and smaller doses of both antibiotics and psychotropic drugs.

A similar result was reported in a later paper by the same author (Annerstedt 1997), comparing life for 28 people with dementia in a Group Living (GL) environment with life in a nursing home (NH), for 29 people matched on age, diagnosis, physical and social dependency. The GL environment was deliberately made small (9 beds) but also incorporated features to make it familiar, homelike and safe.

“During the first year of observation there was a positive development in the GL patient compared to the NH group. However in the more severely impaired residents less effects of the environmental engineering were observed, i.e. (a) the GL residents preserved intellectual and motoric abilities and practical abilities better which was reflected in ADL performances; (b) the GL residents exhibited less aggressiveness anxiety and depression; (c) the use of neuroleptics and tranquilisers was lower In GL care and (d) the numbers of fractures and Incontinent residents were fewer in GL (non-significant). There was a time related decline of the difference between the groups. After 3 years there were no differences to be noticed between the GL and NH groups in physical and mental dependency” (Annerstedt 1997).

In a survey of 53 special care units (SCU's) for people with dementia (Sloan 1998) found strong associations between larger unit sizes and higher resident agitation-levels, increased intellectual deterioration and greater emotional disturbances. The association of larger unit size

“...with higher agitation supports the popular design concept that small units, or the division of large units into smaller functional subunits, will minimise resident agitation by reducing the potential for overstimulation”

In contrast, in a sample of 695 residents of SCU's and traditional nursing homes (Leon and Ory 1999) no significant correlation was found between facility size, in terms of number of residents, and physically aggressive behaviours. However, this study defined large facilities as those with more

than 150 beds, a definition that may have swamped the effects of genuinely small facilities.

A qualitative comparison in which a specialised dementia unit with 11 places was compared with a 4 storey nursing home suggests that small size is associated with better community life. It is clear, however, that the author was unable to separate out the effects of the size of the unit from the other factors that were active.

“The social model of care practiced at Fairhaven, including staff continuity in resident care and an encouragement of staff relationships with individual residents, appears to have encouraged community formation. Also of importance was the small scale of the facility as well as the residents’ ready access to a range of environmental settings, including areas that are conducive to community-like behavior such as kitchens, small spaces for informal interaction, and outdoor spaces that can be used by residents on their own. The design of formal activities at Fairhaven, including attempts to engage residents in a round of expressive activities and to adapt activities to their changing needs and competencies, was another key factor. Underlying and supporting these environmental and programmatic features was an institutional philosophy that promoted flexibility, freedom of choice, and a focus on the continuation of the individual’s functional abilities and independence” (McAllister and Silverman 1999.).

A quantitative comparison between 10 large facilities (16 or more places) and 12 small facilities (Quincy, Adam et al. 2005) indicated no relationship between the size of the facility and quality of life of residents with dementia or their neuropsychiatric symptoms (delusions, hallucinations, agitation or aggression, dysphoria, anxiety, euphoria, apathy, disinhibition, irritability, aberrant motor behaviour, sleep, and appetite and eating disorders). Quality of life was measured using the ADRQL (Rabins, Kasper et al. 2000), an observer rating scale that is not particularly sensitive.

Contrary findings came from another cross sectional study (Torrington 2006) involving 38 residential and care homes in the UK. In this study, small unit size was defined as having fewer than 31 places, medium as 31-40 and large as greater than 40. Small homes scored best in terms of comfort, normalness, choice and control. “The overall well-being scores [as measured by Dementia Care Mapping] were consistently lower in the large homes (13%) than in the small and medium ones, which scored 38% and 33% respectively.”

Another cross sectional comparison of large and small facilities (Kuhn, Kasayka et al. 2002), adds to the confusion. In this investigation

“Key differences were noted between residents living in small, dementia-specific sites (10 to 28 residents) and those living in large sites that were not dementia-specific (40 to 63 residents). The latter group fared better overall with respect to quality of life and diversity of interactions and activities”.

No attempt was made to control for levels of dementia or different care practices. The results are therefore severely limited and at best illustrate the inability of cross sectional studies to provide information on causality.

These studies clearly illustrate the problems associated with coming to a conclusion on the effect of the size (number of people living in a unit). To date, size has never been varied while all other conditions are kept constant. Purpose designed small units are very likely to be homelike, familiar and

safe. While there is a range of evidence that supports the view that small numbers of people in dementia units are better than large numbers, it is not conclusive. The evidence also suggests that the combination of small unit size with the other attributes of specialised units is not demonstrably beneficial in the later stages of dementia.

### 2.2.2 PHYSICAL SIZE OF THE FACILITY

The relationship between behavioural disturbance and the size of the space in which the group lives has also been investigated. A domestic scale and feel have been recommended in the acute care setting in order to make the inpatient experience more familiar and less confusing (Remen 1991; Fottler, Ford et al. 2000; New\_Zealand\_Ministry\_of\_Health 2002). Compact units have been found to provide greater comfort, a more homelike atmosphere and better opportunities for monitoring patients (Morgan and Stewart 1999). A high proportion of violent behaviour has been found to be associated with more beds, more ward area/resident, longer corridors, and more corridor area when compared with units where fewer residents had violent behaviour (Isaksson, Åström et al. 2009).

### 2.2.3 SOCIAL DENSITY

The impact of social density, i.e. the relationship between the number of people and the size of the space they are in, has also been investigated. There is some inconsistency in the findings. A lack of association between the amount of space available in a ward and the level of behavioural disturbance has been found:

“It has been assumed that GL (Group Living) units should be small, to prevent disorientation or confusion. However, we found no relation between confusional reactions and total area, total activity area, or proportion of activity area out of total area” (Elmstahl, Annerstedt et al. 1997).

However, a decrease in disruptive behaviour and aggression was found in residents who were relocated from a high to a low density unit (Morgan and Stewart 1998; Morgan 1998.; Morgan and Stewart 1999). These findings are supported by two studies which found more violent behaviour in units with a higher number of residents (Nelson 1995.; Isaksson, Åström et al. 2009). Positive results in the form of more active and engaged behaviour in a lower density environment were also found in residents in double versus multi-occupancy bedrooms (Hsieh 2010). This is supported by the finding of higher well being in residents who moved from shared to private bedrooms (Morgan 1999.).

There is evidence that lower social density is associated with better care outcomes: private bedrooms lead to improved sleep (Morgan and Stewart 1998); increasing the number and size of bathrooms made it easier for staff to assist with toileting (Hutchinson, Leger-Krall et al. 1996) and units with a higher number of residents had higher drug prescriptions than units with a lower number of residents (Zuidema, de Jonghe et al. 2010).

However, there may be some disadvantages to lower social density. Hsieh (2010) observed fewer opportunities for social interaction between residents, supporting the finding that social withdrawal scores tend to be lower in larger facilities with more residents (Zeisel, Silverstein et al. 2003). There is some evidence that low social density is associated with boredom (Morgan 1999).

A comparison of behaviour and use of spaces before and after transfer from traditional nursing home to an SCU (Kovach, Weisman et al. 1997) showed increased social activity which was attributed to the small physical

and numerical size of the unit. Results from a qualitative study of staff and family members views (Morgan and Stewart 1997) indicated that there were positive effects in providing additional space for wanderers in a lower density environment in a new unit, as this resulted in less noise and general activity. However, the increased space and smaller number of residents decreased social interaction. A combination of small numbers of residents in a compact design was recommended to overcome this problem.

A study that compared behaviour problems before and after transfer to a unit where the dining area was both physically and numerically smaller (Schwarz, Chaudhury et al. 2004) also demonstrated beneficial effects:

“The new dining spaces served eight to 10 residents compared with the 25 to 30 residents who had their meals in the large dining area before the renovation. Behavioral mapping data indicated that there were fewer incidents of disruptive and agitated behaviors in the new dining areas than in the larger dining space that served the residents prior to the renovation. Staff members seemed to be having more sustained conversations with the residents in the new dining spaces than they were having in the old dining space. The reduction of group size in the new dining areas reduced the possibility of the chain reaction of disruptive behaviors during mealtimes.”

A qualitative comparison between a purpose built Alzheimer’s facility and a traditional nursing home (McAllister and Silverman 1999) suggested that the small scale of the special unit contributed to the higher level of community formation and social interaction found there. An interesting association between large homes and an emphasis on health and safety issues resulting in lower enjoyment of activities and less ability to control the environment has been found in a UK study (Torrington 2006).

## 2.3 Allow people to see and be seen

*The provision of an easily understood environment will help to minimise confusion. It is particularly important for people with dementia to be able to recognise where they are, where they have come from and where they can go. When a person can see key places, such as a lounge room, dining room, their bedroom, kitchen and an outdoor area they are more able to make choices and see where they want to go. Buildings that provide these opportunities are said to have good visual access. Good visual access opens up opportunities for engagement and gives the person with dementia the confidence to explore their environment. It can also enable staff to see residents. This reduces staff anxiety about the residents’ welfare and reassures the residents.*

The observation that ‘people with dementia stand a better chance of finding something if they can see it from where they are’ led to the idea of ‘Total Visual Access’. Total visual access was incorporated into the design of the NSW Health Department for the confused and disturbed elderly. These units, which became known as CADE units (Fleming and Bowles 1987), focussed on a very simple, corridor free environment.

The evaluation of the first of the CADE units suggested that the main impacts of this style of environment were to be found in improvements in self help, socialisation and behaviour (Fleming 1989), although it is clear that these changes were brought about by the combination of both the environmental and psychosocial factors in operation in this specialised unit for people with dementia.

### 2.3.1 WAYFINDING

---

More recent research has shown that a simple building 'where residents should be able to proceed from one decision point to the next as they walk along without having to plan for future decisions' is beneficial for resident orientation. It also suggests that the simple environment must be supplemented with a certain amount of explanation or training for the residents to function better (Passini, Rainville et al. 1998.) Direct visual access to relevant places along with the integration of reference points and the implementation of several zones with a unique character have been identified as helpful for a resident's wayfinding. (Netten 1989; Elmstahl, Annerstedt et al. 1997; Passini, Pigot et al. 2000; Marquardt and Schmiege 2009).

### 2.3.2 BENEFITS FOR STAFF

---

Good visual access also provides benefits for the staff. If staff can see the residents from the places where they spend most of their time they are less likely to feel anxious. At the same time the visibility of the staff to the residents helps them to feel supported. Staff working in healthcare facilities with good visual access spend less time locating and monitoring their patients (Morgan and Stewart 1999). Good sight lines between the nurses' station and other key locations have been found to be influential in prompting or supporting informal social interactions (Campo and Chaudhury 2012). In hospitals, the decentralisation of the nurses station to small bays located to improve monitoring by staff, and visibility of staff to patients, has been found to reduce the use of the nurse call system and, by implication, improve contact between staff and patients (Burns 2011).

## 2.4 Reduce unhelpful stimulation

*Because dementia reduces the ability to filter stimulation and attend to only those things that are important, a person with dementia becomes stressed by prolonged exposure to large amounts of stimulation. The environment should be designed to minimise exposure to stimuli that are not specifically helpful to the resident, such as unnecessary or competing noises and the sight of signs, posters, spaces and clutter that are of no use to the resident. The full range of senses must be considered. Too much visual stimulation is as stressful as too much auditory stimulation.*

People with dementia have difficulties in dealing with high levels of stimulation. Their ability to screen out unwanted visual and auditory stimuli appears to be reduced. They can become more confused, anxious and agitated when over stimulated (Cleary, Clamon et al. 1988.; Netten 1993.). Common causes of over stimulation are busy entry doors that are visible to residents, clutter, public address (p.a.) systems, (Cohen 1991; Brawley 1997), alarms, loud televisions (Hall 1986.; Evans 1989.), corridors and crowding (Nelson 1995).

There is strong evidence from the Zeisel et al study that residents are less verbally aggressive

"where sensory input is more understandable and where such input is more controlled" (Zeisel, Silverstein et al. 2003)

Hospital patients are extremely sensitive to their auditory environment and in particular to noise levels which at times may be high. This calls for a high degree of control of the acoustics in the inpatient common spaces (Lawton, Fulcomer et al. 1984; Bergsland 2002; Harris, McBride et al. 2002; Edvardsson and Nay

2009) if aggression is to be avoided (Cohen-Mansfield and Werner 1995).

An environmental approach to reducing stimulation was demonstrated in a Reduced Stimulation Unit housing 11 residents

“...where the doors could be easily closed and camouflaged. Small tables for eating and for small group activities were set up in four of the rooms. Visual aspects of the unit (for example, pictures and wall colors) were neutral in design and color. There were no potential sources of stimulation from televisions, radios and telephones except one telephone for emergencies. Residents were free to ambulate anywhere as well as eat and rest whenever they wished on the unit. A planned, consistent daily routine scheduled rest and small-group activity periods” (Cleary, Clamon et al. 1988).

Three months after admission the residents were significantly more involved in ADLs and required significantly less restraint than 3 months prior to admission. Agitation and wandering had decreased while medication usage had not changed. Improved relationships between residents and between residents and staff were noted but not measured. The results were modest and whether they were the effect of better care practices or by the environment or a combination of these, could not be determined.

