Towards A Dementia-friendly Built Environment

Wayfinding Systems to Support Persons with Dementia in Geriatric Psychiatry Units
Toronto Rehabilitation Institute

By

Taghreed Zuhair Al-Zubaidi

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ABSTRACT:

The aim of the study was to generate informed design recommendations for Geriatric Psychiatry Units in hospitals in order to create and facilitate a dementia-friendly built environment with accessible inclusive wayfinding systems. In establishing a set of design guidelines to achieve this outcome, three sources of knowledge and practice were drawn together: preliminary observations; interviews with the staff of the GPU unit at the Toronto Rehabilitation Institute; and a meta-ethnography study. The results show that simple design modifications with properly designed floor layout may have a significant impact on residents' behavioural outcomes; such as using landmarks, cues, colour schemes, and dementia-friendly signage system.

The guidelines of the research indicate and argued that wayfinding systems have to be designed and based on the particular environmental responses of the residents, making these systems more readily accessible and inclusive for the diversity of resident population including their abilities and background. Of particular importance, is that research points to the need and potential for designing environments with home-based social activities in mind; like laundry folding, cleaning dishes, green table to play cards, and old fashioned office desks, etc. Recommendations established to address these needs are relatively low-cost for GPU units, and may be extendable to other built environments outside of hospital settings.

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Thank you,
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هذا من فضل ربّي
عفت

TO ALL WHOM SUFFERING FROM
DEMENTIA, HOPE THIS WORK WILL
HELP IN YOUR DAILY LIFE.

TO MY BELOVED PARENTS, HUSBAND, AND CHILDREN
WHOS AFFECTION, LOVE, ENCOURGMENT, AND PRAYS
OF DAY AND NIGHT MAKE ME ABLE TO GET SUCH
SUCCESS AND HONOR......

TABLE OF CONTENTS

LIST OF TABLES

LIST OF GRAPHS

LIST OF FIGURES

List OF FIGURES' URLs:
(All figures last accessed on May 09, 2015)

Figure (15) Salisbury District Hospital
http://www.altro.ie/getmedia/57e29704-2667-44f5-9a28-f7413a977831/Salisbury-Hospital-Dementia-Unit-Altro-Whiterock-Digiclad-17.aspx?maxsidesize=800

Figure (16) Dementia-friendly clock wall
http://www.countrywidehealthcare.co.uk/media/catalog/product/cache/1/small_image/170x/9df78eab33525d08d6e5fb8d27136e95/U/C/UC-0508.jpg

Figure (17) Ingleton Wood- Specialist Dementia Facilities at Bedford Hospital
http://www.ingletonwood.co.uk/uploads/images/DSC_0198.jpg

Figure (18) Hillingdon Hospital
http://www.hpcimedia.com/images/website/ManChemNews/DIR_25/F_25432.jpg

Figure (19) Salisbury District Hospital
http://www.hpcimedia.com/images/website/ManChemNews/DIR_25/F_25432.jpg

Figure (20) Bridgwater Community Hospital
http://www.dka.co.uk/timthumb.php?src=http://www.dka.co.uk/wp-content/uploads/2013/12/Patient-Lounge-Towards-Screen-furniture-revised.jpg&w=620&h=455&zc=1

Figure (21) Friendship Home of Audubon
http://www.friendshiphome.com/uploads/3/0/8/5/3085842/8156697.jpg?182

Figure (22) Orientation Signs
https://www.medidirect.com.au/MEDIstores/PRODUCTS/Categories/592/ATTRFILE_Image1/_thumb/BetterLiving-OrientationSignage-Sticker-range.png

CHAPTER ONE: INTRODUCTION

1.1 INTRODUCTION:

Individuals living with dementia have an increased sensitivity to indoor environmental conditions; this sensitivity may induce problematic behaviours such as agitation, getting lost, and intense pacing. These symptoms indicate distress for the person and result in increased forms of burdens for care givers day and night; Evans in 2005 has stated: *"The built environment has direct and indirect effects on mental health"*.

According to a new study commissioned by the Alzheimer Society of Canada (2012), the number of Canadians living with cognitive impairment, including dementia, **now stands at 747,000 and will double to 1.4 million by 2031** (Alzheimer Society, 2012). Furthermore, in 2012, the combined direct (medical) and indirect (lost earnings) costs of dementia total $33 billion per year. By 2040, this figure will increase to $293 billion per year. With this increase, pressures on family caregivers are mounting.

In 2011, family caregivers spent 444 million unpaid hours per year looking after a relative with dementia, representing $11 billion in lost income and 227,720 lost full-time equivalent employees in the Canadian work force. It is projected that caregivers will lose 1.2 billion unpaid hours per year towards caring activities by 2040. (Alzheimer Society, 2012).

Many studies had been undertaken for dementia and include:

A focus on medical aspects of dementia; dementia specific communication skills and daily behaviours, approaches to maintaining the cognitive abilities, problem solving

including approach for persons with dementia, cueing advantages for the health outcomes, working with the medical teams, working with families, interagency partnering, confidentiality (Bird, 2005).

On the level of individuals living with dementia on a daily basis, there is now **an urgent need to develop expertise in the field of architecture and built environments** that can affect positive change in outcomes for persons with dementia who may be in healthcare facilities but also at home (Falk, 2010). **The actual design elements** of these spaces can impact the experience of the residents of GPUs, and include affordances of environmental elements, such as doors, flooring, lighting, artwork, wall treatments. These elements can be approached from a design perspective as wayfinding systems; Wayfinding enables people to orient themselves and navigate from place to place. The design of wayfinding systems is one component and an important element of the built environment (Julian, 2010).

Through this focus, the research included a combination of research techniques including a review of the literature on current design and architectural recommendations for dementia residents, review of literature on the impact of dementia on perception and cognition relevant to navigating and experiencing the built environment, review of current interventions intended to assist in wayfinding and the design of dementia friendly environments. This translational research, was

complemented by interviews with experts to determine the obstacles and frustrations in an existing dementia care environment.

The meta-ethnography study is intended to capture the cognitive practices and activities of residents in response to the building environment of hospital to identify general design recommendations for dementia- friendly environments. The current configuration and design of the unit is typical of the majority or semi-private ward based healthcare facilities in use today, and as such represents an environment that is generalizable.

The setting of the study was carried out at the **Toronto Rehabilitation Institute's geriatric psychiatry unit (GPU-TRI)**. This is an approximately 20 bed unit that receives the majority of its residents from long term care facilitates where residents are not responding well to the environment or care provided such that they are exhibiting aggressive behavior or high levels of distress.

The intention of this study is to develop a deeper understanding of the environmental elements of a geriatric psychiatry unit (GPUs) that impacts residents' behaviors, and that will inform design interventions to assist residents in compensating for the effects of dementia and to support retention of their function and skills. The overall aim **is to enhance the quality of life of residents with dementia such that aggressive and other behaviors**, indicative of distress, are reduced. Improving the efficiency of these institutions is also addressed. This is part of a larger need to develop design

recommendations for designers of architecture and interior design to facilitate dementia-friendly environments. These recommendations may eventually assist architects and builders who design and construct aged-care accommodation, as well as those providing redesign and alteration services for dementia residents residing at home.

1.2 BACKGROUND AND SIGNIFICANCE:

Dementia is a general term indicating changes to cognitive function that result from a range of specific, usually progressive and irreversible disorders of the brain (Devous, 2002). The changes most commonly encountered by residents with dementia are **deterioration of short-term memory, spatial perception, difficulty with planning activities, and lowered stress thresholds**. As a consequence, the physical environment in long-term care facilities can become a challenge to residents with dementia (Alzheimer Australia, 2004).

In the late stages of dementia a person will ultimately become dependent on other people for nursing care. Memory loss extends to older memories and a person may not be able to determine the function of familiar objects or recognize people who are close to them. There is a gradual and increased loss of speech. These people are often restless may have a tendency to want to search for someone or something. A common occurrence is the desire to be with their mother or in their own home, even if that is where they are being cared for (Timlin and Rysenbry, 2010). This results in the most

addressed problem for **residents who spending hours circulating around and around within the GPU looking for the exit.**

In an environment designed to specifically meet the needs of persons with dementia, residents should be more likely to be able to utilize their retained abilities with minimal frustration, and experience the highest possible quality of life. From this perspective, making sure residents can move about a facility with ease and find their room without stress is a necessary aim. The importance of wayfinding systems is clear then. Brandon (2012) has defined Wayfinding design as: *"wayfinding is the process of organizing spatial and environmental information to help users find their way".* **Wayfinding design for those who have dementia is about providing environmental cues and scaffolding for moving independently from one spot to another.** It requires attention to what dementia people see, what they think about and what they do when finding their way from one place to another "(Brawley, 1997).

A challenge to individuals with cognitive impairments in wayfinding is a disability in remaining oriented, recalling routines, and traveling in unfamiliar areas. These individuals rely on limited cognitive and memory capacity, especially in GPUs where stays usually lasts about three months. While people without disabilities often use maps or written directions as navigation tools, this population is very sensitive to issues of abstraction (e.g. icons on maps or signage) and **presents the designer with a challenge to tailor navigation information specific to each user and context**. (Chang, 2010)

1.3 PROBLEM QUESTIONS:

Behavior is an important form of non-verbal communication for dementia residents. For the person with dementia experiencing communication difficulties, challenging behavior may be seen as an expression of need. These behaviors like:

- Walking a lot around and around for several times (lost, hot, in pain)

- Frustration at dead ends (especially at the corner rooms).

- Anger or depression at feeling imprisoned (looking for the exit doors)

- Frustrations because of not understand and how to use normal things like taps and toilet flush

- Agitation from too much noise or dark spots.

These behaviors raised the following problem questions/gaps for the researcher:

1. **What are the design aspects which create inclusive dementia-friendly built environment for persons with dementia in The Geriatric Psychiatry Units GPUs at hospitals?**

2. **What are the inclusive accessible wayfinding systems for residents with dementia in the Geriatric Psychiatry Units GPUs at hospitals**?

1.4 RESEARCH OBJECTIVES AND OUTCOMES:

The researcher investigated the possibility of developing inclusive wayfinding systems for the GPU-TRI to overcome the existing obstacles of wayfinding. Also to find inclusive design approaches for residents suffering dementia, after determining the negatives of

the existing wayfinding systems. The main goal is to achieve a dementia-friendly built environment. Building on that; the researcher addressed the following objectives statement:

- **Address the design recommendations to create accessibly wayfinding systems to support persons with dementia in Geriatric Psychiatry Units (GPUs) at hospitals to achieve dementia-friendly built environment.**

1.5 THE FOCUS OF THE RESEARCH:

The built environment can have a big impact on the behavior of someone living with dementia. It can make them feel anxious, lost, confused and frustrated. Although each person with dementia handles these feelings in their own way, certain behavior is common in residents with the disease.

The researcher studied these behaviors and questions like: Are residents just frightened, vulnerable and anxious because they feel they are in an alien environment that they cannot make sense of; with people that they do not know; and whose purpose and intend is unknown to them? Or are they merely carrying out purposeful actions or behaviors?

To help in understanding residents' behavior in the built environment, the researcher identifies design recommendations to redesign the wayfinding systems, and to create a dementia-friendly built environment that will help to overcome some of the cognitive and behavioral problems of the residents.

1.6 THE METHODS AND DESIGN PROCESS:

The research approach was a combination of literature review and three techniques to reveal the issues, needs, and the effectiveness of the current design elements of the GPU-TRI to achieve the study objectives.

1.7 DEFINITIONS:

1.7.1 WHAT IS THE MEANING OF 'DEMENTIA'?

Dementia is a descriptive term derived from the Latin root (de mens), indicating an observable decline in mental abilities. It is an acquired clinical syndrome characterized by deterioration of mental functioning in its cognitive, emotional and conative aspects (Gustafson, 1996).

Dementia is an umbrella term used to describe the range of conditions that cause changes in memory and other cognitive abilities that are severe enough to interfere with daily life. It is caused by changes in the brain, and is more common in older people. Normal ageing has an impact on the senses – particularly sight and hearing – but this is exacerbated by the additional damage to the senses and perception associated with dementias such as Alzheimer's disease (Waller et al, 2013).

Also according to world health organization, **Dementia** is a syndrome in which there is deterioration in memory, thinking, behavior and the ability to perform everyday activities (World Health Organisation, 2012).

1.7.2 WHAT IS THE MEANING OF 'GERIATRIC PSYCHIATRY UNIT - GPU'?

It is **a hospital unit** which is specialize in assessing and treating persons age 65 and older who have behavioral challenges related to Alzheimer's disease and other types of dementia. The unit has expertise in addressing the full range of physical, mental, emotional and social issues associated with dementia (UHN-Toronto Rehabilitation Institute, 2015)

1.7.3 WHAT IS THE MEANING OF 'WAYFINDING'?

Wayfinding is viewed as the most common means of acquiring place knowledge. Characteristics of place recognition are examined along with discussion of errors in place cognition and the role that spatial familiarity plays in attaching importance weights to distinguish primary nodes (anchor points) from other places (Golledge, 1992). Also, Wayfinding is the cognitive element of navigation. It does not involve movement of any kind but only the tactical and strategic parts that guide movement (Darken, & Peterson, 2002).

1.7.4 WHAT IS THE MEANING OF 'DEMENTIA-FRIENDLY'?

It is widely recognized that **a building and an environment** can have a significant effect on a person with dementia. It can support them or it can hasten their deterioration (O'Sullivan, 2008).

Dementia-friendly built environment is creating buildings and neighborhoods that are responding to the lifestyle changes for persons with dementia that can reduce the risk

of developing the condition. The design of these built environment is to support patients who become agitated; improving predictions of the future financial costs of dementia; living well with the condition; and the effects of visual aids on wellbeing and quality of life (Duffin, 2014).

1.8 LITERATURE REVIEW:

Many studies have been proposed to ascertain the needs for design products, services, and environments for persons who are suffering of dementia. Although the literature covers a wide variety of such fields, this review will focus on four major themes which emerge repeatedly throughout the literature reviewed. These themes are: **Dementia** and its effect on economy, dementia **symptoms and needs**, dementia and the **built environment**, dementia and the **wayfinding systems, and Methods**. Although the literature presents these themes in a variety of context, this review will primarily focus on their application to design.

1.8.1 DEMENTIA IN GENERAL:

Dementia is a progressive or persistent loss of cognitive function, which can be caused by any of a number of diseases and conditions. The specific symptoms may include difficulties with memory, ability to understand and use language, spatial orientation, and limitations in executive function, such as the ability to plan and loss of impulse control. People who have a dementing illness may also experience behavioral difficulties and changes in mood (Hyde, 2012).

The increasing interest and research effort devoted to dementia and to other disorders of the latter part of life are a reflection of the longevity of the population in developed countries.

In Canada, 10.6% of the population was age 65 and above in 1991. This age group is assumed to increase to 14.5% in 2011 and to 21.8% in 2031 (McDowell et al., 1994). Dementia affects up to8%of the population of 65 or older. Dementia of the Alzheimer's type (DAT) counts for about 50% of all forms of dementia (McDowell et al., 1994).

Alzheimer Society of Canada (2012) recently published the statistics of dementia in Canada:

- In 2011, 747,000 Canadians were living with cognitive impairment, including dementia - that's 14.9 % of Canadians 65 and older.

- By 2031, if nothing changes in Canada, this figure will increase to 1.4 million.

Stating the economic implications of Dementia in Canada, Alzheimer Society (2012) calculated that:

- Today, the combined direct (medical) and indirect (lost earnings) costs of dementia total $33 billion per year.

- If nothing changes, this number will climb to $293 billion a year by 2040.

(Dementia numbers in Canada, 2012).

The above data are taken by this paper as rationale for examining the growing literature on medical care, needs, and possible improvements to the care of persons living with dementia. Topo, et al. have addressed that need in their book: Dementia, Design and Technology: Time to Get Involved, which aims to increase the understanding of the subjective needs of persons with dementia and the way this understanding can promote and improve their involvements in the design process (Topo, et. al, 2009).

1.8.2 DEMENTIA SYMPTOMS AND NEEDS:

A prospective analysis of risk factors for Alzheimer's disease was a major objective of the Canadian Study of Health and Aging, a nationwide, population-based study in 2002 done by Lindsey, et.al. This study addressed the causes of dementia such as increasing age and fewer years of education. The results addressed in particular, regular physical activity could be an important component of a preventive strategy against Alzheimer's disease and many other conditions. (Lindsey, et al. 2002)

Lindsey, et al. in 1999 looked at **synthesis risk factors** such as genetics, demographic and statically data and preventative care, while advanced dementia brings numerous physical, affective and behavioural symptoms, impairments and comorbidities. Chang and Johnson in 2012 studied that diagnosing and managing symptoms in people with advanced dementia is often made difficult by communicative difficulties of a person with dementia. They stated that adopting a systematic and holistic approach to

assessment and management of symptoms means that people with advanced dementia are more likely to receive appropriate care. These challenges point to the professional development and training needs for dementia-friendly services. (Chang & Johnson, 2012)

Keating and Gaudet in (2012) focused on causes and treatment of Alzheimer's disease and on **reduction of costs of the burden of care to society**. Considerable emphasis is now placed on **person-centered care** and the need to enhance the quality of life of people with chronic illnesses and conditions. The purpose of the research is to review the current state of knowledge about quality of life of persons with dementia and to recommend a set of interventions toward enhancing their quality of life (QoL). Results of the review indicate a set of objective and subjective indicators of QoL with most interventions focused on compensating for losses related to the disease. Keating and Gaudet propose a framework for creating age-friendly dementia environments. This is based on hypotheses that quality of life can be enhanced through augmenting personal resources and contexts, and that the progression of the illness results in changes in the 'best fit' between resources and contexts (Keating and Gaudet, 2012). From here it is clear the need for accessible design theme to be implemented for the built environment.

The importance of **an accessible design of the built environment for persons with dementia is highly recommended** to manage the spatial disorientation for persons with dementia as had been addressed by Liu et al, which he states that:

"Although spatial disorientation is frequently observed in persons with Alzheimer disease, it is not well solved in the built environment". A descriptive study was conducted by Liu at 1991 to examine spatial skills associated with spatial orientation. Spatial tasks were selected and grouped into three types of spatial skills: perceptual, cognitive, and functional. The results indicated that the subjects with special disorientation were impaired on half of the perceptual spatial tasks and all of the cognitive spatial tasks. On the functional spatial tasks (Liu, 1991), the connection between spatial disorientation is related to the spatial recognition memory, which had been addressed by Adelstein, who founds that patients diagnosed as dementia of the Alzheimer's type, and normal elderly subjects were tested for spatial order and a spatial recognition memory **the results for spatial order memory indicated that compared to normal elderly subjects, patients showed an impaired memory only for the last serial positions.** In contrasts, with respect to spatial recognition memory, patients showed an impaired memory only for the early serial positions. Patients impaired on all serial positions for both spatial order and spatial recognition memory (Adelstein, 1992). Besides Adelstein, Veldkamp et al. in (2008) stated that one of the main symptoms of dementia is a gradual decline in memory. This can **result in topographical**

disorientation and the loss of one's way during unaccompanied walks. However, dementia patients performed better on recognition of landmarks compared with recognition and recall of spatial layout. Studies have been carried out on the quality of landmarks (Veldkamp et al. 2008).

The spatial disorientation, memory loss, spatial misrecognition memory, and spatial disorder are the cognitive abilities of persons with dementia which effects their daily life activities in any built environment, **which confirm the importance of the design of the built environment on the quality of life for persons with dementia**.

1.8.3 DEMENTIA AND THE BUILT ENVIRONMENT:

Dementia in all its forms, including Alzheimer's disease, is, by definition according to the Encyclopedia of Housing (2nd Edition) characterized by multiple cognitive deficits. Although difficulty with short-term memory is often the most notable, from a design perspective, other cognitive shortcomings are more important. These include ability to plan and execute complex tasks, wayfinding and mental maps; poor safety awareness; loss of visual acuity and other sensory losses (Carswell, 2012).

 Hyde agreed with Carswell about the effects of dementia on the mobility and realizing the physical spaces. Hyde stated that the disease as it is in progresses, balance and mobility are increasingly impaired. Finally, depression and increased emotional liability are frequent concomitants of Alzheimer's disease. In addition to the types of modifications known to increase safety among older adults and those with disabilities, a

number of design features have been found to alleviate these symptoms. These include the following: **clarity for orientation, reduction of frustration, appropriate lighting and contrast,** appropriate levels of auditory, olfactory, and social stimulation, personal space, and access to nature, outdoors, walking paths, and views (Hyde, 2012)

Borbasi addressed the importance of the built environment for person with dementia and how the design is effecting significantly the residents' behaviours. He studied an interpretative research project about the care of patients with dementia admitted to the hospital. Open-ended interviews were conducted with 25 medical, nursing, and other health care professionals drawn from 3 metropolitan teaching hospitals in Australia. Qualitative data analysis generated 5 major themes relating to the built environment and organizational "system" as determinants of practice, current dementia care management, and ideal dementia care management. Results showed acute **care hospitals are not the best place for people with dementia and can negatively influence health outcomes such as functional independence and quality of life**. Participants reported attempts to provide best practice but experienced major constraints stemming largely from environmental, sociocultural, and economic issues. Recommendations include **the delivery of acute services in tandem with dementia services and a whole organization shift in thinking away from what conveniently suits the institution to thinking that is person-centered and dementia-friendly** (Borbasi, 2006).

Buffel & Phillipson (2012) stated that developing environments responsive to the aspirations and needs of older people has become a major concern for social and public policy. The researchers aimed to provide a critical perspective on what has been termed 'age-friendly cities' by shifting the focus from questions such as 'What is an ideal city for older people?' to the question of 'How age-friendly are cities?' This approach suited to deal with the complexities of cities as sites of interlocking and conflicting commercial, social, and political interests. This theme is developed by examining: first, the main factors driving the age-friendly debate; second, constraints and opportunities for older people living in urban environments; third, options for a critical social policy; and, fourth, examples of involving older people in the development of age-friendly environments. The article concludes with a brief summary of current tensions and contradictions in the age-friendly debate (Buffel & Phillipson, 2012).

Hus in 2012 identified the **spatial disorientation** is one of the first recognizable symptoms of patients with Alzheimer's disease because of the negative effect it has on daily function. Nine elders with moderately severe dementia and their caregivers from three special care units participated in this field study. A survey was conducted, monitoring daily activity twice weekly for one month and monitoring non-daily activity once weekly for two months. A qualitative description was applied to record the results of the survey monitoring the subjects' movement from the dining room or from the public activity space through the corridor to the entrance of their bedrooms and from

the bedroom entrances to each subject's bed. The assessment of environmental factors affecting the individuals' identification ability of spaces was made through the record of tracing travel route and the caregivers' interviews with the demented elders (Hus, 2012). Hus's study stated **the importance of the wayfinding systems in the built environment of the hospitals residents with dementia.**

Over the last 30 years, studies have shown that dementia-friendly environments can significantly promote health and well-being (Marshall 2001; Fleming, Cookes & Sum 2008; Fleming & Purandare 2010). Davis et al (2009) define a dementia-friendly environment as "a cohesive system of support that recognises the experiences of the person with dementia and best provides assistance for the person to remain engaged in everyday life in a meaningful way" (Davis et al 2009). **Dementia-friendly environments are important in the care, support, health and well-being of people living with dementia, allowing people to feel valued as an individual, independent and in an environment where they are safe and are provided a sense of normalcy and sustain a quality of life**.

One of the aspects to achieve dementia-friendly environment is accessible wayfinding systems which will help to do the daily activates of the residents at GPU, these systems should be compatible with the special recognition abilities of the residents with dementia.

1.8.4 DEMENTIA AND WAYFINDING SYSTEMS:

Wayfinding design involves two distinct aspects: **spatial organization and environmental communication.** Spatial organization refers to the ordering of functions and facilities and the creation of a circulation system which, in a general sense, determines the wayfinding problems users have to solve. Environmental communication refers to the architectural and graphic expression of information necessary to solve wayfinding problems (Passini et al, 1998).

Wayfinding design makes the built environment more efficient, safer in case of emergencies, and accessible to a larger section of the population, it also can bring about an architecture that is well-articulated in spaces and details, rich in spatial experience, as well as aesthetically pleasing.

Morganti 2011, stated that the ability to orient in space starts declining with age and it constitute one of the main signs of cognitive impairment in neurological patients. **Spatial orientation decline** constitutes however a high limitation for elderly population and it has a great impact on subject the day-life autonomy and on her/his relatives and caregivers. Despite this, the neuropsychological approach to understanding spatial cognition does not allow researchers and clinicians to have an accurate assessment of patient's everyday wayfinding ability. This could be critical in a borderline situation, such as in an age-related cognitive decline, in which spatial stimuli wayfinding is compromised. The main aim of this contribution is to introduce preliminary data about a

spatial evaluation procedure on healthy elderly and Alzheimer's population. This will support the identification of specific treatments able to prevent the cognitive decline in elderly and the rehabilitation of spatial orientation in neurological patients. (Morganti, 2011).

Kirasic in (2000) found empirical relations among age, general spatial ability as assessed by psychometric tests, wayfinding-related skills as assessed by experimental tasks in the laboratory, environmental layout learning as assessed in afield experiment, and wayfinding behavior as observed in a field experiment were modeled in a study involving 120 younger and 120 older adults. The best-fitting model showed that age-related differences in learning environmental layout were significantly, but not exclusively, mediated by a single ability factor defined by psychometric tests. **Knowledge of environmental layout** was the exclusive mediator between general spatial ability and wayfinding behavior. Thus, age differences in psychometric test performance were found to be a major factor in accounting for aging-related decline in learning environmental layout, but other variables not assessed in this study also play a significant role (Kirasic, 2000).

This paper identified the **importance of the design of wayfinding systems** that should be compatible with the aged populations' abilities, especially those who are suffering from dementia. Passini et al. in 1998 conducted a study to explore wayfinding abilities in dementia of the Alzheimer type (DAT) and suggests possible design interventions like

create an identity at each location, different from all others, use landmarks to provide orientation cues and memorable locations, and create well-structured paths. Fourteen patients and a control group of 28 subjects, matched in terms of age, sex and education, were asked to reach a prescribed destination in a large hospital. Results showed most DAT patients to be incapable of developing an overall plan to solve the wayfinding task and incapable of producing decisions involving memory or inferences. Conversely, they were better able to make decisions based on information of explicit architectural nature. Exploratory behavior was more prevalent in DAT patients compared to normal subjects. Patients performed poorly when forced to extract relevant information from graphic displays and tended to be confused by irrelevant information displays (Passini et al, 1998).

The study concludes with a discussion of **design criteria concerning the spatial organization** of settings and the circulation system as well as environmental communication as the study shows that **Alzheimer patients can deal with wayfinding decisions as long as the information is immediately accessible**. They have difficulties when information has to be remembered or inferred and have lost the ability to plan and to understand the spatial layout of a setting (Passini et al, 1998).

Besides Passini, Hus in his study identify the importance of the wayfinding cues that should be used in the interior design to achieve inclusive dementia-friendly built environment. Hus founds in his study of the Influence of Environmental Factors on the

Wayfinding of the Elderly with Alzheimer's disease in Special Care Units (2012), that one-third of the participants got lost and failed to find their bedrooms. Environmental factors, such as the nursing station, emergency exits, furniture, ends of corridors, photos, pictures, doors and elevators have been employed as useful reference points on the wayfinding of demented elders. **The location of the nursing station, the shape and material of doors or exits, residents' personal belongings and furniture arrangement were major issues for environmental design in the future**. Nevertheless, because of the complexity of the psychiatric symptoms in the demented elderly, it cannot be proved that the use of environmental factors as reference points would be effective for every demented patient (Hus, 2012).

Fuchsberger et al., 2010 studied how to support older adults in wayfinding, both outdoor and indoor as the goal of the built environments, which seeks to develop a home platform to be used for trip planning and navigation, as well as a mobile navigation aid, they found out that the participants were open to use technical support for navigation, they also indicated a lack of trust in the available devices. Furthermore, they reported orientation or navigation problems e.g., in unknown cities or underground car parks, which seem to be caused by inappropriate signage or too few information points. The results suggest that **the development of the navigation aid should make use of already applied navigation and orientation strategies in order to support recognition of spaces rather than recall the mental mapping for spaces.**

1.9 SUMMARY OF THE LITERATURE REVIEW:

A dementia-friendly built environment enhances the quality of life of its residents and the maintenance of self-dependence as long as possible. The basic human needs as physical, psychological, or social, require the person to reach destinations. Accessible and inclusive Wayfinding is a major prerequisite of mobility within GPUs and, thus, of independence and personal autonomy.

The design of the built environment can provide information to solve wayfinding problems by using an architectural elements including features of interior design and of a graphic nature. The dementia-friendly built environment should be compatible with the residents' different abilities.

CHAPTER TWO:
RESEARCH METHODS

2.1 INTRODUCTION: METHODS, SETTING, AND PARTICIPANTS

This research is carried out to understand meanings, look at, describe and understand experience, ideas, and intangibles such as these. The area of study that would benefit from the qualitative research would be that of architects and interior designers' design styles and design approaches to achieve a dementia-friendly built environments and wayfinding systems, which are understood subjectively by designers.

Built environment research consists of cognitive, affective, as well as behavioural components. Existing built environment research most often utilises strong quantitative methodologies. The use of a mixed methods approach is suggested to counteract this imbalance and to enhance research into the built environment (Amaratunga, 2002).

THE PARTICIPANTS:

To obtain a variety of observations, 16 staff members who could be assumed to have different and complementary experiences were interviewed on an individual basis. They were composed of different specialities and duties. All of them who work at the Geriatric Psychiatry Unit in TRI. The selection criteria required them to have worked at the center for at least 1 year.

The interviews were run in a semi structured way so as to allow for a full and in-depth response. The major items covered were the perception the staff had concerning the behaviours of the GPU's residents, a profile of the wayfinding abilities of the residents

and the problematic spaces with respect to their free movement; the major problems encountered with respect to the general circulation of the residents, as well as the responses of the residents to the elements of the built environment of the GPU. The interviews with the staff members were recorded and generally lasted between 20-45 minutes.

THE SETTING:

The GPU at the TRI, under the auspices of the provincial government of Ontario, was chosen for possession of characteristics representative of most Geriatric Psychiatry Units at hospitals intended for residents in more or less advanced stages of dementia. Government policies in Ontario are aimed at keeping Alzheimer's patients in their home environment as long as possible before transferring them to a nursing home or GPUs in hospitals, which accounts for the relatively old population in nursing homes and the degree of cognitive deterioration. The chosen GPU is situated in Toronto. It lodges 20 residents on one floor and contains a number of communal and social functions at the same floor. The layout of the GPU floor are shown in Figure (1).
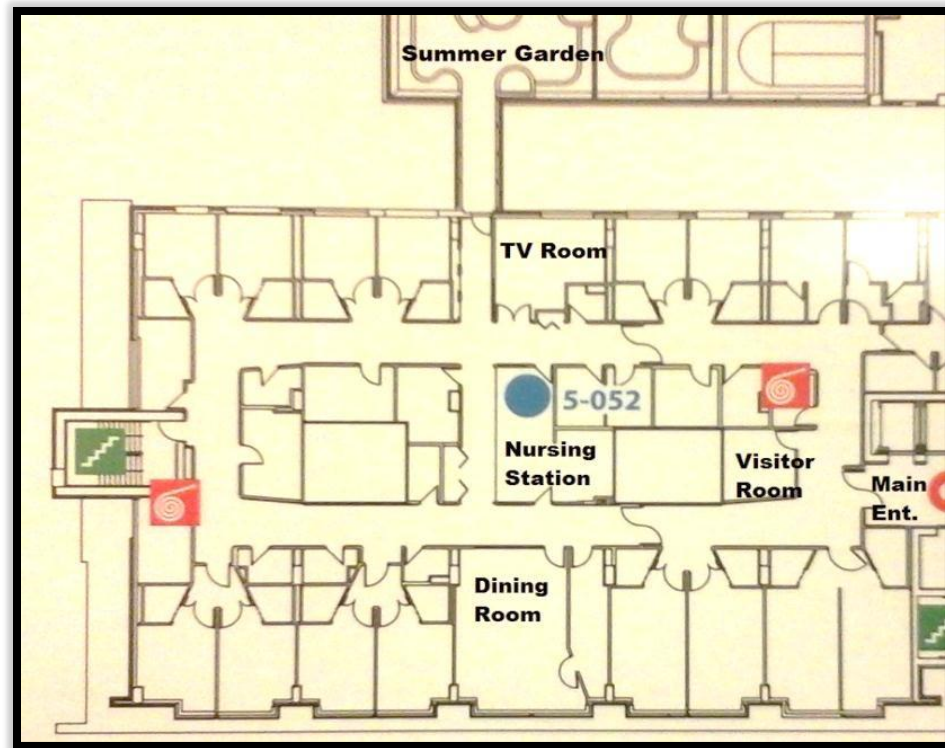
Figure (1): The Layout of GPU – TRI, which illustrate the locations of the main common spaces within the unit.

2.2 THE METHODS:

The project's research methods were modeled after the below recommended methods by Alzheimer Europe, a non-governmental organization aimed at raising awareness of all forms of dementia by creating a common European platform through co-ordination and co-operation between Alzheimer organizations throughout Europe. Alzheimer Europe is also a source of information on all aspects of dementia (Alzheimer Europe, 2009).

Alzheimer Europe (2009) stated the following research methods to study any design aspects of the built environment related to dementia:

1. Experiments

2. Surveys

3. Questionnaires

4. Interviews

5. Case studies

6. Participant and non-participant observations' studies which involve observing people can be divided into two main categories, namely participant observation and non-participant observation.

7. Observational trials studies using the Delphi method

It has been considered particularly useful in helping researchers determine the range of opinions which exist on a particular subject, in investigating issues of policy or clinical relevance and in trying to come to a consensus on controversial issues (Alzheimer Europe, 2009). While for the researcher's study **Towards a dementia-friendly built environment**; it was not appropriate to conduct any of these methods because of the vulnerable residents with dementia.

The researcher depended on three research methods to investigate the research problem and to achieve the research objectives, which are:

- **Preliminary Observations**

- **Semi-structured interviews** with staff and administrative members of the GPU-TRI to identify the needs of the residents as well as the residents' responses to the built environment.

- **Meta-ethnography study** to address the general design recommendations.

2.2.1 PRELIMINARY OBSERVATIONS:

The preliminary observations and an onsite assessment enabled the researcher to identify the obstacles faced by persons with dementia through their daily behaviors in the GPU at TRI. This also included evaluation of the current wayfinding systems at the GPU of TRI and noted its weaknesses and strengths.

These observations were for 6 hours a day in different days and times for 6 months, started January 2014 to July 2014. The preliminary observations enabled the researcher to understand the context of the GPU – TRI and to form the research proposal, as well as to understand the problematic spaces and the weakness and gaps of the design for the built environment of the GPU – TRI.

The research proposal was initially framed around issues of the GPU's wayfinding systems. This informed the preliminary observations that yielded a useful starting point

for the research. The research began by investigating the site's strengths and limitations in wayfinding systems towards establishing preliminary design recommendations for a dementia-friendly built environment within the GPUs of hospitals.

Preliminary observations assisted the researcher in understanding the context of the GPU built environment and how it functions as a dementia-friendly built environment, including the environment's impact on daily wellbeing, activities, and treatment of residents. The preliminary observations achieved the following:

1. The researcher determined the obstacles encountered by persons with dementia through their daily behaviors relevant to the design of future wayfinding systems.

2. Current wayfinding systems were identified, studied and assessed for weaknesses and strengths, towards minimizing weaknesses and enhancing strengths of the wayfinding systems.

3. Identified the design details which negatively affect the cognitive and behaviors of residents; for example, exit doors and nursing station design.

2.2.2 SEMI-STRUCTURED INTERVIEWS:

The second method is the semi-structured interviews with the staff of GPU-TRI, who are **the experts regarding knowledge of residents' behaviors.** This method enabled the researcher to understand the residents' responses to the current built environment of the GPU, and their responses to colors, signs, pictures and cues; which helped to design the suggested wayfinding system for the GPU- TRI. This method helped the researcher to address the design gaps at the GPU-TRI.

Interviewing is one of the most common methods used in small-scale qualitative research. The semi-structured interviews, is based on a general structure by deciding in advance the ground to be covered and the main questions to be asked. The detailed structure is left to be worked out during the interview, and the person being interviewed has a fair degree of freedom in what to talk about, how much to say, and how to express it. Semi-structured interviewing is a very flexible technique for small-scale research. It is not suitable for studies involving large numbers of people, but is most helpful in mini-studies and case studies (Drever, 1995). Open questions give a very good idea of the variety of ideas and important observed themes of the GPU-TRI staff regarding the needs of residents of GPU. It enables the interviewees to think and talk for longer and to show their perspectives and views more fully.

Following a continued recognition of the importance of relational aspects of quality of life for people with dementia, Campo (2012) has examined environmental influences on informal social interaction in dementia care units. The purpose of this ethnographic study was to identify and explore key elements of the physical and social environments that act as facilitators or barriers for social interaction among people with dementia living in special care units. Campo conducted in-depth interviews with staff members.

Besides Campo, Caspi (2014) has addressed the importance of using semi-structured interviews for wayfinding systems of dementia-friendly built environments, he stated that: *"The concerning phenomena of spatial disorientation and wayfinding difficulties among elders with Alzheimer's disease or a related dementia in assisted living residences are understudied".* This qualitative study of Caspi, aimed to identify the types of wayfinding difficulties as experienced by residents with memory-loss in two special care units of an assisted living residence. The data collection period included participant observation complemented by semi-structured interviews with care staff and managers and review of clinical records. A wide spectrum of wayfinding difficulties was identified as experienced by six residents. The residents experienced difficulties reaching several destinations on the units. The implications of the findings to practice, architectural design, and policy are discussed.

The researcher behind **Wayfinding Systems to Support Persons with Dementia in Geriatric Psychiatry Units (GPU) - Toronto Rehabilitation Institute (TRI)** conducted semi-structure

interviews with TRI staff to define the current design gaps at the GPU-TRI, as well as define its residents' needs for **a dementia-friendly built environment** and **accessible wayfinding systems.**

The interviews were run in a semi structured way so as to allow for a full and in-depth response. The major items covered were: the perceptions of the staff that had concerning the GPU residents' and the residents responses to the current built environment of the GPU; a profile of the wayfinding abilities of the residents with respect to their free movement; the major problems encountered with respect to the general circulation of the residents, as well as shortcomings concerning the signage, and place identification that might help in wayfining systems; the policies of restricting the movement of the patients; the role and importance of the nursing station; and the spaces usages (See Appendix E). The interviews with the (16) staff members were recorded and generally lasted from 20 -45 minutes.

