

## Patient centric solution for smart and sustainable healthcare

### WP1: Primary and secondary user involvement and pilot studies

#### D1.1: End-user classification and recruitment

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**Table of Contents**

1	Abstract	6
2	Introduction	6
3	Primary end-user criteria and classification tools	7
3.1	General screening and classification tools of the primary end-users	8
3.2	Criteria reflecting oral health and salivary response	9
3.2.1	Oral health assessment and user classification	9
3.2.2	Salivary response and user classification	11
3.3	Technology acceptance assessment and user classification	13
3.4	User profiles	14
4	Formal caregiver classification and recruitment	15
5	Conclusions	15
6	Document History	16
7	References	17

## ABBREVIATIONS

AAL	Active Assisted Living
ACESO	Patient centric solution for smart and sustainable healthcare
INCARE	Integrated Solution for Innovative Elderly Care
GGA	Comprehensive Geriatric Assessment
SARC-F	Screening Tool for Sarcopenia
ADL	Activities of Daily Living
iADL	Instrumental Activities of Daily Living
GDS-4	Geriatric Depression Scale
AMTS	Abbreviated Mental Test Score
MNA-SF	Nestle's Mini-Nutritional Assessment
SUS	System Usability Scale
UTAUT	Unified theory of acceptance and use of technology
EWGSOP2	European Working Group on Sarcopenia in Older People
THI	Tongue Hygiene Index
API	Approximal Plaque Index
BOB	Bleeding on Brushing Index

Ergonomics	Scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance.
Xerostomia	Dryness in the mouth, which may be associated with a change in the composition of saliva, or reduced salivary flow, or have no identifiable cause.
Primary Users	Older adults or elderly people (60+ years old)
Secondary Users	Professional caregivers (medical doctors, dentists, hygienists, assistants, nurses, etc)

**LIST OF FIGURES**

Figure 1. Plaque Control Record in PI..... 9  
Figure 2. BOB conical interdental brushes..... 10  
Figure 3. Bleeding grading table. .... 10  
Figure 4. Visual exemplification of the BOB bleeding grades. .... 11  
Figure 5. Recordings from the salivary protocol..... 12  
Figure 6. UTAUT model..... 14

**LIST OF TABLES**

Table 1. Profiles of primary ACESO users based on age, general and oral health criteria. .... 14

## 1 Abstract

This task is preparing the user involvement in the ACESO pilots by defining user's inclusion and exclusion criteria, recruiting users and defining classification and assessment criteria and tools. End-user recruitment was done through the end-user organizations.

The invitation to participate was extended to persons aged 60 years or more. The invited primary users were in Romania patients of the dental office LS DINTIIMEI SRL aged over 60, with different dental status that require prosthodontic treatment, from fixed rehabilitation to removable rehabilitations. In Slovenia, they were either older adults age 60+ from the MKS network or patients of the dental clinics with which MKS has established a collaboration. In Poland, the primary users were enrolled both as the inpatients from the Department of Internal Medicine and Geriatrics, University Hospital, Kraków, Poland, and the Geriatric Outpatient Clinic, University Hospital, Kraków, Poland.

The secondary users, dental care practitioners, were recruited in Romania from among the personnel of the LSMD clinic, collaborating clinics, colleagues of Dr. Ligia Muntianu who is also Associate Professor at the University of Medicine and Pharmacy "Carol Davila" Bucharest. In Slovenia, the professional caregivers were recruited through the MKS network of dental offices. In Poland, the recruited professional caregivers were the health-care professionals including dentists, oral hygienists, and geriatricians at the Krakow University Hospital. JUMC has recruited 5 dentists and oral hygienists from among the employees of the University Dental Clinic and 5 others from private practices having older patients in their care. In addition, 5 geriatricians from the University Hospital were recruited to be active on a regular basis in the outpatient and inpatient setting.

A total of 110 primary (30 in Romania, 30 in Slovenia and 50 in Poland) and 39 secondary (14 in Romania, 10 in Slovenia and 15 in Poland) users were recruited for the ACSO pilots (and 30 secondary users).

