Deliverable D24.11

Report on the results of experimentation in Charles Foix Hospital (France)

Caroline MOREAU (Sorbonne University, Institut des Systèmes Intelligents et de robotique, CNRS UMR7222, Paris, France)
Consuel GRANATA (ACETIAM)
Etienne DUPUY (ACETIAM)
Jaghathish SANKARAN (ACETIAM)
Giuseppe PALESTRA (Sorbonne University, Institut des Systèmes Intelligents et de robotique, CNRS UMR7222, Paris, France)
Jean Louis BAUDET (ACETIAM)
Sylvie PARIEL (Assistance Publique des Hôpitaux de Paris Groupe Hospitalo Universitaire Pitié Salpêtrière - Charles Foix)
Joel BELMIN (Assistance Publique des Hôpitaux de Paris Groupe Hospitalo Universitaire Pitié Salpêtrière - Charles Foix)
Laurence CHABI (Sorbonne University, Institut des Systèmes Intelligents et de robotique, CNRS UMR7222, Paris, France)
Mohamed CHETOUANI (Sorbonne University, Institut des Systèmes Intelligents et de robotique, CNRS UMR7222, Paris, France)

Version 01
Delivery date: 13.06.2019

CONTENTS

Glossary of Terms

ECHORD++: European Coordination Hub for Open Robotics Development Plus Plus (E++ for short)
TUG : Timed Up and Go test
DHG : Day Hospital Geriatric
MMSE : Mini Mental State Examination
CNIL : Commission Nationale Informatique et des Libertés

1 SCIENTIFIC JUSTIFICATION AND GENERAL DESCRIPTION

1.1 Medical context

Although aging well is a major government issue, it is clear that many people aged 65 and over are fragile, that is to say at high risk of loss of motor and functional autonomy. A person is considered fragile if she has at least three of the five criteria: unintended weight loss (4.5 kg in the previous year), exhaustion, weakness measured by grip strength, speed of slowed down and low level of physical activity (Fried, 2001, Fairhall et al., 2008). Under these conditions, she develops disorders of walking and balance and great difficulty in maintaining its functional abilities in the long term. According to the health monitoring institute (InVS), one-third of over-65s living in their homes, and half of over-85s, have at least one fall per year (Ricard & Thelot, 2008). Each year in France, InVS take a census for this population, more than 450 000 falls (80% of the accidents of the everyday life) of which 9 300 are fatal, 70 000 fractures of the neck of the femur, 500 000 passages with urgencies, 100 000 hospitalizations.

A fall leads to mobility decrease which increases dependency, lack of confidence and decline in the person's functional abilities leading to an increase in the number of hospitalizations. In their study, Rockwood et al. (1999) showed that this vulnerable population has a significantly higher probability of progressing to a loss of functional independence and being admitted to hospital or institution. However, hospitalization, a major stressor, often has negative consequences for the elderly (Gill et al., 2011) such as loss of functional independence (Subra et al., 2012) and the occurrence of a disability (Gill et al., 2011).

Since the risk of falling and the loss of functional independence are highly correlated and predominant for this at-risk population, these polypathological elderly people require comprehensive care enabling regular and personalized follow-up. This monitoring makes it possible to detect, as soon as possible, degenerations and pathologies related to aging. In addition, because in elderly people at risk of loss of autonomy, once the pathologies installed, the decline can be rapid, regular monitoring and adaptation to the needs of the patient is needed. To do this, multidimensional geriatric assessment, as an early detection tool, was created in the 1980s (Rubenstein, 1995). Thus, people at risk of falling, and/or first-time fallers, and people at risk of loss of functional autonomy are subject to high vigilance in geriatric day hospitals. Thes hospitals are mostly focusing their care both evaluation of postural instability - mainly from the Timed Up and Go test (TUG) (Podsialo & Richardson, 1991) - and functional autonomy – mainly from Barthel's index (Mahoney & Barthel, 1965).

Currently, these assessments are carried out by one or more health professionals using paper based questionnaires. Information and Communication Technologies (ICTs) provide technological tools to improve practices, to free up time for health professionals, while maintaining the necessary and unavoidable analysis of results by them.

1.2 Engineering context

Despite the efforts of many researchers in the field (Wrobel et al., 2014), there is no on-the-self system to able to provide hospital health professionals assessment tools multidimensional geriatrics assessment. Only a few online applications have been introduced (Rocha et al., 2013), but most of them are limited to forms similar to questionnaires or requiring direct collaboration between the patient and the health professional. There are mobile applications, generally used for cognitive assessment (A Arean et al., 2013) (Bandera et al., 2013). For example, in Zorluoglu et al. (2015), cognitive tests are implemented as an application for mobile devices that runs on Android OS.

The goal of the ASSESSTRONIC project is to develop a system that allows health professionals to perform geriatrics assessments using the benefits of technology to make the evaluation of functional and motor autonomy easier, faster, more traceable and reproducible in order to provide value-added, objective and fine results.

2 OBJECTIVE AND WORKING HYPOTHESIS

2.1 Objective

The purpose of this study is to evaluate the feasibility and the usability of Barthel index and Timed Up and Go test (TUG) computerized in tests system during a day hospital geriatric (DHG) consultation.