- • **INCLUSION CRITERIA OF CHOOSING THE INTERVIEWEES:**

The selection criteria of interviewees were designed to obtain varieties of inclusive perspectives from the staff with different specialties, to achieve a full range of perspectives of the residents' responses to the current environment and discuss positive design changes within the unit. The 16 interviewees, with their official job titles, included:

1. Occupational Therapist (one participant)

2. OTA/PTA (Occupational/Physical Therapy Assistant) (one)

3. Service Coordinator/Outreach Clinician (one)

4. RPN (Registered Practical Nurse)- two

5. Recreation Therapist- one

6. Physiotherapist (PT)- one

7. Psychogeriatric Resource Consultant (PRC)- one

8. RN (Registered Nurse)- one

9. Program Service Manager- one

10. Advanced Practice Leader (APL)- one

11. Geriatric Psychiatrist & Medical Director- one

12. Geriatric Psychiatrist-one

13. Speech Language Pathologist (SLP)- one

14. Clinical Nurse Educator- one

15. Administrative Assistant- one

2.2.3 META-ETHNOGRAPHY METHOD:

The third method is the meta-ethnography study which enabled the researcher to have comprehensive perspective about how to achieve dementia-friendly built environment in general and what are the design aspects that should be covered.

Meta-ethnography **achieves more than a traditional literature review about dementia-friendly built environment**, and in relation to a more focused question about the wayfinding systems.

The chosen studies represent a conceptual development that constitutes a fresh contribution to the literature. In particular, seven key concepts have been identified for the wayfinding systems and linked together to two key concepts to achieve dementia-friendly built environment; *"in a line of argument that accounts for residents' wayfinding systems in different settings of buildings that are serving those with dementia."* (Britten et al, 2002)

Meta-ethnography is one of several methods for synthesizing qualitative research and is being used increasingly within health care research. **Meta-ethnography is a useful method for synthesizing qualitative research and for developing models that interpret findings across multiple studies.** For now, there is growing use in health research (Atkins et al, 2008), for the meta-ethnography studies. Meta-ethnography is an approach to research synthesis that is especially appropriate for qualitative studies (Sage, 2008).

Walsh agreed with Atkins about the importance of meta-ethnography for the researches related to health studies, he stated: "Meta-ethnography and synthesis are important technique for qualitative researchers and can deepen understanding of the contextual dimensions of health care." (Walsh, 2005).

While Britten et al, found that Meta-ethnography can produce significant new insights, but not all meta-ethnographic syntheses do so. Instead, some will identify fields in which saturation has been reached and in which no theoretical development has taken place for some time. Both outcomes are helpful in either moving research forward or avoiding wasted resources. Meta-ethnography is a highly interpretative method requiring considerable immersion in the individual studies to achieve a synthesis. It places substantial demands upon the synthesiser and requires a high degree of qualitative research skill (Britten, 2011).

One of the important studies that used the meta-ethnography method which is related to the researcher's study is used the data resources of published literature from Australia, Europe, and North America, between January 1999–October 2009, was identified **from database to synthesize evidence and knowledge from published research about nurses' experiences of nurse-patient relationships with adult patients in general, inpatient hospital's GPU.** Bridges found in his study that; The findings of this meta-ethnography draw together the evidence from several qualitative studies and articulate how the organizational setting at a unit level can strongly influence nurses' capacity to build and sustain therapeutic relationships with patients (Bridges, 2013).

The Meta-ethnography approach will help the researcher by synthesising the studies that is related to the researcher's study to achieve general design recommendations for

dementia-friendly built environment and accessible wayfinding systems for persons with dementia.

The rational of using the meta-ethnography study as a third method for this study is as Atkins stated that: ***"The increasing volume of qualitative research available has drawn attention to synthesis as one means of combining knowledge gathered from individual studies and of developing theory. Much of the groundwork in developing methods for synthesizing the findings of qualitative studies has been conducted in the health and education fields"***. Within health care, these developments have been led, to some extent, by the growth of systematic reviewing as a tool for synthesizing evidence on the effectiveness of health care interventions (Atkins et al, 2008).

The meta-ethnography phase of this study **enabled the researcher to study the built environment of GPU-TRI and the residents' responses to it**. The identification of the residents as a highly vulnerable group who are not able to give the consents, as well as, the policies of GPU-TRI which required high level of institutional and personal oversight to do any observations, surveys, questionnaires, interviews to the residents, participatory design, or experiments. The researcher used the method **meta-ethnography** to scan the **literatures and synthesized its results to have a comprehensive perspective of the problem in different settings, approaches, and culture in the absence of the other methods**.

Best practices gleaned from this meta-ethnographic study enabled the researcher to achieve the general design recommendations to design accessible wayfinding systems to support persons with dementia in the GPUs at hospitals for dementia-friendly built environment.

- **THE CRITERIA OF META-ETHNOGRAPHY:**

Research began with a broad scan across multiple sources using basic keywords, such as "built environment" and "dementia-friendly" combined with "wayfinding".

In order to find the literature most relevant to this study, the researcher applied narrower criteria, which aided selection of references. The studies used in this method are focused searches in the specific collections about the related fields of the study. Two key criteria were taken as priorities:

1- GPUs built environment research

2- Research focused on establishing linkages or evidence for the connection between wayfinding, advanced stage of dementia and the built environment.

- **INCLUSION CRITERIA OF CHOOSING THE STUDIES OF THE META-ETHNOGRAPHY:**

The inclusion criteria depended on the following:

- Qualitative research analyzed using qualitative methods and presenting qualitative data.

- The type of the study (theoretical, experimental or field study paper),

- Techniques used in the study (such as interview, questionnaire, observations, residents shadowing, experimental testing)

- Research about people living with dementia in nursing homes. This was refined to add advanced stage of dementia as it is the base of the research case study.

- Research examining the impact of the dementia on wayfinding abilities.

- Dementia-friendly built environment

- Search words and data bases

As the aim of the meta-ethnography was to have general design recommendations for designing any dementia-friendly built environment, and to address wayfinding systems for persons with dementia, the researcher used search words that would reflect the research's focus. These included broad definition words such as "perception", "cognitive impairments", "aging", and "problem solving abilities" that would offer the researcher a profile of the issues related to dementia decline in wayfinding   abilities. Then the researcher chose words that indicated the dementia-friendly built environments, such as "wayfinding systems" and "landmarks," and then included words that would indicate design in GPUs such as "design elements" and "design details." The words have been used in this research are:

- Multiple stages of dementia.

- Wayfinding, wayfinding systems, wayfinding design.

- Dementia-friendly built environment.

- Design for dementia, aging in place.

The focus of the inclusion criteria was to find qualitative literature, that described the wayfinding abilities of the residents' of GPUs who are suffering from advanced stage of dementia, and elements of dementia-friendly environment. The researcher limited the publication dates from 1990 onwards when the role of wayfinding systems comes as a major component for the built environment and a priority in the western designers' agendas in response to aging population, and therefore prompted a wider range and greater depth of research articles.

2.2.3.1 META-ETHNOGRAPHY METHOD:

The following table is the description of the analysis of the meta-ethnographic method about wayfinding systems and dementia-friendly built environment to achieve the objective of defining the general design recommendations.

	Theme	Meaning
1	**Aim**	To extract general design recommendations for dementia-friendly built environment
2	**Search strategy**	Text words included: wayfinding, dementia, dementia-friendly, dementia design, obtained 87 abstracts
3	**Quality assessment**	Assessed for quality using design criteria, extracted data
4	**Synthesis approach**	Meta-ethnographic analysis of 12 primary studies using line of argument synthesis to develop a second order interpretation.
5	**Key findings**	A model that indicated recommendations to design: wayfinding systems, and dementia-friendly built environment.
6	**Hypotheses emerging from the synthesis**	- The need for dementia-friendly built environments. - Dementia-friendly built environments have great impacts on the daily living of the residents of GPUs as well as their behaviours for a better caregiving. - Wayfinding systems play a significant role in achieving dementia-friendly built environments. - Wayfinding systems should be compatible with the cognitive abilities of the GPUs' residents.

Table (1): The description of the meta-ethnography study

2.2.3.2 SEARCH RESULTS:

This table presents each paper of the meta-ethnography study and the number of direct

mentions to wayfinding systems and dementia-friendly built environments within each.

	Researcher	Year of the study	Total mentions
1	Alzheimer's Australia	2010	15
2	Bissell	2010	8
3	Caspi	2014	3
4	Garcia et al	2012	4
5	Liu et al	2014	6
6	Mace	1993	2
7	Marquardt	2011	8
8	Passini et al	2000	10
9	Scialfa et al	2004	8
10	The King's Fund's	2013	16
11	Tily et al	2009	15
12	White	2013	16
13	**Total**	-------------	**111**

Table (2): The search results of the meta-ethnography study
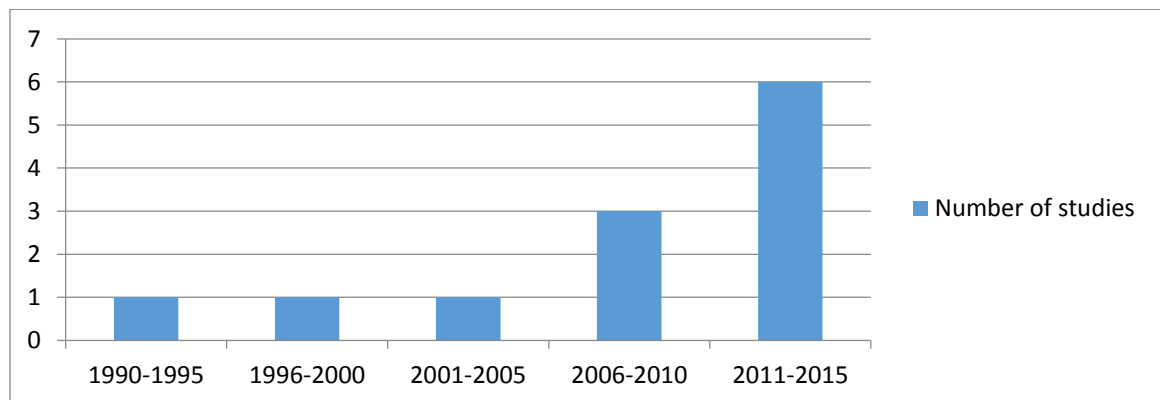
Graph (1): Number of studies according to the publishing dates
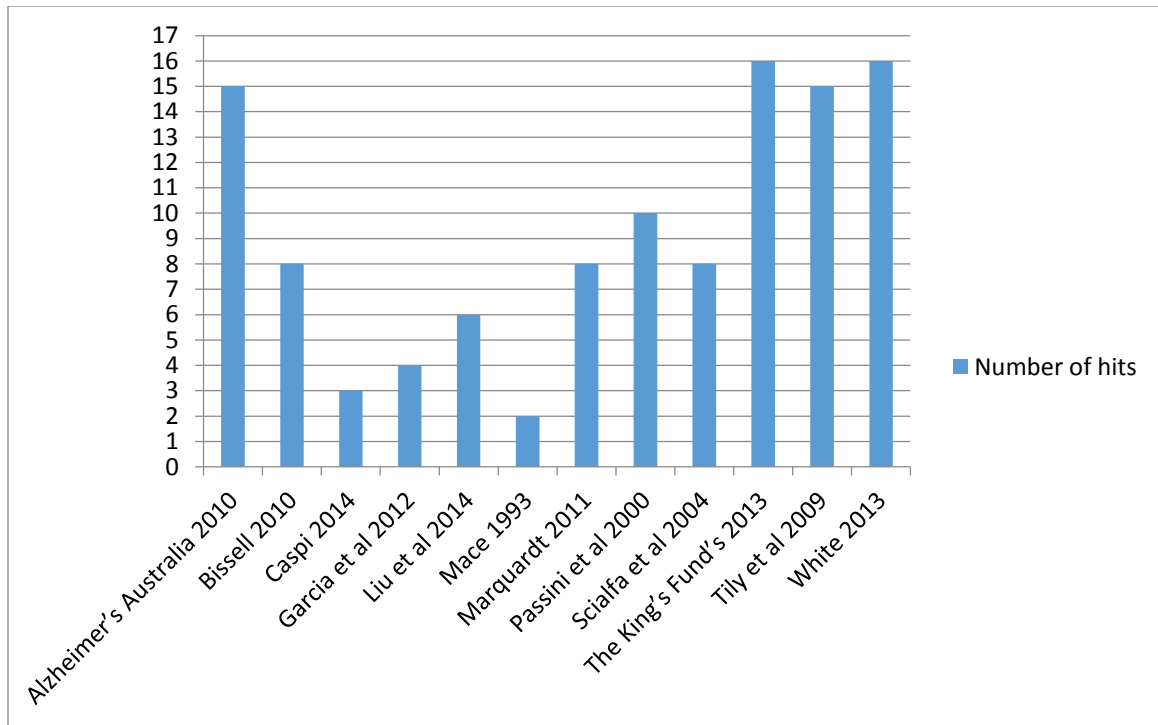
Graph (2): The meta-ethnography study analysis and how many direct mentions to the researcher's study of wayfinding systems and dementia-friendly built environment

2.2.3.3 QUALITY CRITERIA AND RESULTS FOR THE CHOSEN PAPERS:

This table indicates the analysis of the quality criteria for the chosen studies of the meta-ethnography study, which enabled the researcher to assess the solidity of each research.

	Question	Yes	No	Unclear
1.	Is this study qualitative research?	12		
2.	Are the research questions clearly stated?	11		1
3.	Is the qualitative approach clearly justified?	9	1	2
4.	Is the approach appropriate for the research question?	11		1
5.	Is the study context clearly described	12		
6.	Is the role of the researcher clearly described?	12		
7.	Is the sampling method clearly described?	10		2
8.	Is the sampling strategy appropriate for the research question?	10	1	1

9.	Is the method of data collection clearly described?	9		3
10.	Is the data collection method appropriate to the research question?	9		3
11.	Is the method of analysis clearly described?	10		2
12.	Is the analysis appropriate for the research question?	12		
13.	Are the claims made supported by sufficient evidence	12		

Table (3): Quality Criteria and Results for the chosen papers
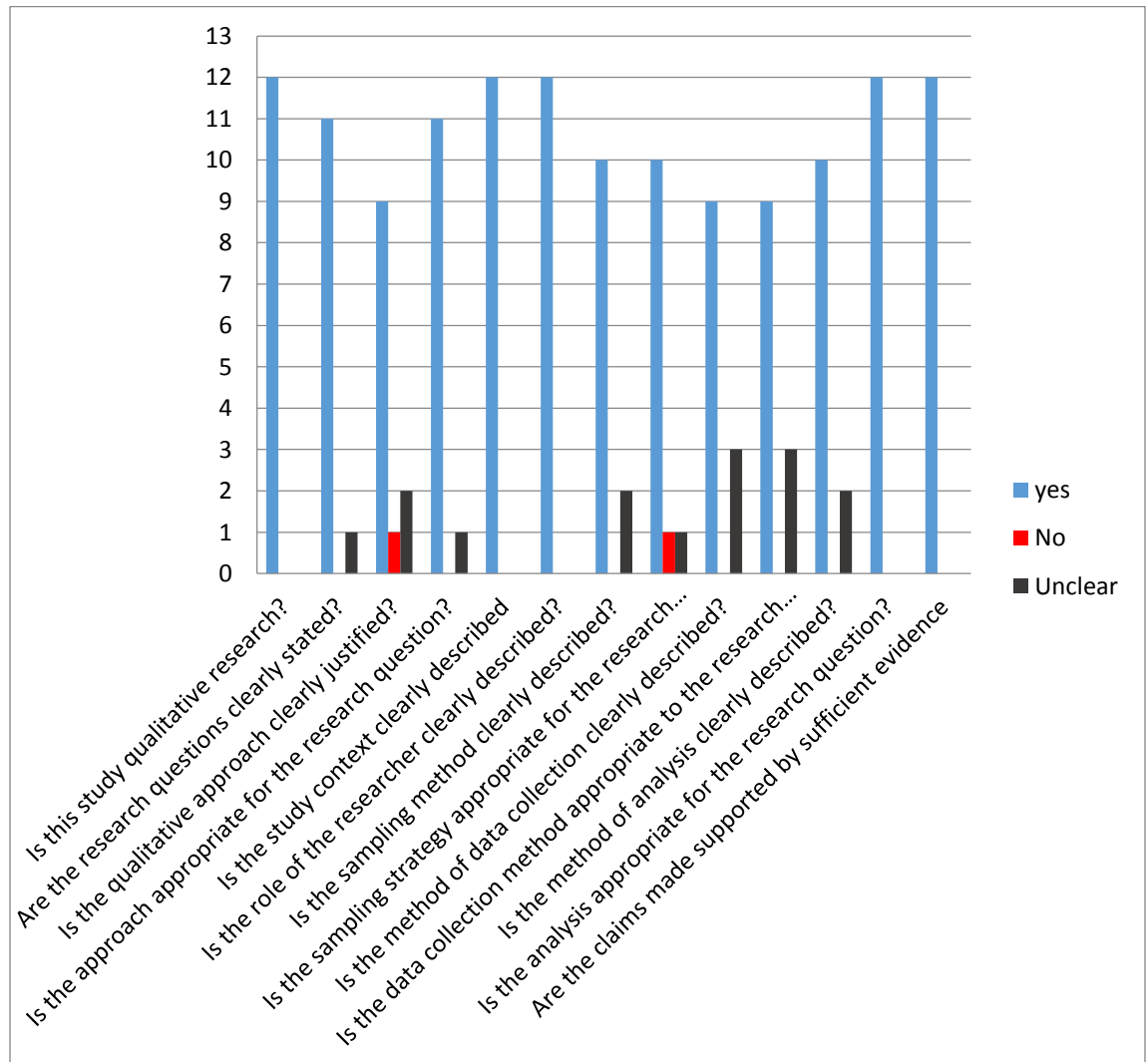
Graph (3): Quality Criteria and Results for the chosen papers

2.2.3.4 THEME RESULTS FOR THE SELECTED STUDIES:

By breaking down the chosen papers to themes, the researcher found the following:

Themes	Details	Number of Mentions
WayFinding Systems	Landmarks and Cues	16
	Colours System	10
	Lighting Systems	5
	Visibility Aspect	6
	Layout of the floor plan	14
	Signage System	11
	Design Details	14
Dementia-friendly Built Environment Themes	General themes	25
	Dementia-friendly Activities	10
Total		**111**

Table (4): The direct mentions of the papers to the design themes
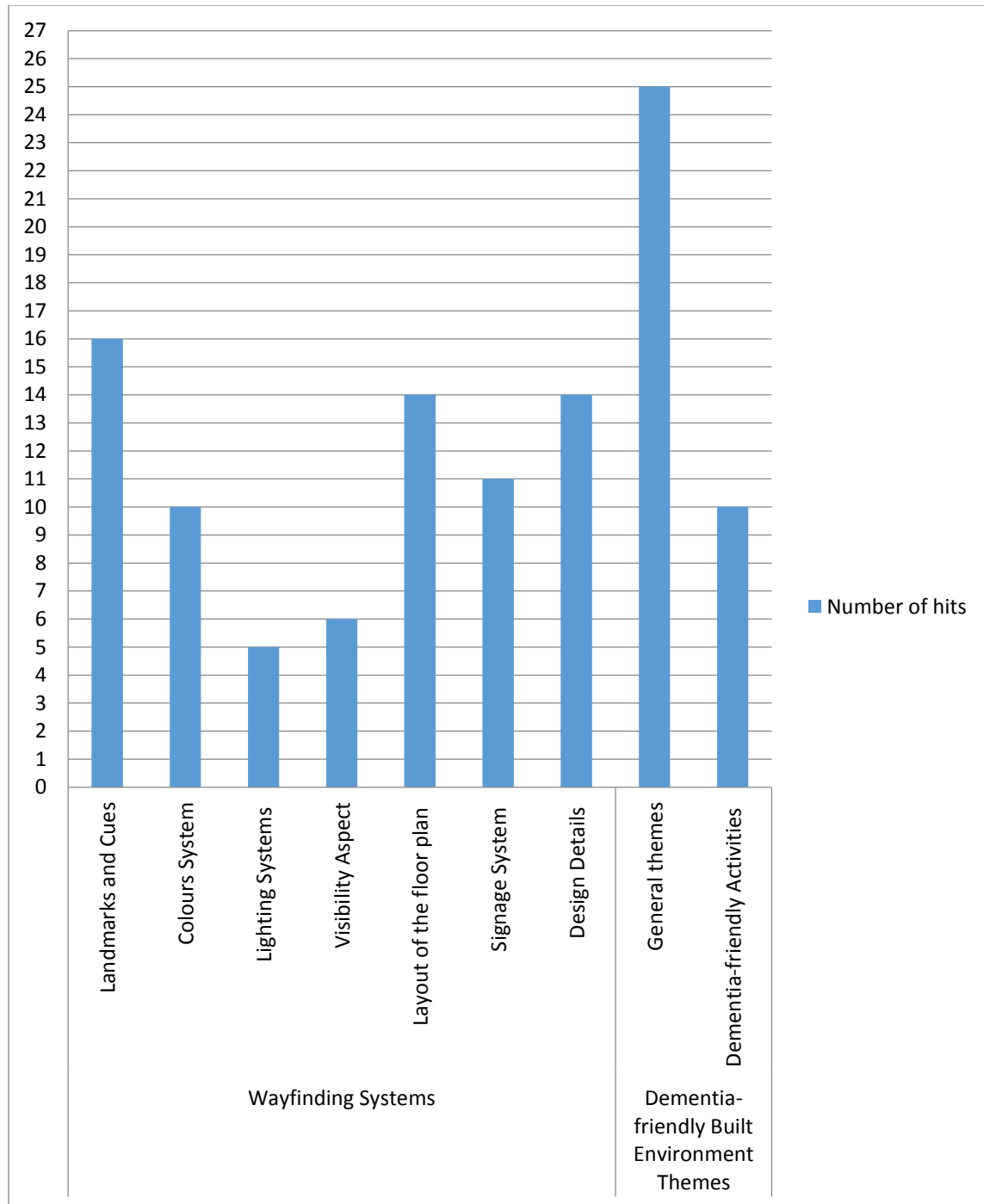
Graph (4): Theme Results for the selected studies

2.3 SUMMARY:

The methodology used for this research combines preliminary observations, semi-structured interviews, and a meta-ethnography study implementing qualitative approaches. Research methods are used to determine, discover, interpret, and devise facts about the design context of the GPU-TRI in the first place. Secondly, they inform how to design a dementia-friendly built environment. The three methods which have been used enabled the researcher to understand the context of the GPU-TRI through the use of preliminary observations, utilizing semi-structured interviews to address the design gaps of wayfinding systems to achieve dementia-friendly built environments in the GPU-TRI and studying the meta-ethnography method to achieve the general design recommendations of any dementia-friendly built environment by synthesizing previous studies.

CHAPTER THREE:

RESULTS AND DISCUSSION

3.1 INTRODUCTION:

This section discusses the second and third methods that have been used to achieve the objectives of the study. To make the discussion more accessible and easy to understand; this chapter has been divided into two parts; the first part relates to the Semi-structured Interview Method, discussing firstly: Qualitative Themes and Results for the Interviews Method, then secondly: Qualitative visualized data from the interviews method, whilst the second part of the chapter goes on to discuss the Synthesis of the Meta-ethnography Study in order to analyse the research data.

The discussions of the data collection methods are presented in each corresponding section under two parallel theme pairings:

a) **Wayfinding Systems**, which is divided into: 1) Landmarks and cues, 2) Colours System, 3) Lighting System, 4) Visibility, 5) Layout of the floor plan, 6) Signage System, and 7) Design Details.

b) **The Dementia-friendly Built Environment, and Dementia-friendly Activities.**

For example, the data obtained from the interviews are presented separately but under the same headings as the meta-ethnographic data, which illustrates the agreement or the contradiction between the views of the staff, if there are any.

Each heading concludes with a short discussion and suggestions for possible design interventions (See Graph 21).

PART (I): THE SEMI-STRUCTURED INTERVIEW METHOD

3.2 DISCUSSION OF THE QUALITATIVE THEMES AND INTERVIEW RESULTS
METHOD:

The interview data reflects how the staff of the GPU-TRI perceives the degree of mobility of the residents of the GPU-TRI and their responses to the unit's environment. The researcher asked the staff if the residents they were in charge of; could perform wayfinding tasks comparable to tasks possible in a dementia-friendly built environment. The assessment by the staff varied greatly. The variations were partly due to their involvement with different populations of the GPU-TRI residents, but they were also due to their perceptual differences and perspectives for example a number of staff members observed that residents prefer to be at dining room while other staff members observed that the residents prefer to be at their bedrooms.

3.2.1 THEME 1: THE WAYFINDING SYSTEMS:

- Landmarks and Cues

- Colour Systems

- Lightning Systems

- Visibility

- Floor Plan Layout

- Signage Systems

- Design Details

3.2.1.1 LANDMARKS AND CUES – Table 25:

Landmarks and cues are distinctive elements in the environment that are remembered or recognized. These landmarks have a major function in wayfinding and spatial orientation for persons with dementia. Landmarks and cues act as reference points in localizing spaces and help in making wayfinding decisions along hallways (Passini et al, 2000).

The staff identified that there are no features on the GPU-TRI, while, according to them, that might determine as landmarks or cues for the residents. However, it was agreed the interviews that the visual contact is happening in each space are the help for the residents to localize the required space.

From the insights gained from the literature, the researcher identified that the landmarks and cues might be composed of spaces with distinct functions such as the nursing station, the living room, and the TV room.

3.2.1.2 COLOUR SYSTEMS- Table 26:

The term colours system refers to all paint colours at the GPU-TRI for the hallways and other spaces of dining room and TV room.

It is generally agreed by the interviewees that the residents prefer the bright colours and they can identify the basics colours of blue red and yellow, though, it is depending upon the resident's cognitive level and cognitive functioning.

3.1.2.3 LIGHTING SYSTEMS – Table 27:

The term lighting system encompasses all types of lighting at the GPU-TRI for the hallways and other spaces such as the dining room and TV room.

It is generally agreed by the interviewees that the **residents prefer a brighter light for daily activities** such as eating as well as group activities, but prefer a dimmer lighting for relaxing times in the TV rooms and bedrooms. The lighting system can be an effective tool for positive wayfinding or deterring residents from entering some spaces.

3.1.2.4 VISIBILITY:

The term visibility refers to the possibility of visualizing the activities that are happening in the spaces of the GPU-TRI.

The interview **data highlighted challenges of the visibility aspect at the GPU-TRI,** the positive visibility of the internal wall of the dining room which enables the residents to see the activities happening in the dining room whether it is eating or group activities. This property of the space is helps to draw the residents to it. While, the transparency of the nursing station's windows is helping to form a problematic situation attracting the residents to join the nurses in their work activities and duties. The residents keep trying to enter the nursing station due to its central location and the two doors it has from both sides.

The visibility is playing a major role in wayfinding design to orient the residents to the common activities (see Table 28).

3.1.2.5 FLOOR PLAN LAYOUT:

The staff in the interviews stated that the figure (8) layout is the most important design aspect of the GPU-TRI as it enables the residents to keep walking in circles around the unit. This is a successful design compared with the previous unit which was a single corridor layout and all the bedrooms and other spaces were arranged on both sides.

Due to the symmetrical layout of the current GPU floor at TRI, some residents mix up the two sides and tend to look for their bedrooms in the wrong corridor. This confusion is particularly evident with new residents. The length and narrowness of the corridors is a dementia-friendly design due to the wideness that allows continuous flow of the walking residents, wheelchairs residents, visitors, and the staff.

The staff addressed **the importance of the central location of the nursing station** which controls the whole unit and enables the nurses to be always close for the residents in need of help.

For the wayfinding theme, it has been noted that members of the staff take most of the residents who can leave their bedrooms to their destination. New residents seem to have more difficulties getting around. Problems are evident when having to find their bedrooms and when having to distinguish one wing of the layout from the other (see Table 29).

3.1.2.6 SIGNAGE SYSTEM:

The term signage in this study represents all written and iconic information displayed in the GPU-TRI.

The staff in the interviews generally agreed that the signage was poorly designed and is not a dementia-friendly signage system at GPU-TRI, because the residents are mostly unable to read, and these signs do not respond to the cognitive functioning of dementia residents. Even the positioning of the signs is ill adapted. Some suggest that the size of the sign is too small and the numbers of the rooms are confusing even for the staff. The staff supported the researcher suggestion to use pictorial signage system for the GPU-TRI (see Graph 20 and Table 30).

Figure (2): Current Bedroom's Sign – GPU –TRI
This figure illustrate the poor design of the current signage system at the unit

3.1.2.7 DESIGN DETAILS:

The monotony of the bedrooms was a point of critique, and it was suggested that: by changing the colours of the wings of the unit, having cues and landmarks, changing the lighting system and using music would be helpful design improvements for a dementia-friendly built environment.

The researcher addressed the need to cover the wide windows with dementia-friendly curtains as many residents are getting agitated because of the fears of these wide windows or feeling cold as they perceive the windows to be open in winter. While most of the interviewees agreed that the furniture at the GPU-TRI is compatible with the residents' needs. The most important aspect is the need to make the unit a homely environment instead of an institutional environment (Table 21).

3.2.2 THEME 2: THE DEMENTIA –FRIENDLY BUILT ENVIRONMENT:

The staff stated that the GPU-TRI need to be more homely environment in terms of the design details, spaces, and furniture.

The staff agreed with the researcher that there is a need to have a music system to enhance the performance of the residents in a positive way.

- **DEMENTIA-FRIENDLY ACTIVITIES – Table 32:**

The researcher addressed the need for bringing new activities to the GPU with the staff, who are helping the residents spend therapeutic time maintaining what is remaining of their cognitive abilities, as well as raising the level of good living. The semi-structured

56

interviews with staff opened a discussion of the possibilities of new activities the GPU might provide.

The general desire to have a homely environment at the GPU instead of the institutional appearance, and to achieve that, it is required to have homely activities that are also safe, for example: laundry room for washing clothes, folding and ironing, or washing dishes zone. While the other suggestions are a play room or personal interest activities like a men's zone and a ladies' zone. These two zones related to men's hand working activities, and women hand making activities.

3.3 DISCUSSION OF QUALITATIVE VISUALIZED DATA DERIVED FROM THE INTERVIEW METHOD:

The researcher used quotes coding to analyse the data from the conducted interviews. These data are presented in tables of quotes, which are categorized according the structures of the interview guidelines; these tables are then broken down to direct data (Appendix 1) and presented in visual data themes by graphs, which enabled the researcher to address the design gaps of GPU-TRI for wayfinding systems and the dementia-friendly built environment for GPUs at hospitals.

3.3.1 Table 1,2 and Graph 1- THE PREFERED SPACES FOR THE RESIDENTS:

The most preferable space for the residents which they spend most of their day time hours is the **dining room,** as it is brightly lit, spacious, and all the group activities are arranged in this room. The dining room has the property of being divided into two

separate spaces by a folded partition, to accommodate two different activities like playing checkers on one side and piano singing on the other side.

The researcher found that **the residents prefer to be where the activities are and where are the other residents gather**, as one of the interviewees stated:

> *"I see the resident really relaxed and wanting to be close to the staff, I see them being relaxed in the dining room with the group, when is the right environment. For example I see the most relaxed when there is music running or when they are engaged in programs that have some meaning to them. "*

From the same graph, the TV room and the bedrooms are the second preferable spaces for the residents who are looking for dimmer and quit space to relax in, or have a nap in the day time hours.

Figure (3): Dining Room, GPU- TRI
This figure illustrates the brightness and wideness of the dining room.

3.3.2   Table 3,4 and Graph 2- THE PROBLEMATIC SPACES AT THE GPU-TRI

The problematic spaces at the GPU-TRI are the dining room as well as the bedrooms

located at the corners of the unit. Although, the dining room is the most preferable for

the residents, it is a problematic space at the same time. The reasons behind this

contradictory fact are that the dining room has the most of the activities happening at

the unit, and it is the most crowded space as most of the residents crowed there. This

crowding situation is exacerbated when there is more than one resident with mobility device or motor-wheelchair.

As one of the interviewees stated:

"Dining room, because the dining room there are a lot of them, and a lot of them make noises and they start screaming and yelling. So it's confusing the other patients. Or the bedrooms because a lot of them don't like the other patients entering their room's so that a lot of complex there".

The other problematic spaces at the unit are the corner bedrooms, these rooms have small foyers which are inviting spaces, to which the residents gravitate; while they are doing there their continues rounds in the hallways (see Figure 3). These entrance spaces are problematic when there is more than one resident stuck in this small space and isn't aware of how to get out. Furthermore, the problems of that space become more complex when these corner rooms are the bedrooms for a territorial resident who is gets easily agitated when there is another resident trying to enter his or her bedroom.

One interviewee said:

"The alcove area, that some random space where there is doors into alcove area which leads into two separate rooms that often some

patients are getting stuck in that area. And if there is more than one

patient in that area it is a potential issue".

Figure (4): The Foyer of the Corner Bedrooms, GPU- TRI
This figure illustrates the small space that is opened to the main hallway which conflicts
usually happening in it by crowding residents.

3.3.3 Table 5, 6, 9 and Graph 3, 4- WHAT ARE THE PREFERABLE SPACES

FOR THE RESIDENTS' VISITORS?

The residents' visitors vary in their choices in which spaces they usually spend the time

with the residents. **Most of the residents' visitors prefer to meet their relatives mostly**

in the resident' bedroom when they are looking for privacy for relaxed conversation or

sharing gifts and special traditional meals.

The other choice is the dining room, when the visitors want to join the resident while having the group activity at the unit. One interviewee said:

> *"Sometimes they go to patient's room sometimes they go in the TV room*
> *if it's not crowded several family members they might prefer to use the*
> *small room to have little privacy".*
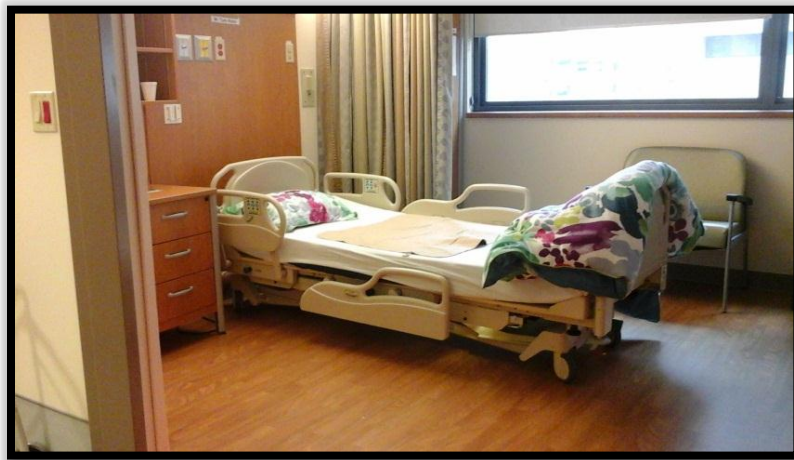
Figure (5): Bedroom, GPU- TRI
This figure illustrates the design of the residents' bedroom

Figure (6): Sitting zone at Bedroom, GPU- TRI
This figure illustrates the sitting zone on the single bedroom.

Figure (7): Visitors' Room, GPU- TRI
This figure illustrates the outer elevation of the visitors' room which has the welcome sign written on a coloured quilt.

From table (9) the interviewees stated from their daily observations that the residents' visitors are not using the visitor's room. The visitor's room is **only used at the time a new resident's admission**, when the staff meets and orients the caregiver of the proposed resident in an orientation session to the unit.

3.3.4 Table 7, 8 and Graph 5- HOW DO SPACES AFFECT BEHAVIOURS, IN POSITIVE OR NEGATIVE WAY, WHY?

One of the interviewees stated:

"Well if the room was crowded with noisy people, that's going to make some patients agitation, hmm… if music is too loud, if there is too many things going once that's make them unease, hmm… on the other hand might like quite music and be relaxed if the music, might quite like the idea of people going to be closed by and doing activities for them be involved with, so it depends".

This suggests that the properties of elements of a built environment include not only physical qualities, but what is happening in the space and the quality of these human factors, such as noise and lighting type are affecting the behaviours of the residents in many ways. What is effecting positive outcomes are: a homely environment; calm and warm, the relaxing or familiar music, and other people around like residents and staff members. What is effecting in a negative way is:

small spaces, erratic noise, and a lot of activity are happening around in the same

time.

Figure (8) TV Room, GPU- TRI
This figure illustrates the design of the TV room which has armed cozy chairs and armed sofas that residents might have naps on it.

3.3.5 Table 10, 11 and Graph 11- HOW THE RESIDENTS CAN FIND THEIR WAY AT THE GPU?

The data from interview method shows that most of the residents cannot find their way

from space to space, which requires the physical help of the staff guiding the residents

to find their way. This happens mostly in the morning, to when the residents want to

reach the dining room from their bedrooms.

As one interviewee stated: "Most of them no, they can't. Only very highly cognitive patients they are able to do some of them they do remember their rooms and they would find the way but most of them they wouldn't."

3.3.6 Table 10, 11, 12, and Graph 6, 7, 8- What would help the residents to find their way?

The staff's assessment of the current signage system of GPU-TRI, is not compatible to the residents' needs. The current signage system is:

- Small size of the text with a non-accessible font.

- Complicated numbering system, which is (5- Room number according to the floor)

- Absence of any illustration pictures to help the residents to identify the spaces.

Most of the interviewees agreed that **an improved signage system would help the residents to find their way around the unit**, and noted the potential of pictures and arrows in particular can help more. As an interviewee said: *"Some kind of signs, pictures on the wall maybe with directions with arrows".*

However, the current signage system has not been integrated to be an important element in the wayfinding systems at the GPU-TRI, as was stated in the interviews (Table 14), this data confirmed that the signage system at GPU-TRI is not helpful for residents (Figure 9); the wayfinding systems at the GPU-TRI are not efficient nor compatible with the cognitive and physical abilities of the residents (Graph 11).

Figure (9)   - The Main Sign, GPU- TRI
This figure illustrates the current not an accessible style of signage system which small in size, confusing in numbers and arrows.

Furthermore, any other cues to activate the wayfinding at GPU are absent as well, according to Table 15. These cues can be pictures, paintings, or objects.

The interviewees agreed with the researcher suggestion that **the pictorial signage system** will be beneficial in the wayfinding systems for the GPU-TRI, as demonstrated in Graph 18.

3.3.7 Table 16, 17, 18, 19 and Graph 9, 10 - WHAT ARE THE RESIDENTS' PREFERENCES IN OBJECTS, FURNITURE, COLOURS, AND LIGHTING SYSTEM?

The data from the interviews showed that the majority of the residents can identify objects like culinary tools, types of furniture, and differences of colour, as one of the

interviewees stated: "they like balls, colored balls, colored blocks, easy puzzles and greeting cards".

