Appendix A. 5-2-1-0 example

Table 1 in the paper defined Elementary Compliance Reward instances for the 5, 2, 1, and 0 goals. The instance of *Elementary Compliance Reward* below defines the penalty for more than 3 fruit. We define this penalty in an indirect way. First, we define a reward for > 3 fruits a day (Fig. A-1) and then we wrap it with a Persistent Reward (Fig A-2) that "inverses" the initial reward, i.e., the Persistent Reward is activated only if the patient is NOT rewarded for eating too many fruits.

The penalty starts with the 4th fruit. However, because this Elementary Compliance Reward is not used on its own, but is only check as part of a complex pattern that awards for perfect behavior of 5-2-1-0, the "provide_reward" property is assigned the value of false.

Figure A-1. Example of an instance of *Elementary Compliance Reward* "More than 3 fruit a day"

The four instances of Table 1 in the paper, and the instance above, are each "wrapped" as a *Persistent Elementary Pattern Reward*, so that they could be combined further by Logical_Combination_Reward. See an example below.

Figure A-2. Persistent Elementary Pattern Reward which "wraps" the More Than Three Fruits a Day instance.

The instance of Logical Combination Reward below presents an extra award for a perfect behavior of all four 5-2-1-0 and in additional not more than 3 fruit that day.

Figure A-3. Logical Elementary Pattern Reward for a perfect 5210 behavior during one day

Appendix B. A mechanism to retrieve FHIR resources required to calculate reward scores

It is relatively easy to build a mechanism to retrieve FHIR resources required to calculate scores associated with specific rewards. It would employ tagging specific instances of rewards with codes coming from the standardized terminology (e.g., SNOMED CT) and used in Observation resources (the code property) to identify information characterizing a specific activity (e.g., the duration of a session). When calculating the score for a particular patient and reward, we retrieve Observation resources matching the patient, the code, and the time interval associated with the reward, and then check the value property to get relevant session information.

A prototype solution was implemented within the CAPABLE system. For example, rewards for the walking activity were tagged with the 308931006 code from SNOMED-CT, as this code was used in all Observation resources capturing information about this activity. To check for the milestone reward, we retrieved all walking Observations for a given patient, while for the medal rewards only those from the last week.

Appendix C. Rewards defined for the CAPABLE Project

Rewards are used to notify the patients on the achievements he/she reached by performing capsules (activities -- in this document we use both terms interchangeably). In CAPABLE, rewards can be related to single activities or to a specific goal (that includes more activities).
When a patient is enrolled, the oncologist is able to prescribe some goals and/or activities to the patient through the dashboard.

The recommended frequency for each capsule is reported in Table 1.

Table 1

Capsule	Frequency / scheduling
Tai Chi	Every day
Yoga	Every day

Breathing Exercise	Every day
Imagery training	Every day
Physical activity promotion	Every day
My Usual Walk	3 times a week
Garden Bowl	Once a week
Vase of Gratitude	Once a week
Photo Voice	Once a week
Educational Material	Once a week

Definition of Reward Patterns

We define the following 5 types of rewards:
- Milestones: achievement that is assigned when a patient reaches a significant number of activities of the same type (e.g. 50 times Tai Chi)
- Weekly Medals for capsules (Gold, Silver, Bronze): achievement that is assigned when the patient is compliant to the prescription of a single activity that has a scheduling frequency of "Every Day" or "3 times per week", according to the rules described in Table 3.
- Weekly badges for capsules: achievement that is assigned when the patient is compliant to the prescription of a single activity that has a scheduling frequency of "Once a week".
- Weekly badges for goals: achievement that is assigned when the patient is compliant to the prescription of a goal, see rules below
- Monthly reward: achievement that is assigned when the patient is getting at least one achievement per week for three weeks in one calendar month.

Rules for the definition of milestones. See Table 2.

Table 2. Rules for the definition of milestones for each capsule.

Capsule	Milestones to be rewarded
Tai Chi	5,10, 20, 30, 50, 100
Yoga	5,10, 20, 30, 50, 100
Breathing Exercise	5,10, 20, 30, 50, 100
Physical activity promotion	5,10, 20, 30, 50, 100
My Usual Walk	5,10, 20, 30, 50, 100
Imagery training	5,10, 20, 30, 50, 100

Garden Bowl	5,10, 20, 30, 50, 100
Vase of Gratitude	5,10, 20, 30, 50, 100
Photo Voice	5,10, 20, 30, 50, 100

Rules for the definition of weekly medals and weekly badges for capsules - see Table 3.

Table 3. Rules for the definition of weekly medals or badges for capsules.

Frequency of the Capsule	Gold Medal (number of times in one week)	Silver Medal (number of times in one week)	Bronze Medal (number of times in one week)	Weekly Badge
Every Day	6	4	2	-
3 times per week	3	2	1	-
Once a week				✅

IMPORTANT: when computing weekly rewards, we consider the entire week as going from Monday to Sunday (so the patient will receive the rewards on Sunday night). If a capsule is activated during the week, for the first days (until the first Sunday after activation) the patient will receive a motivational message to continue using the capsule and receive rewards.

Rules for the definition of weekly badges for goals
Each week, we will consider all the activities that are associated with a goal and we will compute:
- The total number of occurrences of activities that have to be performed every day (regardless of their type)
- The total number of occurrences of activities that have to be performed 3 times per week
- The total number of occurrences of activities that have to be performed once week

Then we check if medals or badges could be assigned within the above three frequency categories (we use the rules from Table 3). If a medal or a badge would be assigned to the patient, then a weekly badge for the goal is given to the patient.

Rules for the definition of monthly rewards.
A patient will be assigned a monthly reward if he has been able to reach at least one weekly medal/badge for at least 3 weeks over a calendar month.

Icons and Text Messages for Rewards

Each achievement will have an icon on the app and a text related to it. The icons and messages are shown in Table 4.

Table 4. Text for different reward type

Reward	Icon	Text to be associated with the reward
Milestone	TBD	You did <activityName> X times. Great job!
Gold medal for capsule (weekly)	TBD	Congratulations! You received a gold medal for <activityName>! You completed the activity x out of y times this week!
Silver Medal for capsule (weekly)	TBD	Congratulations! You received a silver medal for <activityName>! You completed the activity x out of y times this week!
Bronze medal for capsule (weekly)	TBD	Congratulations! You received a bronze medal for <activityName>! You completed the activity x out of y times this week!
Weekly badge for capsule	TBD	***You completed the activity related to your <CapsuleName> this week. Great job!***
Weekly badge for goal	TBD	***You completed the activities related to your <GoalName> goal this week. Great job!*** ***You worked well on your <GoalName> this week. Congratulations!***
Monthly reward	TBD	Congratulations! You received a monthly reward! You got medals for three weeks this month!

Appendix D. Demographics of participants in the experiment

Group	Control	Intervention
#participants	25	29
Gender: Male	12 (48%)	14 (48.3%)
Female	12 (48%)	14 (48.3%)
Prefer not to say	1 (4%)	1 (3.4%)
Language spoken at home: Arabic	22 (88%)	26 (90%)
Hebrew	2 (8%)	2 (7%)
Other	1 (4%)	1 (3%)
Age group: 21-25	22 (88%)	26 (86%)
26-30	2 (12%)	4 (14%)