2.2 Working hypothesis

The working hypothesis studied in this study is that the ASSESSTRONIC system allows the data to be collected at least as efficiently as during usual conditions.

3 MATERIALS AND METHODS

3.1 Type of study

3.1.1 Protocole type

This is a feasibility study and usability of a geriatric test system available on a tablet, without longitudinal monitoring of subjects, comparing a control group (usual data collection conditions) to an experimental group (collection of data and/or testing using the ASSESSTRONIC computerized test system).

3.1.2 Description of study groups

Experimental group

The experimental group is divided into 2 groups:

1. *Group Application*: In this group, the evaluation of the Barthel and TUG tests are carried out under usual conditions. In this case, it is a "degraded version" of the ASSESSTRONIC system. Indeed, only the application is used and the tablet is manipulated only by the professionals authorized to pass the tests. In this group, the application is used as a computerized questionnaire.
2. *Assesstronic Group*: In this group, the Barthel and TUG tests are evaluated using the ASSESSTRONIC full system. Thus, the patient and his relative realize:
    a. The Barthel test, alone, answering the questions of the application of the ASSESSTRONIC system via the tablet;
    b. The TUG, in the presence of the authorized health professional using the ASSESSTRONIC system (workstation and tablet module).

Since the patient's appointments are random, the doctor will include the patients alternately in each of the two groups.

Control group

Each patient and relative are their own witness. Thereby,

- For Barthel: patients and relatives, in each experimental group, are called by phone 3 to 4 weeks after hospitalization;
- For the TUG: the data are collected during the experimental transfer to the hospital by the authorized health professional.

Thus, the control group corresponds to the Barthel and TUG test data collected by a professional authorized to pass these tests by means of paper questionnaires.

3.1.3 Description of the evaluated tests

Barthel Index

The Barthel index, allows to measure the autonomy of the elderly person. Thus, this test makes it possible to monitor the state of loss of independence of the elderly person and to measure the decline over time. The people evaluated must answer a questionnaire with short answers that allows them to evaluate the following topics: diet, bath, rectal and urinary continence, movements, stairs, clothing, personal care, use of the toilet and transfer of the bed to the chair.

Timed Up and Go test (TUG)

The TUG is a timed chair lift test designed to measure the dynamic balance of the elderly person (risk of falling, walking speed, functional mobility). To carry out this test the elderly person can use his usual technical assistance. In this test, the elderly person must get up from the chair, walk three meters at a comfortable speed, retrace his steps and sit back on the chair. The timer starts at the start signal and stops when the elderly person's back touches the back of the chair. A patient called "stable" must perform the test in less than 20 seconds: he is then considered to be autonomous for his transfers and his basic movements. A time greater than thirty seconds evokes a postural instability.

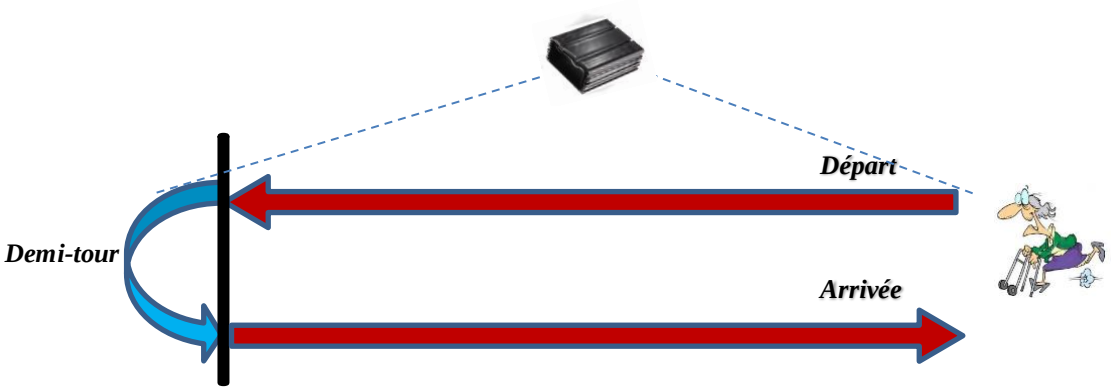

Figure 1: TUG Path

3.1.4 Technical characteristics of the equipment

The ASSESSTRONIC pass system is composed of:

- A Galaxy Tab A6 tablet from Samsung, 10.1-inch screen and 32GB of memory;
- Workstation module: housing incorporating a 3D camera, a processor, batteries and laser pointers (Figure 2 - Device developed by the company ACETIAM) see Figure 1 to realize its implementation.

Figure 2: left, Galaxy touch pad; right, Workstation module

3.2 Study population

3.2.1 Inclusion criteria

Patients

+ 65 years old and over;
+ Requiring consultation in DHG or in consultation with the Ambulatory Geriatric Department at Charles Foix Hospital;
+ Accompanied by a relative;
+ Agreeing to be called, by telephone, three to four weeks after hospitalization;
+ Able to read and/or understand the newsletter about the conditions of the study;
+ Having read and signed the consent form to participate in the study.

Relatives

+ Agreeing to be called, by telephone, three to four weeks after hospitalization;
+ Able to read and understand the newsletter about the conditions of the study;
+ Having read and signed the consent form to participate in the study.

