Virtual coaching platform for stroke rehabilitation: preliminary usability results from vCare project experience

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CARE'S CONTINUITY AT HOME: A NEED FOR PATIENTS WITH STROKE AFTER THE DISCHARGE

Stroke causes different **impairments** such as loss of _muscle strength_, _sensation and coordination deficits_, _gait and balance disorders_, _motor disabilities of the upper limbs and hands_

Impairments and the related disabilities may have a significant **impact on an individual's independence**, **safety**, and **QoL**

**Missing continuity of care**
➔ calls for an **innovative approach** integrating the **home rehabilitation seamlessly into the clinical care chain**

COVID-19 accentuated the interruption of care's continuity for patients with stroke in transition from hospital to home

vCare: CARE'S CONTINUITY THROUGH PERSONALIZED VIRTUAL COACH HOME-REHABILITATION

Several projects have been focused on **virtual coaches** development in order to **improve patients' rehabilitation** through an _intelligent environment_, integrating _machine learning_ technologies together with well-elaborated _coaching and clinical treatment services_

vCare project, funded under the EC's Horizon 2020 call "Personalised coaching for well-being and care of people as they age" (SC1-PM15-2017), fits into this context by proposing a new ICT-based concept

Multicenter project with a consortium composed by 12 partners from 7 European countries (e.g.: clinical centers for _neurological_ and _cardiological_ rehabilitation)
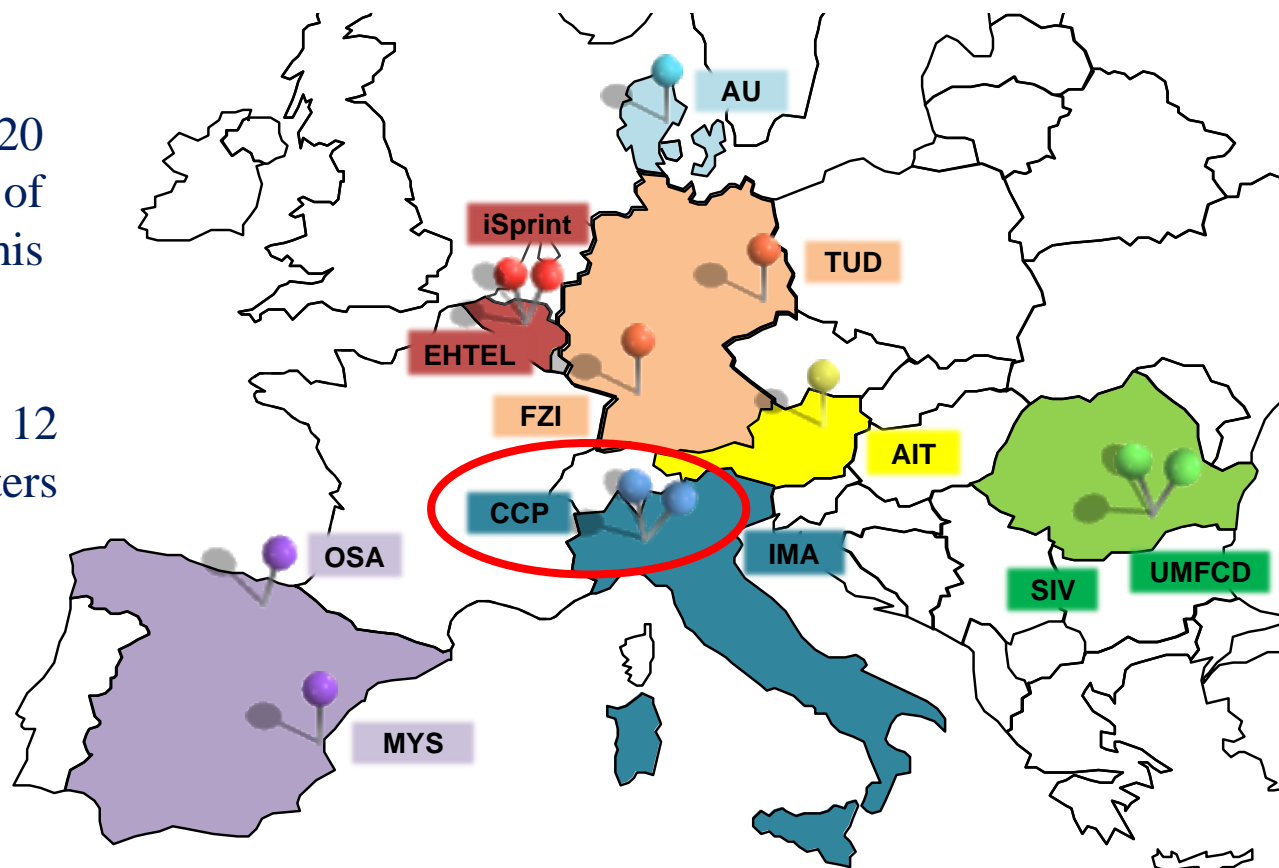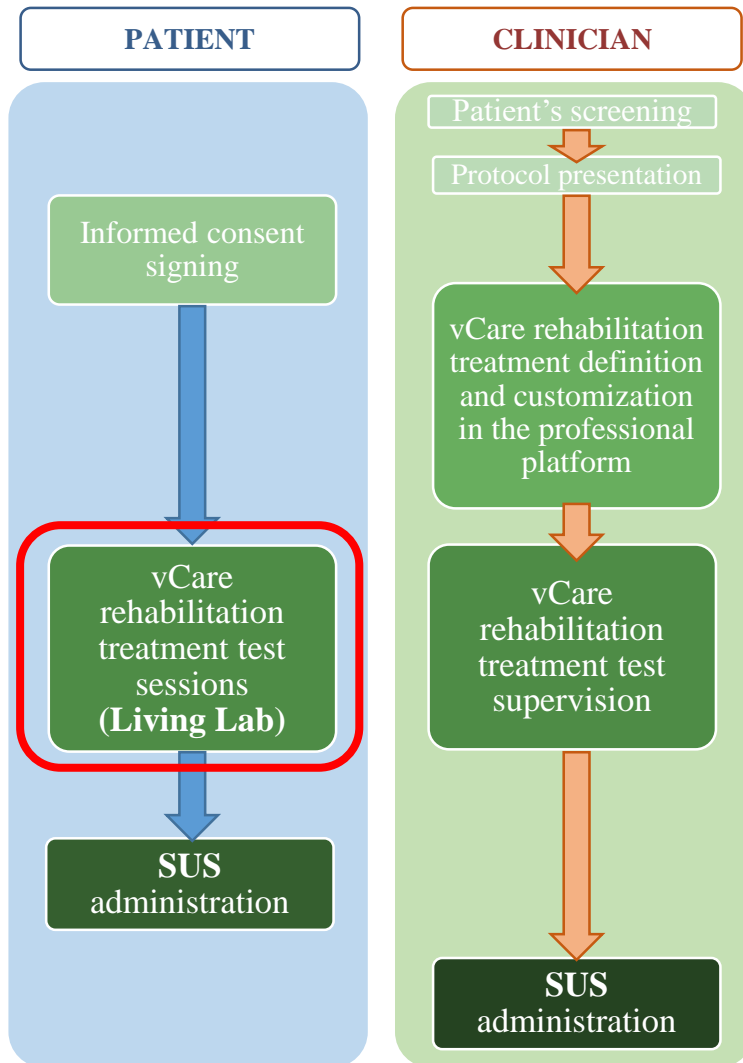
AIM OF THIS PRELIMINARY STUDY

Evaluate the **USABILITY** of the *vCare platform* after **direct experience** from

