D7.3 MARIO 2 Operational and User Manual

Project Acronym:	**MARIO**
Project Title:	**Managing active and healthy aging with use of caring service robots**
Project Number:	**643808**
Call:	**H2020-PHC-2014-single-stage**
Topic:	**PHC-19-2014**
Type of Action:	**RIA**

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D7.3

Work Package:	WP7 Integration, Testing & Iterative Development	
Due Date:		Month 32
Submission Date:		30th November 2017
Start Date of Project:		1st February 2014
Duration of Project:		36 Months
Organisation Responsible of Deliverable:		RUR Robots
Version:		1.0
Status:		Final
Author name(s):	John Foley	Institution RUR
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Nature:	☒ R – Report ☐ P – Prototype ☐ D – Demonstrator ☐ O - Other	
Dissemination level:	☒ PU - Public ☐ CO - Confidential, only for members of the consortium (including the Commission) ☐ RE - Restricted to a group specified by the consortium (including the Commission Services)	
Project co-funded by the European Commission within the Horizon 2020 Programme (2014-2020)		

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Revision history			
Version	**Date**	**Modified by**	**Comments**
0.9	11/9/2017	J Foley	Initial version for review
0.91	26/9/2017	Aimee Teare, (Stockport)	Provided updates
0.92	28/9/2017	Megan Burke (NUI Galway)	Provided updates
0.93	28/9/2017	Alessandro Russo (CNR), Grazia D'Onofrio, Francesco Giuliani, Antonio Greco and Francesco Ricciardi (IRCCS)	Information on CGA Application added
0.94	6/10/2017	Aimee Teare (Stockport).	Updated start-up sequence to remove unnecessary manual steps.
0.95	11/10/2017	J Foley	Improvements to formatting.
0.96	24/10/2017	Aimee Teare (Stockport).	Some images updated
0.97	30/10/2017	Alessandro Russo (CNR).	Section on Motion Subsystem and Approach Behaviour added after input from
0.98	23/11/2017	Geoff Pegman (RUR)	Section 1 updated with input
0.99	23/11/17	Aisling Dolan NUI Galway	Formatting & content updates
1.00	27/11/2017	J Foley (RUR)	Merged changes from version 0.97 and 0.98.

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Executive Summary (1 Page Max)

This is the MARIO 2 Operational and User Manual (Deliverable D7.3) for the MARIO system. It is targeted at the caregivers operating at the pilot sites.

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1. Introduction

The objective of this work is to document the use of the MARIO system both as a guide for users of the system and as an explanation of user-accessible functionality available. It is intended that readers of the manual should need little to no knowledge of the MARIO system in order for the document to be understandable.

The key outcome is the user manual itself, which is a self-contained document, albeit one that builds upon all the technical work carried out within the MARIO project.

1.1. Work Package 7 Objectives

Work package 7 focuses on the system level delivery of competent robots to the various validation sites and has three primary roles to fulfil:

1. The integration and test of the various subsystems to provide the validation sites with a robust first version of the robot system.
2. The ongoing support to the validation sites to assist with any operational problems and to fix problems with intended functionality.
3. To perform a system wide upgrade, based on the first round of validation sites, incorporating new or changed functionality as appropriate to support the final round of validation trials.

This document supports the second objective and specifically supports one of the objectives of Task 7.1, vis the production of a user manual for the pilot sites.

1.2. Purpose and Target Group of the Deliverable

The purpose of this document is to explain to the user accessible functionality of the MARIO system and how this is accessed through the MARIO Human-Robot interfaces.

The document is meant as a guide to the Pilot Site users as well as a general guide to the wider community on the functionality and user interface of the MARIO companion system.

1.3. Relations to other Activities in the Project

As this user manual documents the final version of the MARIO system, it encompasses nearly all of the technical work undertaken within Work Packages 2-7.

1.4. Document Outline

Section 2 provides an outline of the basics of starting up, shutting down, charging and moving the robot. Section 3 provides a detailed guide to configuring the MARIO robot and selecting preferences while Section 4 provides a detailed step by step guide to the use of the MARIO system. Finally, Appendix A provides technical data on the system together with information on changing the hand controller batteries.

1.5. About MARIO

MARIO addresses the difficult challenges of loneliness, isolation and dementia in older persons through innovative and multi-faceted inventions delivered by service robots. The

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effects of these conditions are severe and life-limiting. They burden individuals and societal support systems. Human intervention is costly but the severity can be prevented and/or mitigated by simple changes in self-perception and brain stimulation mediated by robots.

From this unique combination, clear advances are made in the use of semantic data analytics, personal interaction, and unique applications tailored to better connect older persons to their care providers, community, own social circle and also to their personal interests. Each objective is developed with a focus on loneliness, isolation and dementia. The impact centres on deep progress toward EU scientific and market leadership in service robots and a user driven solution for this major societal challenge. The competitive advantage is the ability to treat tough challenges appropriately. In addition, a clear path has been developed on how to bring MARIO solutions to the end users through market deployment.

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2. Overview

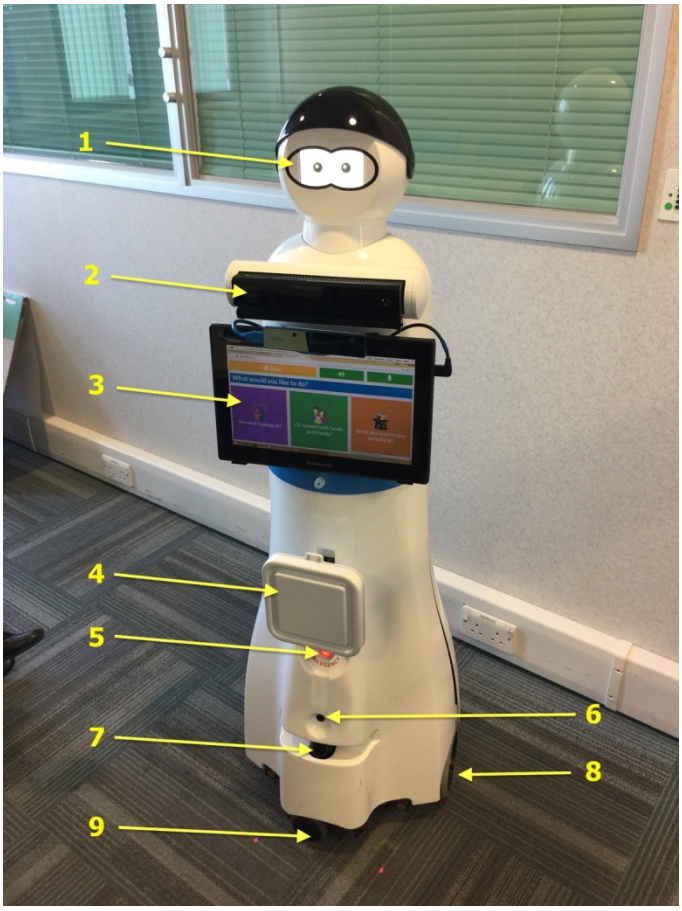

Figure 2-1: Overview of the MARIO Robot

Figure 2-1 shows the MARIO robot and its main features as described in Table 1.

Item	Description
1	Eyes screen
2	Kinect 2 (including camera and microphone)
3	Touch Screen
4	RFID Antenna
5	Emergency call button
6	Video camera
7	Navigation laser
8	Driving wheel
9	Castor wheel

Table 1: MARIO Features

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2.1. Starting up the robot

To start MARIO you first need to access the control panel (shown in Figure 2-2) by removing the cover plate at the back. This is achieved by pressing on the side of the cover so that it rotates outward.

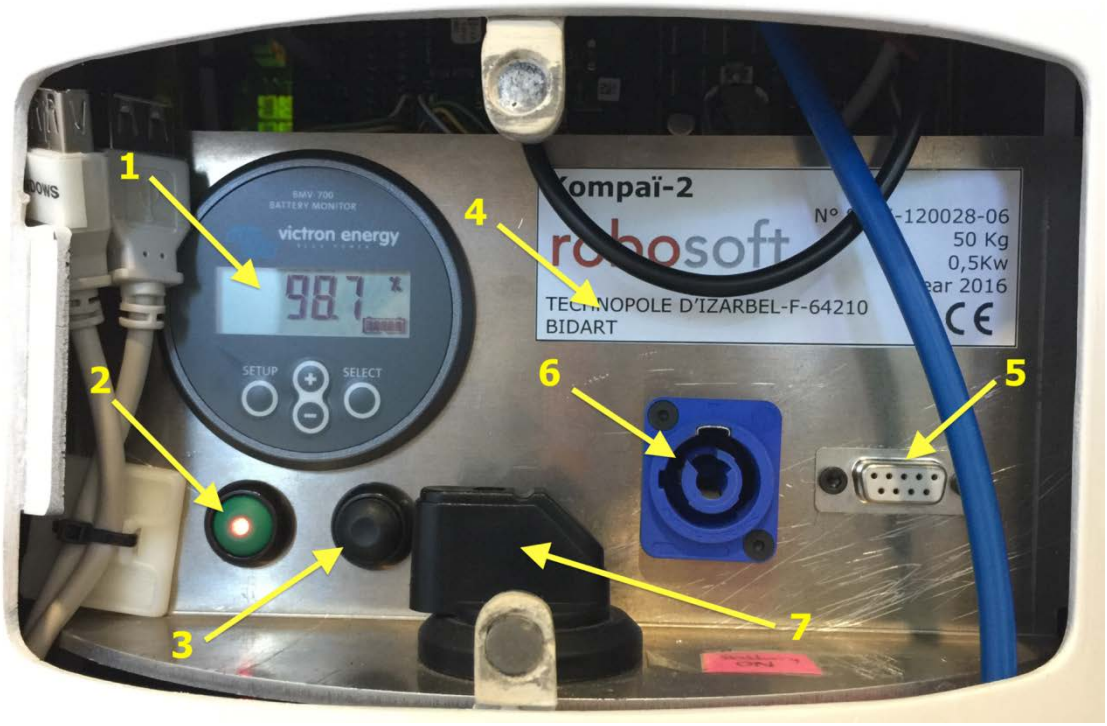


Figure 2-2: MARIO Control Panel

Table 2 lists all the control panel functions.

Item	Description
1	Battery controller
2	ON/OFF button
3	Brake release button
4	Product information label
5	CAN socket
6	Charging socket
7	Battery switch

Table 2: MARIO Control Panel Functions

Table 3 lists the steps needed to power up the MARIO robot. Once this procedure is completed, the MARIO software must be started separately as described in section 3.1 below.

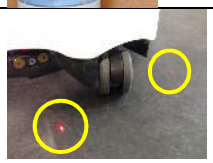
Item	Description	
1	The brake release button must be released.	
2	Check that the battery cut switch is in the OFF position.	
3	Check the robot's battery level on the battery control panel.	
4	Press on the ON/OFF button, a red LED will turn on.	
5	In Manual Mode: Take the Xbox controller in your hand and press the central button. The central light of the controller turns for few seconds and will stop on the upper left dial.	
6	The eyes and touch screen turns on.	
7	The floor detectors and SOS buttons turn on as well.	

Table 3: MARIO Startup Sequence

2.2. Shutting down the robot

This should be done only after the MARIO PC has been properly shut down using the Windows shutdown procedure as you would do on any Windows 10 computer. This ensures that any changes to settings - for example screen timeouts - are safely saved to disk and available the next time the MARIO PC powers up. The LED of the ON/OFF button, the eyes and screen, the floor lasers, and the SOS button turn off.

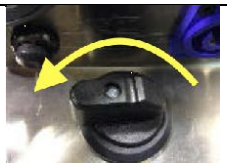
Number	Description	
1	Press the ON/OFF button	
2	Put the battery cut switch on the OFF position (only when turning off the robot for long periods)	

Table 4: MARIO Shutdown Sequence

2.3. Charging the batteries

The batteries can either be charged using the charging cable or via the optional docking station.

The current practice is to manage battery levels manually by reading the battery level monitor and recharging via the charging cable when necessary. However, the intended behaviour is that the robot should warn automatically that recharge is needed when the battery level is at 40%, (but not interrupt its operation at that time), and when the batteries reach the 35% critical battery level the robot should either return to its docking station or the charging cable must be used (as the robot will interrupt its operation).

Note that these percentages are used to preserve battery life.

When the batteries are charged to about 70% the robot should have enough charge to function for approximately a day.

Also note that when the charging cable is inserted the cable must be turned to lock it into position (and likewise to release it).

2.3.1 The docking station

Figure 2-3: The Docking Station

The docking station is an optional feature. An example is shown in Figure 2-3.

The docking station can be used either:

a) by the user manually driving the robot to the station using the hand controller, or
b) when the robot drives itself to the docking station. This requires the robot to be working in Automatic mode.

2.3.2 The Charging Cable

The charging cable needs to be plugged into the control panel as shown in Figure 2-4:

Figure 2-4: Control Panel with charging cable in place

Note that the charging cable plug needs to be pushed into place and then turned right until it locks.

Never simultaneously use the docking station and the charging cable. This will lead to serious damage to the robot.