3.2.2 Non-inclusion criteria

Patients

+ having significant cognitive impairment (MMSE <16);
+ Not entitled to ground support;
+ Being bad or not seeing;
+ Having a heavy pathology;
+ Having had surgery in the last 3 months;
+ subject to a legal protection measure;
+ Participant in another study protocol.

Relatives

+ Subject to a legal protection measure;
+ Participant in another study protocol.

3.2.3 Recruitment methods

The patients are recruited during the medical consultation with the doctor. If the patient meets the criteria for inclusion and non-inclusion, the information letter is given to him and explained by the hospital doctor in charge of his file. The doctor responds to all the questions of the patient having interest in the study.

The relatives are recruited at the same time as the patient they accompany. If the person meets the criteria for inclusion and non-inclusion, the information letter is given to him and explained by the hospital doctor in charge of the file of the patient he accompanies. The doctor answers all of the questions of the relative who is interested in the study.

Recruitment can be done the same day of the study by the patient and his relative.

3.3 Judgement criteria

3.3.1 Principal judgement criteria

Strong correlation between test results in usual condition (control group) and those collected during testing with the ASSESSTRONIC test system (experimental groups). At least, the score different between profiles.

3.3.2 Secondary judgement criteria

Questionnaires for acceptability of tablet, satisfaction and use of the ASSESSTRONIC system for the 3 profiles (patients; medical professional; relatives).

4 PROTOCOL OF INTERVENTION

4.1 Research Schedule

The patient and their relative are solicited once for the study.

The total duration of the study for a patient and his relative is approximately one hour and half (~ 1h30). This time includes: experimentation presentation duration; tests acquisitions (in classical conditions or with the ASSESSTRONIC system); questionnaire of acceptability, satisfaction and use of the system.

The total study duration is 4 months.

4.2 Summary table of the organization of the study

Steps \ Calendrar	Inclusion	Tests	Data collection	Data analysis
Verification of inclusion and non-inclusion criteria during a medical visit for the patient and relative	X			
Information about the subject and his relative: delivery of the newsletter and the consent form	X			
Experimental group Application: Transfer under usual conditions (professional expert uses the tablet application)				
Barthel: patient - health professional		X	X	
TUG: patient - re-educator		X	X	
Questionnaire of satisfaction and use: health professionals			X	
Assesstronic experimental group: Pass with system (patient and relative use the tablet application)				
Barthel: patient alone		X	X	
Barthel: relative alone (for the patient)		X	X	
TUG: patient with relative - re-educator		X	X	
Questionnaires of satisfaction and use: patient and relative			X	
Control group (Barthel by telephone, TUG during experimental transfer)				
Barthel: patient - professional				
Barthel: relative - professional				
TUG: patient - re-educator				
Data analysis and writing of the final report				X

4.3 Progress of the study

4.3.1 Experimental groups

Experimental group Application

The patient and his relative are received by the doctor in his usual consultation room. The doctor explains to them the different tests that the patient must perform today. The doctor answers all their questions.

The relative waits for the patient in the waiting room and the patient will carry out the various tests with the various professionals authorized to pass the tests.

Barthel test: the patient passes this test with a medical professional. The professional connects to the ASSESSTRONIC application. He asked questions to the patient; logs responses obtained using the ASSESSTRONIC application and disconnects from the application.

The professional takes the patient and his relative to the rehabilitation room. The physiotherapist hosts the patient. His relative is waiting in the waiting room.

TUG test: the patient passes this test with a physiotherapist. The physiotherapist connects to the ASSESSTRONIC application; assess the TUG to the patient in his room; records the results obtained using the ASSESSTRONIC application and disconnects the application.

The physiotherapist takes the patient and his relative to the doctor's consultation room. The doctor takes care of the patient and his relative to close the visit.

Professionals who have used the application complete a satisfaction and usage questionnaire at the end of the study.

Experimental group Assesstronic

The patient and his relative are hosted by the doctor in his usual consultation room. The doctor reminds them of the principle of the study, presents them with the system and the various tests that the patient and his relative must perform today. The doctor answers all their questions.

The patient and his relative are cared for by an authorized professional, knowing the application and the various tests. The professional accompanies them in the room dedicated to the handover; create patient account. It provides them with a tablet each, helps them connect to their respective profile on the app and start testing.

Barthel test: The patient stays in the room and answers for him. The relative waits for the patient in the waiting room, answers Barthel's questions for the patient he accompanies. In case of blockage they can ask the professional (tablet use, misunderstanding of the question, etc.).

Once the test is finished, the patient and his relative informs the professional. The professional recovers both tablets and takes them to the rehab room to pass the TUG. The physiotherapist hosts the patient. His relative is waiting in the waiting room.

TUG test: the patient passes this test with the physiotherapist. The physiotherapist has the necessary equipment: chair, tablet and workstation module of ASSESSTRONIC system. If necessary, it helps the patient to connect to the ASSESSTRONIC application. The patient is positioned on the chair and the physiotherapist begins the test by following the instructions provided by the application.

The physiotherapist takes the patient and his relative to the doctor's consultation room. The doctor takes charge of them to close the visit.

The patient and his relative answer the questionnaires of satisfaction and usability of the ASSESSTRONIC system.

