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*Published in:*

Healthcare and Society: new challenges, new opportunities

2016

[Link to publication](#)

*Citation for published version (APA):*

Persson, J., Erlingsdottir, G., Olander, E., Löfqvist, L., & Johansson, G. (2016). Innovations to support people in the physical environment in homecare – a workplace for one, a home for the other. In *Healthcare and Society: new challenges, new opportunities*

*Total number of authors:*

5

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## **Innovations to support people in the physical environment in homecare – a workplace for one, a home for the other**

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### **Abstract:**

The amount of care provided in the home will grow significantly as care transforms to meet the challenges of an aging population. When care services move into the home, this environment becomes a workplace for a number of professionals, while still being a home for the care recipient. Much equipment and material is needed in the care situation and tends to turn parts of the home into a hospital. In an ongoing research project with home care organizations in Sweden, we are examining the need for improvements in the physical environment in home care and generating solutions to meet these needs. The solutions need to be functional for the home care workers and at the same time be attractive and preserve a homelike atmosphere. We have observed how issues related to hygiene, working surfaces, disposable materials, and lighting can result in non-ergonomic work postures, eye strain, and other risks for the practitioner and the care recipient. Emanating from these issues, university students have been engaged to generate a number of concepts and prototypes from a product development and design perspective. These prototypes are now ready to be evaluated in the home care context to gain feedback from care recipients, relatives and home care workers. The close collaboration with the actual healthcare setting in which these solutions are meant to be used has called attention to the fact that there is no existing business model or market for these types of products. This paper presents some of the innovations and discusses the problems that are connected with the marketization of these types of new products.

**Keywords:** Home care, transition of care, physical work environment, design, business model

### **1. Introduction**

Healthcare is increasingly provided in the home as a means to save resources and to make the care more efficient, but also as a service to the citizens who prefer to be cared for in their own home (Genet et al., 2011). When care services move into the home, this environment becomes a workplace for a number of professionals, such as assistant nurses, nurses, physicians, and physiotherapists who perform services ranging from assisting with personal hygiene or preparing breakfast to more healthcare-related activities such as giving injections, dressing wounds or managing medical devices. Much equipment and material is needed in the care situation and it becomes part of the home environment. The home should not be turned into a hospital for those who live there, while efforts need be taken to create a good work environment for the home care workers. Merging these often contradictory needs can be a challenge and home care often generates zones in which a hospital-like feeling dominates.

### **2. State of the Art**

The homelike atmosphere is important for older adults. It represents personal values and lifestyle and it provides a feeling of safety (Gillsjo, Schwartz-Barcott, & von Post, 2011). Preserving this atmosphere is hence central when introducing changes related to homecare. Designing for a

homelike feeling in special care residences for elderly has been studied to some extent (de Veer & Kerkstra, 2001; Vihma, 2013) as well as interventions for increasing the independency of the care recipient (Hjalmarson & Lundberg, 2015; Rechel et al., 2013). While research related to receiving care in the home and its impact on the older adult's sense of "being at home" has not gained much attention (Gillsjo et al., 2011).

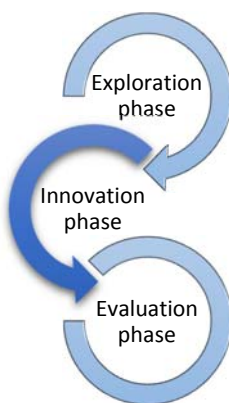
On the other hand, working in home care is associated with several occupational hazards (Hignett, Edmunds Otter, & Keen, 2016; National Institute for Occupational Safety and Health, 2010). These can be due to lifting, pushing or pulling and uncomfortable work postures. Contamination, slips and falls are other risks. Absences due to long-term sick leave are common among Swedish home care assistant nurses and nurses (38.4 and 23.7 of 1000 employees, respectively), where musculoskeletal disorders and mental illness are most common (AFA Insurances, 2014). Improvement of this environment related to providing care is thus highly motivated.