2.4. Driving the robot in manual mode

Two manual modes are available, one with the help of the Xbox hand controller provided with the robot. In this last mode, the speed of the robot is significantly slower for security reasons. The hand controller is used to:

a) Enable the robot to start moving: see item 5, Table 3.
b) To drive the robot.

To drive the robot the hand controller is operated as follows:

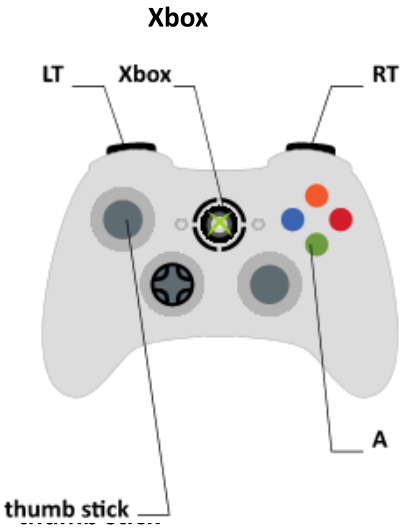


Figure 2-5: The MARIO Hand Controller

Action	Button
Power ON the hand controller	Xbox Button
Go forward	RT and green A button
Go Backward	LT and green A button
Turn Right	Right on left thumb stick and green A button
Turn Left	Left on left thumb stick and green A button

Table 5: MARIO Hand Controller functions

The controller switches itself off after it is not used for a small period.

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2.5. Troubleshooting

The robot is not responding to the controller

1) Is the robot on?
2) Does the controller require new batteries?

The robot is not turning-on

1) Does it have enough battery power?
2) Is the battery cut switch turned on?

The robot won't move

1) Is it controllable by the controller? If not, does the controller need new batteries?
2) Is there an obstacle or a drop in its path?
3) Are the external sensors turned on?

The screen doesn't turn on

1) Is the robot on?
2) What is the intensity of luminosity?
3) Is the screen's power cord unplugged? Damaged?

The robot's sound doesn't work

1) How loud is the sound turned up?

The robot is not responding to verbal commands

1) Ensure that the default microphone is configured correctly.

The robot isn't connecting to the internet

1) Is its Wi-Fi on? Check the Windows 10 Wi-Fi and proxy settings.
2) Does the Internet connection work?

The PCs aren't turning on

1) Is the robot on? Check the rear control panel.
2) Check the batteries are charged.

Please be aware that the robot cannot do the following:

1) Be used outside
2) Go up or down stairs
3) Open doors
4) Stop for obstacles which it cannot detect

2.6. Safety Rules

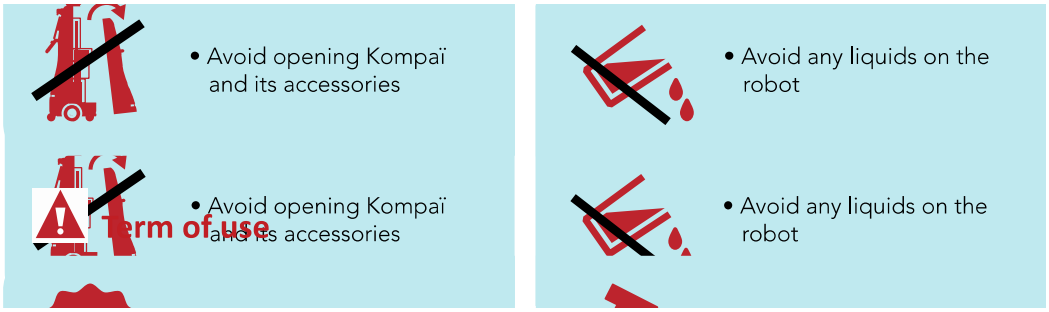


Figure 2-6: Safety Rules

2.7. Terms of use

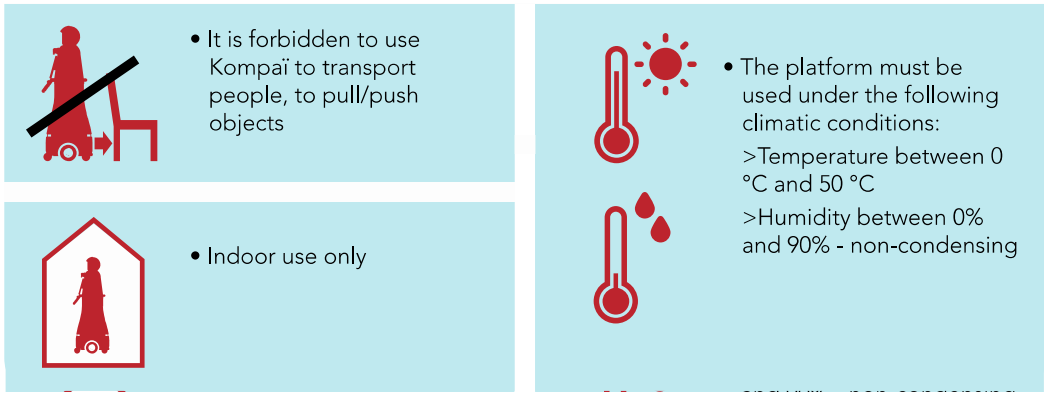


Figure 2-7: Terms of Use

3. The MARIO Software

3.1. Starting the MARIO Software

Once the robot has been powered up (as described in the Overview above) the MARIO software needs to be started up.

The procedure for this is shown below.

1) Switch the robot on (as described in Section 2).
2) Once the startup has finished, the caregiver screen will appear as in Figure 3-1. This screen provides four options:
   a. User Selection/Setup (in the **Open User Profile** Window ①),
   b. Patient Setup (via the **Patient** menu in the left-hand menu bar ②),
   c. MARIO Application setup, (via the **MARIO Apps** menu in the left-hand menu bar ③) and
   d. Launching the Main MARIO application (via the green **Launch MARIO!** button at the bottom left ④).

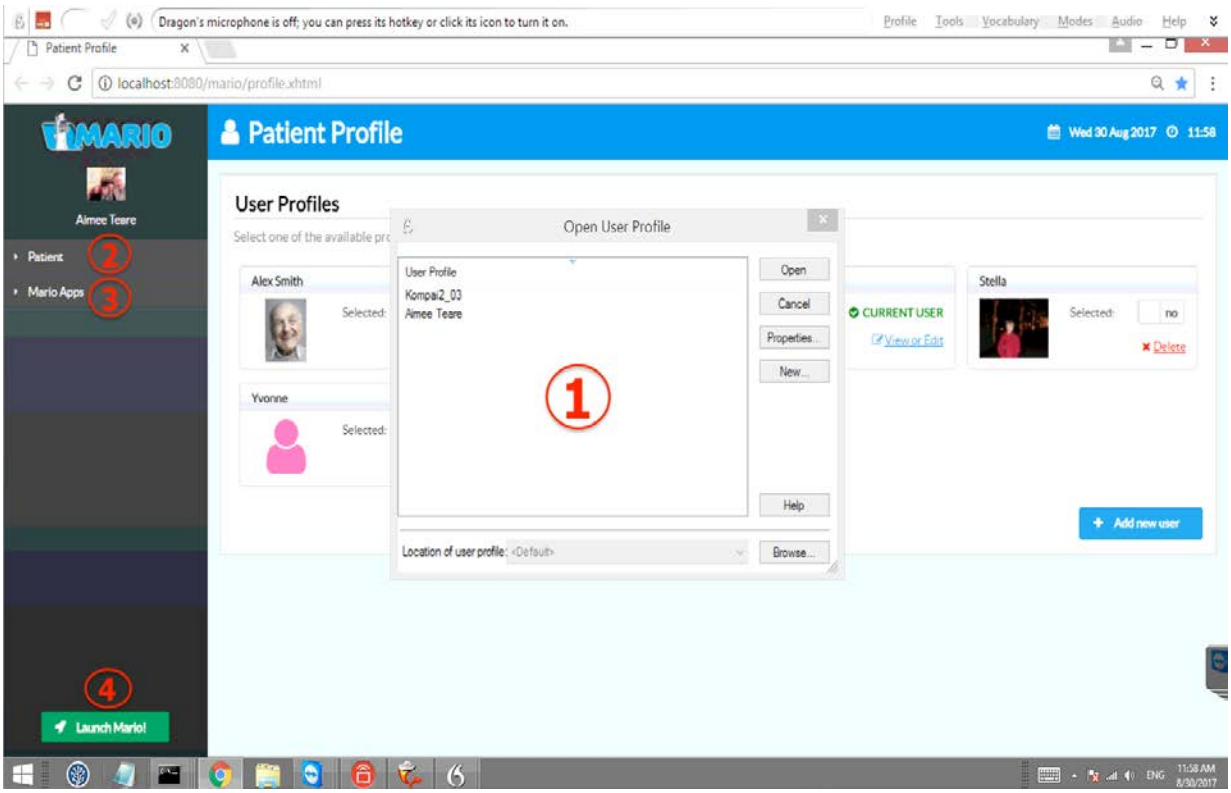


Figure 3-1: Patient Profile screen.

Note that Option d) is the "normal" default; the other options are only exceptionally entered when setting up or updating options for a patient.

3) A connection to the local Wi-Fi network needs to be established. Most of the time this will be automatic, but it is worth checking this by opening a web browser and accessing a favourite website. If there is a problem, use the Windows 10 control

panel to select the appropriate network and password. The details of this will vary (and may occur automatically).

Before it is possible to proceed further one of the users in the User Profile dialog box must be chosen (and confirmed via the **Open** button). This is used to tell the system which voice recognition profile to use when recognising and responding to voice commands.

Figure 3-2 shows the User Profile screen which appears after the User Profile has been selected.

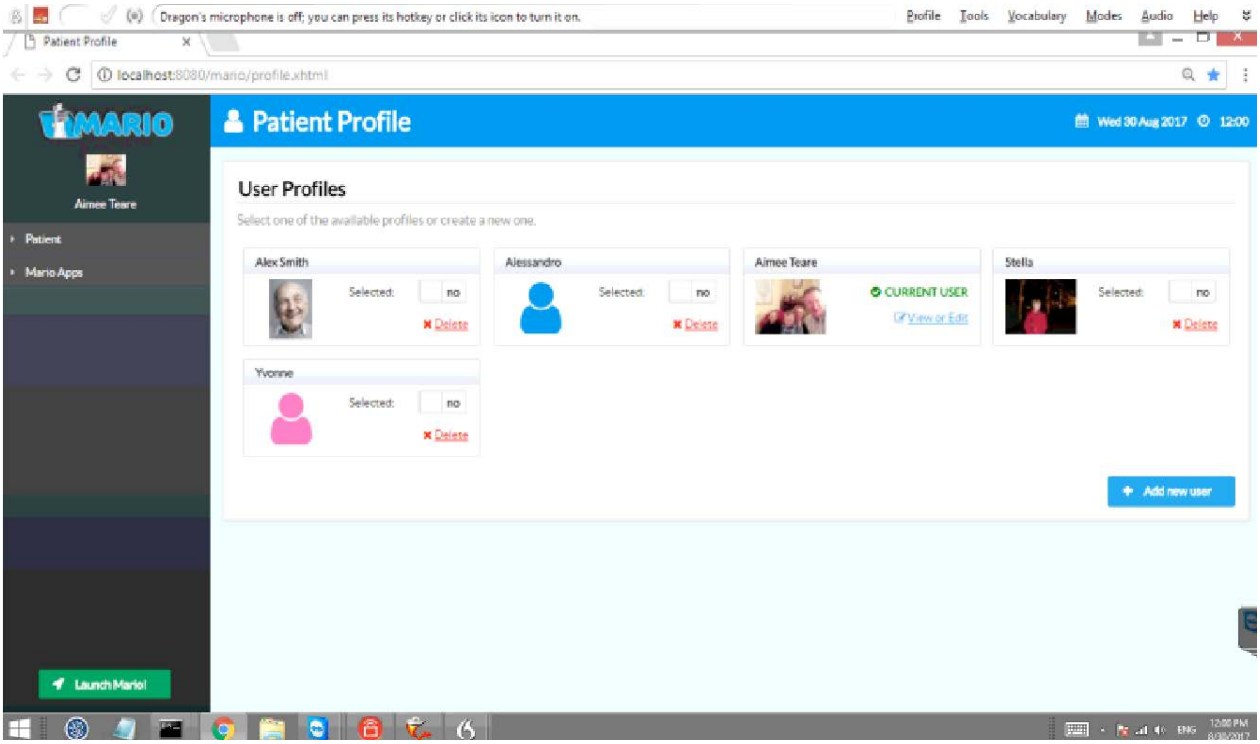


Figure 3-2: User Profiles Screen after User Profile Confirmation

The remaining options are described further below.

3.2. Patient Setup

Figure 3-3 shows the screen when a Patient is chosen. The details for the selected patient can be entered or modified by clicking on the **View or Edit** link underneath the green **CURRENT USER** label. Note that the other patients all have a **Delete** link which can be used to remove their accounts. Also, a new patient can be created using the **Add new user** button.

