A Personalised Integrated Care Platform

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1 Executive Summary

This deliverable describes how UDUS and UTV plan to perform the pilots from the perspective of the infrastructure allocated (rooms, infrastructure in the rooms, proposed calendar, etc.) and personnel involved (from the hospital, number of users expected in every round, project partners, etc.).

2 Introduction

The PICASO project builds a service oriented, information and communications technology (ICT) based integration platform that supports collaborative sharing of care plans across sectors based on dynamic and personalised orchestration of care services. It will further provide a method for sharing patient information across all relevant formal and informal care providers using a unique, trust federated solution to the problem of data privacy in cloud based health systems.

Two proof of concept trials including patients will be performed.

2.1 Purpose, context and scope of this deliverable

This deliverable describes how the Policlinic of Rheumatology and Hiller Research Unit Rheumatology, University Clinic Düsseldorf (UDUS) and The University Hospital of Tor Vergata in Rome (UTV) plan to perform the pilots from the perspective of the infrastructure allocated (rooms, infrastructure in the rooms, proposed calendar, etc.) and personnel involved (from the hospital, number of users expected in every round, project partners, etc.).

Trial 1 will be carried by PICASO partner UDUS and involves patients above the age of 18 with Rheumatoid Arthritis (RA) and Cardiovascular Disease as co-morbidity.

Trial 2 will be carried out by PICASO partner UTV and it will involve patients over the age of 65 with Parkinson Disease (PD) and Cardiovascular Disease as co-morbidity.

2.2 Content and structure of this deliverable

For the content and the structure of this deliverable see the summary table.

3 Trials at UDUS

Two proof-of-concept clinical trials will be carried out by the PICASO partner UDUS (Policlinic of Rheumatology and Hiller Research Unit Rheumatology) and will involve patients above the age of 18 years with Rheumatoid Arthritis (RA) and any cardiovascular co-morbidity. RA treatment is optimally delivered by a multidisciplinary team and involves different competencies

3.1 Patients involved at UDUS

Overall n=30 patients will be enrolled from the outpatient clinic at Policlinic of Rheumatology and Hiller Research Unit Rheumatology at the Heinrich-Heine-University, University Hospital of Düsseldorf (UDUS). During the PICASO trial, patients will be followed by their usually caring rheumatologist at UDUS.

Patients need to fulfil the following inclusion and exclusion criteria

Inclusion criteria:

- Patients above 18 years of age
- Diagnosis of rheumatoid arthritis (ICD-10 M05.* or M06.*) [1]
    a) Any disease activity status (remission, low or active disease)
    b) Any functional status
    c) Any disease duration
- Have at least one known, documented cardiovascular co-morbidity at study entry
    a) Patients suffering from following cardiovascular co-morbidities will be included:
        1. Arterial hypertension
        2. Arrhythmias
        3. Coronary heart disease
        4. Heart valve diseases and other heart structure failure, e.g. myocardial cause
        5. Heart failure, e.g., insufficient pump performance
        6. Former apoplexies
        7. Hypercholesterolemia
        8. Hyperlipidaemia
- Are willing to participate and sign data transfer agreements
- Are willing to interact with the platform over a period of nine months
- Agree to setting up and de-install the infrastructure at home
- Internet connection (either existing or agreeing to be build up)
- Have a sufficient understanding of the German language
- Patients are allowed to be pregnant
- Patients are allowed to be followed in registries / observational studies
- Signed informed consent
- Patients need to have health care insurance and are treated at outpatients clinic at UDUS

Exclusion criteria:

- Participation in other clinical trials phase 1 to 3 or studies according to AMG (German acronym for ‘Arzneimittelgesetz’ (Medicinal Products Act))

[1] ICD10 Code: "International Statistical *Classification* of Diseases and Related Health Problems" https://www.dimdi.de/static/de/klassi/icd-10-gm/kodesuche/index.htm

Patients are pre-identified via our patient documentation system and asked randomly as they show up in our outpatient clinic at UDUS.

3.2 Medical Personnel involved in UDUS trials

Professionals involved in the two UDUS trials and the belonging responsibilities are depicted in Table 1: Professionals involved at UDUS trials of this deliverable

The list includes medical personal employed at UDUS and physicians in private practices collaborating with UDUS in PICASO.