The geriatric the Comprehensive Geriatric Assessment tools were collected and prepared by JUMC. These will include screening for sarcopenia, assessment of the capability to perform daily living tasks, cognitive assessment, etc. Dedicated and recognized scales for the assessment of dental hygiene and health were also proposed. In addition, a salivary stimulation protocol was developed by LSDM. The "Unified theory of acceptance and use of technology" scale and the System Usability Scale were identified as relevant for user satisfaction, acceptance of technology, willingness to pay, etc. Primary users' profiles were defined.

## 2 Introduction

The ACESO project is aiming to exploit modern Artificial Intelligence (AI) technologies in order to build an integrated health and oral-care platform in which intelligent devices use data analytics for adaptable health and wellbeing. The ACESO platform will support active patient engagement and ensure sustainable health care through:

- Monitoring of parameters related to physical health (including physical fitness) and oral hygiene in an integrative manner which provides primary users with personalized and adaptive feedback extracted by the underlying AI engine;
- User-centric approach by actively involving users in maintaining their health (reminders for regular monitoring, timely medication and self-care);
- Improved oral care through personalized brushing experience extracted from the user's brushing behavior over time;

- Remote digital assessment tools for caregivers who will be able to optimize care interventions and to coach their patients over time, helping them to form better routines or recover from a treatment.

Thus, in the above context, attaining the ACESO goals requires that the target users are involved in the development, testing and optimization of the platform. While elderly, informal caregivers and professional ones can benefit from the ACESO solution, the target users during the project will be elderly and professional caregivers, in particular the one active in the stomatology field. The reason for this is the already piloted health monitoring component in previous projects. The pilots in the INCARE AAL project<sup>1</sup> have involved elderly and informal caregivers using a platform with a similar implementation of the health monitoring component with ACESO. The feedback gathered during the INCARE pilots by CITST and the other piloting sites is positive with respect to the health component and its official reporting will be available in December 2021. Consequently, primary and secondary users involved in the ACESO pilots are:

- Primary users are 60+ years old who suffer from modifications due to ageing regarding the whole-body functionality (e.g., chronic cardiovascular diseases, diabetes, etc.) and also require particular care with oral hygiene in order to avoid gastrointestinal disorders, mouth candidiasis, buccal aphthous lesions, oral stomatitis or aspiration pneumonia. Some of these users often suffer from hyposalivation or dry mouth due to medication or old age.
- Secondary users, i.e., dentists and hygienists, will be involved during: (1) testing of new technologies for the alleviation of hyposalivation; (2) field trials with the ACESO platform.

### 3 Primary end-user criteria and classification tools

Inclusion criteria for the primary users:

The invitation to participate was extended to persons aged 60 years or more. The invited primary users were in Romania patients of the dental office LS DINTIIMEI SRL aged over 60, with different dental status that require prosthodontic treatment, from fixed rehabilitation to removable rehabilitations. In Slovenia, they were either older adults age 60+ from the MKS network or patients of the dental clinics with which MKS has established a collaboration. In Poland, the primary users were enrolled both as the inpatients from the Department of Internal Medicine and Geriatrics, University Hospital, Kraków, Poland, and the Geriatric Outpatient Clinic, University Hospital, Kraków, Poland.

Exclusion criteria:

- free from major neurological deficits (e.g., dementia, focal neurological deficits, major tremor) precluding the unassisted use of the oral hygiene devices, free from oral pathologies precluding the use of a toothbrush or salivary stimulation device, or heart pacemaker and ICD device.
- free from systemic or local clinically apparent infection, and they will be free from cancer.
- Finally, they will be free from the history of major severe disease (including stroke or myocardial infarction) in the past three months, and they will not take anticoagulants or be on dual antiplatelet therapy.

We have recruited a total of 110 primary users for the ACSO pilots (30 in Romania, 30 in Slovenia and 50 in Poland).

Out of these, approximately 20 users per site will enter the pilots with individual elements in Task 1.2 and 10 will enter, together with their dental caregiver the pilots in Task 1.3 (extended pilots with the integrated platform). The next sections describe the screening and classification tools for the primary

users such that they are selected for the pilots in Task 1.2 (section 3.2) and in Task 1.3 (sections 3.1 and 3.2).