Clicking on the **View or Edit** or **Add new user** link results in an edit screen as shown in Figure 3-3:

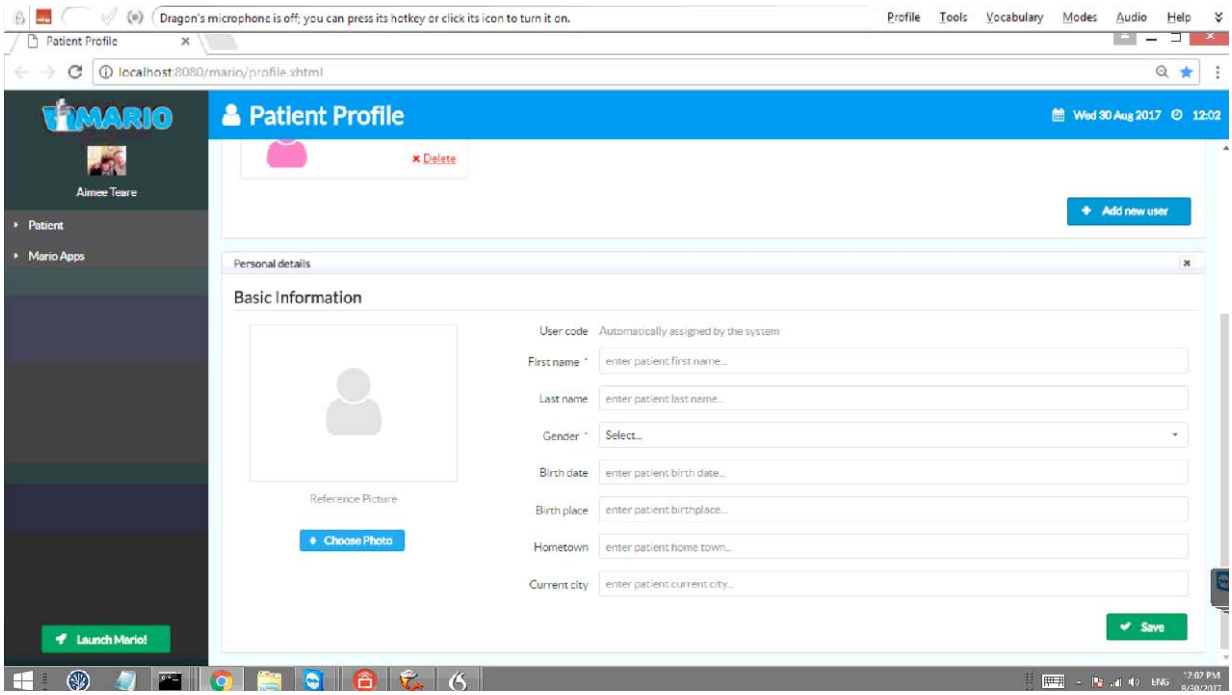


Figure 3-3: User Profile Edit Screen.

Note that there are two compulsory fields (First name and Gender) which are marked with an asterisk as a reminder.

It is possible to associate an image with a user. This is selected using the **Choose Photo** button, as shown in Figure 3-4.

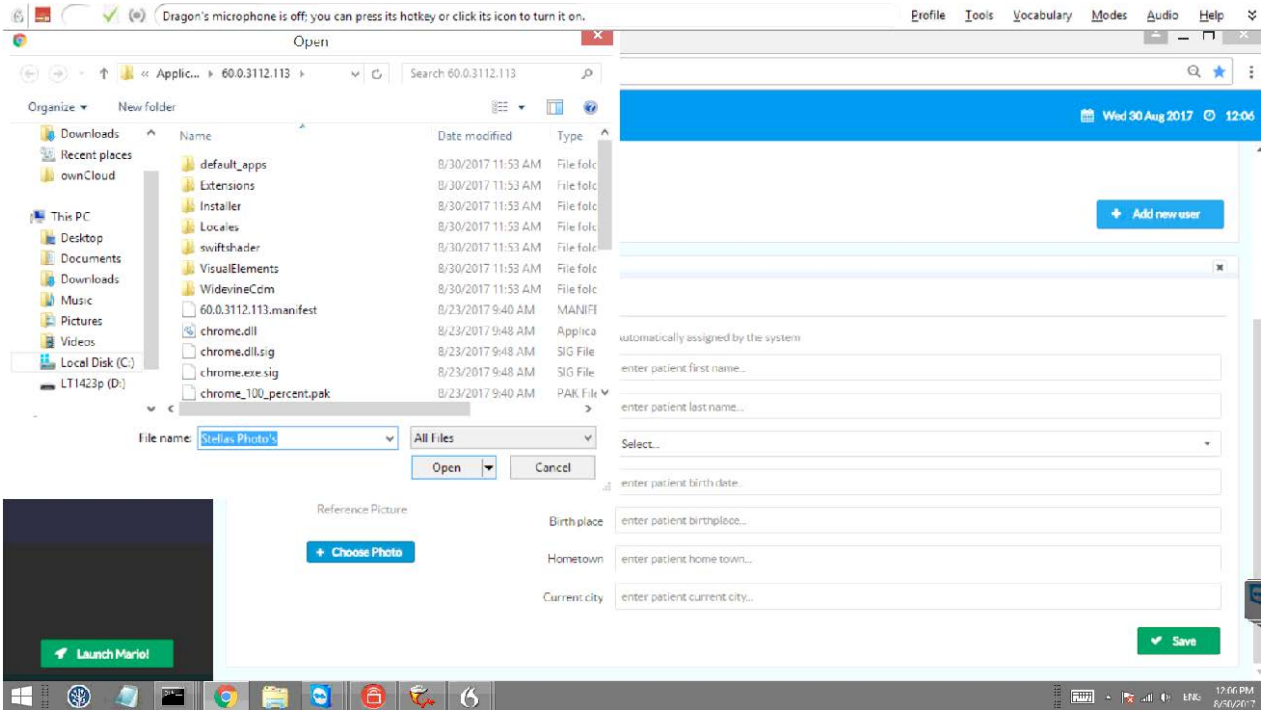


*Figure 3-4: User **Choose Photo** screen.*

Once the various fields have been suitably edited, the changes are saved using the **Save** button.

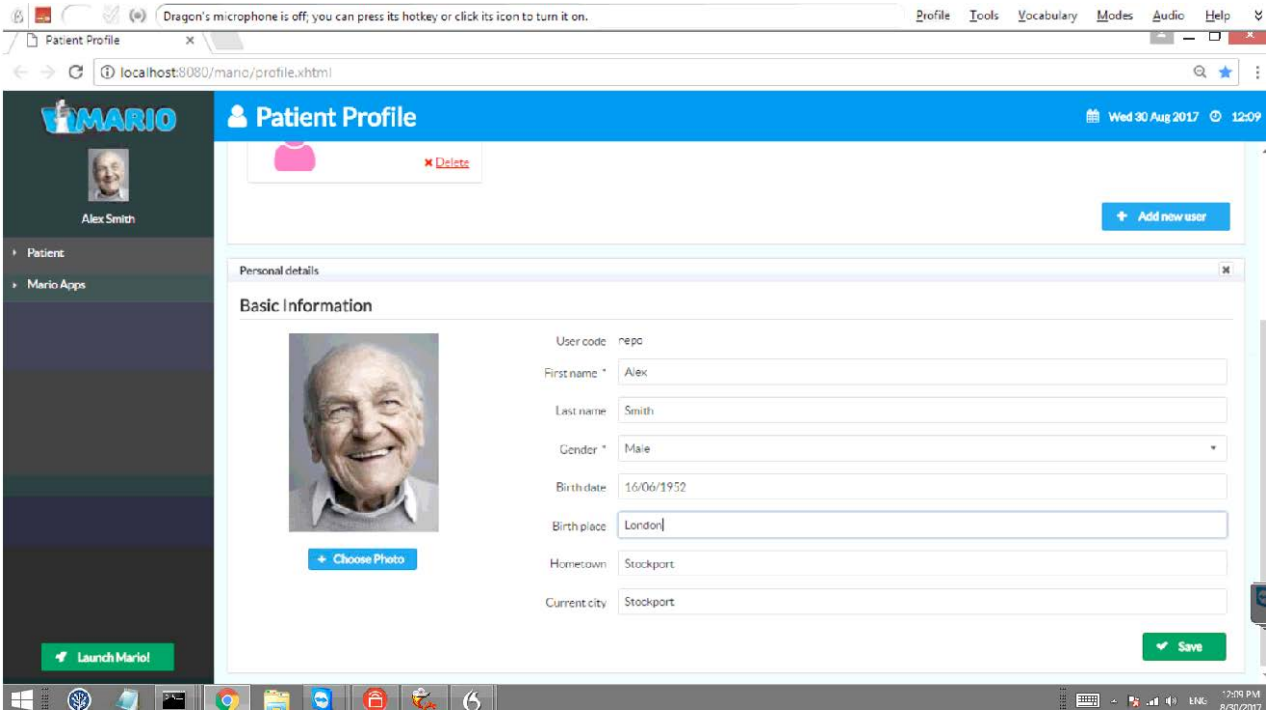


Figure 3-5: User Profile after image selection

3.3. Patient Profile

Once a patient is setup there are additional options to associate the patient with members of a family and friends group and to add photos of life events. First the 'Patient' menu item is clicked (see menu item marked in red in Figure 3-6). This expands the menu bar on the left as shown in Figure 3-7:

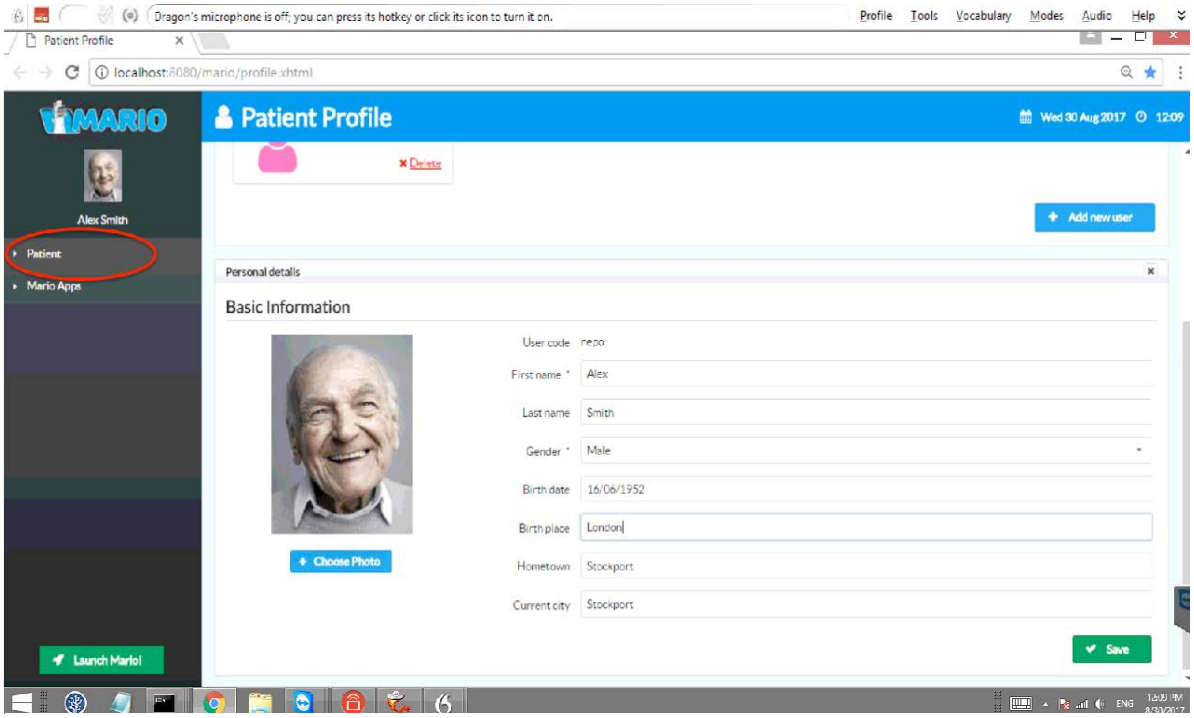


Figure 3-6: Patient Profile Setup button

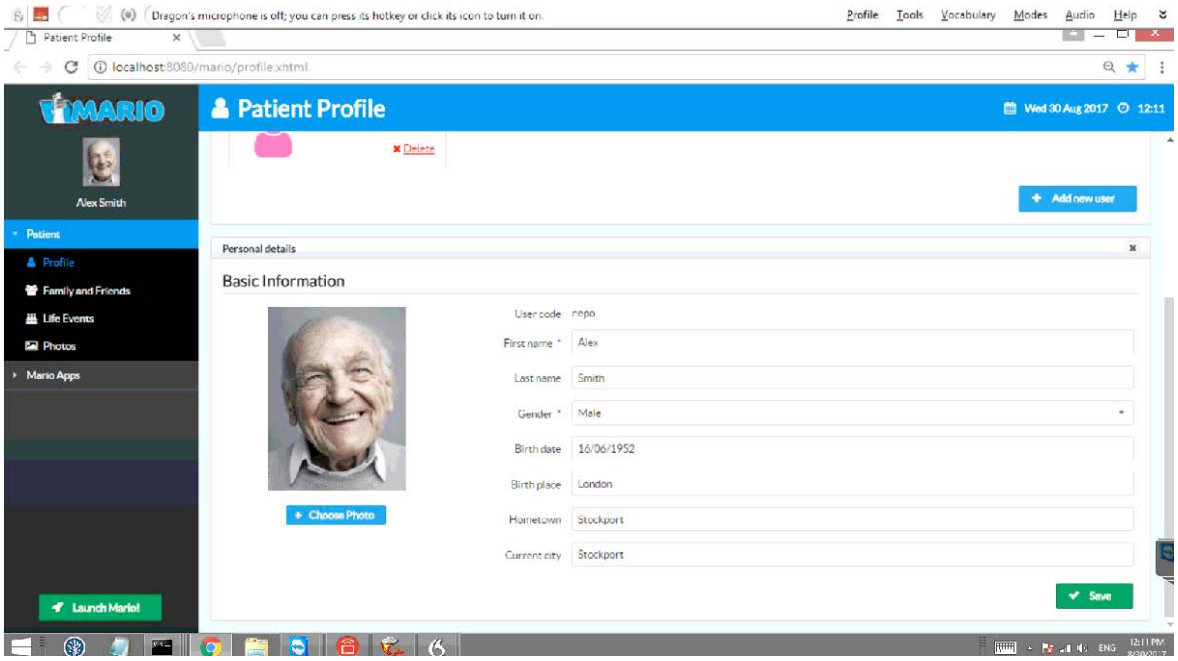


Figure 3-7: Patient Profile selection options

These options will be discussed in turn.

