sefas

SENTER FOR ALDERS- OG SYKEHJEMSMEDISIN

UNIVERSITAS BERGENSIS

2025 Annual Report

TROND MOHN FORSKNINGSSTIFTELSE

eureka eurostars

Funded by the European Union

erc European Research Council

GC RIEBER FONDENE

The Research Council of Norway

esa

HELSE VEST

Helse- og omsorgsdepartementet

CONTENTS

MESSAGE FROM BETTINA	3
VISION AND MISSION	4–5
ORGANIZATION	6–7
INTERNATIONAL COLLABORATION	8–9
USER PANEL	10–11
COMMENTARY PIECES	12–19
THE SEFAS PROJECTS AND STUDIES	20–41
THE SEFAS STAFF AND STUDENTS	42–47
TECHNOLOGY AND DIGITAL INNOVATION	48–49
EDUCATION AND DISSEMINATION	50–51
SCIENTIFIC PUBLICATIONS IN 2025	52–55
SEFAS IN THE MEDIA	56–58
CONTACT	59

EDITORS: Eli Synnøve Vidhammer, Bettina S. Husebø.
ART DIRECTION/LAYOUT: Inhouse UiB by Eli Synnøve Vidhammer.
PHOTOS: Coverpage + page 4, 8, 20, 23, 27, 38, 40, 52: Colourbox.com. Page 6, 19, 24, 32, 39, 59: Silje Robinson. Page 4, 15, 29, 36, 41, 48 top: Designer. Back cover Bergen photo: Monica Patrascu. Page 34: GC Rieber Fondene. Page 35: Per Jon Odeen. Page 37 + envihab picture page 9: the German Aerospace Center (DLR). Page 9 bottom right + page 13: Paul André Sommerfeldt. Page 29 group photo: Ricky Heggheim. Page 29 situation photos + page 28, 50, 51: Berit Øxnevad-Gundersen. Page 47 bottom: Zoya Sabir.

Redefining Ageing Through Interdisciplinary, Multicultural Collaboration

We are entering a new era in which meaningful engagement across disciplines is not merely beneficial, it is essential. Ageing populations, complex health trajectories, rapid technological transformation, and shifting societal expectations demand solutions that no single field can produce alone. What emerges is a world where multicultural perspectives and interdisciplinary collaboration form the foundation for better care, smarter innovation, and more resilient societies. And this, we aim to realize at SEFAS.

In our landscape, interdisciplinarity becomes a living practice. Engineers and clinicians analyse and interpret sensor data together; psychologists and AI researchers co-design models of behaviour such as sleep, agitation, movement, and pain; a building engineer collaborates with social scientists to envision age-friendly housing; and ethicists sit at the core of technology development and user experiences rather than at its periphery. These integrated efforts create knowledge that is more accurate, more humane, and more responsive to the lived experiences of older adults and people with dementia or Parkinson's disease living at home or in the nursing home.

The long-term policy effects of such collaborations are profound. Evidence from interdisciplinary research informs national priorities in Ageing in Place, digital health, and end-of-life care. This annual report 2025 underscores the political push for older adults to live safely at home and highlights SEFAS' expanding research into socially and technologically supported living environments that meet future societal needs. These findings shape debates on long-term care models, healthcare workforce planning, and investment in age-friendly infrastructure.

Municipal implementation is equally important. SEFAS collaborates closely with municipalities, providing training in palliative care, symptom assessment and treatment, and digital tool use across multiple regions, supporting frontline staff and integrating new technologies into everyday practice. Municipalities serve as testbeds where innovations such as sensor-based monitoring or oral health standards in people with dementia are trialed, adapted, and refined before national scaling.

Yet everyday research practice brings significant challenges. Ethical and regulatory complexities remain central. CC.AGE's ethics work package illustrates the need for GDPR compliant recruitment, robust consent procedures, and ongoing ethical oversight of AI-driven tools in vulnerable populations. Researchers must navigate privacy regulations, ensure safe data handling, and continuously evaluate the acceptability of technological interventions for participants who are no longer able to give informed consent and their families.

Building trust is essential. Researchers foster trust through transparency, repeated dialogue, and close involvement of relatives, user panels, and healthcare staff. Planned or ongoing qualitative studies within CC.AGE and 5-D show that listening to family members' concerns, offering clear information, and demonstrating respect for vulnerability are key to maintaining ethical integrity and participant confidence.

Despite these challenges, interdisciplinarity strengthens resilience. By embracing multicultural and interdisciplinary collaboration, we create research ecosystems that are ethically grounded, societally connected, and capable of shaping the future of ageing with dignity and meaning.

Bettina S. Husebø, leader of SEFAS

Vision and Mission

SEFAS is committed to improving health and end-of-life care for older adults and individuals with complex conditions, including dementia and Parkinson's disease. Our vision is to promote independent ageing with a good quality of life through research-based knowledge, innovative care solutions, and strong interdisciplinary collaboration.

The overarching paradigm of SEFAS is to discover, validate, and translate novel approaches to improve our understanding of good ageing and to support our society in developing high-quality treatment and care. We strive to facilitate healthy and independent ageing for older adults, and to support their informal caregivers (relatives) and formal caregivers (healthcare professionals). Our mission includes building expertise on ethical and regulatory considerations regarding digital solutions for dementia care, implementing clear consent procedures, robust data protection measures, and continuous ethical oversight.

We work to achieve this by:

- Developing competent assessment and treatment strategies for pain and distressing symptoms.
- Advancing palliative care at the end of life.
- Exploring solutions that enable older adults to live safely and independently at home, including those who wish to die at home.
- Combining technological innovation with rigorous ethical standards, ensuring privacy, dignity, and meaningful participation for older adults, including those who are not able to speak for themselves.
- Leveraging a strong interdisciplinary centre profile combined with a network of excellent national and international partners.
- Including the patient and public perspective in our research to ensure that our research covers real needs within the sector.
- Monitoring the healthcare and societal development to target new projects accordingly.

Through these efforts, SEFAS strengthens competence and drives innovation in the municipal health and care services. Supported by the Norwegian Government and organized under the University of Bergen, we operate within a robust administrative and developmental framework.

Research Plan and Strategy

We apply novel technologies to improve treatment, care, and service provision for older adults. Sensing technology, including active and passive sensors integrated into the person's environment, provides valuable supplementary data for evaluating symptoms and distress. Several projects focus on digital phenotyping, using data from devices such as smartwatches and wall-mounted sensors to develop digital biomarkers that enhance precision in assessments.

We have a strong focus on interdisciplinary collaboration across clinical sciences, engineering, ethics, and social science to ensure that our research remains dedicated to

high-quality care and answers societal needs. Through the ALIVE platform in the CC.AGE project, we aim not only to assess but also to intervene based on sensor data.

An important concern is to strengthen our national role in both using and guiding the ethical, legal, and responsible application of digital tools in dementia and ageing research. Our own projects employ these technologies, and our expertise should support others in adopting them safely and effectively.

User involvement is embedded throughout our research processes, engaging older adults, relatives, healthcare professionals, and volunteers to secure practical value and ensure quality of services. Translation of our findings into tools, guidelines, and training resources is equally important to support municipal health and care services.

Demographic studies show that older adults with complex conditions are increasingly posing major challenges for healthcare provision in the 21st century. At the same time, there is a political goal that more older adults should be able to live safely at home. To meet this challenge, SEFAS will expand our research into social, affordable, and sustainable living environments for older adults. This strategic direction addresses long-term needs at the intersection of construction, urban planning, digitalization, and healthcare, shaping the future of smart, age-friendly communities. This is supported by the GC Rieber Foundation in 2026.

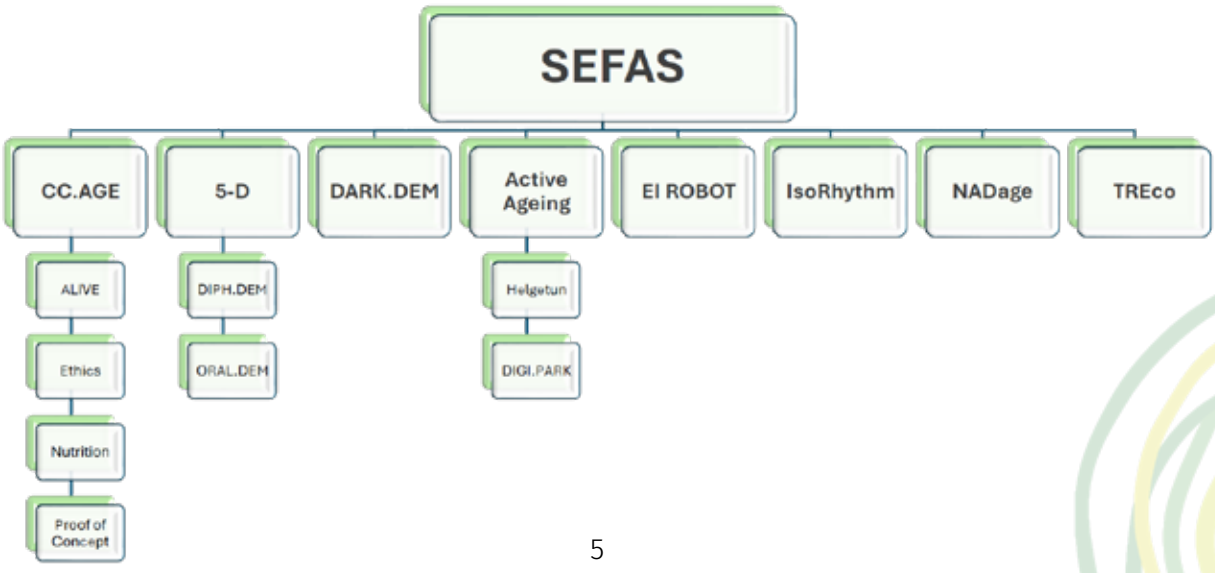
In parallel, we prioritize recruiting young researchers and students, fostering education in collaboration with other university units, and serving as a strong, knowledge-based voice in public debate.

Recent topics

The Norwegian society is facing a paradigm shift. For decades, investments have focused on traditional nursing homes, yet research and political goals emphasize enabling older adults to live, and even die, at home. SEFAS responds to this challenge by investigating innovative methods for symptom assessment, non-pharmacological interventions, care services, and age-friendly living environments.

In 2025, our research included 7 research projects (see details in the project section), with the current studies:

- Pain and symptom interdependencies at the end of life in dementia *(Clinical studies using sensor technology and biomarker mapping)*
- Virtual darkness to reduce behavioural symptoms in dementia *(Randomized clinical trial)*
- Sensor-based symptom assessment in Parkinson's disease *(Observational clinical study using wearable sensors)*
- Innovative living environments promoting social and active ageing for older adults *(Qualitative study)*
- Relatives' attitudes to sensor utilization in dying nursing home residents with dementia *(Qualitative study)*
- Oral dementia care for better end-of-life care and knowledge building *(Clinical observational cohort study with biological sample analysis)*
- Digital platforms for safe, independent living at home for older adults, including people with complex conditions *(Pilot clinical study leading toward a randomized controlled trial)*
- Social robots to manage behavioural symptoms in dementia and intellectual disabilities *(Technology innovation and feasibility study)*
- Circadian rhythm research in isolation and confinement environments *(Physiological systems study, planning phase in 2025)*
- Nutrition study examining how older adults living at home obtain food and how this relates to nutritional status and quality of life *(Observational, cross-sectional study with quantitative assessments*



Organization

SEFAS is part of the Section for Elderly Medicine, Social Pharmacy and Inter-professional Workplace Learning (FEST) at the Department of Global Public Health and Primary Care (IGS) at the University of Bergen (UiB).

Established in 2012 in collaboration with the G.C. Rieber Foundations, SEFAS became Norway's first Centre for Elderly and Nursing Home Medicine. Since 2014, the centre has received basic funding from the National Budget, and currently, additional project support from key partners, including:

- G.C. Rieber Foundations
- Trond Mohn Research Foundation (TMF)
- University of Bergen (UiB)
- Western Norway Regional Health Authority (Helse Vest)
- Research Council of Norway (RCN)
- European Research Council (ERC)
- Eureka Eurostars
- ESA: European Space Agency

SEFAS currently employs 28 staff members in an interdisciplinary environment, consisting of 14 PhD candidates, 4 postdocs, 3 researchers, 3 professors, 2 research assistants, and 2 administrative staff members. Together, these positions correspond to a total of 25.9 full-time equivalents (FTE). The centre is located at Årstadvollen within the Alrek Health Cluster, a hub for innovative health and care solutions in collaboration with the Eitri Medical Incubator. We are working in a highly interdisciplinary and multicultural environment, with 14 different professions and employees from 13 countries.

Board

The SEFAS Board ensures high-quality research, innovation, and education, and oversees financial and organizational management. It meets twice a year and consists of:

- **Marit Bakke (Chair)**, Dean, Faculty of Medicine, UiB
- **Bjarne Robberstad**, Head of Department, IGS, UiB
- **Nina Broch Mathisen**, Regional Director, Innovation Norway
- **Kjell A. Wolff**, Municipal Director, Bergen Municipality
- **Bettina S. Husebø,** Head of SEFAS

User Panel

One of SEFAS' strategic research goals is to cater to the user perspectives with the involvement and participation of patients, relatives, health personnel, and volunteers to contribute to personalized treatment and care. In this regard, the Centre has established an advisory user panel to strengthen the connection between the research and those who actually benefit from the results – other older adults, patients, and their relatives. More about this in a separate chapter.

Partnerships

SEFAS collaborates with leading institutions globally and nationally:

- International: Leiden University, Exeter University, Tohoku University, Yale University, Harvard University (McLean), and the NET4AGE-FRIENDLY COST Action network (27 countries).
- National: Bergen Municipality, Haukeland University Hospital, Haraldsplass Deaconess Hospital, NORCE, Western Norway University of Applied Sciences, and universities in Oslo, Tromsø, and Trondheim. A particularly close collaboration includes Neuro-SysMed – Norway's first centre for clinical treatment research on neurological diseases, where SEFAS leads the Care node.

"SEFAS plays a pivotal role towards the vision of IGS, which is to create "knowledge for better health and a better society". Its research offers understanding and solutions for a vulnerable and rapidly growing population, that can contribute to reduce socially and politically driven inequalities in health. The department congratulates all staff and affiliates with important milestones achieved during 2025.

Bjarne Robberstad, Head of Department, IGS, UiB

Meeting Points

- **Interdisciplinary learning and collaboration:** SEFAS staff and students participate in FEST's monthly interdisciplinary seminar, an arena for shared learning across ageing research, pharmaceutics, and health sector collaboration. This is complemented by an annual lunch-to-lunch FEST meeting, bringing together researchers, students, and the user panel for invited speakers, workshops, and interdisciplinary discussions. Daily informal lunches in the FEST environment further support ongoing dialogue and collegial exchange. In the Neuro-SysMed environment, monthly seminars provide similar updates in the neurological field.
- **Coordination of research activities**: Weekly internal meetings among postdocs and permanent researchers to ensure continuity, planning, and alignment across ongoing research activities.
- **Scientific discussion and peer development**: A bi-weekly journal club provides a structured arena where PhD candidates present their work, practise scientific communication, and receive peer feedback. The Neuro-SysMed Junior Scientist Symposium four times a year provides similar training.
- **Project follow-up and collaboration**: Bi-weekly project meetings support coordination and knowledge sharing across key projects (ActiveAgeing, 5-D, DIPH.DEM, ORAL.DEM, DARK.DEM, CC.AGE). EI ROBOT project meetings take place monthly.
- **Structured supervision of PhD candidates**: Bi-weekly individual supervision meetings help candidates progress with data collection, analysis, and scientific writing.
- **Centre-wide information flow**: Monthly meetings gather all SEFAS staff and students to share updates, discuss current issues, and maintain a common understanding of the centre's activities.
- **User involvement and co-creation**: User panel members meet with their respective project teams every six weeks, while the full panel convenes two times a year.
- **Social activities**: Christmas lunch, Easter lunch, a summer event, and ad hoc gatherings.

International Collaboration

SEFAS collaborates with a broad network of international partners to strengthen research quality, expand methodological expertise, and support innovation in elderly and nursing home medicine and care.

SEFAS has long-standing partnerships with internationally leading universities such as Leiden University and Exeter University in Europe, Tohoku University in Japan, and Yale University and Harvard University (McLean Hospital) in the US. SEFAS also participates in the NET4AGE-FRIENDLY COST Action, connecting us with partners across 27 European countries. Through Neuro-SysMed, SEFAS contributes as the Care node in a national centre for clinical research on neurological diseases. This partnership provides access to international networks and seminars, shared project development on relevant projects, and a translational neuroscience research school.

Apart from collaboration in our relevant research projects, SEFAS had in 2025 extensive collaboration with our international partners in the form of research visits, conference presentations, and proposal developments.

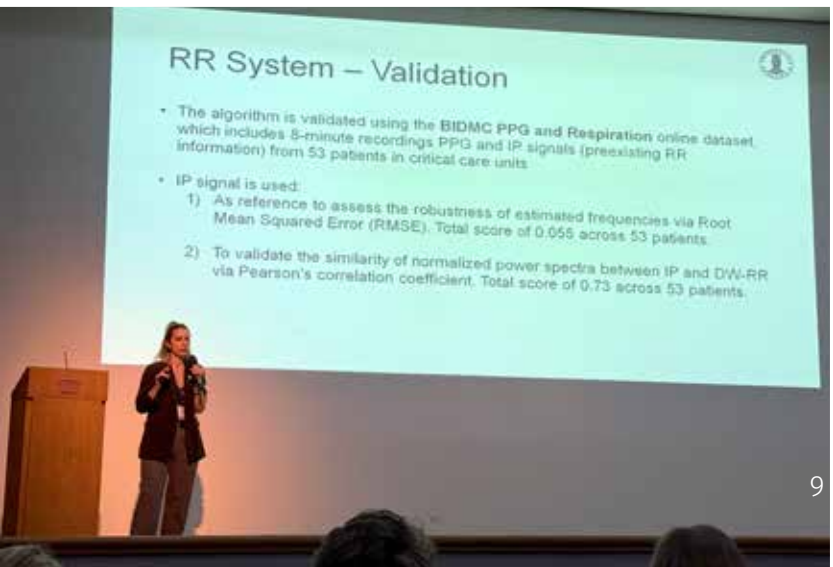
Heather Allore is a professor at Yale School of Medicine who has broad experience in biostatistics and trial design encompassing elderly people. For over 10 years, she has collaborated with Bettina Husebø and SEFAS. She paid SEFAS a two-day visit in September, attended workshops related to the CC.AGE, DARK.DEM and 5-D projects, and provided constructive feedback on how to improve design and reporting in the trials.

Bettina Husebø, Monica Patrascu, and Line Iden Berge attended the International Psychogeriatric Association (IPA) Congress in Kanazawa, Japan, in September 2025. They hosted a successful symposium entitled “Transforming Care in the Digital Era”, which also included contributions by Associate Professor Ipsit V. Vahia from Harvard McLean Hospital, US, and Rui Nouchi, University of Human Environments, Matsuyama, Japan. At this conference, Monica Patrascu was also appointed as a member of the IPA AI task force. The group also paid a visit to the head of innovation at the Norwegian Embassy in Tokyo, discussing future collaboration with Japanese academic and industry partners.

Our international collaborators also contributed substantially to several research proposals in 2025. Unfortunately, the INTPART proposal on Trustworthy AI in Ageing and the BetterAge proposal for the Centre for Research-Based Innovation with our above-mentioned partners were not funded, although the SFI proposal advanced to the second and decisive round. Although they were ultimately not selected, the process strengthened our partnerships and clarified long-term strategic priorities.

Finally, the work of Monica Patrascu and Valentina Casadei in the IEEE EMBS, see page 48, is ongoing, with more activities to come in 2026.


PRESENTER


RR System – Validation
The algorithm is validated using the BIDMC PPG and Respiration online dataset, which includes 8-minute recordings PPG and IP signals (preexisting RR information) from 53 patients in critical care units.
IP signal is used:
1) As reference to assess the robustness of estimated frequencies via Root Mean Squared Error (RMSE). Total score of 0.055 across 53 patients.
2) To validate the similarity of normalized power spectra between IP and DW-RR via Pearson's correlation coefficient. Total score of 0.73 across 53 patients.


CC.AGE

User panel

A strategic research goal at SEFAS is to meet the user perspectives with involvement and participation of patients, relatives, healthcare personnel, and volunteers, to contribute to personalized treatment and care. In this connection, the Centre has established an advisory user panel to strengthen the link between research and those who actually benefit from the results – patients, other elderly people, and their relatives.

The SEFAS user panel consists of members who have personal experience with the healthcare services. The panel's main task is to ensure that users' experiences and views are taken into account in the assessment of research projects, and that the Centre's research areas cover real needs within the sector. In addition, the panel will ensure the quality of the services that are being developed.