A soothing environment has been associated with periods when wandering did not occur (Algase, Antonakos et al. 2011). On the other hand, brighter light and more variation in sound levels have been associated with more wandering behaviour than low light and low levels of sound (Algase et al., 2010).

Improvement in the attention of residents, less weight loss and reduction in the use of restraints have been brought about by using internal partitions to reduce distractions, minimising distractions from televisions and phones and camouflaging exit doors, (Cleary, Clamon et al. 1988). Studies involving the combination of reduced stimulation with other environmental and care practice manipulations have shown reductions in behavioural disturbance (Bianchetti, Benvenuti et al. 1997; Bellelli, Frisoni et al. 1998).

An increasing risk of falls has been associated with the presence of unhelpful stimulation. Bold floor patterns and dark lines or surfaces can disorient people with dementia (Passini, Pigot et al. 2000) and texture, joint presence and colour have been associated with risks of falling on pathways (Zamora 2008).

#### **2.4.1 OVER-STIMULATING ENTRY DOORS**

Busy entry doors pose particular problems for staff and residents. They are a constant source of over stimulation and tempt residents to try to leave, especially if they are locked. Several ways to avoid these problems have been described and evaluated, such as hiding the door or door handle (Namazi 1989.; Dickinson, McLain-Kark et al. 1995) and installing blinds when a door offers tantalising views of the outside world to head off attempts to leave (Dickinson, McLain-Kark et al. 1995; Dickinson and McLain-Kark 1998). These studies show that the attraction of a view to the outside is very strong. It can overcome the aversive effect of dazzling and confusing patterns painted on the floor (Namazi 1989.; Chafetz 1991), indicating that there is likely to be an advantage to reducing the stimulation provided by these views. This is best done by using blinds or curtains, rather than adding to the stimulation by painting grids on the floor. Another way of reducing the attention on paid to a door is to disguise it with a mural (Kincaid and Peacock 2003) or placing a mirror on it (Mayer and Darby 1991). The use of mirrors has, however, been found to be disturbing for some people with dementia so mirrors should be used with great care.

## 2.4.2 NOISE AND TEMPERATURE

Noise and temperature have been shown to be independently associated with quality of life among residents. Specifically, high temperature in the resident's bedroom was associated with lower quality of life, and high noise levels in the living room were associated with low levels of social interaction (Garre-Olmo, López-Pousa et al. 2012).

The reduction of night time noise and light levels in a nursing home has been shown to improve sleep during the night and reduce day time sleeping (Alessi, Martin et al. 2005). High levels of noise are associated with increased wandering and aggressive and disruptive behaviour (Cohen-Mansfield and Werner 1995; Nelson 1995.; Algase, Beattie et al. 2010; Garcia, Hébert et al. 2012) and agitation (Joose 2012). Behavioural disturbances and violence are reduced when noise is avoided by turning down the volume of electronic devices, the distribution of earphones and reducing staff talking (Meyer, Dorbacker et al. 1992). However, there is not universal agreement on the link between noise and behavioural disturbance. Ouslander (2006) did not find such a link, nor did this study show a link between noise levels and quality of life or well being (Ouslander, Connell et al. 2006) as was found in another study (Garcia, Hébert et al. 2012). This contradictory finding may be explained by the difficulty Ouslander team's had reducing sound levels sufficiently.

While high sound levels have been shown to reduce levels of social interaction (Garre-Olmo, López-Pousa et al. 2012), moderate levels of sound appear to be associated with more engaged behaviours (Cohen-Mansfield, Thein et al. 2010), giving rise to the idea that a very quiet environment may not be comfortable.

There is a small but growing body of literature on the detrimental effects of extremes of temperature on people with dementia (van Hoof, Kort et al. 2010). A comfortable room temperature has been associated with less agitated or disruptive behaviour (Cohen-Mansfield and Werner 1995; Cohen-Mansfield and Parpura-Gill 2007) and an uncomfortable room climate with lower quality of life (Garre-Olmo, López-Pousa et al. 2012). However, another study did not observe an impact of a room's temperature or humidity on wandering behavior (Algase, Beattie et al. 2010).

Some of the decision making problems experienced by people with dementia can be explained in terms of the effects of unnecessary stimulation. They commonly have problems in choosing what to wear from the variety of clothes hanging in a wardrobe. This problem can be alleviated by having two wardrobes, one obvious and one hidden, with the obvious wardrobe containing only one or two sets of clothes. The overwhelming choice is then reduced to manageable proportions. This can be taken a step further by designing the wardrobe to enable staff to display clothing in a pre-selected order (underwear first, shirt, trousers, etc). This has been found to increase residents' independence in dressing and reduce the amount of physical help the person with dementia required (Namazi 1992).

## 2.5 Optimise helpful stimulation

*Enabling the person with dementia to see, hear and smell things that give them cues about where they are and what they can do, can help to minimise their confusion and uncertainty. Consideration needs to be given to providing redundant cueing i.e. providing a number of cues to the same thing, recognising that what is meaningful to one person will not necessarily be meaningful to another. Using text and image in signs is a simple way to do*

*this. Encouraging a person to recognise their bedroom through the presence of furniture, the colour of the walls, the design of a light fitting and/or the bedspread is a more complex one. Cues need to be carefully designed so that they do not add to clutter and become over stimulating.*

### 2.5.1 SIGNAGE

One way of enhancing helpful stimulation is the provision of signs and aids to assist wayfinding. This is integral to the design of many special environments for people with dementia (Grant, Kane et al. 1995).

“Signs may help to recognize places when architectural and interior design features are not sufficient in passing the message. They may provide directional information to remind the residents of where facilities are located and of how to return to their points of origin”(Passini, Pigot et al. 2000).

The available evidence suggests that signage is of limited effectiveness but can be improved when combined with verbal prompting from the staff (Hanley 1981).

Evaluation of an Italian approach to the design of SCUs incorporating the use of signs associates them with reductions in behavioural symptoms (Bianchetti, Benvenuti et al. 1997). The placement and nature of the signs is important; signs placed low and using words rather than pictograms are most effective (Namazi and Johnson 1991b; Scialfa, Spadafora et al. 2008). Signs should be clear and highlighted by a contrasting background, while those that are only relevant to staff should not have high levels of contrast (Dinshaw 2006).

A sign naming a feature is a poor replacement for seeing the feature, as demonstrated in a study in which people with dementia were able to see the toilet directly. Clear visibility of the toilet increased its use eightfold (Namazi and Johnson 1991a).

The best place for the signs is not at the top of the door but low down, even on the floor, to compensate for the downcast gaze of many people with dementia (Namazi and Johnson 1991b). This study indicated that the best results for getting residents to use a publicly available toilet on their unit were obtained by using the word ‘toilet’ on an arrow on the floor pointing to the toilet. The placing of a graphic depicting a toilet on the toilet door at eye level was also effective, but not as effective as the arrow on the floor. (In practice however, the use of arrows on floors can be confusing, as it is rare that people only move in one direction to one destination.)

The signs must be large enough to be seen by people with poor vision. In a study with a small sample it has been shown that large signs when combined with orientation training were effective, but not when simply put up without drawing residents’ attention to them (Hanley 1981).

“Signposts alone then do not seem to be generally effective in facilitating improvement in ward orientation. However, in combination with a preceding ward orientation training or more especially an accompanying ward orientation and signs training, improvements are effected, which for two of the four residents above, are maintained fully at three month follow up”. (Hanley 1981).

Some signs and cues can have a negative impact. Exit signs and panic bars on exit doors, for example, appear to cue residents to try to leave the facility. These can be countered in a number of ways. In a study with a small sample, placing a horizontal grid of black tape in front of an exit reduced



contact with the door by up to 97% in 4 people with Alzheimer's disease (Hewawasam 1996). The presence of a mirror in front of an exit cues the response 'not to touch', reducing attempts to leave by 50% (Mayer and Darby 1991). In another study investigating ways to reduce attempts to leave the unit (Dickinson and McLain-Kark 1998), residents were exposed to three test conditions: a mini-blind that concealed the view from the door, a cloth panel that concealed the panic bar of the door, and both the mini-blind and the cloth panel. The findings indicated that hiding the panic bar behind a cloth panel reduced the number of attempts to leave. (While research suggests such measures may prove effective, compliance with current Building Code requirements must not be compromised.)

The debilitating effects of signs in public buildings are carefully and considerably described in an analysis of the wayfinding problems encountered by people with Alzheimer's disease trying to find locations in a hospital (Passini, Rainville et al. 1998.). This research describes the frustration of trying to read textual signs and the searching behaviour that continued after a sign had been read indicating that the destination had been reached. Passini et al highlight the problem of depending on conventional signage:

“One of the major recommendations emerging from this research is to clean up information clutter on circulation routes. The non-discriminatory reading of information by DAT residents is among the most confusing interferences in the wayfinding process. Graphic wayfinding information notices along circulation routes should be clear and limited in number and other information should be placed somewhere else. It is quite feasible to create little alcoves specifically designed for posting public announcements, invitations and publicity, and these areas could even become small gathering places encouraging social interaction.

The graphic information provided would be of consistent design and systematically located so that the user knows what to look for and where to look for information. This rule facilitates graphic communication and also reduces chances of the user being overloaded by information” (Passini, Rainville et al. 1998.).

Relevant (and only relevant) information needs to be presented in a variety of ways to maximise the chances of it being noticed and understood. Signs and cues in the form of text and graphics are not the only way in which information about the location of spaces can be made available:

“The physical environment not only creates the wayfinding problems people have to solve but it can also provide information to solve these problems. ... Information should be presented by different means to allow for personal preferences and redundancy. ... Attention has to be paid to avoid distracting residents by non relevant information displays. The environment has to speak a language that the user, the Alzheimer's patient, can understand” (Passini, Pigot et al. 2000).

## 2.5.2 USING FAMILIAR OBJECTS

The recognisability of personally familiar objects can be used to aid orientation (Gross, Harmon et al. 2004). Featuring personal items, selected by relatives because of their significance, in display cases outside residents' rooms is a more effective approach than displaying distinctive, but non-personal items (Namazi, Rosner et al. 1991). Personally significant memorabilia were most useful for people with moderate dementia; higher

functioning residents were able to orient with familiar but non-personal memorabilia as well. Sadly the findings suggest that neither approach was helpful for lower functioning residents. In a replication of this study which more carefully focused on the precise nature of the memorabilia (Nolan, Mathews et al. 2002), some improvement in the location of rooms was found when photographs of the person in their youth were prominently displayed. This effect was contrasted with the ineffectiveness of current photos. The 6 residents in the small sample had moderate dementia.

The beneficial effect of displaying personal objects outside a resident's room has been suggested:

“Special glass cases installed outside residents' rooms enable a display of favorite personal objects and pictures. Having personal memorabilia in the shared spaces would provide the possibility of remembering the stories, events, people, and places associated with them. The items also provide an opportunity for the staff to know more about the residents, understanding the individuals as persons with preferences, attitudes, and values” (Kovach, Weisman et al. 1997).

This approach has been supported by other researchers (Namazi, Rosner et al. 1991) and extended to hospital environments by placing personal objects close to the patient's bed, preferably with the relatives helping the patient to choose and place them (New\_Zealand\_Ministry\_of\_Health 2002).

Residents' ability to perform activities of daily living can be improved by placing labels on drawers and cupboard doors, making objects visible through the doors and removing distracting items (Chard, Liu et al. 2008). Repetitive questioning about food and meal-times are reduced when a clock and signs are provided in the dining room (Nolan and Mathews 2004).

### **2.5.3 CONTRAST**

---

Contrasting objects with their background is one of the most powerful ways of optimising helpful stimulation. A contrasting toilet seat is particularly useful in helping the resident, or patient, see the toilet. Contrast is also useful to help residents eat well. Brighter light and greater colour contrast between the tablecloth, place mats and dishes results in more eating and less agitation (Koss and Gilmore 1998; Brush, Meehan et al. 2002). There is some evidence that the use of colour to distinguish the doors to resident's rooms has a beneficial effect (Lawton 1984.) but the experimental design leaves open the possibility that it was the contrast, not the colour, that contributed to the outcomes.

Contrast can have negative effects when it creates an appearance of sharp edges between floorcoverings or geometric patterns. These can be seen as steps by people with dementia (Whall and Conklin 1985; Perritt, McCune et al. 2005).

### **2.5.4 GOOD ILLUMINATION**

---

The provision of adequate levels of illumination is fundamental to enhancing helpful stimulation. Wayfinding, for example, is impaired in low light levels (Netten 1989) and lower lighting conditions have been associated with more signs of lower wellbeing (Garre-Olmo, López-Pousa et al. 2012). As higher overall light levels are associated with improved function (Brush, Meehan et al. 2002), there has been a great deal of interest in the potentially beneficial effects of increasing light levels to overcome the exceptionally low

exposure to bright light experienced by many people with dementia living in institutions (Ancoli-Israel, Clopton et al. 1997) (Brawley 1997) (Campbell, Kripke et al. 1988).