### 3.1 General screening and classification tools of the primary end-users

The assessment and the classification of the primary end-users to participate in Tasks 1.3 will be done in the beginning of the pilots based on the selected and modified elements of the Comprehensive Geriatric Assessment (CGA),<sup>2,3</sup> that were collected and prepared by JUMC. These will include the screening tool for sarcopenia (SARC-F),<sup>4,5</sup> the assessment of the ability to perform rudimentary tasks – the activities of daily living scale (ADL), the assessment of the ability to perform advanced daily tasks – the instrumental activities of daily living (iADL), the shortened four-item geriatric depression scale (GDS-4),<sup>6</sup> the abbreviated mental test score (AMTS),<sup>7</sup> and the screening part of the Nestle's Mini-Nutritional Assessment (MNA-SF).<sup>8</sup> The assessment will give an important input at the analytical stage enabling stratification of the analyses by the end-user status and the adjustment for potentially important confounders. Second, the attitudes of the end-users towards the smart and e-health devices, and the status of their awareness of the oral health issues will be assessed with the custom-prepared questionnaires. Finally, a screening dental examination will assess the state of the participant's oral hygiene.

The GGA is a multidimensional tool designed for the thorough assessment of health status and individual needs of older adults. It comprises an evaluation of general health and well-being, medications and drug-related problems, functional, nutritional and cognitive status, as well as financial needs and social support. For the purpose of the study, we selected easy-to-use, internationally validated, and highly reliable geriatric inventories that can be performed by pre-trained personnel without a formal geriatric background.

SARC-F is a 5-item, self-scoring screening questionnaire recommended by the European Working Group on Sarcopenia in Older People (EWGSOP2) to detect cases of sarcopenia. It contains questions regarding difficulties when lifting and carrying 10 pounds, walking across a room, transferring from a chair or bed and climbing a flight of 10 stairs, and a question regarding falls. The cut-off suggested for sarcopenia case-finding is at least of 4 out of 10 points.

The Katz Activities of Daily Living Scale is a simple measure of a subject's dependency when performing basic activities of daily life, such as bathing, dressing, feeding, toileting, transferring and continence. The Lawton Instrumental Activities of Daily Living Scale is of a similar design, measuring a subject's dependency when performing more complex activities of daily life, such as the ability to use a telephone, shopping and independent transferring, food preparation, housekeeping and laundry, and being responsible for a subject's own medications and finances.

The abbreviated mental test score is a 10-point screening tool for cognitive impairment. Tasks assessing subject's time orientation, long and short memory, and attention are conducted in a quiet environment. As required by the protocol and study group entry criteria, subjects with cognitive impairment defined as < 7 points in the AMTS scale, will be excluded. The shortened, 4-point Geriatric Depression Scale is a screening instrument that includes questions regarding the subject's mood and feelings within the last 2 weeks. Scoring 1 or more out of 4 points, should alert the clinician as raising suspicion of depressiveness.

The Mini-Nutritional Assessment, Short-Form is the first part of a complex nutritional inventory that enables assessment and delivery of a dietary care plan. MNA-SF is a 6-point, self-scoring questionnaire that contains information about a subject's appetite and weight within the last 3 months (with a body mass index calculation), mobility, acute disease or psychological stress, and potential

neuropsychological problems. Older adults who score less than 12 out of 14 points are considered as those who are at risk of malnutrition or malnourished.

All the above tools, being widely recognized and used, are available in the consortium languages.

### 3.2 Criteria reflecting oral health and salivary response

#### 3.2.1 Oral health assessment and user classification

In order to assess and classify the primary users at the start (Task 1.2 and Task 1.3), mid and end of the pilots (Task 1.3) we will employ the methods and tools described below or variations of thereof.

Toothbrushing is the most widespread mechanical means of personal plaque control. Unfortunately, removal plaque from all tooth surfaces is a difficult and time-consuming activity, and relatively few people effectively clean their teeth properly. Thus, the **Plaque Index (PI)**<sup>9</sup> or **Approximal Plaque Index (API)**<sup>10</sup> will allow us to estimate the level of oral hygiene and thus on the impact of improved oral brushing techniques and habits due to the usage of the ACESO platform. Both indexes involve the usage of e.g., erythrosine to determine the presence of plaque on all four tooth surfaces. The presence (+) or absence (-) of plaque is recorded in a simple chart, and the plaque incidence in the oral cavity is expressed as an exact percentage (PI). The API is indicated for individual patient data collection and for motivation. API has a scoring of 0 to 5. It correlates with the BOB index described below.