The role of the members

The user panel members shall have a proactive role. They shall be active contributors with the opportunity to influence medical research, keeping focus on issues that are important to patients, users, and the patients' families. The panel constitutes a resource for SEFAS, where the panel members bring valuable perspectives and contribute to the impact of the research. At the start of new research projects, the role of the users is clarified in relation to the individual stages of the process, mutual expectations, the need for training, common objectives, etc.

Composition of the panel

The members are appointed by the head of SEFAS, and the panel acts as an advisory body for research and development projects. To ensure relevant expertise, members are expected to have long-term and personal experience related to the specific projects. This may include experience as a patient, family of a patient, as healthcare personnel or as a representative from a patient organization. The panel members should complement each other in terms of background. The panel can have up to six members, depending on current needs.

Organization and meetings

The members of the panel are appointed for two years at a time, and they are compensated according to current rates. The user panel meets twice a year. When required, the members also participate in meetings related to the individual research projects. The goal is to have at least two members involved in each project.

Project meetings are currently established for the CC.AGE centre, for the 5-D project, including DIPH.DEM and ORAL.DEM, and for DARK.DEM and EI ROBOT. See separate project chapters.

When working on these projects, the panel focuses on the following areas:

1. Update on the project process.
2. Clarification of where in the project process the members' contributions are needed.
3. Clarification of expectations of the members.
4. Clarification of expectations of the researchers and collaborators.
5. Assess the need for training.
6. Set up common success criteria and goals.
7. Defining or adjusting milestones for evaluating the collaboration.

Through close collaboration between researchers and the panel members, the panel will contribute to ensuring that the research at SEFAS is relevant and practice-oriented, which will strengthen the quality of knowledge and services in the sector.

Pårørendebanken

Pårørendebanken – the dementia "caregiver bank" – was an excellent initiative in 2025 by one of the SEFAS user panel's members, Finn Patrick Nilsen. The aim was to create a safe arena for knowledge sharing, peer support, and practical guidance for relatives at different stages of the caregiving journey.

The group met weekly from August 2025 to December 2025. Caregivers participated in structured knowledge-sharing sessions, while people living with dementia were offered accompanied walks, followed by a shared lunch. Once a month, invited speakers contributed with educational sessions on relevant topics, including digital tools in dementia care, municipal services, nutrition, and managing anxiety at home.

Despite extensive promotion, participation remained limited, with a maximum of 15 attendees. Feedback from participants was consistently positive, and the meetings provided valuable opportunities for the exchange of experience and support.

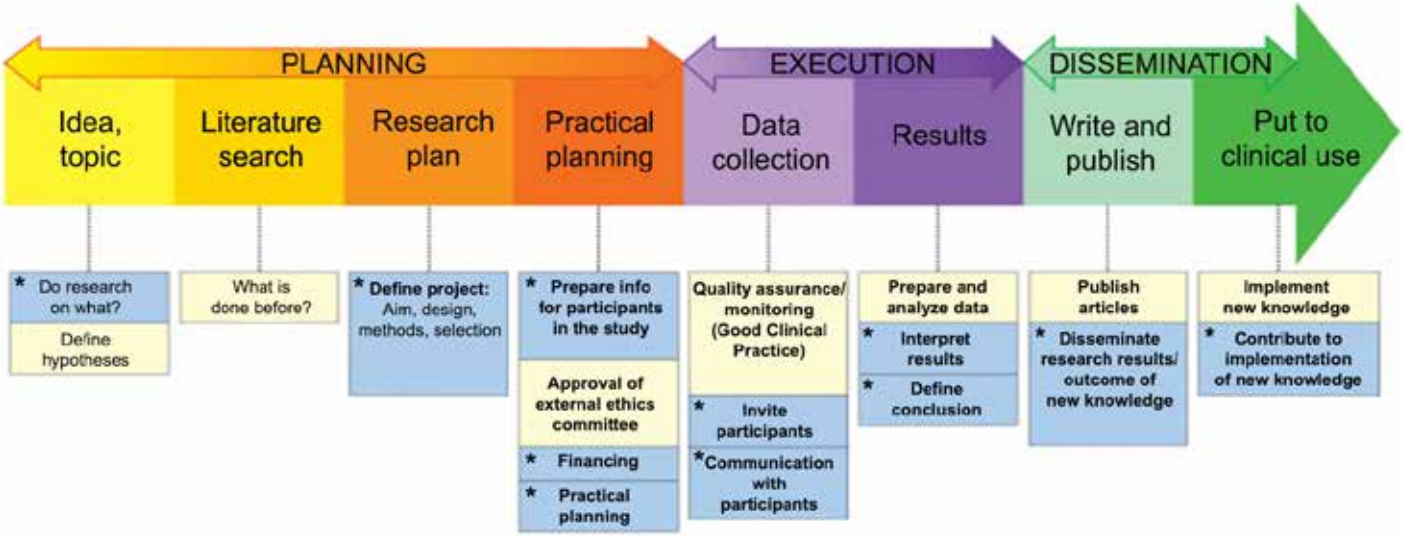
The initiative will not continue in its current form in 2026 due to the resources required to coordinate it, given the limited number of participants. Nilsen has started a bi-weekly meeting for relatives / next of kin of nursing home residents and will be further discussing with SEFAS how other initiatives to assist caregivers can be continued or incorporated into future activities.

The initiative was supported by SEFAS, Bergen Sanitetsforening, Bergen Demensforening, Bergen Municipality, Alrek Kafé, and several volunteers who contributed to content delivery, facilitation, and meals.

MEMBERS OF THE USER PANEL IN 2025

In 2025, the user panel consisted of the following members:

1. **Rune Samdal**, experiences with a family member with dementia, former employee at SEFAS as a user representative and member of the User Panel for Alrek Health Cluster and Expert Group for Elderly Health
2. **Siren Tyssebotn**, palliative care nurse at Haukeland University Hospital, former home care nurse, is holding a master's degree in palliative care
3. **Anne Pedersen**, experiences with a family member with primary progressive aphasia, midwife
4. **Trude Antoniazzi**, experiences with a family member with dementia, head of section at the Western Norway Regional Health Authority ICT, member of the quality committee and ethics committee at NKS Olaviken Geriatric Psychiatric Hospital
5. **Finn Patrick Nilsen**, experiences with a family member with dementia, organizer of Pårørendebanken and other dementia caregiver initiatives



The research process with user representatives. Fields in blue/with star are possible contribution areas for user representatives. Graphics by EUPATI

Embedded Pragmatic Clinical Trials: Testing What Works in Real-World Healthcare for Older Adults

Heather Allore, PhD, Yale School of Medicine and School of Public Health

When it comes to healthcare research, older adults often fall through the cracks because traditional clinical trials rarely mirror real life. This commentary by our collaboration partner Heather Allore explores how pragmatic trials can close that gap by testing what actually works for older people in the everyday settings where care really happens.

Traditional randomized controlled trials (RCTs) often don't reflect real-world conditions for older adults. They typically test treatments under ideal circumstances rather than examining how interventions work during routine clinical care.

What Makes Pragmatic Trials Different?

Embedded Pragmatic Clinical Trials (ePCTs) aim to provide evidence that directly applies to everyday healthcare practice and policy decisions. Unlike conventional RCTs, ePCTs use broad eligibility criteria with minimal recruitment barriers and focus on real-world effectiveness rather than ideal-condition efficacy.

In practice, most trials fall somewhere between purely pragmatic and purely explanatory. Researchers use planning tools like PRECIS-2 to design trials that balance scientific rigor with practical application. Before launching an ePCT, researchers should verify the intervention is ready for pragmatic testing using frameworks that assess readiness.

Special Considerations for Older Adults

ePCTs must work within existing healthcare system structures, often requiring intervention modifications. This is particularly important for older adults, who have historically been excluded from clinical trials or only included if they had minimal health problems. Adapting interventions for older populations requires understanding patients with multiple chronic conditions.

Another key consideration involves the relationships between older adults and their caregivers, whether family members or friends. Researchers must carefully distinguish between simply having caregivers report outcomes versus designing studies that formally examine how both patients and caregivers are affected.

Adapting Trial Design

Researchers may need to shift from treating individual patients to implementing changes across entire healthcare practices or systems, requiring clustered trial designs. Settings might change, for example, from hospital-based to long-term care facilities. Interventions themselves may be simplified or enhanced, with adjustments to how frequently, how long, and how intensively treatments are delivered.

These adaptations ensure that research findings truly reflect what works for older adults in real healthcare settings.

Commentary piece

Sensors in Elderly Care

Ipsit V. Vahia, MD, McLean Hospital, and Harvard Medical School

As populations age globally, health systems face mounting pressure to support older adults with complex medical, cognitive, and functional needs, often with fewer caregivers and limited resources. Sensor technologies can enable safer, more independent aging while improving clinical insight and reducing caregiver burden. Rather than replacing human care, sensors provide visibility into older adults' daily lives, capturing signals that are otherwise intermittent, subjective, or invisible. The future of elderly care will depend not just on whether sensors are available, but on how thoughtfully they are designed, deployed, and integrated into care workflows.

Wearables and Mobile Sensors: Continuous, Personal Data

Wearable and mobile sensors are among the most mature and widely adopted technologies in elderly care. Devices such as smartwatches, fitness trackers, and smartphones can passively and actively collect data on movement, sleep, heart rate, location, and device usage patterns. These signals are particularly valuable because they reflect real-world functioning rather than episodic clinical snapshots.

Platforms like Beiwi or MindLAMP exemplify how mobile sensing can be clinically meaningful rather than merely descriptive. These platforms combines passive data (e.g., activity levels, phone usage, mobility patterns) with active inputs such as surveys or cognitive tasks, allowing clinicians and caregivers to track behavioral and cognitive changes over time. In elderly populations, this can support early detection of functional decline, mood changes, or worsening cognitive impairment, and can be adapted for conditions such as dementia, depression, or autism in older adulthood.

Crucially, mobile sensing allows personalization. Baselines are established at the individual level, making deviations—rather than absolute thresholds—the signal of concern. This is especially important in aging, where "normal" varies widely across individuals.

Practical Challenges: Charging, Adherence, and Usability

Despite their promise, wearables face persistent real-world challenges. Charging remains one of the most significant barriers to sustained use among older adults. Devices that require daily or even weekly charging are often forgotten, misplaced, or intentionally abandoned due to frustration. For individuals with cognitive impairment, executive dysfunction, or arthritis, charging can become an insurmountable obstacle.

Adherence is also influenced by comfort, stigma, and perceived value. Devices that are bulky, medical-looking, or intrusive may be rejected. Even well-designed wearables can fail if caregivers are expected to manage too many devices or platforms. These challenges underscore the need for longer battery life, passive operation, caregiver-friendly dashboards, and clear clinical utility—so that effort is justified by meaningful outcomes.

Infrared and Radio Wave Sensors: Passive and Environment-Based Monitoring

Environmental sensors offer an alternative or complement to wearables by reducing reliance on user participation. Infrared sensors, commonly used for motion detection, can track movement patterns within the home, identifying changes in activity levels, nighttime wandering, or prolonged inactivity that may signal falls or illness.

More advanced radio wave–based sensors (such as Wi-Fi or radar-based systems e.g. the Emerald device) can detect presence, movement, respiration, and even heart rate without cameras or wearables. These systems are particularly valuable for older adults who cannot reliably wear devices or who prefer non-contact monitoring. Because they operate passively and continuously, they

can capture subtle longitudinal changes while preserving a sense of autonomy.

However, environmental sensors raise their own challenges, including installation complexity, cost, and interpretation of data across shared living spaces. Still, their role in future elderly care is likely to expand as accuracy improves and privacy-preserving designs mature.

Facial Recognition, Voice Sensing, and Multimodal AI

Emerging sensing modalities focus on expressive and communicative signals rather than physical movement alone. Facial recognition and facial expression analysis can help detect affective states such as pain, distress, or apathy, particularly in individuals with limited verbal communication. While ethically sensitive, these tools may offer value in supervised care settings when used transparently and with consent.

Voice sensing is especially promising in elderly care. Changes in speech rate, prosody, word choice, and hesitation can signal cognitive decline, depression, or delirium. Voice can be captured through phone calls, smart speakers, or clinical interactions, often without requiring new behaviors from the individual.

When combined with AI-based language processing, these signals can be analyzed at scale to detect patterns that humans might miss. Natural language processing can identify semantic drift, reduced lexical diversity, or increased confusion over time. Importantly, these tools work best as decision-support systems—flagging concerns for human review rather than making autonomous judgments.

Conclusion: Toward Thoughtful, Integrated Sensor Use

The future of elderly care will not hinge on any single sensor or technology, but on integrated ecosystems that balance insight, usability, and ethics. It is especially imperative that data from sensors be additive to high quality clinical care and be used to enhance rather than replace the current human-based standards of care. Considerable practical challenges, whether they are adherence and charging challenges, expense, digital literacy or tech troubleshooting require addressing. A workforce proficient in incorporating data also must be developed through training and skills-building.

To succeed, sensor systems must be designed around the realities of aging—not idealized users—and embedded into care models that respect dignity, privacy, and human judgment. When thoughtfully deployed, sensors can shift elderly care from reactive to proactive, supporting independence while ensuring that help arrives when it is truly needed.

Ageing in place trends to align the desire with the reality

Janet MacNeil Vroomen, Department of Internal Medicine, Section of Geriatrics, Amsterdam University Medical Centre, the Netherlands, and the Department of Heart Disease, Haukeland University Hospital, Norway

Ageing in place has become a defining policy priority as populations grow older, yet the gap between what people hope for and what current systems enable is widening. While most older adults wish to remain in their homes, countries struggle to deliver the coordinated housing, care, and governance structures needed to make this possible. Understanding these trends is essential to ensuring that ageing in place becomes a supported choice rather than an unsupported default.

The 2025 National Institute of Ageing in Canada Survey found that 81% of Canadians aged 50 and older want to remain in their current home for as long as possible; however, 62% have made no modifications or plans to prepare for it[1]. The gap between the desire to age in place and the capacity to actually do so captures something essential about where ageing in place (AIP) policy stands today. AIP is widely embraced as a goal, poorly understood as a practice, and rarely evaluated with the rigour it demands.

The UN Decade of Healthy Ageing (2021–2030) elevated AIP as a global priority, and by 2023 nearly 87% of WHO member states reported a national plan aligned with healthy ageing[2,3]. The demographic pressure behind this is enormous: the OECD projects 52 people aged 65+ for every 100 working-age adults by 2050[4], and in January 2026 the oldest baby boomers began turning 80. Countries have responded with ambitious reforms. But what do we actually know about whether those reforms work?

Less than we should. Many countries have taken very different approaches[5-8]. For example, the Netherlands decentralised rapidly under austerity and soon saw hospital admissions spike and costs shift between sectors[9-11]. Norway pursued gradual structural integration but had to layer on additional governance mechanisms to manage the fragmentation that followed[12]. Japan invested heavily in prevention through its universal long-term care insurance, yet shifting deaths from institutions to home settings was elusive[13,14].

What can we change? The most urgent gap is in how we evaluate these reforms. A scoping review of 41 studies found that most assessed costs or healthcare use within a single sector[15]. Only five examined cost-shifting between nursing homes and home care; just six looked at out-of-pocket costs[15]. We are evaluating transformative, multi-billion-euro reforms with data that captures only a fraction of their impact. The February 2026 OECD working paper on long-term care coordination makes the same point from a systems perspective: governance, funding, workforce, and data-sharing are deeply interdependent, and evaluating any one in isolation misses the picture[8].

AIP is not experienced equally. Socioeconomic position, gender, migration background, and geography determine who can access adequate housing, formal care, and assistive technologies[16]. Women and minority groups disproportionately shoulder unpaid caregiving, often entering old age with fewer resources and poorer health[16,17]. A policy that works well for an affluent couple with a strong family network and a well-adapted home may be a source of isolation and risk for a widowed woman in social housing with no nearby services. Unless outcomes are systematically stratified by equity dimensions by using frameworks like PROGRESS-Plus[18], we risk designing reforms that widen the very disparities they claim to address.

This brings us back to the Canadian survey[1]. Part of the explanation is straightforward: people struggle to visualize their future selves, and what they cannot picture, they do not plan for. But the 81%-versus-62% gap is not

just about home modifications[1]; it reflects a broader failure to support older adults and their families in making informed decisions about care[1]. Successful ageing in place requires a support team, an accessible environment, and proactive, honest conversations about care preferences, financial realities, and health trajectories[19,20]. We know that structured advanced care planning reduces burdensome end-of-life care[21]. We know that accessible planning tools increase engagement across diverse populations[22]. Yet in most countries, shared decision-making remains something that happens (if it happens at all) in a crisis, not as a routine part of clinical care and community support. Without it, ageing in place risks becoming a default rather than a deliberate, supported choice.

Technology will play a growing role through smart monitoring, telehealth, and shared digital records, but only if embedded in care systems that are actually coordinated and accessible[8,23]. And we need to start measuring what older adults themselves say matters: autonomy, social connection, sense of purpose, safety[2,24]. The OECD's PaRIS initiative has shown that patient-reported outcomes can be collected systematically across countries[24,25]. Adapting that approach for AIP is entirely feasible.

The coming decade will determine whether ageing in place becomes a way for older adults to live with dignity, autonomy, and adequate support or if it becomes a polite label for being left to cope alone. Getting this right is not a technical problem. It is a question of what kind of societies we choose to be.

References

1. Qureshi T, Gallant G, Bronstein T, Hazelden M, Brierley A, Sinha S. Perspectives on Growing Older in Canada: The 2025 NIA Ageing in Canada Survey. Toronto, ON: National Institute on Ageing 2026.
2. World Health Organization. Decade of healthy ageing: Plan of action for 2021–2030. Geneva: World Health Organization, 2020.
3. World Health Organization. Progress report on the United Nations Decade of Healthy Ageing, 2021–2023. Geneva, 2023.
4. OECD. Pensions at a Glance 2025: OECD and G20 Indicators. Paris: OECD Publishing; 2025.
5. Spasova S, Baeten R, Coster S, Ghailani D, Peña-Casas R, Vanhercke B. Challenges in long-term care in Europe. A study of national policies. Brussels: European Commission, 2018.
6. Llena-Nozal A, Barszczewski J, Rauet-Tejeda J. How do countries compare in their design of long-term care provision?: A typology of long-term care systems. Paris: OECD Publishing, 2025.
7. Gori C, Fernandez J-L, Wittenberg R. Long-Term Care Reforms in OECD Countries. Bristol: Policy Press; 2016.
8. Kim S, Llena-Nozal A, Lorenzoni L, Patrini V. How can co-ordination improve long-term care delivery. OECD Health Working Papers. Paris: OECD Publishing; 2026.
9. Wammes JD, Bakx P, Wouterse B, Buurman BM, Murphy TE, MacNeil Vroomen JL. Acute hospital use in older adults following the 2015 Dutch reform of long-term care: an interrupted time series analysis. Lancet Healthy Longev 2023; 4(6): e257–e64.
10. MacNeil Vroomen JL, Wammes JD, Wouterse B, Smalbrugge M, Murphy TE. Utilisation of nursing home care before and after the 2015 Dutch national reform: an interrupted time series analysis. Age Ageing 2025; 54(2).
11. Wammes JD, Wouterse B, Murphy TE, MacNeil Vroomen JL. Impact of the 2015 Dutch Long-Term Care Reform on Nursing Home Use and Access for People With Dementia. J Am Geriatr Soc 2026.
12. Monkerud LC, Tjerbo T. The effects of the Norwegian Coordination Reform on the use of rehabilitation services: panel data analyses of service use, 2010 to 2013. BMC Health Services Research 2016; 16(1): 353.
13. Wammes JD, Nakanishi M, van der Steen JT, MacNeil Vroomen JL. Japanese National Dementia Plan Is Associated with a Small Shift in Location of Death: An Interrupted Time Series Analysis. J Alzheimers Dis 2021; 83(2): 791–7.
14. Wammes JD, Nakanishi M, van der Steen JT, MacNeil Vroomen JL. The Revised Medical Care Act is associated with a decrease in hospital death for the total Japanese older adult population regardless of dementia status: An interrupted time series analysis. PLoS One 2022; 17(3): e0264624.
15. Wammes JD, Vullings I, Kringos DS, et al. Performance Indicators for the Assessment of Aging-In-Place Reform Policies: A Scoping Review and Evidence Map. J Am Med Dir Assoc 2024; 25(11): 105249.
16. Bolster-Foucault C, Vedel I, Busa G, Hacker G, Sourial N, Quesnel-Vallée A. Social inequity in ageing in place among older adults in Organisation for Economic Cooperation and Development countries: a mixed studies systematic review. Age Ageing 2024; 53(8).
17. Schulz R, Beach SR, Czaja SJ, Martire LM, Monin JK. Family Caregiving for Older Adults. Annu Rev Psychol 2020; 71: 635–59.
18. Karran EL, Cashin AG, Barker T, et al. Using PROGRESS-plus to identify current approaches to the collection and reporting of equity-relevant data: a scoping review. Journal of Clinical Epidemiology 2023; 163: 70–8.
19. Miller KEM, Green CM, Fassinger A, Wolff JL. Long-Term Care Services and Supports Needed for Successful Aging-in-Place: A Critical Review. Annu Rev Public Health 2025; 46(1): 487–505.
20. van der Steen JT, Van den Block L, Nakanishi M, et al. Optimizing Advance Care Planning in Dementia: Recommendations From a 33-Country Delphi Study. J Pain Symptom Manage 2025; 69(6): e755–e72.
21. Wolff JL, Scerpella D, Giovannetti ER, et al. Advance Care Planning, End-of-Life Preferences, and Burdensome Care: A Pragmatic Cluster Randomized Clinical Trial. JAMA Intern Med 2025; 185(2): 162–70.
22. Freytag J, Street RL, Jr., Barnes DE, et al. Empowering Older Adults to Discuss Advance Care Planning During Clinical Visits: The PREPARE Randomized Trial. J Am Geriatr Soc 2020; 68(6): 1210–7.
23. Buffel T, Phillipson C. Ageing in Place in Urban Environments: Critical Perspectives. London and New York: Routledge; 2024.
24. OECD. Rethinking Health System Performance Assessment: A Renewed Framework, OECD Health Policy Studies. Paris: OECD Publishing; 2024.
25. OECD. Does Healthcare Deliver?: Results from the Patient-Reported Indicator Surveys (PaRIS). Paris, 2025.

