



Gerontech Innovation Expo cum Summit 2022

Improving Sleep Quality for Nursing Home Residents through Technology

Nordic Healthy Cities

Lead city: Aarhus (Denmark)

Partner cities: The Municipalities of Syddjurs and Copenhagen (Denmark), Torshavn (Faroe Islands) and Helsinki (Finland)

Who am I?

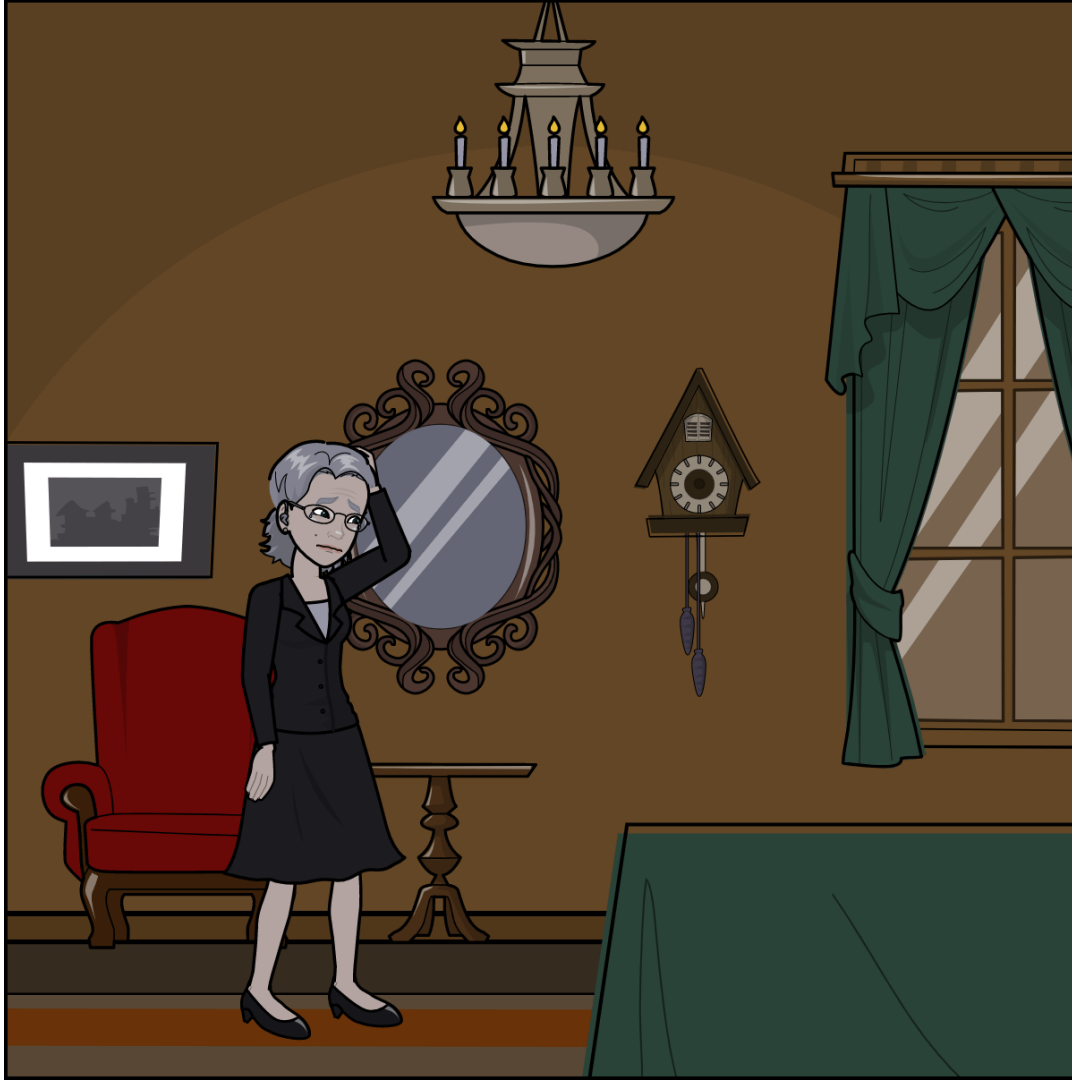
- Christoffer Rinder Larsen
- Project manager, Assisted living technology, Aarhus Municipality, Denmark
- Physiotherapist
- MSc in Clinical Science and Technology
- MA in Biomedical Design
- Project leader on “sleep monitoring” from august 2022