The data showed that the residents can identify the primary colors and bright colors, like *"red, yellow and blue, bright green bright blue purple just vibrant colors",* one of the interviewees stated.

The preferable furniture for the residents is the generic sitting chairs. These chairs are more used than the arm chairs and sofas; the reasons behind this are the usability, accessibility, and the dimensions of the chair that are compatible with the physical abilities of the residents.

Figure (10): Generic Chairs, GPU- TRI.
This figure illustrates the type of preferred chair for the residents.

Figure (11): Other types of furniture, GPU- TRI
This figure illustrates other types of furniture, such as sofas and armed chairs which are different than the generic chairs at the unit.

For the lighting system, the staff's observations of the residents regarding spaces' lighting system are indicative to the mood of the residents, and for those who want to be with a group and interact in activities; the bright lights attract and draw the attention of the residents, such as the dining room lighting. For those who are looking for calm and warm spaces for relaxing and mediation, their preferences will be for dimmer lighting, which can be found in the TV room, where many residents have naps. As shown in Graph 8, the data from interviews indicated that **the lighting system in the dining room and in the TV room is both preferable by the residents but according to particular need**. One interviewees related "I think residents they need both; they need a

69

bright room when they're being active in participating and things in, when they agitated

I think they need subdued lights not dark but just soft lights".

Figure (12): Lighting System, GPU- TRI Dining Room. This figure illustrates how the dining room is bright.

Figure (13): Lighting System, GPU- TRI TV Room. This figure illustrates how the TV room is dimmer.

3.3.8 Table 20 and Graph 15, 16- ARE THERE ANY DEMENTIA-FRIENDLY ELEMENTS IN GPU-TRI'S BUILT ENVIRONMENT?

The data of the interviews in Graph 12 shows that the GPU-TRI is a dementia-friendly built environment only in one capacity which is the layout design. The majority of the staff agreed that **the hallways are the most successful dementia-friendly element in the built environment of the unit;** especially when it is compared to the old unit which was one single corridor with double sided rooms.

 The researcher addressed the successfulness of the GPU-TRI's layout which meets the requirements for dementia-friendly built environment that achieved continues walking flow for the residents in the hallways layout in shape (8) or the (0) movement without meeting dead ends which is raising the conflicts incidents between the residents. **The dining room according to its size, lighting system, flexibility in furniture and partition division ability, helped to shape the dementia-friendly character of the dining room.** But the monotony of the doors, the space using policy, and the design details of the unit still needs more design solutions to categorize the GPU-TRI as dementia-friendly built environment. These facts can be realized from what is stated in one of the interviews:

"No, I don't think it is dementia-friendly, there are aspects they are dementia-friendly, and another many aspects they are not friendly, the fact that it's a big O or a big figure 8 I think it's very dementia-friendly, but I think that finding rooms is not friendly, and I

think everything is looking the same nothing is personalized so I think it's very not

dementia-friendly."
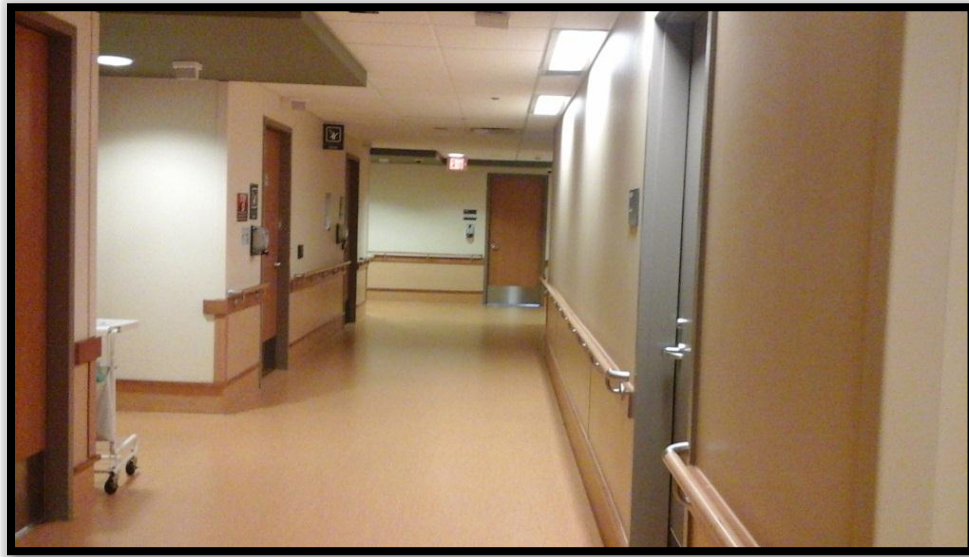
Figure (14): Hallways, GPU- TRI

This figure illustrates the monotony of the unit where all wings of the unit are in same colours as well as the type and colours of the doors.

3.3.9 Table 21, 22, 23 and Graph 17, 18, 19 - THE MISSING DESIGN OPPORTUNITIES AT THE UNIT AND RECOMMENDATIONS

The researcher addressed the need to bring new activities to the residents of the GPU that will achieve a dementia-friendly built environment through raising the level of better living for the residents and reducing the incidents of conflicts and agitating behaviours of the residents. The current daily hours at GPU are divided between eating meals, having group activities, walking in continues rounds in the hallways, and checking

all the door knobs to find an exit. The researcher **insight of this research** is to bring new activities for the residents to spend more beneficial time by these activities through the day time hours. This approach will help to make the residents less bored through the day, as well as, it will distract them from looking for exits or having conflicts because of the long leisure time. The data showed that the main concern of the staff is how to achieve **homely environment** inside the GPU though it is an institutional unit (Table 2). The suggested activities are varied in personal activities, play room, housekeeping activities, and/ or professional activities like men workstation/ knitting zone. One of the interviewees stated the need of the residents to meaningful activities that are strongly connected to their daily lives before being admitted to the unit or before being a person with an advanced stage dementia, these activities are imbedded in their long term memory which may be as an active part of their cognitive abilities. The interviewee said:

"I think that there are ways we can help people feel more comfortable, the type of activities that are meaningful for them to participated helps people feel more comfortable." The staffs were not sure about the location or the properties of the space that might be compatible to any suggested activity. This gap raised the insight of the researcher to suggest **new activities to the GPU-TRI** and to change the functions of the current spaces, to adopt the new approach which will achieve dementia-friendly built environment at GPU-TRI.

3.3.10 Table 24 - THE IMPORTANT INSIGHTS OF THE INTERVIEWS:

The researcher discussed provided insightful ideas about a dementia-friendly built environment in GPU-TRI. The GPU-TRI **could be achieved, particularly regards design details and dementia-friendly activities a comfortable, safe, and functional environment in which the residents can find meaningful activities and physical engagement,** as which **suggest a need to develop more activities like signing and dance, and enhance the usability of spaces, especially for the exercise room and the summer garden space.** The current GPU is also in **need for more design response in the washrooms, bathrooms, nursing station design details, furniture arrangements.** One of the interviewees said: *"Just make the environment more comfortable for the patients, just they don't have anywhere to go so they just walking around, just a little bit more space to spend time in.",* and another one said: *"Showers have nowhere to put towels for clothes we have a hanger in the corner that clothes they might have wet if you hanged towels nowhere to put.",* this concern was shred with another interviewees as he/she stated: *"Really important any changes in the environment can be made that make it easier for people with dementia to be able to reach the toilet."*

3.4 ADDRESSING THE DESIGN GAPS OF THE GPU-TRI:

The researcher addressed the design gaps of the GPU-TRI from the data of the semi-structured interview method and stated **the following needs for the GPU-TRI**:

1- The need to rethink of the functions of the spaces of the GPU, as the researcher addressed the less using capacity of the common spaces at the unit.

2- The need for accessible design details for the washrooms, bathroom, colours system, furniture arrangements and patterns, and the interior design finishing materials. The current built environment is not compatible with the needs of the residents to be dementia-friendly built environment in its design details.

3- Rethinking and redesign the signage system of the GPU. This will help in responding to the urgent need of dementia-friendly signage system, which is the main component of the wayfinding systems that are missing in the GPU-TRI

4- The need to suggest dementia-friendly activities is the major insight of the researcher to the unit which will help in achieving dementia-friendly built environment; these activities should be served in a compatible space for it.

PART (II): THE META-ETHNOGRAPHY METHOD

The meta-ethnography study addressed the systematic identification and charting of the key concepts in the papers being synthesised. In this synthesis, the concepts of each study were compared one by one with the key concepts in order to form the recommendations of design to wayfinding systems for dementia-friendly built environments. The conclusions of each theme were extracted in the form of an explanation, and interpretation or description as appropriate. These explanations, interpretations and descriptions then formed the basis of the general recommendations. The synthesis is based on several key themes that need to be made explicit for the researcher. It is assumed that the results of each study are not specific to one particular context at one particular point in time, and that concepts are transferable across settings. The analysis is done in three stages: the first stage is an overview of each study to identify as pre relevant to wayfinding systems and dementia-friendly built environments, while the second stage is a second-order interpretations to move beyond description. In meta-ethnography synthesis, it is necessary to go back to the original data in order to check the analysis. The third stage is the third-order interpretations to support the general design recommendations for dementia-friendly built environments in terms of accessible wayfinding systems.

3.5 SYNTHESIS OF META-ETHNOGRAPHY STUDY:

The meta-ethnography study was done in three filtering stages: 1) The first-order interpretations explained each study sample, data collection, the setting, the examined themes, the residents' stage of dementia, analysis of wayfinding systems, and analysis of dementia-friendly built environment if any. 2) The second-order interpretation informed general design recommendations, and 3) The third-order interpretations, which guided the researcher to refine thematic design opportunities through which to achieve a dementia-friendly built environment.

3.5.1 STAGE 1: FIRST-ORDER INTERPRETAIONS

This stage enabled the researcher to scan and evaluate each study validity, and its connections to the researcher's study (Appendix 2).

3.5.2 STAGE 2: SECOND-ORDER INTERPRETATIONS

From the first stage of the meta-ethnography study, the researcher developed the second stage which is the second-order interpretations; this stage is the general design recommendation that can be used in any dementia built environment, as well as the importance of each of these themes; for detailed references for this stage, please refer to Appendix 2. This stage divided into two themes, which are the wayfinding systems, and the dementia-friendly built environment, as following:

3.5.1.1 WAYFINDING THEMES:

The wayfinding themes are divided into:

- landmarks and cues

- colour systems

- lighting systems

- visibility aspect

- floor plan layout

- signage systems

- design details

3.5.1.1.1 LANDMARKS AND CUES:

Landmarks and architectural cues are one of the most important wayfinding systems for any built environment. The landmarks and cues for the GPUs should be compatible with the cognitive abilities of the residents who are suffering from dementia. From the meta-ethnography study, the researcher found the following design recommendations for achieving landmarks and cues as one of the aspects of wayfinding:

1- Designed architectural features that help differentiate space s can be archways, suspended or raised ceilings, columns, and fenestrations. Other landmarks that have been successfully used in memory care facilities are: indoor gardens, large sculptures or fountains, and large views of the outdoors.

2- Planned architectural features, like personalised doorways.

3- Use of environmental cues such as plants, works of art, and furniture because they make useful landmarks and reference points. For example: garden flower beds, sculpture, photography, paintings and other decorative features.

4- Works of art as landmarks should be simple, unique, and easy to recognise for subsequent reference, and they should be selected based on the sensory and perceptual limitations of the residents.

5- Providing landmarks within functional activity areas and at entrances from corridors can work as distinctive cues. (E.g. clocks, artwork, hanging quilts, or items of furniture that the resident may find meaningful).

6- Personalising room entrances to make them more relevant to individuals. Photography is seen as being helpful if the person can recognize him or herself. Photos taken in the past tend to be more easily recognized by the patients. It has also been suggested that the numbering of rooms is intended for visitors rather than patients, as few of the latter are able to remember their room numbers.

7- Familiarity with common objects may have contributed to a better performance in wayfinding systems.

3.5.1.1.2 COLOURS SYSTEMS:

Using colours is one of the most common and important systems for wayfinding design, from the meta-ethnography study the researcher found the following design recommendations:

1- Color is a very powerful tool, and when used correctly, a successful one.

2- To achieve successful wayfinding systems the design might depend on changes in colours.

3- Results from a recent study suggest use of vivid colour coding can improve short-term memory and improve ability. Older people find it increasingly hard to distinguish colours on the basis of hue and lightness. Colour choice is important if cues are to be read appropriately.

4- In order to increase wayfinding within a space, color is necessary.

5- Each floor should be treated with a different colour to facilitate recognition. The color is repeated on doors and door frames. However, it was observed that the colors used were not sufficiently strong to be distinguished.

6- Designers should take advantage of color-coding because this is effective for older adults. Avoid colors in the short-wavelength (e.g., blue) range and emphasize colors in the long-wavelength (e.g., red-orange) range.

7- Avoiding the use of dark lines/patterns on a light floor, as they are often interpreted as holes or pits by patients with Dementia of the Alzheimer's Type.

8- The use of vivid colour coding and the use of bright contrasting colours have both been found to improve short-term memory ability.

3.5.1.1.3 LIGHTING SYSTEMS:

Lighting design is an essential aspect in the wayfinding systems. At the GPUs, the lighting design can achieve a dementia-friendly built environment from the following:

1- The positive effects of artificial bright light (2,000 lux [lx]) and also of outdoor natural light on people with dementia can lead to positive effects, including increased sleep duration and less aggressive and agitated behaviour.

2- Lighting can be used to encourage both positive and prohibitive way finding and is a very important consideration when designing memory care facilities.

3- Lighting is essential in guiding patients to community areas and to encourage activity in these areas.

3.5.1.1.4 VISIBILITY:

Visibility can be determined as one of the major systems that should be focused on in the designing of wayfinding systems for persons with dementia,

1- Visibility for both patients and staff in a dementia or memory loss facility is essential.

2- Allow visual access and wide overview. Because of the degeneration of their brains, people with dementia cannot mentally represent spatial situations that they cannot see directly. Therefore, all places that are relevant to them should

allow for visual access, and it should be possible for them to clearly see their entire immediate living environment.

3- Visual access to major spaces such as activity areas increases their use.

4- Accessibility, visibility and safety of bathrooms and dining rooms.

5- Make key places such as dining rooms, bathrooms and living rooms easily seen.

6- Toilets should be visually accessible and easy to find for the residents. The setup of the toilet areas should encourage and cue independent use through visual access and legibility.

3.5.1.1.5 LAYOUT OF THE FLOOR PLAN:

There are many design aspects that should be respected in order to achieve the dementia-friendly built environment and help in enhancing the wayfinding systems.

1- Environmental interventions that promote wayfinding can be implemented on two levels: the design of the floor plan typology and the environmental cues, which comprise signage, furnishings, lighting, colors, etc.

2- Small-scale layout maximizes direct eye contact between staff and residents and therefore, improves staff supervision.

3- Small scale units assist staff in early identification, prevention, and de-escalation of a variety of behavioral expressions such as resident-to-resident aggression.

4- Small-scale units were found to be associated with reduced levels of anxiety and depression, increased mobility and self-care skills, and an increased quality of life.

5- Some of the basic spatial orientation skills were intact, namely, visual recognition of shape, and size.

6- Floor plans should be simple, but not repetitive in order to increase residents' wayfinding ability.

7- Avoiding dead ends in corridors by creating comfortable seating, activities (e.g. life skill station), or signage at the end of the hallway to reorient the residents and lead them back to activity areas.

8- key-relaxed planning single rooms

9- When the layout of a typical residential floor shows a certain symmetry, some patients become confused with the two sides and tend to look for their rooms in the wrong corridor. This confusion is particularly evident with new patients.

10- It has been shown that the ability to cognize the spatial organization of a building is already affected at the early stages of Alzheimer's disease.

11- Finding the circulation routes should be simple, nor must they be monotonous.

12- Environmental layout (shape of space and ease of getting around.

13- Floor plan design of long-term care homes in particular has a significant influence on resident spatial orientation and wayfinding.

14- Effective floor plans means less need for signage.

3.5.1.1.6 SIGNAGE SYSTEM:

Signage systems for people with dementia have a certain criteria that can make the signs in a built environment more accessible and compatible to their physical and cognitive abilities, like:

1- Signs and pictograms were identified as useful in supporting the identification of the wayfinding systems.

2- The names given to rooms must relate to a function. They should to be consistent among the patients and the staff, to concord with the vocabulary used on signs and other wayfinding supports, and they ought to reflect the cultural particularities of the patients as much as possible.

3- Consider placing signs and information in the floor pattern because this is where dementia patients usually look when navigating. Signs mounted on walls are not usually helpful for such patients because they are not in their line of sight.

4- Minimize the use of signs that require reading because many dementia patients cannot read. Simplicity is critical.

5- Coordinate cues with the vocabulary used on other signs and ensure cues are reflective of the linguistic and cultural particularities of the residents to the greatest extent possible. In some cases, pictures may be more valuable than words for cueing and direction, although silhouettes of a man or a woman are

not particularly successful. Where possible, consider using signs and pictures that include objects.

6- Utilize signs and pictograms in various locations to support the identification of the bathroom to ensure the entrances to these areas are visually distinctive, consider placing the cue at different heights or areas within the view of PWD. This difference in levels of sight will ensure those people who are walking up-right, those with a downward gaze, and those in a wheelchair can all see the cue.

7- Keep signs simple as people may no longer be able to understand complex language or writing.

8- Place signs at eye level, for those using wheelchairs.

9- Use bold accent colours & signage that includes pictures as well as text.

3.5.1.1.7 DESIGN DETAILS:

To achieve a dementia-friendly built environment by designing accessible wayfinding, the following design details should be addressed:

1- A successful alternative to the keypad is to paint a wall mural on all exit doors. By painting the same color on the door and the panic bar, and by excluding the trim around the door, the resident will see the door as merely another part of the wall.

2-   Decorating residents' bedroom doors with personal items increased their ability to identify their own rooms.

3-   Use redundant cues when possible. A consistent combination of signs/symbols, landmarks and color-coding will help minimize memory demands.

4-   Interventions that proved useful included the use of mirrors on doors and a horizontal grid of black tape on the floor in front of the door.

5-   The reactions are particular to individuals but nonetheless real. It seems that dark patterns should be avoided as well as any decisive separation of one area from the other. However, the major lesson from these observations is that design ideas concerning decorative elements must be pretested. It is indeed very difficult to foresee the emotional and interpretive reaction of an Alzheimer's patient.

6-   Transform corridors by providing handrails, appropriate artwork, thoughtful use of colour & lighting, & regular resting points.

7-   Increase architectural legibility. The function of rooms and other spaces, as well as the behavior that is expected and appropriate there, can be made clearly legible by means of size, proportion, materials, and furnishings. In this manner, distinctive places that can be remembered and located more readily are created, thus promoting residents' spatial orientation and wayfinding.

8-   Install sanitary ware of a recognisable style, with contrasting colours for toilet seats & grab-rails.

9-   Make exits less obvious to reduce visual cues for exiting so the resident who wanders does not realize exiting is possible.

10- Sturdiness and visibility of handrails and furniture.

11- Contrast of the toilet and sink from the wall and the floor.

12- Avoid flooring with patterns and reflective shine and high glare as PWD often mistake dark markings on floors as holes, bugs, etc., and glare is often mistaken for icy surfaces.

13- Bathing facilities with non-slip surfaces

3.5.1.2 DEMENTIA-FRIENDLY BUILT ENVIRONMENT THEMES:

Dementia-friendly built environment has firm connections with wayfinding systems, which can be interpreted into:

1- Suggesting the Incorporation of supportive wayfinding features into the design of therapeutic care units.

2- Learning wayfinding systems seem to be slow and the adaptation to the new settings may take months.

3- Wayfinding performance, and the resulting degree of spatial mobility, is dependent on the patients' cognitive abilities and the nature of the physical and

human environment. An attitude of encouragement by the staff is all-important in prolonging the patients' autonomy and their prerequisite, mobility.

4- To achieve a dementia-friendly built environment the design should avoid the following elements: poor signage & lack of wayfinding cues, poor use of colour & contrast. Also avoid lighting that causes glare & pools of light and shadow, shiny floors, clutter and distractions, and stark, unwelcoming spaces off long, featureless corridors. Finally avoid no personalisation of space, and under-use of gardens and outside spaces.

5- The physical environment can encourage and support independence while promoting safety.

6- The optimal environment feels comfortable and familiar, as a home would, rather than a hospital.

7- The environment should be less about physical structures and more about the feeling inspired by the quality of the place that helps to prevent behaviour problems.

8- Safety and working condition of equipment and fixtures (e.g., bedside commodes, shower chairs, adequacy of brakes on wheel chairs.)

9- Appropriate use of personal safety devices, such as canes, walkers or wheelchairs

DEMENTIA-FRIENDLY ACTIVITIES:

The activities that are happening in any built environment that is related to people with dementia have a great impact on the residents behaivours and their daily lives, the studied researches of the study addressed the following recommendations:

1- A home environment provides opportunities for residents to have privacy, sufficient lighting, pleasant music and multiple opportunities to eat and drink, and it also minimizes negative stimuli such as loud overhead paging and glare.

2- Create purpose-specific rooms so people know what to expect when they enter them.

3- Social environments were perceived to be more important than the physical environments, and flexibility in these environments was perceived to be essential.

4- The results of this study suggest that individuals with moderate to advanced dementia manifesting disruptive behaviors would best be suited in a home that offers a homelike environment with minimal barriers, a certain degree of privacy for residents, and, above all, a minimal level of noise.

5- Design elements will enable individuals with dementia to experience the best quality of life possible while reducing the care load on both formal and informal caregivers.

6- Create activity zones with recreational opportunities, such as multi-sensory theme boxes, that residents can explore with staff encouragement.

7- The common spaces should be popular for activities, and to have distinct rooms and themes to accommodate behaviours.

8- Sub-divide large spaces such as day rooms & dining rooms to make them domestic sized so that they feel more homely.

3.5.2 STAGE 3: THE THIRD-ORDER INTERPRETATIONS:

From the Meta-ethnography study – stage two, the researcher refined its findings according to the structure of the researcher's study themes and achieved stage three, as following:

3.5.2.1 THEME 1: THE WAYFINDING SYSTEMS

The wayfinding themes are divided into: landmarks and cues, colour systems, lighting systems, visibility, the layout of the floor, signage systems, and design details.

3.5.2.1.1 LANDMARKS AND CUES:

From the meta-ethnography study stage two, the researcher found the following design recommendations for achieving landmarks and cues as one aspect of wayfinding:

1- **Landmarks and architectural cues** are one of the most important wayfinding systems for any built environment. The landmarks and cues for the GPUs should be compatible with the cognitive abilities of the residents.

2- **architectural features** that help differentiate spaces which have been successfully used in memory care facilities are; personalised doorways, plants, works of art, and furniture because they are useful landmarks and reference points; for example: flowerbeds, sculpture, photographs, paintings and other decorative features such as; clocks, artwork, hanging quilts, or items of furniture which the residents find meaningful.

3- Works of art as **landmarks** should be simple, unique, and easy to identify as subsequent reference points, and should be selected based on the sensory and perceptual limitations of residents.

Figure (15): Salisbury District Hospital – United Kingdom. This figure illustrates the using of photos as landmarks and cues for the GPU and how the exit door camouflaged with the same colour of walls.
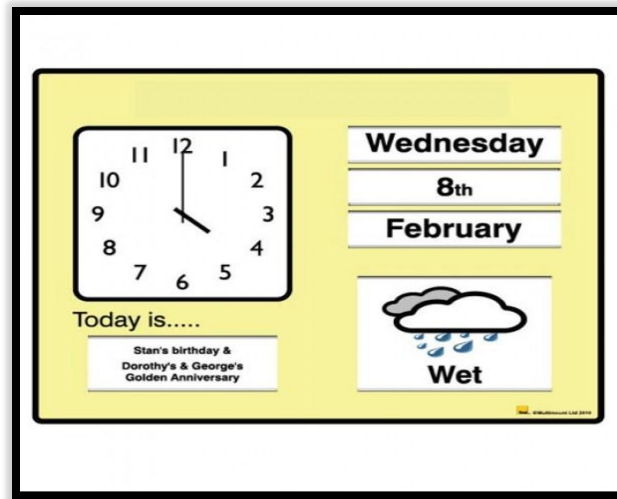
Figure (16): Dementia-friendly clock wall (Countrywide, 2015)
This figure illustrates the type of dementia-friendly clock wall that might be used as a landmark. This clock has a writhen date of the day, number of day, and the month, the weather condition, and if there is an event in that date.

3.5.2.1.2 COLOURS SYSTEM:

Using colours is one of the most common and important systems for the wayfinding design. From the meta-ethnography study the researcher found the following design recommendations:

1- In order to enhance wayfinding within a space, **colour** is necessary. Each floor (or part of a floor) should be treated with a different colour to facilitate recognition.

2- Use of **vivid colour coding** can improve short-term memory and improve the cognitive ability of wayfinding. Furthermore the use of bright contrasting colours in the long-wavelength (red orange) range is recommended. Avoid the use of dark lines/patterns on a light floor, as they are often interpreted as holes or pits by patients.

Figure (17): Ingleton Wood- Specialist Dementia Care Facilities at Bedford Hospital-United Kingdom. This figure illustrates how colours are used as a wayfinding system to differentiate two bedrooms

Figure (18): Hilling don Hospital-United Kingdom. This figure illustrates the use bright green to differentiate the furniture inside the resident's bedroom.

3.5.2.1.3 LIGHTING SYSTEM:

Lighting design is an essential aspect of wayfinding systems in GPUs. The lighting design can promote a dementia-friendly built environment through the following:

1- **Lighting** can be used to encourage positive wayfinding by encouraging the residents to enter a space, while prohibitive wayfinding can be achieved in the space where it is needed to discourage the residents from entering or staying, such as corridors or corners. Lighting systems is a very important consideration when designing memory care facilities.

Figure (19): Salisbury District Hospital – United Kingdom. This figure illustrates the colours systems combined with the lighting system and paintings on walls to achieve dementia-friendly built environment.

3.5.2.1.4 VISIBILITY:

Visibility refers to the property of spaces, partitions, windows, glazed walls, and other elements of any built environment, which allows or prohibits residents from seeing the activities behind a given space. Design features which allow visibility includes:

1- **Visual access** to major spaces such as activity areas increases their use.

2- Make key places such as dining rooms, bathrooms and living rooms easily seen.

    Accessibility, visibility and safety of dining rooms, washrooms and toilets should be visually accessible and easy to find for the residents. The visibility aspect should be in harmony with the safety, privacy, and basic intended recognition of space and their functions.

Figure (20): Bridgwater Community Hospital-United Kingdom. This figure illustrates the use of glass between the sitting room and the hallways to allow visibility practise from both sides.

3.5.2.1.5 LAYOUT OF THE FLOOR PLAN:

There are many design aspects that should be respected to achieve a dementia-friendly built environment and to help in enhancing the wayfinding systems.

1- Floor plans should be **simple**, but not repetitive in order to increase wayfinding ability.

2- **Avoid dead ends** in corridors by creating comfortable seating, activities (e.g. life skill station), or signage at the end of hallways to reorient the residents and lead them back to activity areas.
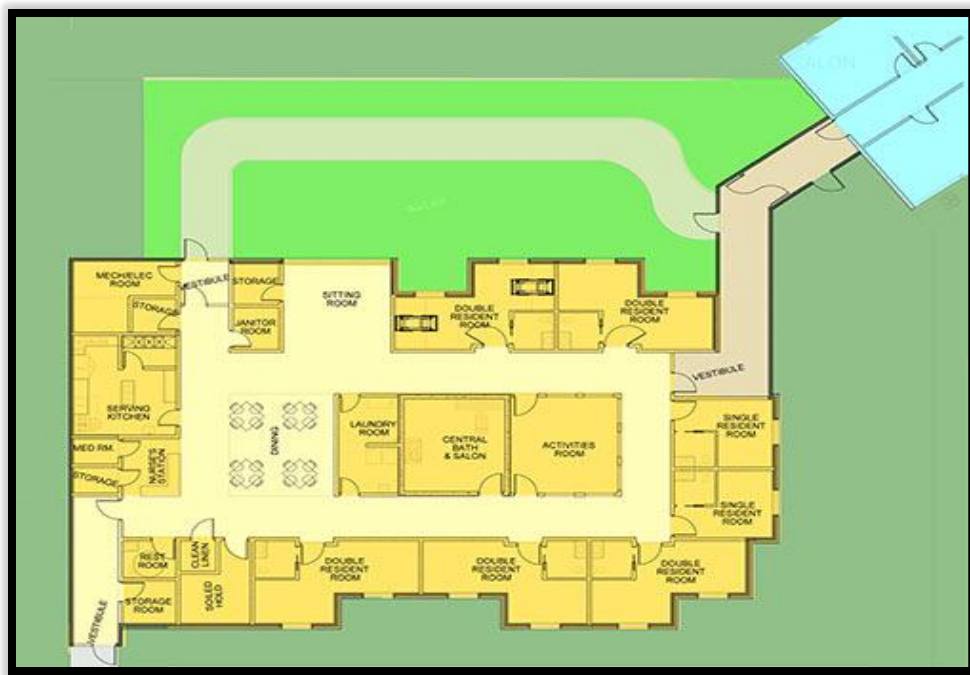
Figure (21): Friendship Home of Audubon- United States. This figure illustrates the dementia-friendly layout, which is free of dead ends and it comes in (O) shape.

3.5.2.1.6 SIGNAGE SYSTEM:

Signage systems for people with dementia have a certain criteria that can make the signs in a built environment more accessible and compatible to their physical and cognitive abilities, like:

1- **Signs and pictorial signs** were identified as useful in supporting the identification of the wayfinding systems, and the use bold accent colours and signage that includes pictures as well as text is recommended.

2- The **names given to rooms must relate to a function**, and the positioning of signs should be at eye level, for those using wheelchairs.

Figure (22): Orientation Signs – Dementia-friendly signage (Medi-Direct, 2015)

This figure illustrates the type of dementia-friendly signs which has pictures in big font size with constructed colours.

3.5.2.1.7 DESIGN DETAILS:

To achieve a dementia-friendly built environment by designing accessible wayfinding, the following design details should be addressed:

1- **Decorating** residents' bedroom doors with personal items increased their ability to identify their own rooms.

2- Make **GPUs exits** less obvious to reduce visual cues for exiting so the resident who wanders does not realize exiting is possible.

3- **Contrasting** the toilet colours and sink colours to help the residents differentiate, as well as fixtures, edge tabs from the wall and the floor.

Figure (23): Ninewells Hospital -United Kingdom.

This figure illustrates the design details of the toilet, which has constructed colours between the toilet's ring against its body, as well as against the floor pattern.

Figure (24): St George's Hall Residential Dementia Care Home -United Kingdom
This figure illustrates the design details of the doors which are contrasted in colours as well as have the personalized signs on each door.

Figure (25): Bickford Senior Living, Mary B's. - United States
This figure illustrates the camouflaged exit door and the planted homely furniture in the same space

3.5.2.2   THEME TWO: DEMENTIA-FRIENDLY BUILT ENVIRONMENT

The built environment can encourage and support independence while promoting safety for the residents. The optimal environment feels comfortable and familiar, as a home would, rather than a hospital; for example, adding art works, curtains, and fake kitchen cupboards, combined with the wayfinding systems, will achieve a more dementia-friendly built environment.

DEMENTIA-FRIENDLY ACTIVITIES:

The activities happening in any built environment have a great impact on the residents' behaviours and daily lives. A home environment provides opportunities for residents to have privacy, sufficient lighting, pleasant music and multiple opportunities to eat and drink. It is recommended that large spaces such as day rooms and dining rooms should be sub-divided to make them domestic sized so that they feel more homely. To achieve a dementia-friendly built environment, it is also recommended that activity zones be created, providing recreational opportunities, such as multi-sensory theme boxes, that resident can explore with staff encouragement (Figure 26).

Figure 26: Exercise as a group activity in the GPUs (Cirillo, 2014)
This figure illustrates an exercise activity conducted by a member of the GPU's staff

3.6 FINDINGS FROM THE META-ETHNOGRAPHY STUDY:

This table represents the findings of the meta-ethnography study from the three stages, as

following:

Themes	System	Details
Wayfinding	**Landmarks and Cues**	• Plants and garden beds
		• Personalised doorways
		• Works or visual art: sculptures, paintings, photographs, wall clocks.
		• Furniture

	Colours System	• Different colours for floors and wings. • Vivid and bright colours
	Lighting System	• Bright lighting for positive wayfinding. • Dimmer lighting for prohibitive wayfinding.
	Visibility	• Common areas like: dining room, TV room. • Shared and individual bathrooms.
	Layout Design	• Creating comfortable seating for the hallways ends.
	Signage System	• Pictorial Signs • Enlarge text • Highlighted Background • Image of the function of the space, like bread for the dining room.
	Design Details	• Camouflage of exit doors. • Contrast in colours of features like toilets.
Dementia-friendly	Built Environment	• Avoid the institutional interior design. • Achieve the homely environment.
	Dementia Activities	• Homely activities like: folding laundry. • Create activity special zones.

Table (5) – The findings of the meta-ethnography study

3.7 SUMMARY OF THE META- ETHNOGRAPHY STUDY:

Meta-ethnography helped the researcher to re-interpret meaning across many studies about wayfinding and the dementia-friendly built environment. A clear related question to the researcher's study helped to set the boundaries for the scope and depth of a meta-ethnography: what are effective design recommendations to achieve a dementia-friendly built environment.

3.8 SUMMARY OF THE DISCUSSION SECTION:

This chapter addressed the qualitative data collection and analysis methods of the study: semi-structured interviews and meta-ethnography.

Conducting a meta-ethnography of qualitative design research poses a number of methodological challenges, including locating studies, synthesising these and presenting findings. The researcher addressed these challenges by synthesizing meta-ethnographic and interview-based qualitative findings with a design-based inquiry, allowing a refinement of practical themes and locations for design interventions; this design-based inquiry process is discussed in more detail in chapter 4.

The semi-structured interview method enabled the researcher to define the design gaps within the specific unit from observations made by the staff, allowing a design response to the residents' needs. The meta-ethnography method then enabled the researcher to define the general design recommendations for dementia-friendly built environments by facilitating accessible wayfinding systems. These two methods are the basis from which the researcher formed multiple design insights to present to the GPU-TRI in order to make it a dementia-friendly built environment.

CHAPTER FOUR:
THE DESIGN RESPONSE

4.1 INTRODUCTION:

This section outlines the researcher's recommendations for a design response to address the environmental design gaps of GPUs, specifically the GPU at TRI, which have been identified from the research methods section. These recommendations are:

1- Create dementia-friendly wayfinding systems

2- Create dementia-friendly layout and the distribution of spaces

3- Create dementia-friendly design modifications, which support the wayfinding systems

4- Create and facilitate dementia-friendly activities

4.2 DEMENTIA-FRIENDLY WAYFINDING SYSTEMS:

4.2.1 Landmarks and cues, such us decorating schemes, sculpture, paintings and other decorative features should be used in the GPU-TRI to help the residents in finding their way. The unit possess colourful quilts opposite to the nursing station and at the TV room, which can **be used strongly to create a remarkable landmark** for the GPU-TRI (Figure 27).

The researcher suggests also using pictures of: **babies, baby animals like puppies and kittens,** and basic single flowers; these categories are the identifiable dementia-friendly pictures as was indicated by the conducted interviews method of this research.

These features should be fixed in dementia-friendly frames at many locations within the GPU-TRI, such as: the side of the current visitor room, dining room, TV room, beginning of each hallway as explained in Figure 28. Pictures on quilts fabrics twill enhance the wayfinding abilities of the residents, as well as achieve a homely environment. Furthermore, these quilts will establish a signature design style for the GPU.

Figure (27): The quilts of the TV Room- GPU-TR
This figure illustrates the significance of using the wall quilts on the walls of the GPU-TRI
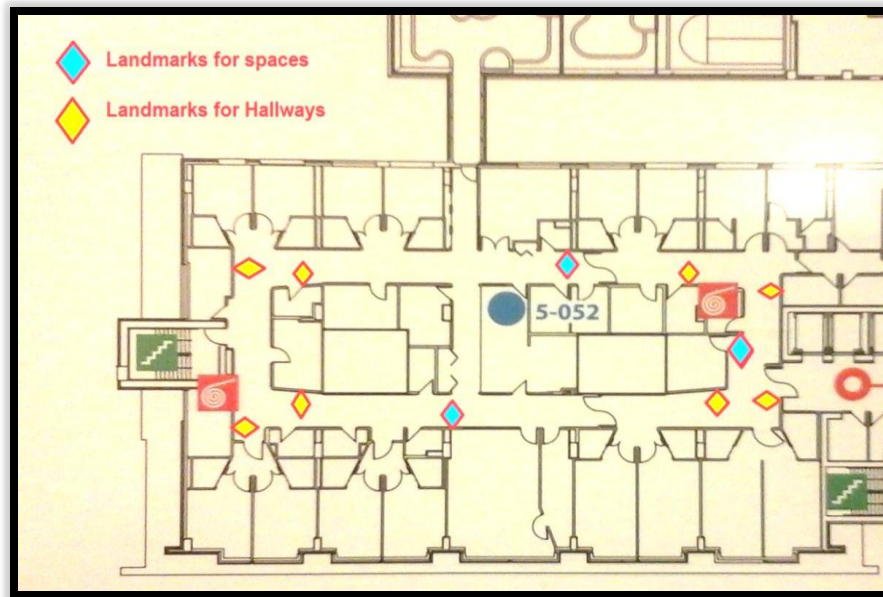
Figure (28): Suggested locations of landmarks and cues. This figure illustrates the suggested landmarks and cues across the unit on the floor plan drawing.

4.2.2 DEMENTIA-FRIENDLY COLOUR SYSTEM:

The suggested colour system for the GPU-TRI is divided to three categories. The first suggestion is for the hallway colours, while the second recommends personalizing the frames of bedrooms' doors, and the third addresses the fixtures at the unit, such as toilets.

The bedrooms side of the GPU's east wing should be in **Neon Lime green**. The researcher suggests adding wallpapers of brick texture should modify the lower part under the level of the handrail. Furthermore, the skirting of this side should be in dark green. Staff rooms' doors should be camouflaged by coloring them the same colour as walls. The brick texture will give the feeling of a street scene, while the personalized

bedroom doors will represent owned homes for the residents. The green lime colour will harmonize with the existing colour scheme of the unit.

Regarding the west wing of the unit and for the bedrooms side, the recommended colour is **light salmon**, which is a colour mixed between brown, red and peach. The light salmon color will have the properties of: contradiction between this wing and the east wing, matching with current colour scheme, matching the brick texture of the suggested wall paper of the opposite wall.

These changes in the colour system will help the residents to orient themselves within the unit, help to identify the location of each resident's bedroom according to that colour coding, as well as help residents locate the common spaces inside the unit, while the TV room will be in the green side while the dining room will be at the red side.