4.3.2 Control group

Barthel test: the patient and his relative are called, by telephone, 3 to 4 weeks after the transfer to the hospital, by an authorized professional, different from the one who passed the tests to the hospital. The professional collects the information using a paper based questionnaire adapted to the Barthel test.

TUG test: The physiotherapist collects information as usual during the experimental procedure with the ASSESSTRONIC system.

4.4 Commentary notebook

The data observed in the study are collected in a notebook of paper observations by the technician of study.

4.4.1 Data anonymization procedure

The anonymization procedure consists of two basic elements:

1) A subject directory containing the experimental files of the subject:

EO_NuméroD'InclusionSujet

2) Experimental files containing all data collected from the subject:

EO_InclusionNumberType_Date_Type

With the following codes:

- EO = Observational study;
- InclusionNumber: 01 to 99;
- Date (of data recording): DDMMYY;
- DataType: Barthel Topic = 01; Barthel Accompanying = 02; Barthel Professional = 03; etc. up to 99.

The whole of this codification will be recorded in an independent file in the report book.

For example, for the subject Mr. Martel, first subject of the study (01), having to carry out the test of Barthel on the date of June 1, 2017 (010617) to carry out alone (01):

EO_01_010617_01

The anonymity of the subjects will be ensured either by the mention of the repertoire subject, indicated on all the documents necessary for the study, or by erasure, by the appropriate means (blank corrector, etc.), personal data on the copies source documents for the documentation of the research.

It should be noted that paper notebooks will be kept for 15 years in local fireproof by the sponsor of the study, in a secure place.

4.4.2 Data study

All information required by the protocol will be recorded in the paper record as it is obtained by the experimenter, whether clinical or para-clinical data.

These data will be divided according to the following items:

1. Inclusion
    a. Patients data
    b. Relatives data

c. Medical professional data
d. Inclusion criteria
e. Criteria of non-inclusion

2. Collect information
    a. Barthel by the doctor
    b. TUG by the physiotherapist
    c. Barthel by the patient with the ASSESSTRONIC system
    d. TUG by the physiotherapist with the ASSESSTRONIC system
3. Study exit

For any missing data in the casebook, the investigator must provide an explanation.

The erroneous data found on the observation form will be corrected. All corrections will be validated by the principal investigator. An explanatory note will be added for each corrected incorrect data.

4.4.3 Rules for stopping research

All individuals who are suitable for research will be able to withdraw their consent and ask to leave the study at any time and for whatever reason. In case of premature discharge, the investigator will document the reasons as completely as possible.

Likewise, unforeseen events or new research information, in the light of which objectives are unlikely to be achieved, may cause the sponsor to terminate the study prematurely.

5 STATISTICAL ASPECTS

5.1 Size of the study

In order to obtain statistically significant results, a staff of 50 patients per group is desired.

5.2 Description of the study population

The description of the population will be done by analysis of the means and standard deviations of the standard quantitative data: gender; age; MMSE.

5.3 Primary endpoint

The main analysis focuses on the strong correlation between test results under usual conditions (control group) and those collected with all or part of the ASSESSTRONIC test system (experimental groups: Applications and Assesstronic).

Each experimental group is compared with the reference data (control group) by linear regression analysis thus allowing the analysis of the link between the responses of the experimental groups compared to the responses of the control group (Application Group *vs* Control Group, Assestronic Group vs Group Control).

Then, a correlation analysis will account for the intensity of these links.

5.4 Secondary endpoints

The secondary endpoint relates to the questionnaires of acceptability, satisfaction and use of:

+ Patient during the tests with the ASSESSTRONIC system;
+ Health professionals with the ASSESSTRONIC system;
+ Relative during the tests with the ASSESSTRONIC system.

This analysis will provide a descriptive analysis of user behavior in terms of percentage.

6 ETHICAL AND REGULATORY CONSIDERATIONS

6.1 Access to data and source documents

The data and source documents collected during this study will remain strictly confidential and can only be consulted by the promotor or health professional under the responsibility of the investigator. Only anonymous data will be accessible to all members of this study. They will also be used anonymously before being included in a report or scientific publication.

The computerized processing of personal data will be carried out in accordance with the provisions of Law 78-17 of 6 January 1978 relating to computers, files and freedoms and subsequent laws that have changed. In particular, the person participating in the research may exercise his right of access and rectification guaranteed by articles 39 and 40 of this law by contacting the investigating doctor who has taken care of him.

6.2 Processing and storage of data and documents related to the study

The documents of a study must be archived by all parties for a period of 15 years after the end of the research.

This indexed archive contains:

- copies of letters of the mandatory notice of the Ethics Committee;
- successive versions of the protocol;
- correspondence with the promoter;
- all specific appendices to the study;
- the final report of the study from the statistical analysis and quality control of the study;
- the possible audit certificates made during the research.

The database that gave rise to the statistical analysis must also be archived by the analysis manager (paper or computer).

6.3 Ethical considerations

The subjects participating in the study will be considered with respect: respect for their person, their word, their image (in case of photos or film), their privacy.

The subjects will be fully and fairly informed, in understandable terms, of the objectives and constraints of the study, the possible risks incurred, the necessary surveillance and security measures, their rights to refuse to participate in the study. or the possibility of retracting at any time.

All this information is contained in a newsletter provided to the subject. The free and informed consent of the subject will be collected by the investigator, or a physician who represents it, before final inclusion in the study.