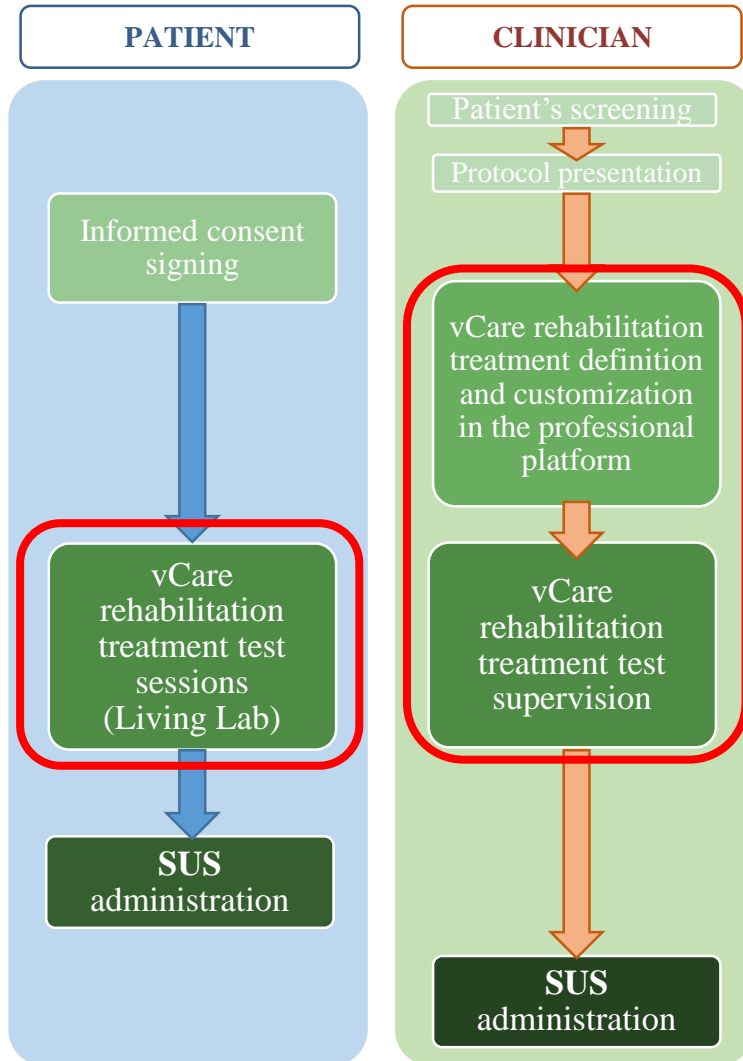## users' point of view (patients and health professionals)

EXPERIMENTAL PROCEDURE, ELIGIBILITY CRITERIA AND SUBJECTS ENROLLMENT

PATIENT

CLINICIAN

Patient's screening

Protocol presentation

Informed consent signing

vCare rehabilitation treatment definition and customization in the professional platform

vCare rehabilitation treatment test sessions **(Living Lab)**

vCare rehabilitation treatment test supervision

SUS administration

SUS administration

The expression 'Living Lab' refers to **experimentation environments in which technology is given shape in real life contexts** and in which (end-) users are considered 'co-producers' (Ballon et al. 2005).

