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D3.7 ValueCare Virtual Coach

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Statement of originality

This deliverable contains original unpublished work except where clearly indicated otherwise. Acknowledgement of previously published material and of the work of others has been made through appropriate citation, quotation or both.

History

Date	Version number	Change
15.04.2022	0.1	First Draft
05.05.2022	0.2	Second Draft
10.05.2022	1.0	Final version for submission

EXECUTIVE SUMMARY

The value-based methodology for integrated care supported by ICT (ValueCare) approach aims to deliver efficient outcome-based integrated health and social care to older people with chronic health conditions, frailty or (mild) cognitive impairment. The project's vision of integrated value-based care will be supported by a robust, secure, and scalable digital solution that will be tested and evaluated in 7 large-scale pilots in Europe. D7.3 provides the description of the main characteristics and implementation details of the virtual coach in the ValueCare project.

In particular, the deliverable describes the virtual coach in the context of the ValueCare project by first enlisting the set of interventions that will be developed in each of the seven pilots. These interventions include a total of 25 different targets, including the main aspects relevant to be monitored in order to improve patients' quality of life. Examples of these targets are the monitoring of physical activity, nutrition, social behaviour, compliance to medication and other categories of targets specific to the different pilot domains. The selection of the different intervention domains was conducted in the co-design process of the project in conjunction with researchers, clinicians and patients.

In addition to enlisting the different intervention domains, the deliverable describes the way in which the virtual coach technology operates, describing the principles of the HORUS.AI underlying platform and the way it collects, processes, and delivers information in a multi-layer approach. It is reported the capabilities as well of HORUS.AI to utilise an hybrid artificial intelligence approach by enabling its utilisation from the definition of evidence-based rules that could be refined through its usage by means of a machine learning strategy in which data collected from users interactions can be used to train a predictive model to enhance usability and engagement with the virtual coach.

Finally, the deliverable describes how the virtual coach is implemented in its different steps from the methodology used for defining each of the interventions at a high level of abstraction, up to the code development of the software solution for applying the different rules and specific interactive dialogs. The overall process consisted in defining first every dialogue of the virtual coach through a co-design process involving the pilot researchers, the end users, and the technical partners, following the needs of the single intervention and considering the communication with the mobile app and the dashboard. Successively, the dialogs were coded following a rule-based event driven mechanism in which at a high abstraction level it was possible to identify 3 different types of rules accordingly to the needs of triggering each of them as: i) follow-up rules, ii) intervention process execution and iii) time-based triggers.

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LIST OF ABBREVIATIONS

D	Deliverable
M	Month
WP	Work Package

1 Introduction to the ValueCare project

Healthy ageing along with independent living have become fundamental challenges for Europe as all EU member states (and virtually every country in the world) are experiencing growth in the number and proportion of older persons in their population. Several international organisations (Council of Europe, 2014; International Longevity Centre Brazil, 2014; WHO, 2002) have remarked the importance of the independence, participation and autonomy of older people to remain healthy and, consequently, to ensure their quality of life.

The WHO defines health as "...a state of complete physical, mental and social well-being and not merely the absence of disease". The idea of health as the absence of disease has long been considered insufficiently broad and not covering all aspects of health. Unfortunately, it is at present likely unobtainable for many, particularly with the rise in chronic disease and an aging population, with many people with multi-morbidity and frailty who require a coordinated care plan involving numerous health providers, social and other care services. The concept of health promoted by WHO is also hard to measure, is not tailored to the individual and, according to some authors, of limited use for assessing whether a health system is providing value to citizens. Greater acknowledgment of areas of wellbeing providing wider value to older people and those with chronic illnesses, such as societal participation and coping capacity, may allow for a more practical and thorough assessment of value in healthcare, particularly in high-income countries. Shilton et al. (2011) propose a definition of health focussed on giving people the income, education, and power to control their lives, highlighting the role of supportive systems, environments, and policies in enabling health.

In this context, ValueCare's vision of healthy ageing is that any older individual in society can live the best life possible according to what they value, facilitated by access to high quality, person-centred, evidence-based and affordable health and social care services, supported by strong and integrated health and social services. ValueCare partners believe that taking an "enhanced value-based approach" (including not only health but also lifestyle and social care in the concept of value-based care) supported by secure and robust digital technologies will help to achieve this. In addition, the project will also consider the job satisfaction and the wellbeing of the health and social service providers. Not only satisfying the Triple Aim; i.e. (i) improving the experience of care (including quality and satisfaction); (ii) improving the health of populations; and (iii) containing and potentially reducing, by means of a better use of the available resources, the per capita cost of care, which mainly focuses on the person's side, but taking also into account the care providers and integrating their satisfaction in the job and wellbeing in order to truly optimize ValueCare's performance.

1.1 Objectives of the project

ValueCare addresses Horizon 2020 Call: SC1-DTH-2018-2020 – Digital transformation in Health and Care. The project aims to deliver personalised integrated (health and social) care services, better outcomes for citizens, improved care experience, improved staff satisfaction and greater efficiency in the use of resources and coordination of care in a setting that ensures trust of users and policy makers with regard to data access, protection and sharing and which can be replicated and deployed at large scale in other EU countries. In alignment with the above, ValueCare will focus on the following general objectives:

- Objective 1. To deliver efficient outcome-based integrated (health and social) care to older people suffering from cognitive impairment, frailty, and multiple chronic health conditions in order to improve their quality of life (and of their families)
- Objective 2. To contribute to the sustainability of health and social care systems in Europe
- Objective 3. To provide a secure, scalable, and robust digital solution for integrated care

2 Introduction to the deliverable

2.1 Deliverable objectives and scope

The objective of this deliverable (D3.7) is to present the ValueCare virtual coach functionality, the underlying technologies that enable its implementation, the different intervention instances that were defined for each pilot and the steps involved from the definition of the interventions up to the final corresponding software implementation.

2.2 Relation to other WPs and deliverables

This deliverable is strongly linked with the following WPs and deliverables, please see the Table 1 below:

Table 1: Relation to other WPs and deliverables

WP	Deliverable	Relationship
WP2	D2.7	This deliverable provided the requirements from the different pilots after mid-term codesign including those related to the implementation of the Virtual Coach.
WP3	D3.1	Deliverable D3.1 described the various methodologies and algorithms required for building the Virtual Coach.
WP3	D3.2	In D3.2, the definition of ValueCare technical requirements were described and are at the basis of the implementation defined in this deliverable.
WP3	D3.3	The description of D3.3 details the ValueCare conceptual design that describes at its basis the Virtual Coach concepts and overall, high level interaction with other technical components.
WP3	D3.6	The ValueCare application containing the Virtual Coach is described in D3.6.
WP4	D4.2	In deliverable D4.2, the implementation of the various pilots is detailed including the main characteristics impacting on the Virtual Coach details for each pilot site.
WP8	D8.8	D8.8 is the incremental version of the ValueCare Data Management Plan and consequently details the data to be used by each pilot concerning the Virtual Coach.

3 Content of the deliverable

3.1 Virtual Coach in ValueCare Context

A key component of the technical solution of ValueCare project is the virtual coach to support patients in reaching the health and care goals established as part of their care plan. In ValueCare, a patient recruited for the pilots in coordination with his/her formal caregiver (e.g. nurse, doctor, social care professional, etc.) is appointed to assess his/her overall health condition and to schedule a personalised set of interventions to support the prescription of an individual care plan. The kind of interventions that are prescribed include different aspects in which each of the various ValueCare pilots intends to provide a significant contribution to care. Among these pilots there have been identified different types of behavioural and treatment aspects that can support the acquisition and maintenance of virtuous lifestyle conducts in patients. The different intervention targets selected for each pilot are described in table 2 below:

Table 2: Selected intervention targets per pilot

Pilot	Disease/Condition	Interventions
Athens	Diabetes	• Physical Activity • Nutrition • Blood pressure + Glucose and Medication adherence
Coimbra	Social Isolation	• Social Interaction • Physical Wellbeing • Emotional Wellbeing
Cork/Kerry	Frailty	• Physical Activity • Medication Uptake • Nutrition • Social Prescription
Rijeka	Hypertension	• Medication • Physical Activity • Nutrition
Rotterdam	Stroke	• Physical Activity • Medication • Lifestyle • Awareness
Treviso	Mild Cognitive Impairment	• Cognitive Stimulation • Physical Activity • Awareness • Socialisation
Valencia	Frailty	• Nutrition • Physical Activity • Medical Adherence • Social Prescription

The general aim of the ValueCare virtual coach, is to provide patients suffering from the different conditions specified in table 2 and their treating healthcare professionals with advanced mechanisms for better managing their disease through the definition of a semi-automated Shared Care Plan (SCP) aimed at increasing value-based care while empowering patients on self-management.

For each of the 25 interventions defined in table2, a detailed set of parameters were set as potential goals to associate each pilot participant with, according to their specific health condition. This means that a range of acceptable values for each goal were set and fine-tuned for each participant. For example, if a recruited participant in Valencia was identified with the need to follow a diet rich in proteins or to focus on a certain category of the Harvard Plate[1], she would be assigned as a goal the specific food to consume and monitor during the next days (e.g. legumes). In that case, the virtual coach would support the achievement of the desired behaviour in order to reach the goal (e.g. minimum two portions of legumes every three days). After acquiring the nutrition data the virtual coach would be able to detect the possible deviations (or coherence) with the target goals and react accordingly with motivational suggestions, contextualised feedback or behaviour reinforcements. At the end of the goal period the virtual coach can assess the level of fulfilment of the goal and could suggest a repetition of the intervention or the definition of a new one.

A high-level representation of how to insert the virtual coach in ValueCare system is shown below in Figure 1. This representation is composed by four main components:

The Shared Care Plan (SCP) implemented as part of the web dashboard by VIDAVO, through which healthcare professionals can define and manage the intervention treatment agreed with the patient and monitor all relevant inputs related to the plan, originating from different sources (patient interactions, personal devices, etc). The SCP acts as a hub for sending inputs to the virtual coach and distributes the virtual coach outputs to the intended recipients (healthcare professionals' dashboard, patient app.)

The virtual coach applies intervention strategies and manages interaction dialogs and messages to provide proactive support to patients and healthcare professionals applying AI rule-based methods. These combine and exploit data, treatment models and domain knowledge to execute the most appropriate action given the specific context and the patient conditions. Further incorporation of machine learning methods is described in section 3.4 of this document.

The ValueCare patient app provides the user a tool for interacting with the overall platform. The app is based on an adaptive interface approach that allows the dynamic creation and personalisation of

[1] https://www.hsph.harvard.edu/nutritionsource/healthy-eating-plate/

functionalities, content, and interaction modalities with healthcare professionals in the SCP and with the virtual coach through an embedded conversational bot.

The virtual coach solution in ValueCare will define specific coaching strategies for the most important self-care behaviours for disease management after co-design activities with all the pilot sites.

For implementing the foreseen concept, on the patient side, the virtual coach is characterised by a highly usable conversational virtual coaching companion front-end, based on a bot, that will be able to establish personalised goal-oriented conversational interactions to patients. The virtual coach back-end will then take care of collecting all relevant inputs related to the treatment plan defined and monitored through the Shared Care Plan such as information from lifestyle trackers, mobile devices and direct system interactions with patients and healthcare professionals to process them through a reasoning engine and produce relevant proactive outputs for supporting better management of the patient condition.

The sustainability of the virtual coach concept relies on the fact that, through patient empowerment, the workload of healthcare professionals can be dynamically re-adjusted adopting a stepped-care intervention approach according to patients' response to the system as proposed in previous research (Makcic et al, add the year). The stepped-care intervention will be designed based on the actual response of patients to the coaching strategies that the SCP adopts at any point in time.

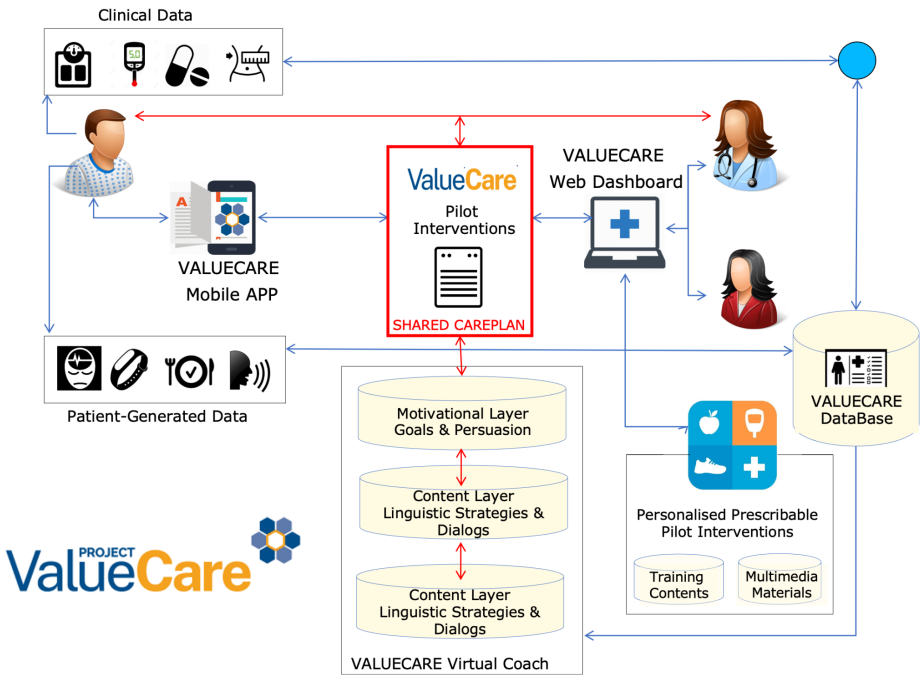


Figure 1 - Virtual Coach as part of the ValueCare system

As already mentioned above, the conversational bot-based coaching front-end that proactively interacts with patients to provide motivational messages will be contextualised, on the one hand, to the current state of the patients in relation to the implementation of the SCP (e.g. the next actions foreseen in the SCP), the values measured for the different lifestyle and patients parameters, the current level of achievement of the agreed goals, etc. and, on the other hand, personalised since the beginning through the professionals web interface in terms of interaction according to patient's preferences such as identification of best time of the day to prompt the patient to reach the highest level of response, recognition of best interaction modalities for increasing patient engagement (e.g. which media is preferred for learning: text vs video, preferred interaction: typing vs clicking buttons, etc.). The intervention strategies, dialogs and messages conveyed by the bot are modelled in the knowledge base of the virtual coaching platform (Figure 1) and delivered to/received from the patient by means of the bot-based front-end. After collecting a high number of inputs from patients' interaction it may be further processed by the end of the project piloting period, utilising Artificial Intelligence techniques exploiting machine learning algorithms applied to specific domains of interaction and agreed goals defined in the SCP. Through this innovative technique the ValueCare solution aims to maximise future exploitation on patient engagement impacting on the overall adoption and effectiveness of the system.

3.2 Virtual Coach Technology

- 3.2.1 Virtual Coach Layers and Reasoning

The virtual coach technology utilised in the ValueCare project is based on the HORUS.AI system briefly outlined in Deliverable 3.1 (section 2.1) and detailed here. As mentioned in that deliverable the virtual coach relies on the use of four main layers for providing timely feedback to users related to the specific personalised coaching strategies defined, namely:

• **Input Layer:** The Input Layer is responsible for detecting events triggering the platform activities and accounts for the ability of a persuasive system of sensing the context of interaction. These events can be of two types: (i) data input, where data are sent from the Input Layer to the Knowledge Layer; and (ii) context communication, where contextual information is sent from the Input Layer to the Persuasion Layer that may exploit this information for persuasive purposes.