The Need







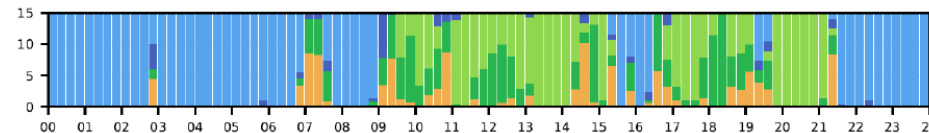
Health consequences

- 75% of all residents in nursing homes experience sleep or circadian rhythm disturbances (1).
- Health complications
 - Affects overall well-being and Quality of Life
 - Worsening symptoms from Dementia.
- Some cases: **aggressive physical** reactions to residents and staff at nursing homes.

1) V.R. Porter et al. Sleep, Cognition and Dementia. Curr, Psychiatry Rep 2015 Dec; 17(12):9

Current Solutions

- Consumer wearable Tech:
 - Bracelets - **Target Group with dementia**
 - Sleeping sheets – **Not compliant with EU General Data Protection Regulation (GDPR)**
- Cameras – **Not compliant with Danish laws.**
- 2018-2020 Aarhus Municipality pilot with Wearable sensor – Demos-10
 - **Potentials support a good night's sleep**
 - **Wearable solutions doesn't fit all**
 - **-> Need for a bed-sensor system**

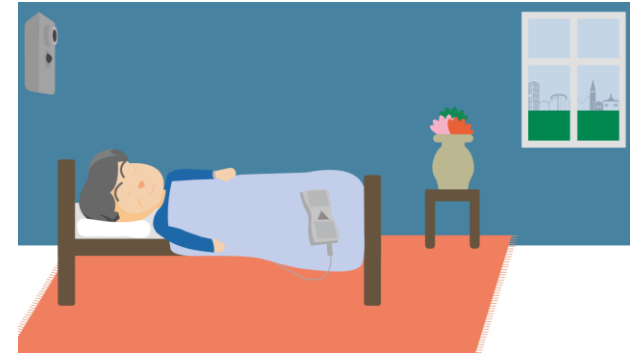




Nordic Innovation

Public Privat Innovation project

- 2020 “Sleep monitoring project” - Public-Private-Project
- **Nordic Healthy Cities project**
 - Collaboration in Nordic Smart City Network
 - The aim is to create supportive urban environments and living, to improve health and quality of life.
- **Municipalities:**
 - Lead: Aarhus (DK)
 - Collaborators: Copenhagen (DK), Southern Djursland (DK), Helsinki (FI), Tórshavn (FRO)
- **Companies:**



Aim of the sleep monitoring project

To improve the sleep of residents with cognitive impairments (e.g. dementia) at nursing homes in a cross Nordic collaboration.