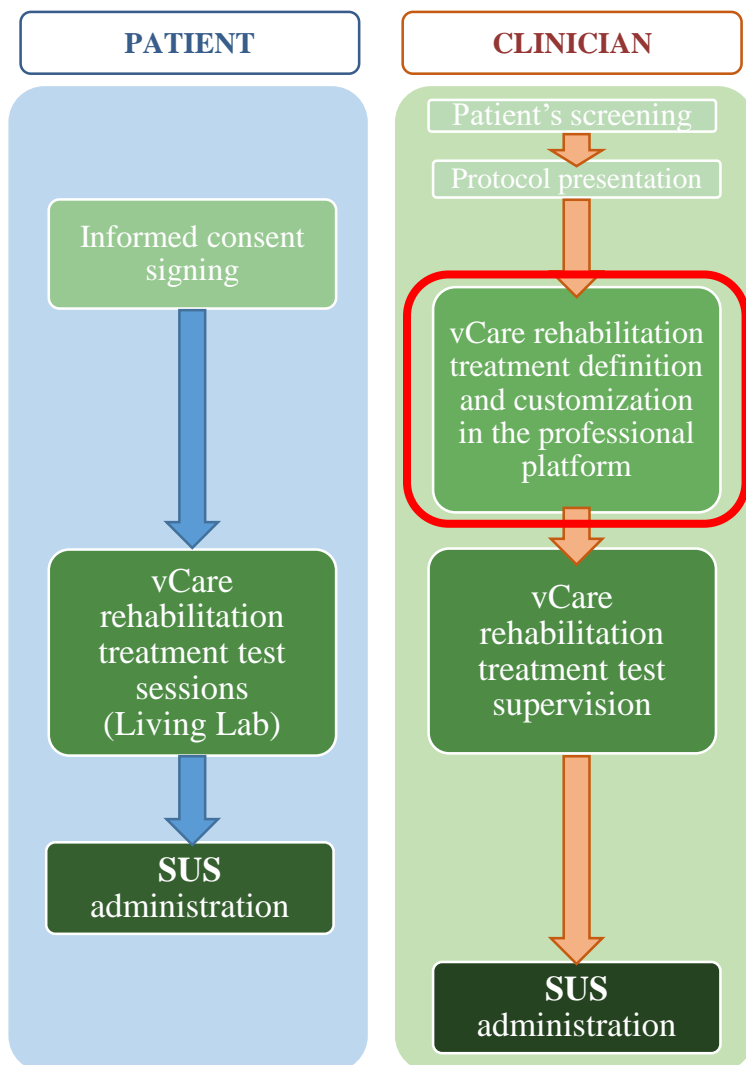# EXPERIMENTAL PROCEDURE, ELIGIBILITY CRITERIA AND SUBJECTS ENROLLMENT

PATIENT

- Informed consent signing
- vCare rehabilitation treatment test sessions (Living Lab)
- SUS administration

CLINICIAN

- Patient's screening
- Protocol presentation
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- vCare rehabilitation treatment test supervision
- SUS administration

Stroke survivors were enrolled among patients hospitalized at *Casa di Cura del Policlinico* (CCP) (Milan, IT)

| *INCLUSION CRITERIA*	*EXCLUSION CRITERIA*
• **Age ranged from 65 to 85 years** • **Experience of an ischemic or haemorrhagic stroke event confirmed by a CT and/or MRI** • **NIHSS score lower or equal to 14**	• **Global aphasia** • **Presence of a severe cognitive impairment** • **Presence of other major chronic, systemic, psychiatric diseases** • **Refusal of the informed consent**

Health professionals were recruited among members of the CCP staff because the *setting up and the supervision of the rehabilitation treatment test* were carried out by medical staff, who were in parallel involved in the evaluation of the vCare system

PATIENT'S MEDICAL EVALUATION & REHABILITATION TREATMENT PRESCRIPTION

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According to patient's clinical status and clinicians' indications, the vCare system proposes *personalized rehabilitation treatments* providing a suite of **motor and cognitive serious games** in a **virtual reality environment (VR)**
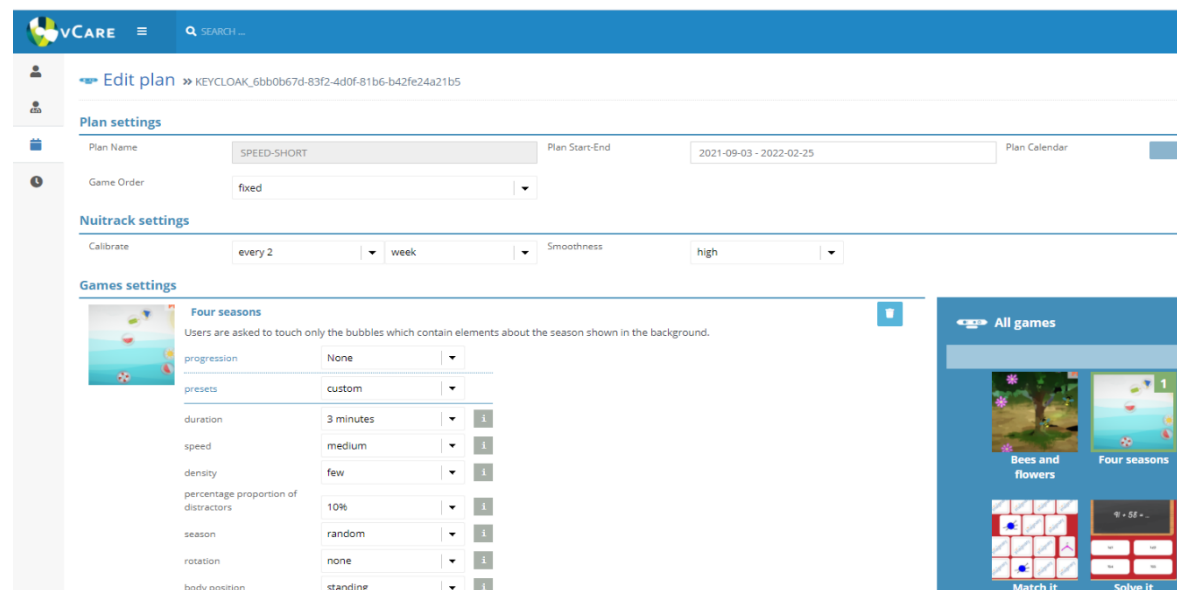
→ Future development: *home-based personalized treatment by the **virtual coach***