The distinction between data input and context communications relies on the use of parameters by

the system. Input data represent facts of the world related to the user's behaviour that trigger knowledge layer rules in the specific domain (e.g., the assumption of meals encouraged or discouraged by the Shared Care Plan recommendations). Context communication is related to the environment in which the user is acting (e.g., timing or localization), and provides information to the Persuasion layer allowing the choice of the most appropriate message generation strategy.

The Input Layer includes the possibility of both, explicit user interactions through a mobile app or other human-computer interaction solutions, and automatic sensing of the context enabling the automatic data transfer to the platform (e.g. from a wearable device). One of the most prominent challenges in the design of an effective and efficient Input Layer is to reduce as much as possible the time-consuming activities on the user side. Indeed, when we refer to the digital health domain and, in particular, when we consider monitoring dimensions such as the nutrition and physical activity, the effort necessary for providing all information required by the whole platform might be significantly time consuming (i.e., the input of all consumed foods). In ValueCare the technical partners together with the various pilots through co-design activities, defined the specific strategies to minimise the burden to patients when entering required information, namely requesting the minimum required number of inputs with the lowest possible frequency in order to create an engaging user experience.

• **Knowledge Layer:** this layer contains (i) the structured knowledge linking provided data with domain information (e.g. a specific application ontology) and (ii) the reasoner used for elaborating such data.

The set of structured knowledge for each of ValueCare pilots, can be exploited by a SPARQL-based reasoner (SPARQL is an RDF query language—that is, a semantic query language for databases—able to retrieve and manipulate data stored in Resource Description Framework format) for detecting undesired situations or deviations within specific users' objectives, i.e., verifying if user's dietary and activities actions are consistent with the monitoring rules defined by domain experts in the Share Care Plan. When inconsistencies are detected, the knowledge base in the virtual coach is used for providing feedback to users. Such inconsistencies may be due either to patients not being able to follow the recommendations of their clinical/social carers regarding expected behaviours and goals, or in those cases in which patients can achieve their goals in advance due to a more proactive behaviour. In both cases, specific feedback can be proposed either to suggest and encourage correction of behaviours or to reinforce positive attitudes towards goal achievement.

Regarding the reasoning mechanisms, they can be triggered in two ways. First, each time a user enters new data to the virtual coach application, or modifies existing ones with new behaviours, in the

knowledge base, the reasoner is invoked for processing the new, or updated, information. Second, at the end of specific timespan, such as the end of a day or of a week or whatever period was defined together by the patient and her formal caregiver for achieving a goal, with the aim of checking the overall user's compliance of goals in such timespan. In the latter case, the reasoner works on a collection of data labelled with a timestamp valid within the expected assessment timespan.

Figure 2 summarises the reasoning process of the virtual coach in which the green path, drawn with a continuous line, executed as the first step, is in charge of collecting the rules to validate depending on the trigger received by the reasoner. The red path, drawn with a dotted line, executed as a second step, is invoked for collecting rules that can be validated as semantically associated with the ones collected during the green path. The blue path, drawn with a dashed line, executed as third step, generates, and populates violations before storing them into the knowledge repository.

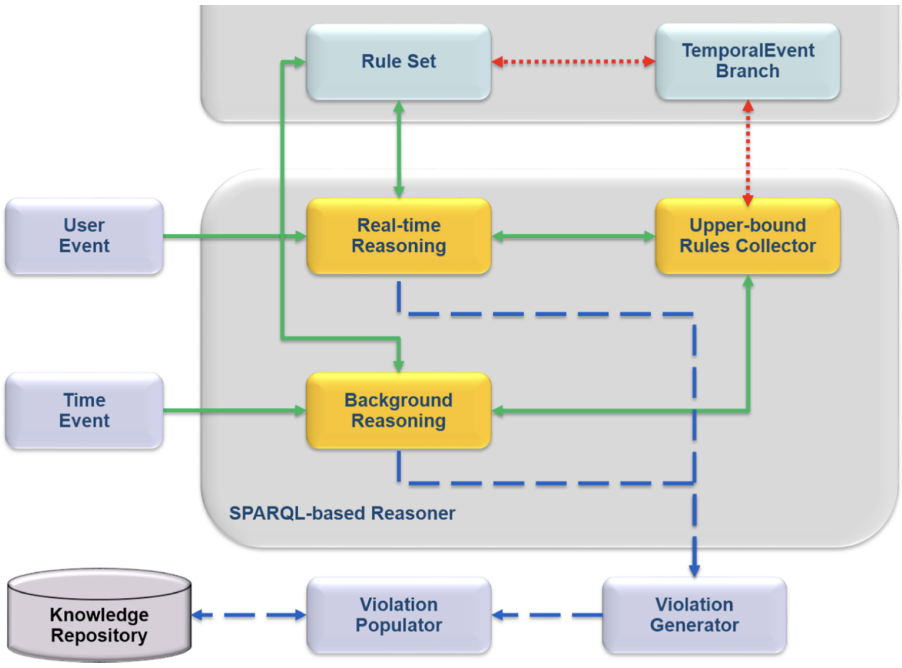


Figure 2: Virtual coach reasoning process

The rationale of having two different triggers (user and time events) is due to the different nature of the rules defined within the system. These monitoring rules are divided in two sets:

1) Event-Based Rules (EB-Rules): these rules define, for the specified entity to monitor, the interval of values allowable for a specific event. Examples of these rules are the maximum amount of a specific food category that can be consumed during a single meal, or the minimum number of minutes of a specific activity that a user has to perform, and in ValueCare these are initially setup in the web interface.

2) Timespan-Based Rules (TB-Rules): these rules define, for the specified variable to monitor, the interval of values allowable for a specific timespan. Examples of these rules are the minimum number of portions of a specific food category that have to be consumed during a day, or the minimum number of sport activity sessions that a user has to perform during a week. In ValueCare, these values are personalised according to the specific Shared Care Plan prescribed to each patient.

• **Persuasive Layer:** this layer contains the linguistic strategies and vocabularies for generating the feedback sent to users. In the ValueCare project, this layer was built after iterative co-design activities between the technical partners involved in the design and development of the virtual coach and the various pilots. During these sessions, the various contents of messages were initially proposed by the technical and pilots' partners and later-on validated with target users during the participatory co-design sessions. The resulting messages were proposed as the specific input to provide patients after certain conditions were triggered. These messages were in most of the cases built considering different aspects such as the expected feedback, the argument of the message and the eventual suggestions to convey to patients. In general, message "Feedbacks" can be considered as the part of the message that informs the user for example about the unhealthy behaviour. Feedback is generated considering data included in the selected violation of a rule. In the technical solution, the entity of the violation represents the object of the feedback, whereas the level of violation (the deviation between the expected food quantity and the actual one) is used to represent the severity of the incorrect behaviour. Feedback also contains information about timing to report the moment in which a violation was committed. The "Argument" of the message is the part that informs the user about the possible consequences of a behaviour. For example, in the case of diet recommendations, the argument consists of two parts: (i) information about nutrients contained in the food intake that caused the violation and (ii) information about consequences that nutrients have on health. Consequences imply the positive or negative aspects of nutrients according to the encourage or discourage intention, respectively. The "Suggestion" is the solution proposed to the user in order to motivate him/her to change his behaviour. This suggestion informs the user about the alternative and healthy behaviour that he/she can adopt.

• **Output Layer:** This layer is in charge of presenting the feedback to users and is in charge of closing the loop by providing the feedback to users. It is represented by one of many devices able to receive the data produced by the Persuasion Layer and to deliver the physical feedback to users (textual or audio messages, graphics alerts, vibration, etc.). The main challenge this layer has to address is to find the best trade- off between two dimensions:

• Type of feedback: it is necessary to determine the optimal way for communicating with users. This choice is strongly associated with the kind of device used for providing the feedback and the type of media such device can convey.

•Presentation: how content generated by the Persuasion Layer is presented to users is relevant for completing the process of sup- porting the behaviour change.

The Output layer is responsible for designing an effective presentation strategy based on the hardware capabilities of the device used. and regards the format of the content to present to the users. In ValueCare we use different types of representations depending on the message intention, namely a text provided within the chatbot interface of the virtual coach, a video to be played, an audio, an image, etc.

Finally, the output provided by the platform could also be a further request of inputs; thus, a connection between the two layers has to be foreseen.

- 3.2.2 HORUS.AI Hybrid Approach on AI-based Coaching

The HORUS.AI virtual coach platform allows the combination of a hybrid AI approach in which knowledge-based rules and machine learning techniques coexist for providing evidence-based and data driven knowledge. The knowledge derived from domain experts in HORUS.AI could be used to enable data collection and consequently provide feedback to the user, transforming data models incrementally from an "input + rules → results" paradigm to an "input + results → new rules" paradigm.

Rules Design in HORUS.AI

The knowledge-based component in HORUS.AI utilises domain experts for supporting modelling of the different "domain rules" that are needed to apply for activating interventions. By considering as example the Mediterranean Diet, a prototypical rule could be the quantity of Vegetables that a person should eat every day. If we translate a domain rule into a logical representation usable within HORUS.AI, it corresponds to the premises of the entailment. This means that in HROUS.AI the experts provide only the premises of the entailment. Indeed, given the infinite combinations of data that can be provided by a user, the conclusion of the entailment (i.e., a violation) cannot be exactly defined a priori. For simplicity, hereafter with the term rule we mean the premises of the entailment that are defined by the experts. Rules are represented with a fixed structure within the knowledge

base (as a rule template), and domain experts have only to provide the parameters instantiating the rule template with the actual values. A tool being developed as an antecedent of the web application in ValueCare is presented in Figure 3. This way, domain experts do not need to learn the formal language for writing the monitoring rules. domain experts are able to provide rule parameters and how the tool transforms them into the formalism used by the application back-end for representing each rule.

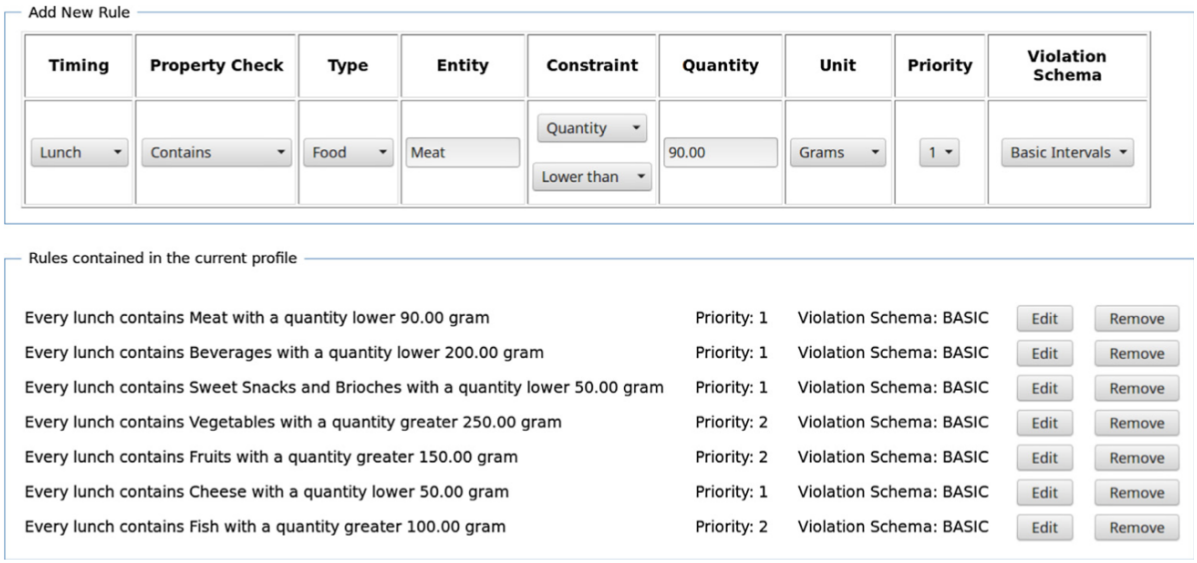


Figure 3: Rule composition in HORUS.AI

Once the domain experts insert all the parameters, they are able to save the rule into the system. The saved rule is transformed into a structured representation for being interpreted by the system, and it is also translated in a simple natural language message for informing the domain experts about what they have inserted. From the list of inserted rules, the domain expert is then able to edit or remove rules according to their needs.

Reasoning in HORUS.AI has the goal of verifying if a user's lifestyle (i.e., eating behaviour and physical activity) is consistent with the monitoring rules defined by domain experts, detecting and possibly materialising violations in the knowledge base, upon which further actions may be taken. Reasoning is triggered each time a user's profile or associated meals are added or modified in the system, and at specific points in time such as the end of a day or week, to check a user's behaviour in such timespans; although infrequent, changes to the monitoring rules, food, or nutrients parts of the ontology also trigger reasoning.

Machine Learning in HORUS.AI HORUS.AI can implement machine learning strategies on top of the data captured after the dialogs generated from the knowledge-based interventions in order to

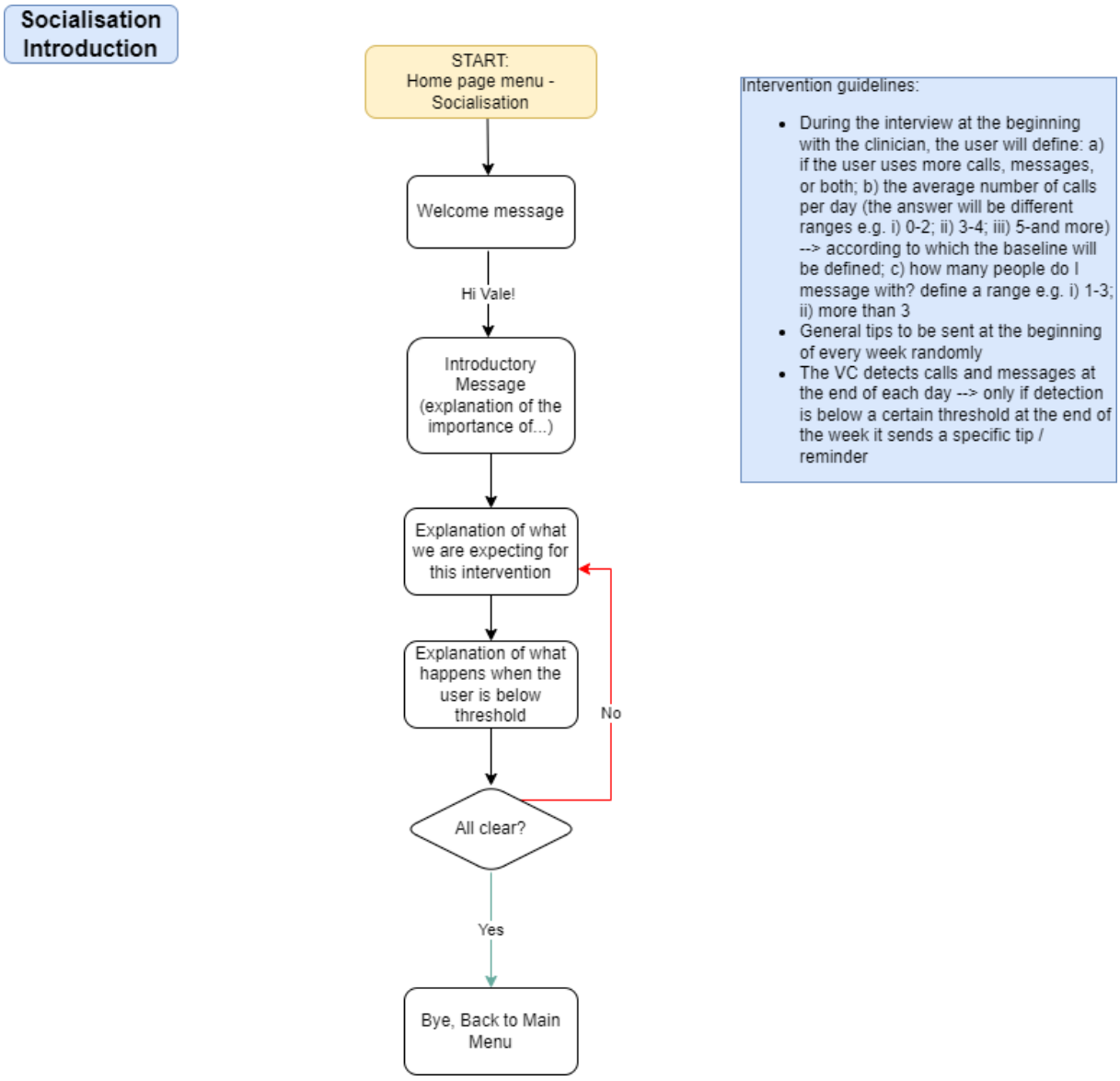
improve the usability and engagement of the virtual coach users. In order to deploy the specific machine learning strategies in a virtual coach application, HORUS.AI requires a large amount of data to train machine learning models in order to execute predictive or dynamic interaction strategies. As detailed in Deliverable 3.1 section-3 (Data-driven Virtual Coach Possible Refinement Based on AI HYBRID Approach), the data models needed for conducting predictive analysis for improving engagement and maximising user experience, thus positively impacting on system adherence, are a prerequisite for testing the data-driven performance of the system. In ValueCare project the required data models for testing the machine learning approach will be composed from an initial symbolic representation of the knowledge and data collected within the various pilots in order to create an initial model enriched iteratively by data collected during pilots to train neural networks with the purpose of achieving a set of inferences to predict and improve the models' performance (see example on D3.1 section 3).