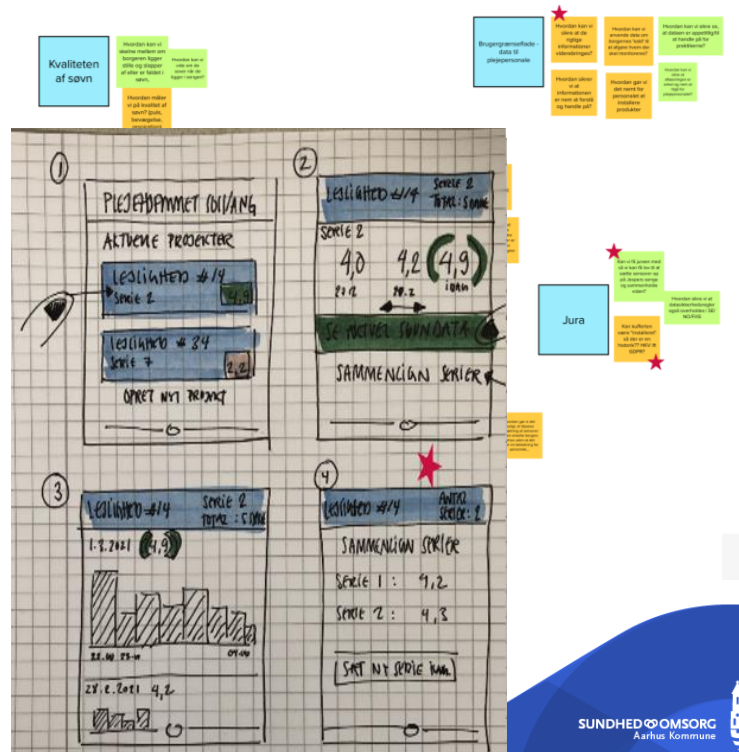
1. To design a sensor system to monitor residents' sleep that complies safety requirements and personal data in the Nordic countries.
2. To get a tool that objectively can evaluate efforts to improve residents' sleep and circadian rhythm.
3. To support systematic professionalism and interdisciplinary collaboration with the residents in focus.
4. To generate insights on sleep monitoring across the Nordics.



Early phase of project: Co-creation and design sprints

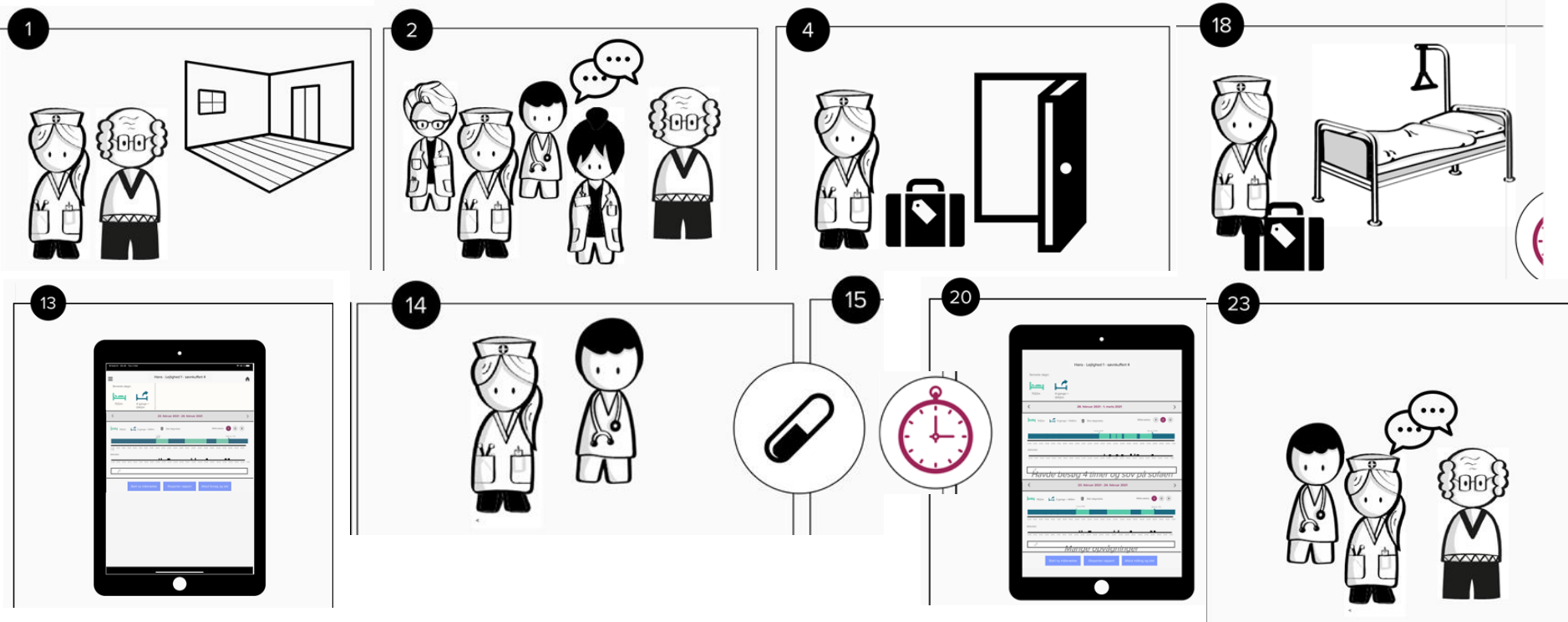
- Designsprints in 2021
 - Companies / Tech developers
 - User: Health Care Professionals
 - Project managers from Municipality
 - Sleep expert
- Defining and understanding the challenge, objectives and user journey
- Qualification of ideas and decisions regarding the prototype of the bed sensor
- Co-Creation with Mock-ups.
 - How should the rating of sleep be visualized for the user?