Increasing illumination to typical day time levels has been shown to regulate circadian rhythms and improve sleep patterns for people with dementia (Satlin 1992; Mishima 1994). However, some studies have shown that high levels of illumination are associated with increased agitation (Satlin 1992; Mishima 1994; Lovell 1995.; Barrick, Sloane et al. 2010) and wandering (Algase, Beattie et al. 2010).

There is some evidence suggesting that sunlight in patient rooms can reduce depression, which is often found in people with dementia (Beauchemin and Hays 1996).

A very well constructed randomised control trial (RCT)(Ancoli-Israel, Gehrman et al. 2003) involving a comparison between morning and evening bright light sessions (mean of 105 minutes exposure to 2,500 lux) with similar exposure to dim red light and normal, baseline light exposure showed that:

“...the effect of light treatment on sleep and circadian activity rhythms in residents with AD suggest that increased bright light exposure, whether in the morning or in the evening, consolidates night time sleep by lengthening the maximum sleep bouts during the night. There was, however, no effect of light treatment on total sleep time nor on wake time during the night or day. In other words, sleep was consolidated but overall time asleep did not change as there were longer but fewer sleep bouts. The magnitude of this effect was also clinically meaningful. Morning light increased the maximum sleep bout length by over 30 min while evening light increased the maximum sleep bout length by over 20 min. As night time sleep disruption is detrimental to caregivers as well as to residents, the patient’s more consolidated sleep may decrease both caregivers’ sleep disruption and their concerns about the patient during the night. Therefore, even though the patient’s total sleep time is not increased, both the patient and caregiver are likely to sleep better when the patient’s sleep is more consolidated”.

Early work (Satlin 1992) supports the use of light therapy but is marred somewhat by having the people with dementia restrained in chairs in front of the light box for 2 hours. This work was extended (Mishima 1994) to show that 2 hours of light box therapy providing more intense light, 3,000 to 5,000 lux, not only improved sleep but also reduces behavioural disturbance.

The application of this approach in a more naturalistic way, i.e. avoiding the restrictions inherent in getting people with dementia to sit beside light boxes for extended periods by providing elevated light levels in public areas, has been well investigated (Sloane, Christianna et al. 2007).

“Analyses of data from this cluster-unit intervention trial of persons with dementia in two care facilities indicate that high-intensity ambient light therapy in the morning or throughout the day resulted in a small but statistically significant increase in night time sleep minutes and inconsistent effects on night time sleep consolidation and daytime sleepiness. ...The study also demonstrated that bright light was well tolerated and was not associated with adverse effects. The light delivery method used in this study involved remodelling the activity and dining areas of institutional settings, thereby providing passive light exposure. Data on intervention fidelity indicate that this

method produced median light intensities close to the target level of 2,500 lux. Furthermore, mean participant exposure was comfortably above the target of 1 to 2 hours per treatment day, and more than 85% of participants received at least 1.5 hours of exposure regardless of treatment. ...These results suggest that environmental modification may be superior to light boxes, the current therapeutic standard, as a light delivery method. Although statistically significant, the clinical significance of the finding that total sleep time was 11 minutes longer under morning or all-day light is unclear”.

The authors go on to provide a standard by which the significance of these changes can be assessed.

“To better gauge the clinical significance of this finding, the results were compared with those of published clinical trials of commonly prescribed sleep medications. Zolpidem and temazepam, the most commonly prescribed sleep medications in 2005, produce approximately 30 minutes of additional sleep in young adults and healthy elderly volunteers, but the favorable effect of hypnotic medication appears attenuated in older persons. One randomized trial in 72 elderly persons with chronic insomnia, for example, reported only 4.4 more minutes of sleep with temazepam than with placebo. Furthermore, in long-term care populations, the risks of (adverse effects from) sedative-hypnotic medications are particularly high”.

Unlike the light box therapy approach, this methodology does not appear to involve any additional staff resident interactions. The positive results are therefore more likely to be due to the increase in light levels than to the beneficial effects of spending time with staff.

In addition to beneficial effects on sleep patterns the provision of very high light levels (10,000 lux) during a 30 minute breakfast period has been shown to have positive effects on behavioural disturbance as measured by the Cohen Mansfield Agitation Index (Thorpe, Middleton et al. 2000). The provision of simulated dawn/dusk variations in light produced consolidation in sleeping patterns (Gasio, Kräuchia et al. 2003). Significant improvement in MMSE scores ( $p=0.0012$ ) was obtained in a group of 9 nursing home residents with either Alzheimer’s disease or vascular dementia given 2 hours of bright light therapy (3,000 lux) each day for 10 days. No improvement was observed in the randomly allocated control group (Graf, Wallner et al. 2001).

However, some studies have shown that high levels of illumination are associated with increased agitation (Satlin 1992; Mishima 1994; Lovell 1995.; Barrick, Sloane et al. 2010). A recent review of non-pharmacological therapies for agitation in dementia (Livingston, Kelly et al. 2014) summarised the evidence for the benefits of light therapy provided in three randomised controlled trials and came to a negative conclusion:

“Light therapy hypothetically reduces agitation through manipulating circadian rhythms, typically by 30–60 min daily bright light exposure. We included three RCTs, all in care homes (Ancoli-Israel, Gehrman et al. 2003; Dowling, Graf et al. 2007; Burns 2009). Among participants with some or significant agitation, light therapy either increased agitation or did not improve it. The SES was 0.2 (for improvement) to 4.0 (for worsening symptoms) compared with the control group. There is therefore no evidence that light therapy reduces symptomatic or severe agitation in care homes and it may worsen it.”

There is some evidence suggesting that in hospitals sunlight in patient rooms can reduce depression, which is often found in people with dementia (Beauchemin and Hays 1996).

## 2.6 Support movement and engagement

*Purposeful movement can increase engagement and maintain a person's health and wellbeing. It is encouraged by providing a well-defined pathway, free of obstacles and complex decision points, that guides people past points of interest and opportunities to engage in activities or social interaction. The pathway should be both internal and external, providing an opportunity and reason to go outside when the weather permits.*

Poorly designed environments can contribute to the agitated wandering sometimes seen in people with dementia (Neistein and Siegal 1996). Planned movement has two components: the provision of a well-defined path, and the access the path provides to a range of experiences that might encourage the person with dementia to engage in something other than wandering. The specific characteristics of indoor and outdoor walking paths that encourage walking have been found to be: the presence of attractive destinations, less fragmentation (i.e. few decision points), absence of steps and attractive views (Joseph and Zimring 2007).

### 2.6.1 ACCESS TO NATURE

The benefits of going outside into a natural environment or being involved in indoor gardening include better self-reported health (Rappe and Kivelä 2005), reduction in stress as indicated by lowering of cortisol levels (Rodiek 2002; Lee and Kim 2008), improved cognition (Lee and Kim 2008), reduced agitation (Detweiler, Murphy et al. 2008; Lee and Kim 2008), improved sleep-related outcomes, reduced use of antipsychotics, and fewer falls and fall-related morbidity (Detweiler, Murphy et al. 2009).

Access to a secure outdoor area has been shown to be one of the defining features of an SCU (Grant, Kane et al. 1995). The beneficial effects on levels of agitation of being able to get outside have been well demonstrated (Namazi and Johnson 1992a) and described under 'Unobtrusively reduce risks'.

There have been studies of environments that have outside areas incorporated into their design as an amenity to be used by residents (Wells and Jorm 1987), but it is impossible to identify the relative contribution that the outside area has made to the beneficial effects (in this case of maintaining the function of the residents). It is unfortunate that an attempt to include access to a garden in a very well controlled study (Zeisel, Silverstein et al. 2003) was thwarted by lack of information on whether residents could actually access the gardens that had been identified as being present.

### 2.6.2 THE ROLE OF STAFF IN FACILITATING THE USE OF THE GARDEN

An Australian study was the first to demonstrate empirically an increase in pleasure associated with being in a landscaped garden (Cox, Burns et al. 2004). This study examined how effective two types of multisensory environments were in improving the wellbeing of older individuals with dementia. The two multisensory environments were a Snoezelen room and a landscaped garden in a nursing home. These environments were compared to the experience an environment without these features. The observed

response of 24 residents with dementia was measured during time spent in the Snoezelen room, in the garden, and in the living room. Both the Snoezelen room and the garden decreased the signs of sadness shown by residents in comparison with the living room, and significantly increased the signs of pleasure. However, there was a significant increase in pleasure in the three environments when the residents were approached by staff. The authors concluded that

“... in terms of the relative effectiveness of each environment in improving well-being of participants, the quantitative data indicate few differences between them. Qualitative data obtained by interviewing staff and caregivers indicated that ‘No matter which of the three environments was being spoken of, it was the opportunities of a one-to-one relationship, quality time, and to feel closer, that was valued...”

Wood (2005) supports this stating that the presence of a pleasant, safe outside space had no effect that could be attributed to it that was not secondary to the impact of the relationships with the staff (Wood, Harris et al. 2005).

So while

“Gardens are a lovely and interesting way to provide a source of sensory stimulation and avoid monotony - a virtual symphony of sight, sound, light, color, fragrance, birds, and small animals. Outdoor spaces offer unique opportunities for a wide range of stimulating, potentially life-enriching activities such as assisting someone who has been a lifetime gardener to maintain some form of small outside gardening spot” (Brawley 2001).

Their use, however, requires the support of staff. Perhaps the least contribution staff could make to the use of outside spaces would be to ensure that the access to them is open. Even when a garden provides opportunities for social interaction and engagement in activities it may not be used (Cohen-Mansfield and Werner 1999).

### 2.6.3 OPPORTUNITIES FOR ENGAGEMENT

The provision of access to an outdoor area is not in itself sufficient. If the space is unfriendly, too large, or too complicated, it is unlikely to be used. A systematic approach to developing a ‘therapeutic garden’ with points of interest and opportunities to engage in activities or social interaction is required to encourage residents to use it. This may explain the finding that the availability of a garden area, whether well designed or not, appeared to reduce aggression and falls in comparison to a facility without a garden (Mooney 1992).

The enrichment of the experimental facility by the provision of an outside patio (in conjunction with improving security features) had no differential impact on the behavioural or cognitive course of the dementia of residents when compared to the non-enriched, control environment (Chafetz 1991).

A U.S. wide survey of long term care facilities with outdoor areas investigated the characteristics and features of these areas and how they related to the perceived impact on their users. (Cohen-Mansfield and Werner 1999). Most respondents rated outdoor spaces as very useful and as having a great benefit for users. The perceived benefit was related to the presence of design features, such as the presence of gazebos, and to the number of activities offered in the area. Despite these positive findings respondents stated the areas were not used as much as possible.

An innovative study of the external environment in the community provides

some clear guidance on the characteristics that make the outside world friendly to people with dementia. It should be familiar, legible, distinctive, accessible, comfortable and safe (Mitchell and Burton 2006).

## 2.7 Create a familiar place

*A person with dementia is more able to use and enjoy places and objects that are familiar to them from their early life. The environment should afford them the opportunity to maintain their competence through the use of familiar building design (internal and external), furniture, fittings and colours. The personal backgrounds of the residents need to be reflected in the environment. The involvement of the person with dementia in personalising the environment with their familiar objects should be encouraged.*

The opportunity for residents of aged care facilities to increase the familiarity of their surroundings by the personalising the environment, often by bringing in their own belongings, has been associated with the maintenance of activities of daily living and reductions in aggression, anxiety and depression (Greene and Asp 1985; Annerstedt 1997; Morgan and Stewart 1999; Zeisel, Silverstein et al. 2003; Charras, Zeisel et al. 2012; Garcia, Hébert et al. 2012). It has also been associated with higher levels of quality of life (Fleming, Goodenough et al. 2014).

In contrast, the provision of a non-familiar atmosphere in a bathroom has been shown to cause problematic behaviours (Namazi and Johnson 1996). However, there is no way of identifying what contribution staff attitudes and training, or other environmental features of the group living units, contributed to this result.

Making the healthcare environment as familiar as possible has been recognised as contributing to the avoidance of agitation and disorientation (Marshall 2005; Cunningham 2006) and to improving staff morale on institutional psychiatric wards (Devlin 1992). An early study emphasising the need for a familiar environment (Greene and Asp 1985) suggested that improvements in behaviour were measurable in 50% of the residents.

### 2.7.1 TECHNOLOGY

While it is possible for people with dementia to learn to use new technologies, this is not easy and requires a great deal of support from skilled staff (Lekeu, V et al. 2002; Fleming and Sum 2014). It is much easier, more practical, and possibly more pleasant, for the person with dementia to be provided with fittings, e.g. taps, of a design that they can operate because their use is recorded in their long term memory.

### 2.7.2 CULTURAL DIFFERENCES

People with dementia who come from other cultures are at particular risk of finding themselves in an unfamiliar environment. A detailed knowledge of their heritage, customs and beliefs is required to provide an environment that will help them make the most of their abilities (Day and Cohen 2000).