3.3 Virtual Coach Construction

In ValueCare, every dialogue of the virtual coach was defined through a co-design process involving the pilot researchers, the end users, and the technical partners, following the needs of the single intervention and considering the communication with the mobile app and the dashboard.

The implementation of the virtual coach followed the overall conceptual design based on the methodology described in D3.1. An example of how the virtual coach dialogs were produced from their conception to their actual implementation is shown in this section. For simplicity, we describe the case of the definition and construction of the "socialisation intervention" conducted for the pilot in Treviso.

The design starts from the intervention diagram that resumes the main aspect of the intervention, as shown in figure 4:



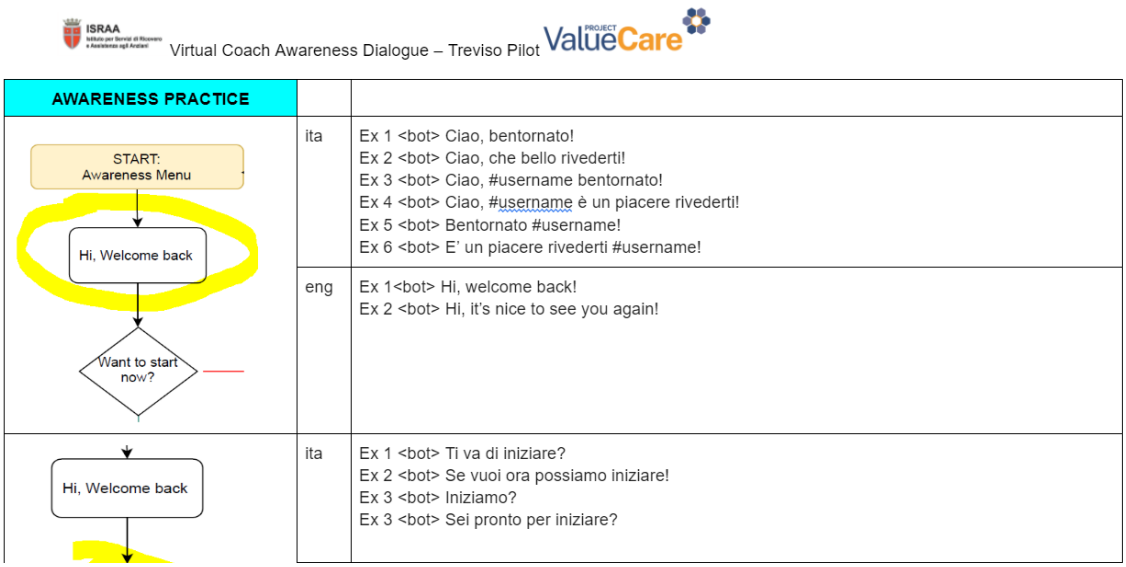
- Figure 4: Socialisation Introduction diagram

Next, the details of the dialogues structure and rules logic (i.e., the algorithm) follows a rule-based event driven mechanism in which at a high abstraction level it is possible to identify 3 different types of rules according to the criteria that triggers them as follows:

- Follow up rules: using this general rule (common to all intervention) the Virtual Coach develops the dialogue following a precise, predefined script.
- Process and follow up rules: this category of rules is specific for every intervention. The Virtual Coach analyses the data of the user and chooses the best possible answer to monitor and to motivate the user towards the accomplishment of their goals.

- Time management rules: every intervention is designed to follow a specific temporal schedule. The Virtual Coach manages every user calendar and notifies when is time for the patient to follow a specific intervention.

The detailed implementation of rules and dialogs is derived from a joint analysis by the health domain experts and the virtual coach technologists that design a detailed step by step set of actions to be implemented accordingly to the specific intervention flow diagram. A snapshot of the step-by-step definition of an intervention can be seen in figure 5.



- Figure 5: Step by step dialogs design

Starting from the analysis, dialogs and logic defined as shown in figure 5, the associated implementation is done at the software level through a script defining two main sections, namely the coding of the sentences and functions to be used for the interactive dialogs (see code 1 box) and the definition of possible target goals (see code 2). The dialogs and the potential target goals are then structured in a way that the flow described in Figure 5 is implemented as a series of events to be collected and rules to be verified in order to define the next actions proposed by the virtual coach to maximise individual goal achievement.

```
"sentences": [...,
  {
    "chatId": "id_chat_it_socialisation",
    "chatName": "Socializzazione",
    "messageType": "html",
    "messageId": "id_it_so_introduction",
```

```
"messageText": ["Stare in contatto con le persone a te care porta molti benefici alla tua salute. Mantenere delle interazioni significative può aiutare ad allontanare il declino cognitivo e a migliorare il tuo umore.\n\nNelle prossime settimane ti stimolerò ad essere in contatto con i tuoi familiari e i tuoi amici inviandoti dei suggerimenti sull'importanza della socializzazione.\n\nInsieme parleremo di quante chiamate e/o messaggi fai ogni giorno e se durante la settimana ti capiterà di farne molte meno sarò pronto a consigliarti qualche strategia per essere più connesso con i tuoi cari.\n\nE' tutto chiaro?"],

"messageTextENG": ["Staying in touch with your family and friends brings many health benefits. Maintaining meaningful interactions can help prevent cognitive decline and improve your mood.\n\nIn the incoming weeks I will encourage you to be in touch with your family and friends by sending you tips on the importance of socialising.\n\nTogether we will talk about how many calls and/or messages you make every day and if you make far fewer calls and/or messages during the week I will be ready to advise you on some strategies to be more connected with your family and friends.\n\nIs everything clear?"],

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"answerPayload": [

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  "content-type": "text",

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  "titleENG": ["Yes"],

  "attachment": [],

  "action": "message"

 },

 {

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]

},...
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- Code 1: Sentence implementation

-

-

```
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   "description":"Socialsation",
   "type":"calls",