The protocol, the newsletter of the study will be submitted for opinion to an Ethics Committee.

The notification of the favorable opinion of the ethics committee will be sent to the sponsor of the study.

The persons participating in the study will not receive compensation and will not be registered in the VRB file as they are subjects of the geriatric service with cardiological and neurological orientation proposing the participation to the research.

6.4 Requesting an opinion to the ethics committee

In accordance with article L.1123-6 of the Public Health Code, the research protocol must be submitted by the promoter to an Ethics Committee. The opinion of this committee shall be notified to the competent authority by the promoter before the start of the research.

6.5 CNIL Declaration

The law provides that the declaration of the computerized file of personal data collected for research must be made before the actual start of the search.

A reference methodology specific to the processing of personal data, carried out within the framework of biomedical research defined by law 2004-806 of August 9, 2004, as falling within the scope of articles L.1121-1 and following of the Public Health Code, has was established by the Commission Nationale Informatique et Libertés (CNIL) in January 2006.

This methodology allows a simplified reporting procedure when the nature of the data collected in the search is compatible with the list provided by the CNIL in its reference document.

This study is part of the "Reference Methodology" MR-003 in application of the deliberation n ° 2016-263 of July 21, 2016. The research promoter and the investigators undertake to respect this "Methodology of reference".

STUDY RESULTS

7 BARTHEL INDEX RESULTS

7.1 Description of the population

During the month of November 2018, 21 people (12 patients and 9 caregivers – *Figure 1*) were included during the 7 recruitment sessions, each 4 hours, carried out during consultations of the service. The majority of patients included are women (66.67%) with a median age of 78.62 years (± 9.13) and a median MMSE of 22.5 / 30 (± 5.61). Relatives, for their part, are predominantly men (66.67%) with a median age of 64.50 years (± 10.87) (*Table 1*).