Figure (29): The suggested modifications to the hallway at the east side of the unit.
This figure illustrates the new colour scheme of the east side of the unit.

Figure (30): The current hallway at the east side of the unit.
This figure illustrates the current colour scheme of the east side of the unit.

The suggested colour system will also help the nurses as well to easily identify each resident's bedroom **without high cognitive effort to remember where the required bedroom is.**

Figure (31): suggested hallway colour scheme for the west side of the unit
This figure illustrates the new colour scheme at the unit that will help in the wayfinding systems.

Figure (32): Current hallway colour scheme for the west side of the unit
This figure illustrates the new colour scheme at the unit that will help in the wayfinding systems.

The second suggested change is to alter bedroom door colours to **personalise the doors**; the personalized doors represent planned architectural features in any layout, which will help the residents to find their way to their bedrooms. The researcher suggests changing the door colours of the east wing to **forest green**, and the west wing doors to **Indian red,** as shown in Figure (33) and Figure (34).
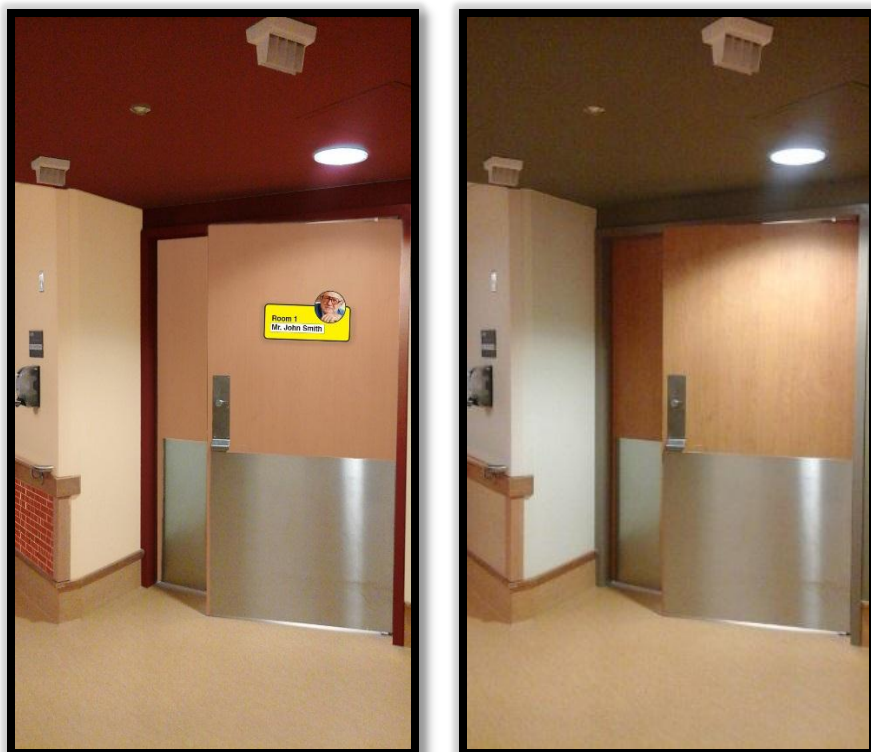
Figure (33): The east side bedrooms – The current doors (Right) and the Suggested doors (Left)
This figure illustrates the new colour scheme of doors for the east side of GPU, currently and the new suggested colours.

Figure (34): The west side bedrooms – The current doors (Right) and the Suggested doors (Left)
This figure illustrates the new colour scheme of doors for the west side of GPU, currently and the new suggested colours.

The third aspect of the proposed colour system is **changing the colours of the washrooms' fixtures** to be contrasted between the top of the fixtures and the body; the suggested color should be matched with the wing colour. The east side the suggested colour can be a tone of green and the west side can be a tone of brown red (Figure 35, 36).

Figure (35): The current colour scheme for the bedrooms' washroom.
This figure illustrates the harmonic colours of the toilet which should be constructed instead.

Figure (36):   The suggested west side washrooms (Right) and the Suggested east side washrooms (Left)
This figure illustrates the new colour scheme of washrooms for the west and east side of GPU, which is constructed in colours in all details.

The fourth aspect of the colour system is to use wallpaper or a wall finish other than paint in some areas to improve wayfinding, for example in the **dining room, activity room, TV room**, and around entrances. **The fifth** aspect of the colour system, addresses visibility needs: use one-way windows for the nursing station, which will enable the nurses to monitor spaces from within the station, while preventing the residents from seeing the nurses inside. The one-way glass will help to stop the residents' agitated behaviours due to the need for being close to their nurses or to be inside the station for acute care (Figures 37 and 38).

Figure (37): Current Nursing Station at GPU-TRI
This figure illustrates the visibility of the nursing station which is agitating the residents in many cases, as they want to enter the station and/or reaching their duty nurse.

Figure (38): The Suggested Nursing Station at GPU-TRI
This figure illustrates the use of the one-way glass for the nursing station, which will help to stop some of the agitating incidents at the GPU-TRI.

4.2.3 DEMENTIA-FRIENDLY LIGHTING SYSTEM:

The researcher suggests using dimming control technology to adjust light as needed. These controls will help the nurses to orient the residents to the required spaces through the day time hours. This technique is required for the problematic spaces at the corner rooms; which can be dimmer through the day time to help achieve negative wayfinding, this suggestion will help to reduce the interest of the residents to be in these spaces which in turn will prevent the conflicts that usually happen in these spaces. While the bright lighting system can be used for the activity room (Current TV room) to

enhance the visibility for the residents and to encourage the residents to spend time in the activity room.

4.2.4 DEMENTIA-FRIENDLY FURNITURE AND ITS DISTRIBUTION:

One of the important criteria to achieve a dementia-friendly built environment is **Furniture Design** and its distribution within the GPU-TRI. Furniture and other objects in a room need to be seen easily against wall and floor patterns, textures and colours.

The current furniture of the GPU-TRI is visually appealing and gives adequate support, chairs and sofas allow the residents to get up and down independently, stable and sturdy tables and chairs, which are free of sharp edges or corners.

To **achieve a dementia-friendly built environment** for the unit, the researcher suggests the following **types of furniture:**

- Dining chair arms that fit under the table in the dining room.

- Dining chairs with good-looking, serviceable fabric

- Home-like bed heads

- Special items of furniture for wayfinding landmarks, which can be used in certain location around the unit

- home-like furniture

- Fabric curtains for a cosier feel, these curtains can be added to the current system. The suggested curtains should be about 55 cm (Half height curtain) to be safer and prevent residents from pulling them down

- The suggested zones to arrange furniture inside the hallways are: in front of the dining room, current TV room, and close to the hallway's foyer situated in front of the corner rooms

- The suggested seating place close to the corner rooms will help create stop points for the residents to prevent pacing in these zones and raising conflicts between them
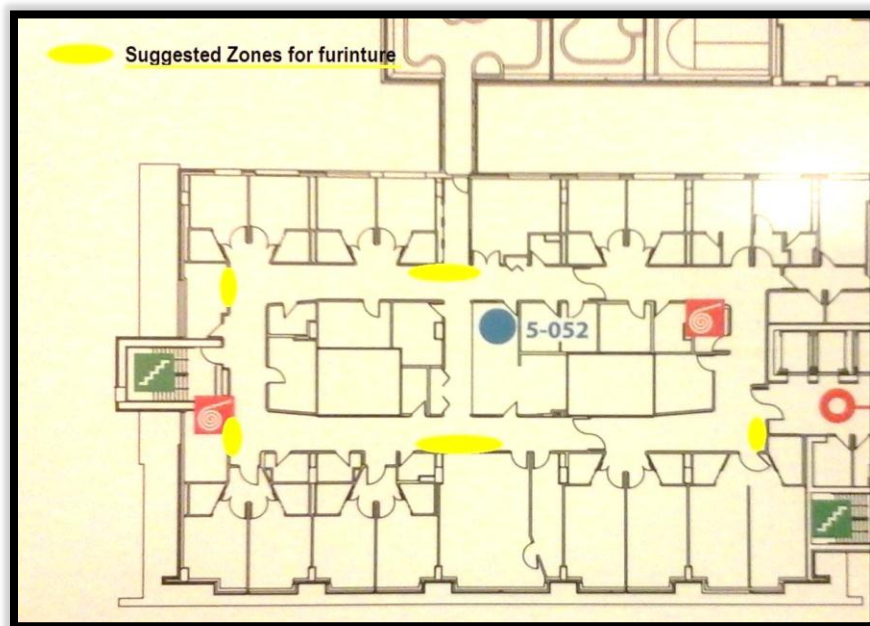
Figure (39): Suggested distribution of furniture in the hallways of GPU
This figure illustrates the suggested locations of sitting furniture which will help the residents to be seated.

4.2.5 DEMENTIA-FRIENDLY SIGNAGE SYSTEM:

Signs are effective elements of wayfinding systems. This tool has a more intensive impact for persons with dementia, who rely on it **as a direct tool for wayfinding perception** more than cues and landmarks, which rely on more cognitive abilities for success. **To achieve a dementia-friendly signage system, signs should be clear, and in simple designs with good contrast colour between text and background.** There should be a contrast between the sign and the surface it is mounted on. The main criteria of dementia-friendly signage are: contrast - yellow and black is the best, words must have a capital and lower case in an accessible font style of Arial, Verdana, or Helvetica. The signs must be mounted 1.2 metres from the floor to be readable by the residents, because the 1.2 m the eye level for persons with dementia. While the signs for the bedrooms should personalise each bedroom entry to make them more relevant to individuals (Figure 39, 40, and 41).
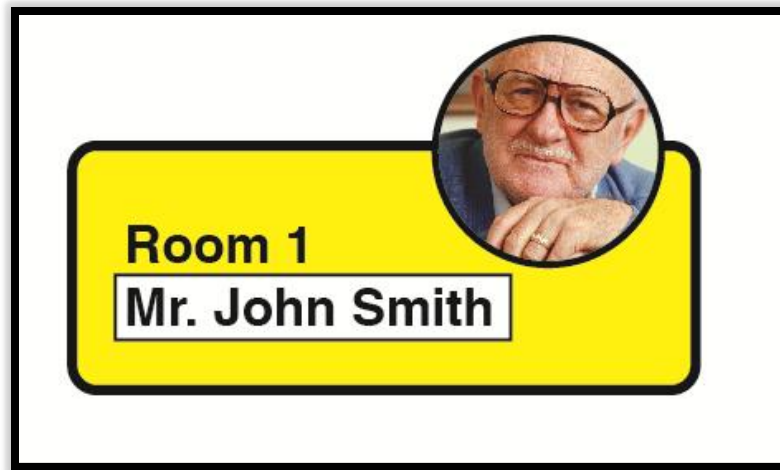
Figure (40): The suggested sign for bedrooms of GPU-TRI
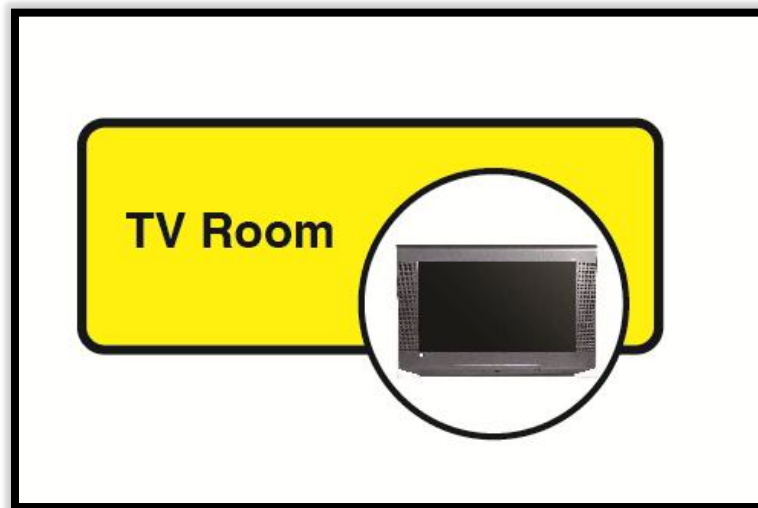
Figure (41): The suggested sign for the common of GPU-TRI

Figure (42): The suggested arrow sign for the GPU-TRI

Figure (40), and (41) illustrates the proposal for the dementia-friendly signage and arrows system which apply the inclusive design principles

4.3 DEMENTIA-FRIENDLY LAYOUT AND THE DISTRIBUTION OF SPACES:

The researcher addressed the need for reorganizing the function of the spaces at the GPU-TRI towards achieving a dementia-friendly built environment. The dining room as it is the most preferable space for the residents, and it holds all the activities of the unit. It is a problematic space, however, because of the crowding and high noise level of voices which annoy many residents, and can factor trigger agitated behaviour.

4.3.1 RETHINKING OF SPACES' FUNCTIONS:

The researcher suggests moving the TV from the current TV room to the Visitors room, which is mostly not used by visitors, to create an **activities room** for the unit.

This suggestion will address the need to reduce the crowding of the residents in the dining room, as well as allow for new and more activities. One of the benefits will be for the piano sessions that the staff hold each Wednesday, which will no longer require moving the piano form the TV room to the dining room, as happens now at the unit.

The admission of the new residents and the orientation session for the visitors could then be done at the meeting room of the staff in the backside of the unit.

4.3.2 RESPONDING TO THE RESIDENTS' NEEDS:

The second recommendation is to turn the third staff washroom located beside the dining room into residents' washroom; this will help urgent need (which it is the norm for persons with dementia) of residents to use a washroom. Currently, residents must rush to their bedroom washrooms, which may be at the opposite side of the unit. This suggested washroom will be a new shared washroom that can be used for the residents in addition to their personal washrooms attached to their bedrooms (Figure 40).
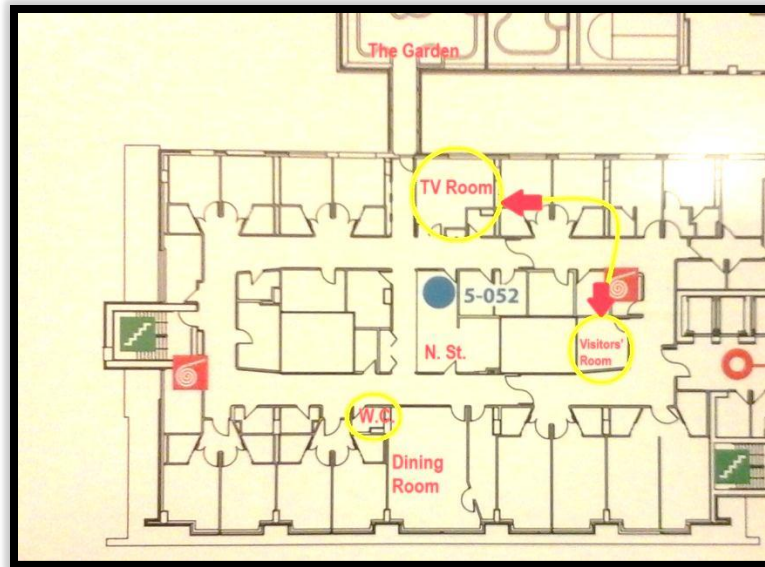
Figure (43): GPU-TRI Current Layout and the suggested new functions for the spaces.
This figure illustrates the current functions of spaces in the unit as well as locating the spaces that need to change its functions.

4.4 DEMENTIA-FRIENDLY DESIGN MODIFICATIONS WHICH SUPPORT THE WAYFINDING SYSTEMS:

The researcher addressed the need for accessible design modification in many elements

and features within the spaces of the GPU, as the following:

4.4.1 DEMENTIA-FRIENDLY BATHROOMS AND WASHROOMS:

Any dementia –friendly built environment in GPUs should reflect respect of people's privacy in bathrooms. Which creates a warm and home-like bathing environment. To achieve these recommendations, there is a design need to rethink bathroom fixtures and fittings.

Currently, GPU-TRI's bathrooms have an institutional feel due to the lack of homely fixtures. The researcher addressed the need to have shelves inside the unit's bathrooms and bathrooms furniture to store the bathing bottles and towels, instead of putting it on the toilet fixture or hanging it on the bath's bars.

Figure (44): Current Bathroom of GPU-TRI, This figure illustrates the need for shelves inside the bathrooms to store the required towels and bottles.

The following design recommendations may address this environmental quality of bathrooms, through low-cost decorative changes and basic building principles. These bathrooms will then be more practical and easy to use. Design can create a sense of calm, reduce risk, noise, glare and odour, and meet needs of the residents and staff. The GPU-TRI can achieve these objectives by using decorative features including soft and colourful towels, indoor plants and home-like pictures on walls.

Hand-held showers on long flexible hoses adjustable to any height are better for the residents and the staff. Hand-held showers let the resident stand or sit when showering. The fixing of the hose of the hand-held shower to the wall should be at a height so the handset will not hit the floor if dropped. A floor mounted fountain can provide water when using the showering chair; while the resident is sitting in his/her chair, this fixture might be operated by nurses via floor foot pads. Half-height shower curtains provide privacy for those seated and keep staff members drier. Finally, the grab rails in showers should be effectively colour-contrasted against walls for good visibility which helps the residents to identify it when they need to use it.

Figure (45): Adjustable shower arm
This figure illustrates the proposed dementia-friendly shower arm that has good flexibility which helps to adjust the arm according to the showering needs.

Home-like open shelves for the bathrooms of the GPU-TRI can further address the need

of the nurses to store the towels and the shampoos bottles and all the bathing needs.

These shelves may help in easing the showering of the residents, and at the same time

will give the look of residential bathrooms, especially if it is paired with bathrooms

pictures. The current toilet fixture should be removed from the bathroom as it is not in

use.

Figure (46): Suggested shelves for the bathrooms

Figure (47): Suggested pictures for bathrooms

The researcher suggests that the colours layout of washrooms should involve colour contrast toilet seats to help the residents to differentiate toilet bowls and floor. The washrooms should have include clearly defined walls vs. floors, doors in walls, door handles on doors and handrails on walls to minimise residents' confusion and maximise independence as shown in Figure 36.

4.4.2 MUSIC SYSTEM:

Many studies proved the positive impact of music on persons with dementia, and it showed a significant improvement in their cognition abilities for them (Winckel, 2004). Cellist Claire Garabedian, who is studying the effects of live and recorded music on people with dementia at the University of Stirling, has also seen for herself the transformation of people who may appear to be in a vegetative state. *"Even when someone can no longer talk," she says, "music becomes an avenue for communication and engagement. It seems to access parts of the brain that remain unaffected by the ravages of dementia."* The power of music, especially singing, to unlock memories is an increasingly key feature of dementia care and dementia-friendly built environments. It seems to reach parts of the damaged brain in ways other forms of communication cannot (Kontos, 2014).

The researcher suggests:

- For the common spaces providing music experiences such as dancing, listening, singing, clapping, shaking musical implements and swaying, playing recorded music or putting on TV shows. The nurses should have control to avoid too much volume and loud advertisements on commercial radio or TV.

- For the bedrooms having an imbedded music systems, as well as common spaces, whilst a better design solution can be supported by personalized music, related to

each resident's cultural background and/or each resident's preferred musical choice which can be identified by his/her caregivers.

4.4.2 DOORS:

The suggested exist doors should be camouflaged with the drawing of book cases, which will distract the attention of the residents to look for the exit, as well as, will give the sense of the homely environment (Figure 45, and 46). While for the other doors of staff's spaces that should be camouflaged by the same colour of the walls that falls in, so for the west side it will take the peach colour, while for the east side it will take the lime green colour (Figure 47).
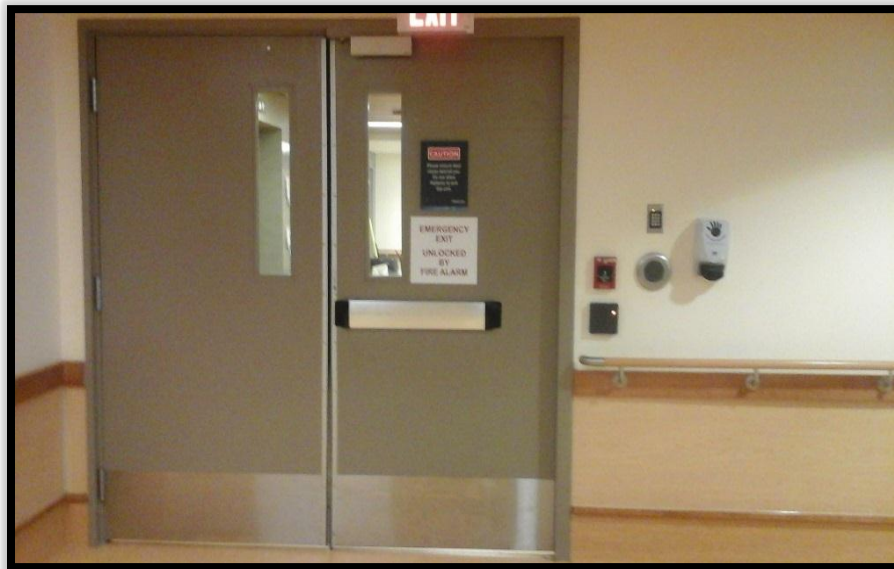
Figure (48): The current main exit door- GPU - TThis figure illustrates the current exit door which can be easily identified from the colour and shape.

Figure (49): The suggested main exit door- GPU - TRI
This figure illustrates the possibility to camouflage the exit door to be a dementia-friendly exit door by using a drawing of a book case.

Figure (50): The suggested camouflaged door- GPU – TRI
This figure illustrates the possibility to camouflage the doors of the staff's spaces to be a dementia-friendly doors.

4.4.4 HOMELY CURTAINS:

The researcher suggest to add curtains to the current windows in front of the current curtains system to give the sense of homely environment, these curtains should be short in length to prevent pulling it down by the residents.

Figure (51): The suggested curtains- GPU - TRI
This figure illustrates the possibility to add homely curtains to the current system to be a dementia-friendly homely built environment.

4.5   DEMENTIA-FRIENDLY ACTIVITIES:

Dementia-friendly activities can directly impact the quality of the built environment in positive ways (Marquardt and Schmieg, 2009). From the meta-ethnography study and the responses of the staff in the interviews, the researcher addressed the following:

The proposed daily activities should be meaningful and purposeful, not just a pastime. These activities should keep the safety standards for the dementia-friendly built environment. For example:

- Domestic: folding laundry, ironing, and, simple dish washing

- Outdoor: like, gardening, planting for the summer garden.

- Social: playing games, watching movies, listening to music, and shopping zone.

- Personal: haircuts, hand massages and manicures, life review, looking at photos, pet visits if possible.

- Artistic: for example, painting and drawing, crafts like knitting, crocheting, decorating placemats, making cards, flower arranging.

- Work life**:** for example, working at a desk, using a computer, other types of works related to past occupations (Davis, 2009).

These activities can be **individual or in groups**. Individual activities which do not need supervision from the staff or otherwise use up their individual time.
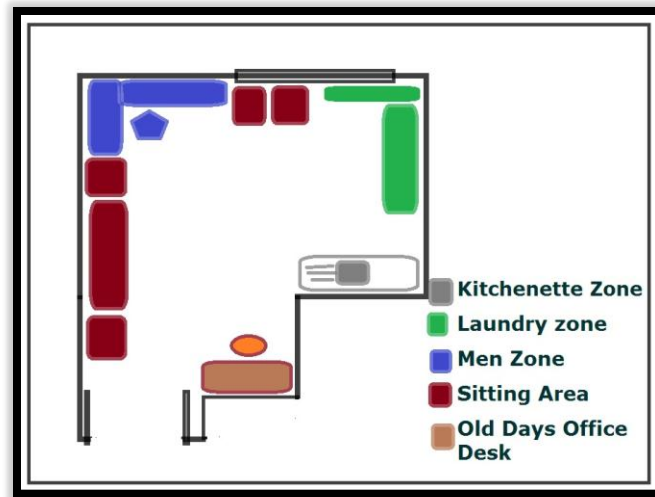
Figure (51): The suggested Activity Room- GPU – TRI
This figure illustrates the suggested activity zones for the proposed activity rom, GPU-TRI

4.6   SUMMARY:

The researcher suggests design responses to the GPU-TRI to overcome the design gaps of the current environment, as well as to achieve dementia-friendly built environment. The wayfinding systems have the major role to achieve the dementia- friendly built environment with additional benefit potentially provided through specific resources to support everyday activities and additional furniture. The proposed design responses achieved the research objective which was to:

Addressing the design recommendations to create accessible wayfinding systems to support persons with dementia in Geriatric Psychiatry Units (GPUs) at hospitals to achieve dementia-friendly built environment.

4.7   TABLE OF IMPLEMENTATION RANGE:

The following table illustrates the findings of the researcher to achieve a dementia-friendly built environment for any dementia unit in hospitals and nursing homes, as well as the design suggesting for the Geriatric Psychiatry Unit at the Toronto Rehabilitation Institute (GPU-TRI). The researcher chose to concentrate on low-cost options deliberately, to accommodate limitations in the GPU-TRI's resources. However, the beneficial impact of low-cost compared to high-cost options is not determined and would require further researcher. Future GPUs or other care environments may benefit from implementing these recommendations from the beginning of their design processes.

Themes	System	Details for any Built Environment	Low-cost mainly cosmetic interventions (Details for the GPU-TRI)	Middle Range Cost interventions including more than cosmetic changes	High Cost Extensive Interventions including high technology costs and/or staffing and architectural modification
Wayfinding	Landmarks and Cues	Plants and garden beds		Can be used under staff supervision	Interior plantings and treescape to extend garden inside the unit
		Personalised doorways	High contrast large letter signage with personalised image	Redesign and installation of doorways using 'streetscape' doors	Electronically controlled sound and image identification system access controlled by digital key

		Works or visual art: sculptures, paintings, photographs, wall clocks.	Simple photographs or paintings of baby animals; basic single flower forms	Indoor fountains, anchored sculptures	Holography, digitally projected animations,
		Furniture	Homely finishing to existing furniture, e.g. upholstering fabric	Homely accessories, including pillows, residential bed linens, decorative objects	Functional and personalized home spaces, e.g. culturally-specific personal living space
		Figure (o) and (8) layout	Adapt to existing architecture	Change functions of spaces to better reflect layout, e.g. bedrooms to activity rooms	Follow design layout from the beginning of construction
		Facilitating the garden for all season	Only for summer months	Insulated enclosure, e.g. small conservatory or greenhouse	Staff/programming to acclimate residents to engaging in garden activities during all seasons
	Colours System	Different colours for floors and wings	separate the GPU into two wings of different colour schemes	Modify furniture colours to match scheme	Lightning included; more specific and personalized colour schemes for specific spaces

		Vivid and bright colours	Painted walls and fixtures, minimally with contrasting colours	Clothing; upholstering and other unit fabrics	Objects and materials involved in daily activities
Lighting		Bright lighting for positive wayfinding	Brightening spaces to encourage use; dimming spaces to discourage use	Combine lighting with other systems, e.g. soundscapes	Lighting can be incorporated into other elements of wayfinding, including floor, signage, and handrail designs; automatic lighting sensors
Visibility		Common areas like: dining room, TV room	Address critical spaces, such as the dining area and nursing station; one-way windows	Create more openings in the TV room (suggested to become the activity room); glazed openings to increase visibility	All common spaces should visible via glazed openings
		Shared and individual bathrooms	Convert staff washroom on west side of unit, next to dining room, into a resident washroom for the benefit of all residents	Increase number of washrooms facilities available for residents	Spaces should be designed from the beginning with emphasis on the bathroom needs of residents

Layout design	Creating comfortable seating for the hallways ends	Create sitting/resting zones with existing furniture	Create homely sitting/resting zones with small tables, flower vases, soft furniture, etc.	Units should be designed with partitions, with visibility considered, in order to create more homely/comm unity spaces, e.g. den, library, café.
Signage	Pictorial Signs, enlarge text, highlighted background, and image of the function of the space, like bread for the dining room	Applicable	Signage for bedrooms made more personalized	Combine with sound and smell design; tactile wayfinding systems for vision impaired residents
Design Details	Camouflage of exit doors	Paint exit doors to camouflage doors within a street scene; e.g. brick wall, houses	Diversify camouflage designs to reflect various cultural backgrounds of residents	Furniture and other design details or structural elements can be blended

Dementia-friendly	**Built Environment**	Avoid the institutional interior design	Elements from this column	Elements from this column	Elements from this column
		Achieve the homely environment	Elements from this column	Elements from this column	Elements from this column
	Dementia Activities	Homely activities like: folding laundry	Modify an existing space into an activity room	Modify more spaces into activity rooms devoted to various different activities	Design environment from the beginning with spaces devoted to specific activities and interests, e.g. a music room, a laundry room, kitchen
		Create activity special zones	Applicable within a single activity room	Zones in different spaces within the unit	Within each dedicated activity room, create zones for specific activities within that type, e.g. an exhibition space within an art room

Table (6): Implementation Range

4.8   LIMITATIONS AND FUTURE STEPS:

The researcher's recommendations are bounded by certain limitations: persons with dementia as research participants are only reachable via indirect means (i.e. observations of residents' behaviours and interviews with GPU staff); logistical limits regarding modifications to the space itself; and time limitations making modifications currently suggested but not yet realized, leaving a need for longitudinal and qualitative study through which to introduce and measure changes for efficacy.

FINAL CONCLUSION:

FINAL CONCLUSION:

The built environment can play a significant role in treatment for and associated outcomes of GPUs and their residents. The design recommendations to achieve a dementia-friendly built environment demonstrates how relatively simple design modifications to the physical environment of existing facilities can have potentially significant benefits for this population.

The researcher concludes that providing an environment that supports a range of different activities for persons with dementia can help reduce negative outcomes such as anxiety and agitation by supporting behaviors such as social interaction. This research indicates a design gap in need of address: a built environment that does not support or promote a range of different activities on a group and individual basis for residents with dementia is likely to result in negative behaviors. There is a need for more collaboration, such as this one, with dementia units to explore design options and develop a more comprehensive understanding of the link between design elements and behaviour. This study provides the beginning of a consolidation of knowledge about dementia and the design choices that might be made to support environments such as the TRI unit. However, more work is needed to test the impact of these design choices. Ultimately, dementia-friendly built environments will enhance better health outcomes for the daily living activities for persons with dementia in GPUs in hospitals.

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APPENDIX A:

SEMI –STRUCTURED INTERVIEWS METHOD TABLES

The following tables are the breakdown of interviews data to theme and filling the tables with quotes that is related to each theme.

Layout	1-What are the preferable spaces for the residents?
Intreviwee 1	Some of them feel at ease in their bedrooms, I guess because it's more relax than hearing other patients and the other place is the dining room, a lot of them likes to sit there and watching from the window and they are making their activities there.
Intreviwee 2	The TV lounge because lighting is dimmer and it's generally quitter than the other areas, in their rooms and the dining room people generally enjoy being there when there is activity is going there, but they can be upset because of the noise from other patients so if there somebody yelling or upset that can comes to be more stressed.
Intreviwee 3	I think it depends on the patient's some are comforted to have people around so the dining room they will feel comfortable there, some they don't like to be a rounded by people so they stay in their own room or in a quite space in the hallways
Intreviwee 4	The dining room most often because I have the most patients in the morning or I tried to find something, sometimes we works as a group and sometimes each individual set up with something that they might find interesting or something that could manipulate or book to read many ...many things the TV room is there sometimes patients wants to be with less people sometimes we have music on CD and we have music for
Intreviwee 5	I've found most our patients comfortable laying on each others beds. Hmm.... we have a TV room where they can actually lounge on the sofas and others sitting in the dining room without any distractions just sitting
Intreviwee 6	They feel more relaxed in the general area where they usually are the good dining room and our patient's family lounge because it's a bigger space for them they can walk around
Intreviwee 7	I think in the common area in the TV room and the dining room especially if there warm and sometimes they want to be in their room just alone
Intreviwee 8	I see the resident really relaxed and wanting to be close to the staff, I see them being relaxed in the dining room with the group, when is the right environment. For example I see the most relaxed when there is music running or when they are engaged in programs that have some meaning to them. so it might be "you know" might be a baking group it might be craft activity I think the number one thing I see is having the biggest impact and wanting to be around people or where are the staff

Advantages of the layout – GPU, TRI

Layout	2- What are the preferable spaces of the residnets?
Intreviwee 9	I am not necessarily the best person to answer these kind of questions would be at that that some residents from others and quiet of their room in and out of other rooms just to get away from people vision comfortable around so that would sit in chairs outside the nursing station or in the lounge area
Intreviwee 10	I think most of them feel relaxed in the dining room but when there is a lot of patients and a lot of noise Some patients get agitated, I saw in the other day after Christmas party we have almost all of the residents all together and it was music and a lot of them a very calm and happy so that was nice it was in the dining room but it was a special event. Yeah, I do see people relaxed there in
Intreviwee 11	Probably still the most relaxed in the TV room that is like the temperature in the room is always a little bit warmer in there there is a bigger comfortable chairs and there is a couch whereas like the other common area would be like the dining room the dining room has more regular chairs and it feels like it has a big table in the middle of the room it feels more like a dining room or as I think this TV room feels more like a living room is something with patience to be accustomed to.
Intreviwee 12	I would say the residents feel most relaxed and at ease in their personal bedrooms and if they often not there then close the store other staff and patients are so in the dining room or in chairs near the care station where staff more cognate
Intreviwee 13	I think in the patio because it's open space the lighting they feel relaxed in the garden they feel relaxed in the activity room especially when there are activities that are engaging them I think they feel relaxed in their own rooms when they need a break from the noise and the motion
Intreviwee 14	Not specified
Intreviwee 15	Not specified
Intreviwee 16	I think it is difference in many times but it is very individual but what I've noticed just from my observations is the majority of people usually feel relax more in groups settings so the area sets like the dining room or the TV room when there is a some type of activity or facility activity happening then usually in this group areas and also right outside of the nursing station where is the group of chairs there as well so when there is some type of social or interaction with others or nurses usually I find it with the staff and not necessary with the patients

Advantages of the layout – GPU, TRI

Layout	3- What are the Problematic Spaces, and why?
Intreviwee 1	Dining room because the dining room there are a lot of them and a lot of make noises and they start screaming and yelling so it's confusing the other patients or the bedrooms because a lot of them don't like the other patients entering their room's so that a lot of complex there.
Intreviwee 2	I think as I said the corner rooms we find sometimes there more altercations in there, hmm... the dining room simply because there is more people in the space.
Intreviwee 3	I think near the exit door it can, hmm... I think in the dining room it can if there is too many people or there is someone agitated when the others is going on or activity when people will be close to each other they could be some hurts or push they can be, hallways when there is a bunch of people all together and anything a destruction attracts people sometimes, hmm... corner rooms a problematic when they are going there and it's interesting how they created some of the privet rooms on the out street side is a problem because there is a door way in and a little pass to view and then doors into privet rooms so somebody think that's territorial and think they own the whole space and they don't like anybody to come into any of the space, I think that's a problem, hmmm... sometimes opened doors are invitation to going there but then it's typically closed doors, hmm... corner spaces people might, dark spaces people might be because they don't know another way to go that's a problem.
Intreviwee 4	Well the area of conflict problem is the nursing station patients always want to get in the nursing station and sometimes they get in because the door it's not quite close and it's hard to get them out Some people bang on the glass of the nursing station or they donot understand sometimes in the dining room if it's crowded and people donot have enough space in between them they grab each other sometimes they steal each other food, Hmm.... sometimes people congregate in the bedroom like at the end of the hallway they tend to congregate usually it's not a problem but sometimes it can be because people get into other peoples space and they don't like it, many patients are very territorial.
Intreviwee 5	Everything is the difference to them, that is my bed not corner that is my bed and that is the same Everything just imagine to them there is no difference.
Intreviwee 6	Hmm... most of the times it's their rooms because they are not able to identify which is their room and when they been accessed to the room it's difficult to take them out and then specially if the patient that also really owns that room it's become conflict because the one who is really owns the room doesn't want to leave and the other patient who's think it's his room also doesn't want to leave.
Intreviwee 7	Hmm... for Some reasons it is the corners at the ends always we are having incidence on the corner or beside the corner rooms, also cool way in the corner still have complex there because patients still bumping each other for Some reasons.
Intreviwee 8	well probably a number of them the corner rooms are probably one of the areas because into those of the most common room so that people tend to wander into and some patients donot like other people in their rooms or maybe they are in the wrong room and because of the most common ones when I think about the incident that happened over the time that I have been here more happening on the corner rooms and in the other rooms what happens in the wardroom you and in the other corners by Murray Street by the West End are these 3 points tend to be the most common rooms , problem no I don't I can't think of a. I think it just might be happenstance about what's happening where there could be problems that people tend to congregate around the dining room in the hallway as there could be opportunity for college just because that is where a lot of people

Advantages of the layout – GPU, TRI

152

Layout	4- What are the Problematic Spaces, and why?
Intreviwee 9	Not specified
Intreviwee 10	I think in the hallway before, around doors I've been seen one resident trying to shut out another resident around that was a dining room door I saw that enough I see in the dining room people at ease in the dining room but I have seen it out over a meal one person is yelling loudly and then another make it very annoyed at that person who's yelling and I have seen patients stealing other people food, in the dining room can be some conflict there.
Intreviwee 11	Not specified
Intreviwee 12	Hmm... right now I would say the rooms at the corners in the unit because a lot of people are wandering around the circle formation they tend to see an open door there and "you know" I guess they're trying to going into those rooms so sometimes might be conflict if there's someone with a more territorial behavior in one of the corner room, hmm... the other one is one of the rear exit of the unit that leads to the space which where we are in right now because patients tend to be congregated in this corner pocket and when staff early thing they want to follow staff out today because I can become agitated.
Intreviwee 13	I think that some of the distant corner rooms, so the corner rooms in the west side of the unit can be problematic space because that even its circular patients tend to get stacked there and go to someone else room I think that's a problematic area and I think sometimes the area around the entrance where is a traffic happening sometimes people want to leave there is a lot of traffic between the entrance and the nursing station I think that's a problematic area as well.
Intreviwee 14	Not specified
Intreviwee 15	Not specified
Intreviwee 16	I already mention that one. The alcove area, that some random space where there is doors into alcove area which leads into two separate rooms that often some patients are getting stuck in that area. And if there is more than one patient in that area it is a potential issue. The other pieces people in different other people's rooms and there is again nothing different to differentiate that's my room and they end up in the same room that is there room or no there room.

