Specifications after 6 month

	Description of requirements after Phase I *(see also Evaluation Matrix for important factors to mention and how your description will be evaluated)*	Description of how the different aspects are addressed in detail after 6 months (Phase I) as preparation of the on the spot evaluation in Barcelona (July 2016)
General requirements		
Overall system	Specification of overall system setup with geometric parameters, weight of the system, description of interaction modalities. One single prototype mainly with mock-up functionalities, see below.	The work to be done during Phase I is mainly addressed. The following tasks have been performed during the first five months (M5): ➔ *The robot: physical and software architectures* ● The software architecture is currently able to run the required tests. Barthel and MMSE have been intensively tested within a mock-up, desktop framework. The Get up & Go test is currently under evaluation within this same framework. The architecture is modular and customizable. With several restrictions (use of the same hardware and software components), we are currently able to add and verify a new test (questionnaire-based or motion-based) in less than one month. ● For running all tests, the software architecture includes an Automated Planning framework (PELEA[1]), able to plan and monitor the course of action from a deliberative perspective. This framework has been successfully endowed within the architecture by the UC3M team (domain and problem definition in the standard PDDL language, connection with the rest of modules…). It is also in charge of connecting the robotic platform with the CGAmed platform (test results, parameters to configure tests, etc.). Standards related to current legislation (data protection) have been considered. ● MetraLabs has built a full operative robot, equipped with two CPUs, one touch screen, one shotgun micro and a kinect v2 sensor. The CLARC prototype fulfills several of the requirements detailed below and required for Phases II or III.

[1] http://servergrps.dsic.upv.es/pelea/overview/

		● The UMA team has updated the CLARC platform to endow it with the software architecture and with those peripherals (e.g. IP camera) do not added by MetraLabs at Ilmenau (Germany). ● Tests have been performed using the CLARC platform under the supervision of clinicians from the SAS team. Individual tests with external users simulating to be patients have been performed, providing the first set of changes to be accomplished on the hardware and software prototypes. ➔ *CGAmed* ● The database for managing the patient profiles has been defined and implemented. It takes into account the whole ontology of the proposed robotised-CGA scenario. The diagram of the conceptual model of the data related to the CGAmed database and the interfaces of the CGAMed system with the clinician are available at https://cacoo.com/diagrams/IHWFHc6qj3jSQyZp More details can be found at the *System design: architecture and diagrams* document[2] (February 2016). ➔ *System interfaces* ● The interface GUI4PRI between the robot and the patient (or relative) is intimately linked with the running test. It prioritizes the verbal channel, but it also uses the touch-screen. Both interaction channels are synchronized. This interface is multilingual, and currently supports English and Spanish languages (configurable for each patient). In the case of the Barthel test, it also supports two additional features required by this test: (1) Questions related to the current patient situation or to the past situation (e.g. "Six months ago were you able to eat without help?"); (2) The possibility to ask to a patient relative about the current or past situation of the patient. ● The interface GUI4CCI between the physician and the CGAmed

[2] This document is available for consulting at https://drive.google.com/folderview?id=0B4c7C4_KDtmOS0h5LUl6SndVaXc&usp=sharing

		allows the clinician to visualize previously recorded sessions on a question-by-question basis. This interface allows the physician to change assessment scores and to compare the videos/audios associated to two executions of the same exercise performed on different sessions. ● The interface GUI4CRI between the physician and the robot allows the clinician to configure and start a session, watch on-line the current session, receive alert messages from the robot and send predefined messages to be said by the robot. ➔ *Evaluation* ● The prototype has been checked at the installations of the UMA team at Malaga. A first set of adjustments has been done after testing the framework with 4 users at the Hospital Virgen del Rocio at Seville (June 20, 2016).
Weight	Describe all specifications concerning the weight of the solution. The specified system must be portable by a normal human, the first prototype can be bigger/ heavier, but needs to give an impression of the final one at the end of stage III.	The CLARC prototype is an autonomous mobile robot. Currently, it can be easily moved by a normal person (the weight is close to 35 kgr but its wheels ease motion). Once the navigation modules are connected to the software architecture (Phase II), it will be able to use its autonomous capabilities for navigating within its operational environment (no lifting or manipulation will be necessary).
Mobility	Mobility is closely connected with the afore described weight criteria of the system and addresses the platform's ability in terms of person following, face tracking, and similar advanced features.	The CLARC prototype is built over the SCITOS platform from MetraLabs. It is endowed with MIRA (http://www.mira-project.org/joomla-mira/) and CogniDrive (http://www.metralabs.com/en/research), a software system that enables vehicles to navigate to arbitrary goal points in an environment. The localization module uses existing environmental structures, so additional sensors or markers are not required. MetraLabs has tested the person following skill in other projects using this same framework. Face tracking to enhance the human-robot interaction is also possible thanks to the use of the kinect v2 sensor. Internalizing the perceptors coming from all modules is one of the key-points of our software architecture. Thus, navigation and face detection modules (and the rest of modules within the architecture) are