## 2.8 Provide a variety of places to be alone or with others-in the unit

*People with dementia need to be able to choose to be on their own or spend time with others. This requires the provision of a variety of places in the unit, some for quiet conversation and some for larger groups, as well as places*

*where people can be by themselves. These internal and external places should have a variety of characters, e.g. a place for reading, looking out of the window or talking, to cue the person to engage in relevant activity and stimulate different emotional responses.*

This principle suggests the need for places that range from the public to the private. The presence of separate social spaces has been shown to differentiate SCUs from non-SCUs in a statewide survey involving 436 Minnesota nursing homes (Grant, Kane et al. 1995). The strongest evidence for its importance comes from Zeisel's well controlled study that provides some certainty about the contribution of the individual factors to the well-being of the residents (Zeisel, Silverstein et al. 2003). It contains findings of direct relevance to the principle as the following quotations demonstrate.

"The degree of privacy-personalisation in the SCUs studied was negatively correlated with patient scores on the Cohen-Mansfield total aggression scale. Residents in facilities with more privacy - more rooms that are individual and more opportunities for personalization - generally scored lower on this scale, representing less anxiety and aggression".

"The amount of variability among common spaces in a facility was negatively correlated with patient social withdrawal scores. The degree of social withdrawal among residents decreased as the variability among the common spaces in a facility increased".

"Those living in environments scoring high on privacy-personalization tended to have lower scores on the psychotic problem scale".

"Characteristics of the environment associated with reduced depression, social withdrawal, misidentification, and hallucinations include common areas that vary in ambience".

Residents in homes with more gradation between private, semi-private, and public spaces are likely to experience higher wellbeing, in addition to more environmental control than residents living in homes with less privacy gradation (Barnes 2006). It is possible that environments that have well defined spaces with different functions are easier for people with Alzheimer's disease to navigate (Passini, Rainville et al. 1998.; Passini, Pigot et al. 2000).

In a paper full of clearly described hints on creating environments that are thought to be helpful to people with dementia, Hoglund et al (Hoglund, Dimotta et al. 1994) stated that

"...one thing that works well is having a variety of rooms and allowing them to have a definite purpose, rather than being a multipurpose space".

While not being able to tease out the characteristics individually there is strong evidence of the benefits of providing spaces that are clearly private:

"The degree of privacy-personalisation in the SCUs studied was negatively correlated with patient scores on the Cohen-Mansfield total aggression scale (p=0.019). Residents in facilities with more privacy - more rooms that are individual and more opportunities for personalisation - generally scored lower on this scale, representing less anxiety and aggression"(Zeisel, Silverstein et al. 2003).

A significant reduction in psychotic symptoms was also found in this study.

An investigation of the relationships between quality of life and the sub-scale scores of the Environmental Assessment Tool (Fleming 2011), which measures the quality of the environment against the ten principles of design



used in this literature review, revealed a significant, positive correlation between quality of life and the provision of a range of spaces. This study involved 275 residents in 35 aged care homes and controlled for high/low care, gender, age, time in care, marital status, ethnic background, type of dementia, global deterioration score, Barthel Index score, physical incapacities, number of psychiatric diagnoses and the number of regular medications (Fleming, Goodenough et al. 2014).

### 2.8.1 SINGLE ROOMS

The advantages of single rooms have been summarised as including: the opportunity to choose between privacy and socialisation; the ability to personalise the space, providing familiarity and continuity with the past; support for a sense of security and individual identity, and allowing residents to control levels of stimulation (Morgan and Stewart 1998). Single rooms are important for most people with dementia in that they provide them with an opportunity to withdraw when they feel threatened (Osmond 1957; Shrivastava, Kumar et al. 1999). They have been associated with a reduction in the need for intervention, including medications, and improvements in sleeping (Morgan and Stewart 1998). Rather than increasing loneliness, when there are opportunities for the person with dementia to spend time elsewhere, single rooms contribute to privacy and choice (Ittleson, Proshansky et al. 1970). Uncooperative behaviours have been found to be associated with shared rooms (Low, Draper et al. 2004).

### 2.8.2 VARIETY OF SPACES IN HOSPITALS

Specific recommendations for providing a variety of spaces in a hospital inpatient unit have been provided, and they include

‘dedicating space for social interaction, clearly indicating a room’s intended use, making areas visually distinct so that the intended use of different parts can be delineated from their appearance, using colours to enhance activities and spaces, using various materials to provide different tactile and visual experiences, using lighting to help define space, and finally, making the spaces that have special meaning to patients stand out’(Kumar and Ng 2001).

## 2.9 Provide a variety of places to be alone or with others-in the community

*Without constant reminders of who they are, a person with dementia will lose their sense of identity. Frequent interaction with friends and relatives can help to maintain that identity and visitors should be able to drop in easily and enjoy being in places that encourage interaction.*

*Stigma remains a problem for people with dementia so the unit should be designed to blend with the existing community and not stand out as a ‘special’ unit. Where possible a ‘bridge’ should be built between the unit and the community by providing a place that is shared by the community and people with dementia. A coffee shop near the unit, for example, may enable a person with dementia to go there easily without needing assistance. Where the unit is a part of a larger site, there should be easy access around the site so people with dementia, their families and friends can interact with other people who live there.*

In an early statement of the principles of good design for people with

dementia (Fleming and Bowles 1987), it was stated that facilities should be placed close to the community of origin of the person because the identity of a person who has lost their recent memories can be more easily supported by familiar sights and visits from friends and relatives. This view has been supported (Chiarelli, Bower et al. 2005), but there have been very few empirical investigations of the advantages of having easy access to the local community (Keady, Campbell et al. 2012). One example is a comparison between residents in assisted living facilities with residents in a residential aged care facilities. Those in assisted living had higher perceived levels of privacy and autonomy, greater satisfaction with going out into the community and communicating with family and friends, and lower reported rates of boredom and less depression (Robison, Shugrue et al. 2011).

### 2.9.1 LINKS TO THE COMMUNITY IN HOSPITALS

The provision of links to the community in a healthcare context involves encouraging visitors. This has been picked up by some architects as described by Poulter (Lisa Poulter 1998). "The idea is to include in the design a welcoming, caring environment for the patient, the visitor, and the neighborhood.". This is achieved by creating spaces that are sensitive to the patient and family experience, welcoming visitors, mimimising patient confusion and anxiety, offering positive diversion to patients and families, providing features that are visually and audibly soothing (e.g. water features) and encouraging wonder and playfulness.

## 2.10 Design in response to vision for way of life

*The choice of life style, or philosophy of care, will vary between facilities. Some will choose to focus on engagement with the ordinary activities of daily living and have fully functioning kitchens. Others will focus on the ideas of full service and recreation, while still others will emphasise a healthy life style or, perhaps, spiritual reflection. The way of life offered needs to be clearly stated and the building designed both to support it and to make it evident to the residents and staff. The building should be the embodiment of the philosophy of care, constantly reminding the staff of the values and practices that are required while providing them with the tools they need to do their job.*

Over the last twenty five years there has been extensive interest in providing 'homelike' environments for people with dementia (Verbeek, van Rossum et al. 2009). It has almost seemed that the only legitimate approach to providing residential care to people with dementia was by providing them with access to small facilities that emphasise involvement in the ordinary activities of daily living. Recently however, there has been a move away from this, and it may well be that the next generation of people in a dementia specific facility will not want to be involved in washing the dishes or hanging out the washing. They may want an environment that provides them with opportunities to engage in a variety of other activities, such as keeping fit, eating well and enjoying virtual experiences. People from different cultural, geographic and economic backgrounds will also have very different experiences and expectations.

This experience is showing that the provision of a 'domestic' or 'homelike' environment' is simply one example of an over-arching principle of providing a building that responds to a clearly articulated vision for a way of life. A building should be the physical embodiment of this vision and capable

of providing the staff and residents, or patients, with the amenities they need to put these values into action. The need to have a clearly formulated philosophy of care to guide the design of healthcare facilities has been recognised. Poulter describes this:-

“Health care providers are beginning to recognize the important role physical space plays in defining quality care experiences- not only for patients, but also for visitors, families, physicians, and staffers. One of the most notable trends is many hospitals’ efforts to incorporate the concept of holistic care in facility design. Whether it’s the familiar Planetree model philosophies such as “Patients First” or the “Healing Environment,” or some other attitudinal framework, the goal is to meet patients’ biological, psychological, and social needs and help them attain higher levels of wellness. And these efforts are paying off-in increased patient, family, and physician satisfaction”(Poulter 1998).

In the hospital setting, the advantages of going beyond a simple medical model aimed at the efficient delivery of medical services is becoming apparent (Edvardsson and Nay 2009). A successful example of this in Australia can be seen in the design of the new Royal Childrens’ Hospital in Melbourne.

### **2.10.1 DOMESTIC OR HOMELIKE ENVIRONMENTS**

The domestic, or homelike, environment continues to be of interest, however, and is the most researched example of the relationship between a philosophy of care and the design of an environment for people with dementia. There is strong, but not uncontested (Samus, Rosenblatt et al. 2005), support for the link between homelike qualities and improvements in the quality of life of the residents (Minde, Haynes et al. 1990; Gnaedinger, Robinson et al. 2007; Charras, Zeisel et al. 2012; Garcia, Hébert et al. 2012; Fleming, Goodenough et al. 2014).

In a domestic or homelike environment, the goal is to encourage the person to undertake the tasks of daily life for as long as possible. This requires that a person has access to all of the normal household facilities, including a kitchen (Marsden, Meehan et al. 2001), and is encouraged to use their abilities (Scott, Ryan et al. 2011). It has been shown that the introduction of a small number of homelike features into an institutional environment resulted in a reduction in pacing, agitation and exit seeking (Cohen-Mansfield and Werner 1998) and improved social interaction and eating behaviour (Melin and Gotestam 1981). The presence of homelike features has also been associated with higher food and fluid intake (Reed, Zimmerman et al. 2005) and less tube feeding (Lopez, Amella et al. 2010).

The rigorous assessment of the effects of providing a homelike environment have taken two basic forms: a comparison of care in a homelike facility with care in the community, and comparisons between facilities that vary in their level of homelike qualities.

The first randomised control trial of admission to a purpose designed, homelike environment was conducted in Australia (Wells and Jorm 1987). The nature of the environment was described in the following way:

“The interior and garden areas are as secure as possible and reflect a homelike atmosphere. Most rooms are single and residents bring their own beds and small items of furniture. There are several multi-purpose living or activity areas and a kitchen/dining room. Where possible domestic furnishings and fittings have been used including carpet

tiles in all but the bedroom and bathrooms. The care programme involves all staff working in the unit and is based on the philosophy of normalisation. It includes continuing assessment and individual program review”.

Residents showed no difference in their rate of deterioration when compared with a matched group of people with dementia dwelling in the community who accessed community services, such as respite care. This is described as a successful outcome as the trauma and difficulties associated with admission to residential care were thought to be likely to accelerate decline. An important additional benefit was found in that the carers of those admitted showed improvements in their stress levels.

However, it is clear from the description of the environment that the contribution of the care staff in undertaking systematic assessments and developing individual programs was seen as central to the provision of appropriate residential care. There is no suggestion that this was provided for the community sample. The results therefore reflect the impact of a range of interventions that include the provision of a homelike environment.

In a similar vein, a comparison between the Quality of Life (QoL) of 62 people with dementia living in a secure care facility (SCF) which is “more comfortable and more like home and offers more choice and more privacy than traditional setting” (Reimer, Slaughter et al. 2004) and 123 matched people living in a number of traditional nursing homes showed positive results for people in the mid to late stages of dementia.

“The SCF ... featured a decreased density of residents, with 10 people living in each of six separate and self-contained semi-attached bungalows; enhanced staffing ratios, which enable the integration of personal care, leisure, and rehabilitation activity into the role of the staff caregiver (rather than an expert model of episodic therapist intervention); and a biodiverse environment (e.g., multigenerational, live-in pets, plants). The physical environment and daily activities were arranged like a typical home, with residents able to help in the kitchen, sweep the floor, sit by the fireplace, or go outside into a small enclosed garden area”.

While it proved impossible for the authors to allocate residents randomly to these settings, the matching of residents on age, sex, Global Deterioration Scale results and co-morbidities provided a firm foundation for comparison.

“This is the first study to directly compare SCF with traditional institutions using prospective follow-up and data collection. Taken as a whole, the findings of the study suggest that QoL for adults with middle-to late-stage dementia is the same or better across time in a SCF than in traditional institutional facilities. This is the first longitudinal study of its type to demonstrate positive effect on QoL over time in these later stages of dementia. Specifically, the group living in the SCF had significantly better ADL function over time than the two control groups, as measured using the FAST. In addition, affect for the residents living in the SCF was better, with increased interest and less anxiety/fear. This study suggests that a purposively designed physical and social environment has a positive effect on QoL.”

The reduction in anxiety and an increase in interest in their surroundings were sometimes accompanied by an increase in agitation which was described as not necessarily

“a negative finding, because it may indicate that residents had the environmental and biochemical freedom for such activity”.

This study again demonstrates the positive impact of a complex collection of interventions and leaves open the question of how much the physical environment contributed to the improvement and how much was contributed by the “enhanced knowledge and skills of caregivers.”