Table 1: Professionals involved at UDUS trials

Role	Profession	Responsibilities
Physicians	Rheumatologists in clinic and private practises	Standard rheumatic care, trial parameters, use and evaluation of PICASO platform, filling evaluation forms
	GPs (e.g. from "Centre for Health and Society" (CHS))	GP care, trial parameters, use and evaluation of PICASO platform, filling evaluation forms
	Cardiologists	Cardiology care, trial parameters, use and evaluation of PICASO platform, filling evaluation forms
	Occupational physicians (e.g. from CHS)	Routine care, filling evaluation forms
Documentation	Documentation officer/ study nurse / research assistant	Documentation of standard rheumatic care, trial parameters, trial support, evaluation forms, transfer into databases
Statistician	Statistician	Statistical analyses
IT	IT personnel	Technical support if not done by INJET/CNET or other applicable PICASO IT partners
	IT personnel	Set-up and maintenance PICASO infrastructure in UDUS
Telephone hotline	Secretary/study nurse	Project support / management for health-related issues Project support / management for technical issues
PICASO IT Partners (IN-JET, CNET and others)	IT personnel / research assistants (medical students)	Setup the PICASO infrastructure at patients' homes in collaboration with UDUS
	IT personnel	Set-up PICASO infrastructure in UDUS

3.3 Technical and physical infrastructure at UDUS

3.3.1 Technical infrastructure at UDUS

UDUS hosts the server with the UDUS PICASO server and the UDUS PICASO Database on two separate servers that mirror each other and thus guarantee a fall-back solution in case that one of the systems breaks down.

UDUS will use their own hospital information system and patient documentation system as required. In case of e.g. power failure or hard disk crashes for these systems back-ups of the databases are available as well.

At UDUS emergency power supply is available.

3.3.2 Physical infrastructure at UDUS

Patient recruitment

Patient recruitment will take place in the UDUS outpatient clinic.

Informed consent is obtained in the outpatient treatment rooms and involve the caring physician (rheumatologist) and the PICASO study personnel (e.g. research assistants (medical students)) as appropriate. Our usually used medical equipment and software used in routine care will be used for the interaction apart from the PICASO platform.

Training on the PICASO system, the home-monitoring devices and the hand over procedures of the preinstalled tablet PCs will take place in a separate quiet room.

Patient follow-up visits

Follow-up visits and interaction with the caring physician will be performed in the standard outpatient treatment rooms and involve the caring physician and the PICASO study personnel. Our usually used medical equipment and software used in routine care will be used for the interaction in addition to the PICASO platform.

Paper-based IT-Knowledge and evaluation questionnaires are handed out on clipboards with pencils. The patients will have enough time to complete them in a quiet area. The filled questionnaires are returned to the study personnel and stored at a central place. The filled-out forms are archived according to legal requirements.

The collected paper-based data is digitized and stored in a database for further analysis.

4 Trials at UTV

The clinical trial will be carried out by the PICASO partner UTV (University Tor Vergata, Department of Biomedicine and Prevention; Rome) in conjunction with the Department of Psychiatry of the Institute of Treatment and Research, Santa Lucia of Rome (SLUCIA). The trial is focused on patients suffering of Parkinson disease and related comorbidities and caregivers and is characterized by two main aspects: a) upload of medical data (including medical reports, blood tests examinations, imaging data) on a dedicated platform accessible by physicians; b) home monitoring of the main health parameters and medication adherence. The professional figures involved in this trial are represented by neurologists, radiologists, nuclear medicine physicians, cardiologists and neuropsychologists. The main objective of this trial is to enhance the exchange of medical data among different physicians. Secondly, to investigate the impact of home monitoring devices on patients care and management.

4.1 Patients involved at UTV

The trial protocol requires the recruitment from 30 to 50 Patients, heterogeneously represented by gender and must be over 65 years old. Case studies are subjected to a simple randomization that will lead to the creation of two arms: 1) standard arm (the patient will be followed as in current clinical practice) and 2) the experimental arm (the patient management based on electronic information sharing and monitoring vital signs with electronic devices). Patients enrolled in the study should present a clinical condition of Parkinson's disease and an associated comorbidity, preferably cardiovascular or psychiatric. Cardiovascular comorbidity is seen both as chronic ischemic heart disease or heart failure either as an autonomic dysfunction due to noradrenergic system impairment due to Parkinson's disease. The patient enrolled in the study will also submit other types of psychiatric comorbidity (e.g. depressive syndrome) or other disease (i.e. oncological diseases). Some patients may have specific needs for support outside the hospital or clinic which may typically be provided by their informal carers, usually family members. Informal carers may have a crucial role in supporting the patient in managing and living with their condition(s) and in caring for the patient at home.