		intimately linked through the existence of an inner model of the outer world. All perceptual skills have been individually tested and will be fully integrated in the platform after Phase I. Currently the system is able to perform face tracking, as required in one of the MMSE test questions. It also detects whether the patient leaves the test scenario. In these cases, the system interrupts the test, calling the patient to come back or the physician for help. For the Get up & go test, the system is also able to check if the patient is seated, and if he/she is walking in the adequate direction.
Power supply	The specified system must be able to be operated both in battery mode for at least 8 hours, as well as in plugged-in mode, the first prototype can be powered by cable. For the final systems, inability to operate in battery mode may be a critical problem because the device will be used in patient's rooms or small places where plugging may be very complicated	The CLARC prototype is able to work in battery mode for more than 8 hours. It can also work in plugged-in mode and recharge its batteries between sessions.
Language interface	Technical concept and prototype of a robust natural language interface which allows for multi-language support. Prototypes in stage I and II can use any European language (preferably English, Spanish, or Catalan), but the capability for multi-language support has to be demonstrated.	The CLARC prototype is currently able to run the Barthel, MMSE and Get up & go tests in English and Spanish languages. The selection of one language implies to change the Automatic Speech Recognition (ASR) module (we are using the Microsoft Speech Platform SDK) and the Text-to-Speech (TTS) module (we can currently use Festival or the Microsoft Speech Synthesis API, that provides a more natural voice). When the language changes, we must also change the specific Grammar that the speech module uploads for the ASR of each question on the Barthel and MMSE tests. Briefly, each language option implies to use a specific txt file containing sentences (Speech module), a specific set of graphical panels (Panel (touch-screen) module), and a specific set of grammars for the ASR module. It also implies to change the language option on the ASR and TTS modules. Language change is automatically done for each patient following the information about language preferences stored in the database. The Deliberative module receives this information from the CGAmed server before launching the test, and publishes it in the inner model of CLARC. These data allow all agents to configure themselves to use the desired language.

GUI design Touch-screen interaction	Mock-up of touch-screen based interaction for all sorts of dialogues, for tests, configuration, and evaluation/data management. Other, yet easy to use and robust interaction modalities besides spoken language are also possible for the tests. They need to be able to be used if the natural language interface is not suitable, e.g. when a patient is not or only hardly able to speak. Also here, the multi-language issues apply in the same form as described above.	The robot is equipped with a touch-screen on its torso that allows to augment the interaction with the patient or relative. Each time the robot speaks, a message is also displayed on the touch screen. A collection of graphical panels have been designed to address this interaction following the general guidelines provided by experts on accessibility from the UC3M team (*User Interface Accessibility: Developers' Guide*[3], February 2016). These panels depend on the specific question under evaluation on the test. Multi-language is supported as mentioned on the previous item. As a general rule the robot tries twice to recognize the answer of the patient using voice. If it is not able to recognize it, the touch screen is activated allowing the patient to introduce the answer using virtual buttons or a virtual keyboard. This behavior can be easily changed by modifying the PDDL encoding of the test. In Phase II the physician will be provided with a GUI to specify it. In questions where the patient is asked to draw or to write on the screen, a tablet is provided for the patient's convenience. The configuration, evaluation and data management, i.e. the interfaces with the technicians or the physician, can also be run on this touch-screen, but the more natural interface will be the monitor of the PC on the physician's room, a smartphone or a tablet. These interfaces have been designed and changed according to the needs and suggestions of the physicians of the Hospital Universitario Virgen del Rocío (SAS). Interfaces are programmed as web services that could be easily updated for supporting multi-language requirement (they currently use English language).
Motion tracking	Concept and exact specification of motion tracking system with planned analyses in context of the Get up and Go test and the Tinetti Balance and Gait tests	Within the software architecture, there is a specific network of components in charge of capturing the temporal evolution of the patient's joints, dividing up the whole exercise within actions units, extracting gait and anatomical descriptors for each action, defining the correctness on the execution of

