HAAL Symposium

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During this symposium we will share the findings of the HAAL project. The overall aim of HAAL is to support people with dementia, their loved ones and care professionals during the different stages of dementia through embedding multiple cares and well-being technologies in an AAL bundle. Partners from the Netherlands, Taiwan, and Italy collaborate and share their experiences in the HAAL project, on the topic of supporting dementia care through state-of-the-art AAL bundles. During the project a Decision Support System (DSS) was iteratively developed and evaluated. In this symposium there will be three presentations focusing on the discuss the insights gained during the in-field evaluation of the DSS, technological development of the DSS, activities conducted with regard to the responsible development of the DSS. Lastly, there will be an interactive workshop providing insight and tools on how to apply co-design.

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The evaluation of a decision support system integrating assistive technology for people with dementia at home

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Purpose With a decreasing workforce of carers care (Denny-Brown et al., 2020) and a transition from care homes to home (Rogers and Mitzner, 2017) people with dementia (PwD) increasingly rely on informal caregivers (ICs) and assistive technologies (ATs). In practice, using multiple ATs still often implies using different separate point solutions and applications. However, the integral, combined use of the data generated using various applications can potentially enhance the insight into the health and well-being status of PwD and can provide decision support for carers (Horsky et al., 2017). **Method** The current study presents the formative evaluation (HAAL beta trial) of a Decision Support System (DSS), connected to multiple ATs. The DSS provides an insight into the physical and cognitive status of the person with dementia, as well as an insight into sleep activity and general well-being. Semi-structured interview sessions were administered, and questionnaires were conducted in the three participating countries (Netherlands, Italy, and Taiwan), and involved 26 older individuals with dementia, alongside 20 informal and 37 formal caregivers. **Results and Discussion** Throughout the study, a multitude of challenges surfaced, spanning various domains. Foremost among these challenges was the notable heterogeneity in the manifestation and severity of dementia among the participating individuals. This diversity posed significant hurdles, particularly during the recruitment phase. Many family members hesitated to enroll their older relatives in the trial due to uncertainties surrounding their reactions and willingness to accept the installation of monitoring devices within their homes. It is paramount to devise scalable and user-friendly solutions to ensure widespread acceptance and ease of use. For example, consolidating the functionalities of various devices into a unified solution not only enhances user acceptance but also mitigates technical challenges associated with data integration. Moreover, it was imperative to discern the specific requirements and preferences of individuals at different stages of dementia. Notably, users exhibited a preference for devices demanding higher levels of interaction. The results, suggest a focus on proposing devices that strike a balance between challenge and adaptability, accommodating the varying cognitive capabilities and technological proficiencies of each participant. In summary, the HAAL beta trial underscored the need for nuanced approaches in addressing the heterogeneous nature of dementia and tailoring technological interventions accordingly. By prioritizing user interaction, scalability, and integration, we can pave the way for more effective and inclusive solutions in dementia care.

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Designing an integrated dashboard for the comprehensive measurement of well-being in people with dementia: A multidimensional approach

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Purpose The rising ageing population affected by dementia urges for a comprehensive monitoring approach to improve care quality and mitigate caregivers' burden. Literature reports that traditional monitoring methods may fail in capturing the overall aspects of well-being in individuals with dementia (PwD) (Jackson, 2020). Using heterogeneous sensor networks for continuous measurement, objective data collection across physiological, behavioral, and environmental parameters may provide a solution. A holistic dashboard that aggregates and analyzes this data can provide actionable insights, facilitating timely care adjustments and optimizing resource allocation (James et al., 2022; Moore et al., 2020). This approach enhances care quality, improves PwD's quality of life, and significantly reduces caregiver burden by prioritizing their focus on personal and emotional support. Therefore, the purpose of the HAAL project is to aggregate innovative products from previous initiatives into a holistic dashboard tailored for PwD. The HAAL dashboard aims to enter the AAL industry and foster a learning community across Italy, the Netherlands, and Taiwan, demonstrating that integrating multiple devices can enrich the platform's value (Morresi et al., 2022). **Method** A wellbeing dashboard has been developed with embedded algorithms to evaluate the overall wellbeing of patients, incorporating data from the HAAL sensor network. The algorithms that monitor various aspects of PwD wellbeing analyze and measure deviations from typical patterns over a period of two weeks, using filtered data to enhance outcome quality. The result of these algorithms are color-coded indicators for assessing wellbeing quantitatively and detailed charts for trend visualization, facilitating quick caregiver assessments. It displays well-being indicators related to general wellbeing (combining sleep, toileting, and eating patterns), sleep activity (from the Whizpad smart mattress), cognitive status (from cognitive game scores), and physical status (recorded by Sensara), all varying in size and color based on device data. **Results and Discussion**. As preliminary results, considering a monitoring period of 36 days, the physical wellbeing of one PwD was monitored, in the framework of the pilot testing. The dashboard's results from the monitored period show that for the physical wellbeing, 38% were rated as BAD, 35% as GOOD, and 18% as NEUTRAL, while the remaining 9% represent days when data collection was interrupted due to sensor malfunctions. This result provides valuable insights to help the caregiver in monitoring daily the PwD, deciding the type of treatments, but also decide whether to promptly intervene or not.