"userId":"cc8f96610e92102f78917e90f2bd6f4c151ac38821b0d8076bca9357fbc3d88cb99ae19b01f7bd4920304 0bade89a7577872526f6972b3e887025737ae99735d",
   "timeFrame":"weekly",
   "target":{"$numberInt":"10"},
   "duration":{"$numberInt":"20"},
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   "clinic_id":{"$numberInt":"1"},
   "start_date":"start_date"
}
```


- Code 2: Goal Definition

References

Council of Europe (2014). Recomendación CM/Rec(2014)2 del Comité de Ministros a los Estados miembros sobre la promoción de los derechos humanos de las personas mayores. Retrieved from: https://goo.gl/xFDLwR

International Longevity Centre Brazil (2015). Active Ageing: A Policy Framework in Response to the Longevity Revolution. Rio de Janeiro: ILCB. Retrieved from: https://goo.gl/YfVQUH

Shilton, T., Sparks, M., McQueen, D., Lamarre, M. C., Jackson, S., & executive committee of the International Union for Health Promotion and Education-IUHPE (2011). Proposal for new definition of health. BMJ (Clinical research ed.), 343, d5359. https://doi.org/10.1136/bmj.d5359

WHO (2002). Active Ageing: A Policy Framework. Geneva: World Health Organization. Retrieved from: https://apps.who.int/iris/bitstream/handle/10665/67215/WHO_NMH_NPH_02.8.pdf?sequence=1&isAllowed=y

J. Makicic et al. Effect of a Stepped-Care Intervention Approach on Weight Loss in Adults. Journal of American Medical Association. Vol 307, No 24 (2012).

Annex - Pilots Intervention Diagrams

Athens Diagrams

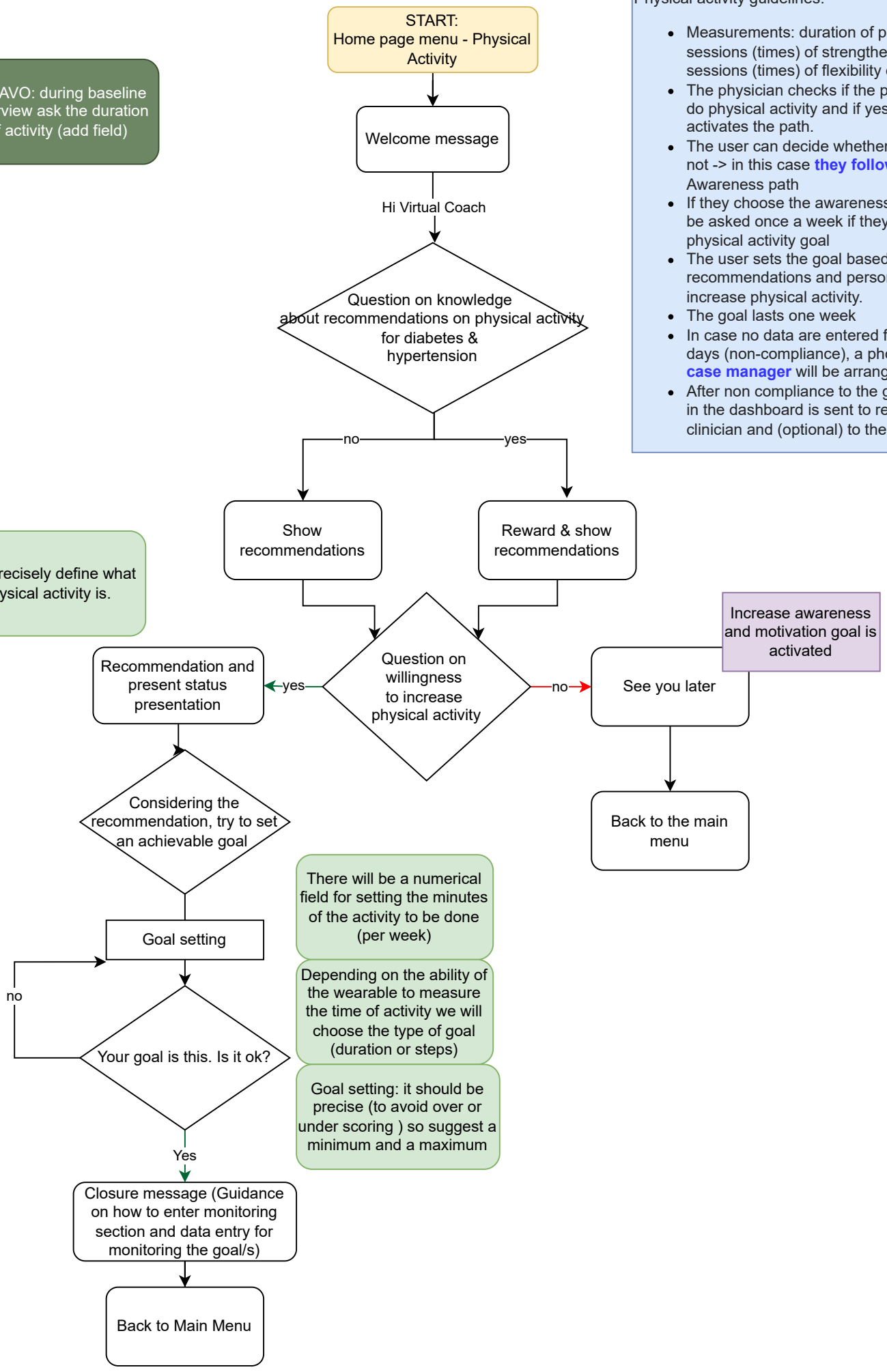
Physical Activity Introduction + goal setting

The virtual coach introduces the physical activity topic to the user. The first goal was set by the clinicians in the Care Plan and the virtual coach presents it to the user.

Physical activity guidelines:

- Measurements: duration of physical activity, sessions (times) of strengthening exercise, sessions (times) of flexibility exercise.
- The physician checks if the patient is able to do physical activity and if yes, he/ she activates the path.
- The user can decide whether to have a goal or not -> in this case **they follow** only the Awareness path
- If they choose the awareness path, they will be asked once a week if they want the main physical activity goal
- The user sets the goal based on recommendations and personal willingness to increase physical activity.
- The goal lasts one week
- In case no data are entered for 3 consecutive days (non-compliance), a phone call from the **case manager** will be arranged on day 4.
- After non compliance to the goal a notification in the dashboard is sent to researcher / clinician and (optional) to the caregiver.

VIDAVO: during baseline interview ask the duration of activity (add field)



NB: Precisely define what physical activity is.

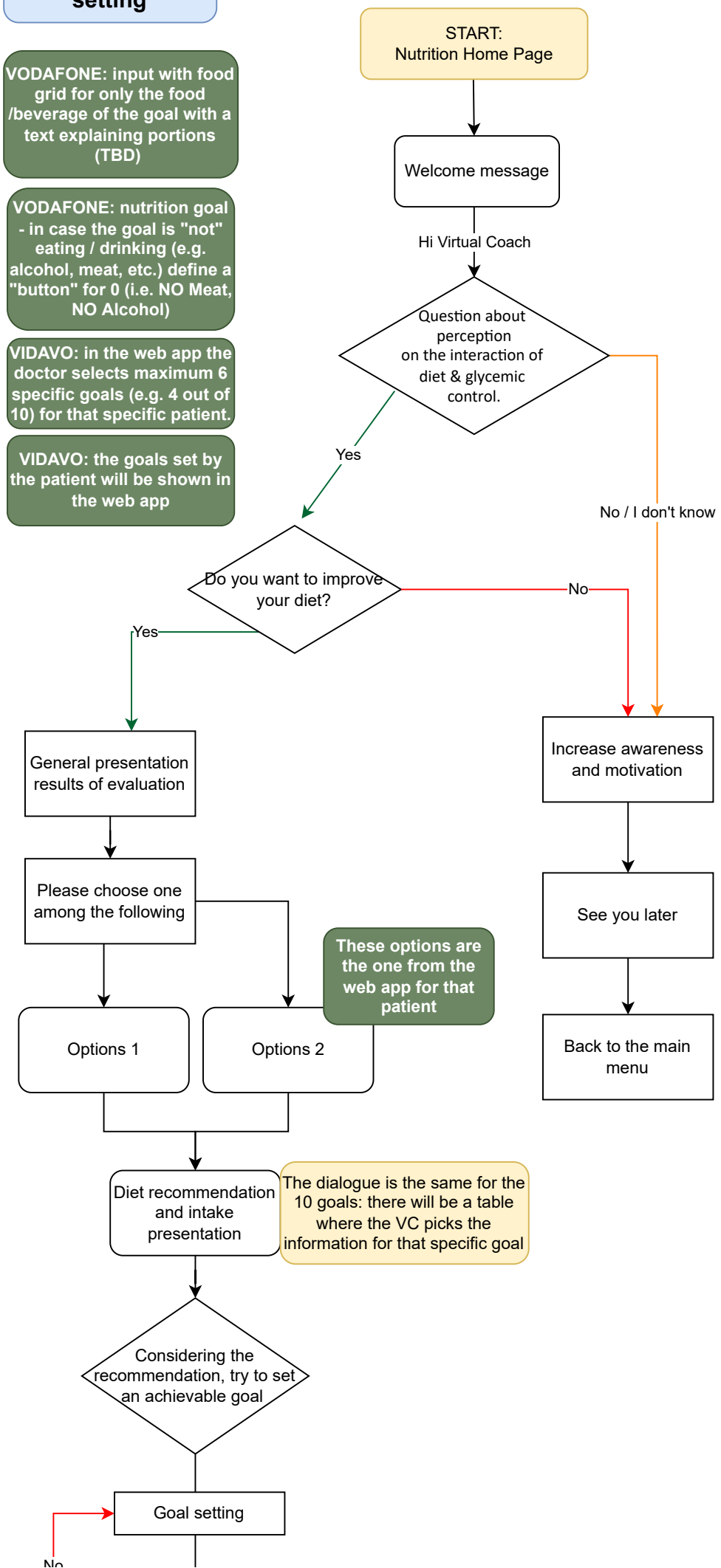
There will be a numerical field for setting the minutes of the activity to be done (per week)

Depending on the ability of the wearable to measure the time of activity we will choose the type of goal (duration or steps)

Goal setting: it should be precise (to avoid over or under scoring) so suggest a minimum and a maximum

Healthy Eating Introduction + goal setting

The virtual coach sends a notification on the first day for explaining the goals



Intervention guidelines:

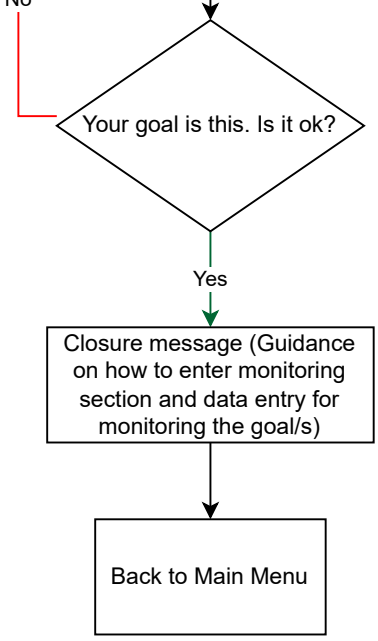
- The user will decide what type of goal he/she will have (awareness / nutrition)
- No/ I don't know --> increase awareness goal
- In case of no / I don't know the number of weeks after which the patients will be asked again
- The intervention lasts 12 months; after 3 months there will a revaluation of the intervention

Awareness activity

- Both videos and text messages will be sent
- Videos will be available in the dedicated storage section only after the first time they are presented
- Every two days a reminder is sent to watch a video / to read text messages

Nutrition goal

- If they answer yes to the first question this goal is activated
- The patient will only see the recommendations that resulted from the baseline questionnaire (more or less 4-6)
- The patient chooses 1 recommendations to work on
- There will be a dialogue related to that goal (the dialogue is the same for the 10 and there will be a table where the VC picks the information for that specific goal)
- Monitoring = every day input from the patient
- If there is no input send an option the day after in the morning (timing to be decided) to enter yesterday's data
- Monitoring of monitoring = positive or encouraging feedback
- Weekly qualitative assessment is done only if there are 7 days input
- Goal checking = weekly and on a weekly basis (the quantitative goal can be reached even in one day, e.g. 8 vegetable portions in the same day)
- Threshold --> 75% means that the goal is achieved
- Between 45 - 74 % --> they will be asked to choose the barriers from not achieving the goal --> depening on what they choose they will receive a tailored message
- Between 0 - 44% --> a message saying that they will be contacted by the helpdesk
- At the goal checking (end of week) the patient is asked if they want to continue with the goal or change the goal (either the same goal or change that same goal)


No
Your goal is this. Is it ok?
Yes
Closure message (Guidance on how to enter monitoring section and data entry for monitoring the goal/s)
Back to Main Menu

Glucose regulation & medication adherence Introduction

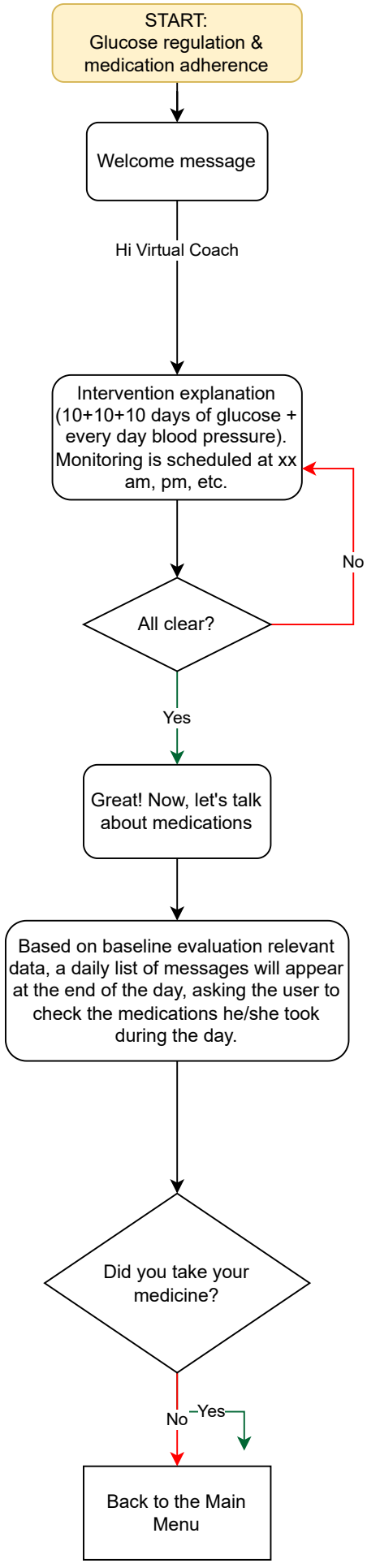
VODAFONE = for drugs send a notification daily that points directly to the drug section

VODAFONE = add checklist for drug input (outside of virtual coach)

VIDAVO = add field for adding patient's scheduled time for blood pressure medication

FBK - check if no drug taken for 3 days, trigger "non compliance" tab

The user receives the notification to check the glucose regulation and medication adherence section for the first time.



The intervention is structured as follows:

- The intervention focuses on: 1) Glucose monitoring and Blood pressure and 2) Drugs monitoring
- The invervention lasts 12 months
- There is no goal associated to the intervention

1) Glucose monitoring