Commentary piece

Navigating Ethics and Regulation in Digital Dementia Care

Bettina S. Husebø, MD, PhD, SEFAS, Department of Global Public Health and Primary Care, University of Bergen

Digital health technologies are rapidly reshaping how we support older adults with complex health challenges, including people living and dying with advanced dementia. From wearable sensors to wall-mounted radars and intelligent lifestyle platforms, the promise is compelling: more autonomy, better symptom recognition, and improved quality of life for individuals who often cannot articulate their needs. But with innovation comes responsibility.

As we have learned through SEFAS' involvement in the CC.AGE and 5-D projects, deploying such technologies in real-world dementia care raises difficult ethical and regulatory questions that must be addressed head-on. How do we protect privacy? How do we ensure consent? And how do we comply with strict European regulations on medical devices and data protection?

In the CC.AGE study, home-dwelling older adults will test ALIVE, a lifestyle-oriented digital platform combining a tablet interface, passive sensors, and personalized recommendations over eight weeks. The aim is to understand not just usability, but acceptability.

In parallel, the 5-D project is observing dying nursing home residents with advanced dementia using smartwatches and a contactless radar sensor (Somnofy) to detect pain, agitation, dyspnea, and other distressing symptoms. Here, the ethical landscape is even more complex, as many residents cannot provide informed consent themselves.

These two projects, one preventive and home-based, the other end-of-life and institutional, give us a unique vantage point on the hopes and hurdles of digital health in dementia care.

Ethical Reflections: Transparency, Trust, and Consent

Across both studies, one message is clear: *ethics matter as much as technology.*

Participants respond positively when systems are transparent, when they understand what data is collected, how it is used, and how they can remain in control. When advice feels like help rather than orders, people keep more control over their choices, which is especially important for those already experiencing a shrinking sense of independence.

At the same time, concerns about passive monitoring are real and justified. Long-term data use, potential repurposing of data, and the mere feeling of being constantly "watched" highlight the need for dynamic consent. Consent, in this context, cannot be a one-time signature; it must be an ongoing conversation.

For individuals with advanced dementia, the question becomes even more sensitive. Should a lack of capacity exclude them from research that may improve care at the end of life? In the 5-D project, we argue no. Presumed consent, combined with robust ethical oversight and close involvement of family and caregivers, may be both ethical and necessary.

Regulatory Realities: MDR and GDPR in Practice

Alongside ethical considerations sit strict European regulations designed to protect patients and their data.

Under the EU Medical Device Regulation (MDR), we found that ALIVE sits in a grey zone. While it integrates physiological data, its primary purpose is lifestyle support rather than diagnosis or treatment. This raises ambiguity about whether it should be classified as a medical device at all, an uncertainty shared by many emerging digital health tools.

GDPR brings its own challenges, especially regarding sensitive health data. Data minimization, secure storage, and strict access control are not optional; they are essential. When working with vulnerable populations, these safeguards must be even stronger.

Our experience underscores that these regulatory frameworks, though demanding, ultimately foster responsible innovation. They force us to be deliberate, transparent, and precise.

A Path Forward: Building Responsibility into Innovation

The lessons from CC.AGE and 5-D are clear: deploying digital tools in advanced dementia care requires navigating a complex ethical and regulatory landscape. But it also shows that the effort is worthwhile.

These technologies hold real potential to improve lives, helping people stay at home longer, supporting caregivers, and bringing visibility to symptoms that often go unnoticed in the final stages of life.

For SEFAS, the way forward is equally clear: ethics and regulation must be embedded from the very start of development, not added as afterthoughts. Only then can digital innovation genuinely serve those who need it most.

SEFAS research projects and studies

CC.AGE

The Trond Mohn Research Foundation and the University of Bergen generously provided financial support to establish the Centre for Complex Conditions and Ageing (CC.AGE). Here, we investigate the use of novel technology and high-quality care to improve the lives of older adults with complex conditions (CC) living at home.

Providing care and support for the steadily growing population of older adults with CC is one of the key challenges of our society. Research has consistently shown that most older adults do not want to be institutionalized and rather wish to live independently at home for as long as possible. In the coming years, the healthcare system will register a lack of professional healthcare workers to match future demands, which calls for a paradigm change.

The primary objective of CC.AGE is to improve the living situation for older adults with CC to live safely and independently at home with a good quality of life, and to support their relatives and municipal healthcare professionals.

To achieve this, we aim to:

- Design, implement, and test the efficacy of a research-based digital plug-and-play platform with a range of technologies integrated into a mobile tool for use at home.
- Identify traditional care areas that can be safely replaced by digital support.
- Determine specifications for integrating existing technologies and for developing new products that will be able to sustain 'plug-and-play' integration.
- Contribute to the design and testing of a social living environment.

Transdisciplinary team

CC.AGE employs major transdisciplinary collaboration between medicine, nutrition, systems science, artificial intelligence, software engineering, economy, and ethics that builds on existing evidence, user involvement, and methodological expertise. Our industry partner, Youwell, is a developer of e-health platforms, while our public sector partner is the Bergen Municipality. Our local scientific partners are the Centre for Nutrition (UiB) and the Bergen Centre for Ethics and Priority Setting in Health (BCEPS), UiB.

Our collaborators include colleagues from Tohoku University (Japan), Yale University (USA), Harvard McLean Hospital (USA), and Leiden University (The Netherlands). Our national collaborators include the EITRI medical incubator and the Alrek Health Cluster.

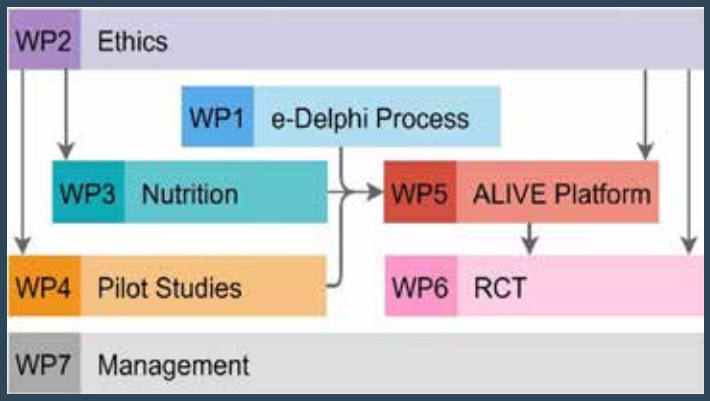
Work package organization

CC.AGE encompasses various work packages (WPs). The central activity will be a 12-week randomized controlled trial (RCT) to explore the effect of a multicomponent intervention in home-dwelling people with CC. WPs 1, 3, and 4 inform the development in WPs 5 and 6. WP2 for ethics informs all aspects of our work. Project management falls under WP7.

Societal impact

CC.AGE will increase access to research-based mental and physical value-based healthcare with a positive impact on safety, quality of life, caregiver burden, ethics, cost-benefit, e-health, and society. This might lead to game-changing support to older adults with complex diseases, enabling them to live safely and independently at home with a good quality of life, at the same time benefiting their relatives and municipal health professionals.

Work packages



WP1: e-Delphi: A combined effort informed by all other work packages, with the entire team contributing under the coordination of Postdoc Zoya Sabir. This WP originally aimed to address a broad set of questions related to technology use in elderly care. However, rapid developments in the field and the publication of several recent systematic reviews have reduced the scientific value of carrying out a Delphi process at this time. The process has been postponed until specific subtopics can be identified where a targeted Delphi study or systematic review would provide meaningful contributions. Partly due to this development, a contribution to a Wiley textbook in the form of a chapter on the ethics of AI in geriatric clinical research was accepted for publication instead (see WP2).

WP2: Ethics: The current WP is led by Professor Bettina S. Husebø in collaboration with BCEPS and PhD-candidate Justin Haugland-Pruitt. He is exploring and evaluating ethical and regulatory challenges related to all other WPs as the project evolves in both practical and theoretical proceedings. Researcher Elise Førsund is assisting with data collection and analysis. This work package continues to address ethical decision-making across all CC.AGE activities, ensuring compliance and identifying emerging challenges.

In 2025, progress includes:

- **GDPR-Compliant Recruitment**: We have supported the design and implementation of GDPR-compliant recruitment procedures for the pilot study, ensuring data protection and participant privacy throughout the process.
- **Qualitative Study on Social Acceptability**: We initiated a qualitative study to assess the social acceptability of technological interventions in dementia care, focusing on family member perspectives and ethical implications.
- **Ethical Support for Study Design and REK Applications:** We have provided guidance on ethical decision-making during planning and design phases of upcoming studies, including preparation of REK applications to ensure regulatory compliance and robust ethical frameworks.
- Work is ongoing to navigate the necessity of a REK KULMU approval process for medical devices, ensuring compliance with regulatory and ethical requirements as part of the upcoming studies.
- WP2 remains central in integrating ethical considerations into all stages of the project, fostering responsible innovation and safeguarding participant rights.

WP3: Nutrition: Led by Professor Jutta Dierkes (Centre for Nutrition) in collaboration with clinical nutritionist and Postdoc Zoya Sabir and PhD Candidate Annelise Breistein Elde, WP3 continues to investigate various aspects related to nutrition and hydration in home-dwelling older adults.

In 2025, progress includes:

- REK approval has been granted for the Food Supply Study, which maps food and meal services for older adults with a focus on cost, availability, and user-friendliness, and examines the impact on nutritional status, quality of life, and general health.

Recruitment and data collection are in progress at the Research Unit for Health Surveys (RUHS), UiB.

- REK approval has been received for the Hydration Assessment Study, which emphasizes the usefulness of a hydration sensor for preventing dehydration in older adults.
- Content development has been planned for a nutrition education module that will be integrated into the ALIVE platform (WP5). The module will focus on several topics, including weight loss and malnutrition, hydration, and official dietary recommendations with emphasis on nutrients that are of particular relevance in the target group.

WP4: Proof of concept (pilot studies): This WP is led by Professor Line Iden Berge and will develop digital interventions for physical health, mental health, and sleep disturbances for older adults living at home. PhD candidate Lisa Aaslestad joined this WP in September 2024, and since then, progress includes:

- Formalization of an agreement with eBehandling, the Western Norway Regional Health Authority (HelseVest), for modification of the "Psyken" program to target older adults.
- REK approval of the pilot study "Digital interventions for sleep in older adults with complex conditions".
- Development of an interactive exercise module for enhancing strength and balance together with Professor Emeritus Rolf Moe-Nielsen.

Aaslestad is now working on analysing data from the SHUTi RCT on a digital cognitive behavioural therapy intervention for people with insomnia, with a focus on the effect in older adults. We expect that these findings will inform the development of the pilot study, in which she will also conduct qualitative interviews with older adults with sleep challenges. Data will be analysed with a person-based approach. We are now starting recruitment of potential participants in collaboration with Bergen Municipality.

WP5: ALIVE platform: WP5 focuses on developing the ALIVE platform and is led by Researcher Monica Patrascu, with significant contributions from PhD Candidate Shivam Pandey and Postdoc Asmat Ullah, who both joined the project in March 2025. The team is working to create an integrated, multimodal, rule-based fuzzy AI platform designed to support older adults with chronic conditions living at home.

In collaboration with Youwell, the project is developing a modular, digital plug-and-play mobile platform that includes five key components: a core application, sensing devices, intervention modules, a human-machine interface, and a user application. Interaction with the physical world is facilitated through sensors, such as the Garmin Venu 3S and Somnofy, and actuators, with user communication occurring via smartwatch, mobile phone, or tablet. Personalized interventions are generated based on a continuous, multidimensional assessment of each user's health status and personal objectives. The design, testing, validation, and evaluation of all automation adhere rigorously to established methods from control engineering and systems theory, with a dedicated focus on stability, robustness, and reliability.

The work is being conducted in two phases: a manual mode and an AI mode. In the manual mode, the app will function as a lifestyle application that provides advice based on general recommendations and activity data received from the devices. Phase 1 is in its final stage, and a comprehensive REK application was submitted in January 2026.

For Phase 2, the fuzzy AI-integrated platform, significant progress has been made, including the in-depth analysis, fusion, and processing of data from the Garmin and Somnofy devices. Development is advancing on parallel tracks: several sub-modules are now in the functional validation phase, while the Youwell team is finalizing the primary development cycle in preparation for deployment testing.

Plans for the upcoming year include finalizing the AI model, submitting a separate REK application for the fuzzy AI-based platform, and integrating the model with the platform. This will be followed by comprehensive testing, trials, debugging, and both functional and expert validation.

This phase will culminate in a pilot study to evaluate the platform's feasibility, usability, and preliminary effectiveness with participants recruited from senior universities and the Bergen Municipality.

WP6: A mixed-method randomized controlled trial (RCT): All activities are directed toward the establishment of the RCT, estimated to begin in autumn 2026. Led by Bettina S. Husebø, this will be a 12-week RCT to explore the effect and cost-effectiveness of a multicomponent intervention in home-dwelling older adults with CC.

Prior to the RCT, a pilot study will test functionality and evaluate whether offering interventions in social activity, physical exercise, sleep, and nutrition through ALIVE improves goal attainment and supports independent living. The effect of ALIVE will be investigated in an 8-week mixed-method, multicomponent study in home-dwelling older adults with CC. We will test the effect of ALIVE on Goal Attainment Scaling (GAS), a person-centred outcome measure that uses a five-point scale to score progress toward individualized goals. Data collection will include traditional assessment scales and digital measures. We will develop interview guides and conduct focus groups and in-depth interviews to investigate user perspectives regarding digital sleep interventions, attitudes towards technology and ethics, and digital nutrition education.

WP7: Project management and coordination: This WP consists of the employment processes and the regular management of the project, and dissemination efforts with scientific presentations, public engagement, and popular science dissemination. WP7 is led by Professor Bettina S. Husebø.

CC.AGE full day meeting

The CC.AGE team met for a full-day project meeting September 8, 2025, at Nygårdsgaten 5 with the internal team members and external partners, marking a significant step in the project's development. The day opened with a welcome from Centre Director Bettina Husebø, followed by updates from all work packages, including ongoing progress, challenges, and opportunities for cross-team input. A central topic was the REK application for the planned pilot study and RCT, where the group worked together to identify potential issues and practical solutions.

The meeting also included focused discussions on the ALIVE platform, particularly planned content, technological integration, and design considerations. A keynote lecture by Rolf Moe-Nilssen on safe home exercises for older adults with impaired gait function provided valuable insights for the physical activity module in ALIVE. CC.AGE user representative Finn Nilsen presented an update on Pårørendebanken and its relevance to CC.AGE, underlining the project's commitment to supporting older adults and their caregivers.

To ensure continued progress, tasks were assigned and soft deadlines established. The meeting strengthened collaboration and contributed to concrete next steps for the project.

CC.AGE webpage
QR link

The 5-D Project

Decoding Death and Dying in people with Dementia by Digital thanotyping (5-D) is a ground-breaking project of international importance supported by the European Research Council (ERC). The 5-D project aims to investigate how sensor technology can be used to recognize various symptoms in people with dementia towards the end of life, as well as detect the dying phase.

Through systematic collection of data from Norwegian nursing homes, the project develops novel methods and tools that can provide a more precise understanding of pain and other symptoms at the end of life, thereby supporting more personalized and compassionate end-of-life care.

Dementia prevalence in Europe is projected to triple by 2050, highlighting the urgency of improving symptom treatment and end-of-life care for this population. People with dementia in the terminal phase represent one of the most vulnerable and clinically complex patient groups, largely due to impaired communication and behavioural expression. Recent evidence shows that individuals with advanced dementia frequently experience neuropsychiatric symptoms, such as agitation, depression, anxiety, apathy, psychosis, and disturbances in sleep and appetite, alongside pain, which remains under-recognized and undertreated. Both under-treatment and over-treatment can exacerbate distress and compromise quality of life.

As death approaches, progressive decline in physical, cognitive, and social functioning further complicates symptom management. Studies indicate that pain and neuropsychiatric symptoms often persist in the last weeks of life, yet symptom burden is inconsistently assessed, leading to variability in care. Nearly 40% of individuals with dementia die unexpectedly, underscoring the need for timely recognition of the terminal phase to enable family involvement and ensure comfort-oriented interventions. **A deeper understanding of the dying process in dementia, including functional trajectories, pain patterns, and behavioural symptoms, is essential for developing person-centred strategies that uphold dignity and optimize quality of life in the final stage.**

The 5-D project aims to integrate clinical assessment tools with wearable sensor technology to monitor (a) pain and distressing symptoms, (b) behavioural and psychological manifestations of dementia, and (c) oral health changes, with the goal to identify the 'point of no return'–the onset of perceived dying."

Using sensor technology to detect symptoms

The 5-D project employs wearable and environmental

sensor technologies to monitor pain, behavioural and psychological symptoms, and we also monitor changes in the oral health status. The devices are designed to minimize discomfort and distress. The Garmin Venu 3S tracks heart rate and physical activity, and the Somnofy radar (VitalThings, Trondheim) monitors sleep patterns, movement, and indoor air quality.

Interdisciplinary team

The 5-D project involves people with various experiences and knowledge, with multifaceted skillsets such as clinicians, nurses, dental health professionals, occupational therapists, engineers, data scientists, and neuroscientists. Bettina S. Husebø is the principal investigator on the project, with extensive experience as a doctor for dementia patients in Norwegian nursing homes. Researcher Monica Patrascu coordinates the model development, Postdoctoral Researcher Kamilla Haugland-Pruitt coordinates the project, and Researcher Brice Marty provides computational programming. The PhD Candidates Anne Therese Hatle and Oda Isene, and the Research Nurse Tanja Lukkari, are primarily focusing on data collection. New team members will join soon, as a new postdoc and a researcher are in the process of being recruited. Additional staff are also involved in the complementary studies.

Complementary studies

We are running complementary sub-studies that look at specific parts of the 5-D project.

The DIPH.DEM study is coordinated by PhD candidate Lydia Boyle and financed by Helse Vest. The study collaborates with the Bergen Red Cross Nursing Home and aims to describe changes in the activity of people with dementia at the end of life. DIPH.DEM functions as a proof-of-concept study for the 5-D project.

The ORAL.DEM study is also financed by Helse Vest. Manal Mustafa is leading this odontology part of the 5-D project, and Farzana Haque works as a PhD candidate on this project. From 2026, Hager Elabdeen joins the team as a research assistant. As people with dementia are classified as a high-risk group for the development of oral diseases, further complicating their situation, the ORAL.DEM project aims to investigate oral health in people with dementia at the end of life and to identify the best measures to enhance oral care.

The Relative Interview Study aims to talk to the family members of participants in the 5-D study. Justin Haugland-Pruitt and Elise Førsund are conducting the interviews, while Kamilla Haugland-Pruitt and Bettina Husebø are actively recruiting relatives. Twelve interviews have already completed, and an additional 3–7 more are planned to take place in January 2026.

Impact

The findings of the 5-D project have the potential to generate critical insights aimed at optimizing individualized treatment strategies for individuals living with dementia. A deeper understanding of the mechanisms, timing, and circumstances under which people with dementia enter the final phase of life will not only advance dementia care but also yield knowledge transferable to other scientific domains and disease contexts. Such insights may contribute to improving quality of life, particularly at the end of life, by enabling the development of more effective and personalized palliative care for individuals who are unable to articulate symptoms or pain. Ultimately, this work aspires to support older adults in experiencing a dignified end-of-life process within the home environment.

Education

At the participating nursing homes, we conduct regular educational sessions for the staff to build a common frame of reference and learn to use the questionnaires and the technology. Further education will be implemented based on the results of the study.