3.3.1 Family & Friends Setup

Figure 3-8 shows the screen after the ‘Family and Friends’ menu has been selected. The process for adding a new ‘family and friend’ member is shown below.

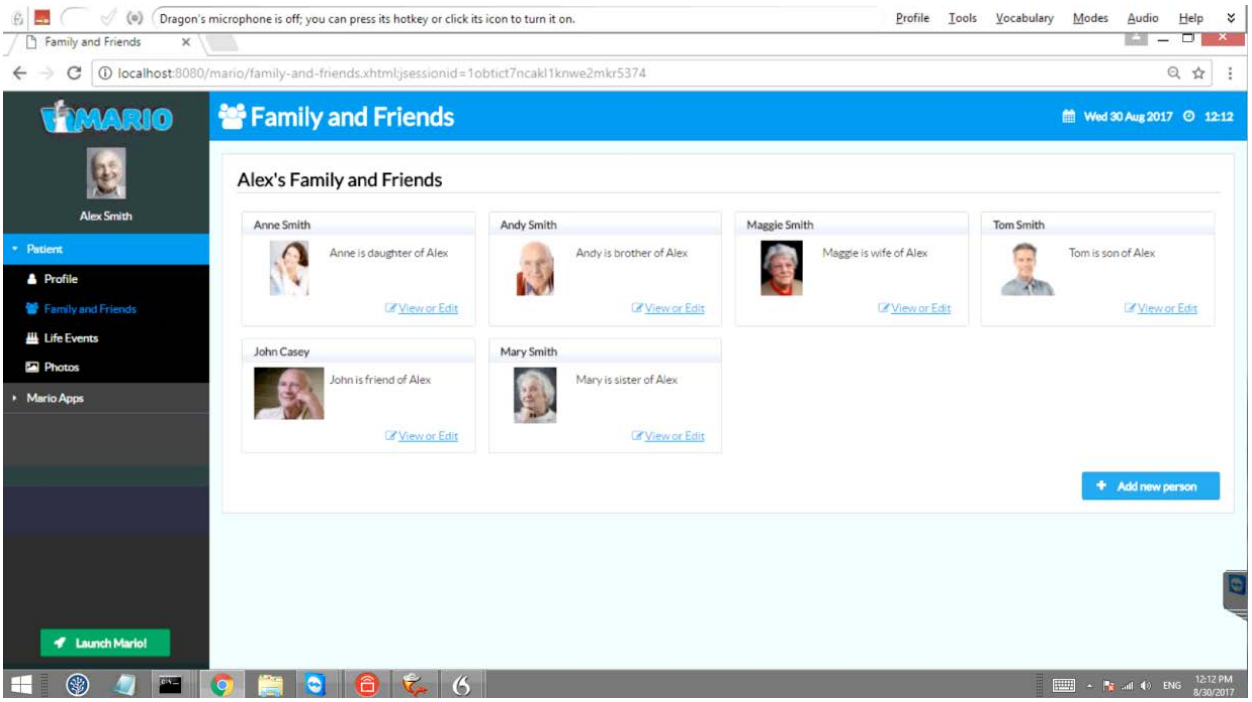


Figure 3-8: The screen after the ‘Family and Friends’ menu has been selected.

First, the ‘Add new person’ button is clicked. The result is shown in Figure 3-9:

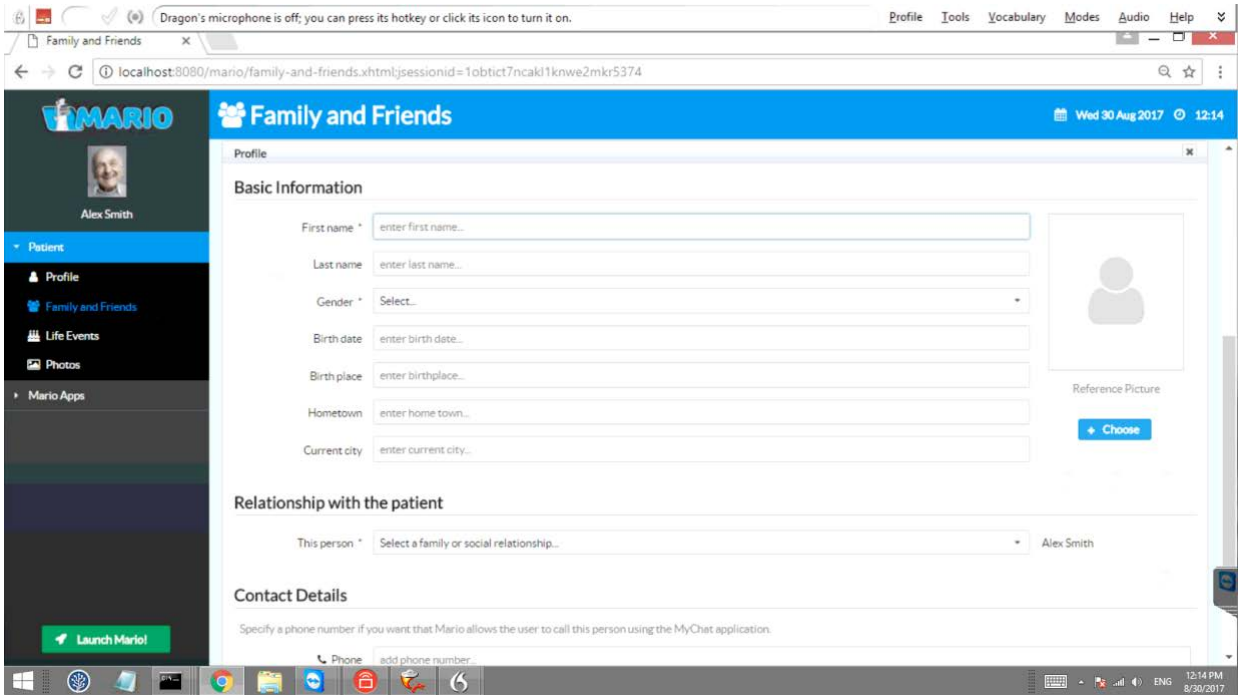


Figure 3-9: Initial set screen for Family & Friends member.

Again, a number of fields are presented and two of these (First Name and Gender) are compulsory.

A menu item is provided to indicate the relationship of the new person to the patient as shown in Figure 3-10. Note that this field is compulsory.

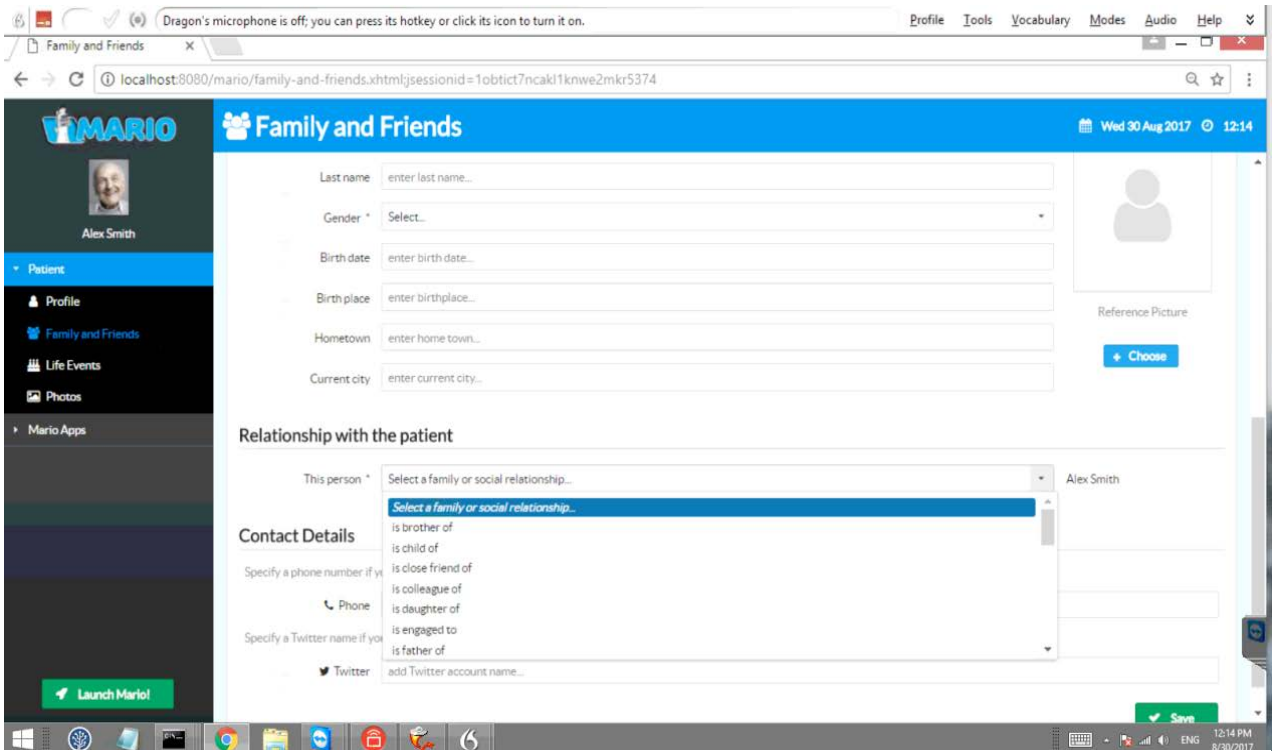


Figure 3-11: Family & Friends Relationship menu

In addition the phone number and twitter accounts of the contact can also be entered (these fields are optional), see Figure 3-11. Note that compulsory fields need to be populated in order for the contact to appear in the Friends & Family application described in section 4.2.

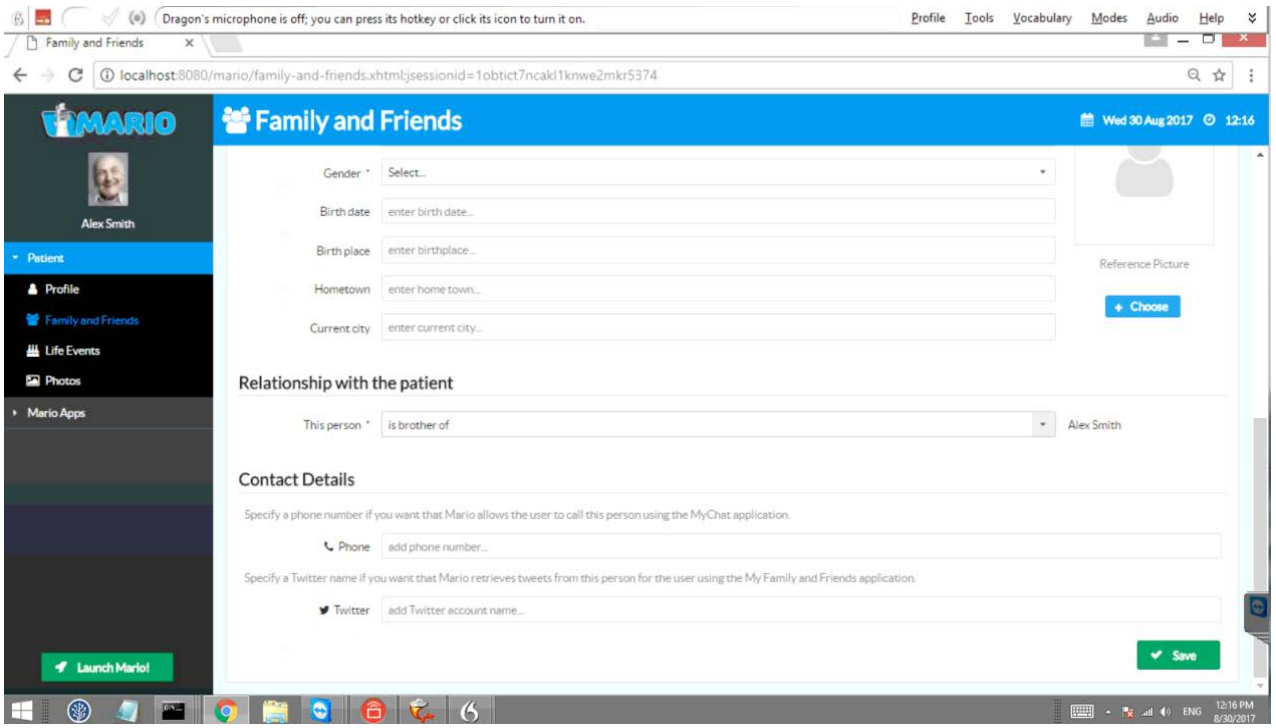


Figure 3-10: Family & Friends Phone number and Twitter account details.