Advantages of the layout – GPU, TRI

153

Layout	5- What are the Preferable spaces for the residents' visitors?
Intreviwee 1	Not specified
Intreviwee 2	usually they would prefer to be in more privet sitting so they would take them to the patient's room or we have a little meeting room in front that has quiet and it's more secured so they would go there but sometimes they sitting area as well and participating whatever activity it might be happen at the time.
Intreviwee 3	A lot of families visit in the common areas particularly where there is activity going on because there is A way they can their family member could be engaged, hmm... they are often visiting in the bedrooms if they can it's quitter, or searching for A quiet place in one of the bigger rooms like dining room sitting in A corner in the lounge area
Intreviwee 4	I think they like the bedrooms is fine, hmmm... they can just focus better their visitors because there is not a lot to distraction.
Intreviwee 5	We don't really have a space especially there is winter, in the summer time we would have we have a garden where they can actually go into the garden and just relaxed a lot more soothing nature there is plants there is flowers there is fresh air, on the unit there is no really any place specific that "you know" families is really to do something, maybe the patients room sometimes I don't think it's very warm because patients are always in and out of the room they are going throw center on another patient's beds, so it's difficult to have the space on the unit where I can honestly say "you know" what family feel secure to be I that location.
Intreviwee 6	Sometimes we are telling families to go to the patient's room specially if they have their own private rooms because it's quiet, hmm... because our dining room with our patients talking laud you can get laud sometimes depending on how many patients are there and there is instant sense that we have a very noisy and restless, hmm... sometimes to give them the front room specially if they have a calibration or they have kids so it's for safety, hmm... if we have activity going on in the dining room or in the patient's lounge then they go visit with them there.
Intreviwee 7	Hmm... sometimes they go to patient's room sometimes they go in the TV room if it's not crowded several family members they might prefer to use the small room to have little privacy.
Intreviwee 8	I think about you I think when there is more lighting I think that's for the most part they like to be in the dining room and it like to be in the hallways typically closest to the nursing station I think there is the places to spend most time

Advantages of the layout – GPU, TRI

154

Layout	6- What are the Preferable spaces for the residents' visitors?
Intreviwee 9	Not specified
Intreviwee 10	Not specified
Intreviwee 11	I think it depending on the patient sometimes is wherever they happen to be so that might be in the hallway I think family tend to bring patients into the dining room or stay in the dining room with the patient if he is already there the dining room is can be pretty quiet I'm thinking more like in the weekends or evenings or they'll visit sometimes in the patient's room I think it's kind of depends on what people are used to doing if the person was in a nursing home before they can be visited in the persons room in the nursing home till probably do that here it also seems like when there is multiple family members then they're likely to stay in the patient's room and visit their whereas if there's just like one or two people visiting they'll kind of just go in a central area or wherever the patient's area is.
Intreviwee 12	I think when they're visiting their loved ones they prefer they seem to really prefer being in their rooms the preference on the part is the residents here or the where the family members are both but just away from distractions and other noises from other residents.
Intreviwee 13	They often visit in the room that's good place for especially if they have a privet room maybe more problematic when they don't have a privet room sometimes the visitors are staying in the dining room and sometimes in the activity but most of them in the dining room and sometimes in the hallways if there is no issue to sit in a privet.
Intreviwee 14	Not specified
Intreviwee 15	Not specified
Intreviwee 16	It is really depend on the visitors so it is fluctuate but I think the staff here is doing a really good job of educating the families or the visitors as what is happening at the unit and what has worked well with that particular patient, I think a lot them sometimes get them to come in and walk with them if that what's the patient's wants to do are sitting in their room or being with them in the social activity engaging that as well so not is of being in the routine too much.

Advantages of the layout – GPU, TRI

Layout	7- What are the Spaces affect behaviours, in positive or negative why?
Intreviwee 1	I think is the TV room is too small, it will be a little bit crowded so they will get a little bit annoyed of each other (negatively) the dining room because it's opened space and they just come in and out so they know where they are going or relaxing in their rooms (positively)
Intreviwee 2	I think when there is less people there people they don't like to get in "right" it's clustering back, like in the TV room we have our music group there because of the piano is there and once it gets crowded with wheelchairs people start to get up to leave or I don't know if that the only reason but it's part of it probably
Intreviwee 3	Well if the room was crowded with noisy people that's going to make some patients agitation, hmm... if music is too laud, if there is too many things going once that's make them unease, hmm... on the other hand might like quite music and be relaxed if the music, might quite like the idea of people going to be closed by and doing activities for them be involved with, so it depends
Intreviwee 4	Absolutely, if they have music playing in the dining room sometimes in the morning when people are "you know" just eating not awake yet if the music is not soft enough to get contributes to the agitation and in generals in the rooms
Intreviwee 5	There is a difference in the dining room depending on the environment if it noisy some patients despise noise, laud or yelling or any repetitive sound like they dislike that so in the dining room we found challenges in the dining room especially since it noisy or one person talking repetitively I think the most challenging part dining room sometimes the music group sometimes the play piano just be the tone of piano if it is really laud like I see is really riled up the patients we have to come some of them that are responsive to noise you have to get them out of the room because it's going to escalate everybody else.
Intreviwee 6	It depends on the environment is also like is there a cool patients around we tried to make them like the last quarter for safety for our patients even the patients going through the hallways if "you know" this like we tried to we don't have the necessary items for example if there is something to stepping down by mistake like an example if their wondering if they could increase their agitation so we have to make the environment for them clear and safe for them all the time.
Intreviwee 7	When they have a personal space a calmer, when it's crowded the patients get angry so easily personal space is beneficial for them
Intreviwee 8	Mostly they seems attracted to the dining room maybe the lighting I think it is the size I think they can see it you can't really see the other group room is very dark and you don't get a good visual from the hallway you can't see the entire room not really inviting it looks like nobody's there dark and looks like nobody's home.
Advantages of the layout – GPU, TRI	

156

Layout	8- What are the Spaces affect behaviours, in positive or negative why?
Intreviwee 9	Not specified
Intreviwee 10	Not specified
Intreviwee 11	I think the most that would be confusing is that all the rooms look the same and it makes it much difficult for people to distinguish between one room and other so yeah all the rooms look similar and then also the fact sometimes those some of the single rooms have that little doorway entrance that has a separate door there and I think of that can be a bit too confusing for people that are territorial is like the feel is a whole space is there I think sometimes the environment is too cluttered like I have always said that I think you have too much furniture I think there's too much furniture in the TV room especially as much as a very comfortable we will often have a lot of people that are in wheelchairs and there is no enough room for everybody to be in there comfortably and it makes it more of an obstacle her people to fall, in the dining room I just said like we have too many chairs in general like there's a lot of patience tend to sit more like these chairs but then we have tons of those really high back chairs but no one really it's on the dining room just really in the dining room the high back chairs in the TV room there aren't any others high
Intreviwee 12	I think the confusion a lot of rooms all look very similar so for those residents who are looking for their particular room "you know" who have some abilities to know that they want to go to their own room they have difficulty finding it can easily get lost on the wrong side of the hallway I think they're in the right place looking for the room and they get disappointed in that way
Intreviwee 13	I think what's going on in the room the number of co-o patients in the room or has a greater impact on their behavior than the natural room itself.
Intreviwee 14	Not specified
Intreviwee 15	Not specified
Intreviwee 16	Yeah, which works for some people and some people are drawn to that but it can also works against some patients "right" because some patients would be drawn who have others and others who are become tutorial on these spaces so I think it is a really individual but I think having those areas that the purpose is more defined by just the way it looks so like the TV room or if there is a way to better define the dining room for the purpose of that room I think it would be good not to confuse patients.

Advantages of the layout – GPU, TRI

157

Layout	9- Is the visitors' room is used by the visitors?	
Intreviwee 1	No	
Intreviwee 2	No	
Intreviwee 3	No	
Intreviwee 4	No	
Intreviwee 5	No	
Intreviwee 6	No	
Intreviwee 7	No	
Intreviwee 8	No	
Intreviwee 9	No	
Intreviwee 10	No	
Intreviwee 11	Not specified	
Intreviwee 12	No	
Intreviwee 13	No	
Intreviwee 14	Not specified	
Intreviwee 15	Not specified	
Intreviwee 16	No	

Advantages of the layout – GPU, TRI

Wayfinding	10- How the residents can find their way at the GPU?
Intreviwee 1	Hmm… some of them can, some of them they are a bit confused that where they are, so we have to direct them to where the common rooms.
Intreviwee 2	I think that the patients most can find the way to dining room because it's in the middle "right" so if you come out no matter which way you turn out you will find it eventually, they don't find the way how to go back to their room that's defiantly not very common, but I wouldn't say it's a problematic because they don't need to go back to their rooms for anything unless they have to go to the washroom or to go lie down.
Intreviwee 3	Hmm… I think they can but some of them they just might luck the people, I mean eventually if you walked around the rectangle you are going to find the rooms so, yes they can find it
Intreviwee 4	Some patients in a higher functioning have no trouble to find the dining room or TV room other patients just from room to room and they wonder, so in depends in what levels of patients are the ones that are somewhat called it if they usually can find the dining-room they just wondering and they find it, Some who has been here for a while to get used to the layout and they have no trouble to find it
Intreviwee 5	Not specified
Intreviwee 6	Hmmm… I can't really say because it's really depends how advanced dementia most of them really need assistance like "you know" taking them to their room some patients just need to tell them turn left turn right 2nd door and if the cognition is very good they be able to find it and they'll be able to read their name outside the door.
Intreviwee 7	Most of them no, they can't only very highly cognitive patients they able to do some of them they do remember their rooms and they would find the way but most of them they wouldn't.
Intreviwee 8	I think it's very confusing in this unit I think it's very hard to way find in this unit I think that all the rooms look some of the same from outside there is no marking that tells you where are you or where is your room

Wayfinding systems

159

Wayfinding	11- How the residents can find their way at the GPU?
Intreviwee 9	Hmm... so the way finding a kind of issues so it's about finding their way to the room but I think more importantly finding the way to toilet I think it's very important for a behavioral unit for people with dementia, that a lot of behaviors are have to do with peoples discomfort around toileting or like a sense that they can't get the toilet in time or they can't find the toilet and they have to go when they become agitated
Intreviwee 10	Not specified
Intreviwee 11	Not specified
Intreviwee 12	Not specified
Intreviwee 13	Not specified
Intreviwee 14	Not specified
Intreviwee 15	Not specified
Intreviwee 16	Not specified

Wayfinding systems

Wayfinding		12- What would help the residents to find their way?
Wayfinding systems	Intreviwee 1	Some of them can still read, so some of them they read the signs because we have some signs up, I think that would help
	Intreviwee 2	I think the biggest cue is the visual contacts so when they walk by the dining room and seeing the people sitting there than they would know they want to come in to see what's going on, so it's necessarily because it's says dining room, the glazed wall defiantly helps if that wall was soled people they wouldn't become in their room
	Intreviwee 3	It depends on the persons whether they still can read or not, how they are vision is, I think you have to put more than one kind of signs, hmm… quick activity, hmm… people, hmm… "you know" I think that often if somebody doesn't know that's time to eat, doesn't know they are hungry, so they need to be directed to the room
	Intreviwee 4	I would like to say pictures like a TV picture to be outside the TV room a big picture with a TV they might understand it better and same is in the dining-room like put a place sitting and put dining room or the words is not as important as what the picture is you could have pictures of beds in front of bedrooms for some people but it might not be appropriate they all wondered each other's, but anyway
	Intreviwee 5	Not specified
	Intreviwee 6	I can't really say because it's really depends how advanced dementia most of them really need assistance like "you know" taking them to their room some patients just need to tell them turn left turn right 2nd door and if the cognition is very good they be able to find it and they'll be able to read their name outside the door
	Intreviwee 7	Some kind of signs, pictures on the wall maybe with directions with arrows
	Intreviwee 8	I don't think we know this definitively my guess would be that the majority because people go in and out and there's also glass in the door so you can see out and see that there's people out there so when they see people out there they'll stand at the door you know staring at you and maybe hoping that they're going to get out there with you, I'm not sure if they can reading the exits, some still have the ability to read but many do not

161

Wayfinding	13- What would help the residents to find their way?
Intreviwee 9	Not specified
Intreviwee 10	Not specified
Intreviwee 11	I do think like colors, pictuers or signs are not necessarily because we have a lot of people that depending on their vision or their education level we have a lot of people that never learn to read and there's just so many signs that we have to have like as part of hospital guidelines that I think it just kind of like all blends in together and I don't think no directions signs it's going to stand up that much
Intreviwee 12	I think most common spaces if they would be heading towards is the dining room and I think the fact that the wall is mainly glass so there is eyes drown on that so little bit different and there are chairs outside of that area so I think they kind of naturally adopted so they could see maybe the purpose of the room a little bit more
Intreviwee 13	Not specified
Intreviwee 14	Not specified
Intreviwee 15	I see different colors in different units and also it would be identified by a name
Intreviwee 16	Not the typical signage of course

Wayfinding systems

162

Wayfinding	14- How do you evaluate the current signage system?
Intreviwee 1	Nothing helpful
Intreviwee 2	Nothing helpful
Intreviwee 3	Nothing helpful
Intreviwee 4	Nothing helpful
Intreviwee 5	Nothing helpful
Intreviwee 6	Nothing helpful
Intreviwee 7	Nothing helpful
Intreviwee 8	Nothing helpful
Intreviwee 9	Nothing helpful
Intreviwee 10	Nothing helpful
Intreviwee 11	Not specified
Intreviwee 12	Nothing helpful
Intreviwee 13	Nothing helpful
Intreviwee 14	Not specified
Intreviwee 15	Not specified
Intreviwee 16	Nothing helpful

Wayfinding systems

Wayfinding	15- What are the Cues for wayfinding?							
Intreviwee 1	Not specified							
Intreviwee 2	Not specified							
Intreviwee 3	Not specified							
Intreviwee 4	Not specified							
Intreviwee 5	Not specified							
Intreviwee 6	Not specified							
Intreviwee 7	Not specified							
Intreviwee 8	Not specified							
Intreviwee 9	Not specified							
Intreviwee 10	Not specified							
Intreviwee 11	Not specified							
Intreviwee 12	Not specified							
Intreviwee 13	Not specified							
Intreviwee 14	Not specified							
Intreviwee 15	Not specified							
Intreviwee 16	Not specified							

Wayfinding systems

What are the:	16- Preferable & Identifiable colors?
Intreviwee 1	I think some with more colors and some with ordinary colors…. just I don't know… I'm not sure.
Intreviwee 2	Red, blue, green and black
Intreviwee 3	Bright colors
Intreviwee 4	Red, yellow and blue, bright green bright blue purple just vibrant colors
Intreviwee 5	Primary colors and bright colors
Intreviwee 6	Not specified
Intreviwee 7	Bright colors
Intreviwee 8	Calming colors
Intreviwee 9	I'm not sure but I can say generally a soothing colors
Intreviwee 10	Hmm…. the colors that depend on the person, black and white
Intreviwee 11	Primary colors.
Intreviwee 12	I'm not sure, I mean some can identify I'm sure but I know that is very confusing for the residents
Intreviwee 13	I think colors might probably attract them but I don't know
Intreviwee 14	It depends on the patients I think
Intreviwee 15	Bright colors, soothing colors
Intreviwee 16	I think probably depending on the patients

Design details

165

Design details	What are the:	17- Preferable & Identifiable objects?
	Intreviwee 1	Some of them annoyed by the wheelchairs because it's in their way, but some of them are fine, I don't see them having any problems
	Intreviwee 2	Tactile objects
	Intreviwee 3	Stuffed animals and dolls
	Intreviwee 4	they like balls, colored balls, colored blocks, easy puzzles and greeting cards.
	Intreviwee 5	Not specified
	Intreviwee 6	It's different
	Intreviwee 7	We can't use many objects that they might use it as a weapon.
	Intreviwee 8	visual pictures
	Intreviwee 9	Objects I think like anything that is familiar
	Intreviwee 10	Common objects, some of the residents who will really recognize an object in a photo
	Intreviwee 11	People like different objects to touch just kind of depends on what they are interesting
	Intreviwee 12	I think just generally "you know" decoration that make feel like home, like more common for the patience is definitely needed
	Intreviwee 13	Not specified
	Intreviwee 14	It depends on the patients I think
	Intreviwee 15	Plants
	Intreviwee 16	I think probably depending on the patients

What are the:	18- Preferable & Identifiable furniture?
Intreviwee 1	I think is all are the same for them, I've never heard them complaining about the chairs or anything
Intreviwee 2	Well they definitely fall sleep on the armchairs because it's more comfortable and they like to lie down on that couch where they can separate out
Intreviwee 3	Large furniture
Intreviwee 4	Chairs
Intreviwee 5	Chairs and sofas
Intreviwee 6	Chairs
Intreviwee 7	Chairs
Intreviwee 8	Not specified
Intreviwee 9	Familiar and homey
Intreviwee 10	Not specified
Intreviwee 11	The big comfy armchairs
Intreviwee 12	We need furniture more familiar or anything a lot of our patients they believe they're in their home definitely help with that
Intreviwee 13	Familiar and homey
Intreviwee 14	It depends on the patients I think
Intreviwee 15	Furniture that has nice patterns
Intreviwee 16	I think probably depending on the patients

Design details

What are the:		19- Preferable & Identifiable lighting design?
Design details	Intreviwee 1	I believe they like it brighter, they feel more comfortable than the darker, so the brighter affect them positively
	Intreviwee 2	I guess it depends in which mood there in certainly the dimmer lighting seems to be having more common affect
	Intreviwee 3	It depends
	Intreviwee 4	I think residents they need both they need a bright room when they're being active in participating and things in, when they agitated I think they need subdued lights not dark but just soft lights
	Intreviwee 5	I found the lighting brighter is more welcoming
	Intreviwee 6	it depends on the mood sometimes they wanted to be like all to be light up and then some of them likes it more not dark but like more calmer
	Intreviwee 7	I think dimmer lights most of them they don't like bright lights
	Intreviwee 8	Bright Lights
	Intreviwee 9	Not specified
	Intreviwee 10	Not specified
	Intreviwee 11	Bright Lights
	Intreviwee 12	I think they're like warmer lights
	Intreviwee 13	Not specified
	Intreviwee 14	It depends on the patients I think
	Intreviwee 15	Bright Lights
	Intreviwee 16	I think probably depending on the patients

	GPU	20- Is the GPU a dementia-friendly built environment?
Dementia –friendly	Intreviwee 1	Not specified
	Intreviwee 2	Not specified
	Intreviwee 3	Better than the long term care houses
	Intreviwee 4	Yes I do believe it is, it's good because of the layout of the floor because it's round I think there's a space Station can go that are nice to be
	Intreviwee 5	I think there's no path so they can just wander for hours and hours in hours I think that is a good
	Intreviwee 6	I would think so the hallways wider comparing to the most hospitals and it's good continuously out when there is no end hallway because patients just walk round and round, yeah so I would say it's a dementia friendly unit
	Intreviwee 7	it's good it's like home. Not very homey because les items but we have enough pictures
	Intreviwee 8	No, I don't think it is dementia-friendly, there is aspects they are and another many aspects they are not friendly, the last time we've talked about this the fact that it's a big O or a big figure 8 I think it's very dementia friendly but I think that finding rooms I think everything is looking the same nothing is personalized so I think it's very not dementia friendly
	Intreviwee 9	I think 50%
	Intreviwee 10	Not specified
	Intreviwee 11	I think it's fairly friendly but I think there's always room for improvement I think the fact that it is like a pretty large space is quite dementia friendly it's not very crowded with people there's a lot of places for people to walk around and explore
	Intreviwee 12	I think it's friendly in the sense that it's generally safe and patients are allowed to walk around and explore
	Intreviwee 13	I wouldn't give it that designation yet
	Intreviwee 14	In some ways it's an improvement from the other units just the design the big difference was this dead-end straight corridor was not very friendly for the patients where is here they can meander and walk around different paths I think it's very beneficial
	Intreviwee 15	I think if I compare it with all units it's a more dementia friendly more than most places I went
	Intreviwee 16	Not specified

169

GPU	21- What is the missing activity at the unit? And the suitable space for that activity?
Intreviwee 1	There should be enough maybe something to do
Intreviwee 2	I think that there are ways that we can help people feel more comfortable the type of activities that are meaningful for them to participated helps people feel more comfortable
Intreviwee 3	Not specified
Intreviwee 4	Not specified
Intreviwee 5	Playing activites, I would like to see the room that's very bright and that like have pads flooring
Intreviwee 6	We need actually like a room where there's no furniture just clear specially at night when patients need to settle
Intreviwee 7	Yeah, we might use another room because we have only two common rooms use one of them is for dining other on the TV room sometimes we use them both for dining or activity
Intreviwee 8	It could be I think we can play with that but we have to put the consideration that it's far away and out of sight so it's hard to monitor from a safety perspective but you know where is the lounge
Intreviwee 9	I think that the staff do the activity with most meaningful for the residents or the ones that they used to do in the past
Intreviwee 10	I like the idea of something functional like the laundry unit, we need like a kind of open homely space would be best like in their home or in somebody's home folding and putting things away and sorting that they can do something open
Intreviwee 11	So this is my job is doing activities for the patients like we have we do have a new a couple new groups that will do every year but kind of change things up I think terms like a room that is specifically designed for something like I thinking of something like the Snoozeling
Intreviwee 12	Not specified
Intreviwee 13	Not specified
Intreviwee 14	I find the patient's many of the patients like to keep their hands busy so an area where they can sort of explorer things with their hands would be sort of beneficial
Intreviwee 15	Not specified
Intreviwee 16	Hmm.... "you know" is this snoozeling cart and they bring In that out to the dining area having a specific room for that and type of the interventions I think it will be beneficial, physical activities can having an impact on the people's cognition and behavior

Dementia –Friendly

GPU	22- What is the major Character of the GPU built environment should be?
Intreviwee 1	Homely environment
Intreviwee 2	Homely environment
Intreviwee 3	Homely environment
Intreviwee 4	Homely environment
Intreviwee 5	Homely environment
Intreviwee 6	Homely environment
Intreviwee 7	Homely environment
Intreviwee 8	Homely environment
Intreviwee 9	Homely environment
Intreviwee 10	Homely environment
Intreviwee 11	Homely environment
Intreviwee 12	Homely environment
Intreviwee 13	Homely environment
Intreviwee 14	Homely environment
Intreviwee 15	Homely environment
Intreviwee 16	Homely environment

Dementia –friendly

GPU	23- What is missing in the GPU for design details and furniture?
Intreviwee 1	No, I think the furniture are ok, it's easy to clean much we have durable I mean durable and clean but the furniture seems fine
Intreviwee 2	We are missing shelving and storage space in the shower room so there are no place to the so there were no places for nurses to put their stuff like towels, shampoos
Intreviwee 3	I say that maybe one washroom that could be used by the general group it would be easy to point them there.
Intreviwee 4	We need chairs in another parts of the hallways
Intreviwee 5	I think with our environment I think we focus on being minimalist with patients behavior
Intreviwee 6	A common washroom beside the dining room
Intreviwee 7	We can't use the images or plants they might use it as a weapon, of times the furniture is in also enough chairs we have a lot of chairs
Intreviwee 8	Yeah, having a work station stations somewhere within the unit that it could be accessible for patients
Intreviwee 9	Yes, to make more meaningful spaces for the patients that are more recognizable for them as a home manner comfortable that is like they have something to keep themselves occupied
Intreviwee 10	Not specified
Intreviwee 11	Curtains
Intreviwee 12	Yeah, I think just generally "you know" decoration that make feel like home, like more common for the patience is definitely needed
Intreviwee 13	It would be nice if we had something retro I think like old telephones old televisions old radios that could be nice it would be nice if we could have more casual seating areas where patients maybe family members could meet, it would be nice to have like an office, like play office paper clips for split second hand items that maybe not safe anyhow, files that may be patient think they have work at the midnight, maybe stations that would stimulate people in proper way
Intreviwee 14	Not specified
Intreviwee 15	Pleasant music or if it's very calming or very soothing or the music they did like I'm sure that they would go to the space where the music is playing
Intreviwee 16	The exercise machine that's kind of small storage room having some way for the patients for them to safely exercise for those who can I think it would be beneficial

Dementia –friendly

172

24- Important Ideas

Important Ideas		
	Intreviwee 1	Just make the environment more comfortable for the patients, just they don't have anywhere to go so they just walking around, just a little bit more space to spend time in.
	Intreviwee 2	I think the exit doors even those they are much better than before someway can camouflaging this door by posters they can hang that they are like a book shelves it would be useful
	Intreviwee 3	Can be like in peoples rooms decorations wild things are huge distraction which is can be detention so any aditional design shoul be safe and functional
	Intreviwee 4	I think it would be nice to have a mirror somewhere in the unit
	Intreviwee 5	About the glasses in the nursing station if we can just a glass shade it so we will see them but it's hard to them to see us
	Intreviwee 6	For the common washroom regarding the toilet about the door you mentioned probably we need a wider door like a bigger toilet because we have patients in a wheelchairs
	Intreviwee 7	Showers have no where to put towels for clothes we have a hanger in the corner that clothes they might have wet if you hanged towels nowhere to put
	Intreviwee 8	I'm not sure.
	Intreviwee 9	Really important any changes in the environment can be made that make it easier for people with dementia to be able to reach the toilet
	Intreviwee 10	Yeah, it would be better to get their photos when they are younger, see I don't think about photos when they old it would be helpful
	Intreviwee 11	I don't think so
	Intreviwee 12	The ceiling is a major problem artifices in this building because it's a drop ceiling
	Intreviwee 13	I think that could be very beneficial to the patients but maybe more some other aspects art like dance, hmm... like music, like singing I think maybe film
	Intreviwee 14	A mural painted over the exit door and it's really camouflage very well and it's really reduced the exit seeking and the attraction to that area
	Intreviwee 15	To be taken consideration is space that people can move around freely especially outdoor space I think outdoor space really needs to be incorporated a quite often to the design because quite often I think I seen because we like to be outside would like to get the fresh air we would like a little bit changing of environment
	Intreviwee 16	If we could incorporate in the space of outer environmental,for a kind of physical activity or something incorporate to that space like a circuit; we could incorporate that the patients could safely use it in a group situation that will be beneficial.

	Themes	25- Landmarks and Cues	Hits
Wayfinding Systems	Intreviwee 1	No, there are no cues for the current place.	0
	Intreviwee 2	I think the biggest cue is the visual contacts so when they walk by the dining room and seeing the people sitting there than they would know they want to come in to see what's	1
	Intreviwee 3	Hmm... quick activity, Hmm... people, Hmm... Staff "you know" I think that often if somebody doesn't know that's time to eat, doesn't know they are hungry, so they need to be directed to the room where they will go to the eat	3
	Intreviwee 4	For some patients if you have some pictures for food to the dining room it might cue them	1
	Intreviwee 5	We don't actually have cues, especially on the rooms doors that there's room numbers	0
	Intreviwee 6	I can't really say because it's really depends how advanced dementia most of them really need assistance	0
	Intreviwee 7	Not specified	0
	Intreviwee 8	There are no landmark to speak of and in some of the rooms because of the design we have these alcove so actually you can't see the room from the hallway	0
	Intreviwee 9	Not specified	0
	Intreviwee 10	Not specified	0
	Intreviwee 11	Maybe if the door way where like an outline differently or a different color	1
	Intreviwee 12	I think they kind of naturally adopted so they could see maybe the purpose of the room a little bit more	1
	Intreviwee 13	Not specified	0
	Intreviwee 14	Not specified	0
	Intreviwee 15	Not specified	0
	Intreviwee 16	We need landmarks	0
		TOTAL	7

	Themes	26- Colours Systems	Hits
Wayfinding Systems	Intreviwee 1	colors are very calming and ordinary colors, brighter colors	3
	Intreviwee 2	If we could have each quarter in different color that may be helpful, patients can name colors (red, blue, green and black)	2
	Intreviwee 3	brightly colorful, I think soothing colors would be better.	2
	Intreviwee 4	Yellow bright green bright blue purple just vibrant colors, I wouldn't on the walls necessarily but just for activities I think they could see them better	4
	Intreviwee 5	They prefer primary colors foundation, bright colors.	2
	Intreviwee 6	The hallways everything is the same color, there is no something like a color breaker.	1
	Intreviwee 7	They will get attracted to the bright colors	1
	Intreviwee 8	The colors I think pretty good they're calming	1
	Intreviwee 9	I'm not sure but I can say generally a soothing colors	1
	Intreviwee 10	I like that idea if we change the color of the hallways quadrant 2-4 colors that will help to the patients to identify their rooms	1
	Intreviwee 11	Primary colors	1
	Intreviwee 12	Changing in colors is very confusing for the residents	1
	Intreviwee 13	Not specified	0
	Intreviwee 14	Not specified	1
	Intreviwee 15	Light colors, interesting colors like cherry, red, turquoise, lime green, and they also like bright colors, It's better to use a solid colors	4
	Intreviwee 16	I think probably all of those depending on the patients	0
		TOTAL	25

175

	Themes	27- Lighting Systems	Hits
Wayfinding Systems	Intreviwee 1	Bright light and sun light	2
	Intreviwee 2	I guess it depends in which mood there in certainly the dimmer lighting seems to be having more common affect so if someone is upset or agitated it's nice to have them in a dimmer	1
	Intreviwee 3	I think bright would be important in common area and softer lighting in the rooms	2
	Intreviwee 4	Both bright and dimmer	2
	Intreviwee 5	Bright light	1
	Intreviwee 6	Both bright and dimmer	2
	Intreviwee 7	I think dimmer lights most of them they don't like bright lights	1
	Intreviwee 8	Bright light	1
	Intreviwee 9	Not specified	0
	Intreviwee 10	Not specified	0
	Intreviwee 11	Home bright lights, bright lights	1
	Intreviwee 12	The brighter light and the dining room has more natural light so it is probably a bonus for them as well	2
	Intreviwee 13	Bright lights	1
	Intreviwee 14	Not specified	0
	Intreviwee 15	I guess the residents seems to see something brighter than they might going towards what's brighter so bright it's more interesting	1
	Intreviwee 16	Any type of artificial lighting that will simulate the natural lighting	1
		TOTAL	**18**

	Themes	28- Visibility Aspect	Hits
Wayfinding Systems	Intreviwee 1	Some of them like it in nursing station. TV room not necessarily to have a glass wall for safety issue	2
	Intreviwee 2	if the TV room has a glass wall also it might be helpful for monitoring because it's just a doorway and it harder to see what's inside is going on	1
	Intreviwee 3	The dining room easier to find because of glass space. TV room not necessarily to have a glass wall because I think it supposed to be quitter, darker.	2
	Intreviwee 4	Some people bang on the glass of the nursing station. I wouldn't... that will not be my preference to make a glass wall in TV room because the room is nice with the TV because it is somewhat secluded it's privet	2
	Intreviwee 5	The challenges with the nursing station I know sometimes a patient gets so anxious because they want to get in the nursing station and there is a glass there "you know" it limits our contact. In TV room no need for glass wall	2
	Intreviwee 6	Not specified	0
	Intreviwee 7	At the TV room, it might be good because we can see what's going on inside the room especially on the right corner	1
	Intreviwee 8	Not specified	0
	Intreviwee 9	Nursing station with the glass walls really creates a barrier between staff and patients and can create some agitated behavior	1
	Intreviwee 10	Not specified	0
	Intreviwee 11	I think it will be better if the glass in the nursing station could look like something different from the other side because people are always going to know if there's something in there	1
	Intreviwee 12	I think most common spaces if they would be heading towards is the dining room and I think the fact that the wall is mainly glass so there is eyes drown on that	1
	Intreviwee 13	Not specified	0
	Intreviwee 14	Not specified	0
	Intreviwee 15	Not specified	0
	Intreviwee 16	I think it is helpful the transparent wall glass where the staff of the nursing station	1
		TOTAL	**14**

177

Themes		29- Layout of the floor plan	Hits
Wayfinding Systems	Intreviwee 1	The TV room is too small here, more space in the dining room and it's much more opened, the main exit door all the time crowded, hallways are good, dining room is the problematic	5
	Intreviwee 2	The figurate 8 pattern good just keep going around in the circle and not getting stacked anywhere, hallways are much wider, corner rooms problematic spaces, it's difficult to reach a bathroom, we are missing shelving and storage space in the shower room	5
	Intreviwee 3	exit door, dining room, sometiems hallways and corner rooms a problematic. they can't find a bathroom. the hallway it's wide enough	3
	Intreviwee 4	Hallways and dining room are good, problematic the nursing station, I think pictures would help them in way finding, we need to put arrows on the floor.	4
	Intreviwee 5	The nursing station and the dining room a high traffic areas, the bedrooms problematic because all looking the same.	2
	Intreviwee 6	In this unit there is almost no dead ends so they can just keep walking and walking around so this is really good. shower room for the patients it's very small, con't find the way to	3
	Intreviwee 7	The hallways are wide, the corners at the ends always we are having incidence on the corner or beside the corner rooms. showers here has a very bad designed	3
	Intreviwee 8	The great advantage about this unit is that so big figure 8 which the hallways being very wide. I think it's very confusing in this unit I think it's very hard to way find all looking the	2
	Intreviwee 9	Toilets are actually visible from the hallway that's a problem	1
	Intreviwee 10	The problematic spaces in the hallways around doors and the dining room.	2
	Intreviwee 11	The hallways are good. the nursing station on the south side of the unit is next to the dining room is always very crowded	2
	Intreviwee 12	I think the advantage is that it's a figure 8 type of system and this really increased the ability of residents to wander around, there is needs to be a solution for storage in patients	2
	Intreviwee 13	problematic when they don't have a privet room when the residents have visitors.	1
	Intreviwee 14	The design like a figure 8 so there is many more options to the patients they can keep walking and not have to be stopped.	1
	Intreviwee 15	The advantages is the actual structure on figure 8, the bathrooms very institutional.	2
	Intreviwee 16	The biggest advantages of the unit is the actual layout and the ability of the patients to almost going on that circular track, the alcove area problematic.	2
		TOTAL	40

Themes		30- Signage System	Hits
Wayfinding Systems	Intreviwee 1	Nothing helpful	0
	Intreviwee 2	Nothing helpful	0
	Intreviwee 3	Nothing helpful	0
	Intreviwee 4	Nothing helpful	0
	Intreviwee 5	Nothing helpful	0
	Intreviwee 6	Nothing helpful	0
	Intreviwee 7	Nothing helpful	0
	Intreviwee 8	Nothing helpful	0
	Intreviwee 9	Nothing helpful	0
	Intreviwee 10	Nothing helpful	0
	Intreviwee 11	Not specified	0
	Intreviwee 12	Nothing helpful	0
	Intreviwee 13	Nothing helpful	0
	Intreviwee 14	Not specified	0
	Intreviwee 15	Not specified	0
	Intreviwee 16	Nothing helpful	0
		TOTAL	0

Themes	31- Design Details	Hits
Intreviwee 1	a lot of them likes to watching from the window, furniture are good, I think they prefer pictures like maybe with animals, food	3
Intreviwee 2	They like windows, we need furniture which is much more home like, need seats in the dining room, they like pictures of children	4
Intreviwee 3	Flexibility in furniture	1
Intreviwee 4	Furniture pretty good, they should have a choice in their bedrooms for lighting system	2
Intreviwee 5	I think we focus on being minimalist with patients behavior they touch stuff and grab stuff	1
Intreviwee 6	They like big windows, we have a problem with same flooring like going to the same rooms or to the hallways everything is the same color, there is no something like a color breaker.	2
Intreviwee 7	We can't use the images or plants they might use it as a weapon, of times the furniture is in also enough chairs we have a lot of chairs.	2
Intreviwee 8	Bathrooms may also be difficult for people to find even when they're in their own rooms by the way that we can better able better navigate people to their own bathrooms	1
Intreviwee 9	Design element like the kind of door knobs and taps in and such that are in the room art work on the wall even something as simple as curtains	3
Intreviwee 10	Not specified	0
Intreviwee 11	Furniture really nice, the handrails annoying residents.	2
Intreviwee 12	The biggest one is sounds "you know" there being in a hospital there are a lot of unfamiliar noises that can be agitating or distressing to the residents	1
Intreviwee 13	It would be nice if we had something retro I think like old telephones old televisions old radios	1
Intreviwee 14	Not specified	0
Intreviwee 15	Not specified	0
Intreviwee 16	I think probably all of those depending on the patients	0
	TOTAL	23

Wayfinding Systems

180

Themes		32- Suggested Activities	Hits
Dementia-friendly	Intreviwee 1	I think they do a lot of activities, they do baking, they do artisan crafts, and they do a lot of infracting.	0
	Intreviwee 2	folding towels, doing thinks that are familiar to them, house hold activities, leaguer activities, hmmm... having places that feeling more home like rather than institutional	5
	Intreviwee 3	More recreation purpose activities	1
	Intreviwee 4	I would like to see more personalized music	1
	Intreviwee 5	Playroom	1
	Intreviwee 6	We need actually like a room where there's no furniture just clear specially at night when patients need to settle	1
	Intreviwee 7	We might need another room because we have only two common rooms use one of them is for dining other on the TV room sometimes we use them both for dining or activity	1
	Intreviwee 8	A work station stations somewhere within the unit that it could be accessible for patients	1
	Intreviwee 9	A kinds of activities that are meaningful for them like for example a kitchen where they can help themselves its either "you know" food preparation tools	1
	Intreviwee 10	I like the idea of something functional like the laundry unit, we need like a kind of open homey space	2
	Intreviwee 11	Not specified	0
	Intreviwee 12	Not specified	0
	Intreviwee 13	I'd like to see activities that are less formal in the staff would be more engaged and interacting with people, with their likes are and what their hobbies are and to trying develop	1
	Intreviwee 14	An activity that reminds them of something that they are used to do in everyday life so that's what I see	1
	Intreviwee 15	Looking for individualized activities, something meaningful like profession activities	2
	Intreviwee 16	Permanent activities stations	1
		TOTAL	19

181

Themes	33- Dementia-friendly Built Environment	Hits
Intreviwee 1	Not specified	0
Intreviwee 2	Not specified	0
Intreviwee 3	Better than the long term care houses.	1
Intreviwee 4	Yes I do it's good because of the layout of the floor because it's round I think there's a space Station can go that are nice to be.	1
Intreviwee 5	Yes, they have a lot of space to wander is very spacious the rooms are big I think there's no path so they can just wander for hours and hours	1
Intreviwee 6	I would think so the hallways wider comparing to the most hospitals and it's good continuously out when there is no end hallway because patients just walk round and round	1
Intreviwee 7	It's good but it's not like a home. Not very homey because we need always less items,mmm but we don't have enough pictures	1
Intreviwee 8	No, I don't well there is aspects they are and another many aspects they are not friendly	1
Intreviwee 9	I think 50% of the way there, it's not a terrible unit I mean obviously that they have made a lot of appropriate modifications but it's not a perfect unit	1
Intreviwee 10	Not specified	0
Intreviwee 11	I think it's fairly friendly but I think there's always room for improvement I think the fact that it is like a pretty large space is quite dementia-friendly	1
Intreviwee 12	I think it's friendly in the sense that it's generally safe and patients are allowed to walk around and explore "you know" the hallways are wide enough for them and the door frames	1
Intreviwee 13	I wouldn't give it that designation yet, I think that the potential to be a dementia-friendly unit because it's so institutional	1
Intreviwee 14	In some ways it's an improvement from the other units just the design the big difference was this dead-end straight corridor was not very friendly for the patients where is here they can meander and walk around different paths I think it's very beneficial	1
Intreviwee 15	I think if I compare it with all units it's a more dementia friendly more than most places I went to however there could be some improvements to make it look more home like	1
Intreviwee 16	I think it is, because of the figuare 8 design.	1
	TOTAL	13

Dementia-friendly

182

APPENDIX B:

GRAPHS OF THE SEMI –STRUCTURED INTERVIEWS METHOD

The following Graphs are the visual interpretations of the interviews method.