A serious attempt to control for these variables has been made in a very sophisticated study involving comparisons between 15 special care units (Zeisel, Silverstein et al. 2003). Statistical controls were included for the influence of, among others, cognitive status, need for assistance with activities of daily living, prescription drug use, amount of Alzheimer’s staff training and the staff-to-resident ratio. This study extended the boundaries of experimental design beyond the traditional randomised control trial. A hierarchical modelling technique was used to emphasise the variability between settings that would not have been apparent in a random sample and overcomes the problems associated with studies of intervention effects when SCU’s are assigned to experimental or control conditions, but the individual is the unit of analysis.

While the study is exciting in its design, the findings in relation to homelike qualities are not dramatic

“Persons living in SCU’s with a more residential, less institutional environment expressed lower levels of overall aggression than those living in more institutional settings”.

There was no relationship between homelike qualities and agitation, depression, social withdrawal or psychotic symptoms.

Perhaps the most obvious features of a domestic environment are the ‘homelike’ furnishings and fittings. A very well controlled investigation of the effects of introducing a few of the most basic elements of a homelike environment into a very institutional nursing home (Cohen-Mansfield and Werner 1998) showed that residents chose to spend time in a corridor containing comfortable chairs, pictures, coffee table, books and the aroma of citrus in comparison with a normal corridor. There was a weak trend to reduced agitation, pacing and exit seeking in comparison to behaviour in a normal corridor, but this positive trend was stronger when instead of a domestic setting being provided, a setting reminiscent of a natural outdoor setting was provided. The differences between the two enhanced settings were small. This study is probably best interpreted as supporting taking any and all steps available to break the institutional character of nursing homes with long hospital style corridors and shiny floors. It does have the advantage of controlling for staff skills and knowledge and other features of the social environment.

Does a homelike environment have any effect on the rate of functional decline of people with dementia? If it can be assumed that homelike qualities are a feature of SCUs in the USA, and there is some doubt about this (Chappel and Reid 2000), then the findings of the 4 State study of 800 facilities (Phillips 1997) are relevant. This showed that SCU residents declined at the same rate as non-SCU residents matched for base line cognitive status, behavioural problems, age, sex and length of stay.

A systematic attempt to define homelike qualities (Quincy, Adam et al. 2005) used the Hopkins Homelike Environmental Rating Scale (HHERS) in a comparison of 22 facilities.

“This 14-item measure was designed to capture the overall homelike climate of each facility. It consists of two subscales: family-like social climate (e.g., “Facility caregivers interact socially with the residents”) and homelike physical environment (e.g., “Residents’ rooms are tailored to their personal taste”).”

The study concluded with the observations that:

“Contrary to our hypotheses, environmental factors, specifically size and homelike setting, were not significant correlates of quality of life. Homelike environment and size also did not appear to moderate many of the affects of agitation, depression, apathy, or irritability on quality of life”.

A similarly negative finding concerning the relationship between homelike qualities, as measured by the Therapeutic Environment Screening Scale (TESS-2+), and agitation, measured by the Resident and Staff Observation Checklist (RSOC) (Sloane, Mathew et al. 1991), was found in a cross sectional survey of 53 special care units for people with dementia (Sloane, Mitchell et al. 1998). While low stimulation, characterised by having residents in bed for part of the day, and small size predicted lower level of agitation, homelike qualities did not.

An Australian qualitative investigation of the views of staff and relatives on a new purpose designed (Cioffi, Fleming et al. 2007) suggested that homelike qualities are related to concepts such as a pleasant milieu, looking homely, a home-like eating environment, feeling homely, like a kitchen at home, tranquillity, light and airy, serene, unrestricted, inviting for relatives and comfortable for children. The authors concluded that:

“This study has shown that an improved environment, such as an SCU, can enhance the QoL for residents, the ‘nursing home’ experience for relatives and the working environment for staff. For residents, the QoL improved as a result of decreased agitation, better sleeping patterns, greater freedom and increased appetite. For the relatives, the nursing home experience was improved as the lighter airy home-like atmosphere with garden access increased their comfort with visiting and with having their family member in care. For staff, their work environment was improved by better access to equipment, and greater ability to monitor residents and provide better care. They were able to feel more comfortable about the safety of the residents.

The main features of SCU design that relatives appreciated were the home-like family environment and tranquil atmosphere; these design features resulted in a SCU that was conducive to visitors. The SCU kitchen and dining room were described as very homely and this resulted in residents gaining weight”.

The appearance of domesticity, i.e. the ‘homelike design of the environment, is only part of a domestic environment. As well as looking like home, a truly domestic environment must provide residents with opportunities to engage in the ordinary activities of daily living that characterise life at home. Many of these activities centre on the kitchen and dining room. The fundamental idea behind these activities is that the resident should not be a passive recipient of services but should be afforded the opportunity of making a contribution, however small, and be recognised as a competent partner (Kihlgren, Hallgren et al. 1994).

The strongest evidence to support this approach (Reimer, Slaughter et al. 2004) comes from a study of a special care facility where “The physical

environment and daily activities were arranged like a typical home, with residents able to help in the kitchen, sweep the floor, sit by the fireplace, or go outside into a small enclosed garden area.” The results included less decline in ADL functions than in the control groups ( $p=0.16$ ), less anxiety ( $p=0.003$ ) and increased interest ( $=-0.017$ ). However, this environment was also designed to be smaller and more domestic than those it was compared with and the effects of these characteristics cannot be extracted from the findings. In a similarly generalised way, it has been observed that a homelike kitchen can become the centre of activity (Marsden, Meehan et al. 2001).

In what may be the most basic demonstration of the positive impact of engaging residents in an ordinary activity, providing a familiar dining experience around a table rather than serving meals to residents in their chairs in corridors was linked with increased social interaction and improved eating behaviour. (Melin and Gotestam 1981.) The authors note:

“However, changes in the patient’s environment do not automatically lead to increased activity. To ensure a positive effect on the patient behavior, contingency analyses have to be made. The ward milieu has to be created to increase the possibility to communicate and to obtain reinforcers, not just by putting the residents close together but also by making them dependent on each other if possible. In the present study this was done by changing the meal situation so that the residents had to communicate to get what they wanted from the table” (Melin and Gotestam 1981).

Simply changing the seating arrangements can result in increasing communication (Gotestam and Melin 1987).

A homelike environment has also been associated with higher food and fluid intake (Reed, Zimmerman et al. 2005), as well as less tube feeding (Lopez, Amella et al. 2010).

Ordinary activities can also include more personal care, such as grooming. There is clear evidence of the beneficial effects on QoL of engaging residents in these activities in a rich environment that included the opportunity to engage in activities such as food preparation (Wood, Harris et al. 2005). However, this study indicates the need for the active and focused intervention of staff for the environmental provisions to have an effect.

“The most enabling environmental presses occurred when staff managed activity situations in ways that continually supported residents’ positive behaviors and affect. ADL times and some activity groups constituted such situations”. (Wood, Harris et al. 2005)

Wood et al conclude that

“Perhaps most importantly, therefore, attention must be paid to how therapeutically designed, beautiful, and homelike architectural spaces can best be transformed into alive occupational spaces, as well as to what personal and institutional contributions and commitments are needed to make such transformations a reality”.

It is clear that there is little evidence to support the idea that the provision of a homelike environment in itself will bring about positive results for people with dementia. It has to be combined with appropriate philosophies of care, well skilled staff and good management practices (Atkinson 1995; Rosewarne, Opie et al. 1997; Moore 1999.). CADE units in NSW were designed to provide the opportunity for the involvement of residents in domestic activities and staff were trained and encouraged to do this (Atkinson 1995).

The evaluation of the first 15 months of operation of the first of these units (Fleming 1989) indicated significant improvement in self-help skills, social interaction and behaviour when compared to baseline measurements established in a long stay ward in a psychiatric hospital.

Supportive evidence of the significance of ordinary activities in establishing social networks and a sense of community has been found (Campo and Chaudhury 2012) and described in a well-executed qualitative study (McAllister and Silverman 1999) which compared a small, homelike facility with a traditional nursing home. One of the residents remarked:

“They cook your meals; sometimes I do the dishes—I don’t have to but I help out’. She also told me she’s glad she doesn’t have to cook here, though ‘it was OK cooking at home because you knew what they liked” (McAllister and Silverman 1999).

This highlights that not only do environmental characteristics and staff practices influence the effectiveness of interventions, but resident perceptions and wishes are also very important.

## 2.11 Summary

An over emphasis on safety may have detrimental effects. There is good evidence that making safety features less obtrusive, for example avoiding obviously locked doors, improves resident well-being, especially depression.

While there is evidence supporting the proposition that small unit size is associated with a variety of positive outcomes for people with dementia, it has not yet been possible to be certain about the contribution that the size of the unit makes in comparison with the other environmental factors that are commonly associated with a purposely designed, small unit e.g. homelike qualities, safety and familiarity. The evidence does support the proposition that there is an optimum balance between the physical size of a space and the number of people in it. Large, empty spaces and small, crowded spaces should be avoided.

The evidence supports the inclusion of clear lines of sight (good visual access) that enable residents and patients to see where they want to go and to see staff. This also benefits staff by enabling them to monitor residents and patients easily.

The careful reduction of unhelpful stimulation and enhancement of helpful stimulation is well supported. While well designed signage and the strategic positioning of personal memorabilia are of some help in wayfinding, the effect is not large. Levels of illumination and contrast need to be high to overcome the effects of ageing on the eye, but the provision of very high levels of illumination has not yet proven to be of benefit.

There is good evidence for the provision of a variety of places in environments for people with dementia. These assist in reducing anxiety and depression while improving social interaction, and they may assist the resident to find their way around. However, specific evidence for benefits of gardens per se, without enhanced staff interaction, is weak. It has been observed that many outdoor spaces are under utilised.

The literature supports the provision of a familiar environment, especially when that is taken to include the provision of single rooms that facilitate personalisation.

While there are examples of providing ways to link a residential facility to the



community through the inclusion of environmental features, such as a coffee shop, their effects on the wellbeing of patients and residents is yet to be systematically evaluated.

The strongest evidence in the research of a link between a philosophy of care, the built environment and wellbeing is to be found in the area of the domestic or homelike environment. However, the difficulties of distinguishing between the effects of the philosophy of care, staff skills, good management practices and the physical environment make it difficult to conclude that a homelike physical environment has a broad impact, especially in the case of people with advanced dementia. There is, however, good evidence that it reduces aggression.

## Acronyms

<b>ACFI</b>	Aged Care Funding Instrument
<b>AD</b>	Alzheimers Disease
<b>ADL</b>	Activities of Daily Living
<b>ADRQL</b>	Alzheimer's Disease Related Quality of Life (scale)
<b>AIHW</b>	Australian Institute of Health & Welfare
<b>DAT</b>	Dementia Alzheimers Type
<b>DICE</b>	Design in Caring Environments
<b>FAST</b>	Functional Assessment Staging Test
<b>GL</b>	Group Living
<b>HDS</b>	Hierarchical Dementia Scale
<b>NH</b>	Nursing Home
<b>QoL</b>	Quality of Life
<b>RACF</b>	Residential Aged Care Facility
<b>SCF</b>	Special Care Facility
<b>SCU</b>	Special Care Unit

## **RESOURCE 1**

**Using the built environment to create comprehensible, manageable and meaningful environments for people with dementia**

