



# DESIGN OF THE PILOT ACTION IN WARSAW

---

Deliverable D.T3.4.1

Version 1  
03 2021

---





## Table of Content

1. Introduction .....	2
2. AP-NURSE monitoring tool .....	2
3. Objectives of the testing.....	2
3.1. Location and geographical information .....	2
3.2. Demographic information .....	4
3.3. Alignment with strategic and policy visions (national, regional, local level) .....	4
3.4. Needs of the target population .....	5
3.5. Partners involved and role in pilot .....	5
3.6. Technologies and technical solution.....	6
3.7. Use cases and target users .....	7
3.7.1. Deployment of devices .....	7
3.7.2. Target users .....	9
4. Definition of local indicators .....	9
5. Procedures.....	10
5.1. Legal and ethical assessment.....	10
5.2. User recruitment and consent procedures .....	10
5.3. Procurement .....	10
5.4. Installation procedures.....	10
5.5. User training and support.....	11
5.6. Operation procedure.....	11
5.7. Termination procedure .....	11
5.8. Evaluation procedures.....	11
5.9. Data management procedure.....	11
5.10. Planning .....	11



## 1. Introduction

This document, Design of the Pilot Action in Warsaw, presents the procedure of preparing the testing of AP-NURSE devices in Social Care Home Warsaw, as part of Output O.T3.3 - Pilot testing of AP-NURSE - persons suffering from Alzheimer's disease in Social Care Home in Warsaw" and deliverable D.T3.4.1. It starts with the overview of the AP-NURSE monitoring tool, continues with the objectives of testing, definition of indicators and the last chapter deals with the defined procedures.

## 2. AP-NURSE monitoring tool

AP-NURSE is a simple and modular monitoring tool designed for patients suffering from Alzheimer's and Parkinson's disease for home and medical application encompassing ambient sensors, which can monitor activity patterns, gas, temperature and other aspects. Its aim is to simplify the work of caregivers or nurses by monitoring basic interactions of the patient with the environment during night or job duties and provide fast alert about possible dangers and support independent living of frail elderly.

The main goal of the tool is to increase the quality of the caregiving services by utilizing smart assistance. Monitoring of the patient's living environment may minimize the consequences of harmful events by fast notification of the caregiving personnel, can provide continual data for a health progress evaluation and may decrease the level of stress of the caregiving personnel.

The AP-NURSE monitoring tool was designed by the Slovak University of Technology in Bratislava (hereinafter STU or PP4) in WP T2 based on the needs of caregivers and patients collected in WP T1. To provide flexibility for home use and medical applications, the development of AP-NURSE is divided to two branches, AP-NURSE Home and Care, three hardware platforms (In-house ESP8266, M5stack and Wasp mote) and 6 physical versions (AP1, AP2, AP4, AP6, AP7 and AP8). More information on these devices can be found in D.T2.2.5.

## 3. Objectives of the testing

The aim of the pilot is to verify the AP-NURSE monitoring tool for patients suffering from Dementia and Alzheimer's diseases and to simplify the work of caregivers in institutional care. Within this implementation plan we have set the following objectives:

- To test the AP-NURSE smart monitoring tool in Social Care Home in Warsaw operated as part of the Alzheimer Center in Warsaw.
- To test the information system designed to collect data from AP-NURSE devices.
- Collect feedback from the caregivers and the representatives with the centre.
- On the basis of feedback from caregivers, further improvement of the system.
- Determine whether the system has improved the work of caregivers (e.g. in terms of reducing the time needed to respond).
- Identify areas of further development and conditions to be used in care centres.

### 3.1. Location and geographical information

The pilot testing will be held in the Social Care Home (SCH), a part of the Alzheimer's Centre located in Warsaw, Poland.



**Figure 1: Map of the Warsaw region**

The Alzheimer's Centre has been operating in its current form since 1 June 2011. It consists of a Social Care Home and a Day Care Home. The Social Care Home is a co-educational facility for 120 chronically ill people, especially those suffering from dementia, including Alzheimer's disease. The range of services provided includes 24-hour care, nursing and care activities, provision of food (three meals a day, including diets), health, psychological, pastoral and social care. In addition, improvement treatments are offered, occupational therapy is carried out and national excursions are organised. In order to provide greater comfort to its residents, the Social Care Home offers laundry, tailoring and hairdressing services.



