

Dwellings for Dementia

Researching the impact of design on well-being of people with dementia.

The built environment cannot change the fundamentals of care for people with dementia, but it can certainly facilitate or hinder this system. Poor design can cause stress and neuropsychiatric symptoms at patients and related work stress at care providers. This study will focus on the built environment as a factor to mitigate such problems and to advance health and well-being of patients and staff. It does so in three stages. First, it combines literature review with Delphi method to reach consensus on relevant critical success factors (CSF) with experts, patients, and relatives. Second, in a naturally occurring field experiment CSF is applied to four real-estate projects of long-term care facilities; and its impact is measured. Measurements include evaluative staff comments on neuropsychiatric problems and stress of patients and perceived workload and actual sick leave of staff. Third, user participation is introduced to assess improved decision making in these real-estate projects.

Relevance

Although sick building syndrome (EPA, 1991) and evidence based design (Ulrich et al., 2008) have shown that there is a general impact of the built environment on human health, there is still little understanding of the impact of such designs on the quality of life of individuals with dementia (Brawley, 2001). This is a real problem because for a long time it is well-known that behavioral problems, such as wandering, falling, escaping, temporal and spatial disorientation, can be stirred up by stress interaction between the patient and the built environment (Valla and Harrington, 1998). These behaviors do not only cause stress and related problems at patients, but also increase work load at staff, work inefficiencies, and related cost for society. In Dutch nursing homes for many patients and staff such situations are still vividly present. This situation can be improved, not only by modifying inefficient buildings, but also with positive changes. To wit, the built environment is also



associated with positive influences. In the context of dwellings for dementia, Calkins (2009) advises to use the environment as a first line treatment of agitation, aggression, depression, rather than beginning with pharmacological interventions. Moreover, Fleming and Purandare (2010) mention, for instance, that a great many people can benefit from small-sized spaces, enhanced visual access, domesticity, safe outside spaces, and objects rather than color for orientation. With respect to domesticity Rijnnaard et al. (2016) also refer to the designs and divides between private spaces and spaces that residents share with others. Although the list of potential benefits is rather comprehensive, it still lacks scientific rigor at the patient and staff level. Longitudinal comparative empirical studies that monitor the effects of changes in the built environment at patients and staff in detail may fill that gap. This study does so in combining knowledge from medicine and built environment.

Objective of the study

The overall objective of study is to improve the quality of life of people with dementia by improving the efficacy of dwellings for dementia. It is also studied if these more efficacious buildings have a positive influence on evaluative staff comments on neuropsychiatric problems and stress of patients, patient autonomy, perceived workload and actual sick leave of staff. Moreover, we also intend to include psychotropic-drug use and job satisfaction as outcome measures. The objective can be divided into 5 coherent goals:

1. A literature-review-based definition of critical success factors (CSF) for specifically designed dementia dwellings (SDDD) that enhance patient and staff outcomes. Outcome measures include the quality of life of people with dementia, reduce reported stress and neuropsychiatric symptoms, psychotropic-drug use, perceived workload and actual sick leave of staff as well as increase of job satisfaction of staff. CSF consensus by means of a Delphi method with experts, patients, and relatives, prioritized on relevancy and expected impact.
2. An application of relevant CSF in four actual real-estate developments of dwellings for people with dementia. Key factor in these design processes is user participation. We acknowledge the differences in the preferences and experiences of people with dementia and staff. In the four different design processes, we will consult with focus groups of users, detailing CSF to a variety of relevant design applications.
3. To develop an implementation toolkit for user participation, applicable in design processes of SDDD;
4. An impact measurement to assess the effect of the CSF on patient and staff outcomes mentioned above (see 1).
5. User participation is introduced to assess improved decision making in the four studied real-estate projects by improving user input and identifying a variety of design applications, such as virtual reality and building information modelling (BIM), that comply with CSF for SDDD.



Research strategy

Hypothesis 1a: Patients in specifically designed dementia dwellings experience better quality of life and, by doing so, also have significantly lower rates of reported stress, reported neuropsychiatric problems, and psychotropic-drug use than in less favorable dwellings.

Hypothesis 1b: Staff in specifically designed dementia dwellings experience higher job satisfaction and, by doing so, have significantly lower rates of perceived workload and actual sick leave than in less favorable dwellings.

Garre-Olmo (2012) found that interventions to ambient factors such as light and temperature increased the quality of life (QoL) of institutionalized individuals with severe dementia. If these findings can be replicated, confirmed, and extended in The Netherlands, this would not only mean improved QoL of many more patients, but also related work pleasure at staff. Moreover, if neuropsychiatric symptoms can be reduced, the perceived workload of staff will be decreased as well as absence due to illness, and patient drug use. Consequently, this will lead to serious cost reduction for Dutch society.

Valla and Harrington (1998), advise us to study human functions at people with dementia in their actual built environment. This is why the design of this study is a naturally occurring field experiment. The core of the study involves a definition of CSF, the design of four SDDD with CSF, a measurement of its impact in patient and staff in a pre- post-test design. Regular old nursing-home buildings to be transformed in a SDDD with CSF-infused real-estate projects are studies in a convenience sample (based on the motivation and possibilities to participate).