# **PART 3** **REFERENCES**

## PART 3

# REFERENCES

- Access\_Economics (2009). Making choices. Future dementia care: projections, problems and preferences.
- AIHW (2012). Dementia in Australia. Canberra, Australian Institute of Health and Welfare. Commonwealth of Australia.
- AIHW (2013). Dementia care in hospitals: costs and strategies. Canberra, Australian Institute of Health and Welfare.
- AIHW. (2012). Dementia in Australia. Canberra, Australian Institute of Health and Welfare.
- Alessi, C. A., J. L. Martin, et al. (2005). "Randomized, controlled trial of a nonpharmacological intervention to improve abnormal sleep/wake patterns in nursing home residents." Journal of the American Geriatrics Society **53**(5): 803-810.
- Algase, D. L., C. Antonakos, et al. (2011). "Estimates of Crowding in Long-Term Care: Comparing Two Approaches." Health Environments Research & Design Journal (HERD) (Vendome Group LLC) **4**(2): 61-74.
- Algase, D. L., E. R. A. Beattie, et al. (2010). "Wandering and the Physical Environment." American Journal of Alzheimer's Disease and Other Dementias **25**(4): 340-346.
- Allan, L. M., C. G. Ballard, et al. (2009) "Incidence and prediction of falls in dementia: a prospective study in older people." PLoS ONE [Electronic Resource] **4**(5): e5521.
- Alzheimer's Australia (2014). Creating a dementia friendly Australia.
- Ancoli-Israel, S., P. CLOPTON, et al. (1997). "Use of wrist activity for monitoring sleep/wake in demented nursing home patients. ." Sleep **20**: 24-27.
- Ancoli-Israel, S., P. Gehrman, et al. (2003). "Increased light exposure consolidates sleep and strengthens circadian rhythms in severe Alzheimer's disease patients." Behavioral Sleep Medicine **1**(1): 22-36.
- Annerstedt, L. (1993). "Development and consequences of group living in Sweden : A new mode of care for the demented elderly." Social Science & Medicine **37**(12): 1529-1538.
- Annerstedt, L. (1997). "Group-living care: An alternative for the demented elderly." Dementia and Geriatric Cognitive Disorders **8**(2): 136-142.
- Atkinson, A. (1995). "Managing people with dementia: CADE units... confused and disturbed elderly." Nursing Standard **9**(25): 29-32.
- Barnes, S. (2006). "Space, Choice and Control, and Quality of Life in Care Settings for Older People." Environment and Behavior **38**(5): 589-604.
- Barrick, A. L., P. D. Sloane, et al. (2010). "Impact of ambient bright light on agitation in dementia." International Journal of Geriatric Psychiatry **25**(10): 1013-1021.
- Beauchemin, K. M. and P. Hays (1996). "Sunny hospital rooms expedite recovery from severe and refractory depressions." Journal of Affective Disorders **40**(1-2): 49-51.
- Bellelli, G., G. Frisoni, et al. (1998). "Special care units for demented patients: a multicenter study." Gerontologist **38**(4): 456-462.
- Bergsland, K. (2002). "Space in mind." Journal for Healthcare Design and Development **33**: 18-24.
- Bianchetti, A., P. Benvenuti, et al. (1997). "An Italian model of dementia special care unit: Results of a pilot study." Alzheimer Disease & Associated Disorders **11**(1): 53-56.
- Boex, W. and S. Boex (2012). "Well-being through design: Transferability of design concepts for healthcare environments to ordinary community settings." Housing, Care and Support **15**(3): 120-128.
- Bowers, L., N. Crowhurst, et al. (2002). "Safety and security policies on psychiatric acute admission wards: results from a London-wide survey." Journal of Psychiatric and Mental Health Nursing **9**(4): 427-433.
- Brawley, E. C. (1997). "Designing for Alzheimer's disease. Strategies for creating better care environments." New York: Wiley.
- Brawley, E. C. (2001). "Environmental design for Alzheimer's disease: a quality of life issue." Aging & Mental Health **5**(2 supp 1): 79 - 83.
- Brush, J. A., R. A. Meehan, et al. (2002). "Using the environment to improve intake for people with dementia." Alzheimer's Care Quarterly **3**(4): 330-338 339p.
- Burns, A. (2009). "Bright light therapy for agitation in dementia: a randomized controlled trial." International psychogeriatrics **21**(04): 711-721.
- Burns, A. (2011). "Help patients see more clearly." The Health Service Journal **121**(6282): 26-27.
- Burton, E. (2012). "Streets ahead? The role of the built environment in healthy ageing." Perspectives in Public Health **132**(4): 161-162.
- Burton, E., L. Mitchell, et al. (2004). Neighbourhoods for life: Designing dementia friendly outdoor environments, Oxford Institute for Sustainable Development, Oxford Brookes University.
- Campbell, S. S., D. F. Kripke, et al. (1988). "Exposure to light in healthy elderly subjects and Alzheimer's patients." Physiology and Behaviour **42**: 141-144.
- Campo, M. and H. Chaudhury (2012). "Informal social interaction among residents with dementia in special care units: Exploring the role of the physical and social environments." Dementia (14713012) **11**(3): 401-423 423p.
- Capezuti, E. (2004). "Minimizing the use of restrictive devices in dementia patients at risk for falling." Nursing Clinics of North America **39**(3): 625+.
- Chafetz, P. K. (1991). "Behavioral and cognitive outcomes of SCU care." Clinical Gerontologist **11**: 19-38.
- Chappel, N. L. and C. R. Reid (2000). "Dimensions of care of dementia sufferers in long-term care institutions: Are they related to outcomes?" The Journals of Gerontology **55B**(4): S234.
- Chard, G., L. Liu, et al. (2008). "Verbal cueing and environmental modifications: Strategies to improve engagement in occupations in persons with alzheimer disease." Physical and Occupational Therapy in Geriatrics **27**(3): 197-211.
- Charras, K., J. Zeisel, et al. (2012).

- Effect of personalization of private spaces in special care units on institutionalized elderly with dementia of the Alzheimer type. Dementia: Non-Pharmacological Therapies: 119-135.
- Chiarelli, P., W. Bower, et al. (2005). "Estimating the prevalence of urinary and faecal incontinence in Australia: systematic review." Australasian Journal on Ageing **24**(1): 19-27.
- Cioffi, J. M., A. Fleming, et al. (2007). "The effect of environmental change on residents with dementia: The perceptions of relatives and staff." Dementia **6**(2): 215-231.
- Cleary, T. A., C. Clamon, et al. (1988.). "A reduced stimulation unit: Effects on patients with Alzheimer's Disease and related disorders." The Gerontologist, **28**: 511-514.
- Cohen-Mansfield, J. and A. Parpura-Gill (2007). "Bathing: A framework for intervention focusing on psychosocial, architectural and human factors considerations." Archives of Gerontology and Geriatrics **45**(2): 121-135.
- Cohen-Mansfield, J., K. Thein, et al. (2010). "Engaging nursing home residents with dementia in activities: The effects of modeling, presentation order, time of day, and setting characteristics." Aging and Mental Health **14**(4): 471-480.
- Cohen-Mansfield, J. and P. Werner (1995). "Environmental influences on agitation: An integrative summary of an observational study." American Journal of Alzheimer's Disease and Other Dementias **10**(1): 32-39.
- Cohen-Mansfield, J. and P. Werner (1998). "The effects of an enhanced environment on nursing home residents who pace." Gerontologist **38**(2): 199-208.
- Cohen-Mansfield, J. and P. Werner (1999). "Outdoor wandering parks for persons with dementia: a survey of characteristics and use." Alzheimer Disease & Associated Disorders **13**(2): 109-117.
- Cohen, U., & Weisman, G.D. (1991). "Holding on to home: Designing environments for people with dementia." Baltimore: Johns Hopkins University Press.
- Cox, H., I. Burns, et al. (2004). "Multisensory environments for leisure: promoting well-being in nursing home residents with dementia." Journal of Gerontological Nursing **30**(2): 37-45.
- Cunningham, C. (2006). "Understanding challenging behaviour in patients with dementia. [Review] [23 refs]." Nursing Standard **20**(47): 42-45.
- Cutler, L. J. and R. A. Kane (2009). "Post-occupancy evaluation of a transformed nursing home: The first four Green House® settings." Journal of Housing for the Elderly **23**(4): 304-334.
- Day, K. and U. Cohen (2000). "The Role of Culture in Designing Environments for People with Dementia: A Study of Russian Jewish Immigrants." Environment and Behavior **32**(3): 361-399.
- Dean, R., K. Briggs, et al. (1993). "The domus philosophy: A prospective evaluation of two residential units for the elderly mentally ill." International Journal of Geriatric Psychiatry **8**(10): 807-817.
- Detweiler, M. B., P. F. Murphy, et al. (2009). "Scheduled medications and falls in dementia patients utilizing a wander garden." American Journal of Alzheimer's Disease and Other Dementias **24**(4): 322-332.
- Detweiler, M. B., P. F. Murphy, et al. (2008). "Does a wander garden influence inappropriate behaviors in dementia residents?" American Journal of Alzheimer's Disease and Other Dementias **23**(1): 31-45.
- Devlin, A. S. (1992). "Psychiatric Ward Renovation: Staff Perception and Patient Behavior." Environment and Behavior **24**(1): 66-84.
- Dickinson, J. I. and J. McLain-Kark (1998). "Wandering behavior and attempted exits among residents diagnosed with dementia-related illnesses: A qualitative approach." Journal of Women & Aging **10**(2): 23.
- Dickinson, J. I., J. McLain-Kark, et al. (1995). "The effects of visual barriers on exiting behavior in a dementia care unit." Gerontologist **35**(1): 127-130.
- Dinshaw, C. (2006). "Surveying nursing practice on wards for older people with mental health needs." Nursing Older People **18**(10): 25-31.
- Dobrohotoff, J. T. and R. H. Llewellyn-Jones (2011). "Psychogeriatric inpatient unit design: a literature review." International Psychogeriatrics / IPA **23**(2): 174-189.
- Dobrohotoff, J. T. and R. H. Llewellyn-Jones (2011). "Psychogeriatric inpatient unit design: a literature review." International Psychogeriatrics **23**(2): 174-189.
- Dowling, G. A., C. L. Graf, et al. (2007). "Light treatment for neuropsychiatric behaviors in Alzheimer's disease." Western Journal of Nursing Research **29**(8): 961-975.
- Draper, B., R. Karmel, et al. (2011). "The Hospital Dementia Services Project: age differences in hospital stays for older people with and without dementia." International Psychogeriatrics **23**(10): 1649-1658.
- Edvardsson, D. and R. Nay (2009). "Acute care and older people: challenges and ways forward." Australian Journal of Advanced Nursing **27**(2): 63-69.
- Elliott, K.-E. J. "Perspectives of the community-based dementia care workforce: "occupational communion" a key finding from the Work 4 Dementia Project." International psychogeriatrics **25**(05): 765-774.
- Elmstahl, S., L. Annerstedt, et al. (1997). "How should a group living unit for demented elderly be designed to decrease psychiatric symptoms?" Alzheimer Disease & Associated Disorders **11**(1): 47-52.
- Engberg, J., N. G. Castle, et al. (2008). "Physical Restraint Initiation in Nursing Homes and Subsequent Resident Health." The Gerontologist **48**(4): 442-452.
- Evans, B. (1989.). "Managing from day to day: Creating a safe and workable environment." Minneapolis, MN: Department of Veterans Affairs Medical Centre..
- Fleming, R. (2011). "An environmental assessment tool suitable for use in homelike facilities for people with dementia." Australasian Journal on Ageing **30** (3):

- 108-112.
- Fleming, R. and K. Bennett (2015). Dementia Friendly Communities Environmental Assessment Tool, Alzheimers Australia WA.
- Fleming, R. and J. Bowles (1987). "Units for the confused and disturbed elderly: Development, Design, Programming and Evaluation." *Australian Journal on Ageing* 6(4): 25-28.
- Fleming, R., Bowles, J. and Mellor, S. (1989). "Peppertree Lodge: Some observations on the first fifteen months of the first C.A.D.E. unit." *Australian Journal on Ageing* 8(4): 29-32.
- Fleming, R., P. Crookes, et al. (2008). A review of the empirical literature on the design of physical environments for people with dementia. Sydney, Australia, Primary Dementia Collaborative Research Centre, UNSW.
- Fleming, R., B. Goodenough, et al. (2014). "The relationship between the quality of the built environment and the quality of life of people with dementia in residential care." *Dementia*.
- Fleming, R. and N. Purandare (2010). "Long-term care for people with dementia: environmental design guidelines." *International Psychogeriatrics* 22(7): 1084-1096.
- Fleming, R. and S. Sum (2014). "Empirical studies on the effectiveness of assistive technology in the care of people with dementia: A systematic review." *Journal of Assistive Technologies* 8(1): 14-34.
- Fottler, M. D., R. C. Ford, et al. (2000). "Creating a healing environment: the importance of the service setting in the new consumer-oriented healthcare system." *Journal of Healthcare Management* 45: 91-106.
- Garcia, L. J., M. Hébert, et al. (2012). "Perceptions of family and staff on the role of the environment in long-term care homes for people with dementia." *International Psychogeriatrics* 24(5): 753-765.
- Garre-Olmo, J., S. López-Pousa, et al. (2012). "Environmental determinants of quality of life in nursing home residents with severe dementia." *Journal of the American Geriatrics Society* 60(7): 1230-1236.
- Gasio, P. F., K. Kräuchia, et al. (2003). "Dawn-dusk simulation light therapy of disturbed circadian rest-activity cycles in demented elderly." *Experimental Gerontology* 38(1-2): 207-216. 38(1-2): 207-216.
- Gnaedinger, N., J. Robinson, et al. (2007). "Renovating the built environment for dementia care: lessons learned at the Lodge at Broadmead in Victoria, British Columbia." *Healthcare Quarterly* 10(1): 76-80.
- Gonski, P. N. and I. Moon (2012). "Outcomes of a behavioral unit in an acute aged care service." *Archives of Gerontology and Geriatrics* 55(1): 60-65.
- Gotestam, K. G. and L. Melin (1987). Improving well-being for patients with senile dementia by minor changes in the ward environment. *Society, stress and disease*. L. Levi. Oxford, England, Oxford University Press. 5: 295-297.
- Government, A. (2004). Australia's Demographic Challenges. Parkes, ACT, The Treasury.
- Graf, A., C. Wallner, et al. (2001). "The effects of light therapy on mini-mental state examination scores in demented patients." *Biological Psychiatry* 50(9): 725-727.
- Grant, L. A., R. A. Kane, et al. (1995). "Beyond labels: nursing home care for Alzheimer's disease in and out of special care units." *Journal of the American Geriatrics Society* 43(5): 569-576.
- Greene, J. A. and J. Asp (1985). "Specialized management of the Alzheimer's disease patient: does it make a difference? A preliminary progress report." *Journal of the Tennessee Medical Association* 78(9): 559-563.
- Gross, J., M. E. Harmon, et al. (2004). "Recognition of Self Among Persons With Dementia: Pictures Versus Names as Environmental Supports." *Environment and Behavior* 36(3): 424-454.
- Gudeman, J. (2005). "Closing Doors on Acute Psychiatric Units: Time to Change?" *Psychiatric Services* 56(9): 1047-1047.
- Hagglund, D. and D. Hagglund (2010). "A systematic literature review of incontinence care for persons with dementia: the research evidence." *Journal of Clinical Nursing* 19(3-4): 303-312.
- Haglund, K., L. von Knorring, et al. (2006). "Psychiatric wards with locked doors -- advantages and disadvantages according to nurses and mental health nurse assistants." *Journal of Clinical Nursing* 15(4): 387-394. 388p.
- Haglund, K., L. Von Knorring, et al. (2006). "Psychiatric wards with locked doors - advantages and disadvantages according to nurses and mental health nurse assistants." *Journal of Clinical Nursing* 15(4): 387-394.
- Hall, G., Kirschling, M.V., & Todd, S. (1986). "Sheltered freedom - An Alzheimer's unit in an ICF." *Geriatric Nursing*, 7.: 132-137.
- Hanley, I. G. (1981). "The use of signposts and active training to modify ward disorientation in elderly patients." *Journal of Behavior Therapy & Experimental Psychiatry* 12(3): 241-247.
- Hanley, I. G. (1981.). "The use of signposts and active training to modify ward disorientation in elderly patients." *Journal of Behavioural Therapy and Experimental Psychiatry*, 12.: 241-247.
- Harrington, T. (1998). Perception and physiological psychology in design for older people. *14th Nordic Geodetic Commission*. Trondheim.
- Harris, P. B., G. McBride, et al. (2002). "A place to heal: environmental sources of satisfaction among hospital patients." *Journal of Applied Social Psychology* 32: 1276-1279.
- Hewawasam, L. C. (1996). "The use of two-dimensional grid patterns to limit hazardous ambulation in elderly patients with Alzheimer's disease." *Nursing Times Research* 1(3): 217-227.
- Hoglund, J. D., S. Dimotta, et al. (1994). "Long-term care design: Woodside Place--the role of environmental design in quality of life for residents with dementia." *Journal of Healthcare Design* 6: 69-76.
- Hsieh, Y. (2010). "Investigation on the day-to-day behavior of a taiwanese nursing organization's residents through shared bedroom style." *Journal of Asian Architecture and Building Engineering* 9(2): 371-378.
- Hutchinson, S., S. Leger-Krall, et al. (1996). "Toileting: a biobehavioral challenge in Alzheimer's dementia care." *Journal of gerontological nursing* 22(10): 18-27.
- Isaksson, U., S. Åström, et al. (2009). "Factors associated with the prevalence of violent behaviour among residents living in nursing homes." *Journal of Clinical Nursing* 18(7): 972-980. 979p.
- Ittleson, W. H., H. M. Proshansky, et al. (1970). "Bedroom Size and Social Interaction of the Psychiatric Ward." *Environment and Behavior* 2(3): 255-270.
- Joose, L. (2012). "Do Sound Levels and Space Contribute to Agitation in Nursing Home Residents with Dementia?" *Research in Gerontological Nursing* 5(3): 174-184.
- Jorm, A. F., A. E. Korten, et al. (1987). "The prevalence of