**Figure 2: The building of the Alzheimer Centrum in Warsaw**

### 3.2. Demographic information

As for 31<sup>st</sup> December 2020 117 patients (75 women, 42 men) live at the Social Care Home. Based on their mobility, the clients can be categorised as follows:

- bed-ridden - 47 people;
- walking but requiring increased care and assistance in daily activities such as hygiene or eating - 52 people;
- requiring minor support - 18 people;

The age range of residents is the following:

- 46-59 years - 5 people;
- 60-79 years - 45 people;
- over 80 years - 67 people.

The Day Care Centre is a day care centre for residents of Warsaw diagnosed with Alzheimer's disease or/and other dementia syndrome. The aim of the activities of the Day Care Centre is to provide the widest possible support to the sick and their families by creating safe and friendly conditions for them to improve their well-being and increase their level of independent functioning in everyday life. The range of services provided includes: care from 8:00 a.m. to 4:00 p.m., provision of three meals a day (breakfast, lunch, afternoon tea), psychological and social care. In addition, rehabilitation treatments are offered, occupational therapy is carried out, excursions are organised and pastoral care is provided.

### 3.3. Alignment with strategic and policy visions (national, regional, local level)

At the national level, the Polish Government created the National Health Program 2016-2020. The strategic goal of the Program was to extend the healthy life of Poles, improve health-related quality of life, and reduce social inequalities in health.

The problem of an aging society was noted, one of the strategic goals was to promote healthy and active aging. This goal was to be achieved, among others, by adapting the health care system to the needs of the elderly:

- development of nursing, care and rehabilitation services tailored to the needs of elderly, dependent people;
- and prevention of falls among the elderly.

At the regional level, in Warsaw2030 Strategy, the authorities of Warsaw also noticed the challenge of the society ageing which city will need to face in a short- and a long-term perspective. One of the operational objectives - We use services close to one's home - provides access to both basic and preventative healthcare as well as social assistance services will be improved, including support for people with disabilities and for seniors.

### 3.4. Needs of the target population

The target population of the AP-NURSE devices are patients suffering from Alzheimer's, Parkinson's disease or frail elderly as well as nurses, professional caregivers or family members, who take care of these patients. In case of the AP-NURSE Home solution, the users are those individuals who are taking care of patients suffering from the Parkinson's and Alzheimer's diseases living in their home environment. These people could be family members of the patients or professionals employed for such care giving. In case of the AP-NURSE Care solution, the users are the personnel employed at care centres, either responsible for care giving or medical treatment of the patients. The users of the stored data could be neurologists, psychologists, general practitioners, specialists and experts in the treatment of Parkinson's and Alzheimer's diseases as well as data analysts, IT specialists and experts in machine learning and artificial intelligence.

The needs of the target population were collected through target meetings and an electronic questionnaire using the LimeSurvey online platform. The questioner consisted of 65 questions focusing on the type of the diseases of treated patients/clients, the experience of the caregivers with IoT (internet of things) solutions, their needs and requirements specific to their treated patients/clients. The survey has been completed by 6 users representing 3 institutions, the Petržalka Municipal District of Bratislava, The University Hospital Olomouc and the Municipality of Olomouc City. Among them, 3 institutions are involved in the care of patients suffering from frail elderly and 3 have experience with all listed chronic diseases (Alzheimer disease, Parkinson's disease and Frailty elderly). Regarding the behaviour of treated patients, the partners responded that their patients live in their own reality, lost, without or in limited contact with their environment. They also suffer from confusion, loss of self-care, need of an accompanying person and separation.

Two out of six respondent claimed that they already have experience with IoT solutions for monitoring the conditions of their patients. Five out of six respondent claimed that they would use IoT solutions for monitoring the conditions of their patients / clients in the future. The results showed that the users of the IoT solution will prefer the combination of motion (5 counts), sound (4), gas (4), temperature (4), pressure (3) light (2), humidity (2) and the opening/closing event (2) sensors.