Ethics

This study is funded by the European Research Council (ERC-2022-CoG 101088414). The 5-D study was approved by the Regional Committee for Medical Research Ethics (REK 2024/657596) and the National Ethics Committee for Medical Research (NEM 2024/116). The study is registered at clinicaltrials.gov (NCT06437132).

Current status

Over 200 participants have been recruited for the study, and over 170 participants have already completed baseline measurements. 101 participants have completed their six-month follow-up measurements, and 42 participants have completed their twelve-month follow-up measurements. Comprehensive training and informational sessions have been systematically implemented across all newly established nursing homes.

Seventeen nursing homes in the municipalities of Bergen, Alver, Stad, Farsund, Bjørnafjorden, Bærum, and Voss have joined the project. The recruitment process has started in all of the nursing homes: Bergen Red Cross Nursing Home, Stiftelsen Metodisthjemmet, Stiftelsen Domkirkehjemmet in Bergen, Stiftelsen Betanien Bergen, Stiftelsen Adventistkirkens Sykehjem Nordås, Siljuslåtten sykehjem, Vetleflaten Omsorgssenter and Voss nursing home, Slettebakken Menighets Eldresenter, Listaheimen and Farsund Care Homes, Oksenøya nursing home, Luranetunet in Bjørnafjorden, Hogatunet, Seljetunet, Såta bu- og servicesenter, Lindås Bu og servicesenter , and Manger Velferdssenter.

In addition to analysing individual symptom profiles, we identify significant interdependencies among the symptoms, which will be addressed in subsequent in-depth investigations.

Communication

The 5-D team participated in the Neuro-SysMed Annual Symposium, held on November 18–19, 2025. During the event, the team presented six research posters addressing key aspects of dementia care: agitation (Anne Therese), pain (Oda), oral health (Farzana), questionnaire development (Tanja), the relatives' study (Justin), and sleep (Kamilla).

We issue two 5-D Newsletters per year and host an annual 5-D Day.

5-D webpage QR link

5-D Day

On October 13, 2025, the 5-D team presented recent project developments and preliminary findings at Alrek Health Cluster in Bergen. The event was attended by approximately 60 participants, including representatives from several collaborating nursing homes. During the session, nursing home staff shared their perspectives and provided constructive feedback, offering valuable recommendations for refining data collection procedures. For example, the 5-D team revised the "event" information guidelines to enhance clarity and ease of interpretation.

Participants expressed a strong interest in receiving continued updates on study outcomes. To maintain engagement, the 5-D team will regularly attend relatives' meetings to provide progress reports. Overall, nursing homes reported high satisfaction with the study and data collection processes, particularly emphasizing the effectiveness of communication and support provided by the 5-D team. Building on this positive collaboration, the next 5-D Day is scheduled for April 13, 2026, and we look forward to welcoming our collaborating nursing homes again.

Program for the 5-D Day 2025 (held in Norwegian)

09.00–09.30: Registrering, inkludert kaffe & skillingsbolle

09.30–09.45: Velkommen! 5-D prosjektbakgrunn og dagens status v/ Bettina Husebø

09.45–10.45: Erfaringer fra sykehjemmene

10.45–11.00: Kaffepause

11.00–12.00: Nevropsykiatriske symptomer og agitasjon v/Anne Therese Hatle

12.00–12.40: Lunsj

12.40–13.00: Hva skjer med dataene? v/Tanja Lukkari

13.00–13.30: ORAL.DEM-studien v/Farzana Haque

13.30–13.40: Kaffepause

13.40–14.00: Søvn, hvorfor er det viktig? Funn fra 5-D v/Kamilla Haugland-Pruitt

14.00–14.20: MOBID2 v/Bettina Husebø

14.20–15.00: Diskusjon: Fremtidsperspektiver og rekruttering v/Bettina Husebø






SEFAS research projects and studies

The DIPH.DEM Study

Digital phenotyping for changes in activity at the end of life in people with dementia: an observational trial based on sensing technology (DIPH.DEM) is a pilot study investigating physical activity levels and sleep disturbances in persons with dementia, to describe the activity trajectory toward the end of life. DIPH.DEM is funded by the Regional Health Authorities of Western Norway (Helse Vest) and functions as a pilot for the larger 5-D study.

Almost 90% of people with dementia develop behavioural and psychological symptoms (BPSD). Recent research shows that data acquired from mapping the physical, mental, and social activities of a person can serve as a marker for some clinical conditions, including BPSD. The use of digital phenotyping (analysis of characteristics and behaviours through sensor technology data) in people with dementia is still mostly unexplored; therefore, there is value in investigating whether these measures can enhance the objectivity of tracking changes during the last period of life in nursing home residents with dementia.

Objectives

The primary objective of DIPH.DEM is to evaluate the physical activity levels and behavioural symptoms of people with dementia living in the nursing home, as many experience restlessness, pain, and poor sleep. For this, the study will combine digital measures with validated assessment tools to describe the activity trajectory. The study functions as a cornerstone project for the larger 5-D study.

Sensors and devices

Sensing technology used in the study includes the Garmin Vivoactive5 smartwatch (physical activity levels using acceleration) and the contactless radar-based sensor Somnofy from Vital Things (sleep quality). Data was collected over 7-day periods every 6 months up to 1 year, with completion of the data collection period in May 2025. All data is stored using the secure server infrastructure at the University of Bergen.

Team

Coordinating investigator is PhD candidate Lydia D. Boyle, who is working with an international multidisciplinary team including Bettina S. Husebø (professor and palliative care physician, main supervisor of the candidate), Monica Patrascu (systems scientist, project manager and co-supervisor), and Brice Marty (neuroscientist).

The collaborators of DIPH.DEM are Kristoffer Haugarvoll (neurologist, co-supervisor), Ole Martin Steihaug (geriatrician, co-supervisor), Rune Samdal (user representative), Ipsit V. Vahia (psychiatrist, USA), Rui Nouchi (psychologist, Japan), and Wilco P. Achterberg (elderly care physician, The Netherlands).

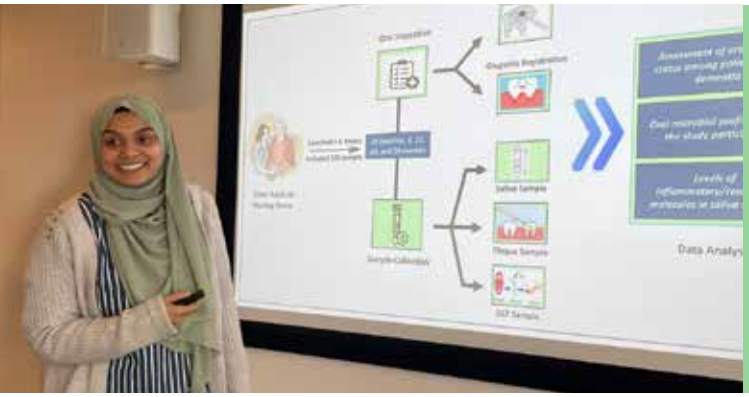
Current status

The DIPH.DEM study began in May of 2023 with REK approval in October 2023. The study's data collection period was completed in May of 2025. The team is very thankful to the families, participants, and healthcare team at the nursing home for making this study possible. The PhD candidate, Lydia Boyle, and her supervision team are currently working on the analysis of the year-long data and dissemination of study results. The first publication for the study, exploring the associations between daytime physical activity levels and sleep quality in people with dementia residing in a nursing home, is as of October 2025 available in Sensors (doi: 10.3390/s25216635).

Two more publications are expected in the Spring of 2026. The study will be completed in the fall of 2026 and will explore additional topics such as psychotropic use for sleep disturbances and long-term use of sensing technologies to monitor physical activity and sleep quality in people with dementia living in nursing homes.

DIPH.DEM webpage
QR link

The ORAL.DEM Study



ORAL care at the end of life in people with DEMentia (ORAL.DEM) is a pioneer study to assess oral health in people with dementia during the last period of life. It is funded by the Regional Health Authorities of Western Norway (Helse Vest) and is part of the European Research Council (ERC) funded larger project *Decoding Death and Dying in people with Dementia by Digital Thanotyping* (5-D).

Caring for people with advanced dementia presents unique challenges, particularly in recognizing when they are approaching the end of life. The Lancet Commission for "The value of death" has highlighted the importance of this phase, stressing the need for timely identification to enable effective end-of-life planning and care. Despite the significance of this stage, oral health is often overlooked in dementia health care.

People with dementia frequently struggle with basic oral hygiene due to memory loss and impaired motor skills. This leads to various dental issues, such as poor oral hygiene and unhealthy dietary behaviour, resulting in many oral problems, including caries and periodontal lesions. These challenges contribute to malnutrition, discomfort, and a decline in overall health. Incorporating oral health into palliative care enables researchers to identify effective ways to improve patient outcomes and better understand the overall needs of people with dementia.

Aims

With the ORAL.DEM study, we aim to develop a state-of-the-art method to assess oral health symptoms in people with dementia during the last period of life. We will create an advanced method for evaluating the oral health status, detecting possible microbial profile changes, and assessing any imbalance in molecules involved in the inflammatory and resolution molecules that might occur.

Impact

In the near future, we expect that this comprehensive approach will not only enhance the quality of life for vulnerable individuals but also reduce healthcare burdens caused by untreated oral health issues, ultimately benefiting society at large.

Bringing in dentistry expertise

SEFAS is collaborating with Haraldsplass Deaconess Hospital and the Department of Clinical Dentistry at UiB in this project. Professor and dentist Manal Mustafa is leading ORAL.DEM. Professor Kamal Babikeir Elnour Mustafa, Leader of the Center for Translational Oral Research, is also contributing. Farzana Haque has commenced her PhD studies and is actively involved in the project. She has submitted her PhD proposal and is contributing to data collection and other research activities. Hager Rahmatalla Zein Elabdeen has joined the project as a research assistant and will be involved in data collection and laboratory work. Associate Professor Ragnhild Eide Skogseth is consulted as a geriatrician and will lead the development of the knowledge package. From the 5-D team, Monica Patrascu (systems scientist) will oversee the data analyses. Rune Samdal is the user representative.

Prevention strategy

We will be adopting the following procedures:

1. **Primary prevention**: Preventing the oral diseases from occurrence (e.g., caries lesions and periodontal diseases) by communication with health personnel at the nursing homes regarding the challenges in providing oral care to people with dementia.
2. **Secondary prevention**: Early detection and

intervention to arrest the early lesions by examining and providing follow-up of the oral health status among the residents.

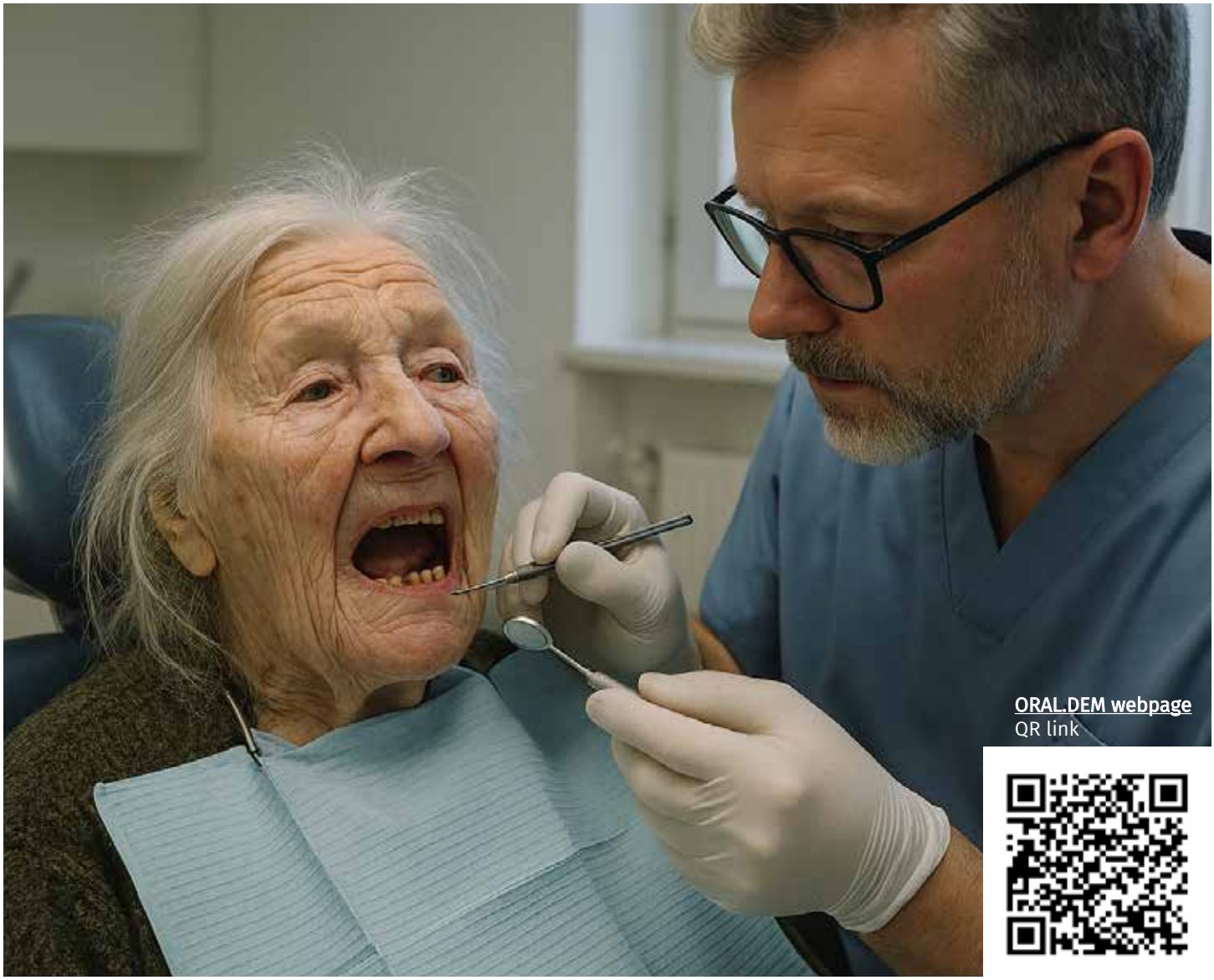
3. **Tertiary prevention**: Referring to treatment when needed to reduce the impact of impairment, disability, and handicap due to pain.

This study is recruiting 129 older adults aged 65 years and above with dementia. Clinical assessments are conducted every six months to evaluate oral mucosa, gingival tissue, and saliva levels, and to record oral lesions, including caries and gingivitis. Caries assessments are performed in accordance with World Health Organization (WHO) guidelines. Unstimulated saliva samples are collected at baseline and at six-month intervals to measure salivary pH and buffering capacity. In addition, dental plaque and gingival crevicular fluid (GCF) are collected and stored for future analyses. Plaque samples will be analysed using the Human Oral Microbial Identification Microarray (HOMIM). Furthermore, levels of pro- and anti-inflammatory molecules in saliva and gingival crevicular fluid will be investigated among nursing home residents.

Current status

A total of 120 participants has by the end of 2025/ January 2026 been enrolled at baseline across the seven participating nursing homes. The first follow-up phase commenced in June 2025 and included 75 participants, and the second follow-up is scheduled to begin at the end of January 2026. The preliminary results of the study were presented on the 5-D Day to nursing home staff and collaborators.

ORAL.DEM, as part of the larger 5-D project, has been approved by the National Ethics Committee (NEM nr 2023/166). Written informed consent is obtained for every participant, ensuring anonymity and confidentiality. Participation is voluntary, and all requested information is confidential.



ORAL.DEM webpage
QR link

The DARK.DEM Study

DARK.DEM is a randomized controlled trial to test whether virtual darkness can alleviate agitation in people with dementia. It is funded by the Research Council of Norway (RCN) and the University of Bergen (UiB) and aims to enhance diagnostics and treatment of behavioural and psychological symptoms of dementia in specialized and municipal dementia care.

Behavioural and psychological symptoms of dementia (BPSD) describe changes in behaviour and mental state caused by the dementia syndrome, and encompass, amongst others, anxiety, depression, psychosis, and agitation. These symptoms are prevalent in persons with dementia, often treatment-resistant, resource-demanding, and contribute to worsening of cognition, independence, reduced quality of life, and increased mortality.

The “gold standard” for assessment of these symptoms is retrospective proxy rating with psychometric scales, yet the low test-retest reliability challenges evaluations over time. This barrier can be overcome by “digital phenotyping”, that is, the characterization of human behaviour by moment-by-moment monitoring with personal digital devices. Moreover, in dementia, circadian rhythms become less robust, which potentiates BPSD. As such, chronotherapy, i.e., interventions targeting the circadian rhythm, is promising. Intrinsically photosensitive retinal ganglion cells (ipRGC) monitor the perception of day and night and are maximally sensitive to light with short wavelengths. This discovery paved the way for virtual darkness therapy, that is, solely exposure to light deprived of blue wavelengths in the evening and night. Lastly, when the new procedures and interventions are applied in health institutions for people with dementia, successful implementation is dependent on knowing the complexity of contextual factors affecting it.

Aim

The aim of DARK.DEM is to develop and evaluate digital phenotyping and virtual darkness therapy to enhance BPSD management in specialized dementia care and facilitate implementation in municipal dementia care.

Methods

In the first part of the project, we use artificial intelligence to examine whether data from smartwatches can provide accurate measures of agitation, depression, and sleep disturbances in persons with dementia admitted to NKS Olaviken Gerontopsychiatric Hospital. Here, we use the Empatica Embrace wristband, measuring movement, heart rate, and its variability, and peripheral skin temperature

data, as well as the GENEactiv watch for measuring actigraphy and light exposure, and Somnofy for sleep tracking.

In the second part of the project, we will conduct a randomized controlled trial to determine whether treatment with virtual darkness, that is, light without blue wavelengths, can alleviate agitation and other BPSD among inpatients at the hospital. This treatment had a striking effect in reducing manic symptoms in persons with bipolar disorders in a recent trial, and in addition, it reduced the need for psychotropic drugs and shortened the hospital stay. A circadian light system is delivered by Chromaviso for this purpose.

In the final part of the project, we are conducting focus group interviews with staff at the hospital and in nursing homes in municipalities to explore barriers and enablers for implementation of the new methods in municipal dementia care. Publications are planned regarding the interviews, looking into the relationships between circadian lights, staff, and patients.

Team

PI of the study is Line Iden Berge, specialist in psychiatry, senior doctor at NKS Olaviken Gerontopsychiatric Hospital, and associate professor at SEFAS. On her team are also systems engineer and researcher Monica Patrascu, PhD candidate Sunniva Vibe Skagen, psychologist and PhD candidate Kjersti Nedreskår, research nurse Anne Marie Espeland, and engineer and postdoc Valentina Casadei. Seniors include associate professor at VID Stein Erik Fæø, psychologist and professor Elisabeth Flo-Groeneboom, UiB, and Tone Elise Gjøtterud Henriksen, chief physician and postdoc at HelseFonna.

A Nordic steering group is connected to the study, consisting of Geir Selbæk, psychiatrist, professor, and head of The Norwegian National Centre for Ageing and Health (Ageing and Health), Norway; Klaus Martiny, professor at the University of Copenhagen, Denmark; and Carlo Volf, light architect from the University Hospital of Copenhagen, Denmark.

Societal impact

This project will enhance the diagnostics and treatment of behavioural and psychological symptoms of dementia in both specialized and municipal dementia care.

Status

A total of 17 DARK.DEM patients have been included in the RCT, with preliminary promising results presented at the International Psychiatric Association Congress in Madrid and the International Psychogeriatric Association Congress in Kanazawa, Japan. All patients who have been invited have agreed to join. Some patients have been very focused on the study equipment, such as digital watches, while others have hidden them in different ways. Other study materials, such as orange glasses, have been requested after the end of the intervention period. Starting new candidates has been going smoothly, and the hospital staff is highly capable of conducting the trial.

Along with the RCT, patients are also recruited for the DIG.DEM work package. 10 out of 10 patients have been included so far. To be eligible for DIG.DEM, patients must have dementia and at least one predominant symptom, i.e., agitation, hallucination, or anxiety. This work package aims to distinguish between symptoms through wearable features, using the Empatica Embrace Plus, as well as Somnofy (when possible). So far, promising results have emerged from the circadian rhythmicity of the data. Some preliminary outcomes have been presented at the Neuro-SysMed Annual Symposium and at the 9th Annual Technology in Psychiatry Summit.

DARK.DEM webpage
QR link

ActiveAgeing – DIGI.PARK

The *Digital Phenotyping in People with Parkinson's Disease* (DIGI.PARK) branch of the ActiveAgeing study explores the use of wearable sensor devices for symptom tracking in home-dwelling people with Parkinson's disease. The study is financed by the University of Bergen, the GC Rieber Foundations, and the Research Council of Norway.