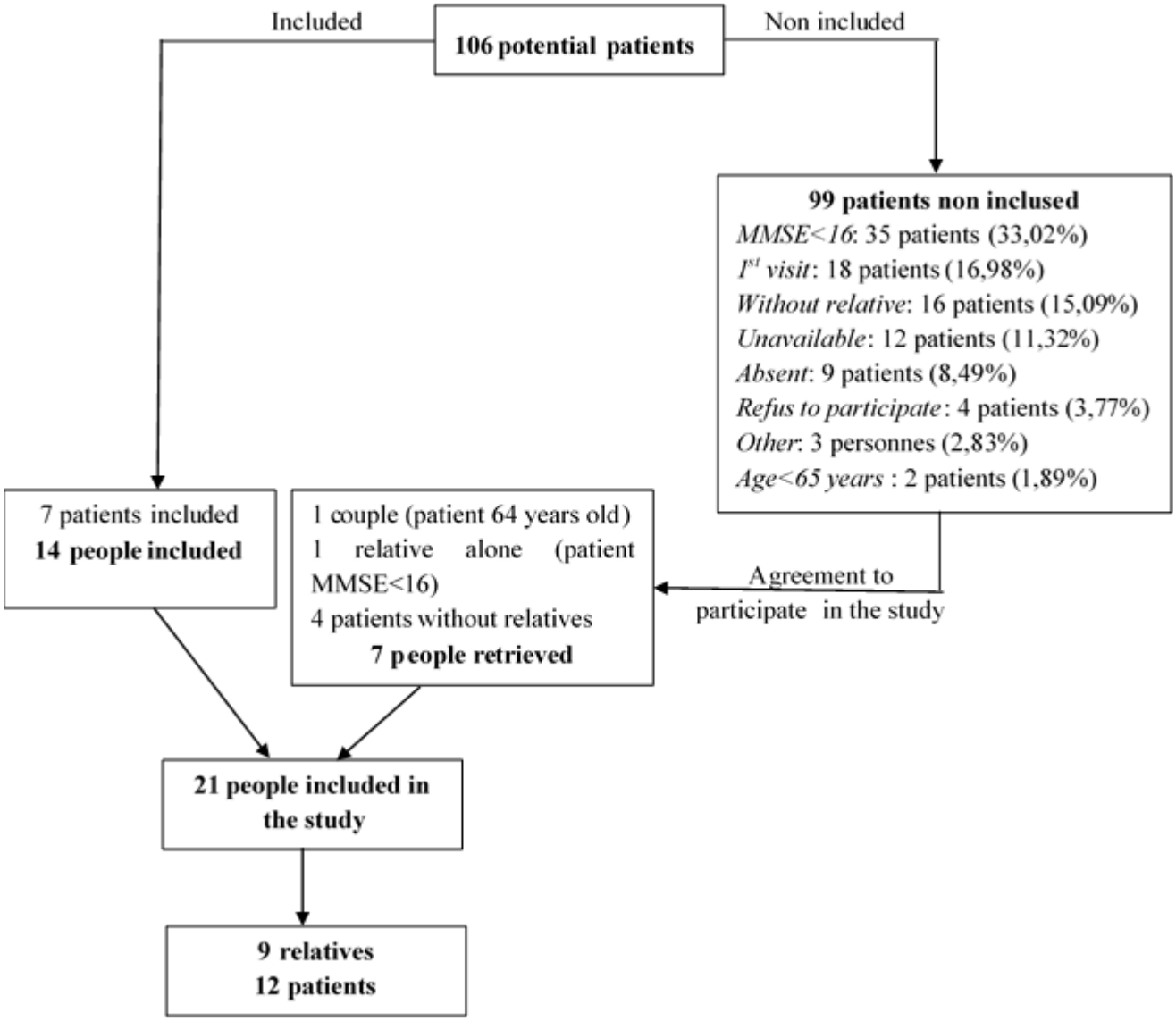

Figure 1: Flow chart of study

Table 1: Basic characteristics of the study population

	Patients N=12	**Relatives N=9**
	Mean(±SD)	Mean(±SD)
Gender		
Men	4	6
Women	8	3
Age (years)		
Mean	76,66 (±8,08)	62,67 (±9,84)
Men	72,75 (±3,77)	64,50 (±10,87)
Women	78,62 (±9,13)	59,00 (±7,81)
MMSE		
Mean	23 (±5,36)	
Men	24 (±5,48)	
Women	22,5 (±5,61)	

7.2 Acceptability of the digital tablet tool

Table 2 shows the acceptability of the tablet to patients and relatives included in the study. It is shown that 54% of the population who used the tablet during this study considers themselves as inexperienced or new to the new technologies. More than 80% of patients and 75% of relatives found it from satisfactory to very satisfactory use. In addition, less than 30% of patients and 25% of relatives would have preferred paper support to tablet support to pass these tests. Overall, more than 70% of patients and 100% of relatives are satisfied with using this tool to answer Barthel's index questions.

Table 2: Acceptability of the digital tablet tool

	Patients N = 11 ; n/N					**Relatives N = 8 ; n/N**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
What is your level of expertise in new technologies?	5/11	1/11	3/11	2/11	0	0	2/8	3/8	1/8	2/8
How did you feel about the use of the tablet	0	1/11	1/11	5/11	4/11	0	0	2/8	3/8	3/8
How do you think the tablet works	0	1/11	1/11	4/11	5/11	0	0	0	3/8	5/8
Encountered difficulties	no difficulty = 9/11 non acceptation = 0 technological break = 2/11					no difficulty = 6/8 non acceptation = 1/8 technological break = 1/8				
Did you appreciate the tablet support to pass these tests?	1/11	2/11	2/11	4/11	2/11	0	0	1/8	5/8	2/8
Would you have preferred another medium than the tablet?	non = 8/11 oui = 3/11					non = 6/8 oui = 2/8				
If so, what other support?	paper = 2/11 oral = 1/11					paper = 2/8 oral = 0				
Do you think you have managed to use the tablet alone?	1/11	1/11	0	6/11	3/11	0	0	0	6/8	2/8
Are you satisfied overall with having passed these tests using the tablet?	2/11	1/11	0	4/11	4/11	0	0	0	4/8	4/8

1: No experience - Very complicated / Not at all satisfactory; 2: Beginner - Rather complicated / Unsatisfactory; 3: Moderately expert - Moderately simple / Moderately satisfactory; 4: Rather expert - Rather simple / Rather satisfactory; 5: Expert - Very simple / Very satisfactory

7.3 Usability of the application for users

Table 3 shows the usability of the application for patients and relatives. It is shown that over 60% of patients and relatives would like to use this app frequently. More than 70% of patients and more than 50% of relatives find it easy to use. 54.5% of patients felt it necessary to have help using this app where 75% of relatives feel they can use it alone. More than 80% of patients and 100% of relatives found this application not at all compelling to use.

Table 3: Usability of the application for users

	Patients N = 11 ; n/N					Relatives N = 8 ; n/N				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
I think I would like to use this application frequently	3/11	0	1/11	0	7/11	1/8	1/8	1/8	0	5/8
I found this application unnecessarily complex	6/11	1/11	0	0	4/11	6/8	1/8	0	0	1/8
I found this application easy to use	1/11	1/11	0	2/11	6/11	0	1/8	1/8	1/8	5/8
I think I would need the support of a specialist to use this application	4/11	0	1/11	3/11	3/11	6/8	0	1/8	0	1/8
I found that the deferent functions of this application were well integrated	1/11	0	2/11	2/11	6/11	1/8	0	0	0	7/8
I found this application too inconsistent	9/11	1/11	1/11	0	0	8/8	0	0	0	0
I think this app will be easy to learn for a lot of people	1/11	0	3/11	3/11	4/11	1/8	0	3/8	2/8	2/8
I found this application very restrictive to use	9/11	0	0	0	2/11	6/8	2/8	0	0	0
I felt confidence when I used this app	2/11	1/11	0	2/11	6/11	0	1/8	1/8	0	6/8
I had to learn a lot before I became familiar with this application	9/11	0	0	0	2/11	5/8	0	1/8	0	2/8

1: Strongly disagree 2: Little agreement; 3: Somewhat agree; 4: Mostly agree; 5 Strongly agree

7.4 Satisfaction of the application for users

The use part of the application is divided into three distinct parts making it possible to judge the utility of the system, the quality of the information as well as that of the interface.