[3] This document is available for consulting at https://drive.google.com/folderview?id=0B4c7C4_KDtmOS0h5LUl6SndVaXc&usp=sharing

each action, and providing a global score of the motion for the Get up & Go test. The capture module is based on the Kinect v2 sensor from Microsoft. This module has two main components: one of them runs on a barebone i7 endowed with Windows OS. It publishes all data related to the people in front of the sensor. This component (WinKinectComp) has been developed in C++ and uses the Kinect SDK from Microsoft to access the sensor, and IceStorm to communicate with a second embedded PC. This second PC runs on Linux SO the second component of the capture module, and the rest of the software architecture. The second component of the capture module is subscribed to the WinKinectComp and collects all data captured from the sensor. Within this data we include the joints of the patient when s/he is performing the Get up & Go test. These joints, the time-stamps associated to each frame, and the depth map are the raw data for categorising the behaviour of the patient on the motion-based tests. Next we provide further details about the planned analysis on the Get up & Go test, as it is the only motion-based test addressed on Phase I. A similar scheme will be used for dealing with the Tinetti Balance and Gait tests.

In the Get up & Go test, the patient is instructed by the robot to get up from a chair, walk for three meters, turn, walk back to the chair and sit back down. The global exercise can then be divided up into seven phases: seated - getting up - walking - turning - walking - sitting down - seated. From the experts from the Sant Antonio Abat Hospital, we know that there are four factors to take into account for evaluating the test: sitting balance, transfers from sitting to standing, pace and stability of walking, and ability to turn without staggering. Previous proposals for automatizing this evaluation usually relied on the extraction of a large collection of gait and anatomical features which are after classified within an a priori set of established categories. In our proposal, the whole exercise is divided up into a set of Actions, which corresponds to the aforementioned phases. These action units are defined by (i) the parameters that allow their detection, (ii) the pose of the robot with respect to the patient to correctly perceive the action, (iii) the local and global features that characterize the correctness on the execution, and (iv) the metric that allows to score its execution. For instance, the Seated action is detected by monitoring the difference between the hip joint and the knees joints. The robot must locate itself in front of the patient, just behind a mark on the floor at three meters of the chair (this pose will remain for all the actions on the Get up & Go test). The correctness while sitting is related to the capability for being stable and steady in the chair. The feature chosen for determining that the patient was not diverted to any side or forward is the angle between the horizontal plane and a virtual straight line linking the hip and the head joints (i.e. a spine link). The metric returns a 4 points score when this angle remains under a small value U_{min} during all the seated phase, and 0 points when it is over an established threshold U_{max}. Scores from 3 to 1 discretize the value of the measured angle if this is within the U_{min} and U_{max} values. Other actions such as the Walking one requires setting more complex features and metric. For instance, for the Walking action, the number of steps and their duration are obtained by analyzing the difference, in *z*-coordinates, of the two heel joints and the available time-stamps. Along with these gait parameters, we obtain a collection of anatomical parameters such as the angle between the legs (using the hip and knees joints), the right and left knee angles (using the shank and thigh joints in each leg), or the distance between the elbows. The metric takes into account all these features to provide a score, always ranged from 0 to 4.

Once the seven phases (actions) have been scored, a global score is obtained by means of the weighted sum of the scores associated to all actions. With this score, the exercise is categorised into five groups

1. No fall risk - Well-coordinated movements, without walking aid
2. Low fall risk - Controlled but adjusted movements
3. Some fall risk - Uncoordinated movements
4. High fall risk - Supervision necessary
5. Very high fall risk - Physical support of stand necessary