Graph 5
Preferable Space for the Residents
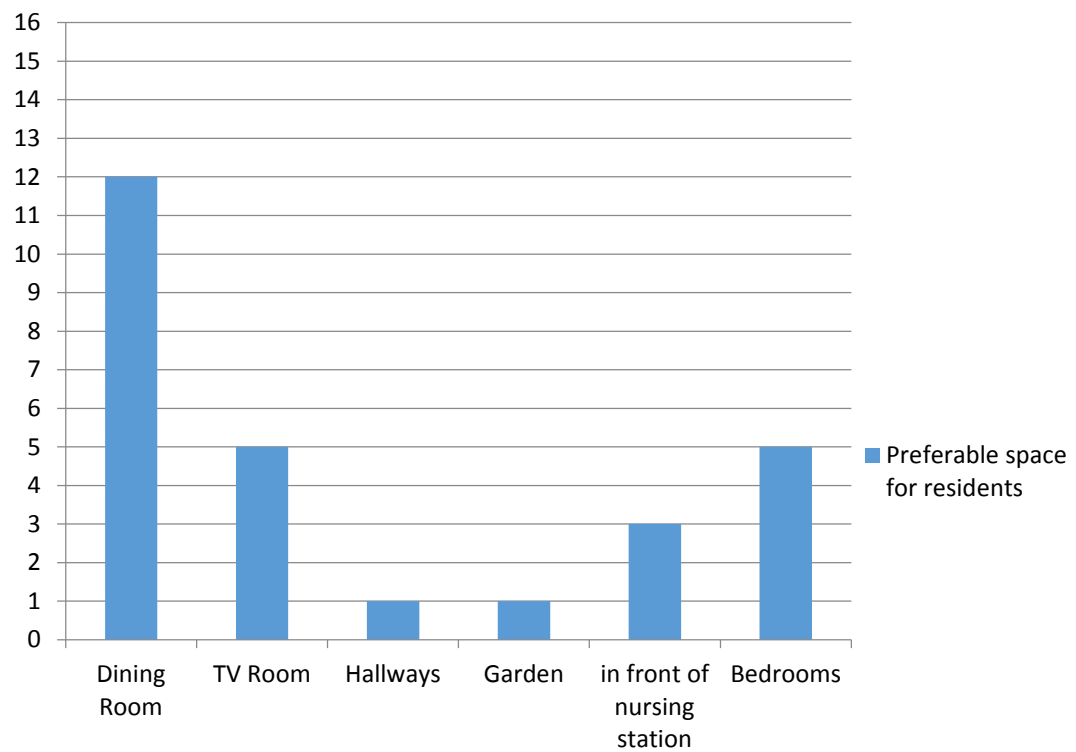
Graph 6
The problematic spaces
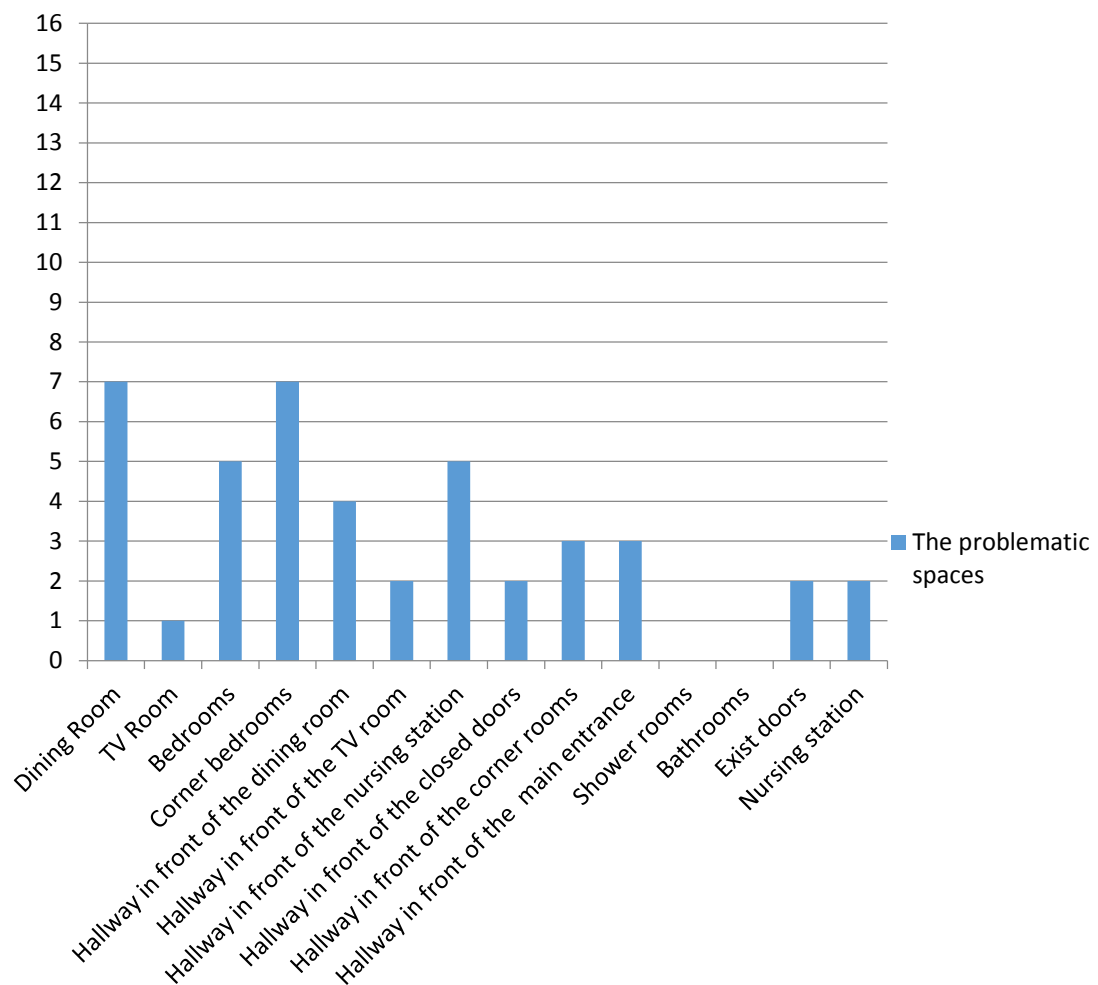
Graph 7-A
Preferable spaces with visitors:

Graph 7-B
Is the visitors' room is used by the visitors?
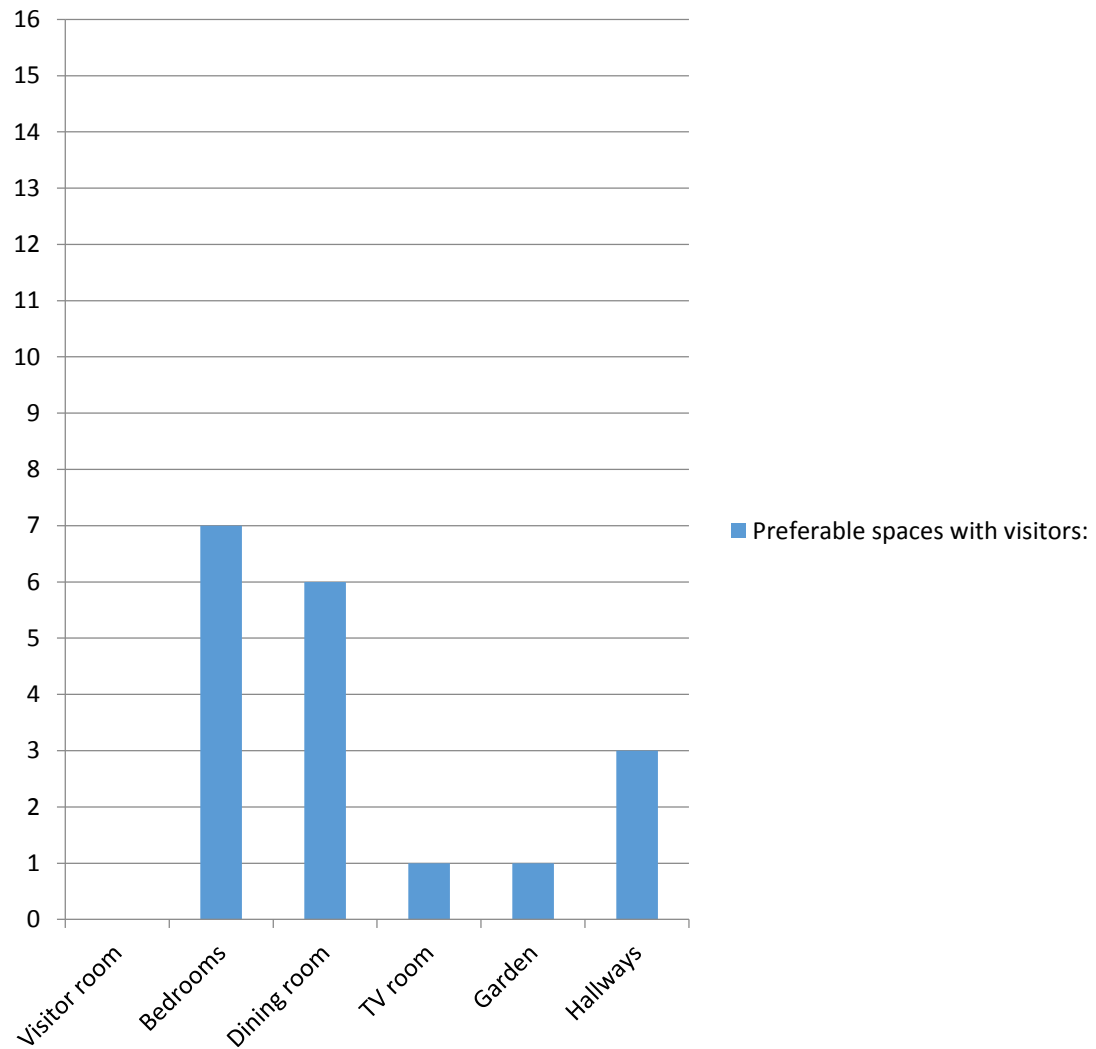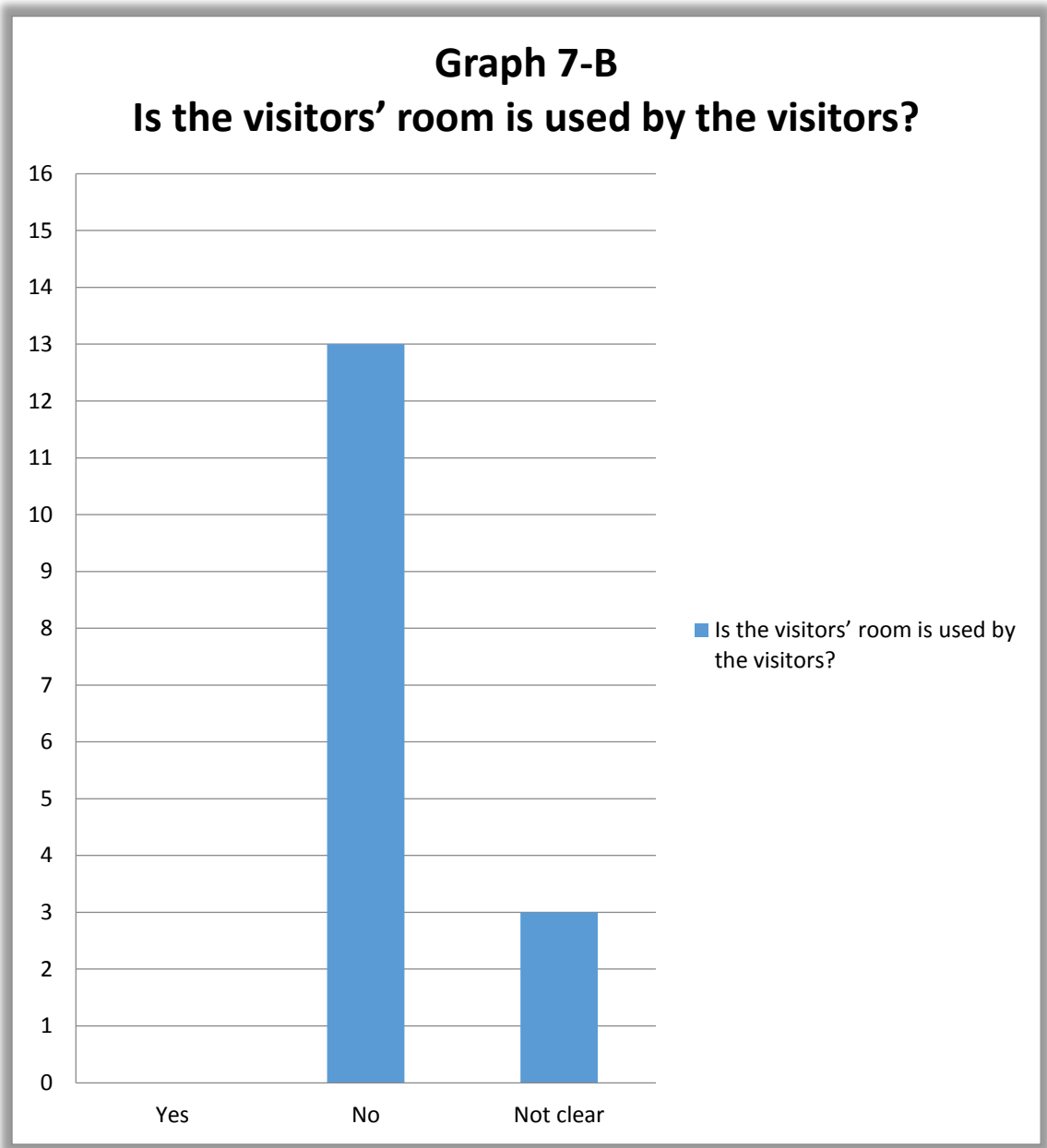
Graph 8
Identifiable objects:

Graph 9
Can the residents identify objects?
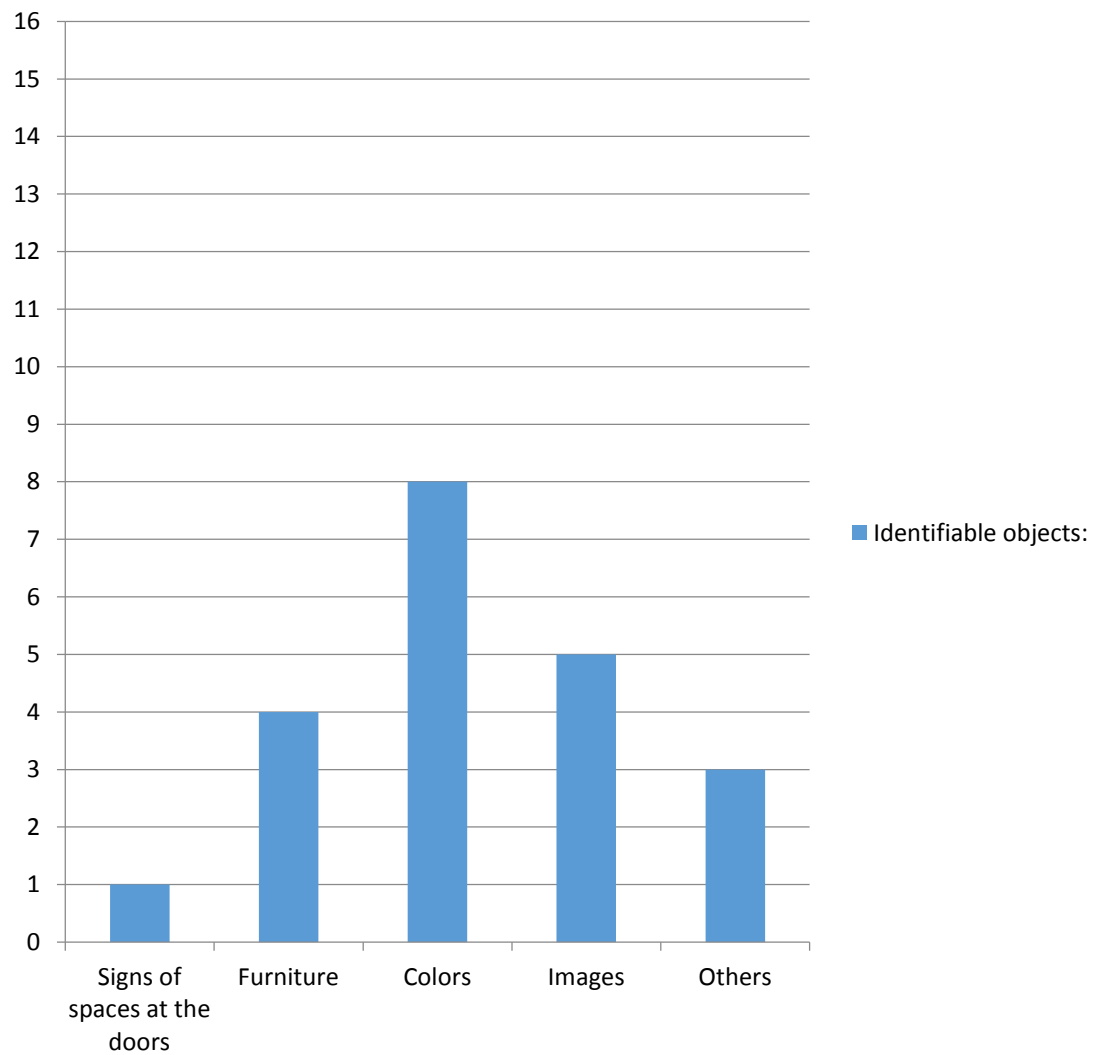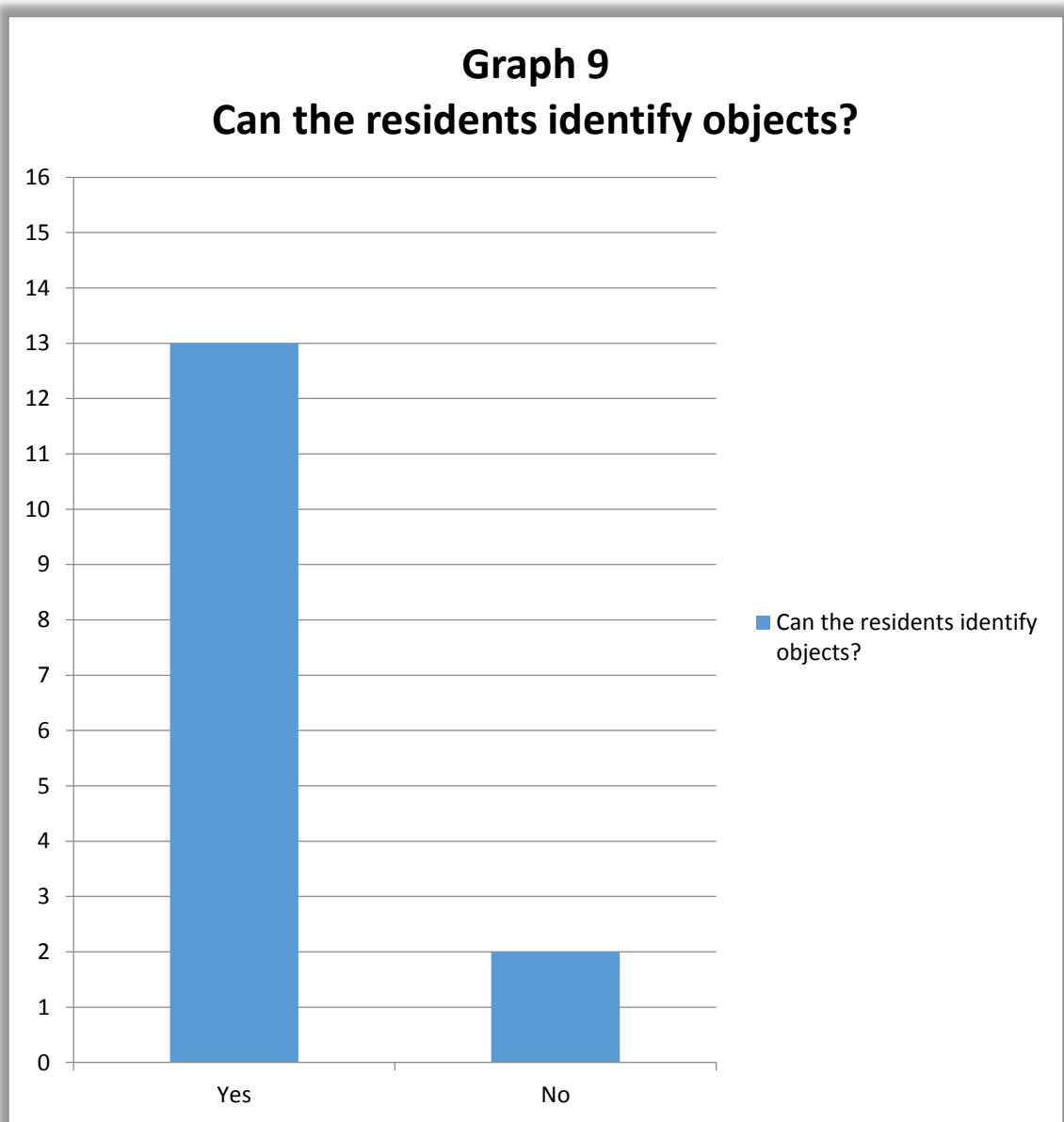
Graph 10
Can the residents identify the diffrences in the furniture?

Graph 11
Preferable furniture

Legend: ■ Preferable furniture

Category	Value
Sofas	1
Benches	2
Arm chairs	5
Chairs	8
Wheeled Tables	0
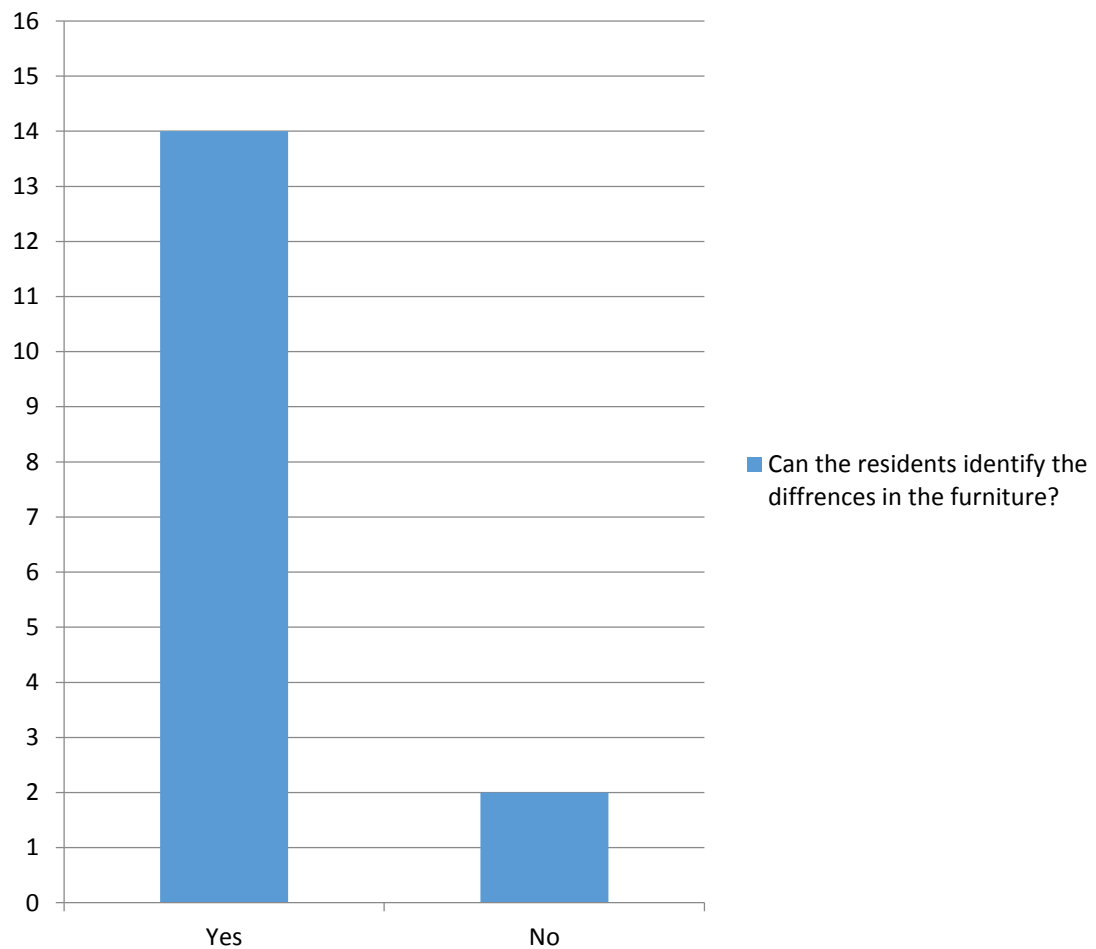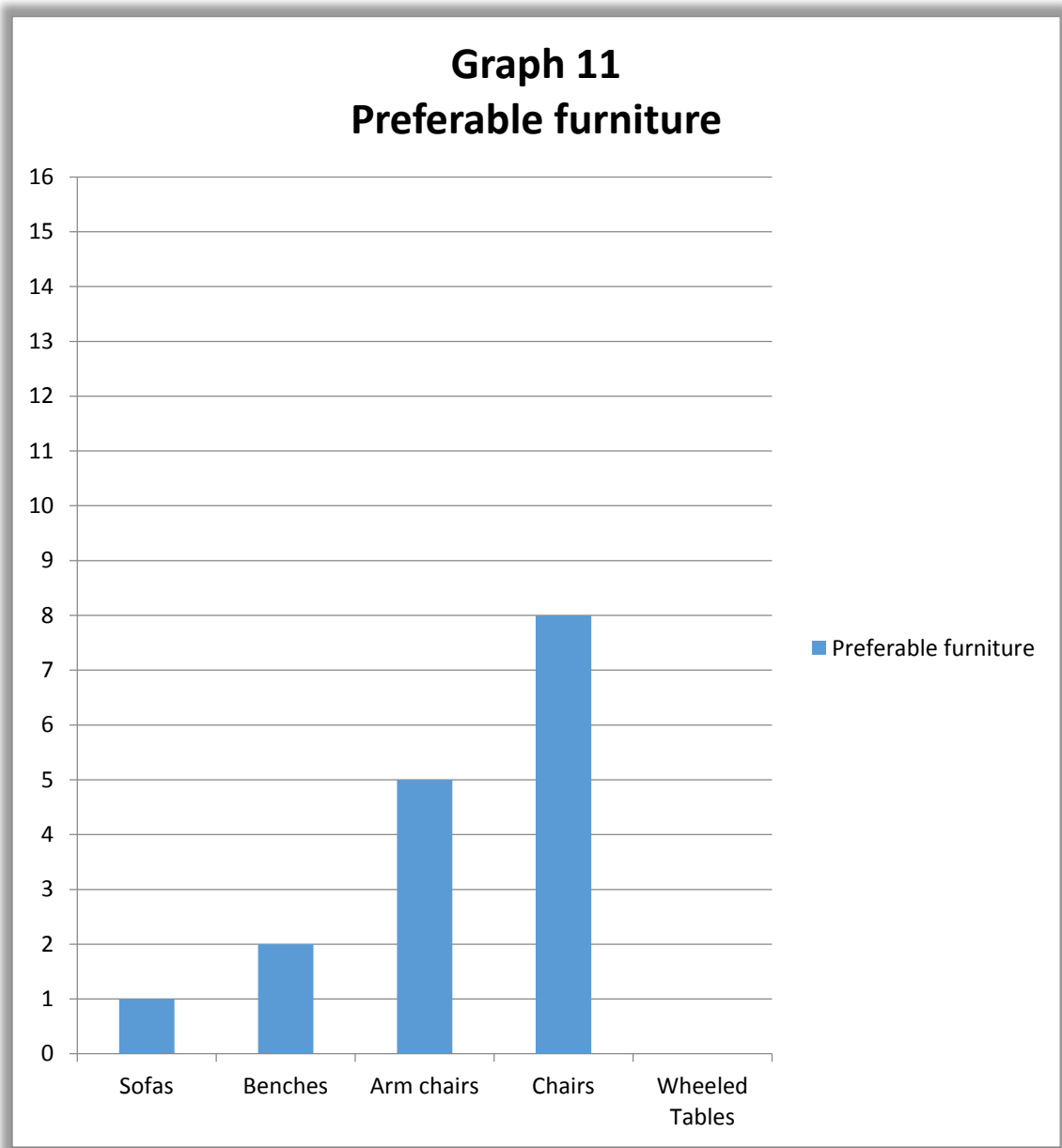
Graph 12
Preferable lighting system
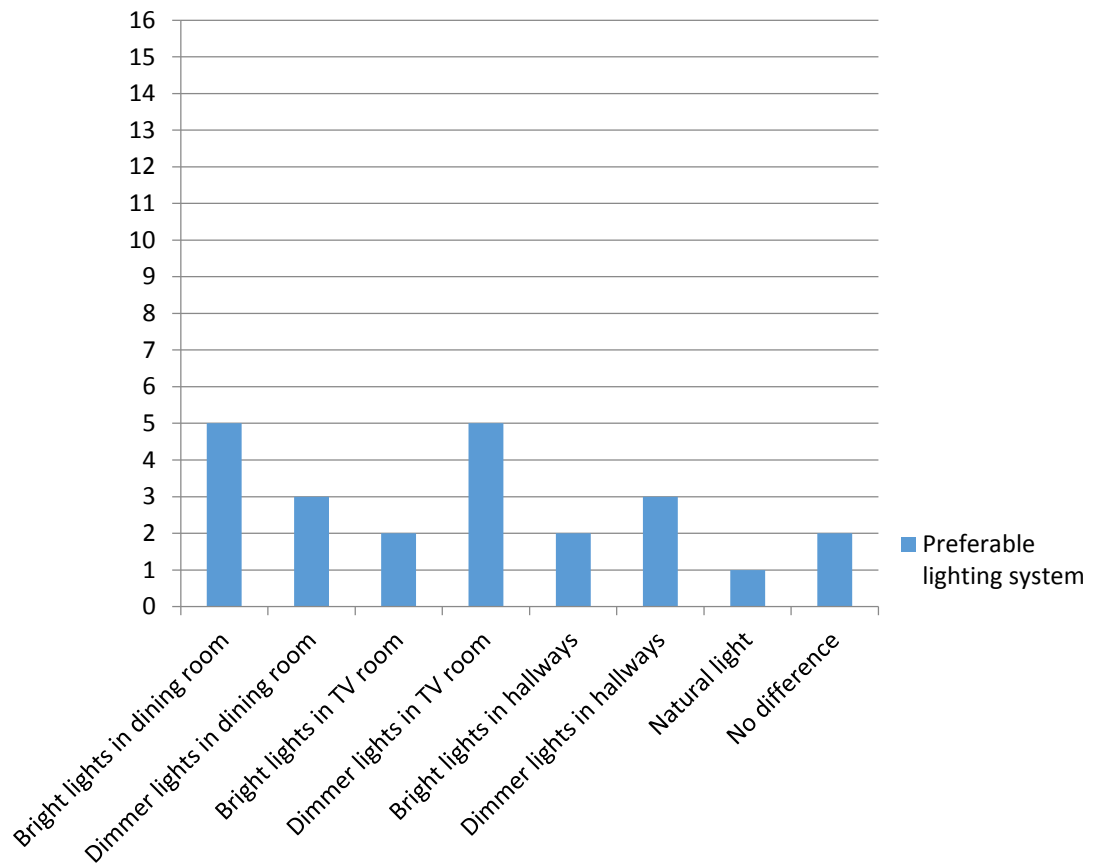
Graph 13
The residents find their way to:
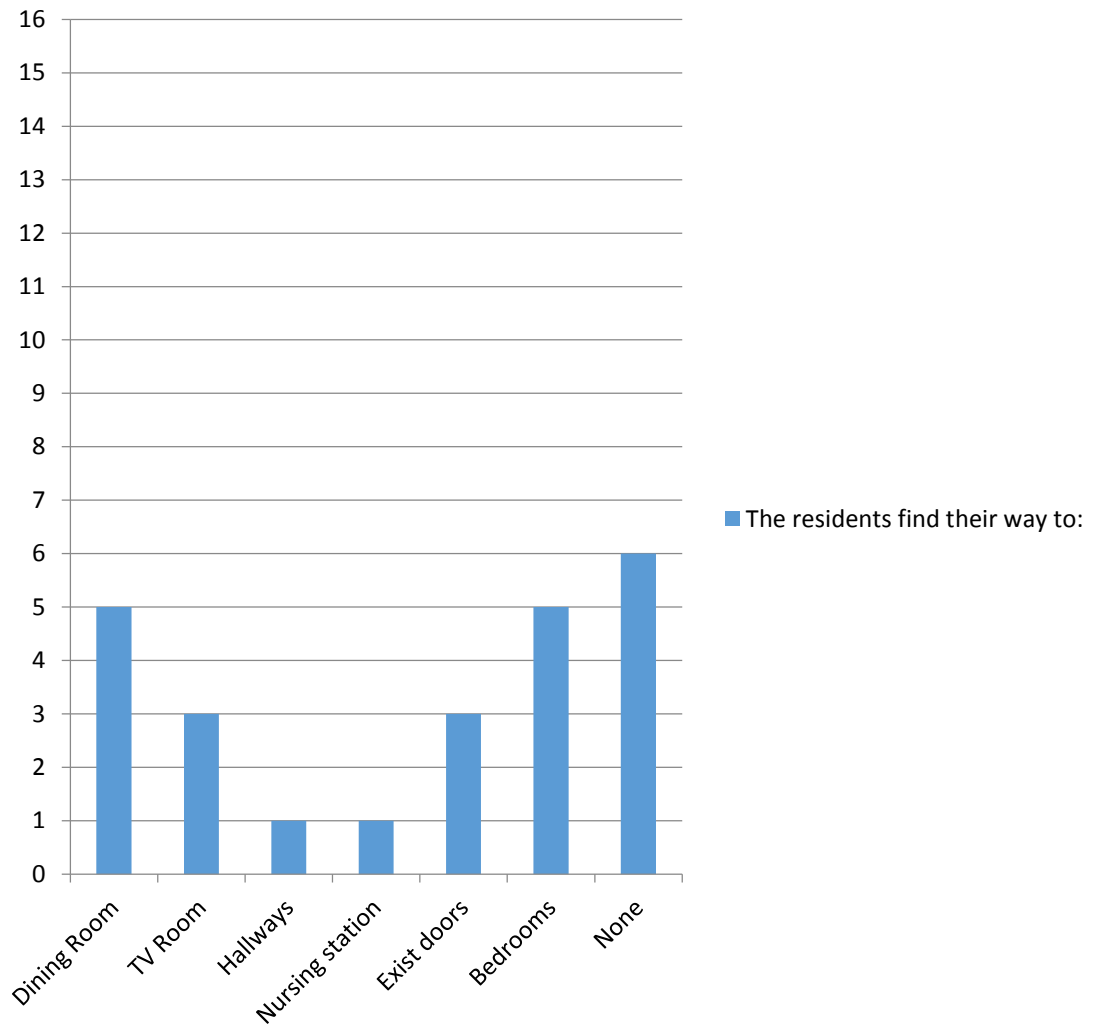
Graph 14
Residents identifye the function of spaces

Graph 15
Assessment of the current wayfinding
system: is it Successful?
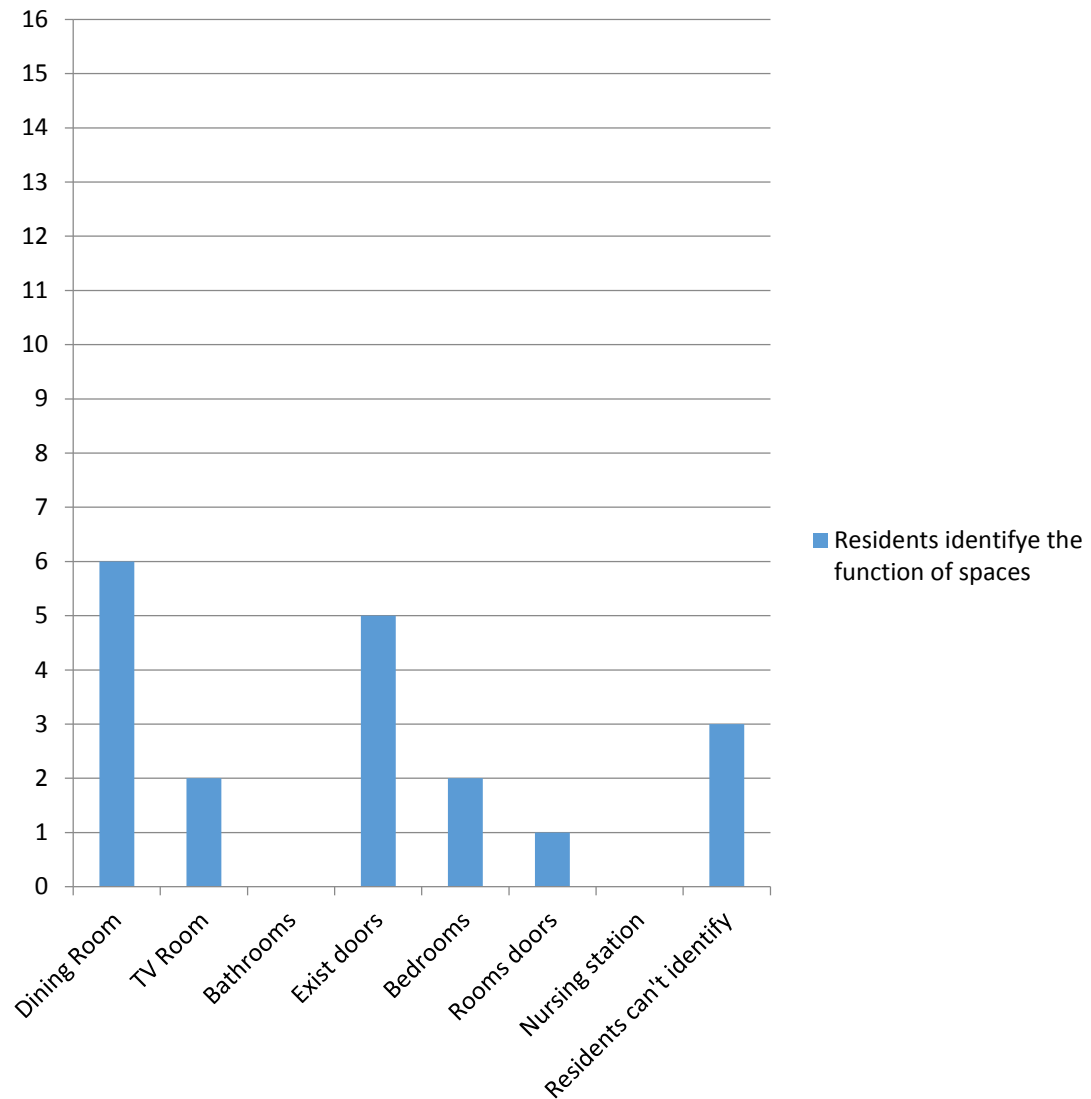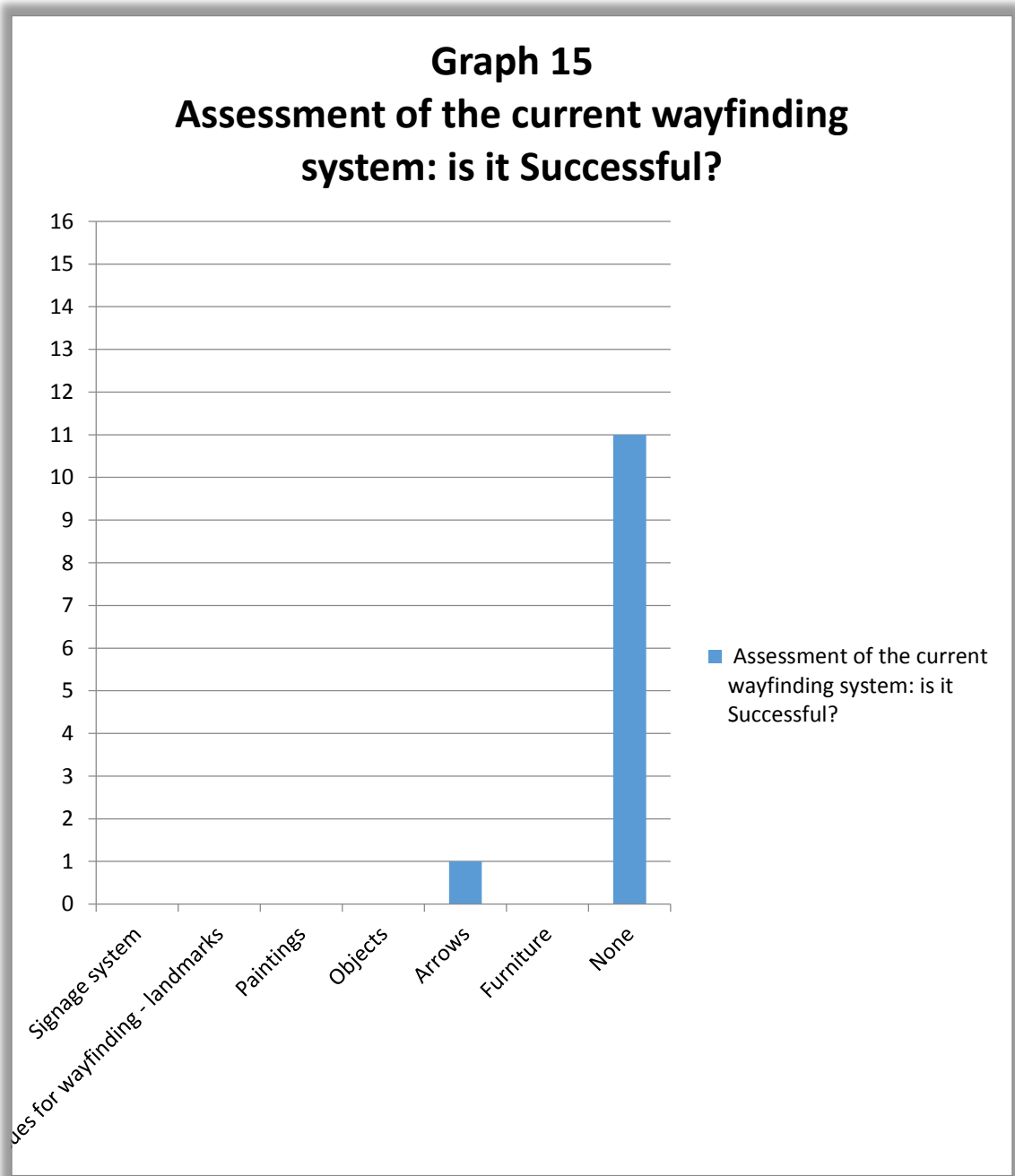
Graph 16
What would help in wayfinding?