- The user is asked to measure and enter data for blood glucose and blood pressure daily.
- Every ten days different blood glucose measurement is proposed to the user to be taken (fasting blood glucose, 2hr postprandial blood glucose, before sleep blood glucose). -> 10 days fasting glucose + 10 days 2h postprandial + 10 days before sleep and continue back from the top
- However, the user can enter 2 or more values (fasting, 2hr postrpandial or before sleep glucose) daily if he/she wishes to. Then, the relevant path would be followed.

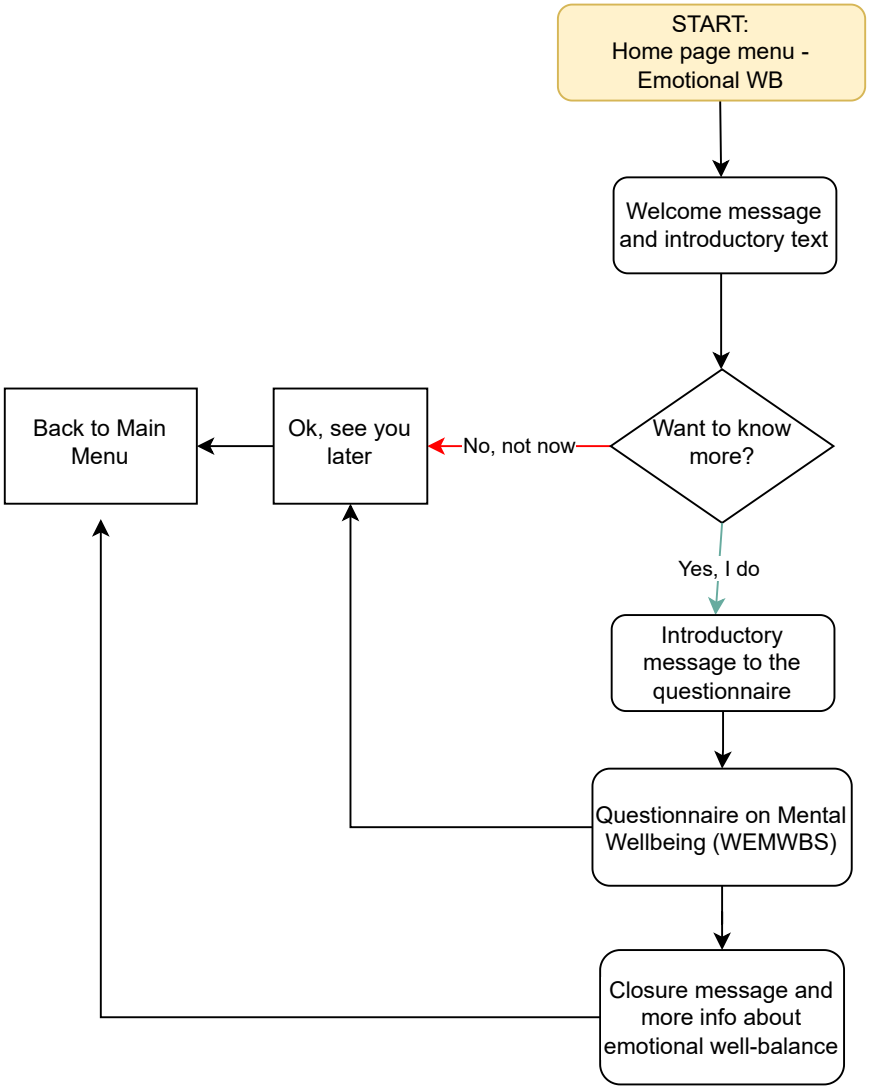
2) Drugs monitoring

- Drugs monitoring: based on baseline evaluation relevant data, a daily list of messages will appear at the end of the day, asking the user to check the medications he/she took during the day.

Coimbra Diagrams

Emotional WB Introduction

1st time the user checks the app



Guidelines

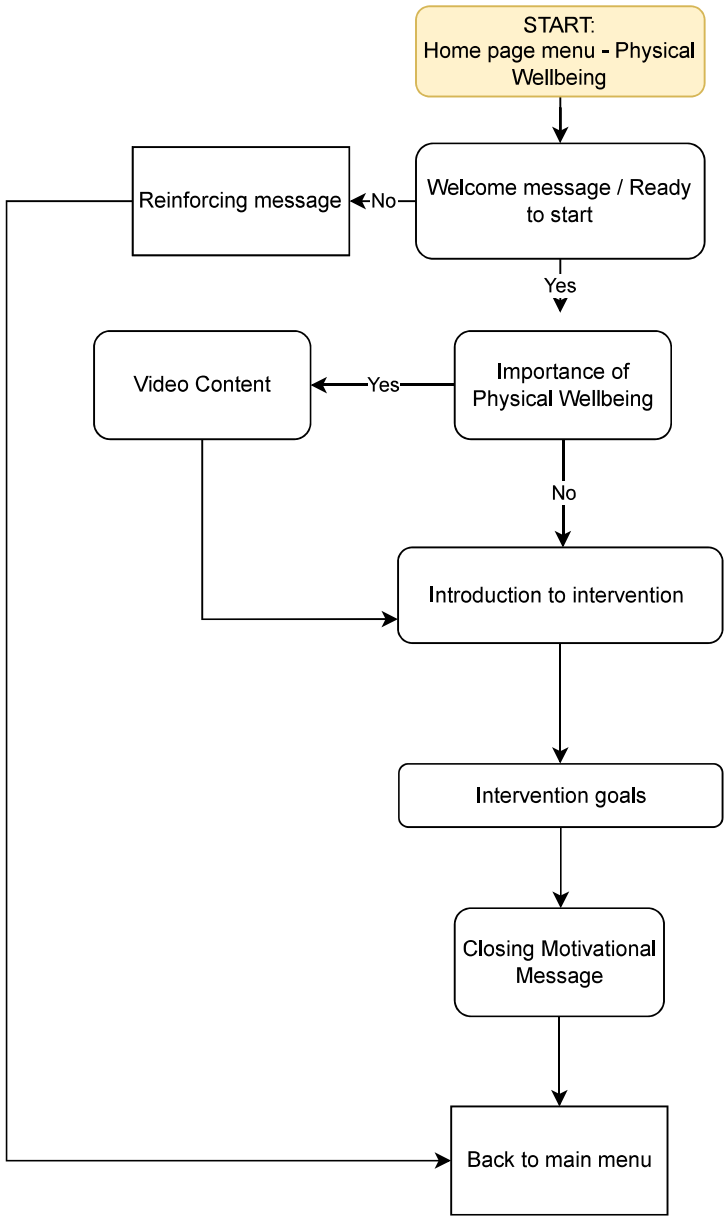
- Introduction to the Emotional wellbeing section and questionnaire
- Weekly Intervention:

1. Weekly question about self-perception of mood ("How have you been feeling lately" and "How would you describe your emotional state in the last few hours?"). Every week a message/tip/information will be given to the user accordingly to the self-reported dominant emotion.
2. After two weeks, if there is at least two negative dominant emotion, an alert will be sent to formal and informal caregivers.

- The user will have the possibility to rewatch/re-read only the videos and tips done so far.

Physical Wellbeing

1st time the user checks the app

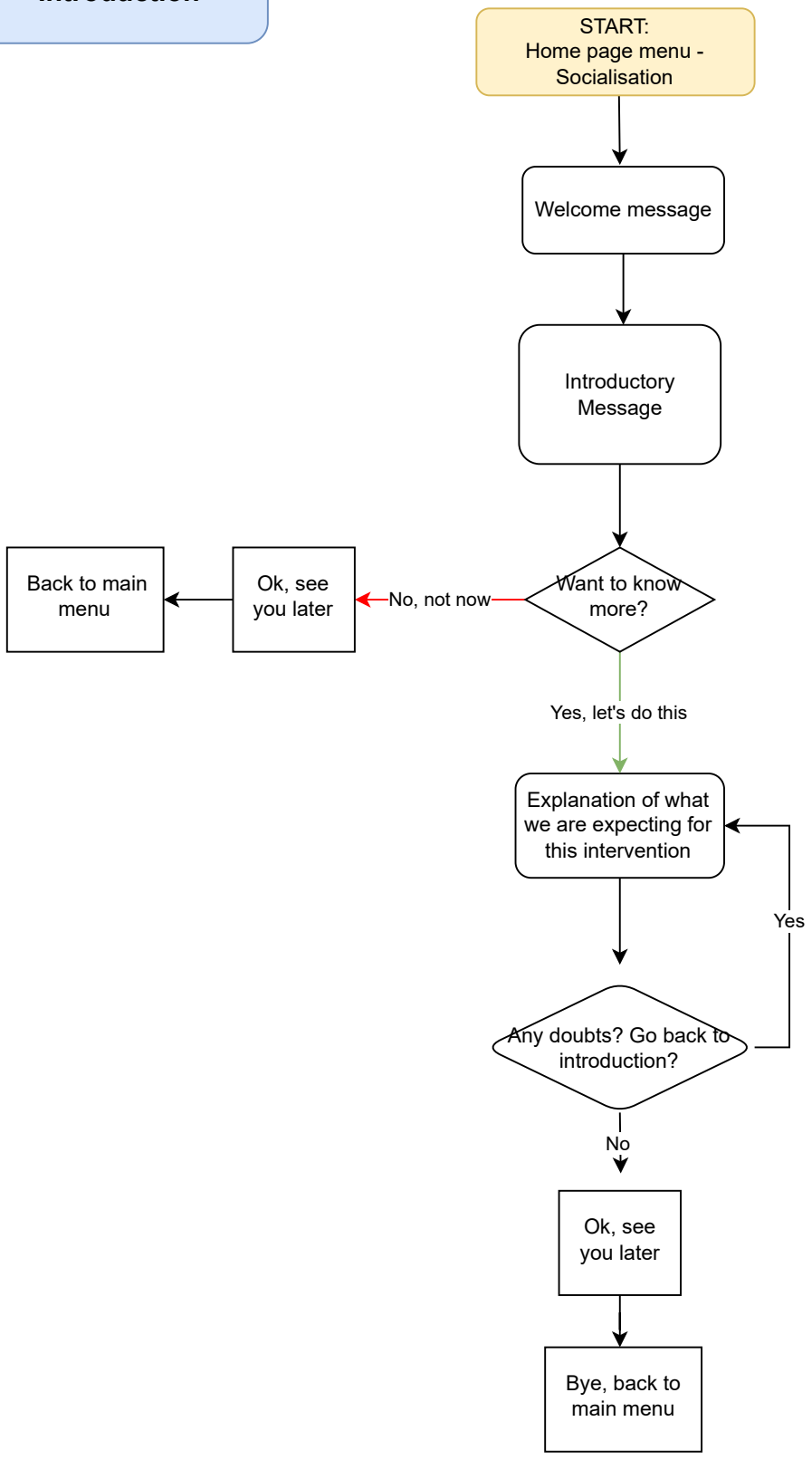


Physical activity guidelines:

- Goal = Weekly:
  - Goal metrics = Reached (atended 3 or more activities)
  - Goal metrics = Partially reached (attended 2 acitivities)
  - Goal metrics = Not reached (attended 1 activity)
- Activities can be meeting/calling a friend or relative, attending an social/cultural event, going to a store or pharmacy, participate in community events, etc
- Participants required to self-report their physical activities when complete, on wednesdays.
- Motivational reminders will be sent to participants on Friday if no activity is reported.
- The virtual coach will ask what has been done and how they evaluate the activity(ies).
- Every monday there will be goal checking to show progress and last chace to report acitivies from the previous week.

Socialisation Introduction

1st time the user checks the app



Intervention guidelines:

Introduction to the Socialization section

Weekly Intervention:

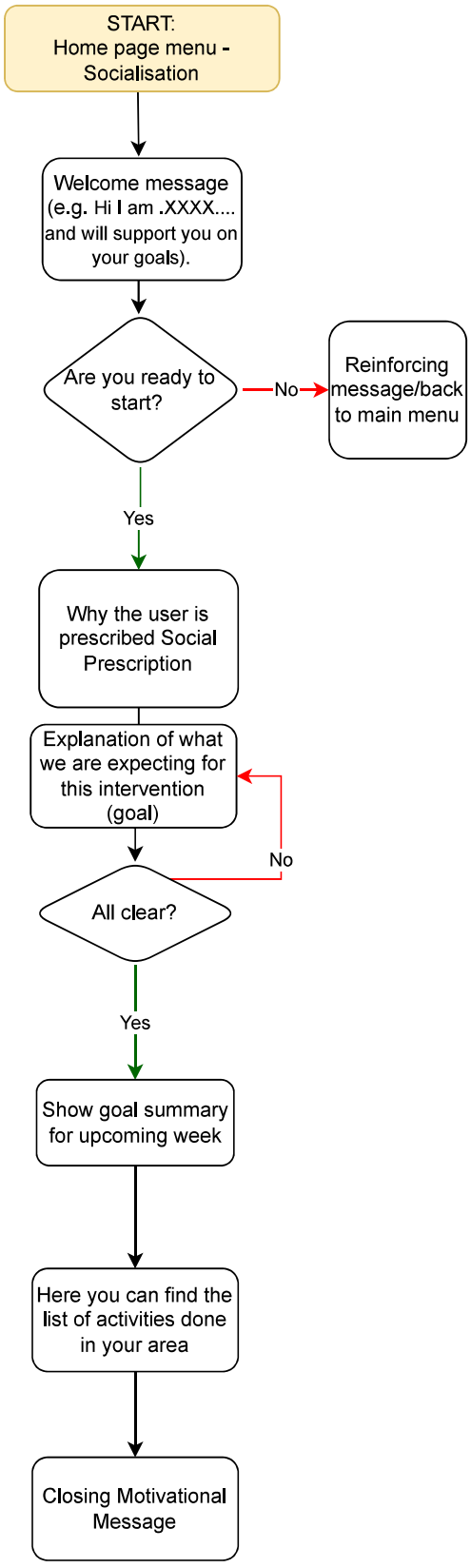
- Weekly questions about calls and text messages made with family and friends.
- Every week a message/tip is sent to users to encourage them to socialize (on-site and per text messages and calls). This is done according to the self-reported number of calls/texts and the reasons for that (e.g lack of motivation, time, etc)
- After two weeks, if the user has not done any calls or sent any text messages, an alert will be sent to formal and informal caregivers.
- The user will have the possibility to re-read the tips done so far.

Cork/Kerry Diagrams

Socialisation Introduction

VODAFONE: videos to be stored in a dedicated section

Live feed of local events/services to be updated regularly - Cork and Kerry distinction will need to be made



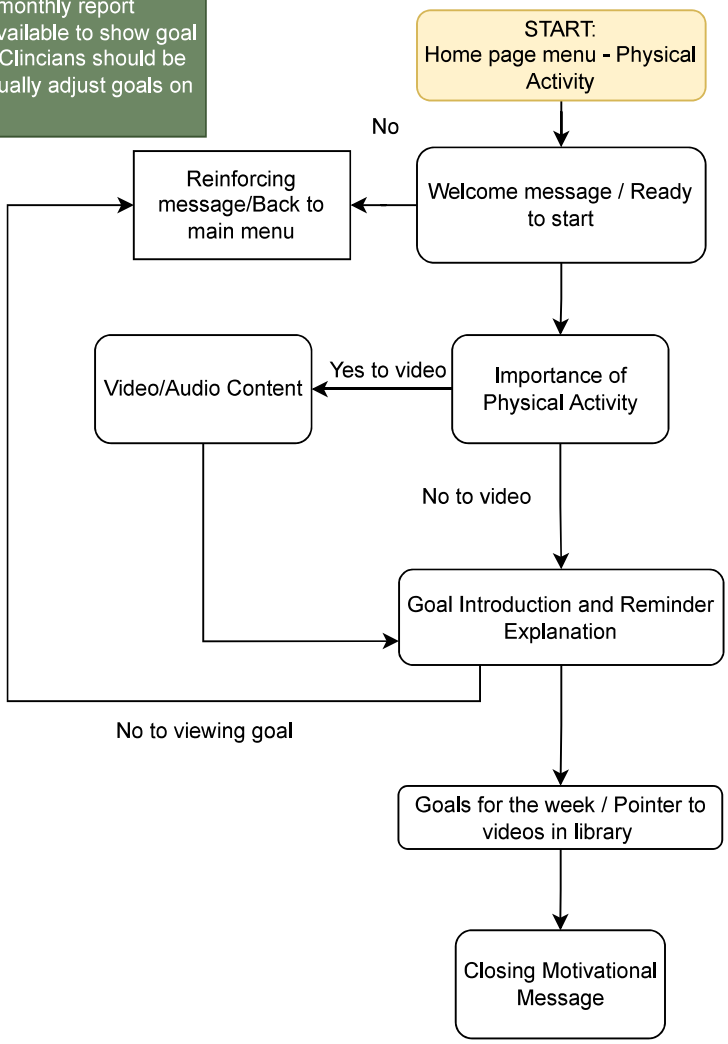
Intervention guidelines:

- The goal is on a weekly basis
- The goal will be defined during the care plan interview with the clinician. Goals can be subsequently adapted using the Dashboard.
- The goal is about social engagement frequency (e.g. twice a week)
- Goal metrics = Reached or Partially reached (intervals)
- Activities can be meeting/calling a friend or relative, attending an social/cultural event, art, cookery, meditation, GAA, men's sheds, music, drama, walking groups
- There will be 2 reminders (on Wednesdays and Saturdays)
- If goal is reached, message to acknowledge achievement.
- Social activities and what they enjoy to be established at enrolment meeting by the clinicians or researcher (informal discussion).
- Clinician will monitor goal achievement at once a month using Dashboard.
- Family caregivers can view their social engagement also and support where necessary
- Coach could suggest arranging with a "buddy" to meet once weekly to achieve their goal and provide them support.

Physical Activity Introduction + new goal

The virtual coach introduces the physical activity topic to the user. The first goal was set by the clinicians in the Care Plan during the interview and the virtual coach presents it to the user. Goals are manually adjusted by clinicians.

VIDAVO: Four weekly reports and overall monthly report should be available to show goal adherence. Clincians should be able to manually adjust goals on Dashboard.

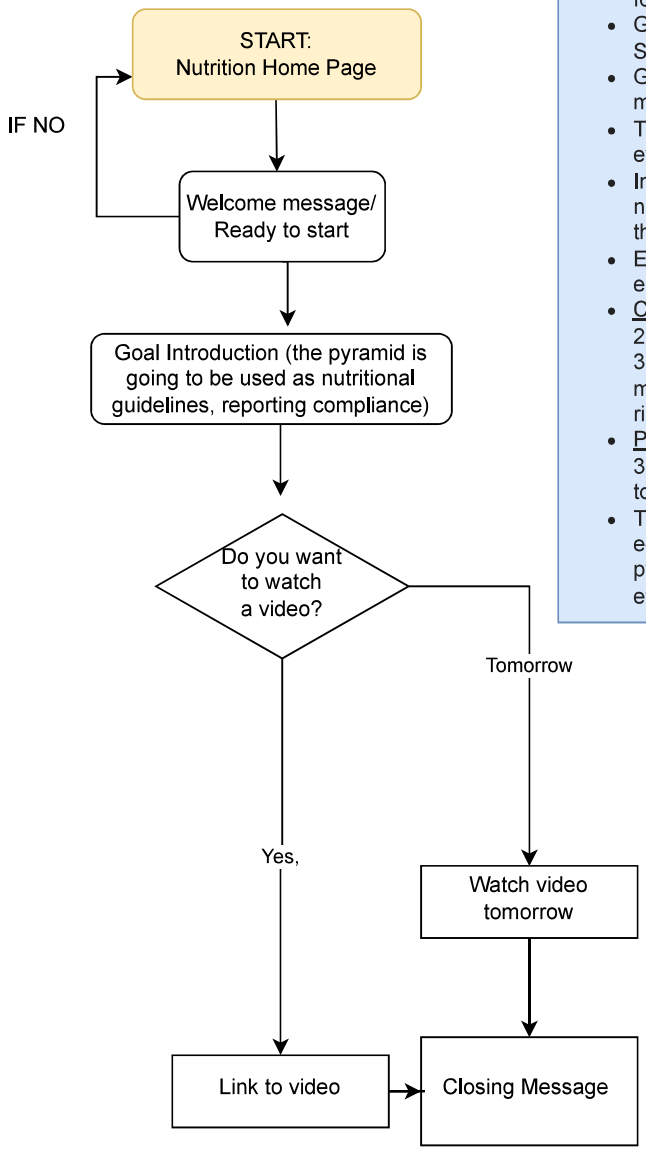


Physical activity guidelines:

- Goal = Weekly
- Participants required to self-report their physical activities when complete. Another opportunity given in end-of-week review if they forgot.
- Goal adherence reports should be available weekly to clinicians. However, may only change goal once a month. If possible, an overall monthly report would be helpful too (depending on clinician availability)
- Dashboard to provide weekly reports of the physical activity for clinician review.
- Motivational reminders to be sent to participants on Wed and Saturday if no activity is reported.
- The virtual coach will ask how many times was the activity done
- At the end of the week there will be goal checking to show progress
- Clinicians can manually change goal using Dashboard and notification sent to participant

Nutrition Introduction + goal

The virtual coach sends a notification on the first day for explaining the goal



Intervention guidelines:

- Goal = weekly generic goal based on the food pyramid
- Goal = the week is from Monday to Sunday
- Goal = is assessed every Monday morning
- The user shoud input his/her meals everyday
- In the evening (8.30 pm) send a notification to enter their daily meals if there was no input by that time
- End of week send tailored message for each category that was "negative"