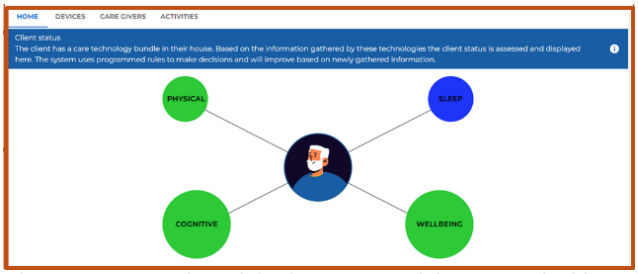

Figure 1. Screenshot of the homepage of the HAAL dashboard for a patient

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Moving from principles to practice: navigating responsible AI-assisted decision-making in the care for older adults

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Purpose The use of AI-based technologies such as decision support systems (AI-DSSs) could support caregivers of older people in assessing and diagnosing care needs, as well as planning, implementing and evaluating care strategies (Buchanan et al., 2020; Martinez-Ortigosa et al., 2023). However, it is broadly acknowledged that the deployment of AI-based technologies in healthcare creates ethical and social challenges (Morley et al., 2019). In recent years, there has been a growing prevalence of high-level guidelines and frameworks to provide guidance on responsible innovation in AI-based technologies. However, current guidelines still leave much room for interpretation (Hagendorff, 2020) and only a few studies specify how AI-based technologies can be responsibly embedded in specific contexts such as the nursing process in the long-term care (LTC) (Lukkien et al., 2023). Therefore, we iteratively explored from a multi-stakeholder perspective how AI-DSSs can be responsibly developed and deployed to support nurses and other stakeholders in the long-term care for older adults. **Methods** The study performs a mixed-methods approach, involving a survey and focus groups with innovators in the HAAL project, and semi-structured interviews with nurses and other professional caregivers in LTC who may use AI-DSSs in the future. Inspired by the DSS in the HAAL project, two imaginary scenarios about the future use of AI-DSSs were defined beforehand and used to enable participants to articulate their expectations regarding the opportunities and risks of increasingly advanced AI-DSSs, and to brainstorm about possible strategies to foster responsible AI-assisted decision-making. In addition, six high-level principles for responsible AI from the World Health Organization were used as probing themes to evoke further consideration on risks of using AI-DSSs and possible mitigation strategies. In addition, during the HAAL project, the development team iteratively reflected on the collected insights. **Results and discussion** Both developers and potential users of AI-DSSs in LTC were found to perceive the potential impact of using increasingly advanced AI-DSSs as an interplay of opportunities and risks that require careful consideration of how these systems are designed, deployed and used in specific contexts. Both opportunities and risks were identified in relation to early identification of care needs, guidance in devising care strategies, shared decision-making, and caregivers' workload and work experience (Lukkien et al., 2024). Depending on the specific design of AI systems and their use in practice, initial advantages of AI can turn into disadvantages. Strategies to address both these opportunities and risks center around themes such as human-centric learning during both the design and practical use of AI-DSSs and incremental trust-centric advancements in e.g., the data gathered, or algorithms deployed. Given the interrelatedness of the identified prerequisites, we call for developers, users and other stakeholders of AI-DSSs to cohesively address different factors important to the responsible embedding of AI-DSSs in practice.

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Co-designing a decision support system for longterm healthcare: An interactive session

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Purpose When designing and developing technology different types of design approaches can be used to gather insights on the user needs (Sanders, 2006). One of these approaches is co-design, in which one actively involves (potential) end users and stakeholders (Sanders and Stappers 2008). Using such an approach ensures that the end-user and thereby their needs and insight receive a key role in the development of the technology, ensuring that the technology matches their needs (Sanders and Stappers 2008; Vargas et al. 2022). **Method** In the HAAL project, which is central in this symposium we used co-design to translate the collected data from different types of care and wellbeing technologies into useful information and visualizations for the HAAL dashboard (Koowattanataworn et al. 2022). Different types of co-design approaches were used to determine the functionalities of the dashboard and to design and evaluate different webpages of the dashboard's user interface. During the symposium we will present the used co-design process and materials. Following there will be an interactive session in which the participants can practice co-design by using HAAL as a case study. Participants will receive an exercise in which they will learn to use the method of paper prototyping. The presenters will share a link to a small toolbox of instruments that can be used when applying this method. **Results and discussion** During this quick exercise participants will be encouraged to integrate several perspectives, such as those of care professionals and informal care givers in their paper prototype. Following, we will ask the participants to reflect on how they can integrate the lessons learned during this workshop in their own projects.

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