- dementia: A quantitative integration of the literature." *Acta Psychiatrica Scandinavica* **76**(5): 465-479.
- Joseph, A., Y.-S. Choi, et al. (2015). "Impact of the Physical Environment of Residential Health, Care, and Support Facilities (RHCSF) on Staff and Residents: A Systematic Review of the Literature." *Environment and Behavior*.
- Joseph, A. and C. Zimring (2007). "Where Active Older Adults Walk: Understanding the Factors Related to Path Choice for Walking Among Active Retirement Community Residents." *Environment & Behavior* **39**(1): 75-105.
- Kallin, K., J. Jensen, et al. (2004). "Why the elderly fall in residential care facilities, and suggested remedies." *Journal of Family Practice* **53**(1): 41-52.
- Keady, J., S. Campbell, et al. (2012). "Neighbourhoods and dementia in the health and social care context: A realist review of the literature and implications for UK policy development." *Reviews in Clinical Gerontology* **22**(2): 150-163.
- Kihlgren, M., Brane, G., Karlsson, I., Leissner, P., & Norberg, A. (1992). "Long-term influences on demented patients in different caring mileaus, a collective living unit and a nursing home: A descriptive study." *Dementia*, **3**: 342-349.
- Kihlgren, M., A. Hallgren, et al. (1994). "Integrity promoting care of demented patients: Patterns of interaction during morning care." *International Journal of Aging and Human Development* **39**(4): 303-319.
- Kincaid, C. and J. R. Peacock (2003). "The Effect of a Wall Mural on Decreasing Four Types of Door-Testing Behaviors." *Journal of Applied Gerontology* **22**(1): 76-88.
- Koss, E. and G. C. Gilmore (1998). Environmental interventions and functional ability of AD patients. *Research and practice in Alzheimer's disease*. B. Vellas, F. Fitten and C. Frisoni. New York, Springer: 185-193.
- Kovach, C., C. Weisman, et al. (1997). "Impacts of a therapeutic environment for dementia care." *American Journal of Alzheimer's Disease and Other Dementias* **12**(3): 99-110.
- Kuhn, D., R. E. Kasayka, et al. (2002). "Behavioral observations and quality of life among persons with dementia in 10 assisted living facilities." *American Journal of Alzheimer's Disease and Other Dementias* **17**(5): 291-298.
- Kumar, S. and B. Ng (2001). "Crowding and violence on psychiatric wards: explanatory models." *Canadian Journal Of Psychiatry. Revue Canadienne De Psychiatrie* **46**(5): 433-437.
- Kwok, T., X. Bai, et al. (2012). "Effect of Physical Restraint Reduction on Older Patients' Hospital Length of Stay." *Journal of the American Medical Directors Association* **13**(7): 645-650.
- Larson, E. B., S. Marie-Florence, et al. (2004). "Survival after Initial Diagnosis of Alzheimer Disease." *Annals of Internal Medicine* **140**(7): 501-509.
- Lawton, M., M. Fulcomer, et al. (1984). "Architecture for the mentally impaired elderly." *Environment and Behavior* **16**(6): 730-757.
- Lawton, M. P., Fulcomer, M., & Kleban, M. (1984.). "Architecture for the mentally impaired elderly." *Environment and Behaviour*, **16**: 730-757.
- Lee, Y. and S. Kim (2008). "Effects of indoor gardening on sleep, agitation, and cognition in dementia patients—a pilot study." *International Journal of Geriatric Psychiatry* **23**(5): 485-489.
- Lekeu, F., W. V. et al. (2002). "Training early Alzheimer patients to use a mobile phone." *Acta Neurol Belg.* **102**(3): 114-121.
- Leon, J. and M. G. Ory (1999). "Effectiveness of Special Care Unit (SCU) placements in reducing physically aggressive behaviors in recently admitted dementia nursing home residents." *American Journal of Alzheimer's Disease and Other Dementias* **14**(5): 270-277.
- Lisa Poulter, H. (1998). "Satisfaction by design." *Marketing Health Services* **18**(3): 4-8.
- Livingston, G., L. Kelly, et al. (2014). "Non-pharmacological interventions for agitation in dementia: systematic review of randomised controlled trials." *British Journal of Psychiatry* **205**(6): 436-442.
- Lopez, R. P., E. J. Amella, et al. (2010). "The influence of nursing home culture on the use of feeding tubes." *Archives of Internal Medicine* **170**(1): 83-88.
- Lovell, B. B., Ancoli-Israel, S., & Gevirtz, R. (1995). "Effect of bright light treatment on agitated behaviour in institutionalised elderly subjects." *Psychiatry Research*, **57**: 7-12.
- Lövheim, H., P.-O. Sandman, et al. (2008). "Behavioral and psychological symptoms of dementia in relation to level of cognitive impairment." *International Psychogeriatrics* **20**(4): 777-789.
- Low, L. F., B. Draper, et al. (2004). "The relationship between self-destructive behaviour and nursing home environment." *Aging & Mental Health* **8**(1): 29-33.
- Marquardt, G., K. Bueter, et al. (2014). "Impact of the Design of the Built Environment on People with Dementia: An Evidence-Based Review." *HERD: Health Environments Research & Design Journal* **8**(1): 127-157.
- Marquardt, G. and P. Schmiege (2009). "Dementia-friendly architecture. Environments that facilitate wayfinding in nursing homes." *Zeitschrift fur Gerontologie und Geriatrie* **42**(5): 402-407.
- Marsden, J. P., R. A. Meehan, et al. (2001). "Therapeutic kitchens for residents with dementia." *American Journal of Alzheimer's Disease and Other Dementias* **16**(5): 303-311.
- Marshall, M., Ed. (2005). *Perspectives on Rehabilitation and Dementia*. London, Jessica Kingsley.
- Mayer, R. and S. J. Darby (1991). "Does a mirror deter wandering in demented older people?" *International Journal of Geriatric Psychiatry* **6**(8): 607-609.
- McAllister, C. L. and M. A. Silverman (1999). "Community formation and community roles among persons with Alzheimer's disease: A comparative study of experiences in a residential Alzheimer's facility and a traditional nursing home." *Qualitative Health Research*, **9**: 65-85.
- Melin, L. and K. G. Gotestam (1981.). "The effects of rearranging ward routines on communication and eating behaviours of psychogeriatric patients." *Journal of Applied Behaviour Analysis*, **14**: 47-51.
- Meyer, D. L., B. Dorbacker, et al. (1992). "Effects of a quiet week'intervention on behavior in an Alzheimer boarding home." *American Journal of Alzheimer's Disease and Other Dementias* **7**(4): 2-7.
- Minde, R., E. Haynes, et al. (1990). "The ward milieu and its effect on the behaviour of psychogeriatric patients." *Canadian Journal of Psychiatry - Revue Canadienne de Psychiatrie* **35**(2): 133-138.
- Mishima, K., Okawa, M., Hishikawa, Y., Hozumi, S., Hori, H., & Takahashi, K. (1994). "Morning bright light therapy for sleep and behaviour disorders in elderly patients with dementia." *Acta Psychiatrica Scandinavica*, **89**: 1-7.
- Mitchell, L. and E. Burton (2006). "Neighbourhoods for life: Designing dementia-friendly outdoor environments." *Quality*