4.2 Medical Personal involved at UTV

- Prof. Orazio Schillaci, Full Professor, MD, Phd, Nuclear Medicine physician, Radiologist
- Dr. Agostino Chiaravalloti, Reasearcher, MD, PhD. Nuclear medicine physician.
- Prof. Gianfranco Spalletta,Associate Professor, MD, Phd. Psychiatrist.
- Dr. Clelia Pellicano, MD, PhD. Neurologist
- Dr. Gaia Pellicano, Neuropsychologist
- Dr.Cinzia Savini, Neuropsychologist
- Dr. Romina Grazia Giancipoli, MD, Specialist in training

4.3 Technical and physical infrastructure at UTV

The clinical evaluation of subjects affected by Parkinson disease and related comorbidities will be carried out in the Neuropsychiatry Laboratory of SLUCIA. This laboratory is located at the 1st floor of the IRCCS Santa Lucia, via Ardeatina 354, 00179 Rome, B1 building, rooms 31, 135, 147, 148, 152. The Laboratory investigates the clinical phenomenology and the biological bases of neuropsychiatric disorders. The scope ranges from psychopathology to neuropsychology, from molecular and cellular biology to neuroimaging. The approach adopted is multidimensional, it uses different survey methodologies and different evaluation tools. Data collection and analysis are entrusted to a multidisciplinary team of psychologists, biologists and physicians. In this highly specialized environment, researchers and physicians study the biological and genetic markers useful in early diagnosis of neurodegenerative diseases (dementia and motion disorders), cerebrovascular (stroke) and psychiatric disorders (schizophrenia, bipolar disorder, depressive disorder, obsessive compulsive disorder). These markers are also used for predicting the clinical course of the disease. The further study of the cognitive function of the individual is accomplished using standardized neuropsychological tests, while neuropsychiatric symptoms are analyzed through psychodiagnostic and psychometric scales. The results achieved allow to characterize the cognitive and psychopathological profiles of subjects with neurological and psychiatric illnesses. The profiles are then correlated with structural, functional and metabolic alterations in the

brain, which can be detected by qualitative and quantitative techniques of neuroimaging (see below). These techniques, widely used by the Laboratory, allow to draw inferences about brain alterations that are the basis of neurological and psychiatric illnesses and their symptomatic manifestations.

Neuroimaging studies will be performed in the Department of Biomedicine and Prevention, University Tor Vergata of Rome and in the Tor Vergata Policlinic of Rome, Nuclear medicine and Radiology Unit. Both Units are located in the Policlinic, floor -1 and floor -2 (see figure 1 and figure 2), Viale Oxford 81, 00133 Rome.