The advantages of the approach are twofold. On one hand, each action can be individually modelled and evaluated. If one action is not significant for the scoring process (e.g. the Sitting down action on the Get up & Go test), it will

		be weighted with a zero, or nearly-zero value. On the other hand, this scheme eases the definition of new motion-based tests. As it will be introduced on Appendixes 4 and 5, the aim is the building of ActionLibs, a library of actions. Using a interface for test definition, the physician could define a new test as a collection of action units, such as Seated - Getting up - Sitting down - Seated. This interface will be developed at Phase II. Of course, if the internal definition of an action is not valid for the desired test, a new action should be defined and stored with a different name. During Phase III we will implement an usable tool to allow the physicians defining new actions units.
Evaluation and data management		
Patient-specific view	Mock-up of the dashboard for one patient's data including his development in test results, and access to raw data, such as answers given in a specific test or videos and other visualization of the motion analysis.	The system implements a specific interface that allows the physician to access to any finished session. The physician is also able to online monitor a live session, using a different interface (see *Overall system* item above). This interface allows the clinician to review and edit scores, to see the video/audio records of any specific question (these videos are annotated with subtitles in the currently selected language), and to compare the videos associated to two previously performed tests. The interface achieves these capabilities thanks to its connection with a server where all data related with the sessions are correctly stored. A specific database structure has been designed for this purpose by experts from the UC3M and UMA teams. Database and web-based interfaces constitute the core of the CGAmed framework. This framework is connected to the robot through the deliberative module, the one that knows when the session has finished and responsible of updating the information on the database. HL7 CDA files respecting medical standards and protocols are used for transferring the data. The interface with the Clinical Data System (CDS) of the Hospital Universitario Virgen del Rocio (Seville, SAS) has been defined. This integration will be achieved during Phases II and III. Accessibility and legal issues have been taken into account. Current access to

		the interface is protected by a combination of login and password and the data is stored in a secure manner. Communications between different modules are not yet encrypted, but it can be easily done in a future.
Analysis of results	Concept to interpret and codify patients/ relatives answers of selected tests and to calculate test scores based on codified information. The Health Professional has to be able to modify or correct tests scores	The Barthel and MMSE tests were provided by the Hospital Sant Antoni Abat (Vilanova) and they have a correct solution that allows to codify the score for each question. Both tests have been checked by the experts from the SAS team. The module in charge of receiving the patient answer (usually the Speech, but also the Tablet/Panel modules) sends it to the Deliberative module, which in turn calculates the score for the answer and stores both answer and score into the database. The behaviour of the patient when performing the Get up & go test is more difficult to measure. As described within the *Motion tracking* item, the whole exercise has been divided up into phases. Then, following the guidelines of medical experts from the SAS, we extract a set of measures from the body joints tracked using the kinect v2 sensor from Microsoft to delineate each action unit, and employ an action-dependant metric for scoring each of these actions. Individual scores are weighted using a set of values set by the SAS experts to provide the global score. The scheme needs further testing to achieve the correct matching between automatic and human-based scoring. Machine learning algorithms will be used in the future when examples of tests scored by clinicians will be available. Finally, it must be noted that currently the interface GUI4CCI allows the physician to visualize any specific question of a session and to change the assigned score for the Barthel, MMSE and Get up & go tests. The interface shows both the automatic score and the corrected one.
Integration into clinical data management	Outline of the possibility to interface with clinical data systems in the overall concept.	The robot-CGAmed interface has been designed and developed within Phase I, allowing the information captured from the test to be locally stored on a server. Furthermore, although it was not required that the CGAmed will be connected to a Clinical Data System (CDS), the interface of the CLARC system

		with the CDS has been reported within several documents generated within the project. Specifically, the *Patient Management document*[4] (March 2016) describes how this information will be managed within the CLARC System. The system design CLARC in Phase I is based on a generic architecture for the exchange of clinical documents with hospital systems based on profile XDS defined by IHE. Patient management is performed using the profile Patient Identifier Cross Referencing (PIX) defined by IHE. This architecture allows the exchange of test results evaluation of patients through HL7 CDA format documents. Specific CDA documents and their implementation guidelines were defined for each kind of evaluation tests (Barthel, Minimental and Get up and Go). These technological standards are included in the European eHealth Interoperability Framework defined by the European Commission with the aim of establishing a European eHealth Market. The *Barthel CDA*, *MMSE CDA*, and *Get up & Go Test CDA* documents[5] (March 2016) describe the CDCA structure of these Clinical Document Architectures and their implementation guidelines. The HL7 CDA is a document markup standard that specifies the structure and semantics of clinical documents for the purpose of exchange between healthcare providers and patients. It will encode the information related to these tests from the CGAmed to other external Information Systems. All these documents have been written by engineers expert in semantic interoperability and health-care information system from the SAS. All the transferred information will be then encoded using HL7 CDA files. As aforementioned, the structure of these files has been defined and will be the base of the exchanging between the robot and the CGAmed server when this issue will be refined on Phase II.