- Categories to be considered: 1) fats/oils, 2) proteins (poultry, fish, eggs, beans, ...) 3) diary (milk, yogurt, cheese) 4) whole meal (cereal, pasta, wheat, potatos, rice,...) 5) veggie and fruit 6) sweets
- Portion rules 1)= 1 portion 2) = 2 portions 3) = 3 to 5 portions 4) 3 to 5 portions 5) 5 to 7 portions 6) 1 or 2 per week
- The first week the user is directed to the educational content i.e what is the food pyramid, what is a portion, fluid intake etc.

Vodafone - Use the food grid (Andrew should send the 12 categories). Double tapping is adding a portion

VODAFONE - at the end of the week recap, the compliance is presented as follows: the food pyramid appears, then the patient clicks and his own weekly pyramid appears

Vidavo - Add in the clinical dashboard a place where the nutritionist can specify diet restrictions (diary, gluten-free, ...)

Need to include special considerations so that it comes up in goal overview i.e. additional protein

Vodafone - Add image for the 6 meals

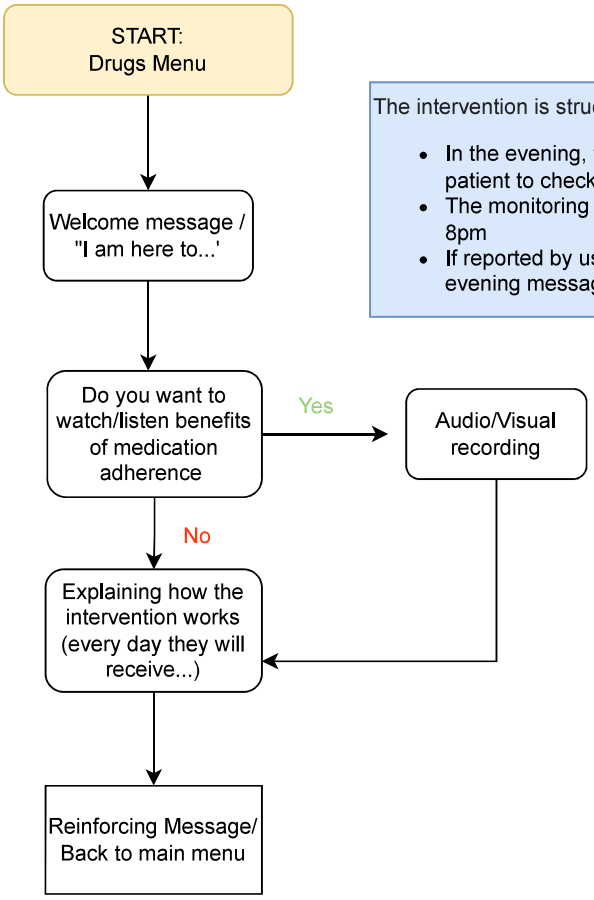
Check this for further info:
https://docs.google.com/document/d/1udhJG2_v56eqzDe1ZIpHEMGHn-m-uHhT/edit

Medication Adherence Reminder

Patient is assigned to receiving the generic daily end of day reminder regarding their medication.

VIDAVO: show a progress bar of the goal for clinicians/ family caregivers

VIDAVO: twice a month send an email to family caregivers for checking the progress bar status



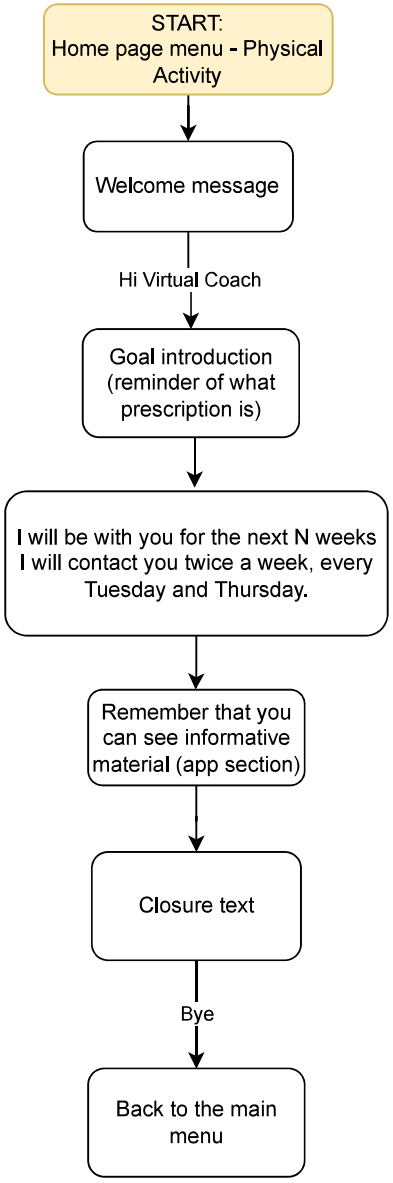
The intervention is structured as follows:

- In the evening, the monitoring is sent to the patient to check if the medicines were taken
- The monitoring message is sent every day at 8pm
- If reported by user before 8pm. no monitoring evening message is sent

Rijeka Diagrams

Physical Activity Introduction + goal

The virtual coach introduces the physical activity topic to the user. The first goal was set by the clinicians in the Care Plan and the virtual coach presents it to the user.



Physical activity guidelines:

- Number of steps is the only measurement
- Engagement strategy: at the end of the week (Sunday) a positive message with their scoring
- Twice a week send motivational messages (notifications)
- More structured interaction only in the motivational part
- The first goal is set by the physician
- Then the default is to keep the same goal: otherwise, the goal can be reset by the clinician / researcher / user (if they want a lower goal ask why) on Monday
- The goal lasts one week
- Non compliance = after three days out of seven (consecutive or not)
- After non compliance to the goal a notification in the dashboard is sent to researcher / clinician and (optional) to the caregiver
- Vodafone --> add an app reminder to charge the smartwatch

Nutrition Introduction + goal

The virtual coach sends a notification on the first day for explaining the goals (awareness and education)

For the introduction of the new goal, is this structure the one to be used?

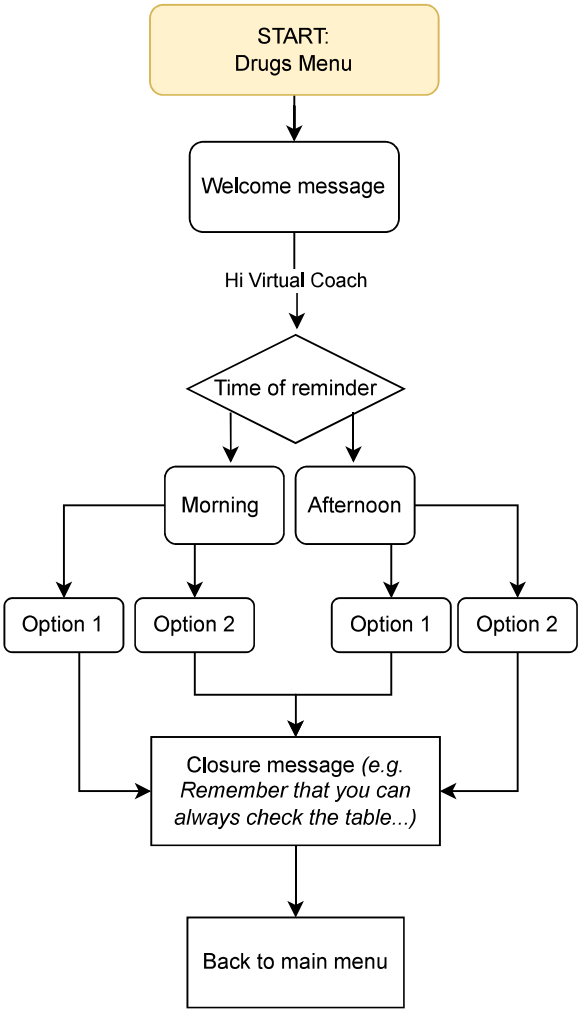
Intervention guidelines:

- The goal is about raising awareness and education
- The awareness goal is measured by a monthly quiz for self-assessment perception.
- The goal is reached when the user answer the question (further analysis might be done by the researcher checking the evolution of the patient - to see if the virtual coach was useful in ameliorating their behaviour)
- Possible reference here: https://www.ucl.ac.uk/epidemiology-health-care/sites/epidemiology-health-care/files/NKQ.pdf
- The educational material will be sent the same days of the physical activity (but only once a week and at different times)
- A quiz is done on Monday at the end of the month with 3 questions for awareness and 3 for education (in total maximum 10 questions).
- The goal ends at the end of a topic (4 weeks)
- The educational goal is about a specific topic, after 4 weeks the topic changes
- The goal was not achieved when less than 60% answer are correct
- Vidavo requirement --> add the questionnaire and the related users' answers in the dashboard

Drugs Introduction

The user receives the notification to check the drug section for the first time.

Vidavo/Vodafone: send an alert to the informal caregiver if some or none drugs were taken



The intervention is structured as follows:

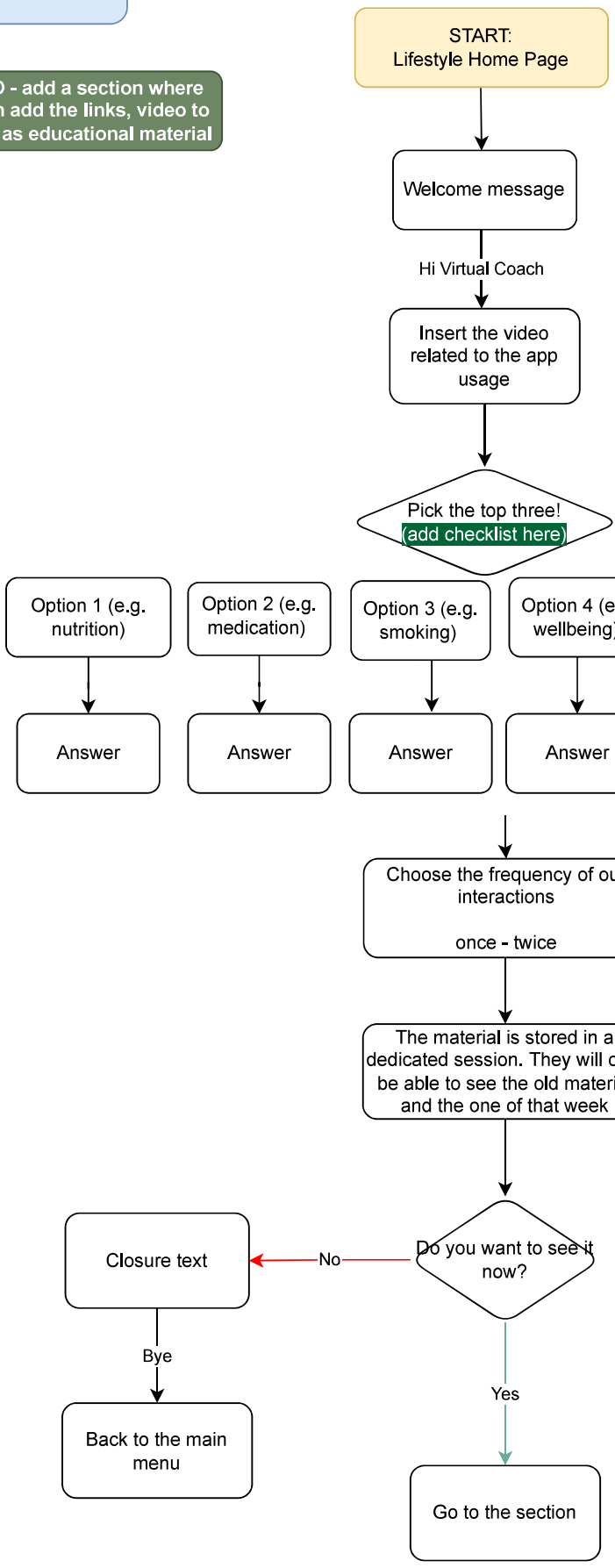
- The reminder is sent everyday (n.b. patients that do not have to take drugs everyday will not be enrolled in this specific intervention)
- The first time, the time is set by the patient
- At the end of the week, the patient can re-set the time of the reminder
- For the first week the time of input assesment is already pre-set (9.30 pm)
- Drugs monitoring: the patient can decide the frequency and time of the day for drugs monitoring (at the end of the week)
- Informal caregiver receives an email (...) if the user did not take all the drugs or some of them
- After 3 months the user can decide to reduce the frequency of the reminder / monitoring IF they were compliant more than 80%
- If the patient was below 80% compliance, after 3 more months this can be re-checked

Rotterdam Diagrams

Lifestyle Introduction + goal

The virtual coach sends a notification on the first day for explaining the goals (awareness and education)

VIDAVO - add a section where they can add the links, video to be used as educational material



Intervention guidelines:

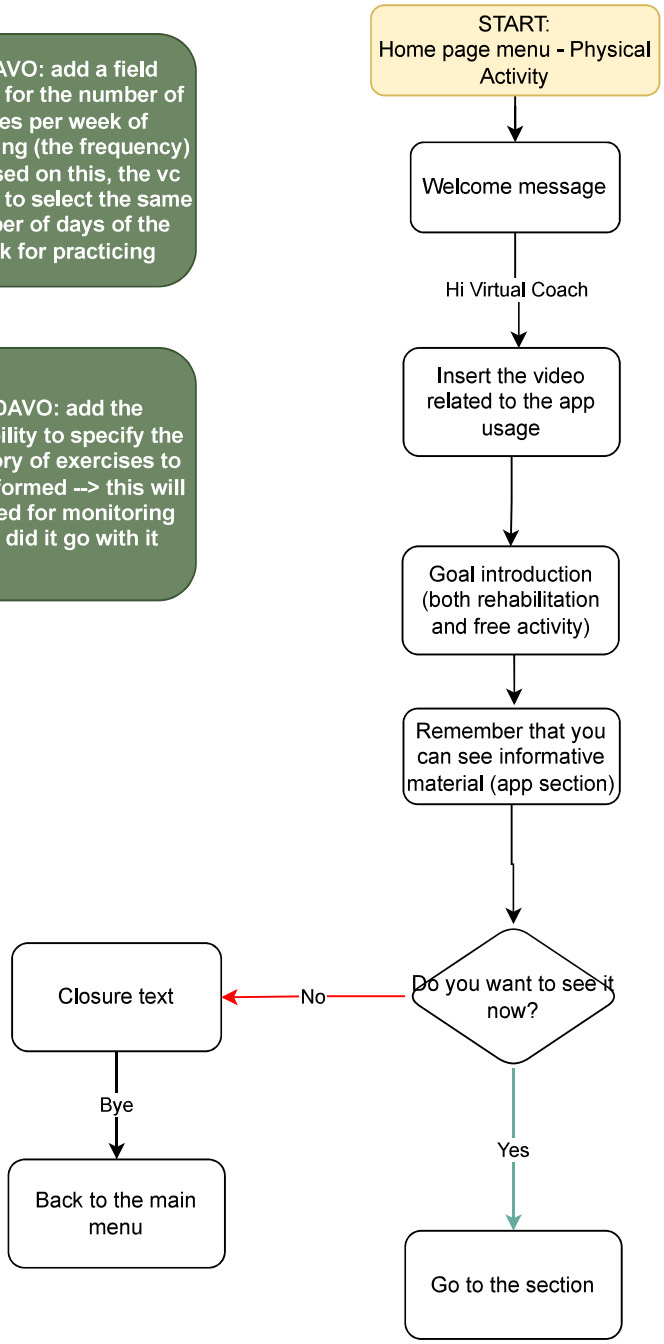
- The intervention is about education
- The patient can change maximum 3 focuses
- Every month they are asked if they want to change the focus and the frequency of interaction (it can be zero)
- Even if a focus is chosen, they will anyway receive (minor) inputs for the other topics

Physical Activity Introduction + goal

The virtual coach introduces the physical activity topic to the user.

VIDAVO: add a field asking for the number of times per week of practising (the frequency) --> based on this, the vc will ask to select the same number of days of the week for practicing

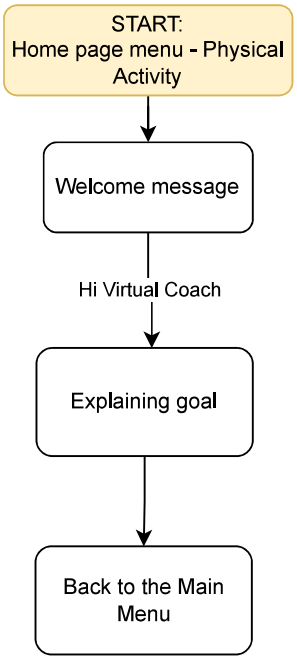
VIDAVO: add the possibility to specify the category of exercises to be performed --> this will be used for monitoring how did it go with it