3.3.2 Life Events Setup

The Life Events setup provides events data used by the Reminiscence application.

Figure 3-12 shows the screen when the Life events option is selected.

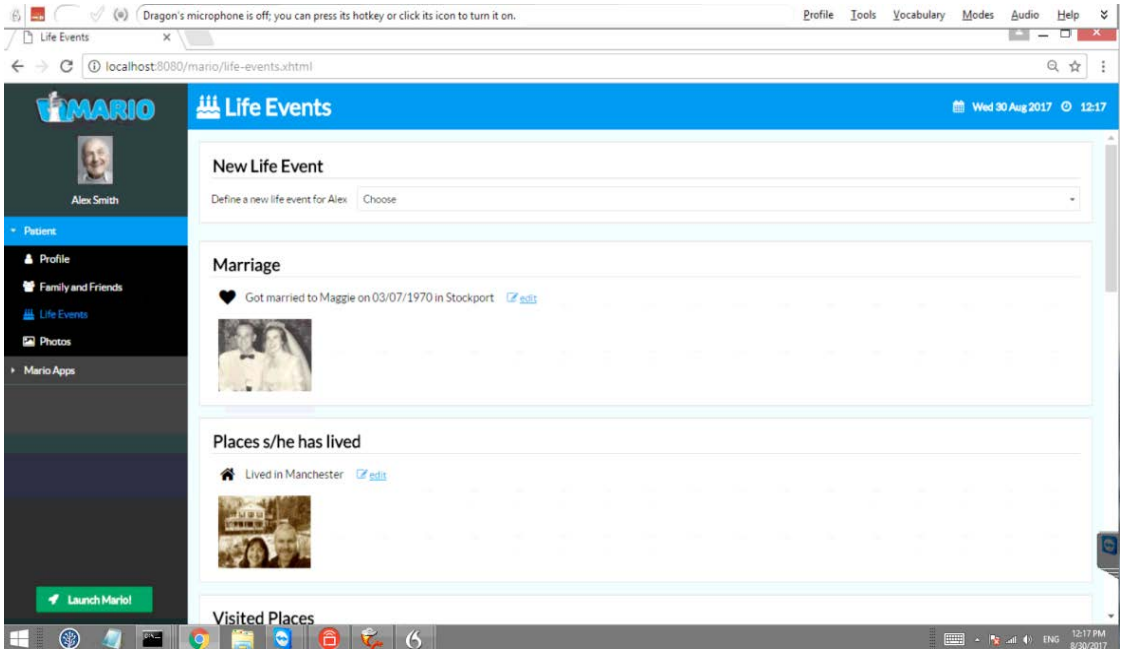


Figure 3-12: The screen after the 'Life Events' menu has been selected.

In order to add a new life event, the 'Choose' menu in the **New Life Event** window is selected. This results in a drop-down menu containing a number of event types, see Figure 3-13:

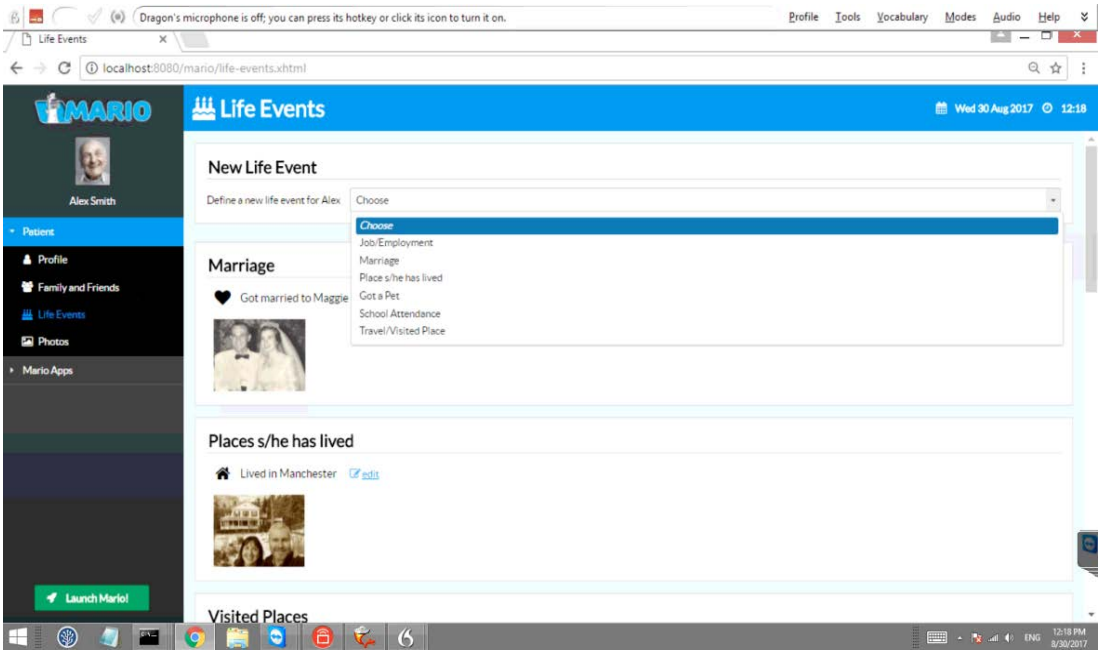


Figure 3-13: Life Events screen with new event

Assume the ‘Job/Employment’ option is chosen. This results in a new form being shown as shown in Figure 3-14

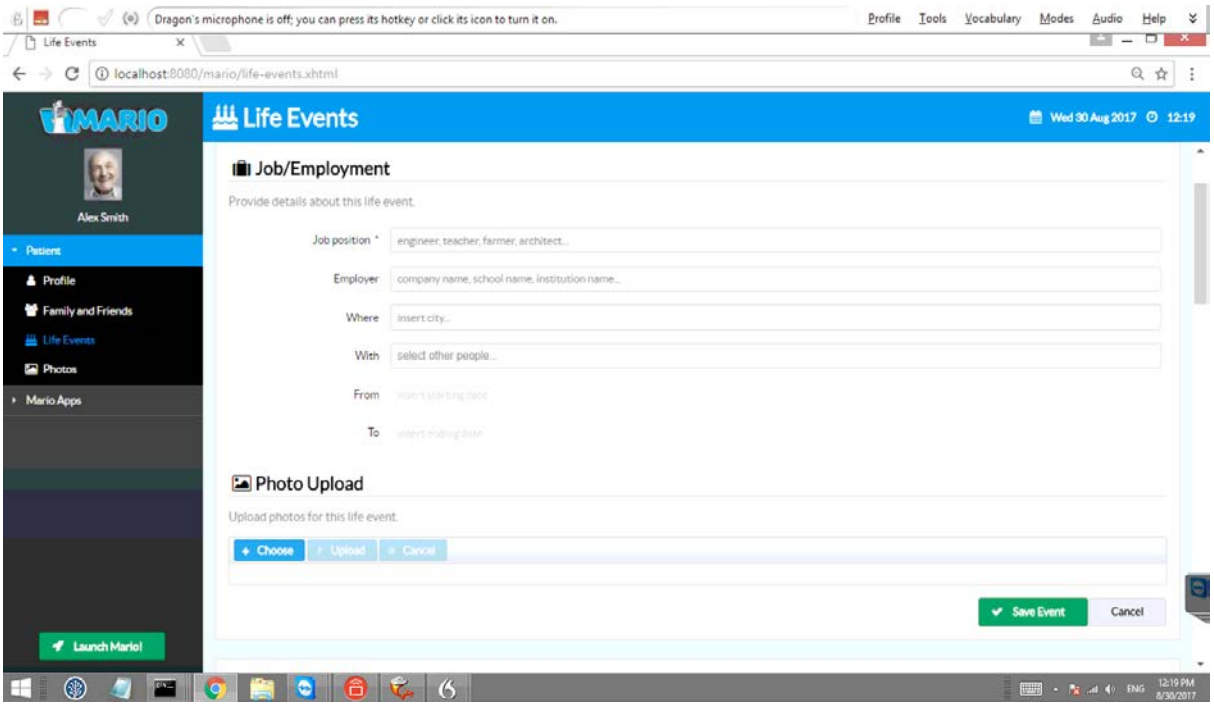


Figure 3-14: Life Events new event job/employment

Note: the **Job position** field is compulsory.

Other event types, such as Marriage, Got a Pet, School attendance, etc. all produce similar forms appropriate to the types.

An image can be associated with the event using the Photo Upload button. This is a two-step procedure. First an image (previously uploaded to some chosen file location) is selected via a file menu as shown in Figure 3-15:

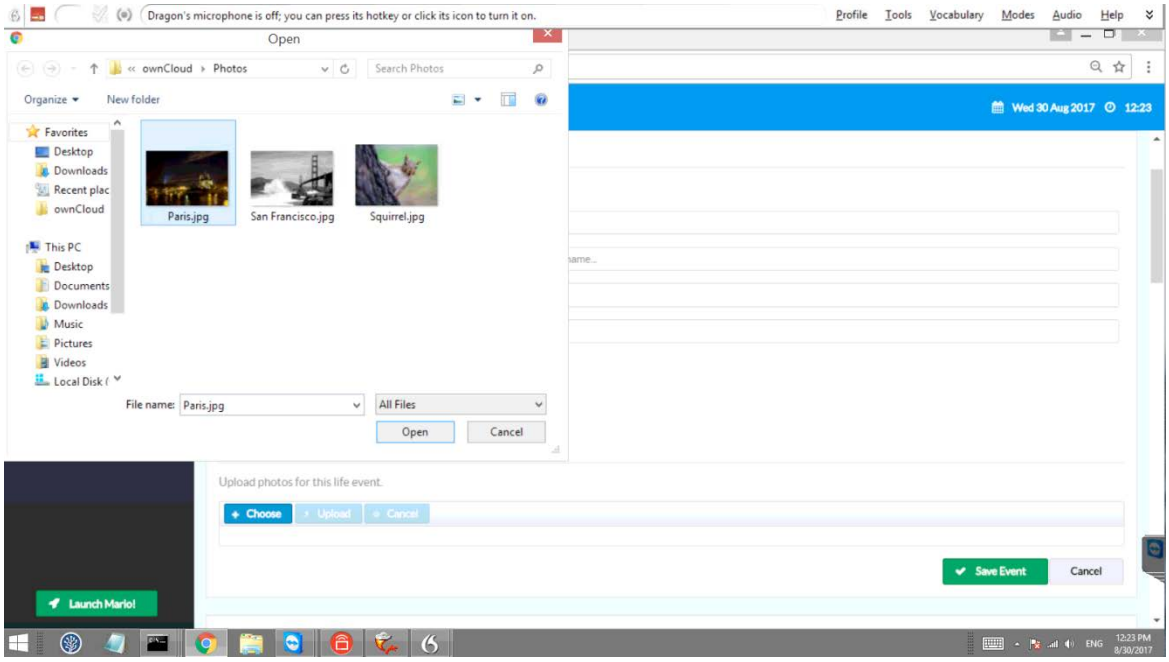


Figure 3-15: Life Event Image selection.

Next, the chosen image is ‘uploaded’ to the event using the ‘Upload’ button, with the result shown in Figure 3-16. Alternatively, the image can be de-selected via the ‘Cancel’ button.