[4] This document is available for consulting at https://drive.google.com/folderview?id=0B4c7C4_KDtmOS0h5LUl6SndVaXc&usp=sharing
[5] These documents are available for consulting at https://drive.google.com/folderview?id=0B4c7C4_KDtmOS0h5LUl6SndVaXc&usp=sharing

Data protection	Description of data protection concept and fulfilment of standards.	Every system must be developed according to a particular regulation framework. Within the *Legislation: data protection and privacy document*[6] (May 2016), the experts from the SAS have resumed the specific legislation enforcing the CLARC system. Thus, this document describes the general European regulation (Directive 95/46/EC, Regulation EC Nº 45/2001 and Directive 2002/85/EC), and how it is applied to the CLARC system. Furthermore, it briefly describes the legislation frameworks both of Spain (Organic Law 15/1999, Laws 41/2002, 14/2007 and Royal Decree 1720/2007) and the Regional Community of Catalonia (Laws 21/2000, 16/2010 and 32/2010). As aforementioned, currently access to the interface is granted by a combination of login and password and the data is stored in a secure manner. Communications between different modules are not yet encrypted, but it can be easily done in a future.
Configuration		
Patient- specific configuration	Description of mock-up of system dialogues for selection of tests and definition of test sequences in form of flow charts, handling of patient data.	As aforementioned, we have defined a specific interface between clinician and robot. This interface, controlled through a specific GUI4CRI (GUI for clinician-robot interaction), allows the clinician to start the test, and also to see on-line the execution of the test. Specifically, the implemented GUI4CRI allows the clinician consulting the patient data from the CGAmed in his/her tablet, pc or mobile, allowing him/her to set the planned time/date or the room where these tests will be performed. Thus, the GUI4CRI allows the clinician to define which tests and in which order these tests have to be performed for each patient. The design and usability of the GUI has been supervised and tested by the experts from the SAS team.

[6] This document is available for consulting at https://drive.google.com/folderview?id=0B4c7C4_KDtmOS0h5LUl6SndVaXc&usp=sharing

Integration of new/additional tests	Description of mock-up of possibilities to develop a new questionnaire-type tests.	Using as basis the types of questions of the Barthel and Minimental tests, an ontology is being created to describe all the possible types of questions and their relationships. A first version of this ontology is available at https://cacoo.com/diagrams/IHWFHc6qj3jSQyZp#F3ED3 Items considered include both question-specific characteristics and test characteristics. Examples of the first ones are the number of options, the possible answers, answers for which the patient should be provided a hint, whether the answer needs to be validated before proceeding to the next question, the number of times the system will try to get an answer, the interaction mode (speech or visual) the user will be allowed to use in each iteration, if while posing the question any movement or body part of the patient needs to be tracked, if the question can be repeated or the answer can be changed, the allotted time for answering, etc. Examples of test characteristics are whether a question is alternative to other(s) one(s), whether skipping a question means skipping another one(s), what to do if the patient fails a number of questions, etc. Once the ontology is able to model any type of question seen in the considered tests for Phase II, a test definition interface will be added to GUI4CCI that will automatically produce the PDDL problems the deliberative module needs to drive the session.
Calibration	Mention, if there is a need to calibrate the motion detection component and if yes, describe the necessary steps.	As aforementioned, the current motion detection module is based on the Kinect v2 sensor from Microsoft and does not need specific calibration. But there is a specific pose for capturing the scene in the Get up & Go test: the robot will be located in front of the patient and chair where s/he will be seated, and just behind the mark where s/he will turn around. This pose is specified on the Action units composing the test (see *Motion tracking* item).
On-site testing		