PD is characterized by disturbances in motor behaviour, including tremors, slowness, stiffness, and several other problems due to a degeneration of neural pathways for which there are no biomarkers, making diagnosis and research challenging. The symptoms are difficult to measure over time due to subjective and low-resolution assessment methods. Current tools for assessing clinical phenotypes and severity of Parkinson's disease (PD) are based on observation while the patient performs a series of tasks. The Movement Disorder Society Unified Parkinson's Disease Rating Scale (MDS-UPDRS) is considered the gold standard for assessing the efficacy of clinical trials testing symptomatic and neuroprotective agents. These tools are, however, limited by a lack of objectivity, low sensitivity and reproducibility, and vast variations depending on the time of the examination, time of last received dose of dopaminergic treatment, etc. One approach to circumvent these limitations and establish more objective measures of severity is that of digital phenotyping via the use of wearable sensor devices.

The aim of the DIGI.PARK study is to explore the use of wearable sensors for symptom tracking in home-dwelling people with Parkinson's disease.

This branch of ActiveAgeing is an observational study comprised of two phases. In the first phase, we investigated the use of wearable sensor technology for research and clinical work in Parkinson's disease. A 2-week data collection was conducted in the participants' homes on 15 participants with Parkinson's and 15 participants without Parkinson's from the innovative living environment Helgetun. We employed clinical assessment tools (cognitive assessment, Parkinsonian symptomology, sleep disturbances), two smartwatches (Fitbit Sense and Empatica E4), and a smart ring (Oura).

The second study is based on the results of the first study, as the data collection procedure is refined according to the first study's data analysis. The second study involves data collection from persons with Parkinson's disease and their spouses, to compare the crossover effects of the disease. Both studies include the design of specific Parkinson's disease digital biomarkers for symptom tracking.

Part of a two-sided study

The ActiveAgeing study consists of two branches – the DIGI.PARK branch and the Helgetun branch. The Helgetun branch is exploring how living in an innovative, community-based environment can affect the lives of older adults, using a qualitative approach. See the separate description on the next page.

Team

DIGI.PARK is a collaborative initiative between the Centre of Excellence Neuro-SysMed and SEFAS. Our team comprises Haakon Reithe, PhD student, Shakil Salim Rajan, PhD student, Dr. Monica Patrascu, systems engineer, Dr. Juan Carlos Torrado Vidal, computer engineer, Dr. Brice Marty, electrical engineer and neuroscientist, Elise Førsund, PhD student in the Helgetun branch, Professor Bettina S. Husebø, palliative care physician and leader of SEFAS, and Professor Charalampos Tzoulis, neurologist and Neuro-SysMed Director.

Current status

The first study was initiated in the spring of 2021, and all data were collected in 2021/2022. The comparative cross-correlation analysis of the three wearable devices is finalized, and a digital biomarker for tremor quantification and one for physical activity response are designed. The second study is being designed and is planned to start in the first half of 2026.

Reithe had his second paper accepted for publication, where we designed and tested an algorithm that quantifies tremor in ranges of 3 to 12 Hz. The algorithm was developed together with Monica Patrascu and Brice Marty, and in the paper, we test the algorithm on participants who exhibit unilateral tremors by examining the differences between the most tremor-affected hand with the least affected hand. The algorithm output gives us a tremor index (TI). Comparing the most affected with the least tremor-affected side, we find a separation in the distributions of the TIs. Moreover, we find that tremor severity and type correlated with the number of frequencies, showing a separation between the hands. This indicates that the TI may have utility for tracking tremor in free living conditions, but needs to be validated in larger samples, such as in a second study of DIGI.PARK.

For the third paper, we propose three types of biomarkers for tracking medication response, two tracking the response to medication in particular, and one biomarker tracking ON/OFF fluctuations. For the two former biomarkers, we are making use of the TI to track the response to medication by comparing the TI's leading up to medication intake and the TI's following, giving us an evolution of tremor and its response to medication. For the latter, we calculated thresholds for "OFF" medication states, calculating the amount of OFF over the recorded period. This article is to be published in the first months of 2026. In this work, we find that there is variation between participants in their response to medication, with some showing clear responses while others remain unchanged. For the ON/OFF, we find that those who report ON/OFF according to standard clinical measurements show comparable amounts of OFF. The proposed biomarkers highlight the potential of the TI but need to be further tested and optimized to be properly validated.

Shakil Rajan Salim is our newest PhD candidate to the DIGI.PARK team. Rajan is a pharmacist with a master's in international community health from the University of Oslo. He was accepted into UiB's PhD program in December and is currently working on his first article using data from the first DIGI.PARK study. His PhD thesis will be based on the second DIGI.PARK study. The second study will have a higher number of participants, i.e., 110, utilizing the Axivity ax6 wearable device to collect sensor data. The aim of his thesis will be to evaluate medication response in participants with PD by analysing changes in Axivity-derived data of motor symptoms in relation to dosing intervals and dosage of antiparkinsonian medications. The compensatory behaviour of the non-dominant hand in people with PD through comparison with movement data from control (people without PD) will also be evaluated in his thesis.

Impact

This project investigates how technology can assist society in addressing the challenges posed by an increasingly aging population with PD. This provides important knowledge for planning of future health care, which is transferable to other diseases that share symptomology with PD, such as tremor and motor dysfunction.

DIGI.PARK webpage
QR link

ActiveAgeing – Helgetun

The Helgetun branch of the ActiveAgeing study explores how living in an innovative, community-based environment can affect the lives of older adults, using a qualitative approach. The study is financed by the GC Rieber Foundations, the University of Bergen, and the Research Council of Norway.

Chronic complex conditions, including age-related neurological diseases, pose one of the greatest challenges facing science and society. Many will end their lives in institutions where they do not wish to be, and which society is finding increasingly difficult to finance. Demographic studies show that patient numbers will continue to grow, and older adults with complex conditions are increasingly posing major challenges to healthcare provision in the 21st century. SEFAS is researching solutions, and one of our focus areas is smart living and care. Care today is very costly, and loneliness is a threat. Self-management and independence should exist alongside social activities and healthcare services. We wish to explore and use novel technology and smart buildings to innovate care and treatment for the elderly through sustainable business models and look at how we can implement new scientific knowledge into action more effectively and efficiently. One such pilot project is Helgetun, built and financed by the GC Rieber Foundations.

Helgetun is a community-based living environment for seniors located in a rural area of Bergen. The first residents moved in in 2019, and Helgetun promotes active ageing by facilitating mental, social, and physical participation. It consists of 31 rental apartments and several shared facilities. At Helgetun, the residents can participate in several group activities such as singing in a choir, joining in on social walks, playing bridge, dancing, volunteering in a kindergarten, working at a farm, gardening, and supporting their neighbours in the nearby Helgeseter Senior Centre.

Among the facilities, there is a common room for social activities and a greenhouse for occasional cultural arrangements.

The aim of this study is to evaluate how this way of living can reduce loneliness and potentially delay the development of chronic complex conditions, allowing people to live longer independently at home. Based on observations, interviews, and sensor data from wearable devices, we are investigating how living at Helgetun affects the lives of the residents.

Team

Professor Bettina S. Husebø is leading the project, and molecular biologist Elise Førsund is employed as a doctoral fellow on this project, doing qualitative research to obtain rich and detailed data about the living environment, based on the residents' experiences. Monica Patrascu, a systems engineer with long experience with artificial intelligence and control systems, is on board to apply their knowledge on discovery and digital signal processing, to detect patterns in the data that show us information about the lifestyle and activity levels of older adults. Rune Samdal joins the project as a user representative, while Juan Carlos Torrado Vidal and Stein Erik Fæø provide experience with qualitative analyses as co-supervisors for the doctoral fellow in the DIGI.PARK branch, Haakon Reithe.

Part of a two-sided study

The ActiveAgeing study consists of two branches – the Helgetun branch and the DIGI.PARK branch. DIGI. PARK is an observational study based on quantitative research, exploring the use of wearable sensor devices for symptom tracking in home-dwelling people with Parkinson's disease. See separate description.

Current status

Three scientific publications have been produced from ActiveAgeing's Helgetun branch. Together, these constitute the doctoral thesis of Elise Førsund, submitted in the fall of 2025. The first article was published in Frontiers in Public Health in April 2024, titled "Active ageing in community-based living environments: an ethnographic study". In this study, we identified three main factors that were important in facilitating active ageing in this living environment. These were "Maintaining self-identity", "Experiencing growth and development", and "Feeling a sense of belonging".

The next article explores a deeper understanding of how this community came about and how older adults experience this process, and we continued by looking at the participants' relocation stories. For this purpose, we used a narrative approach based on unstructured interviews, with the main question, "Can you tell me about when you moved to Helgetun?" This knowledge is important to understanding how these communities form and evolve over time. This article was published in the Journal of Aging and Environment in June 2025.

The last article focuses on the living environment's impact on technology adoption for older adults. In 2021/2022, we collected sensor data from 15 residents at Helgetun at two different timepoints: one in spring and one in autumn. We used two commercial-grade devices (Fitbit Sense smartwatch and Oura ring) and a research-grade wristband (Empatica E4). Interviews were performed after both data collections to investigate the participants' experience with the use of digital devices. This paper is currently under review.

Societal impact

Knowledge from this project might inform policymakers on how we as society should plan the use of novel technology, social living constellations, and person-centred solutions to support independent, safe living for older adults, and maintain or improve their quality of life as well as for their families.

ActiveAgeing Helgetun webpage QR link

The EI ROBOT Project

In collaboration with Vitalthings (NO), Mentech (NL), and SARA B.V. (NL), we have established the project Emotion-Intelligent Robot System for People with Impaired Cognition (EI ROBOT), with funding from the European Union program Eureka Eurostars, the Norwegian Research Council, and the Netherlands Enterprise Agency.

The European (and global) population is ageing, which leads to an increase in age-related afflictions (e.g., dementia) and corresponding challenges regarding their well-being. Declining cognitive functions combined with a shortage of healthcare workers further complicate the matter. Consequently, loneliness, depression, and anxiety for people in long-term care institutions are at risk to increase. Robotic solutions are proposed to support residents in daily routines and alleviate the workload of healthcare workers. With emotion-intelligent robotics, non-pharmacological interventions can be fast and easily fitted for personal preferences and the cognitive abilities of residents.

Emotion-intelligent robot system

The objective of EI ROBOT is to develop an emotion-intelligent robot system to enhance the well-being of persons with dementia or other intellectual disabilities residing in long-term care institutions through personalized interactions while supporting care professionals. The intelligent robotic solution integrates advanced sensing technology, artificial intelligence, and personalized interventions. The system will monitor the residents' physiological states in real-time using non-intrusive sensors, and then accurately interpret this data to estimate the emotional states of agitation and drowsiness. The robot will deliver tailored interventions to address individual needs, thereby enhancing the residents' emotional well-being and reducing the workload on caregivers.

Our sub-objectives are:

1. Advanced Sensing Technology: Implement non-intrusive sensors to monitor residents' physiological and emotional states in real-time, measuring heart rate, respiration, and stress levels.
2. AI-Driven Emotion Recognition: Develop AI algorithms to accurately detect and interpret residents' emotional states, combining data from multiple sensors for comprehensive analysis.
3. Personalized Interventions: Design personalized non-pharmacological intervention protocols based on residents' emotional and physiological states, providing real-time responses to improve well-being.
4. Ethics, Validation, and Acceptance: Maintain ethical considerations through expert validation and trustworthy AI principles and analyse the acceptance of the robot.

Team

The project team at SEFAS is interdisciplinary and is led by Monica Patrascu. Psychologist Kirsti Eikeland joined the team as a researcher with a clinical background in 2025. Bettina S. Husebø and Line I. Berge provide expertise in elderly care, specifically for people with dementia. Finn Patrick Nilsen is the user representative for this project.

Impact

The results of EI ROBOT will provide valuable knowledge on emotion recognition via sensing technology, the delivery of individualized non-pharmacological interventions, and the effect on both users and the care staff. By utilizing a modular and multi-modal approach, the emotion-intelligent robot system has sustainable potential for different use cases and settings in both future extramural and intramural care.

Current status

The project underwent the mandatory ethics assessment from the Eurostars Ethics Committee and received clearance. At the UiB, we continued the user involvement process and began the investigation into the ethical aspects of human vs. machine autonomy. In 2025, SARA B.V. withdrew from the consortium; the project tasks are being restructured, with a new kick-off meeting projected for early 2026. Nevertheless, the aims of EI ROBOT remain unchanged.

Project webpage QR

The IsoRhythm project

SEFAS contributes essential expertise on circadian rhythms to the IsoRhythm project, part of ESA and DLR's 100-day isolation study, SOLIS100. By analysing how isolation and confinement disrupt sleep–wake cycles and physiological stability, the project deepens our understanding of human resilience. These insights directly support SEFAS' work on circadian disturbances in older adults, particularly in dementia and Parkinson's disease.

Future space missions will target multiple destinations, including deep-space environments beyond Earth's orbit. These long-duration missions require thorough investigation, as the psychological and physiological preparation of astronauts is critical to mission success under extreme conditions. The European Space Agency (ESA) and the German Aerospace Center (DLR) launched SOLIS100, an isolation and confinement study designed advance human spaceflight research. The study will take place at DLR's aerospace medical research facility :envihab in Cologne, Germany. To simulate real spaceflight conditions, six participants will live for 100 consecutive days in a confined, space-station-like environment with limited resources. SOLIS100's primary objective is to investigate the effects of prolonged isolation and confinement on human behaviour, performance, and well-being. The study will generate valuable data on the physiological and psychological support required for future long-duration spaceflight missions.

IsoRhythm is one of 18 experiments participating in SOLIS100. The project focuses on the analysis of circadian rhythms, which play a fundamental role in regulating sleep and overall physiological functioning through their interaction with environmental and behavioural cycles.

Methods

Biomedical data, including movement, heart rate, heart rate variability, respiration rate, and peripheral body temperature, will be collected at well-defined timepoints during pre, during, and post mission. IsoRhythm will be responsible for the analysis of changes in circadian, psychological, and physiological outcomes over time. The protocol also includes an emotion recognition and processing paradigm, as well as menstrual cycle logging. Data will be analysed using dynamic systems and signal processing techniques, and validation will be performed using hair follicle analysis as a molecular reference for circadian phase.

Team

The SEFAS team consists of researcher Monica Patrascu (PI), professor Line I. Berge, professor Elisabeth Flo-Groeneboom, and researcher Valentina Casadei.

Impact

At SEFAS, circadian disruption is a well-established research topic, particularly in the context of neurodegenerative conditions such as dementia and Parkinson's disease. Altered sleep-awake cycle patterns and instability of the rhythms are closely linked to diseases and quality of life. Although the causes can differ, circadian rhythms are similarly vulnerable to disruption due to altered habits, light exposure, irregular schedules, and changes in biological variables, conditions that are intrinsic to space missions as well, providing complementary data to support circadian research on older populations.

Status

SOLIS100 has received ethics approval and is currently recruiting participants. IsoRhythm is developing protocols and training materials in preparation for the experiment scheduled to begin in spring 2026.

Project webpage QR

The NADage Study

NADage is a phase II randomized controlled trial of nicotinamide riboside (NR) in aging-related frailty. Here, the aim is to determine whether treatment with NR can increase intrinsic capacity in a community-dwelling older population living with frailty, including assessment of cognitive function and overall quality of life. This is a study headed by Neuro-SysMed, and financed by the G.C. Rieber Foundation, the University of Bergen, the Research Council of Norway (Neuro-SysMed), Haukeland University Hospital, NutriBrain, and the DAM Foundation.

There are currently no treatments that can prevent pathological brain aging and cognitive decline in the elderly. Achieving this requires neuroprotective interventions during prodromal stages of the disease, i.e., while it is still possible to avert irreversible neurodegeneration and prevent clinical progression to dementia. We propose that this can be achieved by augmenting brain nicotinamide adenine dinucleotide (NAD) metabolism in the non-demented, elderly, frail population.

Frailty is defined as a geriatric syndrome of multi-system physiological deterioration, which is closely associated with pathological brain aging and a significantly increased risk of dementia, including mild cognitive impairment (MCI), Alzheimer's disease (AD), and vascular dementia. Frailty may therefore be considered a precursor state to cognitive disorders, offering a therapeutic window for disease prevention. The ideal preventive strategy during this window would involve agents that not only enhance general neuronal resilience but also bolster resistance to disease-specific stressors, while being safe and suitable for long-term use in individuals at risk of cognitive disorders. We propose that this can be achieved through NAD-replenishment therapy, employing oral precursors such as nicotinamide riboside (NR). To test this hypothesis, we are conducting the NADage study.

The primary objective of the NADage study is to determine whether treatment with NR, 2000 mg daily, can increase intrinsic capacity in a community-dwelling older population living with frailty, as measured by the change from baseline to week 52 in the 6-minute walk test (6MWT). Secondary objectives include assessment of cognitive function and overall quality of life.

NADage will recruit a total of 100 participants from all over Norway. The study duration will be one year. 2000 mg NR will be administered orally per day, versus placebo, in older individuals with mild to moderate frailty.

Team

NADage involves a comprehensive team across Neuro-SysMed, SEFAS, and Haraldsplass Deaconess Hospital. The Neuro-SysMed Director, Professor Charalampos Tzoulis, is the study director, with PhD Candidate Katarina Lundervold as coordinator. Professor Bettina S. Husebø is a scientific advisor for the project, as is Senior Researcher Christian Dölle. PhD Candidate Haakon Berven and Clinical Researcher Connor Langworth-Green are on board as investigators, as is Associate Professor and Geriatrician

Ragnhild Skogseth Eide and Consultant Neurologist Kristoffer Haugarvoll. Study nurses are Mona Søgnen and Erika Veslemøy Sheard. Bård Erik Bogen, Astri J. Lundervold, and Jörg Assmus have contributed as scientific advisors in the project planning.

Societal impact

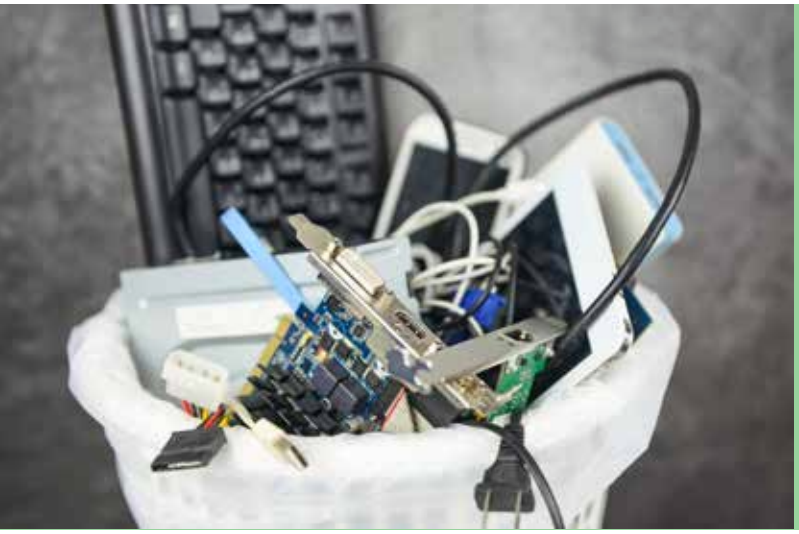
The NADage study has the potential to significantly impact society by offering a promising intervention for age-related frailty, a condition closely linked to cognitive decline and dementia. If successful, the research could lead to an accessible, preventive treatment for older adults, enhancing their quality of life, cognitive function, and overall well-being, while also potentially reducing the societal burden of dementia and long-term care.

Current status

Recruitment of participants is ongoing, and we expect to reach the inclusion of half of the participants in 2026.

NADage webpage QR link

The TREco Project



TREco aims to address systemic inefficiencies in the management and utilization of research technologies, aiming to improve visibility, coordination, and reuse of equipment across institutions. The project's initial development was made possible through funding from UiB Idé at the University of Bergen (UiB), which supported a phase-one pilot project. Additional funding is provided by the Department of Global Public Health and Primary Care (IGS) at the UiB, and the project is supported by Neuro-SysMed.

TREco began with a simple observation: valuable technologies within the research environment were being bought for short-term use, quietly shelved, and forgotten. As researchers, we saw this pattern repeated across institutions, and we realized it wasn't a series of isolated inefficiencies but a systemic gap. TREco was created to close that gap by building a platform that makes research technologies visible, shareable, and trackable across their full lifecycle.

Norway is the leading nation in the production of e-waste, and although efforts for recycling are considered above average, the United Nations annual report emphasizes the need for more ambitious targets with a focus on public campaigns to encourage reuse over replacement. There is currently no specific plan for the reduction of e-waste, and research institutions produce a significant amount of e-waste, purchasing technologies for data collection that are expensive and often only used for short periods of time. Research projects function in silos, making it challenging to realize technology inventories, and there are currently no standard systems for inventory or guidelines for the reuse of these technologies between projects or institutions. TREco aims to be a trusted marketplace where researchers can buy, rent, sell, borrow, or donate technologies, from wearables to robotics, through a platform built specifically for academic environments. Research institutions face a clear challenge: valuable equipment is underused, difficult to share, and often replaced rather than reused. TREco solves this by enabling compliant, efficient reuse of technology across projects, departments, and institutions both nationally and internationally.