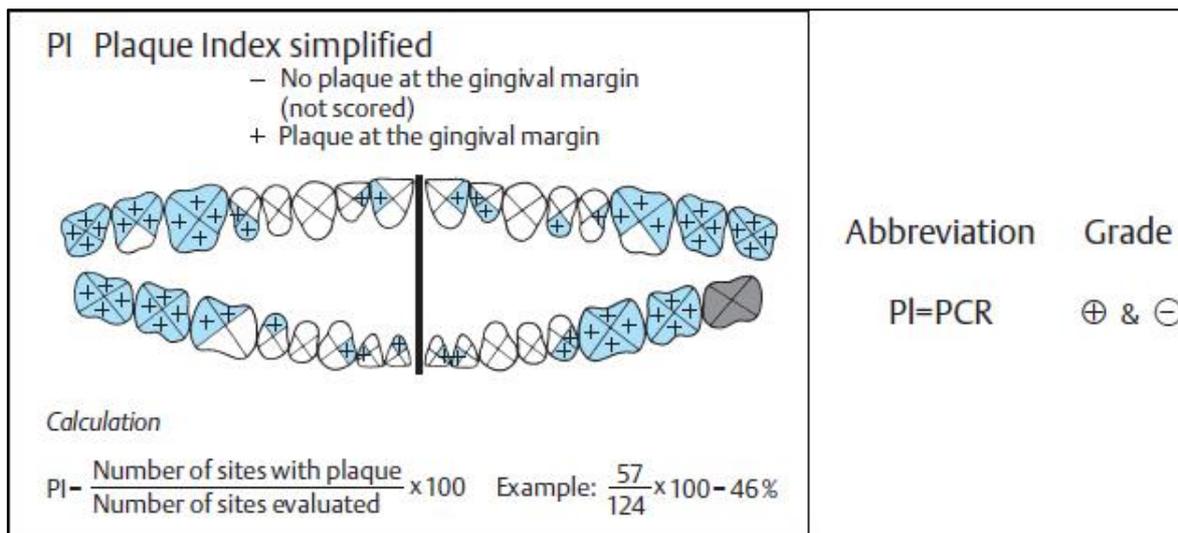


Figure 1. Plaque Control Record in PI.

**Bleeding on Brushing Index (BOB)**<sup>11</sup> allows to assess the efficiency of interdental brushing and flossing to reduce interproximal bleeding. Thus, this index can be used to assess the level of oral hygiene and thus on the impact of improved oral brushing techniques and habits due to the usage of the ACESO platform. Compared to other similar methods, BOB is minimizing gingival trauma by using a non-invasive conical interdental brush. Interdental areas of different sizes can be measured with brushes of different sizes (Figure 2).



Figure 2. BOB conical interdental brushes.

The assessment is done on 28 measurement sites in the complete dentition. Bleeding is provoked by sweeping the sulcus using the brushes in Figure 2. After 20–30 seconds, when a quadrant has been completely probed, the intensity of bleeding is scored with three grades (see Figure 3) and recorded on the dentition chart. The sum of the recorded scores gives the “bleeding number.” The BOB is calculated by dividing the bleeding number by the total number of papillae examined.

Grade	Abbreviation	Grade	0	Normal gingiva; no inflammation; no discoloration (erythema); no bleeding
		1	Mild inflammation; slight erythema; minimal superficial alterations. <b>No bleeding</b>	
		2	Moderate inflammation; erythema; <b>bleeding on probing</b>	
		3	Severe inflammation; severe erythema and swelling; <b>tendency to spontaneous bleeding;</b> possible ulceration.	
0–3	GI			

Figure 3. Bleeding grading table.

The BOB has proven to be particularly useful for assessing inflammation in the interdental papillae by grading and recording bleeding on probing in the interdental areas during the course of treatment. The index therefore offers an excellent means for patient motivation. While the patient watches in a mirror, the practitioner can score the intensity of papillary inflammation. The patient can see when the gingival tissue bleeds, which helps him to realize the progress in inflammation during the course of the project as the index is repeated three times (start, midterm and end of the pilots in T1.3).



Figure 4. Visual exemplification of the BOB bleeding grades.

All the above tools, being widely recognized and used, are available in the consortium languages.