7 ORGANISER 'HKV' Kopier alle HKV noterne ind i feltet, organiser dem og sæt overskrifter på.



Drafts of visualization of sleep data in the app

THE USER JOURNEY



Prototype of Technology for Proof of Concept

Hardware:

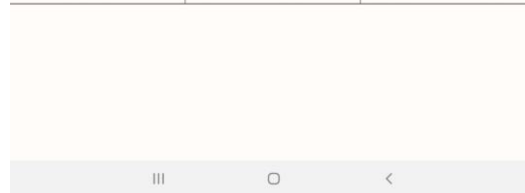
- Pressure sensor:
 - Detects if the resident is in bed
- Vibration sensor:
 - Detects vibrations in the bed
- Gateway
 - Sends data to the cloud anonymously

App: Sleep information

- The time when the citizen goes to bed and leaves the bed
- Total time in bed
- Numbers of out-of-bed
- Movements



The bed sensor installed at the bed frame underneath the mattress



Testing of Proof of Concept

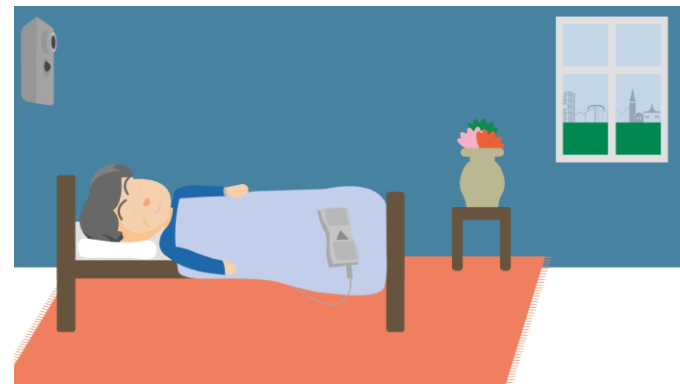
- October 2021: Case-study validation with comparison of other existing products (not scientifically).
- Pilot test postponed because of Covid-19 – Lack of components
- May 2022- now: Usability test in a nursing home in Aarhus
 - User experience of the App
 - Reliability of the hardware and connecting problems
 - Development before larger scale pilot
 - Pre-Results:
 - Valuable data
 - Technical issues
 - as few wires as possible



The app visualizing the sleep data

Pilot with partner cities

- Partners: Copenhagen (DK), Southern Djursland (DK), Helsinki (FI), Tórshavn (FRO)
- Planned November 2022-June 2023
- Aim: Test general effect on sleep and usability
- Knowledge sharing



Methods

- Intervention

- Three prototypes per nursing home in collaborating cities
- Staff free to include residents which complies with inclusion criteria
- Staffs free to choose sleep supporting interventions – has to log
 - Ex. Medication administration, sensory stimulating assistive technologies etc.

- Measurements

- WHO-5: Effect on Quality of life
- Data from sensors: Effect on Sleep / Circadian rhythm
- Notes and Interviews with care takers: Usability, Releasing of time (Business case)
- Interviews with residents / relatives (if possible): Quality of Life & Usability
- Technology readiness level: Commercializability of product

Results - ambitions

- The system may can:
- Residents: Improved sleep and increase **Quality of life**
- Caretakers: a better **working environment**
- Municipality: Positive business case (releasing time for caretakers)
- Companies: Feedback to commercialize a final solution.

Contacts

- chrl@aarhus.dk
- <https://nscn.eu/SleepMonitoring>