CASA DI CURA DEL POLICLINICO

REHABILITATION TREATMENTS

Subjects experienced **two weeks long rehabilitation treatments** autonomously under clinician's supervision

A **3D depth camera** recognized the user's movement without controller. The user's movements in the VR were displayed through a **monitor** (40-inch wide screen) in real time

For cognitive rehabilitation activities, patient used a **tablet** (10-inch)

Motor and cognitive activities were characterized by **specific goals**, generally with **specific rules** to reach them, in some cases **distractor** were presented to **increase the difficulty level**

OUTCOME MEASURE: SUS

PATIENT	CLINICIAN

PATIENT

- Informed consent signing
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- **SUS** administration

CLINICIAN

- Patient's screening
- Protocol presentation
- vCare rehabilitation treatment definition and customization in the professional platform
- vCare rehabilitation treatment test supervision
- **SUS** administration
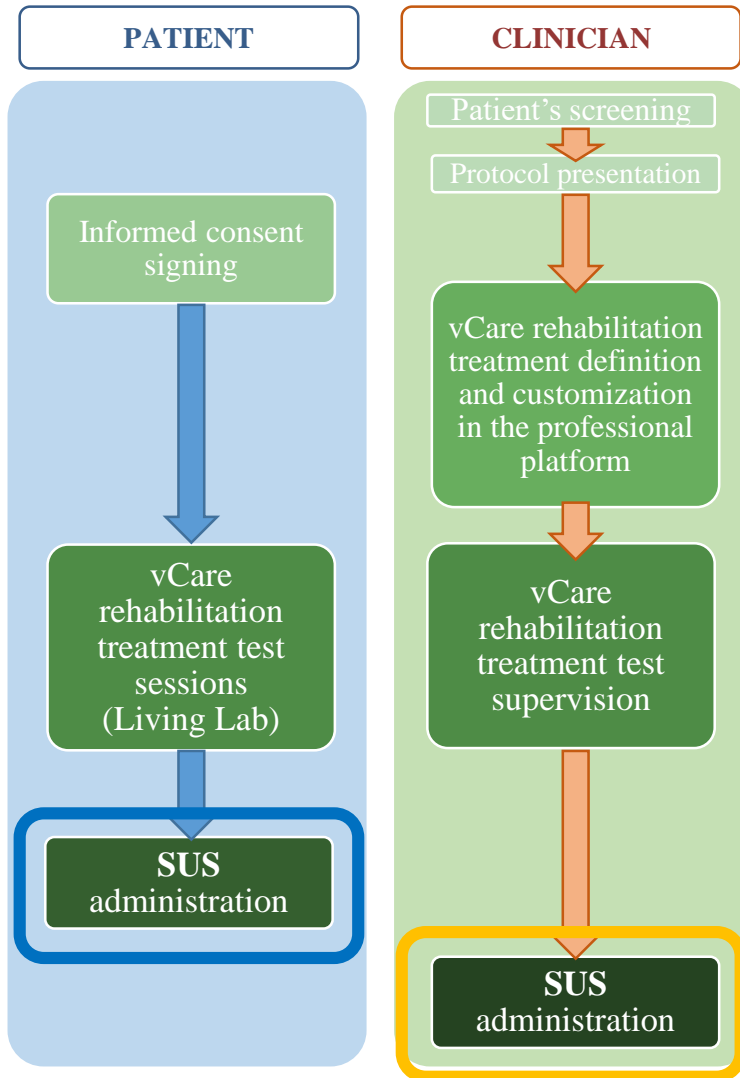
At the end of the intervention, the usability of the platform were assessed by **users** using the questionnaire of the **System Usability Scale (SUS)**

Patients assessed *motor and cognitive services separately*

Health professionals assessed: processes of *patient's characterization*, *rehabilitation plan's definition (and supervision)* inside the vCare clinician platform