7.4.1 System utilty

Table 4 shows that regarding the utility of patients and relatives, they are more than 80% mostly agree and completely agree that the use of the application is easy, 50% of patients and 75% of relatives are agree to strongly agree that they would be effective using this app and over 70% would be able to respond quickly to questionnaires using this app. In addition, 72% of patients and 87% of caregivers felt comfortable using this app.

Table 4: System Utility

	Patients N = 11 ; n/N					Aidants N = 8 ; n/N				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
In general, I am satisfied with the ease of use of this application	2/11	0	0	2/11	7/11	0	1/8	0	2/8	5/8
It is easy to use this application	2/11	0	0	2/11	7/11	0	0	1/8	3/8	4/8
I will be effective using this app	3/11	0	2/11	0	6/11	0	1/8	1/8	1/8	5/8
I will be able to answer questionnaires quickly using this app	2/11	0	1/11	0	8/11	0	0	1/8	1/8	6/8
I will be able to answer the questionnaires with little effort using this application	2/11	1/11	1/11	0	7/11	0	0	1/8	1/8	6/8
I feel comfortable using this app	3/11	0	0	1/11	7/11	0	1/8	0	3/8	4/8
It's easy to learn how to use this app	1/11	0	0	1/11	9/11	0	1/8	0	0	7/8
I believe that I will be quickly more productive using this app	3/11	0	0	1/11	7/11	1/8	1/8	0	0	6/8

1: Strongly disagree 2: Little agreement; 3: Somewhat agree; 4: Mostly agree; 5 Strongly agree

7.4.2 Quality of information

Table 5 highlights the feelings of patients and relatives about the quality of the information provided by the application. For 91% of patients and 87% of the relatives, the information provided by the app are very clear, relevant and allow answering questionnaires. In addition, 100% of patients and 87% of relatives found the organization of information on the screen very clear.

Table 5: Quality of Information

	Patients N = 11 ; n/N					Relatives N = 8 ; n/N				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
This application displays messages that clearly tell me how to solve problems	2/11	0	2/11	1/11	3/11	1/8	0	0	1/8	3/8
Even if I make mistakes using this application, I can solve them easily and quickly	1/11	0	1/11	2/11	6/11	1/8	0	0	1/8	6/8
The information provided by this app is clear	0	0	1/11	0	10/11	0	0	1/8	0	7/8
It's easy to find the information I need	2/11	0	1/11	1/11	7/11	0	1/8	0	0	7/8
The information provided by this application is easy to understand	0	0	1/11	2/11	8/11	0	0	1/8	0	7/8
The information is relevant to help me answer the questionnaires	1/11	0	0	1/11	9/11	0	0	1/8	1/8	6/8
The organization of the information on the screens of this application is clear	0	0	0	3/11	8/11	1/8	0	0	0	7/8

1: Strongly disagree 2: Little agreement; 3: Somewhat agree; 4: Mostly agree; 5 Strongly agree

7.4.3 Quality of the interface

Table 6 is focused in the interface of the application. In fact, the results show that 81.81% of patients find the interface pleasant, while 60% of relatives find their interface pleasant and 37.5% find it moderately pleasant. In general, 72.72% of patients and 87.5% of relatives are satisfied with the application.

Table 6: Quality of the interface

	Patients N = 11 ; n/N					Relatives N = 8 ; n/N				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
The interface of this application is nice	1/11	0	1/11	0	9/11	0	0	3/8	0	5/8
I like to use the interface of this application	3/11	0	0	1/11	7/11	0	0	3/8	0	5/8
This app has all the features and capabilities that I expect from it	2/11	0	1/11	2/11	6/11	1/8	0	0	2/8	5/8
In general, I am satisfied with this application	3/11	0	0	1/11	7/11	0	1/8	0	0	7/8

1: Strongly disagree 2: Little agreement; 3: Somewhat agree; 4: Mostly agree; 5 Strongly agree

7.5 Difference in score of the Barthel index between patient and relative

Eight patient/relative couples used the application simultaneously. Among these 8 couples, 1 patient did not want to use the application, 2 patients underestimate their level of autonomy, 2 patients overestimate it and 3 patients have the same assessment as their relative.

Table 7: Score difference of the Barthel index between patient and relative

	Score Patient	Score Relative	Difference P-R
1	80	85	5
2	100	100	0
3	100	90	-10
4	100	100	0
5	80	90	10
6	0	65	65
7	100	100	0
8	100	85	-15

7.6 DISCUSSION

The main objective of this study is to report on the acceptability of a digital tool and the implementation of such a system in a geriatric ambulatory ward.

During the 7 recruitment sessions, 106 patients were scheduled for a consultation. By strictly applying the inclusion criteria of the study only 6.6% of patients could be included. The main reasons being patients with an MMSE <16/30 (33.02%), patients coming for the first time in the service (16.98% - during these consultations the doctor draws up a complete assessment of the patient allowing, for future visits, to set up support in the service. These patients generally leave the service following this visit), patients without relative (15.09% - as a service where patients come only for the day, the relative drops the patient and comes to look for him at the end of the visits or the least degraded patients come alone), patients interested in the study but unavailable because of their schedule of consultations very loaded (11.32%), planned patients who do not show up for their consultation (8.49%) (Figure 1). Given all these constraints, during the recruitment sessions we decided to slightly increase recruitment. We found it interesting to use this data as part of the secondary judgment criteria on the satisfaction, usability and acceptability of the digital tablet tool and an application for passing the Barthel index because these data are subjective and personal. However, regarding the primary endpoint (the difference between the test scores) only the data of patients and relatives strictly entering the inclusion criteria were used.