Team

Lydia Boyle, Maarja Vislapuu, Brice Marty, Morten Storevik, Rayanne Garcia, and Petra Hribovsek.

Impact

By extending the life of equipment, TREco helps research teams save time and funding while reducing CO_2 emissions and e-waste. Metrics for environmental and economic impact will be built into the platform, giving institutions transparent insight into savings and sustainability gains. TREco promotes a circular economy model where technology is continuously repurposed instead of discarded. Our solution is designed by researchers for researchers, giving TREco a unique advantage in understanding workflows, governance, and real-world constraints. While other marketplaces exist, none

are uniquely tailored to the needs of research-driven environments. As an added benefit, TREco creates new opportunities for equity: smaller or underfunded projects gain access to advanced tools they otherwise could not afford, while larger institutions reduce unnecessary purchases. TREco also strengthens collaboration across universities, hospitals, and municipalities, creating a shared ecosystem dedicated to responsible technology use. By including technology providers as co-development partners, TREco ensures alignment with regulatory, cybersecurity, and sustainability standards. Together, all stakeholders help build a culture where research innovation and environmental responsibility go hand in hand. TREco's mission is to inspire a new way of thinking, where every research project contributes not only to scientific progress but also to a more sustainable and resource-efficient future.

Current Status

In 2025, TREco received funding from UiB Idé at the University of Bergen for a phase-one pilot project and began more than 50 structured interviews and workshops with administrative staff, technical super-users, and researchers at the University of Bergen (UiB), Bergen Municipality, Helse Bergen, Haukeland University Hospital (HUH), and Høgskulen på Vestlandet (HVL) to establish proof of concept. The team now focuses on market acceptance, validating user needs, and preparing for co-design and testing in a phase-two pilot in 2026.

Project webpage QR link

The SEFAS Staff and Students

In 2025, SEFAS continued to grow, adding new staff and students across several disciplines. The centre now includes 14 PhD candidates, 4 postdocs, 3 researchers, 3 professors, and 2 research assistants, in addition to administrative support. This multidisciplinary team covers expertise in medicine, psychology, nursing, nutrition, occupational therapy, engineering, informatics, and social sciences. This diversity strengthens our research on improving health and end-of-life care for older adults and individuals with complex conditions. The Head of SEFAS is listed first, followed by all team members in alphabetical order.

BETTINA S. HUSEBØ — Professor and Head of SEFAS

Bettina S. Husebø, MD, PhD, is a specialist in anaesthesiology, intensive care, palliative care, and nursing home medicine, and a postgraduate of the Harvard Medical School's Safety, Quality, Informatics, and Leadership program (SQIL). As a professor at the University of Bergen, Norway, Department of Global Public Health and Primary Care, she is the leader of the Centre for Elderly and Nursing Home Medicine, SEFAS. In 2023, Dr. Husebø received an ERC Consolidator Grant for the 5-D project and established the Centre for Complex Conditions and Ageing (CC.AGE), with support from the Trond Mohn Research Foundation and the UiB. She received the Dementia Research Award in 2022 from the Norwegian Health Association and the Women's Health Research Award in 2025 from the Norwegian Women's Public Health Association.

Her clinical research has been focused on method development and randomized controlled intervention trials, including nursing home patients and home-dwelling people with dementia, highlighting the assessment and treatment of pain, neuropsychiatric and behavioural disturbances, medication reviews, and end-of-life care. One of her latest publications is the Lancet Commission on The Value of Death, which sheds light on the considerable care gaps at the end of life. Her recent work involves a transdisciplinary approach on technology, smart living, and artificial intelligence in healthy older adults and people with complex conditions, such as dementia and Parkinson's disease. She is also the leader of the Neuro-SysMed Care Node and key partner of the Neuro-SysMed Dementia Node.

LINN SOLVANG AARVIK — Centre Coordinator

Linn holds a Master's degree in Social Anthropology from the University of Bergen (UiB), supplemented with coursework in Organizational Psychology and Project Management. She has extensive experience from various administrative roles at UiB and comes from a position as Research Advisor at the Department of Psychosocial Science (UiB), where she served as Project Manager for an ERC Synergy Grant project. Linn has also worked at HK-dir and has international experience through volunteer service as a human rights observer in the Middle East and as Norwegian Language and Culture Instructor for the US State Department. As Centre Coordinator, Linn will be responsible for coordinating activities and projects at SEFAS and overseeing the centre's daily operations.

LISA AASLESTAD — PhD Candidate

Lisa completed her Master's in 2024 at the UiB/SEFAS with the thesis "Bridging Gaps: Wearable sensing-driven assessment of REM sleep behavior disorder in Parkinson's Disease. Results from the DIGI. PARK study." She is currently a PhD candidate at SEFAS, working with the Centre for Complex Conditions and Ageing (CC.AGE). In her PhD project "Digital Interventions for Sleep and Physical Activity in Older Adults with Complex Conditions," she is working on developing a digital solution aimed at enhancing sleep, with the goal of improving activity levels and the overall quality of life among older adults.

LINE IDEN BERGE — Professor

MD, PhD, specialist in old age psychiatry, senior doctor at NKS Olaviken Gerontopsychiatric Hospital, and professor at SEFAS. Line completed her PhD at the UiB in epidemiology, exploring somatic comorbidity in people with depression. She conducted the LIVE@ Home.Path trial as a postdoc at SEFAS between 2019–2022. From 2023, she has been the PI of the DARK.DEM study, exploring how virtual darkness therapy and digital phenotyping can improve diagnostics and treatment of behavioural and psychological symptoms of dementia. She is also co-PI of CC.AGE, and board member of the American Journal of Geriatric Psychiatry.

LYDIA D. BOYLE — PhD Candidate

M.Phil in global health studies from the University of Bergen and Doctor of Physical Therapy (DPT) from the University of Texas Medical Branch. Lydia is currently a PhD candidate at SEFAS. Her project, funded by Helse Vest and in partnership with Neuro-SysMed, investigates the use of digital biomarkers from sensing technologies for the detection of changes in sleep behaviours and physical activity levels for people with dementia residing in a nursing home (DIPH. DEM).

VALENTINA CASADEI — Postdoc & Researcher

Engineer and PhD who received her master's degree in biomedical engineering from the Università Politecnica delle Marche (Italy), and her doctorate from the University of Liverpool (UK), specializing in wearable signal processing and measurement uncertainty quantification. She is currently a postdoc at SEFAS, working on digital phenotyping for behaviours and psychological symptoms of dementia (BPSD) in the DARK.DEM study. She recently started as a Researcher for the IsoRhythm team as part of the SOLIS100 study funded by the European Space Agency (ESA). She is a member of the Institute of Electrical and Electronics Engineers (IEEE) since 2018, serves as a reviewer for the IEEE Instrumentation and Measurement Society, and is Vice-Chair for the IEEE EMBS Norway Section Chapter.

KIRSTI EIKELAND — Researcher

Psychologist with a bachelor's degree in nursing and a degree in clinical psychology from the University of Bergen. Kirsti is currently a part-time researcher at SEFAS, working on the EI ROBOT project with a focus on ethical assessment and user involvement in the development of emotionally intelligent robotic systems to improve the well-being of persons with dementia or other intellectual disabilities residing in long-term care institutions. Kirsti also holds a part-time position as a clinical psychologist at the Hospital of Vestfold.

HAGER ZEIN ELABDEEN — Research Assistant

Hager is a dentist with a BDS from the University of Khartoum, Sudan (2002), and a PhD from the University of Bergen (UiB), in 2016. From 2021 to 2025, she worked as a researcher at the Oral Health Centre of Expertise in Western Norway (TkVest), Bergen, and as a guest researcher at UiB, where she contributed to two studies: HUSK, and Periolymf. She is currently working as a research assistant on the ORAL. DEM project, evaluating oral health status and assessing the microbial profile (dental plaque) and inflammatory biomarkers in gingival crevicular fluid and saliva.

ANNELISE ELDE – PhD Candidate

A trained clinical nutritionist from the University of Bergen. In March 2025, she started as a PhD candidate in the CC.AGE project at SEFAS. The goal of CC.AGE is to facilitate safe and independent aging at home for people with complex diseases. Annelise's PhD project will focus on nutrition among older people with complex diseases.

ELISE FØRSUND — PhD Candidate

Molecular biologist and MS on the correlation between aging cells and Parkinson's disease. Elise is currently working on her PhD on the "ActiveAgeing" project, Helgetun branch. Her PhD is qualitative and focuses on new living environments for older adults and the implementation of smart technology for this age group. In addition, she is contributing to the CC.AGE project on the Ethics work package. She has a background as a civil engineer and molecular biologist, where she, in her master's, looked at the correlation between the lipid composition of aging neurons and the development of Parkinson's disease.

ANNE THERESE HATLE — PhD Candidate

Occupational therapist with a master's degree in evidence-based practice in health sciences. Since 2022, Anne Therese has been a lecturer in the occupational therapy bachelor's program at Western Norway University of Applied Sciences. In April 2024, she started as a doctoral candidate at SEFAS. Her research focuses on Decoding Death and Dying in people with Dementia by Digital thanotyping (5-D), a groundbreaking study financed by the European Research Council (ERC Consolidator Grant) to precisely investigate the end of life in nursing home patients with dementia utilizing digital technology. Within this project, her specific area of focus is agitation.

KAMILLA HAUGLAND-PRUITT — Postdoc

Kamilla holds a PhD in Neuroscience from the Arctic University of Norway (UiT). She is currently a postdoctoral researcher at SEFAS, working on the 5-D project, which explores death and dying in people with dementia. Her research primarily focuses on sleep disturbances across varying degrees of cognitive decline, and she also contributes to investigations of agitation and pain within the project. Kamilla is actively involved in data collection, statistical analysis, and supervision of PhD and medical students. She regularly presents findings at national and international conferences and engages with nursing homes and relatives to disseminate knowledge about the 5-D project. In addition to her research activities, Kamilla serves as a postdoctoral representative for the IGS research schools and the Faculty of Medicine and is a participant in the Momentum program (2025–2026).

JUSTIN HAUGLAND-PRUITT — PhD Candidate

M.Phil in Global Health from the UiB. During his master's, he explored the experiences and perceptions of medical overuse among migrant health professionals in Norway. Justin is currently a PhD candidate at SEFAS on the CC.AGE project and working closely with BCEPS. He will be studying the ethical and regulatory challenges surrounding assistive technologies, algorithms, and AI in research involving older adults with dementia. He is currently conducting a qualitative interview study exploring the acceptability and ethical considerations of family members of adults with dementia in nursing homes participating in the 5-D project.

FARZANA HAQUE — PhD Candidate

Farzana Haque holds a Bachelor of Dental Surgery from the University of Dhaka and a Master's in Dentistry from University Sains Malaysia (USM). She is currently pursuing her PhD at SEFAS within the ORAL.DEM project, which is part of the European Research Council (ERC) funded research initiative Decoding Death and Dying in People with Dementia by Digital Thanotyping (5-D). Her research focuses on investigating oral health among individuals with dementia in the end-of-life phase. Through clinical examinations and biological sample collection, she helps generate evidence that can guide better oral care for people living with dementia.

EIRIN HILLESTAD — PhD Candidate

Eirin holds an MPhil in Media Studies from the University of Bergen and has completed continuing education in counselling at VID Specialized University. She is currently a PhD candidate at SEFAS, researching volunteer support for older community-dwelling people living with dementia. Her project involves interviewing volunteers, volunteer coordinators, individuals with dementia, and their relatives, as well as conducting participant observations. Eirin works at the Dignity Centre as a Specialist and Research Developer.

ODA SUNNIVA AESCHLIMANN ISENE – PhD Candidate

Master's degree in Cognitive Neuroscience from the University of Oslo. In September 2025, Oda started as a PhD candidate at SEFAS. Her research is part of the 5-D project (Decoding Death and Dying in People with Dementia by Digital Thanotyping), with a focus on the usage of digital sensors for pain assessment in people with dementia.

TANJA LUKKARI — Research Nurse

MSc in nursing from the University of Bergen. During her master's, she investigated the phenomenon of indigenous dementia patients with linguistic problems and health care by conducting interviews with the health care professionals in northern Norway. She has long experience as a registered nurse and additionally as a specialised research nurse. Currently, she is working as a research nurse at SEFAS in a project that aims to phenotype for changes in activity at the end-of-life in persons with chronic cognitive impairment using sensor technology (5-D). A special focus has been on proxy rater measures to assess the challenges and possibilities of such methods.

BRICE MARTY — Researcher

MS in electrical engineering, modelling and systems from Université Toulouse III, France, and PhD in neuroscience from the Université Libre de Bruxelles, Belgium. After a postdoctoral and a lecturer position at the School of Psychology at Bond University, Gold Coast, Australia, he is currently a postdoctoral fellow at SEFAS. He is working on the development of digital biomarkers for symptom tracking in real-world everyday life for persons with dementia and Parkinson's disease. He is involved as a researcher and supervisor in most of the current projects at SEFAS. He is also part of Neuro-SysMed, where he is working on the use of functional near-infrared spectroscopy as a diagnostic tool for Parkinson's disease, and he designed a course in algorithms and coding for health researchers without a computer science background.

KJERSTI NEDRESKÅR — PhD Candidate

Kjersti holds a Cand. Psychol. from the University of Oslo and a bachelor's degree in cell and molecular biology from NTNU. She has seven years of experience as a clinical psychologist and is currently doing her PhD at SEFAS on the DARK.DEM project. Her doctoral work is qualitative, using a hermeneutic approach to study the incorporation of circadian lights in dementia care.

SHIVAM PANDEY — PhD Candidate

Shivam holds a bachelor's and master's degree in computer science with a specialization in Machine Learning, Fuzzy Systems, and Data Mining. After completing his master's, he worked as an ad-hoc lecturer for the course Computer Operator and Programming Assistant (COPA) at the Industrial Training Institute, India, and later served as a Data Scientist at Amazon India. He joined SEFAS in March 2025 and is currently a PhD candidate within the CC.AGE project. His research focuses on developing a nested fuzzy rule-based AI model integrated into the ALIVE digital health platform, designed to promote healthier and more independent lifestyles for older adults living at home.

MONICA PATRASCU — Postdoc

PhD in Systems Engineering and an MSc in Intelligent Systems from the University Politehnica of Bucharest, Romania, with a general research focus on complex psycho-social and biosystems, artificial intelligence, mobile robotics, and symptom tracking for neurological diseases. At SEFAS, Monica has been the main technology designer, focusing on developing digital biomarkers for symptom tracking

in real-world everyday life for older adults, persons with dementia including the end of life, and Parkinson's disease. They are also part of Neuro-SysMed, the chair of the IEEE Engineering in Medicine and Biology Society Norway Chapter, the coordinator of the Complex Systems Laboratory (xLab), and an associate professor member of the Doctoral School of Automatic Control and Computers at the University Politehnica of Bucharest.

SHAKIL SALIM RAJAN – PhD Candidate

Shakil holds an M.Phil. in International Community Health from the University of Oslo. During his master's program, he focused on sociodemographic and health-related factors associated with COVID-19 vaccine hesitancy. Currently, Shakil is a PhD Candidate at SEFAS, affiliated with the DIGI.PARK project (Digital Phenotyping in People with Parkinson's Disease). His research centres on developing digital tools for health monitoring using AI-based smart sensor devices, with the aim of improving the overall health and quality of life for older adults.

HAAKON REITHE — PhD Candidate

Haakon has a background in psychology and neuroscience, where he developed a keen interest in the measurement of human physiology and cognition. He is currently a PhD candidate in the ActiveAgeing study, working on the DIGI. PARK branch. There, he is mainly focusing on cross-evaluating devices for Parkinson's research and clinical use and testing a SEFAS-developed algorithm which quantifies the energy of tremors in ranges 3 to 12 Hz, including testing and validating the algorithm by comparing TI pre and post medication.

ZOYA SABIR — Postdoc

MS and PhD in Clinical Nutrition from the University of Bergen. In her PhD project, she investigated associations of dietary patterns and protein intake with muscle mass and strength in community-dwelling older adults. She is currently a postdoctoral fellow at SEFAS, working on the CC.AGE project. Her work within CC.AGE will mainly focus on food environments, hydration, and nutritional status in older adults with chronic complex conditions. This will include an evaluation of digital methods for assessment of dietary intake and hydration status, with the goal of protecting older adults from nutritional deficiencies and dehydration.

SUNNIVA VIBE SKAGEN — PhD Candidate

MS in psychology from 2023 with a specialization in behavioral neuroscience. Her thesis, titled "An Exploration of the Effects of tDCS on the Supplementary Motor Complex and its Impact on Inhibitory Control: Implications for Tourette's Syndrome," investigated the effects of transcranial direct current stimulation (tDCS) on inhibitory control. Currently, Sunniva is working as a PhD candidate at SEFAS, specifically with the DARK. DEM study, which investigates the potential therapeutic benefits of darkness therapy for reducing agitation in individuals with dementia.

MANAL MUSTAFA — Professor

Dentist with a PhD in dentistry and a master's in clinical oral sciences. She contributes to the ORAL.DEM study by assessing oral health at baseline and follow-up, examining microbial profiles and molecular markers in biological samples related to oral lesions in people with dementia. The project focuses on early disease detection, prevention, and improving end-of-life oral care.

ASMAT ULLAH — Postdoc

PhD in Engineering from NTNU. In his doctoral research, he developed AI and data-driven solutions for optimizing productivity and reducing emissions in sustainable construction machinery. He is currently a postdoctoral fellow at SEFAS, working on the CC.AGE project. His work within CC.AGE focuses on developing digital health technologies to support independent living for older adults with complex conditions. This includes creating AI-powered monitoring systems to detect health deterioration early, with the goal of preventing complications and reducing hospitalizations.

ELI SYNNØVE VIDHAMMER — Senior Executive Officer

Communications officer working with SEFAS' website, flyers, brochures, annual reports, rollups, and other communication tasks in a 20% position. She is also engaged at other research centres at the UiB (Neuro-SysMed and CCBIO, in all 80% at the UiB), and has 20 years of experience at the University of Bergen with administration work (communication, HR, education). Her background is a Bachelor's in English, German, and literature science, and she has previously worked for many years in marketing in the private sector. She works from remote, but visits SEFAS in-person from time to time. Besides UiB, Eli works as a freelance translator.

NEW ROLES IN 2025

Line Iden Berge: since January 2025 full professor, working with DARK.DEM, CC.AGE, EI ROBOT, and IsoRhythm.

Manal Mustafa: now a full professor, 20% at SEFAS, affiliated with the 5-D project (ORAL.DEM).

Monica Patrascu and Brice Marty: from postdocs to researchers, working across all SEFAS projects.

Farzana Haque: from research assistant to PhD candidate, affiliated with the 5-D project (ORAL.DEM).

Valentina Casadei: In addition to being a SEFAS postdoc, she is now also a researcher for the IsoRhythm team as part of the SOLIS100 study funded by the European Space Agency (ESA).

SPECIAL AWARDS IN 2025

Congratulations to the following for these special achievements in 2025!

Bettina S. Husebø was in 2025 awarded the Women's Health Research Award 2025. The award was presented by the Norwegian Women's Public Health Association during its national board meeting and recognizes Husebø's groundbreaking work on pain relief for people with dementia and quality care at the end of life.

Bettina S. Husebø was also accepting the Honorary Mention 2025 on behalf of the GC Rieber Foundations, presented by the Norwegian Housing and Urban Planning Association (BOBY). This was based on the pioneering pilot project in housing and urban planning for older adults, Helgetun, with emphasis on the project's strong focus on research, where SEFAS and Bettina Husebø play a key role.

Lydia Boyle was awarded project support from the innovation funding program UiB Idé in the student project category, for the project named TREco (Technology Reuse Ecosystem).

Monica Patrascu was honoured with a feature story in IEEE Women in Engineering Magazine, portraying Monica's journey into research (and art).

Monica Patrascu was appointed to the International Psychogeriatric Association (IPA) Artificial Intelligence Task Force. Monica will contribute expertise in technology and artificial intelligence and serve as the representative for northern and southeastern Europe. The task force, established in 2025 with its inaugural meeting at the IPA World Congress in Kanazawa, Japan, aims to fill the gap between the availability of AI-based tools and approaches with the potential to improve quality and access to care, and the lack of the requisite evidence base to support best practices and evidence-based guidelines. It is chaired by Ipsit V. Vahia and consists of an international multidisciplinary team.

Technology and Digital Innovation

Technology plays an increasingly central role in SEFAS' mission to improve health, care, and quality of life for older adults, both at home and in nursing homes. SEFAS conducts research on complex age-related conditions, often relying on sensor data, digital monitoring tools, and advanced analytical methods to understand symptoms, disease progression, and care needs.