The integration of these two sides: designing for a homelike feeling and independency for the care recipient, and an improved occupational situation for the home care worker needs further research attention.

### 3. Objectives and Methods

In a research project with home care organizations in Sweden, we examined the need for improvements in the physical environment in homecare with the aim of generating both useful and attractive solutions to meet these needs. The focus is not on generating new technical aids, such as a new lifting device, but on understanding how a smart working surface or lighting can be designed to support home care workers in the care situation and blend into the home of the care recipient.

The research project is divided in three phases: the exploration phase, the innovation phase and the evaluation phase. The exploration phase has been concluded and the results were presented at the 19th Triennial Congress of the IEA in Melbourne 2015 (Johansson, Persson, Olander, & Erlingsdóttir, 2015). The objective of this paper is to present the results of the innovation phase, in which several concepts have been developed, and to discuss problems that are connected with the marketization of this new category of products.



1) The *exploration phase* involved observations and analyses of the home care situation to identify areas that would be relevant to further investigate.

2) The *innovation phase* followed in which the problem areas identified in the exploration phase have been scrutinized to generate concepts and prototypes. This phase is the focus of this paper and will be described in more detail further on.

3) The project will be concluded with an *evaluation phase* in which the most promising concepts and prototypes from the innovation phase are further developed and tested in the home/working environment for feedback from home care workers, care recipients and relatives. This phase will be implemented in the autumn of 2016.

### 3.1 The innovation phase

The physical environment of homes where care is provided was studied in the exploration phase to identify areas in need of innovation. This was done through interviews and by shadowing home care workers when they were working in people's homes (Czarniawska, 2014). The areas that were identified included hygiene, working surfaces, disposable materials, and lighting (Johansson et al., 2015). These needs areas were presented to Master and Bachelor level students (students in industrial design, product design, and mechanical engineering) with the task of designing and developing concepts and prototypes aimed to meet the needs identified.

The work process differed depending on if the students were carrying out the assignment in a shorter course or as a project for their Bachelor's or Master's degree. The main approach was similar though, emanating from a product development process that included aspects related to both the usage and aesthetics (Ulrich & Eppinger, 2014). The students have had access to the collaborating home care organization, the researchers' material from the exploration phase and the researchers as supervisors and sounding boards. An occupational therapist is also involved in the project to contribute knowledge about ergonomics, such as strain and stress, in order to guide the students in these aspects.

## 4. Results & Discussion

Several concepts and/or prototypes have been generated (see table 1).

| Needs area                         | Number of concepts/prototypes |
|------------------------------------|-------------------------------|
| Work posture                       | 3                             |
| Material storage and work surfaces | 5                             |
| Lighting                           | 4                             |
| Handling medicine                  | 21                            |
| Other (e.g. new technology)        | 3                             |

Table 1. Overview of concepts/prototypes generated in the innovation phase.

Some of these have been developed on a briefer conceptual level, while others have been elaborated to the point that physical prototypes could be built and tested. A great part (16 of 21) of the concepts generated for the medicine handling needs is the result of a complete class of students in mechanical engineering that approached this topic in their group project assignment. It resulted in 16 3D-printed prototypes for extracting pills from blister packs, which had been identified as a source of hand strain problems in the medicine handling situation. Hygiene was not presented as a needs area of its own, even though it was presented as one in Johansson et al. (2015). Instead, it has been present in all the concepts by requiring the students to generate ideas that had to meet hygienic requirements, such as materials that tolerate cleaning and disinfection. Two of the concepts will be presented in more detail in this paper to exemplify the process and the results: a piece of storage furniture that includes a portable work surface, and a lighting concept.