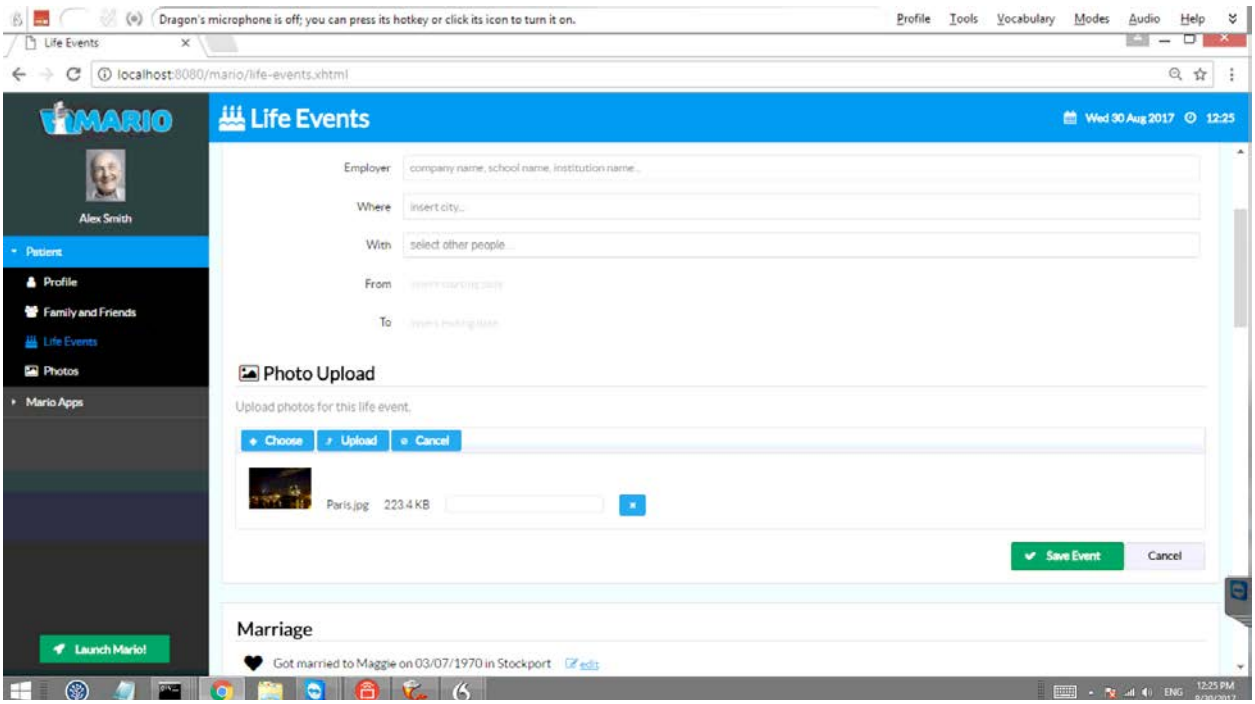


Figure 3-16: Life Event Image post upload to event.

Note that multiple images can be ‘uploaded’ to a given event.

After the image (or images) have been uploaded to the event, then either the ‘Save Event’ key can be pressed to proceed, or the ‘Cancel’ key can be used to undo the uploads.

Once the uploads are completed it is possible to associate members of the Friends & Family’ group to the images. Figure 3-17 shows the screen provided for this:

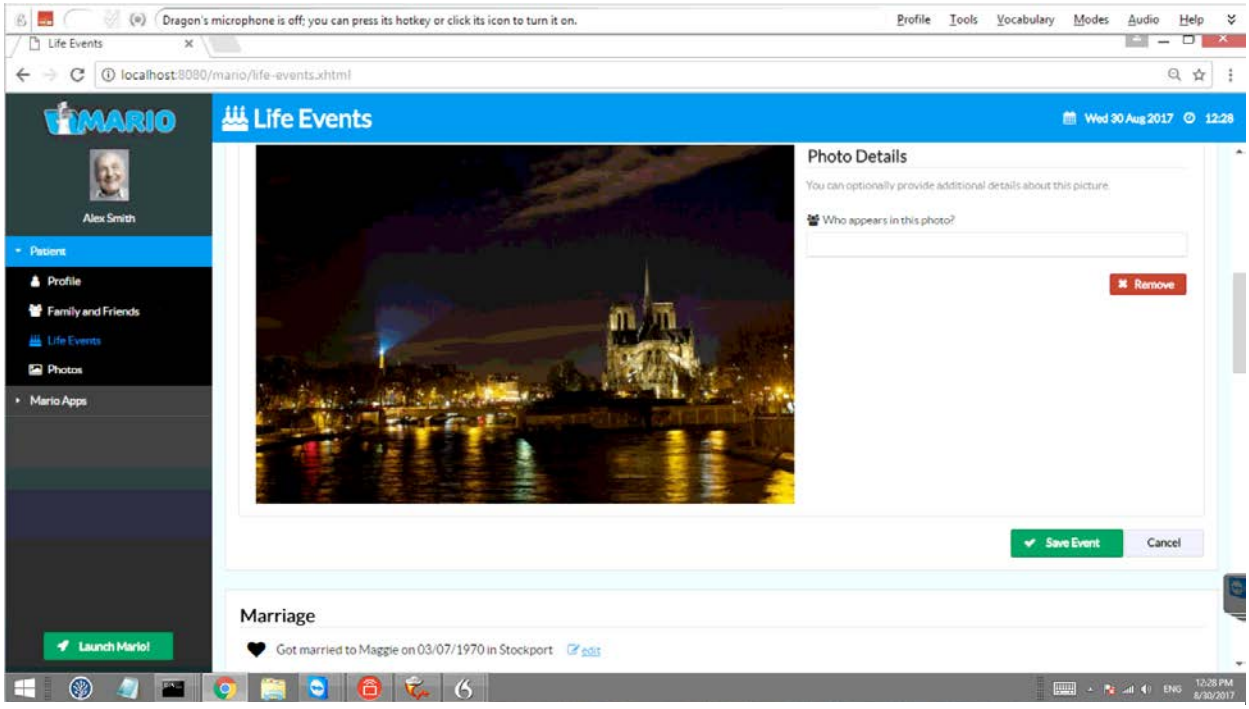


Figure 3-17: Life Event - associating members of F&F to a photo.

To add a member of the Friends & Family to the photo, put the cursor in the 'Who appears in this photo' box and type the name. As you type the system will look for matches and provide a drop-down box from which you can select the required name. Note that it is only possible to add names from the Friends & Family list to the 'Who appears in this photo' field. Then start typing a second name if needed and so on (details of this process are shown in **Error! Reference source not found.** from the Photos setup section below). Once done, hit the 'Save Event' key to update the event and return to the setup screen as shown in Figure 3-12.

3.3.3 Photos Setup

The Photos setup provides the image data used by the Reminiscence application.

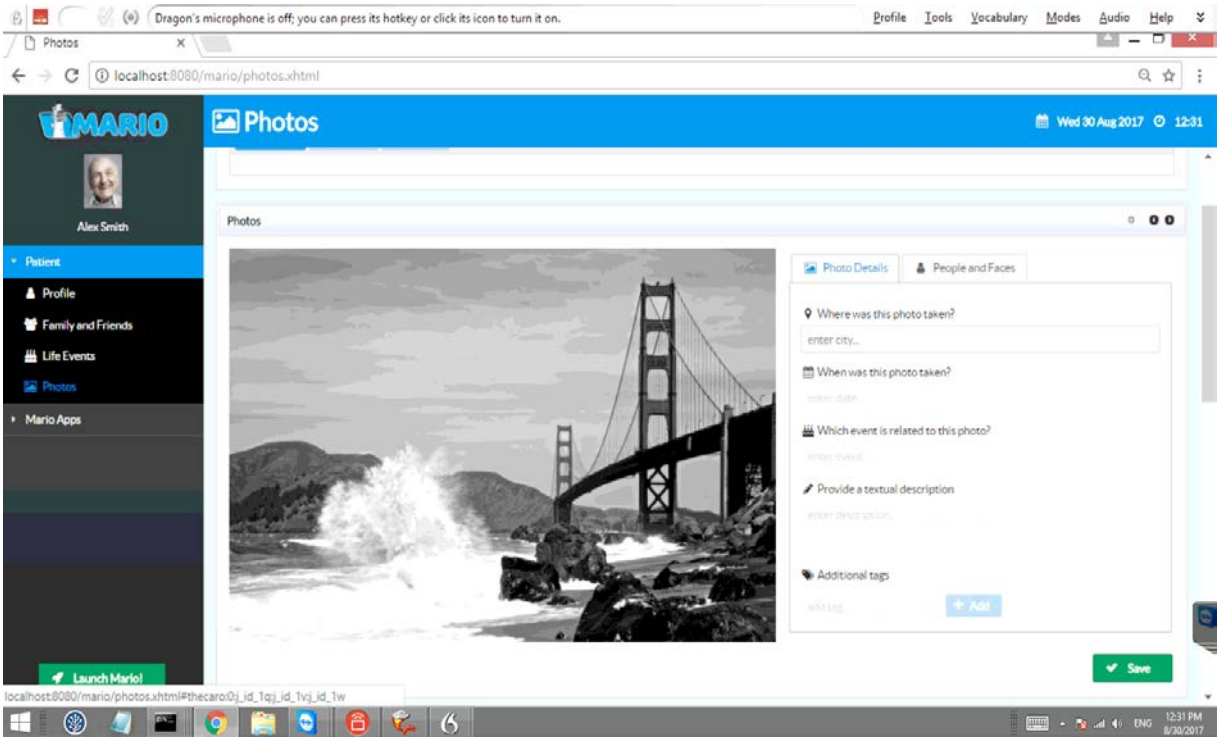


Figure 3-18: Photos setup screen 'Photo details' tab selected.

The screen starts by showing all the photos associated with the patient. It is possible to edit each photos detail and the people associated with it by using the two tabs ('Photo details' and 'People and Faces'). Figure 3-18 shows the 'Photo details' tab selected, and Figure 3-19 shows the 'People and Faces' tab selected.

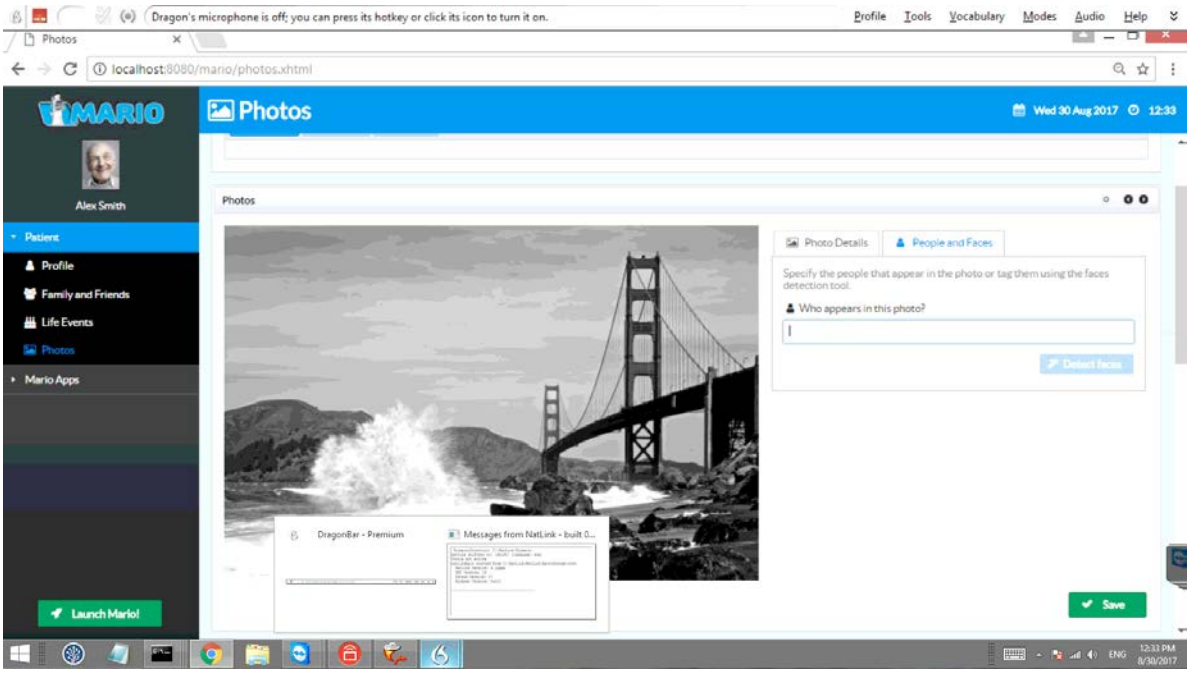


Figure 3-19: Photos setup screen 'People and Faces' tab selected

:

To change the people associated with an image, place the cursor in the 'Who appears in this photo' field in the 'People and Faces' tab. A virtual keyboard will appear as in Figure 3-20:

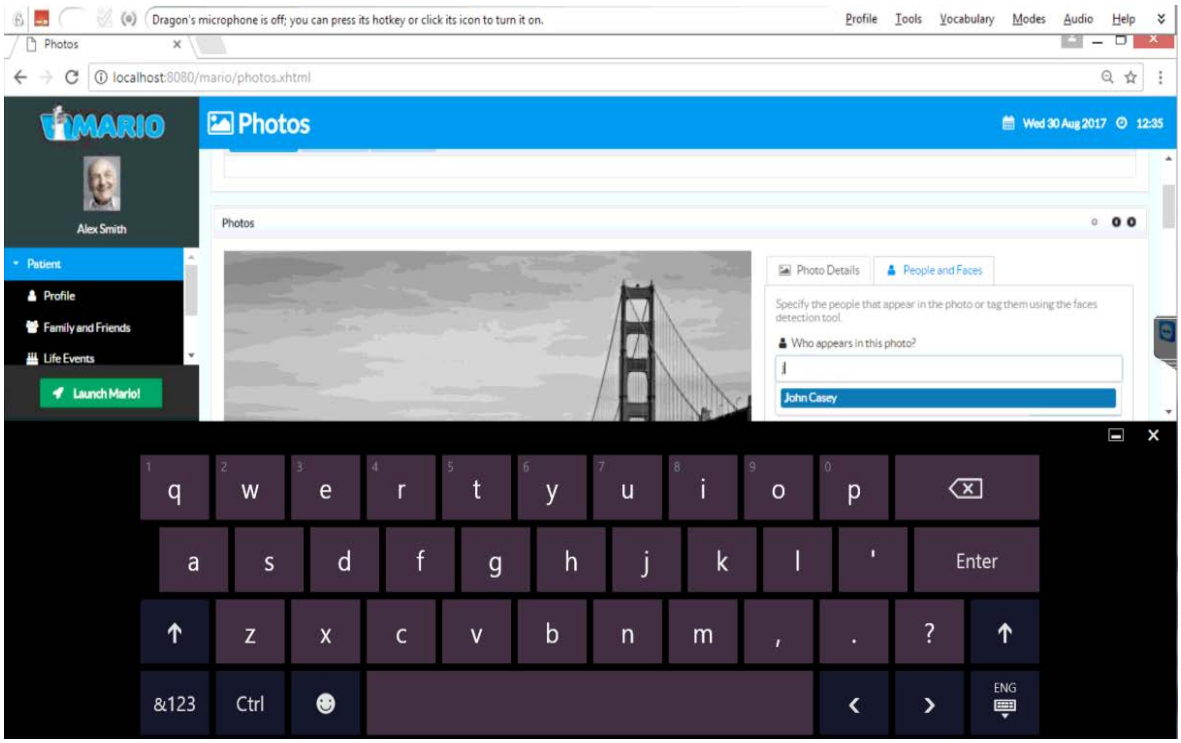


Figure 3-20: Photos Setup - starting to enter a name

As soon as a keyboard character is entered, the system will search for matches from the Friends and Family list, and display a dropdown box. Figure 3-20 shows a name 'John Casey" that has appeared after a single 'j' character has been entered.