Physical activity guidelines:

- 12 months of activities
- Once a month the medical student / research assistant will monitor the patient in the web app and then they will decide whether to call the patient or not
- Two types of physical activity: a) rehabilitation, b) free activity
- a) - prescribed, the goal is defined by the clinician (frequency and type of exercise, duration)
- a) the vc will check (monitor) the patient twice a week in the evening (Thursdays and Sundays)
- a) the goal lasts a month
- b) - check number of steps? only motivational based on subjective assessment? Wearable?
- b) send motivational messages + text (blog post) with an external link or an article/video in the material section of the app
- The motivational message is sent once a week (Sunday). This comes together with a feedback related to the b) free activity : if the compliance is 0 (then why no wearable used or why no data was input) - otherwise (with wearable) - above 5- 70% the message will be reinforcing, below it will be more encouraging. b) free activity (without wearable) - the 5- 70% is based on the ranking based on the images
- b) If there will be no wearables, then there will be 5 "images" related to the type of activity (e.g. bed, chair, walking, ...) that describe their day - this will be asked three times a week
- There will be a predefined time and date for vc interaction and the patient can decide to keep it as it is or modifying it
- Create an introductory video for defining how the app works

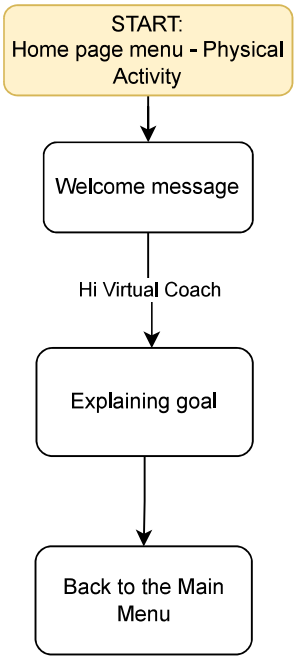
Medication adherence Introduction + goal



Physical activity guidelines:

- In the evening, the monitoring is sent to the patient to check if the medicines were taken
- The monitoring message is sent every day at 8.00 pm

Awareness
Introduction + goal

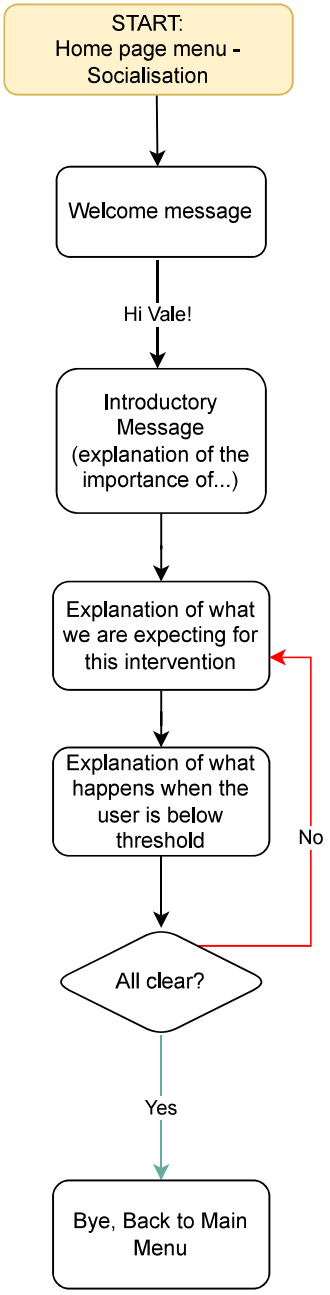


Awareness guidelines (stroke info):

- The intervention is about education
- The participant receives information on stroke, one 'fact' every Monday evening through notification. This lasts for 5 weeks
- After two months, the module is reviewed by asking what the participant thought of the module and information

Treviso Diagrams

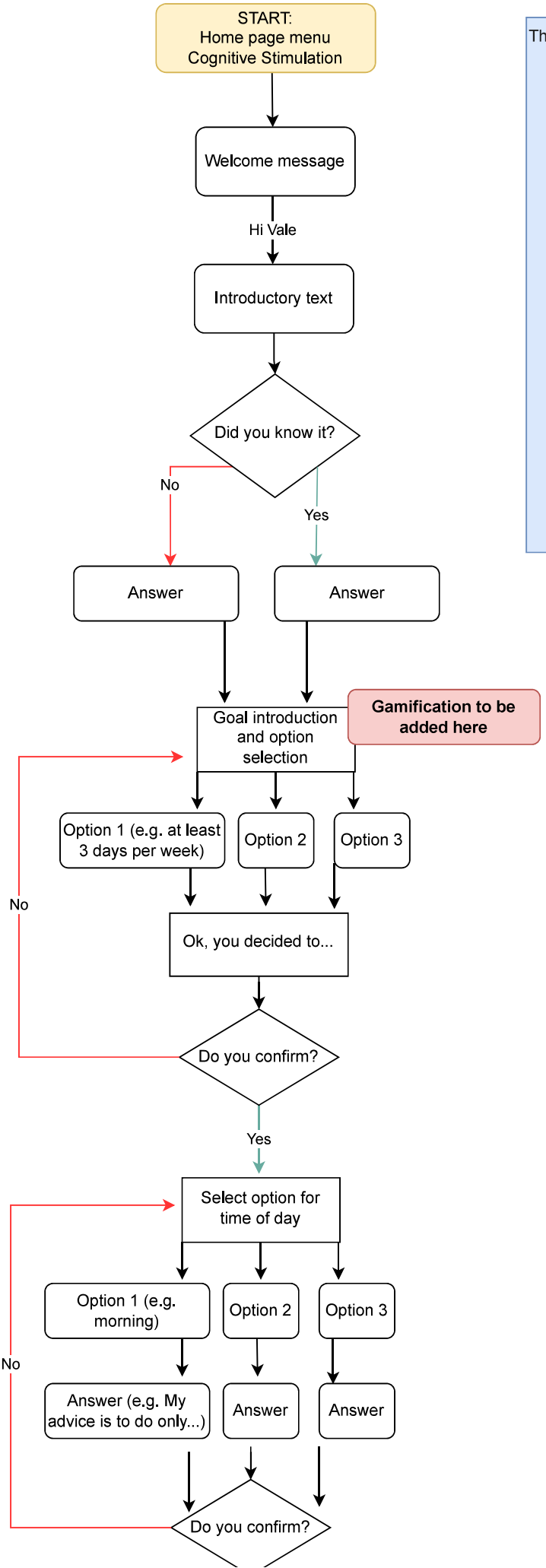
Socialisation Introduction



Intervention guidelines:

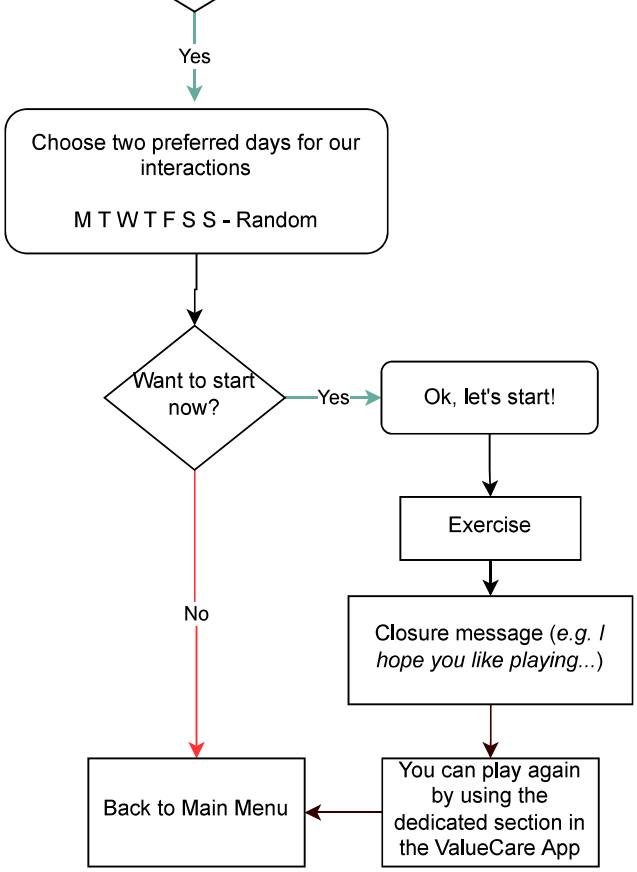
- During the interview at the beginning with the clinician, the user will define: a) if the user uses more calls, messages, or both; b) the average number of calls per day (the answer will be different ranges e.g. i) 0-2; ii) 3-4; iii) 5-and more) --> according to which the baseline will be defined; c) how many people do I message with? define a range e.g. i) 1-3; ii) more than 3
- General tips to be sent at the beginning of every week randomly
- The VC detects calls and messages at the end of each day --> only if detection is below a certain threshold at the end of the week it sends a specific tip / reminder

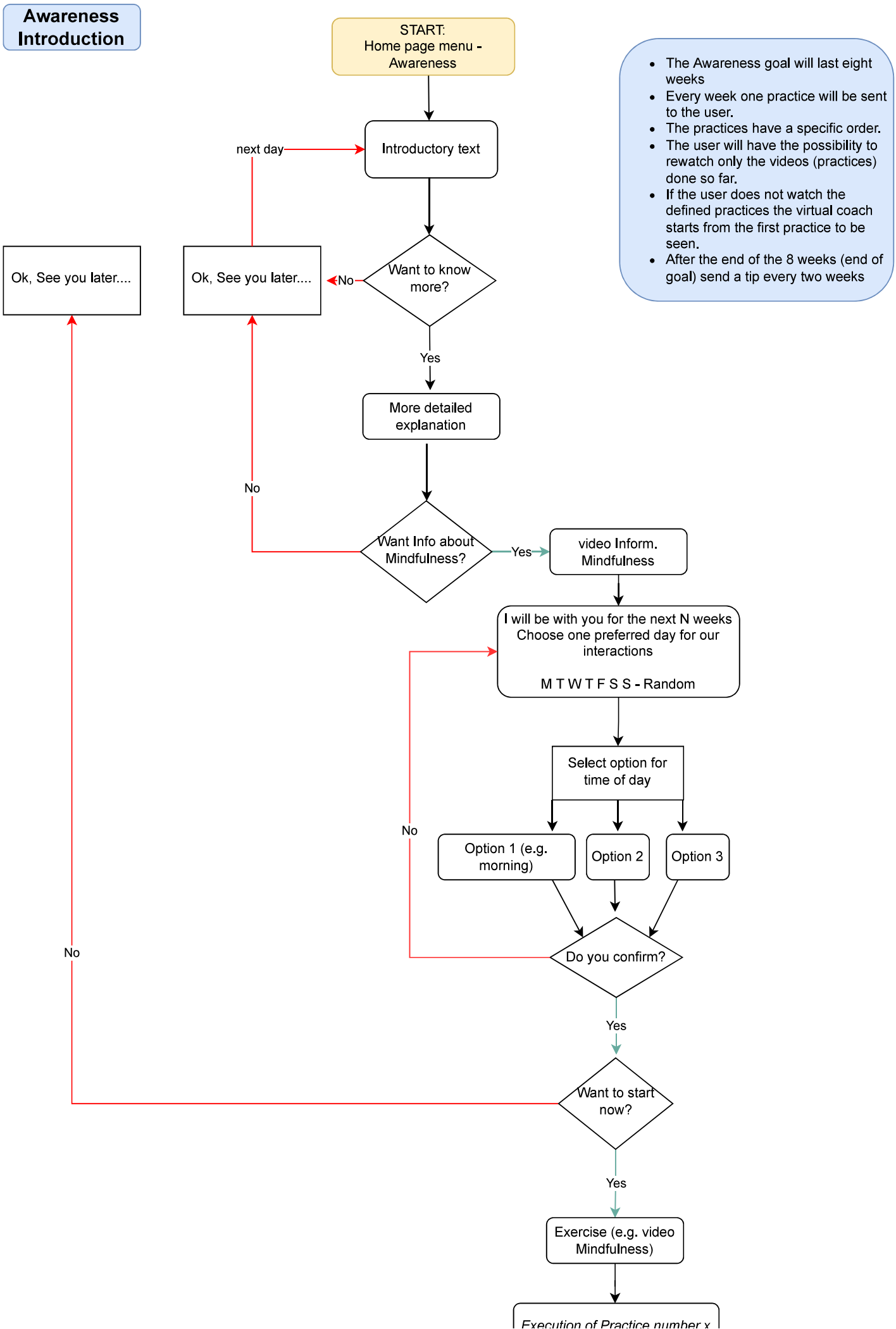
Cognitive Stim. Introduction

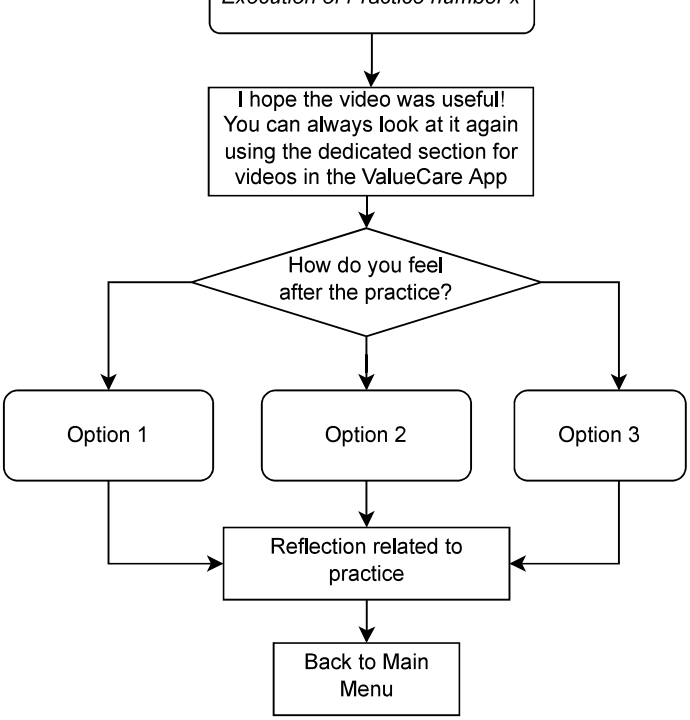


The intervention is structured as follows:

- There are four goals (corresponding to a different function to exercise --> memory, orientation, language, and executive functions)
- Every week a different function is trained
- At the end of each week the goal can be reset
- The games are available when they are unlocked
- Tips for practising to be sent only in case of non compliance
- After 3 weeks of non compliance, a message / mail is sent to clinician
- After 1 week of non compliance, a message / mail is sent to the informal caregiver
- The exact hour for reminder is morning 10 (11 reminder), afternoon 15 (16 reminder), evening 18 (19 reminder)
- Reward points to be assigned each week as follows: 0 points if no goals; 5 points if partially reached (20%-75%); 10 points if all was done (76%-100%).

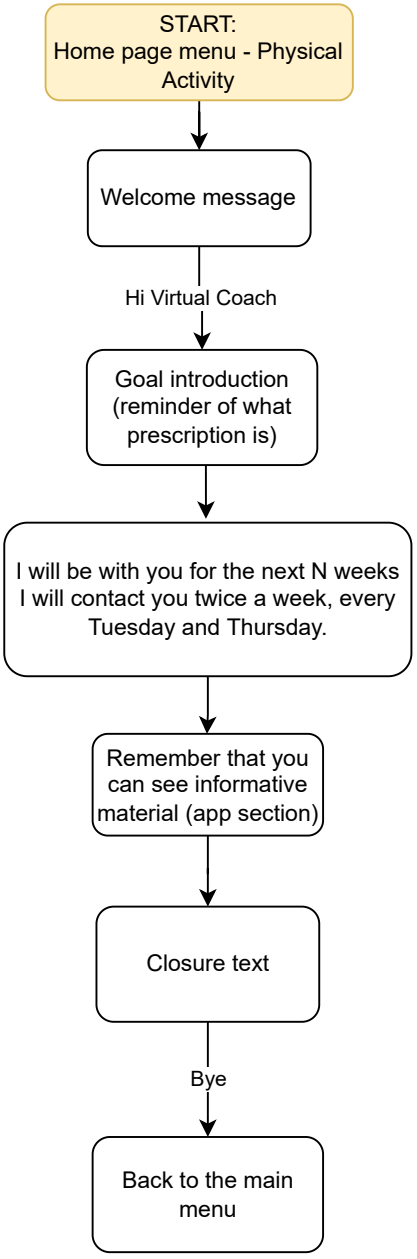

Yes
Choose two preferred days for our interactions
M T W T F S S - Random
Want to start now?
Yes
Ok, let's start!
Exercise
Closure message (e.g. I hope you like playing...)
No
Back to Main Menu
You can play again by using the dedicated section in the ValueCare App


Awareness Introduction
START: Home page menu - Awareness
The Awareness goal will last eight weeks
Every week one practice will be sent to the user.
The practices have a specific order.
The user will have the possibility to rewatch only the videos (practices) done so far.
If the user does not watch the defined practices the virtual coach starts from the first practice to be seen.
After the end of the 8 weeks (end of goal) send a tip every two weeks
Introductory text
next day
Want to know more?
No
Ok, See you later....
Ok, See you later....
Yes
More detailed explanation
No
Want Info about Mindfulness?
Yes
video Inform. Mindfulness
I will be with you for the next N weeks Choose one preferred day for our interactions
M T W T F S S - Random
Select option for time of day
Option 1 (e.g. morning)
Option 2
Option 3
No
Do you confirm?
No
Yes
Want to start now?
Yes
Exercise (e.g. video Mindfulness)
Execution of Practice number x


Execution of Practice number x
I hope the video was useful! You can always look at it again using the dedicated section for videos in the ValueCare App
How do you feel after the practice?
Option 1
Option 2
Option 3
Reflection related to practice
Back to Main Menu

Physical Activity Introduction + goal

The virtual coach introduces the physical activity topic to the user. The first goal was set by the clinicians in the Care Plan and the virtual coach presents it to the user.



Physical activity guidelines:

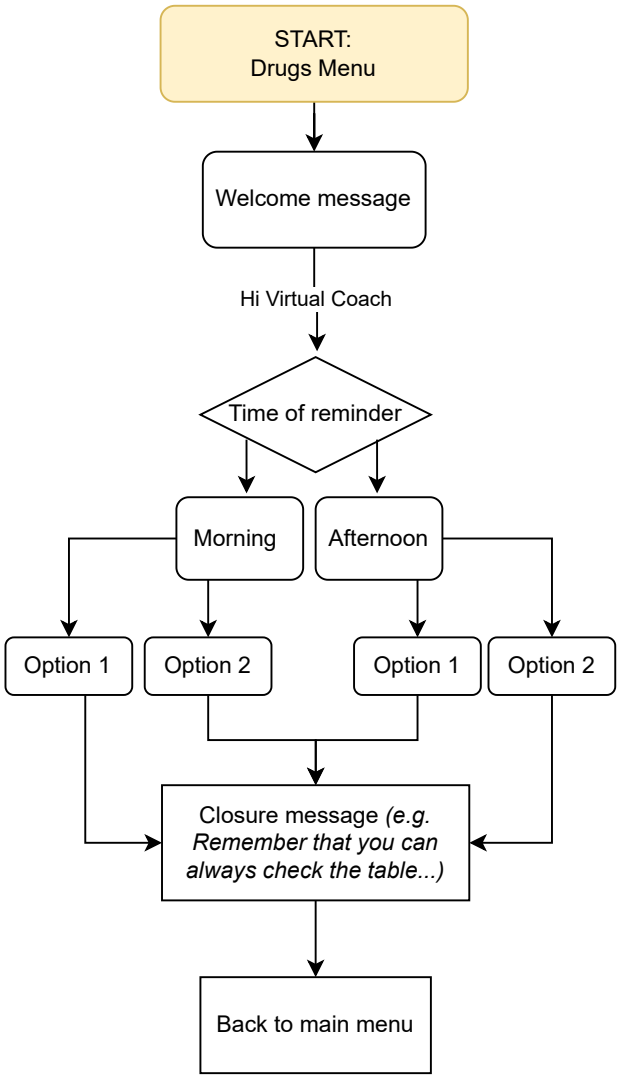
- Number of steps is the only measurement
- Engagement strategy: at the end of the week (Sunday) a positive message with their scoring
- Twice a week send motivational messages (notifications)
- More structured interaction only in the motivational part
- The first goal is set by the physician
- Then the default is to keep the same goal: otherwise, the goal can be reset by the clinician / researcher / user (if they want a lower goal ask why) on Monday