BARTHEL and MMSE Test BARTHEL: 2 tests à 15 min MMSE: 2 tests à 15 min	The proposed solution will be evaluated during the BARTHEL/ MMSE test based on its ability to interact with humans by speaking and natural language processing (even in case of slightly slurred speech) to limited extend, interpreting a set of standard pre-defined answers with multi-language support. An alternative mode of interaction like a touch screen tool may be considered to solve speech recognition issues. Describe possible explanations or Human-Robot Interactions here.	**From a clinician point of view**, a CGA session using CLARC begins by login into the CGAmed web interface, and starts when the patient or relative is ready to answer the test. Then, the clinician presses the start test button on the computer and accompanies the patient or relative to the room where the robot is (in a near future we plan the robot to autonomously accompany the patient to the room). Once the robot detects the patient at the room, the test begins. The robot starts greeting the patient and explaining the purpose and structure of the test. Questions are performed using both speech and text in the screen. Patients can answer by voice or by selecting the right answer on the touchscreen. The system automatically marks the patient performance and stores the scores into the database. The monitoring abilities of the software architecture allow CLARC to ask for help to the medical professional if needed, and to detect and deal with unpredictable situations such as the patient leaving the room, asking for help or not being able to give an appropriate answer for a question. Meanwhile, the clinician can monitor the session from his/her office and change the automatically set scores once the test has finished. Both scores are kept for tracking purposes. The whole patient-robot interaction is recorded (video and audio) by a webcam mounted on the robot, and annotated by the Deliberative module with time-stamps that bound each question or exercise. This allows the clinician to off-line review the tests, directly accessing any specific part of the recorded audiovisual footage. The clinician can also execute side-by-side video comparisons of different executions of the patient of a certain test, to check his/her evolution in mid and long term CGA monitoring processes. **From the system point of view**, once the physician presses the start button, the tests to be performed and their configuration parameters (patient, room, etc.) are sent to the Deliberative component that creates a plan to fulfill them. It then commands the low-level components to perform the desired activities (introduce the robot, introduce the test, ask for a question, wait for

		an answer, monitor the patient movements...) by doing appropriate changes in an inner representation of the state (the Deep State Representation, DSR). The task-dependant components perform their tasks and update the DSR with the results. In turn, the Deliberative component sends updates about the current state to the CGAmed control module. Figure 1 shows a simplified sequence diagram of a use case where a clinician uses CLARC to perform a patient evaluation based on Barthel and MMSE tests. It is a simplification since the low-level components of the architecture are not included, so many steps are skipped. Other diagrams related to the system design are described within the *System design: architecture and diagrams* document[7] (February 2016).
Get up and Go Test 3 tests à 20 min	The Get up and Go Test will be evaluated based on the proposed solution's ability to evaluate and record the patients' performance using standard components for motion analysis to the extent possible, to maintain sufficient visibility for the video and audio recording of patients during the tests and the platform's potential in terms of person following, face tracking, and other advanced features that will be implemented in the subsequent phases. Describe possible explanations or Human-Robot Interactions here.	**From a clinician point of view**, a CGA session using CLARC begins by login into the CGAmed web interface, and starts when the patient or relative is ready to answer the test. Then, the clinician presses the start test button on the computer and accompanies him/her to the room where the robot is (in a near future we plan the robot to autonomously accompany the patient to the room). Once the robot detects the patient at the room, the test begins. The robot starts greeting the patient and explaining the purpose and structure of the test. Then, the robot asks the patient to perform the required activities, and monitors its performance using the Kinect sensor to capture joint 3D positions, and specific human motion capture modules to process these positions, obtain local and global motion features from them, and use these features to get a measure of the patient's performance. The system automatically marks this performance and stores the scores into the database. The monitoring abilities of the software architecture allow CLARC to ask for help to the medical expert if needed, and to recover from unpredictable situations, such as the patient leaving the room, asking for help or going out of the field-of-view of the Kinect sensor -that will correctly cover the desired area of the exercise-.

[7] This document is available for consulting at https://drive.google.com/folderview?id=0B4c7C4_KDtmOS0h5LUl6SndVaXc&usp=sharing

		Meanwhile, the clinician can monitor the session from his/her office and change the automatically set scores once the test has finished. Both scores are kept for tracking purposes. The whole patient-robot interaction is recorded (video and audio) by a webcam mounted on the robot, and annotated by the Deliberative module with time-stamps that bound each question or exercise. This allows the clinician to off-line review the tests, directly accessing any specific part of the recorded audiovisual footage. The clinician can also execute side-by-side video comparisons of different executions of the patient of a certain test, to check his/her evolution in mid and long term CGA monitoring processes. **From the system point of view**, once the physician presses the start button, the tests to be performed and their configuration parameters (patient, room, etc.) are sent to the Deliberative component that creates a plan to fulfill them. It then commands the low-level components to perform the desired activities (introduce the robot, introduce the test, monitor the patient movements...) by doing appropriate changes in an inner representation of the state (the Deep State Representation, DSR). The task-dependant components perform their tasks and update the Inner Model with the results. In turn, the Deliberative component sends updates about the current state to the CGAmed control module.
Ethics	Please note that there are also ethical requirements to be described in a separate deliverable report.	
Economic Viability	Please note that you also need to include considerations concerning economic viability in a separate deliverable report.	