Five out of six respondents found the IoT solution important to provide sound notifications both to the patient and the care giver. Only 33 % of respondents think that it is appropriate to notify only the care giver. In case of system that provides notification on a smartphone or PC/laptop, normal behaviour of the patient should be signalized by green light on the screen. Abnormal condition of the patient should be signalized by yellow light on the screen, with modest alarm beep and by message on mobile phone. In some cases, it would be also preferable to provide a map to the location where the behaviour was observed. The critical condition should be signalized by red light, strong alarm and by message to pager/smart phone. It would be also important to provide information on the patient, i.e. name, room number, map.

### 3.5. Partners involved and role in pilot

In this pilot testing of the AP-NURSE devices the following partners will be involved with the following responsibilities:

#### **Slovak University of Technology in Bratislava (PP4)**

- Leader of the Pilot
- Development, laboratory testing and prototype production of AP-NURSE devices
- Management of the physical testing
- Installation of devices in dedicated rooms

- Collection of data from the testing
- Training of personnel and caregivers
- Preparation of an informed content for the users of AP-NURSE Devices
- Preparation of a summary report from the pilot action

#### City of Warsaw (PP9)

- Providing information on needs of patients and caregivers
- Assignment of a care centre under its supervision for testing
- Ensuring compliance with legal and intellectual property rights

#### Social Care Centre Home as part of Alzheimer Centre in Warsaw (under the jurisdiction of PP9)

- Providing information on needs of patients and caregivers
- Making the centre available for testing
- Anonymized assignment of patients for testing
- Support in installation and data collection

### 3.6. Technologies and technical solution

In this pilot the AP-NURSE technology is tested. The development of the AP-NURSE units is divided into two branches based on the proposed systems (Home and Care). The AP-NURSE Home and Care prototypes were developed based on the former deliverables D.T2.2.1 - D.T2.2.5. The main features of AP-NURSE Home and Care are shown in **Table 1**. AP-NURSE Home is a device designed for home use (with potential also to care centres) comprising a simple design, low price, notifications through a bracelet worn by the caregiver but with a potential to provided data to an information system for later data analysis. AP-NURSE Care is a more robust and complex device designed for use in care centres with affordable price, IS data collection feature applicable in multi-patient environment.

**Table 2: Features of AP-NURSE Home and Care**

	AP-NURSE Home	AP-NURSE Care
Home use	✓	✗
Use in care centres	✗	✓
Simple design	✓	✗
Low-cost	✓	⚖️
PC based monitoring	✗	✓
Bracelet notifications	✓	✗
IS Data collection	⚖️	✓



AP-NURSE has been developed using three technological platforms:

- In-house solution using the ESP8266 microcontroller, covering the whole design process from design to PCB manufacturing
- Stackable solution using the M5Stack modular platform
- Special design using the Wasp mote platform, developed for low power consumption applications

To provide flexibility, several versions of AP-NURSE were developed:

- AP1 version is meant to be placed under the bed of mobile patients or clients of care centres, to monitor basic movement around the room, noise and patient's movement in the bed.
- AP2 is designated to monitor the doors to the bathroom of mobile patients or clients of care centres. Opening the door will trigger the sensor and based on the time delay and optional noise sensor will trigger the alert.
- AP4 should be placed in common places, such as stairways or hallways, to monitor mostly movement during the night, or for monitoring of forbidden areas.
- AP6 is designed to be used in a kitchen like environment, aimed mostly on gases and smoke.
- AP7 is designed to be placed in the room of mobile patients, similar to AP1, however in various locations, not under the bed.
- AP8 is designed to identify falling down of a patient/client out of the wheelchair.

Each device has its preferred field of application and its real use depends on the needs of patients and caregivers in the final destination. The AP-NURSE devices can be combined with each other, and based on the IS data collection features, user defined scenarios of notifications can be set, which ease the work of caregivers, minimize the risk of patients and summarize data for further analysis of the progress of the disease. More information on the versions of the AP-NURSE devices can be found in the D. T2.2.5 deliverable.