For a population considered more than 50% as non-expert in the use of new technologies, more than 75 years old and composed mostly of women, the results show that the acceptability of the digital tablet is rather satisfactory. Indeed, despite the difficulties of use of the tool encountered by some patients, the digital tablet was relatively quickly taken in hand (at the end of the 5th question) which suggests an easier grip over time. The main difficulties encountered were related to too long nails, too long a support on the screen, a poor grip of the tool, the palm of the hand touched the screen slightly which subsequently prevented the application to work properly. This is a lack of knowledge about the tool and its particularities. For greater comfort of the user, especially the elderly who are very tiring, it is necessary that the tablet is installed on a fixed support. Ideally, this support should be slightly inclined. But also that the way to click (short click on the area) is reminded. To overcome this problem, there is voice recognition.

Indeed, the application has a voice synthesis allowing patients to listen to the questions, rather than read them, and a voice recognition to those who wish to avoid touching the screen (*"I do not like touching these machines but with that (voice recognition) I like it."*). The majority of patients who have used this option continue to read texts despite voice synthesis. Some do not like voice synthesis, so they have cut the sound. Others wanted to test the different features by cutting the sound. It then appeared a "default" in the graphical interface of the application. Indeed, on the interface the test questions are located at the top of the screen in a green rectangle. This box being fixed from one question to the other, patients did not read the question (*"I thought it was a general banner, it is believed that it is written the same thing and then it is green! ";"The question in the green band is not visible, it's like advertising so it's information we do not read"*). Beyond that, the majority of patients find the interface very pleasant. The relatives are more mixed. Indeed, their interface is much more efficient and basic. All the questions are grouped on one page with drop-down menus (*"At the beginning it's surprising but once you understand the system it's good, it has to be simple like that"*), for others this interface is too austere and would have preferred to use the patient interface (*"I would have preferred to have the same interface as my father, it is much nicer!"*). Health professionals who have used the application find it simple, basic and intuitive (*"We have little time so we need something that is efficient and clean, and that's fine."*). But find the font size too small for regular use.

Regarding the use of the application, despite difficult beginnings the majority of patients and relatives find it easy to use. Indeed, in the early days some patients (even some relatives) do not understand where to check to answer (*"well I'm doing it by myself, must I press what then?"*). Sometimes even they do not understand the question asked (*"What*

does it mean continent?"), others need to be guided (*"I support that?"; "I arrived at the end of the test and I have to go back?"*) and to be encouraged (*"Grhhh! Susceptible Gear"*). However, it shows a satisfaction (*"I want to continue I like it"; "it's easy, if it remains simple (the application) I would like to use it frequently"; "it's simple, there is the right thing and we are guided"*). The patients, who needed it most, are very aware of their difficulties with this tool and that support is necessary in the use of such an application. Where most relatives feel more comfortable because they are already familiar with this type of tool. What is interesting to note in the results is the fact that the majority of the participants felt comfortable using it and find that using this application requires little effort.

In the same way, the application was built in a very refined way which gives a clear and relevant access to the information for patients and relatives (*"It's easy, if it remains simple (the application) I will like use it frequently"*). However, for the medical staff, the information provided by the application is too limited and should be refined so that they can use the application independently (*"The application must integrate elements of Orbis to limit the number of otherwise we will not use it, we do not have the time."*). Moreover, even if health professionals see a certain interest for them, they remain skeptical about its everyday use. The following questions emerged from the interviews: Who will create the patient profile? Who will give and recover the tablets, load them? Where are we going to store them? Who will support patients and relative? What to do when the internet connection does not work?

From the interview with health professionals, there was limited confidence in the responses that patients could provide to the Barthel index. However, the results collected concerning the Barthel index score difference between patients and relatives are very similar for more than 50% of the cases. It would be interesting to continue studying these differences score by including the medical professional profile and analyzing the correlations.

7.7 Conclusion

In a service like the one where the study took place, patients come for most of the day. After presenting themselves at the reception, a nurse comes to meet them in the waiting room to explain the course of their day. Once done, and after answering the different questions of the patient and his relative, the nurse gives to the relative a paper questionnaire assessing the patient's autonomy. This paper questionnaire will then be sent to the doctor during the consultation. This is where the ASSESSTRONIC system could be introduced. In fact, patients and their relatives could, during their waiting time, fill out the questionnaire on a tablet rather than on paper.

However, this solution has organizational and acceptability limits. Indeed, beyond the questions asked above, how to allow a place of privacy to answer the questionnaires and this mainly for patients who often use voice recognition. Obtaining a room dedicated to this application with healthcarers available to support them requires a complete reorganization in services already optimized in terms of room and healthcarer.

Although the percentage of patients and relatives who raised the issue is low, the fear of dehumanizing the management felt is important to consider (*"It does not suit me to talk to a robot and are closed questions "," it (the application) is not complex but useless ";" Effective?! If it serves something to agree on but I do not want to dehumanize the appointments."*). The introduction of new technologies into a geriatric service should be introduced with great care and support, especially for current generations who are not familiar with new technologies.