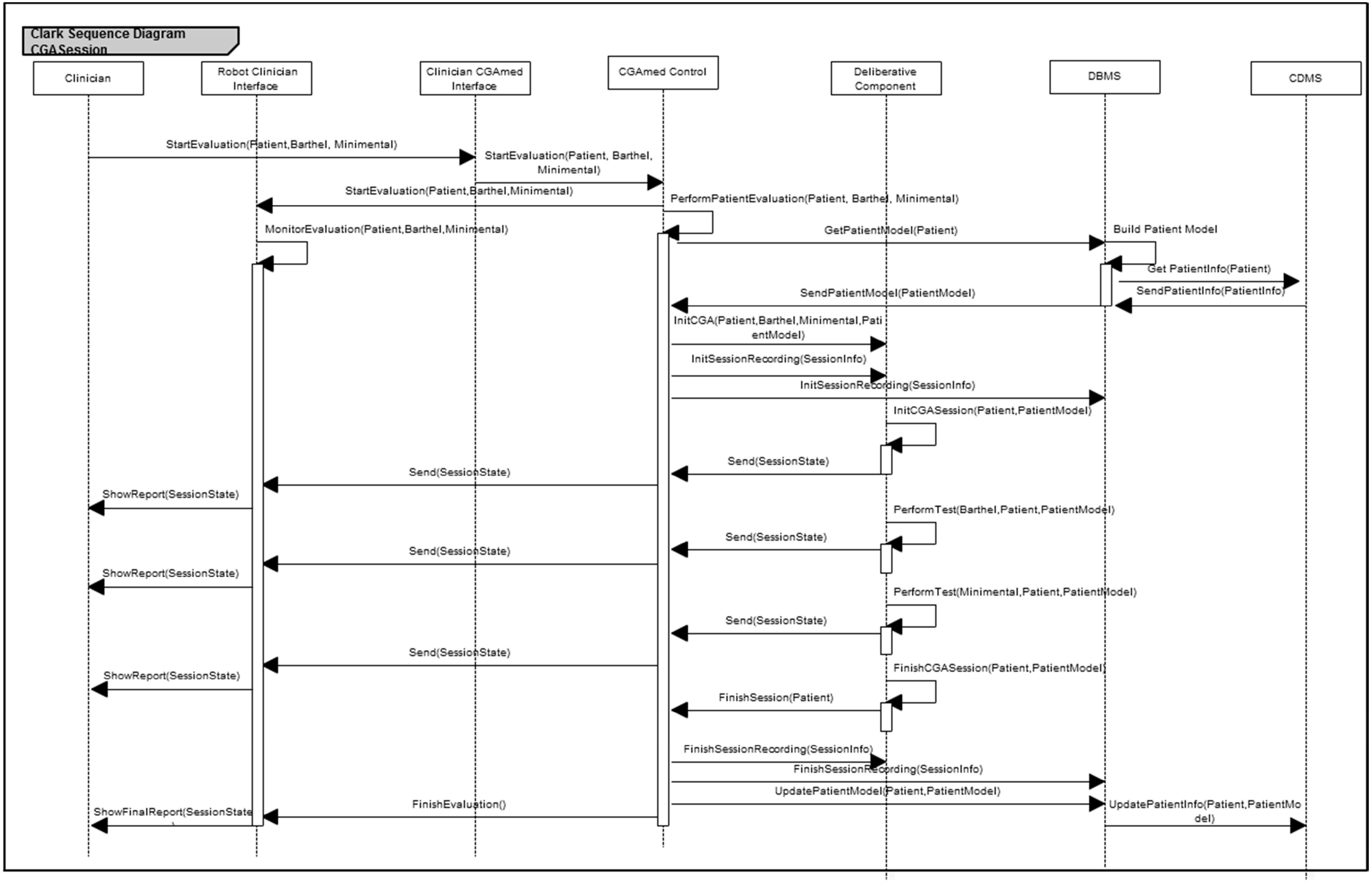

Figure 1 - Sequence diagram of the Barthel/MMSE tests