- in *Ageing* **7**(1): 26-33.
- Mitchell, L. and E. Burton (2010). "Designing dementia-friendly neighbourhoods: Helping people with dementia to get out and about." *Journal of Integrated Care* **18**(6): 11-18.
- Mitchell, L., E. Burton, et al. (2004). "Dementia-friendly cities: Designing intelligible neighbourhoods for life." *Journal of Urban Design* **9**(1): 89-101.
- Mitchell, L., E. Burton, et al. (2003). "Making the outside world dementia-friendly: design issues and considerations." *Environment & Planning B: Planning & Design* **30**(4): 605-632.
- Mooney, P., & Nicell, P.L. (1992.). "The importance of exterior environment for Alzheimer residents: Effective care and risk management." *Healthcare Management Forum*, **5**, 23-29.
- Moore, K. D. (1999.). "Dissonance in the dining room: A study of social interaction in a special care unit." *Qualitative Health Research*, **9**: 133-155.
- Morgan, D. G. and N. J. Stewart (1997). "The importance of the social environment in dementia care." *Western Journal of Nursing Research* **19**(6): 740-761.
- Morgan, D. G. and N. J. Stewart (1998). "Multiple Occupancy Versus Private Rooms on Dementia Care Units." *Environment and Behavior* **30**(4): 487-503.
- Morgan, D. G. and N. J. Stewart (1999). "The physical environment of special care units: needs of residents with dementia from the perspective of staff and family caregivers." *Qualitative Health Research* **9**(1): 105-118.
- Morgan, D. G. and N. J. Stewart (1999). "The Physical Environment of Special Care Units: Needs of Residents with Dementia from the Perspective of Staff and Family Caregivers." *Qualitative Health Research* **9**(1): 105-118.
- Morgan, D. G. S., N.J. (1998.). "High versus low density special care units: Impact on the behaviour of elderly residents with dementia." *Canadian Journal on Aging*, **17**: 143-165.
- Morgan, D. G. S., N.J. (1999.). "The physical environment of special care units: Needs of residents with dementia from the perspective of staff and caregivers." *Qualitative Health Research*, **9**: 105-118.
- Moyle, W., S. Borbasi, et al. (2011). "Acute care management of older people with dementia: a qualitative perspective." *Journal of Clinical Nursing* **20**(3/4): 420-428.
- Namazi, K. H., & Johnson, B.D. (1992). "Dressing independently: A closet modification model for Alzheimer's disease patients." *American Journal of Alzheimer's Care and Related Disorders and Research*, **7**: 22-28.
- Namazi, K. H. and B. D. Johnson (1991a). "Environmental effects on incontinence problems in Alzheimer's disease patients." *American Journal of Alzheimer's Disease and Other Dementias* **6**(6): 16-21.
- Namazi, K. H. and B. D. Johnson (1991b). "Physical environmental cues to reduce the problems of incontinence in Alzheimer's disease units." *American Journal of Alzheimer's Disease and Other Dementias* **6**(6): 22-28.
- Namazi, K. H. and B. D. Johnson (1992a). "Pertinent autonomy for residents with dementias: Modification of the physical environment to enhance independence." *American Journal of Alzheimer's Disease and Other Dementias* **7**(1): 16-21.
- Namazi, K. H. and B. D. Johnson (1996). "Issues related to behavior and the physical environment: Bathing cognitively impaired patients." *Geriatric Nursing* **17**(5): 234-238.
- Namazi, K. H., T. T. Rosner, et al. (1991). "Long-term memory cuing to reduce visuo-spatial disorientation in Alzheimer's disease patients in a special care unit." *American Journal of Alzheimer's Disease and Other Dementias* **6**(6): 10-15.
- Namazi, K. H., Rosner, T.T., & Calkins, M.P. (1989.). "Visual barriers to prevent ambulatory Alzheimer's patients from exiting through an emergency door." *The Gerontologist* **29**: 699-702.
- Naue, U. and T. Kroll (2011). "A reply to 'The "demented other" or simply "a person"? Extending the philosophical discourse of Naue and Kroll through the situated self by John Keady, Steven Sabat, Ann Johnson, and Caroline Swarbrick." *Nursing Philosophy* **12**(4): 293-296.
- Neistein, S. and A. P. Siegal (1996). "Agitation, wandering, pacing, restlessness, and repetitive mannerisms." *International Psychogeriatrics* **8**(Suppl 3): 399-402.
- Nelson, J. (1995.). "The influence of environmental factors in incidents of disruptive behaviour." *Journal of Gerontological Nursing*, **21**,((5)),: 19-24.
- Netten, A. (1989). "The effect of design of residential homes in creating dependency among confused elderly residents: A study of elderly demented residents and their ability to find their way around homes for the elderly." *International Journal of Geriatric Psychiatry* **4**(3): 143-153.
- Netten, A. (1989). "The effect of design of residential homes in creating dependency among confused elderly residents: A study of elderly demented residents and their ability to find their way around homes for the elderly." *International Journal of Geriatric Psychiatry*, **4**: 143-153.
- Netten, A. (1993.). "A positive environment? Physical and social influences on people with senile dementia in residential care." *Aldershot, England: Ashgate*.
- New\_Zealand\_Ministry\_of\_Health. (2002). "Criteria for the design and refurbishment of psychiatric acute and intensive care facilities: a statement from the Ministry of Health." Retrieved June 2013, from <http://www.health.govt.nz/publication/criteria-design-and-refurbishment-psychiatric-acute-and-intensive-care-facilities>.
- Nolan, B., R. Mathews, et al. (2002). "Evaluation of the effect of orientation cues on wayfinding in persons with dementia." *Alzheimers Care Quarterly* **3**(1): 46-49.
- Nolan, B. and R. M. Mathews (2004). "Facilitating Resident Information Seeking Regarding Meals in a Special Care Unit: An environmental design intervention." *Journal of Gerontological Nursing*, **30**(10).
- O'Brien, L. and R. Cole (2003). "Close-observation areas in acute psychiatric units: A literature review." *International Journal of Mental Health Nursing*.
- Oliver, D., J. B. Connelly, et al. (2007). "Strategies to prevent falls and fractures in hospitals and care homes and effect of cognitive impairment: systematic review and meta-analyses." *British Medical Journal* **334**(7584): 82-85.
- Osmond, H. (1957). "Function as the basis of psychiatric ward design." *Mental Hospitals* **8**: 23-30.
- Ouslander, J. G., B. R. Connell, et al. (2006). "A nonpharmacological intervention to improve sleep in nursing home patients: results of a controlled clinical trial." *Journal of the American Geriatrics Society* **54**(1): 38-47.
- Parker, C., S. Barnes, et al. (2004). "Quality of life and building design in residential and nursing homes for older people." *Ageing & Society*



- 24(06): 941-962.
- Passini, R., H. Pigot, et al. (2000). "Wayfinding in a Nursing Home for Advanced Dementia of the Alzheimer's Type." Environment and Behavior 32(5): 684-710.
- Passini, R., C. Rainville, et al. (1998). "Wayfinding with dementia: Some research findings and a new look at design." Journal of Architectural and Planning Research, 15: 133-151.
- Perritt, M. R., E. D. McCune, et al. (2005). "Empirical Findings Suggest Recommendations for Carpet Pattern and Texture." Alzheimer's Care Quarterly 6(4): 300.
- Phillips, C. D., Sloan, P.D., Howes, C., & Koch, G. (1997.). "Effects of residence in Alzheimer disease special care units on functional outcomes." Journal of American Medical Association, 278: 1340-1344.
- Phillipson, L., C. Magee, et al. (2013). "Why carers of people with dementia do not utilise out-of-home respite services." Health & Social Care In The Community 21(4): 411-422.
- Poulter, L. (1998). "Satisfaction by design." Marketing Health Services 18(3): 4-8.
- Proctor, L. P., P. Brook, et al. (1985). "Residents' functioning and staff perceptions of 'ease of management' in two types of old peoples' homes." Social Science and Medicine 21(12): 1315-1318.
- Pynoos, J., & Ohta, R.J. (1991). "In-home interventions for persons with Alzheimer's disease and their caregivers." Physical & Occupational Therapy, 93,(3-4): 83-92.
- Quincy, M. S., R. Adam, et al. (2005). "The Association of Neuropsychiatric Symptoms and Environment With Quality of Life in Assisted Living Residents With Dementia." The Gerontologist 45(1): 19.
- Rabins, P. V., J. D. Kasper, et al. (2000). Concepts and methods in the ADRL: an instrument for assessing health-related quality of life in persons with Alzheimer's disease. New York, Springer Publishing Company.
- Rappe, E. and S.-L. Kivelä (2005). "Effects of Garden Visits on Long-term Care Residents as Related to Depression." HortTechnology 15(2): 298.
- Reed, P. S., S. Zimmerman, et al. (2005). "Characteristics associated with low food and fluid intake in long-term care residents with dementia." Gerontologist: 74-80 77p.
- Reimer, M., A. S. Slaughter, et al. (2004). "Special Care Facility Compared with Traditional Environments for Dementia Care: A Longitudinal Study of Quality of Life." Journal of the American Geriatrics Society 52(7): 1085.
- Remen, S. (1991). "Signs symbols and the psychiatric environment." Psychiatric Hospital 22: 113-118.
- Remen, S. (1992). "How can you keep your psychiatric patients safe?" Michigan Hospitals 28: 21-27.
- Robison, J., N. Shugrue, et al. (2011). "Community-Based Versus Institutional Supportive Housing: Perceived Quality of Care, Quality of Life, Emotional Well-Being, and Social Interaction." Journal of Applied Gerontology 30(3): 275-303 229p.
- Rodiek, S. D. (2002). "Influence of an outdoor garden on mood and stress in older persons." Journal of Therapeutic Horticulture 13: 13-21.
- Rosewarne, R., J. Opie, et al. (1997). Care Needs of People with Dementia and Challenging Behaviour Living in Residential Facilities. Canberra, Commonwealth Dept. of Health and Family Services.
- Sabat, S. R., A. Johnson, et al. (2011). "The 'demented other' or simply 'a person'? Extending the philosophical discourse of Naue and Kroll through the situated self." Nursing Philosophy 12(4): 282-292.
- Samus, Q. M., A. Rosenblatt, et al. (2005). "The association of neuropsychiatric symptoms and environment with quality of life in assisted living residents with dementia." Gerontologist 45 Spec No 1(1): 19-26.
- Satlin, A., Volicer, L., Ross, V., Herz, L., & Campbell, S. (1992). "Bright light treatment of behavioural and sleep disturbances in patients with Alzheimer's Disease." American Journal of Psychiatry, 149: 1028-1032.
- Scandura, D. A. (1995). "Freedom and safety: A Colorado centre cares for Alzheimer's patients." Health Progress, 76,(3): 44-46.
- Schwarz, B., H. Chaudhury, et al. (2004). "Effect of design interventions on a dementia care setting." American Journal of Alzheimer's Disease and Other Dementias 19(3): 172-176.
- Scialfa, C. T., P. Spadafora, et al. (2008). "Iconic sign comprehension in older adults: The role of cognitive impairment and text enhancement." Canadian Journal on Aging 27(3): 253-265.
- Scott, A., A. Ryan, et al. (2011). "Perceptions and implications of violence from care home residents with dementia: a review and commentary." International Journal of Older People Nursing 6(2): 110-122.
- Shrivastava, R., S. Kumar, et al. (1999). "Psychiatric units in district general hospitals: design issues." International Medical Journal 6: 119-124.
- Sloan, P. D., Mitchell, C.M., Preisser, J.S., Phillips, C., Commander, C., & Burkner, E. (1998). "Environmental correlates of resident agitation in Alzheimer's disease special care units." Journal of American Geriatrics Society, 46: 862-869.
- Sloane, P. D., P. Christianna, et al. (2007). "High-Intensity Environmental Light in Dementia: Effect on Sleep and Activity." Journal of the American Geriatrics Society 55(10): 1524.
- Sloane, P. D., L. J. Mathew, et al. (1991). "Physical and pharmacologic restraint of nursing home patients with dementia. Impact of specialized units. [see comment]." JAMA 265(10): 1278-1282.
- Sloane, P. D., C. M. Mitchell, et al. (1998). "Environmental correlates of resident agitation in Alzheimer's disease special care units." Journal of American Geriatrics Society 46: 862-869.
- Suzuki, M., M. Kanamori, et al. (2008). "One-year follow-up study of elderly group-home residents with dementia." American Journal of Alzheimer's Disease and other Dementias 23(4): 334-343.
- te Boekhorst, S., M. F. I. A. Depla, et al. (2009). "The effects of group living homes on older people with dementia: a comparison with traditional nursing home care." International Journal of Geriatric Psychiatry 24(9): 970-978.
- Thomas, B., M. Jones, et al. (2006). "P.r.n. medication use in a psychiatric high-dependency unit following the introduction of a nurse-led activity programme." International Journal of Mental Health Nursing 15(4): 266-266.
- Thorpe, L., J. Middleton, et al. (2000). "Bright light therapy for demented nursing home patients with behavioral disturbance." American Journal of Alzheimer's Disease and Other Dementias 15(1): 18-26.
- Torrington, J. (2006). "What has architecture got to do with dementia care? Explorations of the relationship between quality of life and building design in two EQUAL projects." Quality in Ageing 7(1): 34.
- van Hoof, J., H. S. M. Kort, et al. (2010). "Thermal comfort and the integrated design of homes for older people

- with dementia." Building and Environment **45**(2): 358-370.
- Van Schaik, P., A. Martyr, et al. (2008). "Involving persons with dementia in the evaluation of outdoor environments." Cyberpsychology & Behavior: The Impact Of The Internet, Multimedia And Virtual Reality On Behavior And Society **11**(4): 415-424.
- Vandepitte, S., N. Van Den Noortgate, et al. (2016). "Effectiveness of respite care in supporting informal caregivers of persons with dementia: a systematic review." International Journal Of Geriatric Psychiatry.
- Verbeek, H., E. van Rossum, et al. (2009). "Small, homelike care environments for older people with dementia: a literature review." International Psychogeriatrics **21**(2): 252-264.
- Verbeek, H., S. M. G. Zwakhalen, et al. (2012). "Small-scale, homelike facilities in dementia care: A process evaluation into the experiences of family caregivers and nursing staff." International Journal of Nursing Studies **49**(1): 21-29.
- Wells, Y. and A. F. Jorm (1987). "Evaluation of a special nursing home unit for dementia sufferers: a randomised controlled comparison with community care." Australian & New Zealand Journal of Psychiatry **21**(4): 524-531.
- Whall, A. L. R. N. P. C. S. and C. Conklin (1985). "Why a Psychogeriatric Unit?" Journal of Psychosocial Nursing & Mental Health Services **23**(5): 23-27.
- Wood, W., S. Harris, et al. (2005). "Activity situations on an Alzheimer's disease special care unit and resident environmental interaction, time use, and affect." American Journal of Alzheimer's Disease and Other Dementias **20**(2): 105-118.
- Zamora, T. (2008). "Influence of pavement design parameters in safety perception in the elderly." International journal of industrial ergonomics **38**(11-12): 992-998.
- Zeisel, J., N. M. Silverstein, et al. (2003). "Environmental correlates to behavioral health outcomes in Alzheimer's special care units." The Gerontologist **43**(5): 697.
- Zeisel, J., N. M. Silverstein, et al. (2003). "Environmental correlates to behavioral health outcomes in Alzheimer's special care units." Gerontologist **43**(5): 697-711.
- Zieschang, T., I. Dutzi, et al. (2010). "Improving care for patients with dementia hospitalized for acute somatic illness in a specialized care unit: a feasibility study." International Psychogeriatrics **22**(1): 139-146.
- Zuidema, S. U., J. F. M. de Jonghe, et al. (2010). "Environmental correlates of neuropsychiatric symptoms in nursing home patients with dementia." International Journal of Geriatric Psychiatry **25**(1): 14-22.