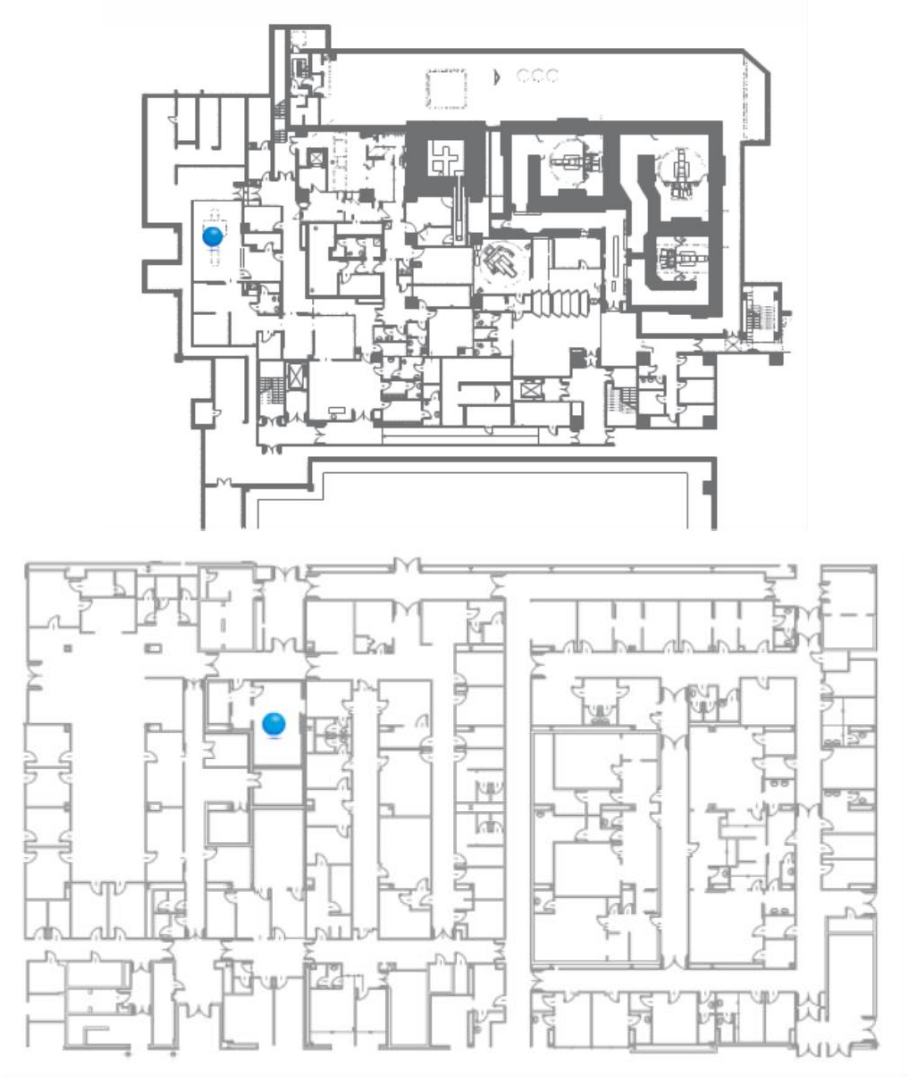

Figure 1:. Plan of floor-1 (a) and floor-2 (b), Nuclear medicine Unit, Tor Vergata Policlinic. The blue dot shows the exact location of PET/CT VCT scanner in (a) and of GE Iq scanner in (b).

For Positron emission tomography/ Computed tomography (PET/CT) examinations, two scanners are available in the Nuclear Medicine Unit. The PET/CT system Discovery VCT (GE Medical Systems, Tennessee, USA) is used to assess brain distribution of selected Radiolabelled compounds in all patients by means of a 3D-mode standard technique in a 256 × 256 matrix. Reconstruction for brain is performed using the 3-dimensional reconstruction method of ordered-subsets expectation maximization (OSEM) with 20 subsets and with 4 iterations. The system combines a high-speed ultra 16-detector-row (912detectors per row) CT unit and a PET scanner with 13440 bismuth germanate crystals in 24 rings (axial full width at half-maximum 1-cm radius, 5.2 mm in 3D mode, axial field of view 157 mm). A low-ampere CT scan of the head for attenuation correction (40 mA; 120 Kv) is usually performed before PET image acquisition. As for GE Iq PET/CT scanner, this system is characterized by highest NEMA sensitivity in the industry at up to 22 cps/kBq, Highest NECR for clinical 18F in the industry, High NECR for both low-count and high-count rate radioisotopes such as 68Ga, 11C, 82Rb and more, optimized for oncology practices administering ^{18}F, which accounts for nearly 94 percent of all PET procedures,up to 75 kcps at 2.4 kBq/mL,largest axial field-of-view coverage in the industry at up to

26 cm, thorax respiratory Motion Free study can be achieved in as fast as four minutes, full organ imaging in the fewest possible bed positions with one-third scan time, 50-slice equivalent CT speed with IQE 1.75 pitch booster, 20 mm CT coverage for fast exams and short breath holds, platform compatible with advanced digital solutions designed to connect machines, people and data through a portfolio of healthcare analytics applications.

Figure 2: PET/CT VCT scanner at UTV.

As for Magnetic Resonance Imaging (MRI), Philips Achieva 3.0T TX is available at floor -1 Radiology Unit, Tor Vergata Policlinic. The system is characterized by multiTransmit technology that overcomes dielectric shading by using simultaneous (parallel) transmissions from multiple Radio Frequency (RF) sources. It automatically optimizes the power, amplitude, phase, and waveform for optimal RFuniformity. The system's exclusive Quasar and Quasar Dual gradient systems offer gradient amplitudes up to 80 mT/m to provide superb performance with excellent linearity.

4.3.1 List of abbreviations

- **PET/CT:** Positron emission tomography/Computed Tomography
- **OSEM**: ordered-subsets expectation maximization
- **GE**: General Electric
- **NEMA**: National Electrical Manufacturers Association
- **68Ga**: Gallium 68 isotope
- **11C**: Carbonium 11 isotope
- **82Rb**: Rubidium 82 isotope
- **Kcps**: kilocounts per second
- **kBq**: kiloBequerel
- **mL**: milliliter
- **RF**: Radiofrequency

5 List of Figures and Tables

5.1 Figures

5.2 Tables