Rate according to your level of agreement (1 – strongly disagree; 2 – disagree; 3 – neutral evaluation; 4 – agree; 5 – strongly agree)

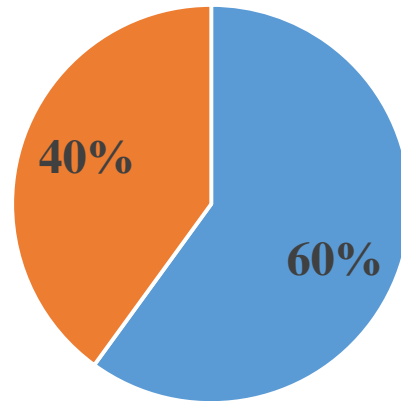| #	Statement	1	2	3	4	5
1.	I think that I would like to use this system frequently				☒	
2.	I found the system unnecessarily complex.	☒				
3.	I thought the system was easy to use.					☒
4.	I think that I would need the support of a technical person to be able to use this system.	☒				
5.	I found the 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.	☒				

Acceptable:	Not Acceptable		Marginal	Acceptable	
Adjective:	Worst Imaginable	Poor	OK	Good	Excellent	Best Imaginable
Grade:	F		D	C	B	A
SUS Score:	0 10 20 30 40 50 60 70 80 90 100					
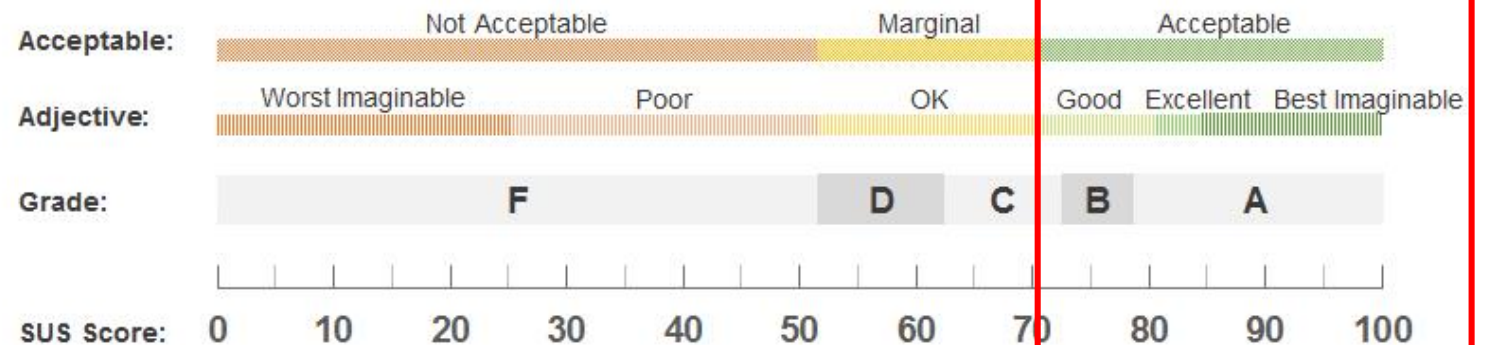
RESULTS: SUBJECTS ENROLLED

Stroke type
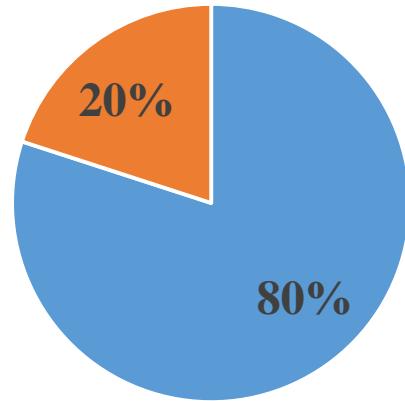
- Ischemic 80%
- Haemorrhagic 20%