### 3.2.2 Salivary response and user classification

A series of protocol for the salivary response was developed such that it can be employed by stomatologists without the usage of a dedicated salivary stimulation device. The protocol relies on salivary stimulation using citric acid which can be used for the assessment and classification of the end-users based on their salivary response. The protocol was employed with 20 primary users in Romania and 20 in Poland.

**Salivary stimulation protocol:** The armamentarium is composed of an analytic scale, cotton rolls (4 in number) and plastic bags also 4 in number, for each salivary gland: parotid bilateral and submandibular and sublingual glands (bilateral). As the submandibular and sublingual gland share the same discharge canal, this is the reason 4 cotton rolls instead of 6 are used. The weight of each cotton roll in a dry state and each assigned plastic bag is measured separately. After putting the cotton rolls into the mouth for 3 minutes, they have to be measured again each in the assigned plastic bag. In this way, we record the results for unstimulated saliva at rest. Determining the quantity of saliva involved simple subtraction from the final result, the weight of the cotton roll in dry state, and that of the plastic bag. The values obtained from each of the 4 measurements are added to obtain the total salivary flow at rest. The same procedure is used to determine the stimulated salivary flow. To stimulate salivation, a citric acid solution (20% mass percentage) is used. A quantity of 2 drops is placed on the dorsal part of the tongue. In the end after some tests and debates, the choice was directed toward 2 drops of citric 20% acid pulverized on the dorsal part of the tongue. The pulverisation was chosen for a uniform spreading. The normal salivary flow rate is 0.3-0.4 ml/min. Under this value is the hyposalivation state. Above this value is considered a hypersalivation state. Figure 1 shows an example of the recordings performed by employing this protocol.



not increase but decrease. Some participants showed normal secretion and a good flow increase. Some showed a normal flow but a difficult increase.

In **Poland**, the age of the respondents ranged between 62 and 84 years. The oral hygiene of the study group was assessed with the API Index described above and found to be sufficient in most cases. Supragingival pathological plaque was present in the form of bacterial dental plaque of varying degrees of maturity, dental calculus, and plaque on the tongue with a tendency to accumulate in the central part. Intraoral examination revealed caries lesions (primary and secondary caries) of the crowns and roots of the teeth. There were also non-caries lesions (attrition, abrasion, erosion). Cavities were filled with composite dental material and amalgam, with a predominance of composite.

Toothlessness (edentulous patients) was diagnosed in 3 people, the remaining ones had mixed tooth defects. These deficiencies were restored with permanent prosthetic restorations (crowns, bridges) or removable dentures (acrylic partial dentures or dental frame works). No dental implants were found. A small part of the respondents did not have a prosthetic reconstruction.

The secretion of resting saliva by the parotid and submandibular glands was varied. It means different intensity of saliva production by the same salivary glands (right and left) as well as between the parotid and submandibular glands. The submandibular glands were more active in some of the subjects. The weight of the secreted saliva increased each time after stimulation with citric acid and the intensity of the secretion was similarly differentiated as in the case of resting saliva. The intensity of salivation was measured in the whole group, except for one person with a strong gag reflex.

In Slovenia, a similar testing protocol was implemented in which the evaluation was done based on the self-assessment of the patients. They have assessed the results immediately after stimulation and after half hour. While no quantitative data was obtained, a similar variation in salivary stimulation response was observed.

### 3.3 Technology acceptance assessment and user classification

The users' acceptance of technology is also an important criterium to be assessed as part of the user involvement in the ACESO pilots and in particular when using the integrated platform for an extended period of time. We are considering the **System Usability Scale (SUS)** which allows to evaluate a wide variety of products and services, including hardware, software, mobile devices, websites and applications.<sup>12</sup> SUS has become an industry standard, with references in over 1300 articles and publications. The noted benefits of using SUS include: a very easy scale to administer to participants; can be used on small sample sizes with reliable results; is valid – it can effectively differentiate between usable and unusable systems. When SUS is used, participants are asked to score the following 10 items with one of five responses that range from Strongly Agree to Strongly disagree:

1. I think that I would like to use this system frequently.
2. I found the system unnecessarily complex.
3. I thought the system was easy to use.
4. I think that I would need the support of a technical person to be able to use this system.
5. I found the various functions in this system were well integrated.
6. I thought there was too much inconsistency in this system.
7. I would imagine that most people would learn to use this system very quickly.
8. I found the system very cumbersome to use.
9. I felt very confident using the system.
10. I needed to learn a lot of things before I could get going with this system.