- The goal lasts one week
- Non compliance = after three days out of seven (consecutive or not)
- After non compliance to the goal a notification in the dashboard is sent to researcher / clinician and (optional) to the caregiver
- Vodafone --> add an app reminder to charge the smartwatch

Valencia Diagrams

Drugs Introduction

The user receives the notification to check the drug section for the first time.

Vidavo/Vodafone: send an alert to the informal caregiver if some or none drugs were taken



The intervention is structured as follows:

- The reminder is sent everyday (n.b. patients that do not have to take drugs everyday will not be enrolled in this specific intervention)
- The first time, the time is set by the patient
- At the end of the week, the patient can re-set the time of the reminder
- For the first week the time of input assesment is already pre-set (9.30 pm)
- Drugs monitoring: the patient can decide the frequency and time of the day for drugs monitoring (at the end of the week)
- Informal caregiver receives an email **(...)** if the user did not take all the drugs or some of them
- After 3 months the user can decide to reduce the frequency of the reminder / monitoring IF they were compliant more than 80%
- If the patient was below 80% compliance, after 3 more months this can be re-checked

Nutrition Introduction + goal

Vodafone Innovus --> add the images of the food categories

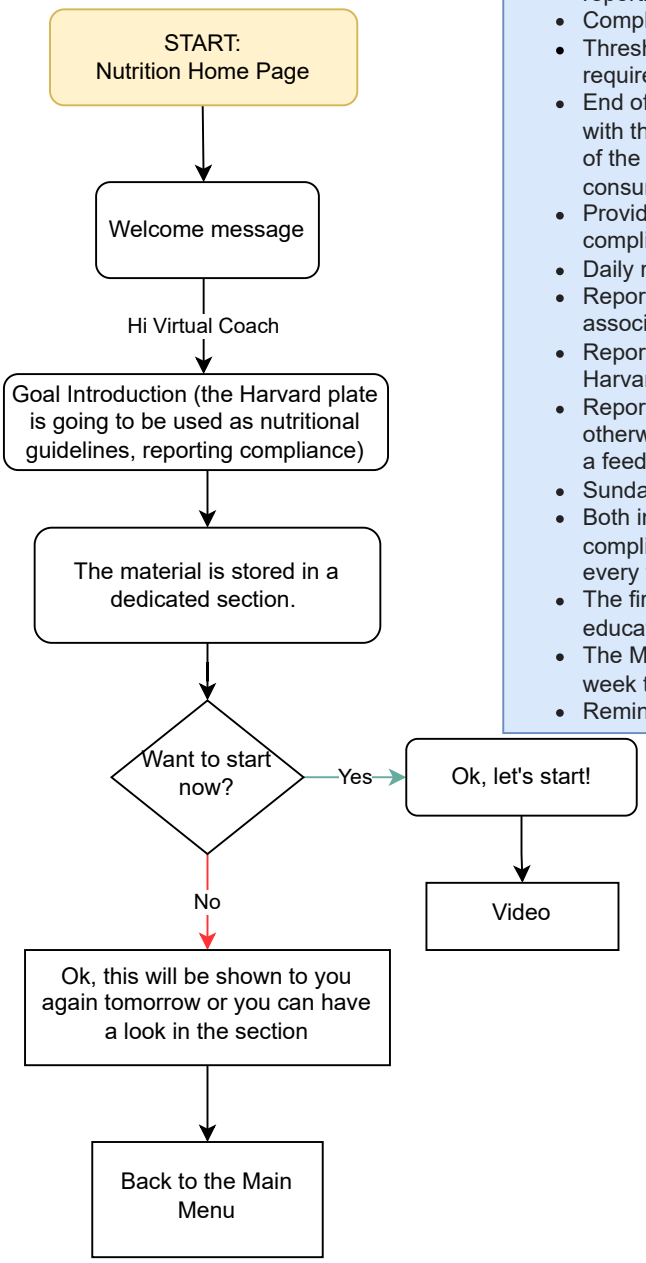
Vodafone Innovus --> make available the videos there were already presented --> make the first video available immediately. Is it possible to list them in a specific order?

Vodafone Innovus --> is it possible to have the video player embedded within the app / virtual coach? Or does it only point to an external player?

Vidavo --> have the weight progress of the patient

Vodafone Innovus - First Pie is the Harvard Plate - then the patient clicks and his own weekly Harvard Plate appears (together with bad consumption) + percentages

The virtual coach sends a notification on the first day for explaining the goals

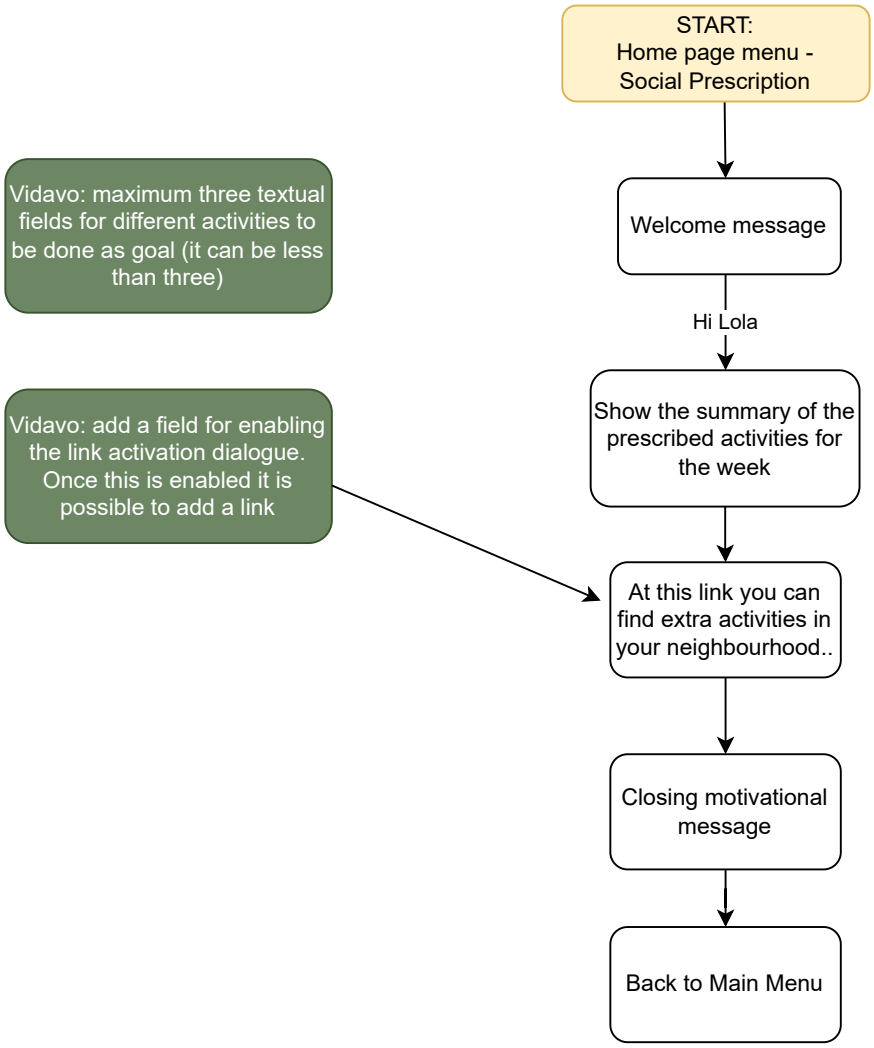


Intervention guidelines:

- Goals = follow the Harvard plate, reporting compliance
- Compliance weekly based, daily recorded
- Threshold for compliance = see doc requirements
- End of the week = show the user a "pie" with the proportion of the four categories of the Harvard plate in the week + bad consumption
- Provide feedback based on the overall compliance
- Daily reporting at 9.30 pm
- Reporting of number of meals (no goal associated, just useful for the clinician) +
- Reporting of the day food within the Harvard plate
- Reporting should be at least for 4 days - otherwise at the end of the week provide a feedback based on that
- Sunday --> review for compliance
- Both in case of non comp. and compliance they will see a new video every two weeks
- The first week will be dedicated to education
- The Monday after finishing the education week the monitoring will start
- Reminder to drink water in summer

Social Prescription Introduction - new goal activity

On Monday, the Virtual Coach will send a notification to check the app. The goal can be changed any time during the week by the professional, but it will be always initiated on Monday, after the completion of the "End of week" interaction



Intervention Guidelines

- Every two weeks the type of prescribed activity changes
- Once a week the Virtual Coach will ask how they feel
- The activities foreseen are different: attending events, calling / visit somebody
- Goal = follow the social prescription task (there is one activity per week, so the goal is either reached or not reached)
- The goal is set by care manager / Mirian
- Weekly assessment of the goals - the Virtual Coach will first remind what the goals were, and then it will ask the patient if he/she achieved the goal (partially, not reached, reached)
- The goal (activity) does not have a fixed duration - it can be changed every week

Physical Activity Introduction + new goal

The virtual coach introduces the physical activity topic to the user. The first goal was set by the clinicians in the Care Plan and the virtual coach presents it to the user.

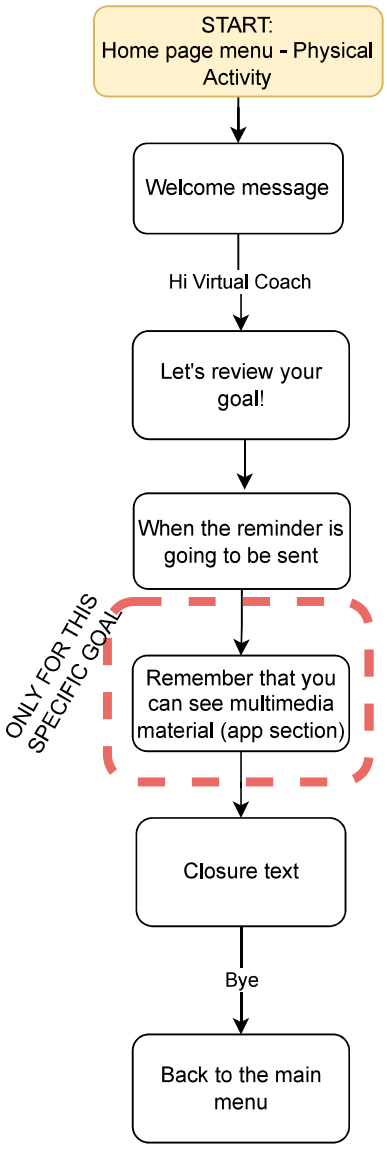
Vidavo: in dashboard section related to goal compliance the clinician can see the details - such as the motivation for non-compliance and the "other activities" done

Vidavo: two different types of goals - programmed vs free activity

Vidavo: the clinician sets the time and day of the reminder (for organised activities)

Vidavo/Vodafone: the clinician can add a new activity --> a new notification is triggered "you have a new activity planned"

Vidavo/Vodafone: the videos will be available only after they are prescribed. From that moment they will be always available



Physical activity guidelines:

- The intervention is related to general sport activity based on specific assignments (go to practice, video, walk, ...)
- The participant may be participating in free activities, programmed ones, or both
- The intervention is flexible for both participants and professionals
- Professionals will review the participant's performance every two weeks
- The first goal is set with the professional team (both in duration and type of goal)
- The clinician sets the time / day of reminder if the activity prescribed for that goal is an organised activity (e.g. nordic walking)
- If the goal is a free activity, then the reminder is sent on Wednesdays and Sundays at 9.30 am
- For organised activity, the patient will receive a monitoring on Fridays asking if he/she went to classes
- If the activity is walking (or any activity to be done e.g. 3 times a week) the virtual coach will monitor twice - on Wednesdays and Sundays (did you do your activity? yes - how many times?)
- The goal can be reached - partially reached - not reached
- On Sundays, there is the "End of week" interactions
- If it is a non-programmed activity, then the "End of week" interaction is asked right after the monitoring one
- Monitoring hours (Wednesdays, Fridays, Sundays) it's 9.30 pm (the same as medical adherence)