Impaired side

- Right 60%
- Left 40%

20 patients with stroke;
10/10 M/F;
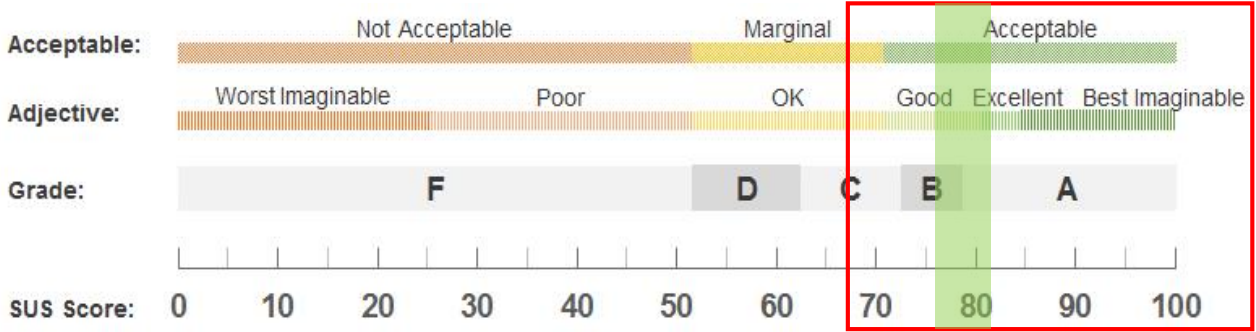age 69.20 ± 15.66;
months from stroke 5.20 ± 16.22

5 health professionals

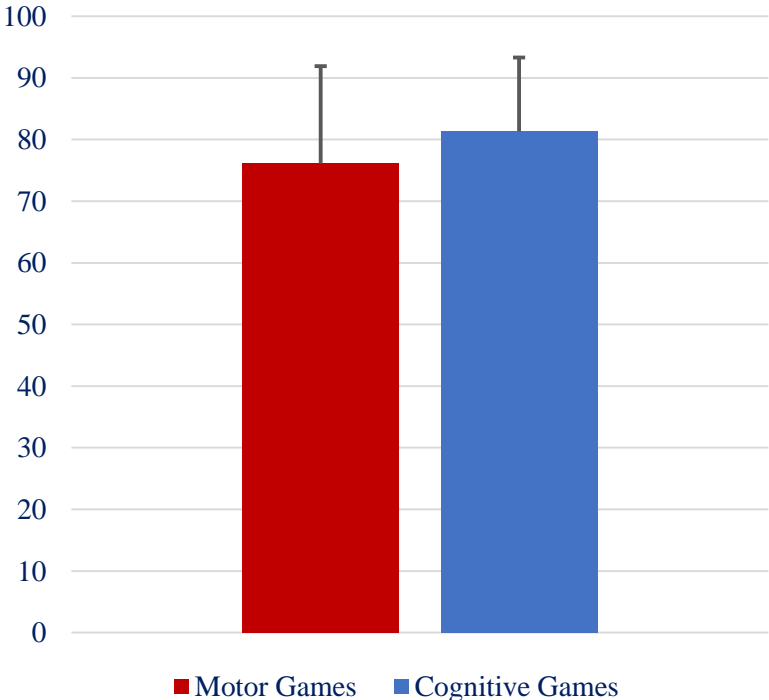*2 neurologists, 1 physiotherapist, 2 neuropsychologists*

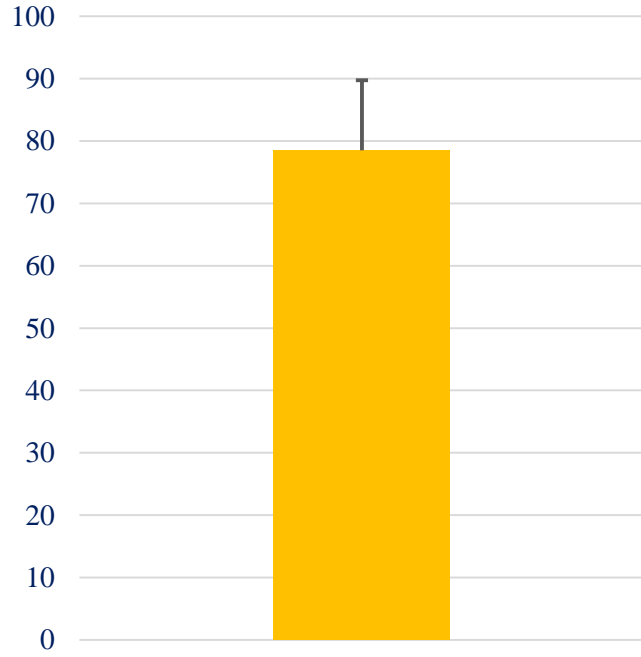were recruited among CCP's clinical staff