Clicking on the name will add it to the list, as shown in Figure 3-21:

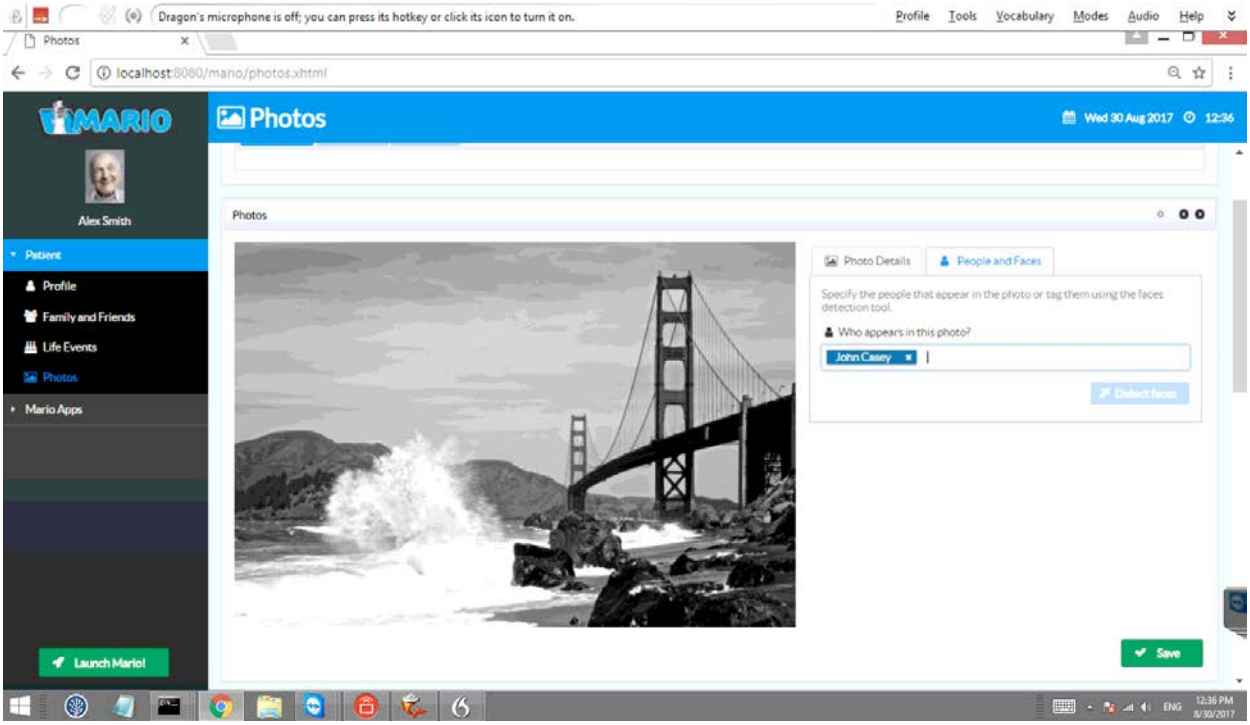


Figure 3-21: Photos Setup - name added to list

A second name can be added using the same procedure, with the result as shown in Figure 3-22:

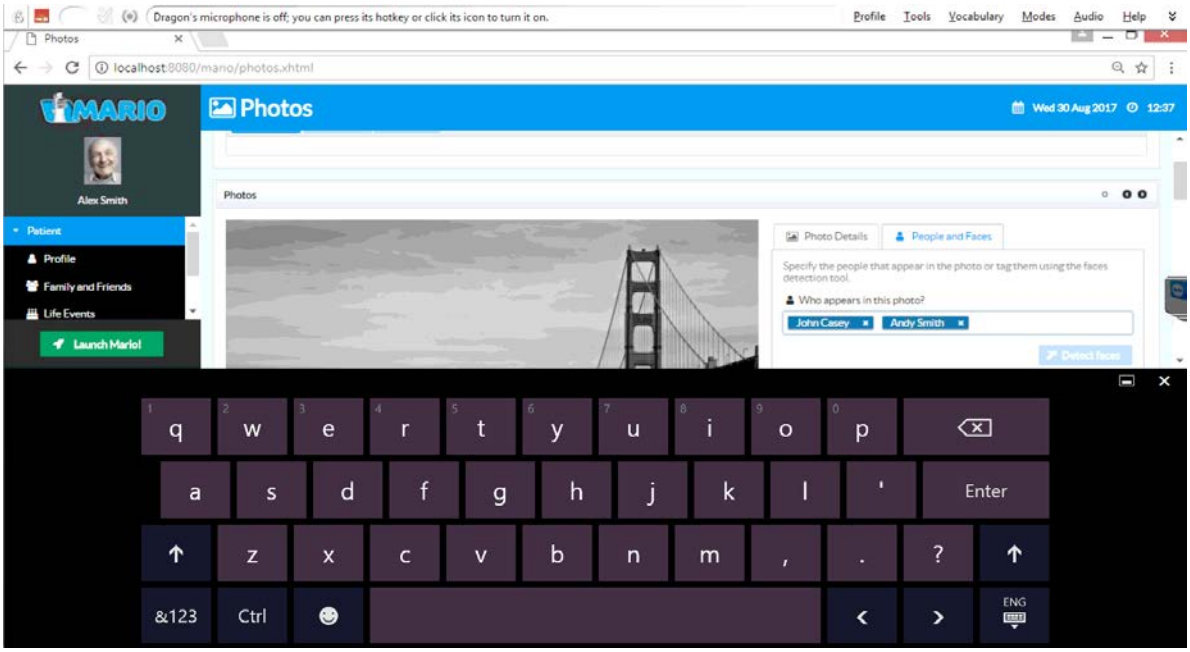


Figure 3-22: Photos Setup - second name added to list

When data entry is completed the keyboard can be dismissed either by tapping the ✕ in the top-right corner or the ENG button in the bottom-right corner.

After the keyboard is dismissed, the screen will revert to Figure 3-21. The **Save** button can then be used to save the changes.

That completes the setup.

3.4. MARIO Applications Setup

The application setup procedure starts by selecting the **MARIO Apps** menu item. Figure 3-23 shows the screen at this point.

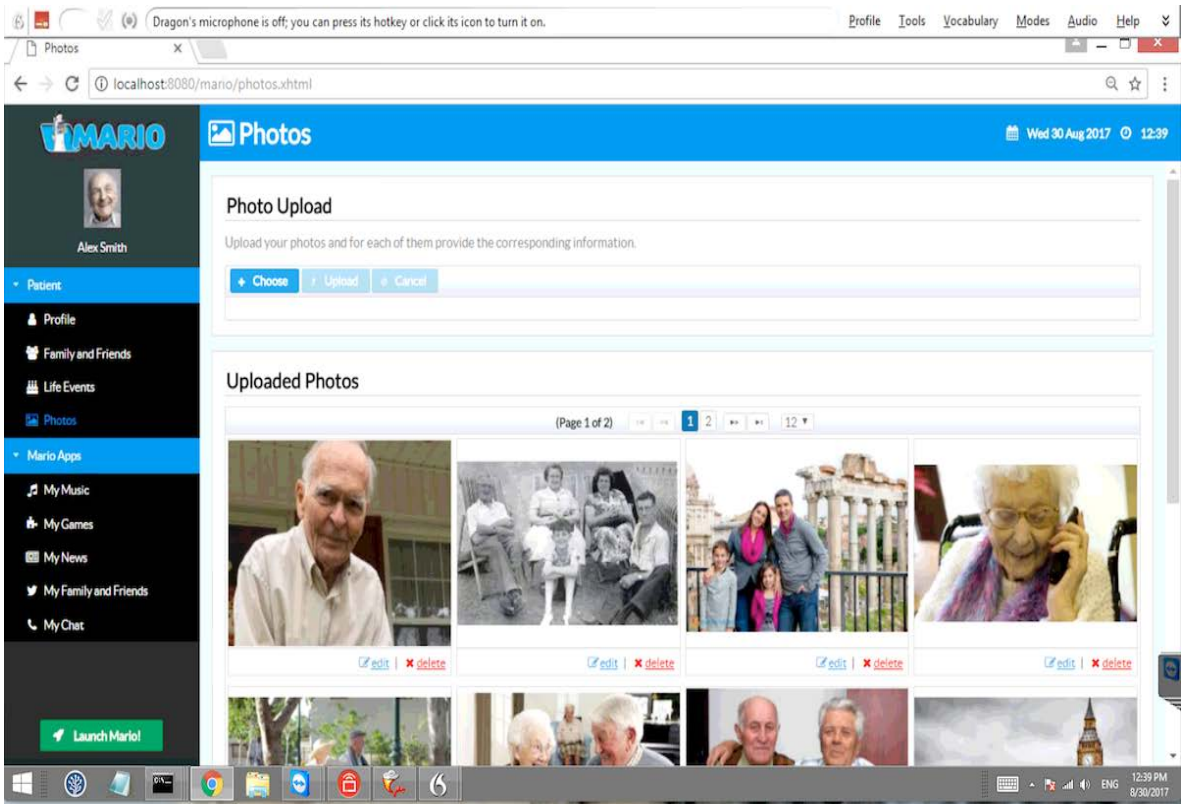


Figure 3-23: MARIO Apps setup selection.

There are six MARIO applications which can be customised for each patient:

a) My Music
b) My Games
c) My News
d) My Family & Friends
e) My Chat
f) My Memories

These are discussed below.

3.4.1 My Music

Figure 3-24 shows the screen after the **My Music** menu item has been selected.

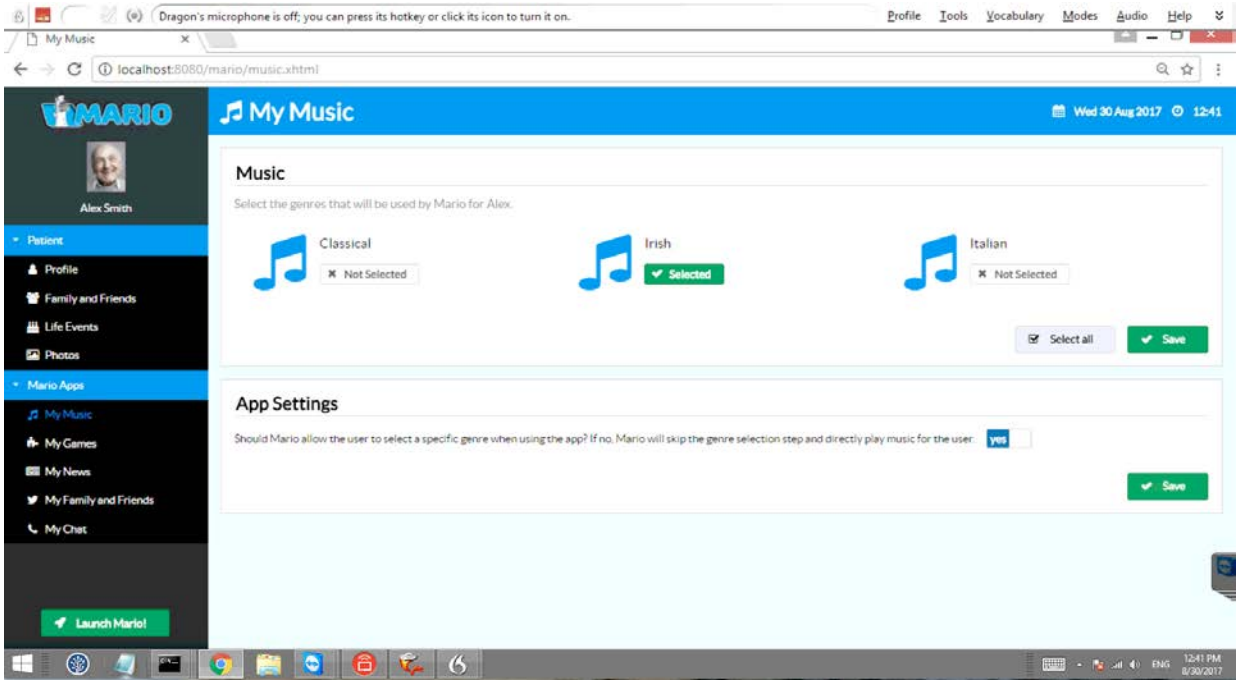


*Figure 3-24: **My Music setup** screen.*

This allows the music played in the MARIO application to be limited to specific genres by clicking on the **Selected** or **Not Selected** boxes to change them to the desired state. It is also possible to select all the genres by clicking on the **Select all** button. There is also a setting to allow the user to select genres within the MARIO application. In Figure 3-24 this setting is shown enabled. Clicking on the Yes button will change the setting to disabled, as shown in Figure 3-25:

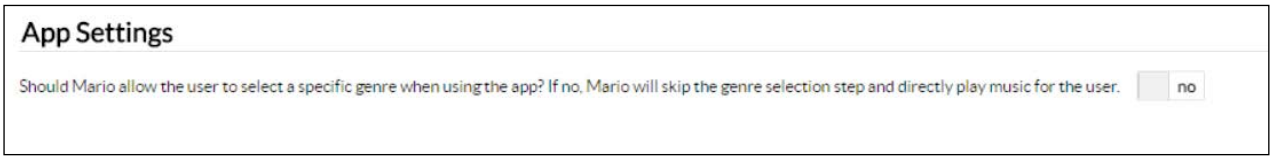


Figure 3-25: Disabling genre selection within the Application.