### 3.7. Use cases and target users

#### 3.7.1. Deployment of devices

The second phase of the pilot testing of AP-NURSE in Social Care Home Warsaw involves the AP-NURSE Home, AP-NURSE Care M5stack and AP-NURSE Wasp mote platforms. Even though, AP-NURSE Home is designed for home use with providing notifications through a bracelet worn by the caregiver in home environment, it also makes possible utilizing the Information System (IS) primary developed for the AP-NURSE Care solution and the use in care centres. Therefore, all platforms involved in the pilot testing will be configured to communicate through the IS. The deployment of devices will be carried out based on the map of the Social Care Home shown in **Figure 3**, the standard daily routines of clients and caregivers and the type of patients. The devices will be deployed in the area dedicated for patients, separated from the administrative building and from the Day Care Home by controlled entry. The premises of the Social Care Home can be categorized as follows:

##### Patients' area

- Orange, green and red zones
- Rooms of mobile and immobile patients/clients
- One or two patients/clients in one room
- Free passage of patients in this area



### Common places for patients

- Brown zone
- Area where the movement of patients/clients is not limited during the day
- Both patients/clients and caregivers may be present
- Corridor, dining room, saloon, common toilets

### Caregivers areas

- Purple zone
- Areas primary dedicated to caregivers
- Patients may be present in some cases, but their free passage is not allowed
- Caregivers room, toilet, laundry, washroom, warehouse, maintenance area, smoking room

### Garden

- Blue zone
- Outside premises available for patients after permission
- Doors from patient's room (closed during night time)

### Administrative building

- Grey zone
- Areas not accessible for patients
- Controlled entry by magnetic cards



Figure 3. Layout of the monitored area in Social Care Home in Warsaw



### 3.7.2. Target users

The target users in this pilot are the patients/clients and the caregivers in the Social Care Home Warsaw, who can be divided to the following categories:

1. Clients in single rooms
  - a. 2 devices in one room,
    - i. one under the bed (AP1)
    - ii. one on the doors (AP2)
  - b. Monitoring if a patient leaves the bed
  - c. Controlling environmental parameters (gas, light, humidity)
  - d. Monitoring if a person opens the balcony door
2. Clients in double rooms
  - a. 2 devices in a room,
    - i. one under the bed (AP1)
    - ii. one on the doors (AP2)
  - b. Monitoring if a patient leaves the bed
  - c. Monitoring if the second person moves in the room
  - d. Controlling environmental parameters (gas, light, humidity)
  - e. Monitoring if any of the patients opens the door to the garden
3. Monitoring of passage through corridors
  - a. Signaling if a person is leaving the corridor of the red, green and orange zone (AP4)
  - b. Important during night regimes
  - c. In combination with data from the exits
4. Monitoring the attempts to leave the controlled areas
  - a. Signaling if a person is approaching the door from the controlled area (AP4)
  - b. Important during night regimes
5. Visitors
  - a. Due to COVID-19 restrictions, no visitors are currently allowed to enter controlled area
  - b. Unauthorized persons without magnetic cards shall not enter the controlled areas

## 4. Definition of local indicators

The developed technology goals are defined in D.T.2.2.3 where the functional and event test are defined. All these tests and requirements were derived from the feedback questionnaires of the project partners that have broad experience with the care about the frail elderly. The goals were set such manner, that developed devices will should enhance the quality life of caregivers and caretakers for the patients. The possible use of Lime survey system can be utilized in the future for the collection of additional indicators from care centres. Reliability of the technology can be measured by evaluating the days without malfunction, representing the number of days of operation not requiring intervention.



**Table 3: AP-NURSE indicators**

Evaluation Goal	Indicator	Measure	Measurement Tool	Data Collection Timing
AP-Nurse is accepted	Technology acceptance	Percentage of interviewers	Tailored <i>LimeSurvey</i> online questionnaire	Intermediate and exit questionnaire
AP-Nurse is easy to use	Usability on the part of the interviewer	Percentage of interviewers	Tailored <i>LimeSurvey</i> online questionnaire	Intermediate and exit questionnaire
AP-Nurse is reliable	Technology reliability	Days without malfunction	Google form to monitor the status of devices	updated on weekly basis

## 5. Procedures

### 5.1. Legal and ethical assessment

The AP-NURSE devices were developed by the STU team (WP4) be in line with all applicable legal and ethical rules. The functionality of devices as well as the data collection do not require identification of the test persons and only anonymized and encrypted data are transferred, thus issues of GDPR do not apply. The testing procedure was developed in strong cooperation with the legal department of the interested party, to minimize and even eliminate any legal and ethical issue.