#### *Storage furniture concept*

The aim of the storage furniture is to have a placeholder in which all the material related to the care situation (e.g. medicine, disposable material such as gloves and material for dressing wounds, and written information related to the care recipient's health status), can be kept in one place. The full process and resulting drawings can be found in Lokøy & Zagar (2016). One early and one late version of the concept is shown in figure 1. The product consists of three modules that can be configured in various combinations, supplemented with a base block and a tray top to complete the

configuration. The three modules are individually designed to fit specific needs: one standard cupboard for storage of standard material such as disposable gloves; one module for medicine handling including a foldable, designated working area for the task; and one drawer for storage of larger volumes such as a two-week consumption of diapers. This design creates a piece of storage furniture that is flexible enough to fit the diverse needs of different care recipients. The top tray is also removable so that material can be put there and carried to the location of the care recipient for further interaction. The idea is to also offer the furniture in various materials so that the care recipient can choose an exterior that fits in with their home environment.



Figure 1. Early (left) and late (right) versions of the storage furniture concept. Concept and images by Lise Lokøy and Viktoria Zagar.

One example where this type of furniture would be useful is when an injection is given. The medicine and material for performing the injection can always be found in a furniture module, be prepared on the tray and then transported to where the care recipient is located. In current practice, this procedure is different at different care recipient's homes. Since it is not always clear where the material is kept, the preparation may have to be done on the kitchen table or something similar. If the care recipient is not near a table, the material is often placed on the floor or directly on the care recipient's body during the actual treatment.

#### *Lighting concept*

The lighting concept shown in figure 2 is a flexible spotlight, the function of which is to provide sufficient lighting when treating the care recipient. Examples of this are when giving an injection or inspecting a wound. Demands on brightness and colour are important aspects to ensure the ocular inspection is performed correctly. The light is designed so that it can be easily attached to an existing lamp in the home and expanded when the home care worker needs it. At other times it can be hidden inside the lamp or used by the resident as a reading light.



Figure 2. The lighting concept consisting of a flexible spotlight that can be integrated into existing lighting solutions. Concept and images by Martin Cavdarovski, Per Croona, Albin Loeb, and Linus Malmberg.

#### **4.1 Putting the product on the market – who is the customer?**

The exploration phase analysis identified a need for products that are useful in the caring situation. The innovation phase has generated several interesting, useful and attractive solutions to meet these needs. However, there is no clear organization for the provision of these types of products in home care. The needs of the care recipient are currently evaluated when the caring situation arises, and healthcare aids are prescribed that are relevant to adjusting the home environment to those needs. If the home care workers have their own special needs for an aid or device that helps them perform certain activities in a safe manner, it is the employer's responsibility to attend to it. Still most of the present solutions and aids are focused on the care recipient, not the caregivers. A piece of storage furniture, like the one presented in this project, is not included in the organization of the home/work environment.

A number of questions emanate from this: Who should be responsible for supplying these types of aids? Who should pay for them? Is the aid for the home care workers so that they can more easily find the material they need? Or is it for the care recipients so that they do not need to have the material lying in plain sight on the kitchen table? Does the care recipient, who is often an elderly person, want a new piece of furniture in the home? Will the aid just be a loan that is later handed back? Should the staff move around the aid between users? All these issues are affecting the market for the product. The project results have illuminated a fundamental problem that does not have a solution in the Swedish context in today's home care organization. Activities to highlight and further discuss this issue will be carried out within the framework of the project. This paper is one way of initiating the discussion in an international context.

#### **5. Conclusion & Perspectives**

Students from design and engineering have served as partners in the project. They can approach the problem areas with a product development and design perspective. This approach has resulted in a number of innovations that aim to improve the physical work environment in home care without affecting the home-like feeling for the residents. This differs from a more pragmatic and function-based approach that is the current standard for developing care support products.

In the next step of the project we will evaluate some of the products designed in the project in different home care settings. In parallel, we will contact and meet different companies to discuss their interest in these types of product and their view of the market situation. We will also lift the discussion to various authorities in the society responsible for working conditions and for elderly care in order to highlight the problems.

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