Legend: What would help in wayfinding?

X-axis categories: Signs, Cues - landmarks, Changing colors, Painting cues, Arrows, Staff help, Sound system, Lighting design, People activity, Plants, Smells, None
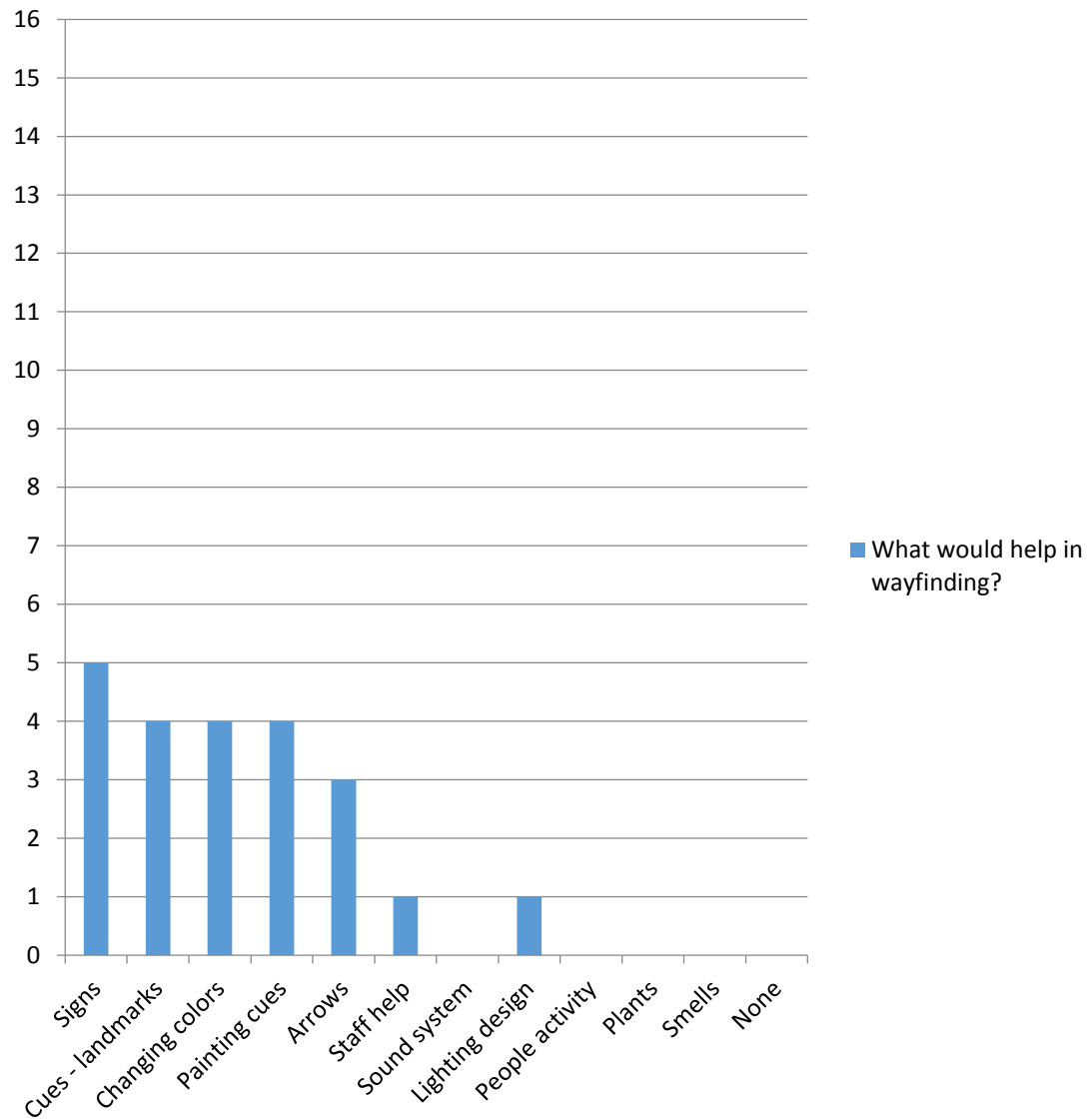
Graph 17
Is the GPU a dementia-friendly built environment?

Graph 18
Are the following spaces is dementia-friendly?
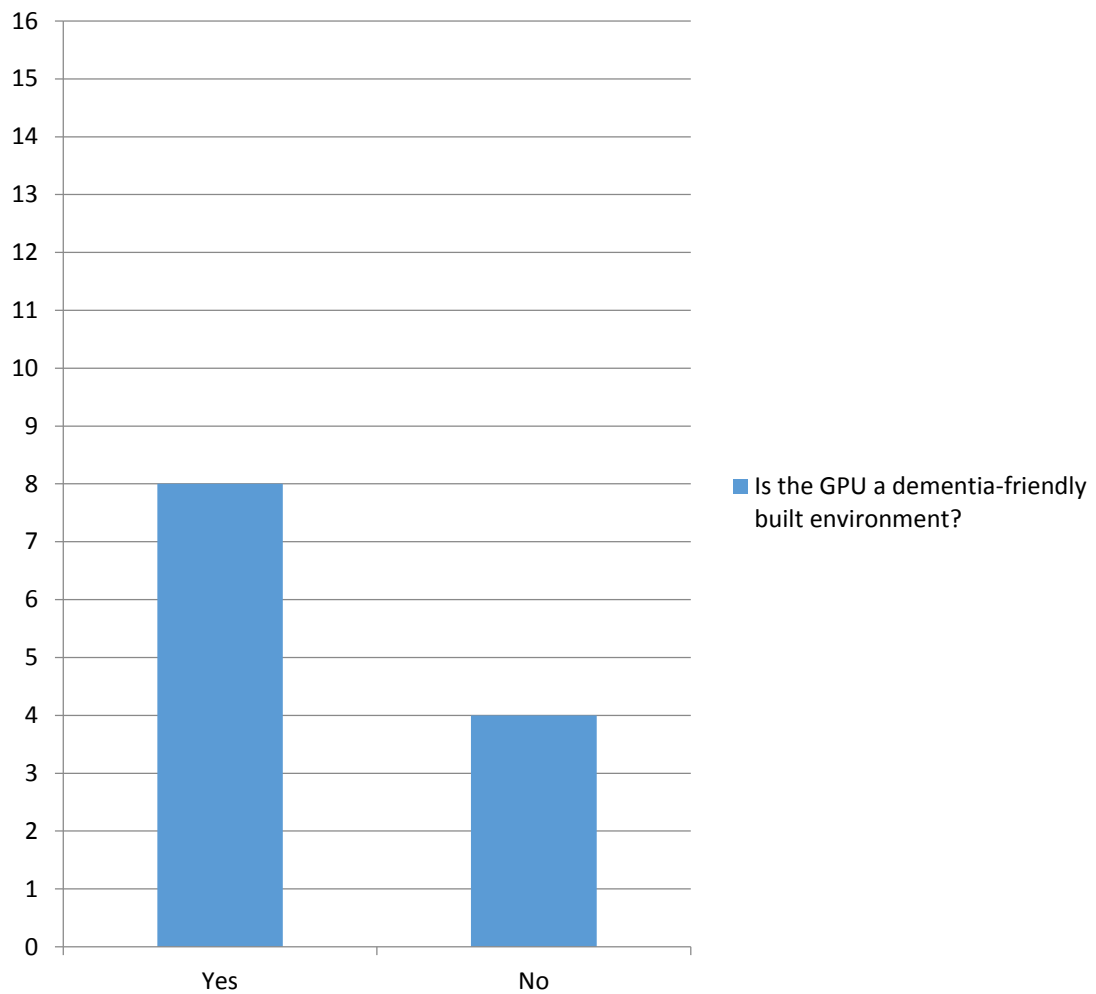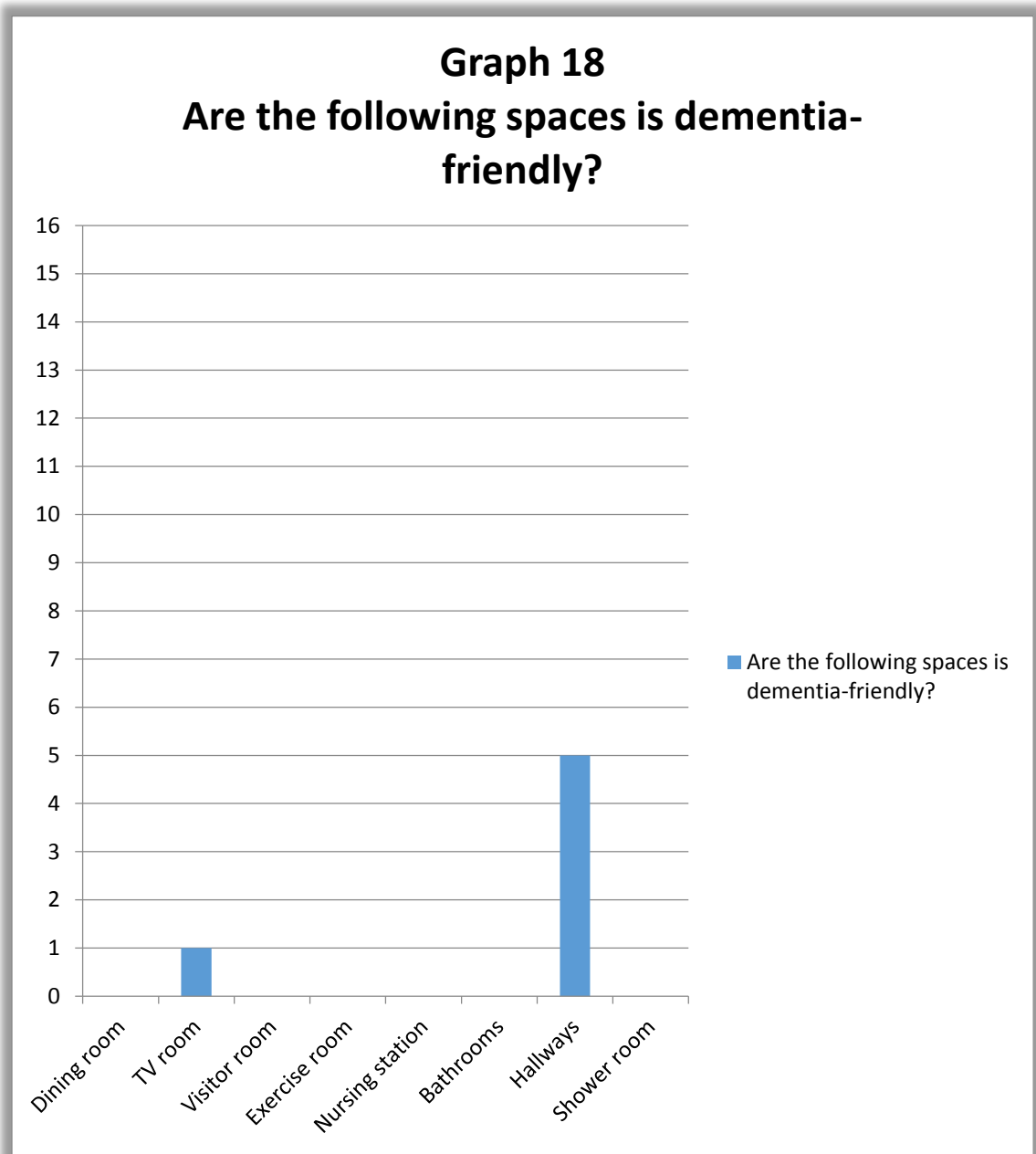
Graph 19
What is the missing activity at the unit?
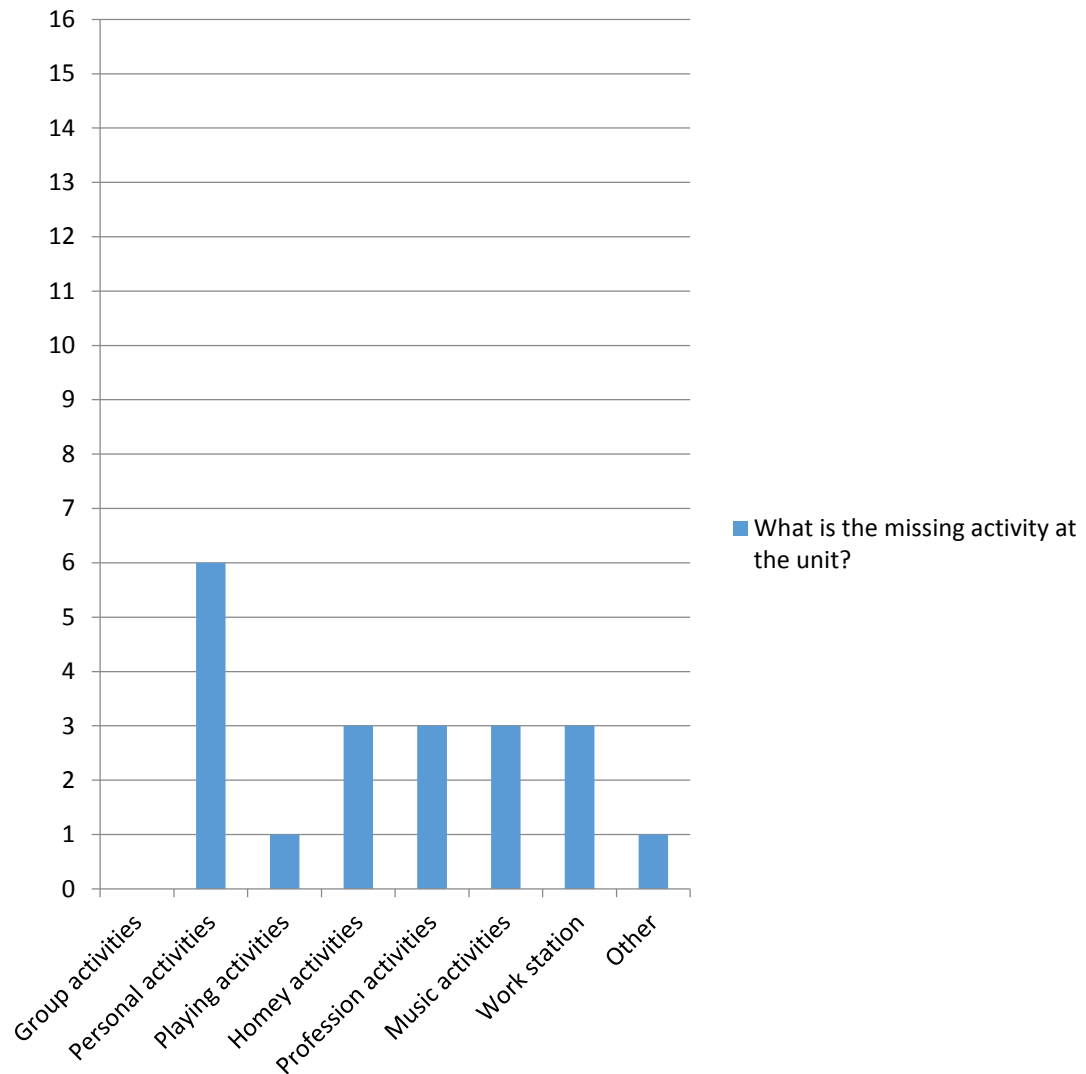
**Graph 20
What are the suggested spaces for the activities?**
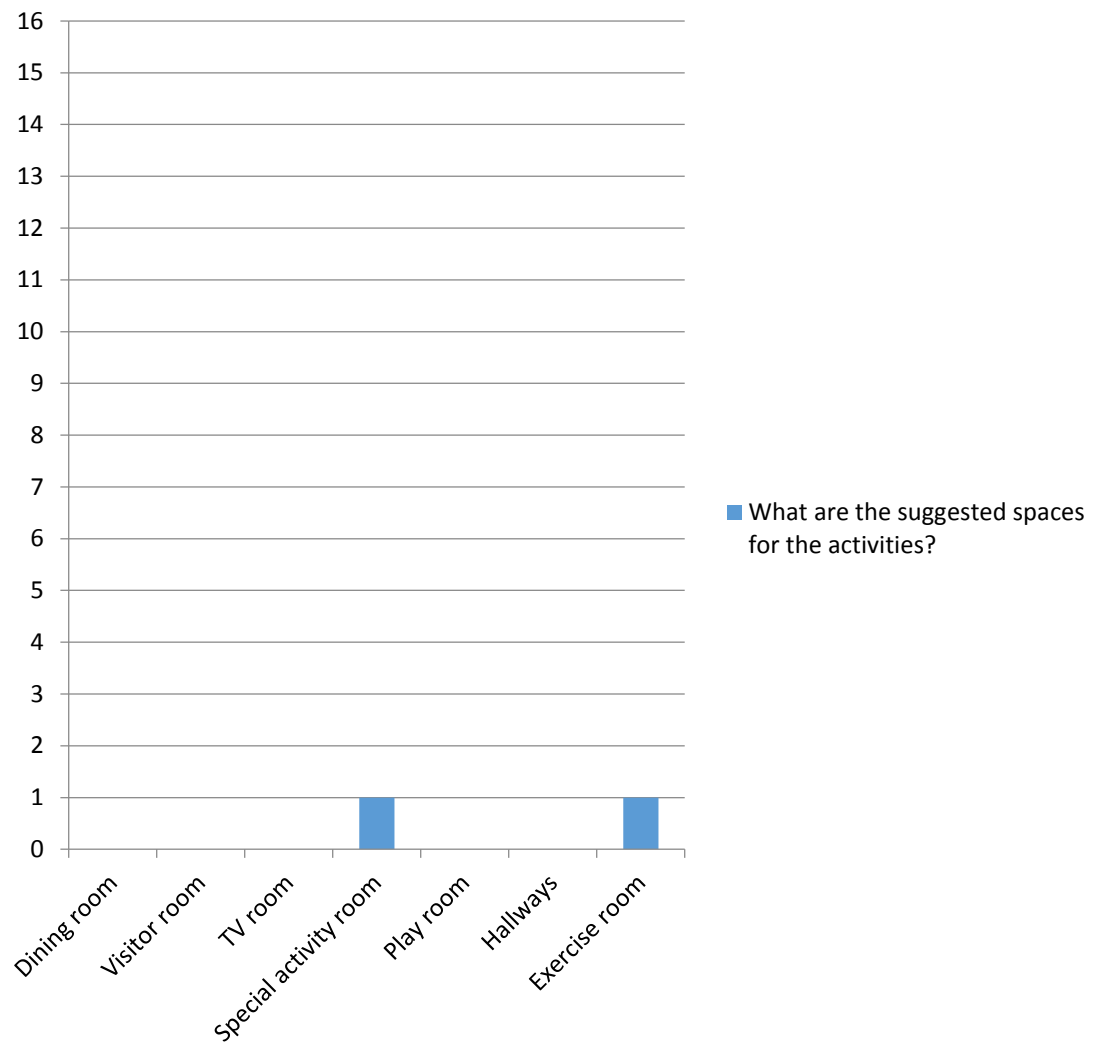
Graph 21
Can we change the function of the:

	Visitor Room	South Corner bedrooms	North Corner bedrooms	Corner rooms	Exercise room

Legend: ■ Can we change the function of the:
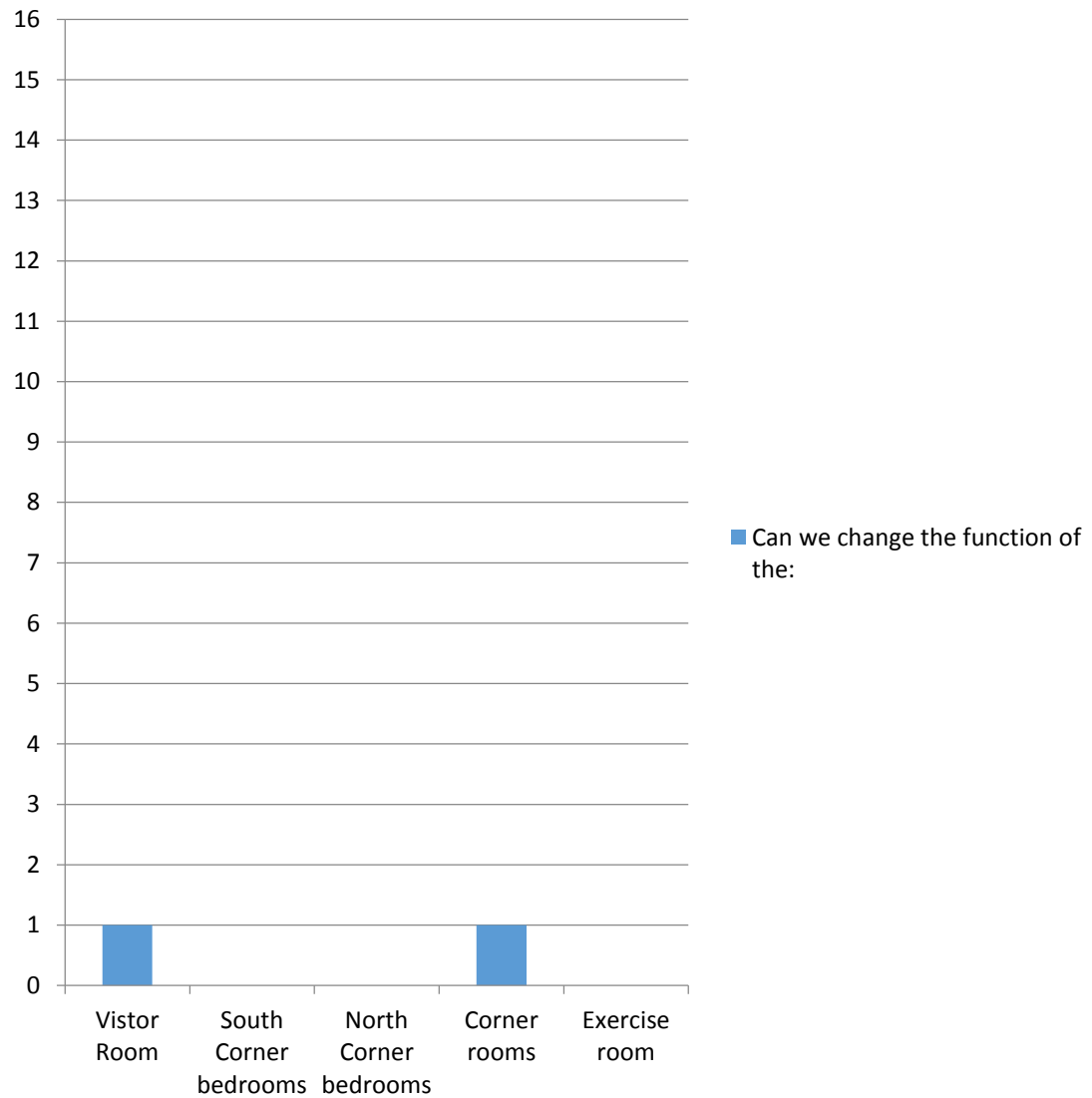
Graph 22
What is the suggested signage system?
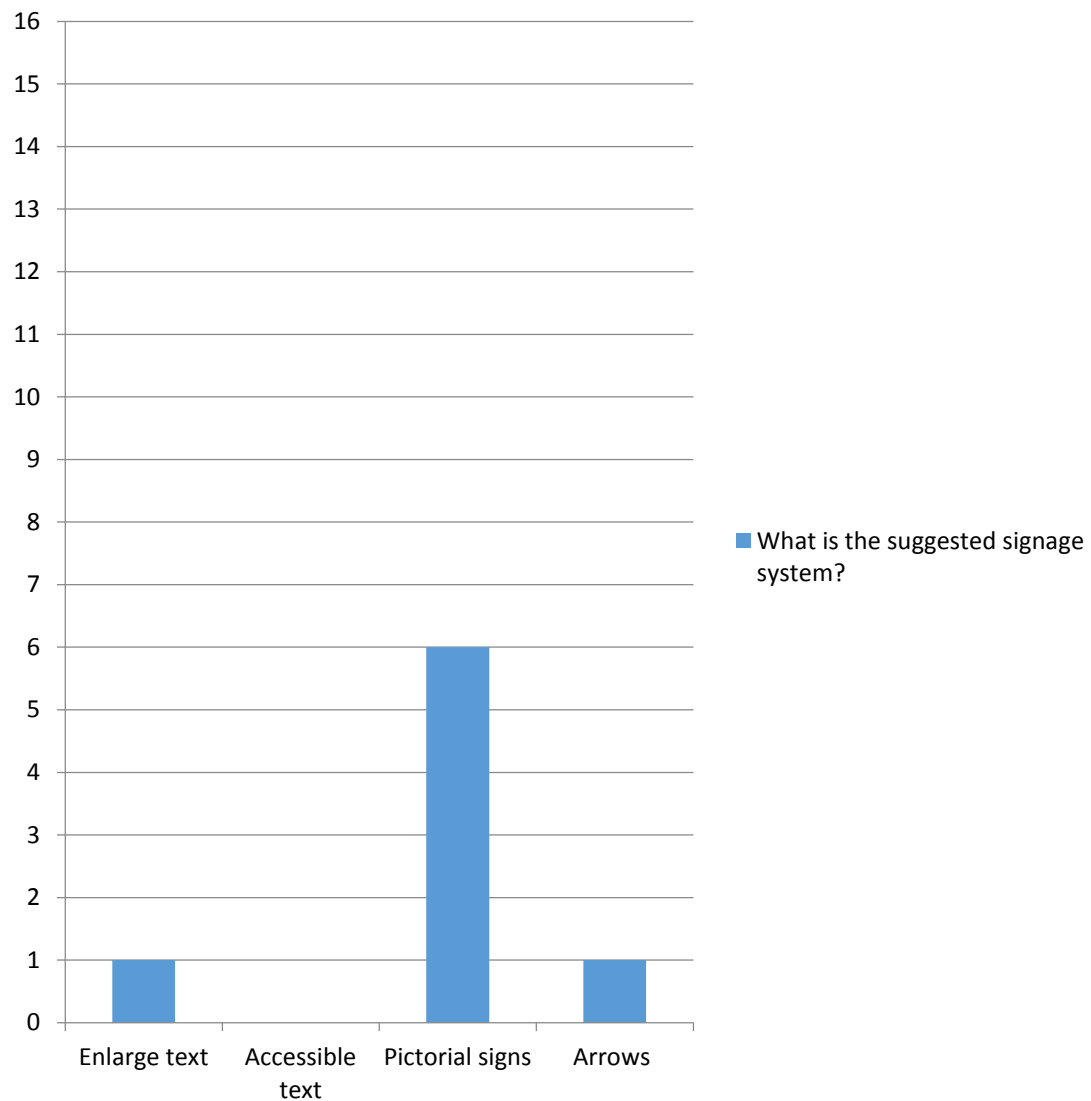
Graph 23
Spaces affect behaviours, in positive or negative way
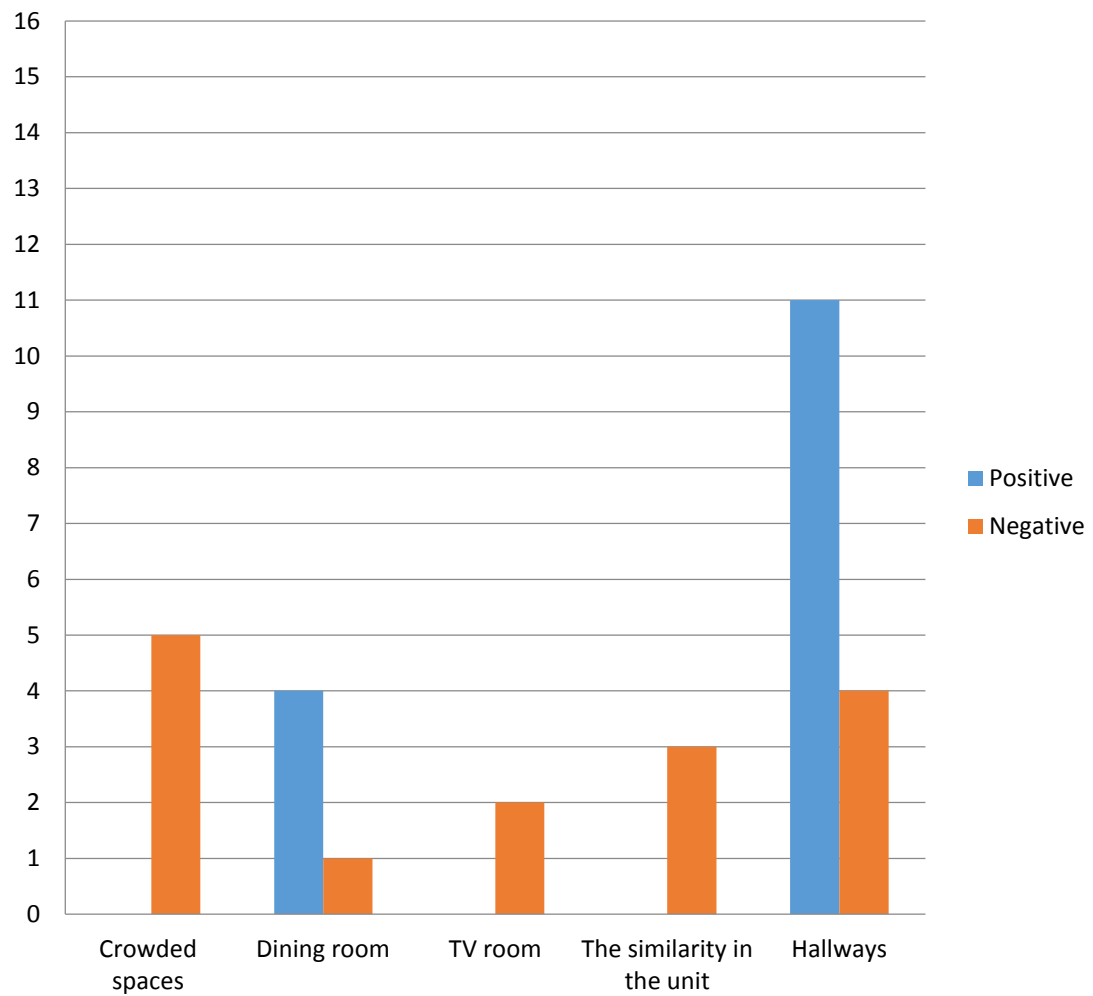
APPENDIX C:

THE SEMI –STRUCTURED INTERVIEWS METHOD SYNTHESIS THEMES OF INTERVIEWS DATA

The following tables are the breakdown data to reach simple and direct themes from the data of interviews, these tables are the bases of the Graphs.

Themes		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	T
Layout	**Advantages of the layout – GPU, TRI**																	
	The preferable spaces of the patients:																	
	Dining Room	+	+	+	+	+	+	+	+		+	+	+				+	12
	TV Room				+	+		+		+		+					+	5
	Hallways		+															1
	Garden													+				1
	in front of nursing station									+				+			+	3
	Bedrooms	+		+	+								+	+				5
	Rationales																	
	What are the problematic spaces																	
	Dining Room	+	+	+	+				+		+		+					7
	TV Room												+					1
	Bedrooms					+	+	+	+								+	5
	Corner bedrooms	+	+	+	+								+	+			+	7
	Hallway in front of the dining room			+					+		+			+				4
	Hallway in front of the TV room			+							+							2
	Hallway in front of the nursing station			+		+			+		+			+				5
	Hallway in front of the closed doors										+							2
	Hallway in front of the corner rooms							+	+		+							3
	Hallway in front of the main entrance										+			+				3
	Shower rooms																	0
	Bathrooms																	0
	Exist doors		+	+	+	+												2
	Nursing station				+	+												2
	Rationales																	
	Preferable spaces with visitors:																	
	Visitor room																	0
	Bedrooms		+	+			+		+			+	+	+			+	7
	Dining room		+	+			+	+				+		+			+	6
	TV room							+										1
	Garden					+												1
	Hallways								+			+		+			+	3

Interviewees

205

Design details	Themes	Interviewees																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	T
	Can the residents identify objects?																	
	Yes		+	+	+	+	+	+	+	+	+	+		+		+	+	13
	No	+											+					2
	Rationales																	
	Identifiable objects:																	
	Signs of spaces at the doors									+								1
	Furniture		+			+		+									+	4
	Colors		+	+			+	+	+					+		+	+	8
	Images		+		+	+								+		+		5
	Others						+				+		+					3
	Rationales																	
	Can the residents identify the diffrences in the furniture?																	
	Yes	+	+	+	+	+		+	+	+	+	+	+	+	+	+		14
	No						+										+	2
	Rationales																	
	Preferable furniture?																	
	Sofas					+												1
	Benches		+												+			2
	Arm chairs									+		+	+	+			+	5
	Chairs						+	+	+			+	+		+		+	8
	Wheeled Tables																	0
	Rationales																	
	What is the preferable lighting system?																	
	Bright lights in dining room	+				+	+		+							+		5
	Dimmer lights in dining room							+		+				+				3
	Bright lights in TV room					+										+		2
	Dimmer lights in TV room		+				+			+				+				5
	Bright lights in hallways		+			+												2
	Dimmer lights in hallways							+		+				+				3
	Natural light																+	1
	No difference											+	+					2

Themes		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	T
Can the residents find their way to:																		T
	Dining Room	+		+	+		+		+									5
	TV Room				+	+			+									3
	Hallways				+													1
	Nursing station				+													1
	Exist doors			+	+		+											3
	Bedrooms			+	+	+	+		+									5
	None							+			+		+	+	+		+	6
Rationales																		
Can residents identifye the function of spaces?		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	T
	Dining Room	+		+	+		+	+	+									6
	TV Room				+												+	2
	Bathrooms																	0
	Exist doors						+		+	+					+		+	5
	Bedrooms				+	+												2
	Rooms doors				+													1
	Nursing station																	0
	Residents can't identify										+		+	+				3

Wayfinding systems

Themes	Interviewees																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	T
Assessment of the current wayfinding system: is it Successful? — Rationales	+	+															
Signage system																	0
Cues for wayfinding - landmarks																	0
Paintings																	0
Objects																	0
Arrows						+											1
Furniture																	0
None	+	+			+		+	+	+	+	+	+	+			+	11
What would help in wayfinding? — Rationales	+	+															
Signs		+	+	+											+	+	5
Cues - landmarks					+					+	+				+		4
Changing colors				+				+	+	+							4
Painting cues						+	+		+							+	4
Arrows							+					+			+		3
Staff help												+					1
Sound system																	0
Lighting design								+									1
People activity																	0
Plants																	0
Smells																	0
None																	0

Themes	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	T
																	Interviewees
1- is the GPU a dementia-friendly built environment?																	T
Yes			+		+	+	+		+		+	+		+			8
No	+							+	+				+				4
Rationales																	
2- Are the following spaces is dementia-friendly?																	T
Dining room																	0
TV room					+												1
Visitor room																	0
Exercise room																	0
Nursing station																	0
Bathrooms																	0
Hallways					+	+	+					+		+			5
Shower room																	0
Rationales																	
3- What is the missing activity at the unit?																	T
Group activities																	0
Personal activities				+					+	+			+	+	+		6
Playing activities					+												1
Homey activities										+			+		+		3
Profession activities									+					+	+		3
Music activities								+			+	+					3
Work station													+	+	+		3
Other							+										1

Dementia – friendly

209

Themes		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	T
Dementia – Friendly	Rationales																	
	4- What are the suggested spaces for the activities?																	
	Dining room																	0
	Visitor room																	0
	TV room																	0
	Special activity room													+				1
	Play room																	0
	Hallways																	0
	Exercise room																+	1
	Rationales																	
	5- Can we change the function of the:																	
	Visitor Room											+						1
	South Corner bedrooms																	0
	North Corner bedrooms																	0
	Corner rooms												+					1
	Exercise room																	0
	Rationales																	
	6- What is the suggested signage system?																	
	Enlarge text															+		1
	Accessible text																	0
	Pictorial signs								+	+	+	+				+	+	6
	Arrows															+		1

210

APPENDIX D:

THE META-ETHNOGRAPHY METHOD

THE FIRST-ORDER INTERPRETATIONS

This appendix is the first stage of interpretations the studies have been chosen to be analyzed for this study.