Another scale considered for the users' evaluation is the "**Unified theory of acceptance and use of technology**" (UTAUT).<sup>13</sup> This scale is particularly relevant in areas like user satisfaction, acceptance of technology, willingness to pay, etc. The scale is specifically designed for user acceptance of

information technology. Different scale items and sizes can be effective for the UTAUT model used in different societies and in different study areas.

The UTAUT aims to explain user intentions to use an information system and subsequent usage behavior. The theory holds that there are four key constructs: 1) performance expectancy, 2) effort expectancy, 3) social influence, and 4) facilitating conditions (see Figure 6). The first three are direct determinants of usage intention and behavior, and the fourth is a direct determinant of user behavior. Gender, age, experience, and voluntariness of use are posited to moderate the impact of the four key constructs on usage intention and behavior.

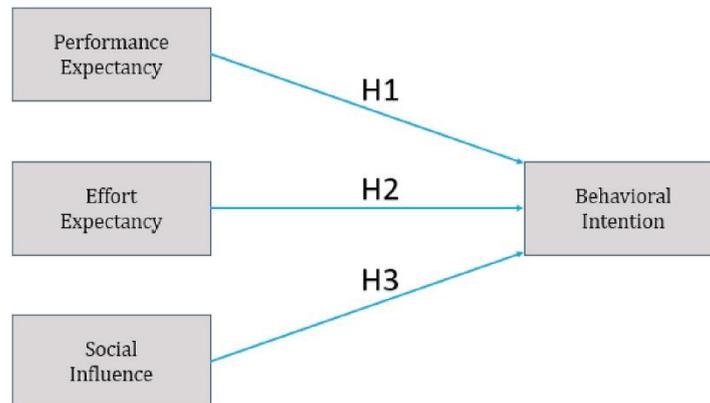


Figure 6. UTAUT model.

Performance expectancy refers to the degree of believing that the individual using the system will perform higher. The influence of performance expectancy has been confirmed in both voluntary and compulsory settings and situations with less experience.<sup>14</sup> However, from a theoretical point of view, performance expectancy may differ according to gender and age.

Effort expectancy expresses the degree of convenience regarding the use of the system. The effort expectancy factor has an influence on behavioral intention in both voluntary and compulsory use environments. However, it has been observed that the effort expectancy factor becomes insignificant in long-term and continuous use which validates previous research. Age, gender and experience variables may differ on the effort expectancy. Carter and Belanger<sup>15</sup> the effort expectancy provides the measurement of a system's interface design, ease of use, flexibility, and ease of learning.

Social influence refers to the degree to which the person who is deemed to be important to the individual believes that he/she should use the new system. This factor becomes effective when the use of technology is mandatory. The variables of gender, age, voluntariness of use and experience may differ on social influence.

All the above tools, being widely recognized and used, are available in the consortium languages.

### 3.4 User profiles

The users' profiles were built taking into account 3 age groups, general health with ADL scores for primary users capable of performing their daily life activities, with non or mild cognitive impairment, oral health identified by plaque buildup (presence of plaque in the beginning of the pilots will help identify a change in oral care). The salivary status as well as the technology acceptance will be assessed for each user in the beginning of the Task 1.3 pilots. The results of this assessment will be part of the personal profile of each user.

Table 1. Profiles of primary ACESO users based on age, general and oral health criteria.

User Profile No	Age	General Health		Oral Health	Salivary Status	Technology Acceptance
		ADL <sup>16</sup>	AMTS	PI		
P1	60-70	4-6	> 7	PI > 2	to be assessed	to be assessed
P2	60-70	2-4	> 7	PI > 2	to be assessed	to be assessed
P3	70-80	4-6	> 7	PI > 2	to be assessed	to be assessed
P4	70-80	2-4	> 7	PI > 2	to be assessed	to be assessed
P5	80-90	4-6	> 7	PI > 2	to be assessed	to be assessed
P6	80-90	2-4	> 7	PI > 2	to be assessed	to be assessed
P7	90+	2-4	> 7	PI > 2	to be assessed	to be assessed
P8	90+	2-4	> 7	PI > 2	to be assessed	to be assessed

#### 4 Formal caregiver classification and recruitment

The secondary end-users include the dentists, dental assistants and hygienists. In Poland, these were complemented by 5 geriatricians from JUMC. A total of 39 secondary users were recruited by the three pilot sites. Out of these, the number of secondary users involved in the first pilots (Task 1.2 - pilots with individual components) is targeted to be 10-15 secondary users per site. The involvement in the pilots with the integrated platform (Task 1.3) is conditioned by the participation together with at least one primary users under their care.