The Centre uses digital health approaches such as wearable sensors, radar systems, and algorithm-based analyses to deepen insight into physiological and behavioural changes in aging populations.

The focus on technology supports SEFAS' broader vision: to generate research-based knowledge that improves assessment, treatment, and end-of-life care for older adults. By integrating engineering, data science, and medicine, SEFAS is shaping the future of elderly care through precise measurement tools, intelligent models, and interdisciplinary collaboration.

Other Technology Activities in 2025

The Norwegian EMBS Chapter
In 2024/2025, SEFAS strengthened its national role in health technology ecosystems when researchers Monica Patrascu and Valentina Casadei were appointed Chair and Vice Chair of the newly established IEEE EMBS Chapter in Norway. IEEE is a major network that counts a wide number of sections and societies, including the Engineering in Medicine and Biology Society (EMBS), which gathers professionals with backgrounds from engineering to clinical disciplines.
This marked the first time Norway held an EMBS chapter. It was established in December 2024 to formalize the growing professional activity in the intersection between engineering, medicine, and biology. The chapter aims to connect researchers, professionals, and students in the field of biomedical engineering and related disciplines to foster collaboration, share knowledge, and support each other in our endeavours. This chapter will serve as a platform for networking, education, and the advancement of our shared interests in biomedical engineering.

Strengthening SEFAS' expertise in signal processing: MATLAB Scientific Workshop
On September 5, 2025, SEFAS hosted a MATLAB Scientific Workshop, highlighting how advanced signal processing tools support elderly and nursing home medicine. MATLAB is a platform widely used for complex data analysis and is particularly valuable for interpreting signals from wearable sensors, radar-based monitoring systems, and digital biomarkers reflecting sleep, respiration, heart rate changes, and activity patterns.
During the workshop, researchers Federico Seri and Carlos de Cos presented recent advances in MATLAB's analytical capabilities. Their contributions directly support SEFAS' ongoing research efforts, where improved signal processing competence leads to more accurate monitoring and a deeper understanding of symptoms in patients with dementia, Parkinson's disease, and other age-related conditions.

This workshop is part of SEFAS' broader effort to strengthen internal capacity in digital science, engineering-based methods, and data-driven care innovation.

Our sensor technology portfolio

Somnofy is a small, contactless radar installation (approx. 10 x 10 cm) developed and tested by Vitalthings in Trondheim, Norway. Somnofy is installed on the wall next to the bed and captures: breathing rate, sleep patterns, movement, air quality, light in the room.

Garmin Venu 3S and Garmin Vivoactive 5 are two wrist-mounted fitness smartwatches. They capture heart rate, inter-beat interval, movement (acceleration for both, rotation for the Venu 3S), and estimate breathing rate.

The Oura ring (versions V2 and V3) is a commercial smart ring that provides several aggregated scores: sleep (hypnogram), heart rate variability, heart rate, and metabolic equivalent task.

Fitbit Sense is a wrist-mounted fitness smartwatch that captures heart rate, inter-beat interval, estimates energy expenditure (calories), number of steps, and metabolic equivalent task scores.

Empatica E4 is a research-grade wrist-worn multi-sensor device, validated for measuring physiological variables: heart rate, inter-beat interval, movement (acceleration), electrodermal activity, and body temperature.

Empatica Embrace Plus is a smart watch equipped with multiple medical-grade sensors designed for continuous measuring of physiological variables, including heart rate (HR), electrodermal activity (EDA), peripheral body temperature and accelerometer.

GENEactiv is a medical wrist-worn device designed to record raw and unfiltered accelerometer data, environmental light, and peripheral body temperature.

ocuWEAR 1.0 is a wearable light logger provided by Chromaviso. This device is designed to track visual and not visual of light, based on the CIE Standard S:26S2018.

Polar H10 is a high-resolution heart rate monitoring sensor worn on the chest with a strap. It is widely implemented in both medical and research applications.

HUME is a sensor system from Mentech measuring stress and its build-up, that can be mounted as a chest strap, a patch or as a sock with sensors (SentiSock). The strap and patch measure heart rate and movement, while the sock measures skin conductance and movement.

A circadian light system at Olaviken is provided by **Chromaviso** and offers changing illumination and colour temperature through the day. The light system is not considered as medical technical equipment and is CE approved.

We explore this to determine whether treatment with virtual darkness, that is, light without blue wavelengths, can alleviate agitation and other BPSD among inpatients at the hospital.

Education & Dissemination

In 2025, SEFAS continued to bridge research and practice through broad education and dissemination activities. We provided training in nursing homes, engaged communities and decision-makers, contributed to seminars and interdisciplinary programs, and supported students at multiple academic levels.

Education in nursing homes

In 2025, SEFAS continued its strong focus on increasing competence in palliative and end-of-life care for people with dementia across Norwegian nursing homes. As in previous years, staff received training in assessment and treatment of pain and distressing symptoms, installation and usage of digital tools, and training in the use of traditional assessment instruments (e.g., behavioural disturbances related to dementia, pain and distressing symptoms at the end of life, dementia stage, activity level, etc.). Training activities were delivered continuously throughout the year in multiple municipalities, including Alver, Farsund, Lister, Øygarden, Voss, Knarvik, and Bergen. These sessions included lectures, follow-up meetings, case-based learning, and practical technology training linked to the 5-D and DIPH.DEM studies. This work remains an important arena for communication training among SEFAS' younger researchers and for strengthening collaboration with municipal healthcare services.

Public engagement

2025 has also been active with measures to reach out to elderly adults, relatives, and decision-makers. An excellent channel for our research dissemination reaching a very relevant group is Senioruniversitetet in Bergen, a popular volunteer-run learning arena for retirees. This is offering lectures on topics such as history, culture, and science, and regularly attracting large audiences from the local senior communities. SEFAS was invited to give talks on three occasions in 2025.

Our efforts to reach decision makers in 2025 have been wide-ranging and directed at multiple levels of influence. As examples, we have discussed the implications of national policy reforms with senior citizens, contributed to an open panel debate on assisted dying, and joined Innovation Norway on a visit to Tokyo to explore future collaboration with academic and industry partners. We have also engaged in dialogue on ageing in place with existing and potential partners from industry and the municipal sector. Most recently, we have taken the initiative to invite ourselves to the Standing Committee on Health and Care Services (Helse- og omsorgskomitéen) in the Norwegian Parliament, to engage in a dialogue on how research can contribute to informed political decision-making. Our media list (page 56–58) highlights how we disseminate our research to the public and contribute to broader societal discussions, while our list of contributions to national and international conferences (page 52–55) reflects our peer-to-peer dissemination within the scientific community.

FEST Seminar

SEFAS is part of the Section for Elderly Medicine, Social Pharmacy and Inter-professional Workplace Learning (FEST) at the Department of Global Public Health and Primary Care (IGS). FEST hosts a biweekly seminar series where staff and students share ongoing work and engage in academic discussion. SEFAS researchers and students contribute actively by presenting their projects, posters, articles, and other relevant topics. In 2025, presentations were held by Line Iden Berge, Shivam Pandey, Anne Therese Hatle, Elise Førsund, Shakil Rajan, and Haakon Reithe.

Every third seminar has dedicated time to the FEST Journal Club, where participants present, critique, and discuss scientific literature from a range of disciplines. Each session features one presenter who selects an article, presents the content, and leads the discussion.

In 2025, scientific publications were presented by Haakon Reithe, Lisa Aaslestad, Valentina Casadei, Kjersti Nedreskår, Justin Haugland-Pruitt, Sunniva Vibe Skagen, Anne Therese Hatle, Tanja Lukkari, and Elise Førsund.

Interdisciplinary training at TVEPS

Our neighbour in FEST, the Centre for Interprofessional Workplace Learning (TVEPS), offers interdisciplinary training to around 900 students from the Bergen health and social welfare professions. Students from various health professions gather in groups to examine patients in workplaces in the municipality. The task is to assemble an interdisciplinary treatment plan for the selected patients. Afterwards, a dialogue meeting is arranged between the students and the health care staff at the selected workplace. One person connected to TVEPS facilitates the meetings, often represented by one of SEFAS' staff or students.

Master's program in Health and Ageing

SEFAS contributes with lectures in the master's program in Health and Society, on the societal challenges of an ageing population (basic and advanced level), quantitative methods, and a full course on the academic process from idea to publication. Supervision of master's students in this program was also one of our commitments in 2025. Two master's students graduated from the program in 2025.

Professional studies in medicine

In the professional studies in medicine, we contribute with lectures on dementia and behavioural symptoms and on collaboration between the primary and specialist health care services. We also provide lectures in old age psychiatry, including team-based learning and case studies. Additionally, we contribute to the organizing committee of the Alrek Student Conference.

The Neuro-SysMed Research School

Through our collaboration with Neuro-SysMed, we have access to ECTS-providing courses in their Research School in Translational Neuroscience. Here, we contribute with lectures where applicable in their seminar series, Junior Scientist Symposia, Annual Symposium, and their courses. In 2025, we contributed with talks in one Neuro-SysMed seminar (Husebø, Sabir, K. Haugland-Pruitt, Casadei) and five lectures in their Junior Scientist Symposium series (Sabir, Elde, Boyle, Casadei, K. Haugland-Pruitt, Pandey). Anne Therese Hatle contributed as coordinator for the CCBIONEUR910 course Patient and Public Involvement in Medical and Health Research, and Lydia Boyle facilitated group work plus presented a dementia case in the same course. In addition, we had 11 posters at the Neuro-SysMed Annual Symposium.

Our PhD and master's level students participate in relevant Neuro-SysMed courses and seminars for their own education.

Graduated master's degree students in 2025

DIONNE ODIJK

Thesis: *A personalized digital educational framework for older adults with complex conditions utilizing the ALIVE platform.*

This work explored how to effectively support older adults with complex conditions in increasing knowledge and self-management through the ALIVE platform. The results were gathered through a literature review, interviews, and feedback rounds. These provided insights for the development of an educational framework, describing recommendations regarding, e.g., personalization, design, and functionalities of a digital health educational framework.

The supervisors were Postdoc Zoya Sabir, PhD Candidate Annelise Elde, and Researcher Monica Patrascu.

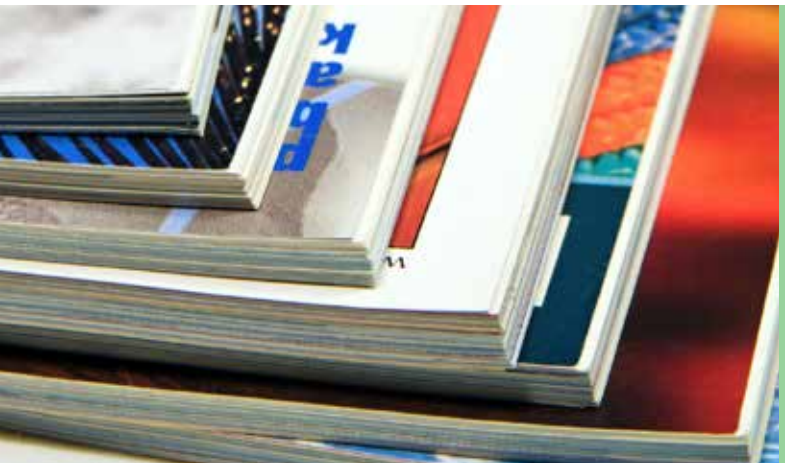
ANINE RAMBECH BAUMANN

Thesis: *Interseksjonalitet og sosial ulikhet i livsstil og helse blant barn og unge: En tverrsnittstudie på samspillet mellom kjønn, klassetrinn og sosioøkonomisk status (Intersectionality and Social Inequality in Lifestyle and Health Among Children and Adolescents: A Cross-Sectional Study of the Interplay Between Gender, Grade Level and Socioeconomic Status.)*

Gender, socioeconomic status, and age are linked to lower life satisfaction, reduced physical activity, and lower fruit and vegetable intake among children and adolescents. This study aimed to identify groups of children and adolescents who are particularly exposed to adverse health outcomes based on their gender, grade level, and socioeconomic status by using data from a large national survey. The findings show that certain subgroups, such as boys in 6th grade and girls in upper secondary school with low socioeconomic status, report lower life satisfaction and less high-intensity physical activity. Boys in upper secondary school with low socioeconomic status also had the lowest fruit intake. Overall, the study highlights that some groups of children and adolescents face a disproportionate risk of adverse health outcomes.

The supervisor was Professor Line Iden Berge.

Scientific Publications



In 2025, SEFAS researchers contributed 18 scientific publications across peer-reviewed journals, conference proceedings, and a textbook chapter. The work spans digital health technologies, dementia and caregiver research, Parkinson's disease, circadian rhythm analysis, epidemiology, and ethical considerations in AI. In addition, we contributed with talks, abstracts and posters at other scientific arenas.

Reithe H, Patrascu M, Torrado JC, Forsund E, Husebo BS, Kverneng SU, Sheard E, Tzoulis C, Marty B. Wavelet-Based Tremor Quantification From Wrist-Worn Sensor Data in Home-Dwelling People With Parkinson's Disease. IEEE J Transl Eng Health Med. 2025 Dec 25;14:19-28. doi: 10.1109/JTEHM.2025.3648704. eCollection 2026.PMID: 41668775

Berceanu C, Bertolotti F, Arshad N, Patrascu M. Understanding the mechanisms of infodemics: Equation-based vs. agent-based models. PLoS One. 2025 Dec 17;20(12):e0338614. doi: 10.1371/journal.pone.0338614. eCollection 2025.PMID: 41406181

Banos DR, Marstein A, Patrascu M, Hartmann A, Bromseth J, Korbmacher M. Response to authors' reply: persistent concerns regarding Nyquist et al. from 15 July 2024. Eur Child Adolesc Psychiatry. 2025 Nov 20. doi: 10.1007/s00787-025-02883-7. Online ahead of print.PMID: 41263956

Banos DR, Marstein A, Patrascu M, Hartmann A, Bromseth J, Korbmacher M. Concerns About Nyquist, Torgersen, David, Diseth, Gulbrandsen and Wæhre's "Treatment Trajectories Among Children and Adolescents". Acta Paediatr. 2026 Feb;115(2):290-291. doi: 10.1111/apa.70375. Epub 2025 Nov 19.PMID: 41255214

Boyle LD, Patrascu M, Husebo BS, Steihaug OM, Haugarvoll K, Marty B. Use of Digital Biomarkers from Sensing Technologies to Explore the Relationship Between Daytime Activity Levels and Sleep Quality in Nursing Home Residents with Dementia: A Proof-of-Concept Study. Sensors (Basel). 2025 Oct 29;25(21):6635. doi: 10.3390/s25216635.PMID: 41228858

Kamilla Haugland; Valentina Casadei; Bettina S. Husebo; Line I. Berge; Monica Patrascu. Multi-Harmonic Visualization for Actigraphy-Measured Circadian Rhythm with Evolutionary Learning in People with Dementia. 2025 IEEE 38th International Symposium on Computer-Based Medical Systems (CBMS). Year: June 2025 | Conference Paper | Publisher: IEEE

Kamilla Haugland; Monica Patrascu; Bettina S. Husebo; Anne Therese Hatle; Tanja Lukkari; Brice Marty; Valentina Casadei. A Clinician Perspective on Sensor Data in People with Dementia at the End of Life: Preliminary Results From the 5-D Study. 2025 IEEE 38th International Symposium on Computer-Based Medical Systems (CBMS). Year: June 2025 | Conference Paper | Publisher: IEEE

Valentina Casadei; Monica Patrascu; Line I. Berge; Sunniva Vibe Skagen; Kjersti Nadreskar; Kamilla Haugland. Circadian Stability via Accelerometer in People with Dementia: A DARK. DEM Proof-of-Concept. 2025 IEEE 38th International Symposium on Computer-Based Medical Systems (CBMS). Year: June 2025 | Conference Paper | Publisher: IEEE

Valentina Casadei; Line I. Berge; Sunniva Vibe Skagen; Monica Patrascu. System-Based Modeling of Respiratory Rate from PPG: A Preliminary Investigation. 2025 IEEE Medical Measurements & Applications (MeMeA). Year: June 2025 | Conference Paper | Publisher: IEEE

Revheim I, Sabir Z, Dierkes J, Buyken AE, Landberg R, Alten I, Spielau U, Rosendahl-Riise H. Bread, wholegrain consumption and weight change from middle to late adulthood: a prospective cohort study. Eur J Nutr. 2025 May 30;64(5):197. doi: 10.1007/s00394-025-03724-8.PMID: 40445392 Free PMC article.

Patrascu M, Berge LI, Vahia IV, Marty B, Achterberg WP, Allore H, Fletcher RR, Husebo BS. The story of pain in people with dementia: a rationale for digital measures. BMC Med. 2025 Apr 17;23(1):227. doi: 10.1186/s12916-025-04057-3.PMID: 40247335 Free PMC article.

Berge LI, Angeles RC, Gedde MH, Fæø SE, Mannseth J, Vislapuu M, Søyland Puaschitz NG, Hillestad E, Aarsland D, Achterberg WP, Allore H, Ballard C, Li F, Selbæk G, Vahia IV, Husebo BS. Burden and care time for dementia caregivers in the LIVE@Home.Path trial. Alzheimers Dement. 2025 Mar;21(3):e14622. doi: 10.1002/alz.14622.PMID: 40042468 Free PMC article. Clinical Trial.

Reithe H, Marty B, Torrado JC, Førsund E, Husebo BS, Erdal A, Kverneng SU, Sheard E, Tzoulis C, Patrascu M. Cross-evaluation of wearable data for use in Parkinson's disease research: a free-living observational study on Empatica E4, Fitbit Sense, and Oura. Biomed Eng Online. 2025 Feb 21;24(1):22. doi: 10.1186/s12938-025-01353-0.PMID: 39985029 Free PMC article.

Boyle LD, Giriteka L, Marty B, Sandgathe L, Haugarvoll K, Steihaug OM, Husebo BS, Patrascu M. Activity and Behavioral Recognition Using Sensing Technology in Persons with Parkinson's Disease or Dementia: An Umbrella Review of the Literature. Sensors (Basel). 2025 Jan 23;25(3):668. doi: 10.3390/s25030668.PMID: 39943307 Free PMC article.

Boyle LD, Marty B, Haugarvoll K, Steihaug OM, Patrascu M, Husebo BS. Selecting a smartwatch for trials involving older adults with neurodegenerative diseases: A researcher's framework to avoid hidden pitfalls. J Biomed Inform. 2025 Feb;162:104781. doi: 10.1016/j.jbi.2025.104781. Epub 2025 Jan 27.PMID: 39864718 Free article.

Banos DR, Marstein A, Patrascu M, Hartmann A, Bromseth J, Korbmacher M. Concerns about Nyquist et al., published 15 July 2024. Eur Child Adolesc Psychiatry. 2025 May;34(5):1675-1678. doi: 10.1007/s00787-025-02649-1. Epub 2025 Jan 25.PMID: 39862245 No abstract available.

Patrascu A, Ion A, Vislapuu M, Husebo BS, Tache IA, Reithe H, Patrascu M. Digital phenotyping from heart rate dynamics: Identification of zero-poles models with data-driven evolutionary learning. Comput Biol Med. 2025 Mar;186:109596. doi: 10.1016/j.compbiomed.2024.109596. Epub 2024 Dec 27.PMID: 39731924 Free article.

Bettina S. Husebø, Justin Haugland-Pruitt, Monica Patrascu. Contribution to Wiley Textbook. Chapter: Ethical challenges for artificial intelligence in clinical practice and research: a case study on people with dementia. In the textbook Neuropsychology in the Age of Digital Health: Exploration, Application, and Practical Implementation. December 2025.

Abstracts & presentations

Presenting our work at national and international meetings and conferences is essential for ensuring that SEFAS' research contributes to scientific progress and clinical practice. These forums allow us to share new findings, receive critical feedback, and strengthen collaborations across disciplines and countries. See a complete list of the 2025 activities below.

Sabir Z: Talk, "TECH-CARE: CC.AGE – Nutrition and Hydration," Neuro-SysMed Seminar, Bergen, Norway (Feb. 12,.2025).

Casadei V: Talk, "TECH-CARE: Biomedical Measurements Uncertainty," Neuro-SysMed Seminar, Bergen, Norway (Feb. 12, 2025).

Haugland K: Talk, "TECH CARE," Neuro-SysMed Seminar, Bergen, Norway (Feb. 12, 2025).

Casadei V: Talk, "Biomedical Measurements Uncertainty on Respiration Data," Neuro-SysMed Junior Scientist Symposium, Bergen, Norway (Mar. 21, 2025).

Haugland K: Talk, "Decoding Death and Dying in People with Dementia Using Digital Thanotyping," Neuro-SysMed Junior Scientist Symposium, Bergen, Norway (Mar. 21, 2025).