Themes		Alzheimer's Australia 2010
	Sample	Reference group members and workshop participants representing peak bodies such as Alzheimer's Australia Vic2.
	Data collection	Based on current research, knowledge and practical experience that might positively inform the building or renovation of residential aged care facilities
	Setting	
	Examined themes	Develop as dementia care practice evolves with ongoing experience and research
	Dementia Stage	All Stage of dementia
	Wayfinding	>> Landmarks, for example a particular tree or garden bed >> Interior and exterior neighborhood decorating schemes >> Sculpture, paintings and other decorative features >> Planned architectural features, like personalized doorways >> Changes in color >> Changes in lighting levels >> Changes in floor surfaces >> Results from a recent study suggest use of vivid color coding can improve short-term memory and improve ability. Older people find it increasingly hard to distinguish colors on the basis of hue and lightness. Color choice is important if cues are to be read appropriately.
	Dementia-friendly	>> Use of vivid color coding can improve short-term memory and improve ability. >> Keep signs simple as people may no longer be able to understand complex language or writing. >> Place signs at eye level, for those using wheelchairs. >> Use bright contrasting colors. >> Personalize room entries to make them more relevant to individuals. >> Create a regular schedule so daily life experiences are in the same place at the same time of day. >> Create purpose-specific rooms so people know what to expect when they enter them. >> Make key places such as dining rooms, bathrooms and living rooms easily seen.

Themes	Bissell 2010
Sample	Evaluation to previous studies.
Data collection	>> Observations >> Literature review
Setting	Built Environment
Examined themes	Tactics that have proven to be helpful in guiding those with dementia throughout a space involve lighting design, providing maximum visibility, integration of floor/wall patterns, identification of landmarks, and consideration for comfort.
Dementia Stage	Alzheimer's disease
Wayfinding	>> Lighting can be used to encourage both positive and prohibitive way finding and is a very important consideration when designing memory care facilities. >> Lighting is essential in guiding patients to community areas or to encourage activity in these areas. >> Visibility for both patients and staff in a dementia or memory loss facility is essential. >> A successful alternative to the keypad is to paint a wall mural on all exit doors. By painting the same color on the door and the panic bar, and by excluding trim around the door, the resident will see the door as merely another part of the wall. >> Color is a very powerful tool, and when used correctly, a successful one. >> In order to increase wayfinding within a space, color is necessary. >> Designed architectural features that help differentiate spaces can be archways, suspended or raised ceilings, columns, and fenestrations. Other landmarks that have been successfully used in memory care facilities are: an indoor garden, a large sculpture or fountain, a large view outdoors, etc.
Dementia-friendly	>> Wayfinding is the single most 23 important aspect of planning and designing for those with dementia. Wayfinding pervades daily decisions and actions in the lives of those with dementia.

213

Themes	Caspi 2014
Sample	>> 12 residents for in-depth study >> 10 consultation meetings with 13 staff and managers >> Phase I, lasted 2.5 months and included getting to know and building rapport with the staff and residents. Phase II, lasted close to eight months for participant observation as the primary data collection method, complemented by informal conversations primarily with staff and managers.
Data collection	>> Participant observation >> Semi-structured interviews with care staff and managers
Setting	Special care units
Examined themes	The spectrum of spatial disorientation and wayfinding difficulties experienced by residents.
Dementia Stage	Alzheimer's disease and related dementia (ADRD)
Wayfinding	>> Small-scale layout maximizes direct eye contact between staff and residents and therefore, improves staff supervision. >> Small scale units assist staff in early identification, prevention, and de-escalation of variety of behavioral expressions such as resident-to-resident aggression. >> Small-scale units were found in previous research to be associated with reduced levels of anxiety and depression, increased mobility and self-care skills, and increased quality of life.
Dementia-friendly	

Themes	Garcia et al 2012
Sample	Eight participating GPUs
Data collection	15 nominal focus groups
Setting	Eight care units.
Examined themes	Explore the perceptions of family and staff members on the potential contribution of environmental factors that influence disruptive behaviors and quality of life of residents with dementia living in long-term care homes.
Dementia Stage	Advanced stage of dementia
Wayfinding	
Dementia-friendly	>> Social environments were perceived to be more important than the physical environments, and flexibility in these environments was perceived to be essential. >> The results of this study suggest that individuals with moderate to advanced dementia manifesting disruptive behaviors would best be suited in a home that offers a homelike environment with minimal barriers, a certain degree of privacy to residents, and, above all, a minimal level of noise. >> The results of the study indicate that specialized physical design features can be useful for maintaining quality of life and reducing disruptive behaviors. >> Design elements will enable individuals with dementia to experience the best quality of life possible while reducing the care load on both formal and informal caregivers.

Themes	Liu et al 2014
Sample	2 groups of 15 person with early stage of dementia
Data collection	Control group, and observations
Setting	Hospital
Examined themes	Examine the special skills with special orientation perceptual spatial skills, cognitive skills, and functional spatial skills
Dementia Stage	Early stage of dementia
Wayfinding	>> Shape recognition >> Familiarity with common objects may have contributed to a better performance in wayfinding. >> The general findings of this study were that persons in the early stages of SDAT were impaired on all tasks of higher cognitive spatial orientation skills. >> Some of the basic spatial orientation skills were intact, namely, visual recognition of shape, visual and tactual discrimination of size, and left-right discrimination. >> On the mental representation tasks, the SDAT group was impaired in recalling the number of rooms as well as in placing these rooms in correct relation to each other. The significant impairment of the SDAT subjects in map drawing can be attributed to an impaired ability to mentally construct an image of the rooms and their locations relative to each other.
Dementia-friendly	>> Prevent behaviors problems

Themes	Mace 1993
Sample	15 months open observation
Data collection	Observations
Setting	Nursing homes, and hospital
Examined themes	Examine the built environment effect on residents' behaviors
Dementia Stage	Advanced stage of dementia
Wayfinding	Low impact changes affect the quality of life for residents
Dementia-friendly	Key-relaxed planning single rooms

Themes	Marquardt 2011
Sample	Evaluation of 45 studies related to dementia-friendly built environment.
Data collection	>> The available literature on wayfinding design for people with dementia in nursing homes was reviewed. >> empirical studies
Setting	Nursing homes
Examined themes	The design of the physical environment plays a major role in supporting the wayfinding abilities of people with dementia.
Dementia Stage	All levels of dementia.
Wayfinding	>> Environmental interventions that promote wayfinding can be implemented on two levels: the design of the floor plan typology and environmental cues, which comprise signage, furnishings, lighting, colors, etc. >> Signs and pictograms were identified as useful in supporting the identification of the bathroom doors with personal items increased their ability to identify their own rooms. >> A combination of multiple cues was found to be even more helpful, for example a portrait-type photograph of a resident as a young adult, a sign stating the resident's name, and personal memorabilia in a display case outside the room.
Dementia-friendly	>> Allow visual access and overview. Because of the degeneration of their brains, people with dementia cannot mentally represent spatial situations that they cannot see directly. Therefore, all places relevant to them should allow for visual access, and it should be possible for them to oversee their entire immediate living environment. >> Increase architectural legibility. The function of rooms and other spaces, as well as the behavior that is expected and appropriate there, can be made clearly legible by means of size, proportion, materials, and furnishings. In this manner, distinctive places that can better be memorized and located are created, thus promoting residents' spatial orientation and wayfinding. >> Interventions that proved useful included the use of mirrors on doors and a horizontal grid of black tape on the floor in front of the door. >> The positive effects of artificial bright light (2,000 lux [lx]) and also of outdoor natural light on people with dementia, both of which lead to positive effects, including increased sleep duration and less aggressive and agitated behavior.

Themes	Passini et al 2000
Sample	10 staff members that could be assumed to have different and complementary experiences were interviewed on an individual basis.
Data collection	1- Interviews with staff and administrative members of the nursing home 2- A wayfinding experience with a small number of patients reflecting different degrees of deterioration at the advanced scale of the disease.
Setting	Nursing homes
Examined themes	Patients with severe cognitive deterioration are able to reach certain destinations.
Dementia Stage	Advanced stage of dementia
Wayfinding	>> Learning wayfinding systems seem to be slow and the adaptation to the new settings may take months. >> It suggests that supportive wayfinding features can be incorporated in the design of therapeutic care units. >> Wayfinding performance, and the resulting degree of spatial mobility, is dependent on the patients' cognitive abilities and the nature of the physical and the human environment. An attitude of encouragement by the staff is all-important in prolonging the patients' autonomy and its prerequisite, mobility. >> The name given to rooms must relate to a function. It has to be consistent among the patients and the staff, to concord with the vocabulary used on signs and other wayfinding supports, and ought to reflect the cultural particularities of the patients as much as possible. >> It is generally agreed that identifying and recognizing a place represents a major challenge to the advanced Alzheimer's patient. >> Each floor should be treated with a different color to facilitate recognition. The color is repeated on doors and door frames. However, it was observed that the colors used were not sufficiently strong to be distinguished.
Dementia-friendly	>> The reaction of the Alzheimer's patients concerned mainly the surface treatment and patterns on the floor. >> The reactions are particular to individuals but nonetheless real. It seems that dark patterns should be avoided as well as any decisive separation of one area from the other. However, the major lesson from these observations is that design ideas concerning decorative elements must be pretested. It is indeed very difficult to foresee the emotional and interpretive reaction of an Alzheimer's patient. >> The photo is also seen as being helpful if the person can recognize him or herself. Photos taken in the past tend to be more easily recognized by the patients. It has also been suggested that the numbering is intended for visitors rather than patients, as few of the latter are able to retain their room numbers. >> An architecturally rich and articulated environment is helpful to all, but appears to be particularly important to the wayfinding of Alzheimer's patients. >> When the layout of a typical residential floor shows a certain symmetry, some patients confused with the two sides and tend to look for their rooms in the wrong corridor. This confusion is particularly evident with new patients. >> The ability to cognize the spatial organization of a building has been shown to be affected already at the early stages of Alzheimer's disease. >> Finding the circulation routes ought to be simple, they must not be monotonous.

Themes	Scialfa et al, 2004
Sample	Alberta Hospital Ponoka
Data collection	Case study that illustrates how we partnered with a multidisciplinary team of designers, architects, mental health professionals, and staff to develop wayfinding signage and related affordances for a facility in rural
Setting	Nursing Homes, long term care homes
Examined themes	Wayfinding systems for older adults who had a range of cognitive impairments.
Dementia Stage	Adult psychiatry, brain injury, and geriatric psychiatry
Wayfinding	>> Use environmental cues such as plants, works of art, and furniture because they are useful landmarks and reference points. >> Works of art (landmarks) should be simple, unique, and easy to label for subsequent reference. >> Works of art (landmarks) should be designed or selected based on the sensory and perceptual limitations of older adults. >> Use redundant cues when possible. A consistent combination of signs/symbols, landmarks, and color-coding will help minimize memory demands. >> Take advantage of color-coding because this is effective for older adults. Avoid colors in the short-wavelength (e.g., blue) range and emphasize colors in the long-wavelength (e.g., red-orange) range. >> Do not use dark lines/patterns on a light floor, as they are often interpreted as holes or pits by patients with Dementia of the Alzheimer's Type. >> Consider placing signs and information in the floor pattern because this is where dementia patients usually look when navigating. Signs mounted on walls are not usually helpful for such patients because they are not in their line of sight. >> Minimize the use of signs that require reading because many dementia patients cannot read. Simplicity Is critical.
Dementia-friendly	

Themes	The King's Fund's 2013
Sample	A clinically led multidisciplinary team that include estates and facilities staff, arts coordinators, modern matrons and other staff, alongside service-user representatives. To critically analyses both the care process and the care environment with service users before developing its plans for redesign and to enable innovative solutions to emerge.
Data collection	Qualitative and quantitated studies
Setting	British hospitals
Examined themes	There is increasing evidence that the environment of care in hospitals can have a significant and detrimental effect on patients with cognitive problems and dementia, leading to additional distress and confusion.
Dementia Stage	All Stage of dementia
Wayfinding	>>Poor signage & lack of wayfinding cues >> Poor use of color & contrast >> Lighting causing glare & pools of light and shadow >> Shiny floors >> Clutter and distractions >> Stark, unwelcoming spaces off long, featureless corridors >> No personalization of space >> Under-use of gardens and outside spaces
Dementia-friendly	Environmental changes that make a difference are: >> Transform corridors by providing handrails, appropriate artwork, thoughtful use of color & lighting, & regular resting points >> Maximize views of nature &, where possible, provide safe access to gardens >> Sub-divide large spaces such as day rooms & dining rooms to make them domestic sized so that they feel more homely >> Use bold accent colors & signage that includes pictures as well as text. >> Make sure patients have independent access to drinks & finger-food snacks all day long >> Make sure there are nice things to touch & hold and books, pictures, local photos, memorabilia to encourage conversation >> Install sanitary ware of a recognizable style, with contrasting colors for toilet seats & grab-rails >> Use numbers, colors & memory boards or boxes to aid orientation

Themes	Tily et al, 2009
Sample	26 dementia care institutions
Data collection	>> Based on the latest evidence in dementia care research and the experience of care experts. >> Comprehensive literature review.
Setting	Assisted Living Residences and Nursing Homes.
Examined themes	An effective care plan builds on the resident's abilities and incorporates strategies such as task breakdown, fitness programs and physical or occupational therapy to help residents complete their daily routines and maintain their functional abilities as long as possible.
Dementia Stage	All levels of dementia
Wayfinding	>> The physical environment can encourage and support independence while promoting safety. >> The optimal environment feels comfortable and familiar, as a home would, rather than a hospital. >> The environment should be less about physical structures and more about the feeling inspired by the quality of the place. Example: A home environment provides opportunities for residents to have privacy, sufficient lighting, pleasant music and multiple opportunities to eat and drink, and also minimizes negative stimuli such as loud overhead paging and glare. >> Providing easy, safe and secure access to the outdoors while maintaining control over unauthorized exiting enhances the environment.
Dementia-friendly	>> Residents should be encouraged to use their remaining skills in their daily activities. Use techniques that encourage residents to be as independent as possible. >> The outcome of an activity or social interaction is not as important as the process of engaging the residents. >> Make exits less obvious to reduce visual cues for exiting so the resident who wanders does not realize exiting is possible. >> Create activity zones with recreational opportunities, such as multi-sensory theme boxes, that residents can explore with staff encouragement. >> Environmental layout (shape of space and ease of getting around) >> Lighting and glare >> Presence of obstructions in both resident rooms and common areas >> Accessibility, visibility and safety of bathroom and dining room >> Sturdiness and visibility of handrails and furniture >> Contrast of the toilet and sink from the wall and the floor >> Safety and working condition of equipment and fixtures (e.g., bedside commodes, shower chairs, adequacy of brakes on wheel chairs) >> Appropriate use of personal safety devices, such as canes, walkers or wheelchairs >> Bathing facilities with non-slip surfaces

Themes	White 2013
Sample	Long term care homes
Data collection	>> Practice-based >> Experiential knowledge
Setting	Long-term care sector
Examined themes	Important physical design elements to facilitate the process of persons with dementia and their care partners to make sense of their environment and improve well-being.
Dementia Stage	All levels of dementia
Wayfinding	>> Floor plans should be simple, but not repetitive in order to increase wayfinding ability. >> Environments which compensate for perceptual difficulties are necessary to assist PWD in wayfinding >> Develop simple, easy to understand decision/reference points such as signage or specific landmarks when dividing long corridors. >> Avoid dead ends in corridors by creating comfortable seating, activities (e.g. life skill station), or signage at the end of the hallway to reorient PWD and lead them back to activity areas >> Landmarks are defined as orientation cues that establish a clear reference point and act as focal points within functionally different spaces. Buildings and monuments serve as focal points or landmarks for a city. Similarly, landmarks can be created for interior spaces by using distinctive architectural elements or by accommodating unique activities in smaller alcoves. >> Provide landmarks within functional activity areas and at entrances from corridors which act as distinctive cues. (e.g. clocks, artwork, hanging quilts, or furniture items to which the resident finds meaningful). >> Coordinate cues with the vocabulary used on other signs and ensure cues are reflective of the linguistic and cultural particularities of PWD to the greatest extent possible (18). In some cases, pictures may be more valuable than words for cueing and direction, although silhouettes of a man or a woman are not particularly successful (6). Where possible, consider using signs and pictures that include objects. >>Wayfinding to bedrooms can be aided by the use of important objects for each individual (e.g., having a picture (2- sided) hung from ceiling to draw attention to their room that include a photo of trains, dogs or other objects that are important to PWD). The picture should be hung about a foot length from threshold outside in hallway. This catches attention of people as they turn corners. >> Utilize signs and pictograms in various locations to support the identification of the bathroom (4, 26). To ensure the entrances to these areas are visually distinctive, consider placing the cue at different heights or areas within the view of PWD. This difference in levels of sight will ensure those walking up-right, those with a downward gaze, and those in a wheelchair can see the cue.

223

Themes	White 2013
Dementia-friendly	>> Visual access to major spaces such as activity areas increases their use
	>> Floor plan design of long-term care homes in particular has a significant influence on resident spatial orientation and wayfinding.
	>> Effective floor plans means less need for signage.
	>> Are common spaces popular for activities? Have distinct rooms and themes to accommodate behaviors.
	>> Incorporate recessed benches in the hallway to allow for resting by PWD who get tired from walking. Ensure that these are detailed in your fire plan
	>> Avoid flooring with patterns and reflective shine and high glare as PWD often mistake dark markings on floors as holes, bugs, etc., and glare is often mistaken for icy surfaces
	>> Toilets should be visually accessible and easy to find for PWD. The setup of the toilet areas should encourage and cue independent use through visual access and legibility.

APPENDIX E:

PRELIMINARY OBSERVATION

This appendix is a sample of the preliminary observation done by the researcher at GPU-TRI in January 2015.

STAFF INTERVIEW TOPIC GUIDE

INTRODUCTION

Thank you for reading through the Information letter about this research and for providing me the signed Consent Form.

This interview will be conducted as part of a study to develop design recommendations for addressing the needs of dementia-friendly built environments in Geriatric Psychology unit - GPU. My aim is to:

1. Promote an understanding of the principles of inclusive environmental design as a basis to achieve a dementia-friendly built environment.
2. Define and apply inclusive wayfinding systems in Geriatric Psychiatry Units.
3. Fulfill an urgent need to develop new and innovative ways of designing for persons with dementia that help in improving their behavior in the built environment rather than controlling behavior through pharmacological means.

My intention is to understand as deeply as I can your experiences and observations in the GPU and the role of the interior design and objects in the unit. As such, I would like to talk with you today for about 30-40 minutes. Please don't feel rushed and take your time to answer my questions. We can always reschedule the interview if you feel unable to fully participate today. Please know that you may stop the interview, or discontinue your participation in the study at any time.

GENERAL QUESTIONS

- Where in the GPU do the residents feel relaxed or at ease? Why? What would help them feel more at ease?

- How have behaviors and interactions of residents impacted the level of ease or unease?
- What have you noticed about their pace, movement, gestures, and routines around the unit? (At specific places?)

226

- What every-day processes and activities contribute to feelings of comfort? What is missing?

- What positive distractions have you noticed that foster positive feelings? (Images, laughter, smiling, sounds and gestures that diminish worry-some thoughts?

- What have you noticed about the places where residents prefer to visit with their loved ones? What is different about this place?

- What do you think have been the advantages and disadvantages of this GPU built environment, space, layout, decoration?

- If there is something you could do to the space to alleviate confusion or distress?

- What would it be? If there is something you could bring into the space what would it be? And why?

- Are there activities that you would like to see happening?

QUESTIONS ABOUT THE LAYOUT OF THE GPU

- Where do the residents prefer to stay? Why?

- Can the residents identify the exit doors, room doors, and spaces? What are the features that help them? Why?

- Where are the problematic spaces that encourage conflicts between the residents? Why?

QUESTIONS ABOUT THE WAYFINDING OF THE GPU

- Can the residents find their way from their rooms to the common spaces, like dining room and TV room?

- Are there some cues that help them in their wayfinding?

- In your opinion, what would help them in the wayfinding?

QUESTIONS ABOUT THE DESIGN OF THE GPU

- Which space is more attractive to the residents in general? Why?

- Which part of the hallway is more crowded than the rest? Why?

- What are the missing fixtures for caregivers and as residents (furniture or objects) in the current spaces now?

- What are the fixtures you are suggesting for the current spaces and for the future spaces?

- What are the interior design details that attract the residents in the spaces?

    1. Size 2. Light 3. Color 4. Furniture 5.Sound

- What are the colors that residents can identify?

- What are the colors that residents prefer?

- What are the objects that are annoying the residents?

- What are the objects that are preferred by the residents?

- What furniture annoys the residents?

- What furniture is preferred by the residents?

- What pictures annoy the residents?

- What pictures are preferred by the residents?

APPENDIX F:

OBSERVATION

Observation 1

Date/ 29th – January 2014

For the spaces:

1- Patients usually spend their times in the multi-purpose (MP) room and the TV room.
2- There is no public washroom for the patients, patients ask for help to take them to their room though it might be far away from the public spaces.
3- Patients cannot find the MP room independently.
4- There is a problem in the acoustic design in the public rooms. That was obvious in the piano time.
5- Few patients can move from MP room to the TV room.
6- Patients can see the persons behind the glass in another space and they try to talk to them.
7- When the staff changed the design of the MP room for the story time afternoon, the patients realized there was a change.
8- Patient entering some of the rooms having a look and leave.
9- The glass wall of the nursing stations looks like the drive through coffee order window to them.

For perceiving pictures and colors:

10- Pictured Signage are more perceivable by patients rather than text signage.
11- Patients can recognize the change of colors of the walls by touching it.
12- Patients are worry about changing the color of flooring.
13- Patients are realizing the change of furniture color.
14- Touching the fire alarm window.
15- Some patients could realize the nature pictures like beaches, forests and mountains.
16- Some of the patients can realize the set color of (Blue, green, red, and yellow).
17- Most of the patients familiar with cats and dogs pictures. The eyes of the cats attract their attention.

For furniture:

18- Touching the hand rail of the walls to figure out more than for support.
19- When a patient wants to sit on a chair, sometimes cannot see the other patient is sitting on the same chair.

For lighting:

20- When the area is dark more than other areas, patients get confused where to go.
21- The lighting effects the patients behaviour (patients touch the floor trying to touch their shadows).
22- Patients prefer to sit on the corridor sitting areas more than in the public rooms for a rest.

Recommendation:

1- The researcher has to attend the activity sessions between patients and the specialist to have more information regarding the patients' responses to the colors and pictures.
2- Patients depend on touch sense to understand the changes in the environment.
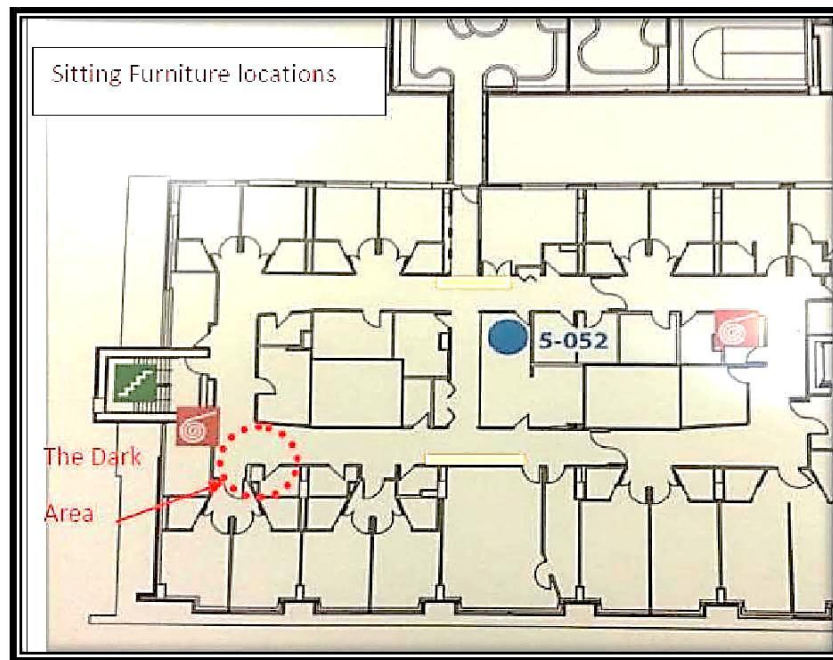
Figures:

Figure (1) this figure illustrates the main location of movable furniture.
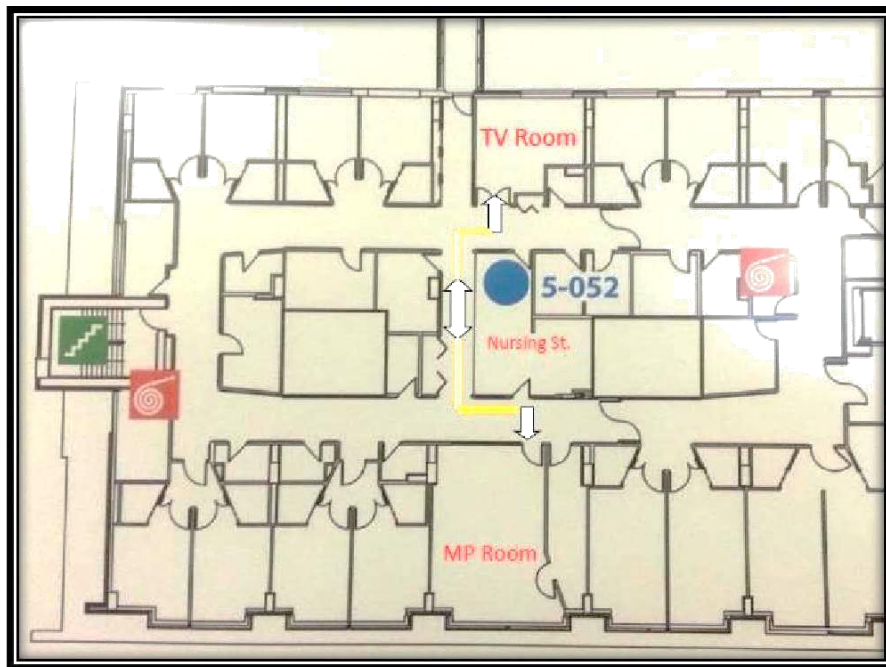
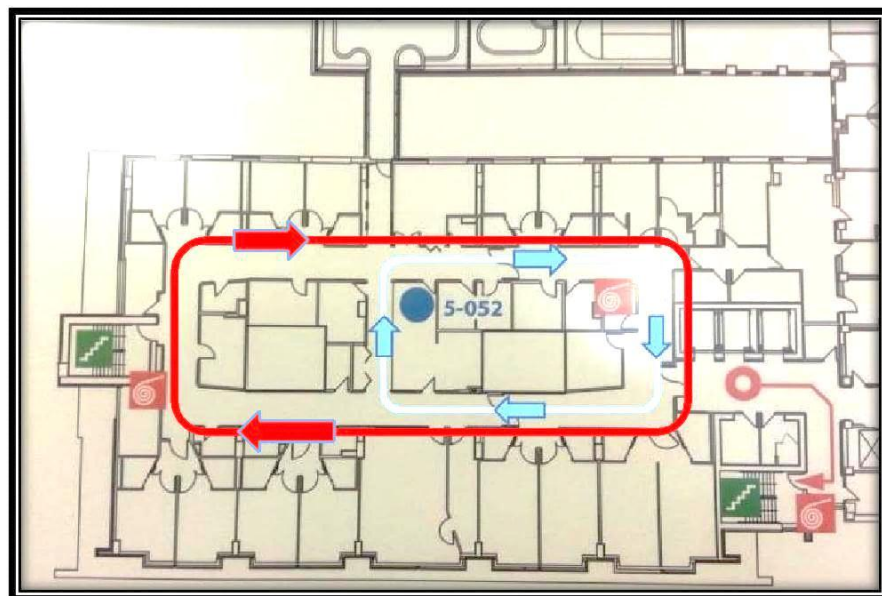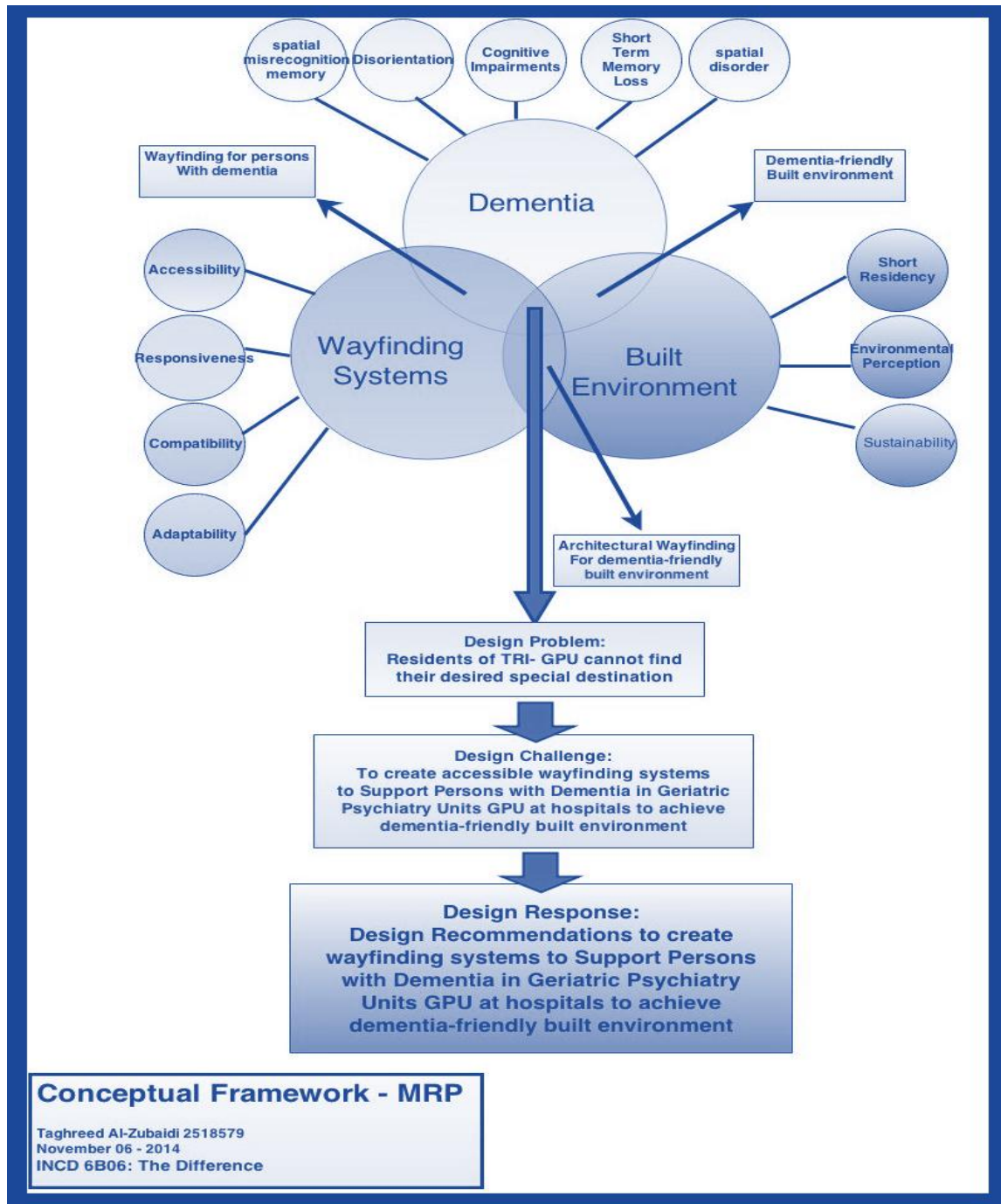Figure (2) this figure illustrates the circulation of the residents between the MP room and the TV room

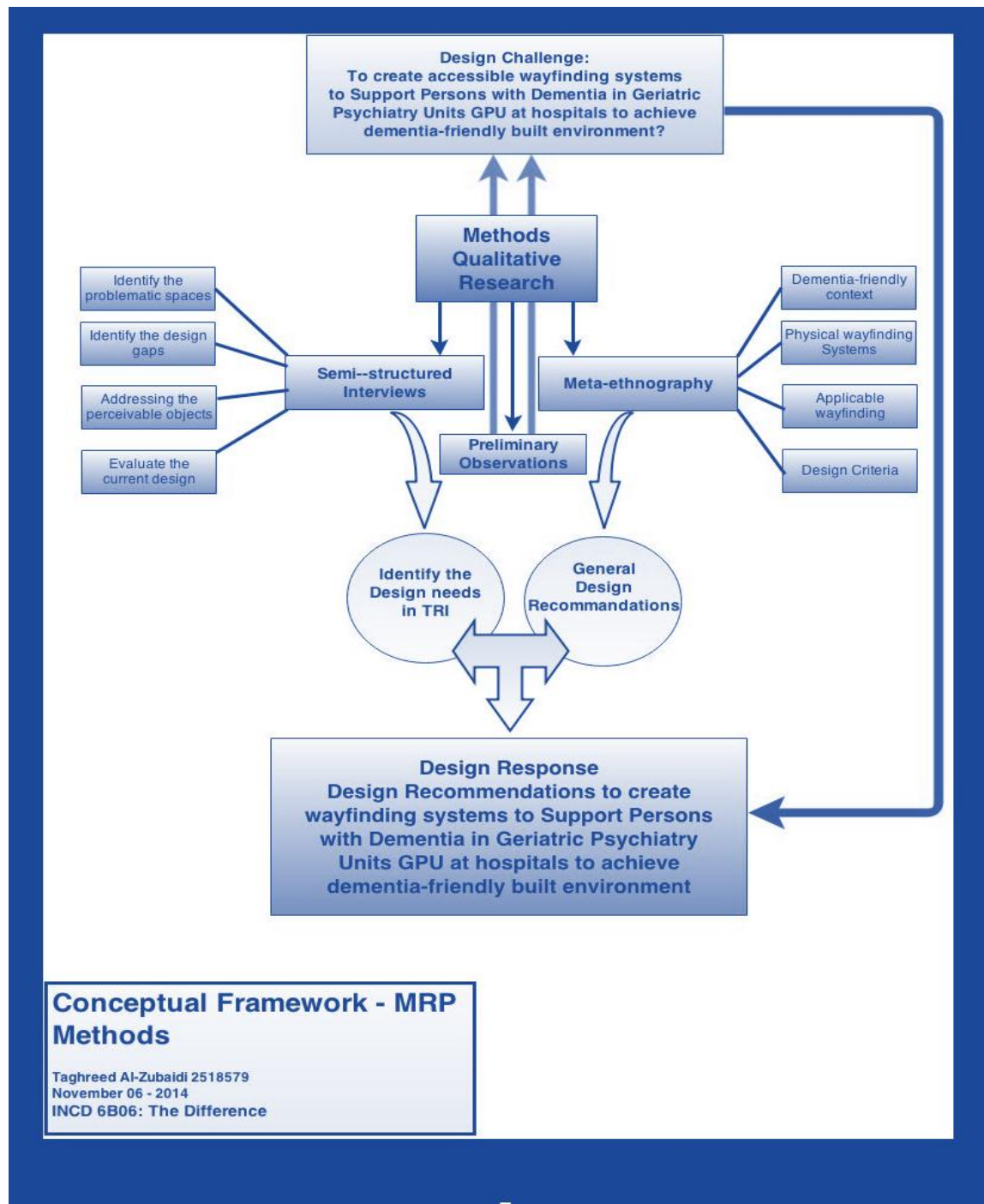Figure (3) this figure illustarates the circulatin rounds within the unit.

APPENDIX G: CONCEPTUAL FRAMEWORK - MRP

Conceptual Framework - MRP

Taghreed Al-Zubaidi 2518579
November 06 - 2014
INCD 6B06: The Difference

APPENDIX H:

CONCEPTUAL FRAMEWORK - METHODS

Design Challenge:
To create accessible wayfinding systems
to Support Persons with Dementia in Geriatric
Psychiatry Units GPU at hospitals to achieve
dementia-friendly built environment?

Methods
Qualitative
Research

Identify the
problematic spaces

Identify the design
gaps

Addressing the
perceivable objects

Evaluate the
current design

Semi--structured
Interviews

Preliminary
Observations

Meta-ethnography

Dementia-friendly
context

Physical wayfinding
Systems

Applicable
wayfinding

Design Criteria

Identify the
Design needs
in TRI

General
Design
Recommandations

Design Response
Design Recommendations to create
wayfinding systems to Support Persons
with Dementia in Geriatric Psychiatry
Units GPU at hospitals to achieve
dementia-friendly built environment

Conceptual Framework - MRP
Methods

Taghreed Al-Zubaidi 2518579
November 06 - 2014
INCD 6B06: The Difference

237

APPENDIX I:
RESEARCH TERRAIN

Taghreed Al-Zubaidi
Research Terrain - 2014