In Romania, the recruited secondary users comprised: personnel of the LSMD clinic, collaborating clinics such as the clinic of Dr. Mirea Liviu with home LSDM has a collaboration agreement, colleagues of Dr. Ligia Muntianu who is also Associate Professor at the University of Medicine and Pharmacy "Carol Davila" Bucharest. A total of 7 dentists, 3 assistants, 2 hygienists and 2 auxiliary personnel members were recruited.

In Slovenia, the professional caregivers were recruited through the MKS network of dental offices. These comprised: dentists 4 (2 F, 2 M), registered nurses 2 (F); dental assistant 2 (F); oral hygienist 2 (1F, 1M)

In Poland, the recruited professional caregivers were the health-care professionals including dentists, oral hygienists, and geriatricians at the Krakow University Hospital. JUMC has recruited 5 dentists and oral hygienists from among the employees of the University Dental Clinic and 5 others from private practices having older patients in their care. In addition, 5 geriatricians from the University Hospital were recruited to be active on a regular basis in the outpatient and inpatient setting.

The classification of the secondary users will be based on their professional background and technology acceptance evaluated using the SUS or the UTAUT scale. The assessment of the latter will determine the technology acceptance with respect to the ACESO platform.

#### 5 Conclusions

A total of 110 primary (30 in Romania, 30 in Slovenia and 50 in Poland) and 39 secondary (14 in Romania, 10 in Slovenia and 15 in Poland) users were recruited for the ACSO pilots (and 30 secondary users).

The invitation to participate was extended to persons aged 60 years or more. The invited primary users were in Romania patients of the dental office LS DINTIIMEI SRL aged over 60, with different dental status that require prosthodontic treatment, from fixed rehabilitation to removable rehabilitations. In Slovenia, they were either older adults age 60+ from the MKS network or patients of the dental clinics with which MKS has established a collaboration. In Poland, the primary users were enrolled both as the

inpatients from the Department of Internal Medicine and Geriatrics, University Hospital, Kraków, Poland, and the Geriatric Outpatient Clinic, University Hospital, Kraków, Poland.

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The geriatric the Comprehensive Geriatric Assessment tools were collected and prepared by JUMC. These will include screening for sarcopenia, assessment of the capability to perform daily living tasks, cognitive assessment, etc. Dedicated and recognized scales for the assessment of dental hygiene and health were also proposed. In addition, a salivary stimulation protocol was developed by LSDM. The "Unified theory of acceptance and use of technology" scale and the System Usability Scale were identified as relevant for user satisfaction, acceptance of technology, willingness to pay, etc. Primary users' profiles were defined.

## 6 Document History

Date	Changes	Version	Author
M2	First draft of D1.1	1	CITST
M2	Second draft with additions from JUMC in section 3.1 and complemented by CITST & MKS	2	JUMC, CITST, MKS
M3	Third draft with the addition of the salivary protocol by LSDM	3	LSDM
M3	Forth draft with the addition of the oral health assessment	4	LSDM, JUMC, MKS
M4	Recruitment and salivary tests by LSDM	5	LSDM
M5	Recruitment by MKS	6	MKS
M6	Recruitment by JUMC and first tests for the salivary stimulation	7	JUMC
M7	Final additions by JUMC	8	JUMC
M8	Two revisions by CITST and JUMC	9	CITST, JUMC
M9	Final version	10	CITST