In order to address stress-induced and other related problems in the physical environment, this study aims at defining, applying, and validating critical factors in the design. Relevant factors will be applied in four new (re)developed SDDD and tested with respect to their effects on stress and behavior. More precisely, in 4 following steps:

1. a) Literature review to identify relevant CSF for SDDD. The study will build upon existing reviews such as Van Hoof (2010), Fleming (2010), and the work done by Stirling University (<http://dementia.stir.ac.uk>). Outcome: a longlist of built-environmental factors capable of positively influencing QoL of people with dementia, a shortlist (CSF) with expected high impact on QoL.

b) Delphi study to reach consensus on the CSF and to further prioritize these. Prospective participants in the Delphi-study are people with dementia and their relatives, nursing-home nurses, occupational therapists, clinical psychologists, elderly-care physicians, architects, and interior designers. Outcome: an experience-based and refined CSF in design for SDDD with expected high impact on QoL.



c) Case selection of four nursing-home real-estate projects that allow for design interventions. Selection will be done by the research team and is based on timing (stage of the design process, decision-making process, and planning), possibilities to influence the design with CSF, and most importantly on the motivation of CEO and staff of the nursing home. Management of the real-estate developer also has to be committed. It is expected that the intervention projects will be studied in sequence of implementation practices. This provides the research team with the opportunity to learn from experiences and performed tests gradually during the execution of the projects. Outcome: four selected highly motivated cases.

2. Implementation of CSF and user participation. First, CSF will be incorporated in the program of requirements (to be used in the design of the real-estate projects to be studied, transforming them into an SDDD). This will be done as detailed as possible in the respective stages of the projects. Second, during the design process user participation will be key. Focus groups of people with dementia, their relatives, and staff will be invited to provide input in the different design stages. 3D-modeling will be developed and applied at the Experience Center (University of Groningen). This vivid experience is expected to ease participation, i.e. involvement of non-experts in design.

Outcome: 4 SDDD, participatory design.

3. While in this process, relevant factors in decision making that positively influence the use and implementation of research outcomes will be assessed. This will result in guidelines for effective decision making in the design and development process.

Outcome: implementation toolkit.

4. For testing the effects an RCT is not appropriate because controlling the conditions in a control group is not feasible and the interventions in the experimental group of 4 nursing homes are not homogeneous. In a pre-post design the measurements will include 2 pre-test measurements (3 months before baseline, at baseline) and 2 post-test measurements (at 3 and 6 months). This is needed to allow for both time effects (gradual changes from -3, 0, 3, 6 months and changes due to the intervention (differences between 3 and 6 months compared to -3 and 0 months). Effects can be associated with the degree of implementation (the degree at which the design complies to CSF). Applied scales are Qualidem (QoL) in dementia (Ettema 2005), NPI-NH (neuropsychiatric problems, Cummings 1994) and NPI-NH (perceived workload), MAS-GZ (Maastricht questionnaire of job satisfaction, Landeweerd, 1996)); medication files will be used to measure psychotropic drug use, HRM files for sick leave of staff, patient files for evaluative



staff comments on stress, behavioral problems. Interviews with groups of patients, relatives, and staff will be held to assess their experience with SDDD. Sample size calculation is not relevant because of the nature of this field experiment study. If we are including 65 residents and 65 staff per experiment, we will allow to detect changes > 0.5 SD (assuming alpha 0.05 and beta 0.2) changes in residents and staff due to death and job change respectively. The actual power will be greater due to repeated measurements.

Outcome: majority of ready-for-use validated measurement tools.

Cost Effectiveness

It is too early to do a cost-effectiveness analysis for this study. Low job satisfaction may lead to absence due to illness, which entails high costs for a care organization. A single percent-point reduction of the average yearly absence due to illness alone will in a medium sized care organization yields a cost reduction of up to yearly € 400.000,-.

Research Group

This PhD study will be carried out by Universitair Medisch Centrum Groningen huisartsgeneeskunde Sectie Ouderengeneeskunde. Principal researcher is drs Arnout Siegelaar MPH MRE, healthcare real-estate expert.

The supervising committee consists of:

- Dr. F. Boersma
- Prof. dr. M. Joëls
- Dr. M. Mobach,
- Drs. C. Oranje
- Dr. ir. J. van Hoof
- Prof. dr. S.U. Zuidema

The members of the committee are leading scientists in their fields. Prof. Zuidema and Dr. Boersma did extensive research on neuropsychiatric symptoms, psychotropic-drug use and non-pharmacological interventions in people with dementia. Dr. Mobach is leading professor of the Research Centre for Built Environment at Hanze University of Applied Sciences and co-supervising (PhD-)projects on the effects of the built environment on humans in long-term care facilities. Dr. Van Hoof is Program Leader Nursing Home of the Future.