Boyle LD: Talk, "Kjønnsbias i forskning," Kvinnedagen event, Media City Bergen, Bergen, Norway (Mar. 7, 2025).

Patrascu M: Conference abstract and presentation, "Dynamic analysis of the effect of isolation on circadian rhythms and their associations with cognitive, emotional and physiological responses: a concept for the IsoRhythm study," ASI–Italian Navy–ESA Workshop, Rome, Italy (Mar. 31 to Apr. 2, 2025).

Berge LI: Talk, "IsoRhythm," ASI–Italian Navy–ESA Joint Workshop, Rome, Italy (Mar. 31 to Apr. 2, 2025).

Berge LI: Poster, "Virtual Darkness for Agitation in Dementia: The DARK.DEM randomized controlled trial," the 33rd European Congress of Psychiatry (EPA), Madrid, Spain (Apr. 5–8, 2025).

Husebø BS: Talk, "Fremtidens eldreomsorg: Smartklokke på bestemor?" Landskonferansen i alderspsykiatri, Bergen, Norway (Apr. 29–30, 2025).

Berge LI: Talk, "Mørketerapi til eldre og personer med demens," Landskonferansen i alderspsykiatri, Bergen, Norway (Apr. 29–30, 2025).

Boyle LD: Talk on a dementia case, and workshop facilitator at the CCBIONEUR910 Course "Patient and public involvement in medical and health research", Eitri/UiB/Neuro-SysMed/CCBIO, Bergen, Norway (May 7–9, 2025).

Sabir Z, Elde A: Talk, "Nutrition and Hydration in Chronic Complex Conditions," Neuro-SysMed Junior Scientist Symposium, Bergen, Norway (May 23, 2025).

Boyle LD: Talk, "DIPH.DEM Study," Neuro-SysMed Junior Scientist Symposium, Bergen, Norway (May 23, 2025).

Casadei V: Talk, "Respiratory Tracking from Wearable Devices," the 20th edition of the IEEE International Symposium on Medical Measurements and Applications (MeMeA), Chania, Greece (May 28–30, 2025).

Nedreskår K: Poster, "Virtual darkness as treatment for agitation in people with dementia: Complex interplays between intervention, socio-cultural context and implementation," European Implementation Event, Newcastle upon Tyne, UK (Jun. 5, 2025).

Patrascu M: Talk, workshop on "Systems in health services," the Tjøme Seminar of the Norwegian Centre for Rural Medicine, UiT, The Arctic University of Norway (Jun. 2025)

Patrascu M: Conference presentation, "Multi-Harmonic Visualization for Actigraphy-Measured Circadian Rhythm with Evolutionary Learning in People with Dementia", the 38th IEEE International Symposium on Computer-Based Medical Systems (CBMS), Madrid, Spain (Jun. 18–20, 2025).

Haugland K: Poster, "A Clinician Perspective on Sensor Data in People with Dementia at the End of Life: Preliminary Results from the 5-D Study," the 38th IEEE International Symposium on Computer-Based Medical Systems (CBMS), Madrid, Spain (Jun. 18–20, 2025).

Casadei V: Poster, "Preliminary Results of Dark Treatment on Patients with Dementia," the 38th IEEE International Symposium on Computer-Based Medical Systems (CBMS), Madrid, Spain (Jun. 18–20, 2025).

Casadei V: Talk, "Multi-Harmonic Visualization for Actigraphy-Measured Circadian Rhythm with Evolutionary Learning in People with Dementia," the 38th IEEE International Symposium on Computer-Based Medical Systems (CBMS), Madrid, Spain (Jun. 18–20, 2025).

Casadei V: Poster, "A Clinician Perspective on Sensor Data in People with Dementia at the End of Life: Preliminary Results from the 5-D Study," the 38th IEEE International Symposium on Computer-Based Medical Systems (CBMS), Madrid, Spain (Jun. 18–20, 2025).

Nedreskår K, Berge LI, Casadei V, Skagen SV: Talk, "Implementing Virtual Darkness in Old Age Psychiatry," Alrek Helsedager, Bergen, Norway (Sep. 17, 2025).

Nedreskår K: Panel debate, "Implementing virtual darkness in nursing homes, case," Alrek Helsedager, Bergen, Norway (Sep. 19, 2025).

Husebø BS: Talk, "Decoding Death and Dying in people with Dementia by Digital thanotyping; 5-D; Pain Branch," International Psychogeriatric Association (IPA) Congress, Kanazawa, Japan (Sep. 25–27, 2025).

Patrascu M: Conference abstract/presentation, "Machine autonomy in the care context for people with dementia: an intelligent robot concept for mood management," International Psychogeriatric Association (IPA) Congress, Kanazawa, Japan (Sep. 25–27, 2025).

Patrascu M: Talk, "Inaugural Meeting of the IPA AI Taskforce – Q&A," International Psychogeriatric Association (IPA) Congress, Kanazawa, Japan (Sep. 25–27, 2025).

Berge LI: Talk, "Transforming Care in the Digital Era," International Psychogeriatric Association (IPA) Congress, Kanazawa, Japan (Sep. 25–27, 2025).

Haugland K: Talk, "Decoding Death and Dying in people with Dementia using Digital thanotyping – 5-D," Fagdag på Skei, meeting focused on digital supervision and sleep monitoring in elderly care, Jølster, Norway (Sep. 30, 2025).

Casadei V: Talk, "IsoRhythm as Part of ESA Isolation Study," Norwegian Space Agency, Romforskningsdagen, Oslo, Norway (Sep. 24, 2025).

Husebø BS: Talk, "Sensorteknologi i demensomsorgen," Eldremedisinsk symposium, Fagråd for geriatri, Haukeland universitetssjukehus (HUS) / Geriatrisk seksjon, HUS / Regionalt kompetansesenter for eldremedisin og samhandling (SESAM), Bergen, Norway (Oct. 1, 2025).

Pandey S: Talk, "AI and healthcare: Promises, challenges and reality with application in healthcare," Neuro-SysMed Junior Scientist Symposium, Bergen, Norway (Oct. 17, 2025).

Pandey S: Poster, "Knowledge-based Fuzzy AI System for Home-dwelling Older Adults with Complex Conditions: Architecture Development," Neuro-SysMed Annual Symposium, Os, Norway (Nov. 18, 2025).

Casadei V: Poster, "Circadian and Sub-Circadian Stability Estimation from Wearable Actigraphy in People with Dementia: Preliminary Results from the DIG.DEM Study," Neuro-SysMed Annual Symposium, Os, Norway (Nov. 18, 2025).

Hatle AT: Poster, "Detecting Individual Agitation Patterns in People with Dementia using Sensor Technology: three case studies," Neuro-SysMed Annual Symposium, Os, Norway (Nov. 18, 2025).

Haugland-Pruitt J: Poster, "Ethics at the End: Listening to Family Members in Dementia Research," Neuro-SysMed Annual Symposium, Os, Norway (Nov. 18, 2025).

Haugland K: Poster, "Pain and cognitive decline disrupt sleep towards the end of life in people with dementia: Preliminary results," Neuro-SysMed Annual Symposium, Os, Norway (Nov. 18, 2025).

Haque F: Poster, "Oral Health Status Among Nursing Home Residents with Dementia in Western Norway: Cross-Sectional Findings from a Longitudinal Cohort," Neuro-SysMed Annual Symposium, Os, Norway (Nov. 18, 2025).

Isene O: Poster, "Pain assessment in nursing home residents with dementia: preliminary sensor data on the development of a novel digital pain interface," Neuro-SysMed Annual Symposium, Os, Norway (Nov. 18, 2025).

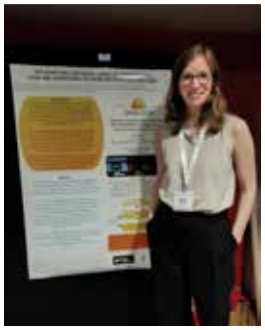
Lukkari T: Poster, "Questionnaires filled in by proxy-raters – Challenges of interpretation," Neuro-SysMed Annual Symposium, Os, Norway (Nov. 18, 2025).

Nedreskår K: Poster, "Exploring contextual mechanisms in implementation of circadian lights in dementia care," Neuro-SysMed Annual Symposium, Os, Norway (Nov. 18, 2025).

Rajan SS: Poster, "Describing the Effect of Sleep and Medication on Motor Symptoms in Parkinson's Disease: A Case Study Using Wearable Devices and Self-Reported Diary Data," Neuro-SysMed Annual Symposium, Os, Norway (Nov. 18, 2025).

Skagen SV: Poster, "Virtual darkness for agitation in dementia: The DARK.DEM randomized controlled trial," Neuro-SysMed Annual Symposium, Os, Norway (Nov. 18, 2025).

Husebø BS: Talk, "Sensorteknologi i demensomsorgen," Alrek Helseklynge (2025).



SEFAS in the Media


Er du klar for å døy heime?

SEFAS had a significant media presence in 2025, with our researchers featured across major Norwegian newspapers, TV, magazines, and academic media, both as commentators and as recognised leaders in our fields. Coverage ranged from prize announcements and research-based expert commentary to societal debates on assisted dying, age-friendly housing, and AI in nursing home medicine. See a complete list of the 2025 media entries below.

Dec. 11, 2025, Dagens Medisin, Helsefolk: "Professor Bettina Husebø er tildelt Sanitetskvinnenes kvinnehelseforskningspris for si forsking på kvinnehelse." On the awarding of the Women's Health Research Prize by the Norwegian Women's Public Health Association to Bettina Husebø for her research. Paper version.

Dec. 4, 2025, Aftenposten: "Moren døde på sykehjem. Døtrene har aldri fått svar på hva som skjedde." Comment from Bettina Husebø on a current topic as an expert on elderly and nursing home medicine.

Dec. 1, 2025, Bergens Tidende: "Moren døde på sykehjem etter flere nakkebrudd. – Vi har mistet all tillit." Comment from Bettina Husebø on a current topic as an expert on elderly and nursing home medicine.

Nov. 29, 2025, Bergens Tidende: "Når trygg behandling på sykehjemmet blir et spørsmål om hvem som er lege." Opinion piece by Bettina Husebø on the lack of common care and medication procedures at Norwegian nursing homes.

Nov. 22, 2025, Bergens Tidende: "FHI anbefaler vaksine til alle på sykehjem. Det gjorde ikke Siljuslåtten." Comment from Bettina Husebø on a current topic as an expert on elderly and nursing home medicine.

Nov. 15, 2025, Dagbladet: "Dødsblikk. Om nær døden-opplevelser." About near-death experiences. Bettina Husebø interviewed as a researcher and MD treating people in their final stages of life. Paper version.

Nov. 13, 2025, Nationen: "Professor Bettina Husebø får pris for forskning på kvinnehelse." On the awarding of the Women's Health Research Prize by the Norwegian Women's Public Health Association to Bettina Husebø for her research.

Nov. 12, 2025, NTB Kommunikasjon: "Kvinnehelse-forskningsprisen 2025 går til professor Bettina Husebø." On the awarding of the Women's Health Research Prize by the Norwegian Women's Public Health Association to Bettina Husebø for her research.

Nov. 7, 2025, Suldalsposten: "Er du klar for å døy heime?" About a societal trend with fewer nursing homes and more elderly people. Interview with Bettina Husebø as an expert in elderly and nursing home medicine. Also in Porten 08.11.25 and Fjordingen 06.11.25.

Nov. 7, 2025, Bergensavisen: "Statsforvalteren mener lege har brutt loven etter varsel om at dødstall økte på sykehjem. – Jeg står for å følge naturlig forløp, uten å gripe inn, sier sykehjemslegen." About a nursing home doctor who believes that medically prolonging life is not always in the patient's best interest. Comment from Bettina Husebø as an expert in elderly and nursing home medicine.

Oct. 11, 2025, Dagbladet pluss, "2000 mennesker døde: Hevder de så dette." Article about near-death experiences and research from the US, interview with Bettina S. Husebø for comments as an expert on people in the final stages of life.

Sep. 2025: UIL Ravenna (Unione Italiana del Lavoro – Ravenna), interview with Valentina Casadei. The interview covers her academic journey, experiences abroad, challenges as a woman in STEM, and reflections on research culture in different countries.

Sep. 4, 2025: TV2 News, "Lysende demenshjelp." Interview on DARK.DEM with PhD student Sunniva Skagen and research nurse Anne Marie Espeland Mork.

Sep. 1, 2025, Psykologtidsskriftet: "Kronikk: Evidens i møte med den enkelte pasienten." Op-ed by PhD student Kjersti

Nedreskår, who argues that findings from group studies gain practical value when integrated with evidence from other research designs and the specific context in which the psychologist is working.

Sep. 29, 2025, Nettavisen, "– Vil man dø, må man få lov til det." About Samuel Massie and his grandfather. Bettina S. Husebø interviewed about people in the final stages of life and the relationship between nursing homes and patients and their families.

Aug. 27, 2025, UiB News: "Å velge døden: En samtale om aktiv dødshjelp i Norge". YouTube-video. A panel consisting of UiB professors Espen Gamlund, Bettina S. Husebø, and Sören Koch is discussing assisted dying through the viewpoints of medical, ethical, and legal research.

Aug. 25, 2025, UiB News: "– Dette har blitt en suksess uten sidestykke". Article about the Helgetun project, interview with Bettina S. Husebø.

Aug. 18, 2025, Regjeringen.no: "Regjeringen vil ha fart på bygging av aldersvennlige boliger." "The government wants to accelerate the construction of age-friendly housing." A highly relevant topic for SEFAS, and closely connected to our research projects at Helgetun and Marineholmen.

Aug. 3, 2025, Bergens Tidende: "– Eldre er en kjemperessurs for samfunnet". Helgetun's residents will now become TV celebrities through the documentary "Senioreksperimentet".

Jul. 7, 2025, Adresseavisen: "Frp vil ha studenter på sykehjem: - Ikke alle som er like glad i å feste". Interview with Bettina S. Husebø about housing models where older and younger people live in the same apartment complex.

Jun. 27, 2025, Vimeo-video: "Senioreksperimentet, trailer." The documentary series Senioreksperimentet highlights the Helgetun project as a possible solution for how Norway can address the aging population. The series consists of three episodes, each 20–25 minutes long, and will premiere on Altibox in the fall of 2025. It follows the residents of the Helgetun housing project in Bergen, with elderly living arrangements serving as a central theme. Statements from SEFAS will also appear throughout the series.

May 27, 2025, Aldring og Helse: "Kan en kommunal koordinator være et tiltak for familier som rammes av demens?" Interview with Line Berge about the results from the LIVE study.

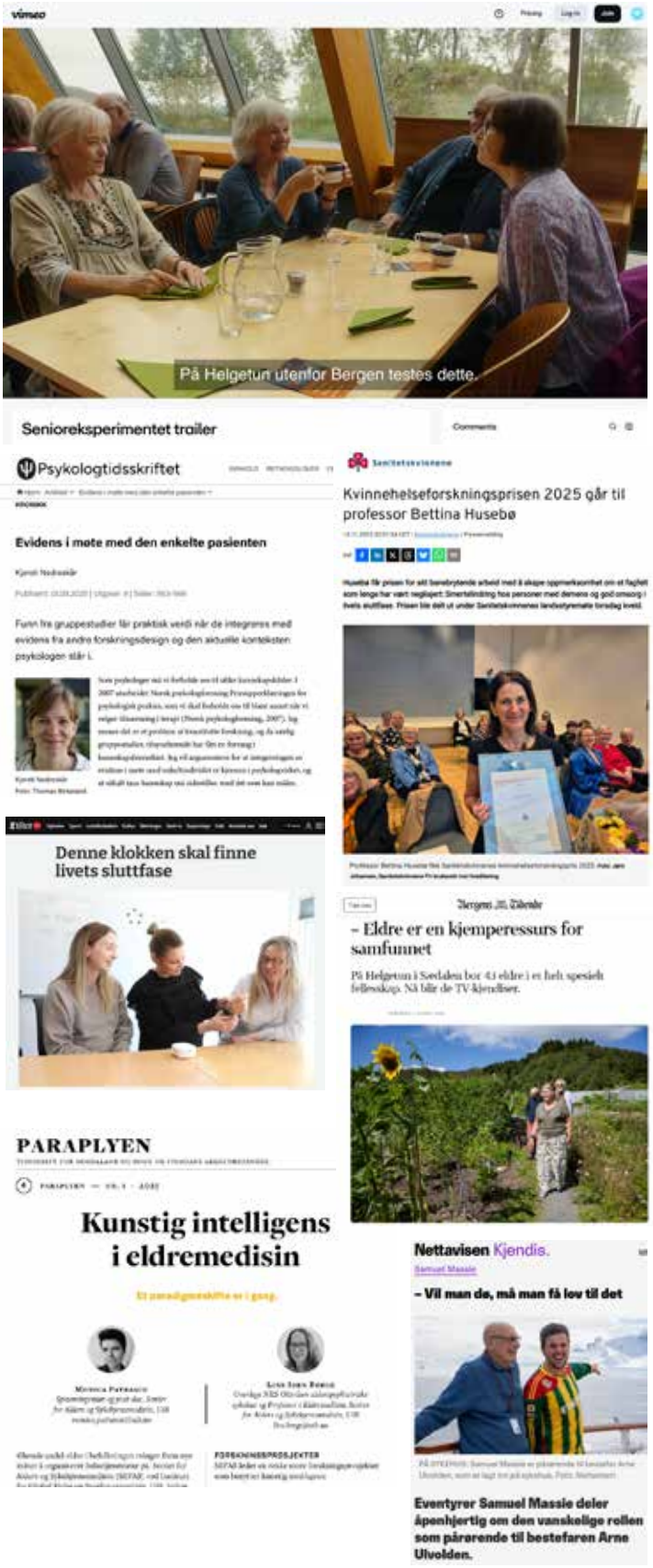
May 20, 2025, UiB News: "Syv innovative prosjekter mottar UiB Idé-finansiering." Article about the projects funded by the innovation program UiB Idé this year, including PhD student Lydia Boyle at SEFAS.

Apr. 23, 2025, IEEE Women in Engineering Magazine. "Dr. Monica Patrascu: The Whole Story [Women to Watch]." Portrait story about Dr. Patrascu, incl. SEFAS achievements.

Apr. 4, 2025, Lister24: "Denne klokken skal finne livets sluttfase." On the inclusion of the nursing homes Farsund Omsorgssenter and Listaheimen in the 5-D project at SEFAS, and the visit from Bettina S. Husebø and Kamilla Haugland-Pruitt.

Mar. 16, 2025, Aldring og Helse. "Kan mørket være medisin?" Interview with Line Iden Berge on the DARK.DEM trial.

No. 1, 2025, Paraplyen: "Kunstig intelligens i eldremedisin: Et paradigmeskifte er i gang." Commentary piece from Line Iden Berge and Monica Patrascu on AI in nursing home medicine.



Social Media

SEFAS established its own social media profiles on Facebook and LinkedIn in 2025, marking a strategic step toward strengthening our visibility and communication. Until now, we relied on our PI's profile and the Faculty of Medicine's channels, and the new accounts allow us to share updates directly with our audiences and highlight our work more consistently. See examples of the 2025 activity below.

Contact

We are very happy to answer any questions you might have, or talk about a collaboration! Call us, e-mail us or make an appointment to see us.

We recommend you to check out our web pages as well, at uib.no/sefas.

Visiting address:
Alrek helseklynge, 3rd floor, section D
Årstadveien 17
5018 Bergen

Postal address:
Universitetet i Bergen
Institutt for global helse og samfunnsmedisin
Postboks 7804
5020 Bergen

Head of the Centre:
Bettina S. Husebø
Phone: 0047 48094660
E-mail: bettina.husebo@uib.no

Centre Administrative Coordinator:
Linn Solvang Aarvik
E-mail: linn.aarvik@uib.no

Contact person for SEFAS, 5-D, and CC.AGE:
Bettina S. Husebø
E-mail: bettina.husebo@uib.no

Contact person for LIVE@Home.Path and DARK.DEM
Line Iden Berge
E-mail: line.berge@uib.no

Contact person for ORAL.DEM:
Manal Mustafa
E-mail: manal.ibrahim.mustafa.sharafeldin@vlfk.no

Contact person for DIPH.DEM:
Lydia D. Boyle
E-mail: lydia.boyle@uib.no

Contact persons for ActiveAgeing:
Elise Førsund for the Helgetun branch, and Haakon Reithe for the DIGI.PARK branch
E-mail: elise.forsund@uib.no and haakon.reithe@uib.no

Contact person for EI ROBOT, and systems engineering:
Monica Patrascu
E-mail: monica.patrascu@uib.no

Contact person for NADage:
Katarina Lundervold
E-mail: katarina.lundervold@uib.no

Helse- og omsorgsdepartementet

GC RIEBER FONDENE

TROND MOHN FORSKNINGSSTIFTELSE

Funded by the European Union

European Research Council
Established by the European Commission

The Research Council of Norway

esa

HELSE VEST

eureka eurostars

Thank you for your support!