## 7 References

- <sup>1</sup> Integrated Solution for Innovative Elderly Care (INCARE); accessed 11.11.2020.
- <sup>2</sup> Parker SG, McCue P, Phelps K, McCleod A, Arora S, Nockels K, Kennedy S, Roberts H, Conroy S. What is Comprehensive Geriatric Assessment (CGA)? An umbrella review. *Age Ageing*. 2018 Jan 1;47(1):149-155. doi: 10.1093/ageing/afx166. PMID: 29206906.
- <sup>3</sup> Piotrowicz K, Fedyk-Łukasik M, Skalska A, Grodzicki T. Is the Clock Drawing Test useful in the screening assessment of aged patients with chronic heart failure? *Adv Med Sci*. 2018 Mar;63(1):199-204. doi: 10.1016/j.advms.2017.11.005. Epub 2017 Nov 29. PMID: 29197261.
- <sup>4</sup> Piotrowicz K, Głuszewska A, Czesak J, Fedyk-Łukasik M, Klimek E, Sánchez-Rodríguez D, Skalska A, Gryglewska B, Grodzicki T, Gąsowski J. SARC-F as a case-finding tool for sarcopenia according to the EWGSOP2. National validation and comparison with other diagnostic standards. *Aging Clin Exp Res*. 2021 Jan 28. doi: 10.1007/s40520-020-01782-y. Epub ahead of print. PMID: 33506313.
- <sup>5</sup> Piotrowicz K, Gryglewska B, Gąsowski J. The usefulness of SARC-F. *Aging Clin Exp Res*. 2021 Apr 2:1. doi: 10.1007/s40520-021-01839-6. Epub ahead of print. PMID: 33797743; PMCID: PMC8017901.
- <sup>6</sup> Sheikh, J.I., & Yesavage, J.A. (1986). Geriatric depression scale (GDS): Recent evidence and development of a shorter version. In T.L. Brink (Ed.), *Clinical gerontology: A guide to assessment intervention* (pp. 165–173). New York: Haworth Press.
- <sup>7</sup> Piotrowicz K, Romanik W, Skalska A, Gryglewska B, Szczerbińska K, Derejczyk J, Krzyżewski RM, Grodzicki T, Gąsowski J. The comparison of the 1972 Hodkinson's Abbreviated Mental Test Score (AMTS) and its variants in screening for cognitive impairment. *Aging Clin Exp Res*. 2019 Apr;31(4):561-566. doi: 10.1007/s40520-018-1009-7. Epub 2018 Jul 30. PMID: 30062669; PMCID: PMC6439164.
- <sup>8</sup> Piotrowicz K, Prejbisz A, Klocek M, Topór-Mądry R, Szczepaniak P, Kawecka-Jaszcz K, Narkiewicz K, Grodzicki T, Januszewicz A, Gąsowski J. Subclinical Mood and Cognition Impairments and Blood Pressure Control in a Large Cohort of Elderly Hypertensives. *J Am Med Dir Assoc*. 2016 Sep 1;17(9):864., e17-22. doi: 10.1016/j.jamda.2016.06.021. Epub 2016 Aug 5. PMID: 27502451.
- <sup>9</sup> Silness J, Løe H., Periodontal disease in pregnancy II. Correlation between oral hygiene and periodontal condition, *Acta Odontol Scand*, 22 (1964), 121-135.
- <sup>10</sup> Lange DE, Plagmann HC, Eenboom A, et al., Clinical methods for the objective evaluation of oral hygiene, *Dtsch Zahnärztl Z*, 32 (1977), 44-47.
- <sup>11</sup> T. Rosenauer, C. Wagenschwanz, M. Kuhn, A. Kensche, S. Stiehl, C. Hannig, The Bleeding on Brushing Index: a novel index in preventive dentistry, *International Dental Journal*, 67(5), 2017, 299-307.
- <sup>12</sup> J. Brooke, Chapter "SUS: A 'Quick and Dirty' Usability Scale" in *Usability Evaluation*, Industry, Edition 1st, 1996, Imprint CRC Press.
- <sup>13</sup> Venkatesh, Viswanath; Morris, Michael G.; Davis, Gordon B.; Davis, Fred D. (2003). "User Acceptance of Information Technology: Toward a Unified View". *MIS Quarterly*. 27 (3): 425–478.
- <sup>14</sup> Y. Lu, T. Zhou, B. Wang, Exploring Chinese users' acceptance of instant messaging using the theory of planned behavior, the technology acceptance model, and the flow theory, *Computers in Human Behavior*, 25 (1) (2009), pp. 29-39.
- <sup>15</sup> L. Carter, F. Belanger, Citizen adoption of electronic government initiatives 37th annual Hawaii international conference on system sciences, 2004 (2004).
- <sup>16</sup> <https://www.alz.org/careplanning/downloads/katz-adl.pdf>