### 5.2. User recruitment and consent procedures

Based on common discussions between PP4, PP9 and the representatives of the Social Care Home in Warsaw, the recruitment of test persons will be performed by the representatives of SCH Warsaw and the STU team, based on the specification and the functionality of AP-NURSE devices selected for testing. The recruitment will include at least 10 test persons, consisting of mobile and immobile patients as well as caregivers. All processes included in the testing procedure for which legal and ethical assessment may apply will be included in the Informed Consent between STU and the Social Care Home in Warsaw and will be summarized in D.T.3.4.2.

### 5.3. Procurement

Since the AP-NURSE device were developed and constructed in WP.T2, the pilot action does not require additional procurement.

### 5.4. Installation procedures

Installation of AP-NURSE technical solutions will be done by the STU staff during the initial phase of the pilot testing in SCH Warsaw. According the proposed plan, this will take place in May 2021. The devices will be installed in dedicated rooms of patients, entrances to dedicated corridors and near the exits from the controlled area, based on the specifications of the SCH Warsaw. The installation of nodes will be performed without the presence of patients in the rooms. The initial threshold values for notification will be set up based on the methodology and achieved results during laboratory testing. The dedicated server for the Information System will be installed by the STU staff outside the premises of SCH Warsaw. The WiFi network allowing the connection of AP-NURSE devices will be put into operation in SCH Warsaw by the STU staff. To provide notifications to caregivers through the Information System, system monitors will be installed in nursing rooms in SCH Warsaw.



## 5.5. User training and support

The training and the support will start with initial briefing between the STU team (PP4), Project manager of The city of Warsaw (PP9) and the caregivers and the representatives of SCH in Warsaw, before the installation of devices. Due to Covid-19 pandemic, this will be performed online and the briefing will be recorded to have the materials available for caregivers who could not attend the meeting, due to their work duties. The aim of this briefing will be to inform the caregivers about the basic functions of the AP-NURSE devices. After the installation of all AP-NURSE components, the caregiving personnel will be trained again by the STU staff. This training will focus on the use of devices and the IS system. PP4 will also provide a simple manual in English language. The STU staff will be available for maintenance at least one week in Warsaw. After this period, support will be given by phone or through email. In case of available funding and in case of necessity, STU staff could come to the centre to solve the identified problem, which cannot be solved remotely.

## 5.6. Operation procedure

The operation procedure will be derived from the initial briefing and the training provided by the STU staff and will be included in deliverable D.T3.4.3. It will include the steps for the installation, operation, dismounting of devices and troubleshooting. The operation of devices will be also demonstrated by the STU staff during the dedicated 7+ days' time period allocated to be present at SCH Warsaw.

## 5.7. Termination procedure

As stated in the informed consent between STU and SCH Warsaw, the representatives of SCH Warsaw can withdraw their consent and therefore terminate the pilot action at any time. Otherwise the devices will be used at least 2 months from their installation, until they are operational and the prolongation of their operation does not require additional financial expenses.

## 5.8. Evaluation procedures

To collect feedback, electronic questionnaire will be developed by STU and fulfilled by the representatives of SCH Warsaw. Based on the achieved feedback, teleconference will be organised, where so far uncovered aspects of the pilot testing could be discussed.

## 5.9. Data management procedure

Notifications and operation data from the connected devices are stored in the information system and are available for subsequent analyses. The collected data are anonym, therefore they cannot directly identify the test persons and are in line with GDPR and the data protection policies of interested parties. Data related to sleep patterns and frequency of notifications will be made available only to partners of the Integer CE NiCE-Life project and the staff of SCH Warsaw for the purpose of the deliverable D.T1.2.3 - "Analysis of the statistical data and interoperability of data". Sharing of data beyond the scope of the Interreg CE niCE-Life project cannot be done without the written consent of SCH Warsaw and STU.

## 5.10. Planning

The time plan of the pilot testing in Social Care Home Warsaw is shown in **Figure 4**.



		2021											
Deliverable	Content of the deliverable	1	2	3	4	5	6	7	8	9	10	11	12
D.3.4.1	Design of the pilot action in Warsaw												
D.3.4.2	Engagement of test persons and consideration of legal aspects												
D.3.4.3	Report from briefing and training of test persons, home care givers and nurses												
D.3.4.4	Installation and testing of technical devices and applications												
D.3.4.5	Collection and analysis of feedback from test and support persons												
D.3.4.6	Summary report from the pilot action in Bratislava												

Figure 4. Time plan of the pilot testing in SCH Warsaw