RESULTS: SUS

Patients' SUS

■ Motor Games   ■ Cognitive Games

Patients' SUS
76.13±15.8 and **81.32±12.0**
for **motor** and **cognitive** services

Health professionals' SUS
78.50±11.26

Health professionals' SUS

REMARKS

Results showed that for **both patients and health professionals** vCare platform's *usability is good*

These preliminary results prove the **vCare system's intuitiveness** and **ease of use** even without a significant training phase and they are fundamental to **enhance patient's adherence to the care plan**

The clinicians' SUS reflects a high usability of the system, demonstrating a **promising future use of this technology also by the therapists**

Patients' SUS

Motor Games   Cognitive Games

The collection of **qualitative data (semi-structured interviews) was added** with the aim of maintaining constant the dialogue with users and not reducing their participation to a simple parametric evaluation
→ used for *technical improvements*

One limitation of the study is the low **number of the users**, however justified by the preliminary and explorative aspect of this investigation. In fact, a further phase (**Pilot @ Home**) has already been foreseen
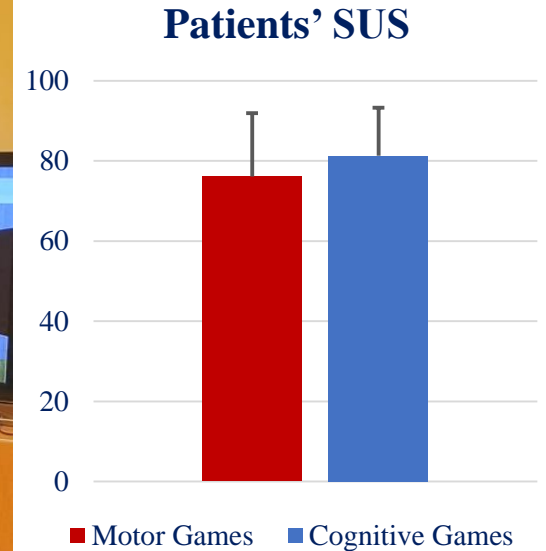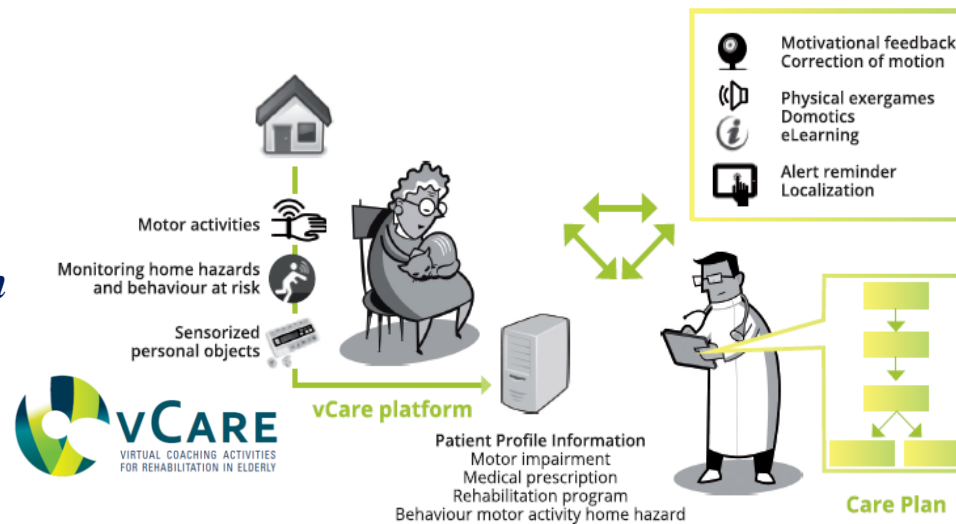
NEXT STEPS: PILOT @ HOME

Considering these usability positive results, it would now be possible to proceed with the deeply evaluation of the overall system, also within the **home context**

→ **Pilot @ Home**

AIM: prove the effective realization of the <u>vCare project's outcomes</u>

Thanks for your attention!

For further information about the vCare project:
https://vcare-project.eu/

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