When the option to select genres is disabled then the MARIO application will play the whole playlist (see section 4.3). The **Save** button is used to confirm the change, as shown in Figure 3-26:

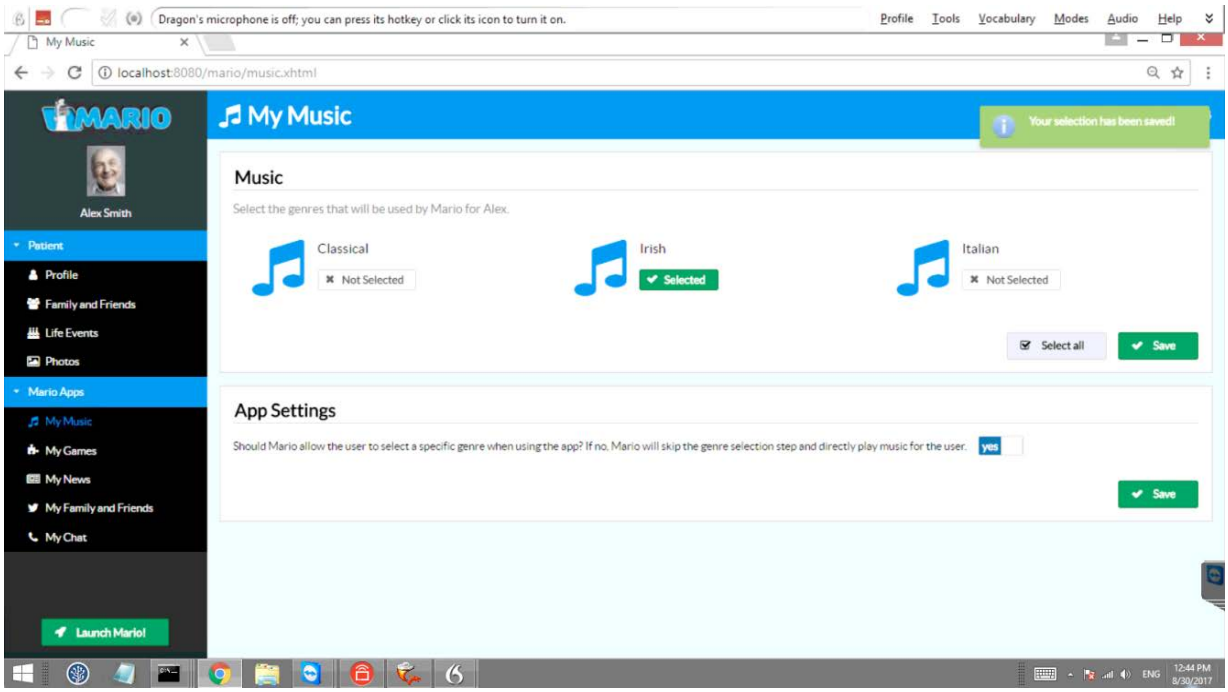


Figure 3-26: ***Change confirmation*** *screen.*

3.4.2 My Games

Figure 3-27 and Figure 3-28 show the games setup screen accessed via the **My Games** menu option. This is used to select the games which the user will be allowed to play.

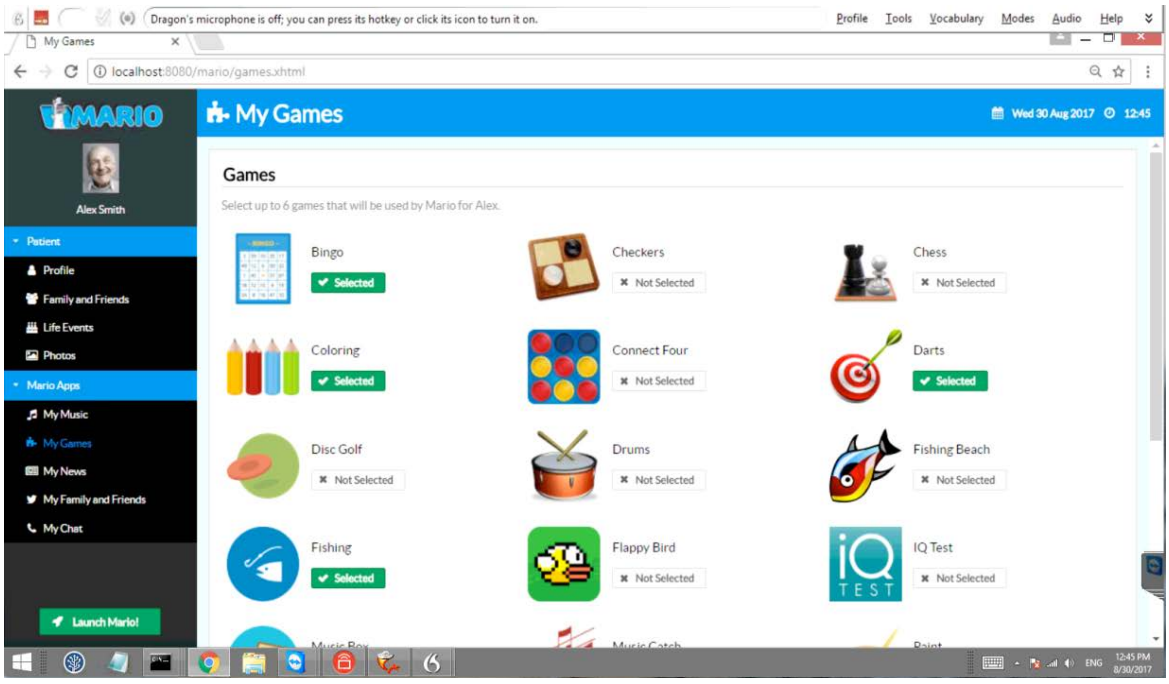


*Figure 3-27: **Game setup screen** upper part*

The games are selected or deselected by clicking on the **Selected** or **Not Selected** checkboxes until the desired selection is obtained. The **Save** button is used to confirm the changes. Note that a maximum of six games can be selected and if this list is exceeded then the system will show an error (as shown in Figure 3-28 at the top right) until six or less games are selected.

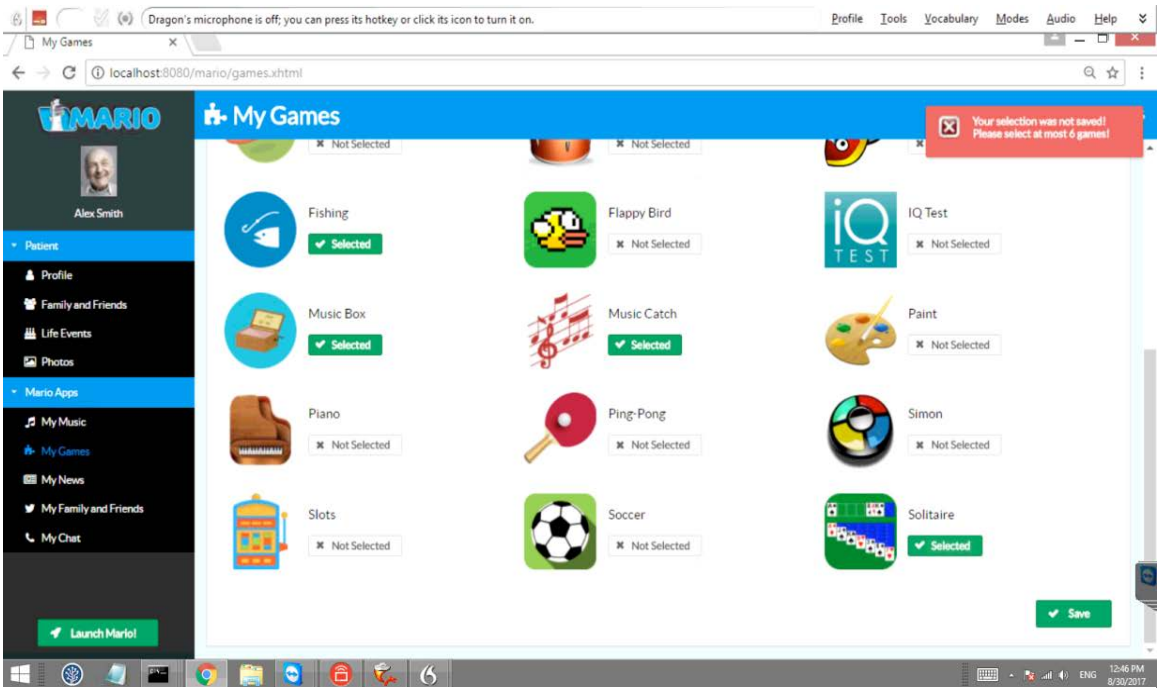


*Figure 3-28: **Game setup screen** lower part*

3.4.3 My News

Figure 3-29 and Figure 3-30 show the News setup screen accessed via the **My News** menu option.

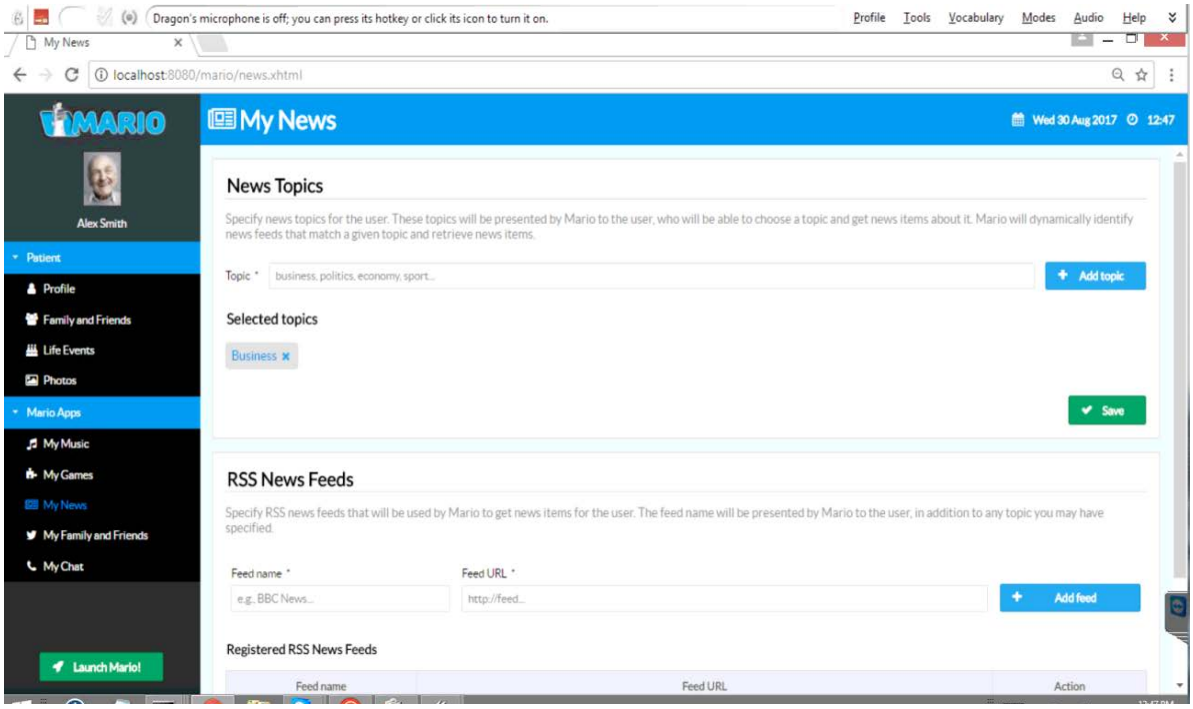


*Figure 3-29: **My News setup screen** upper part*

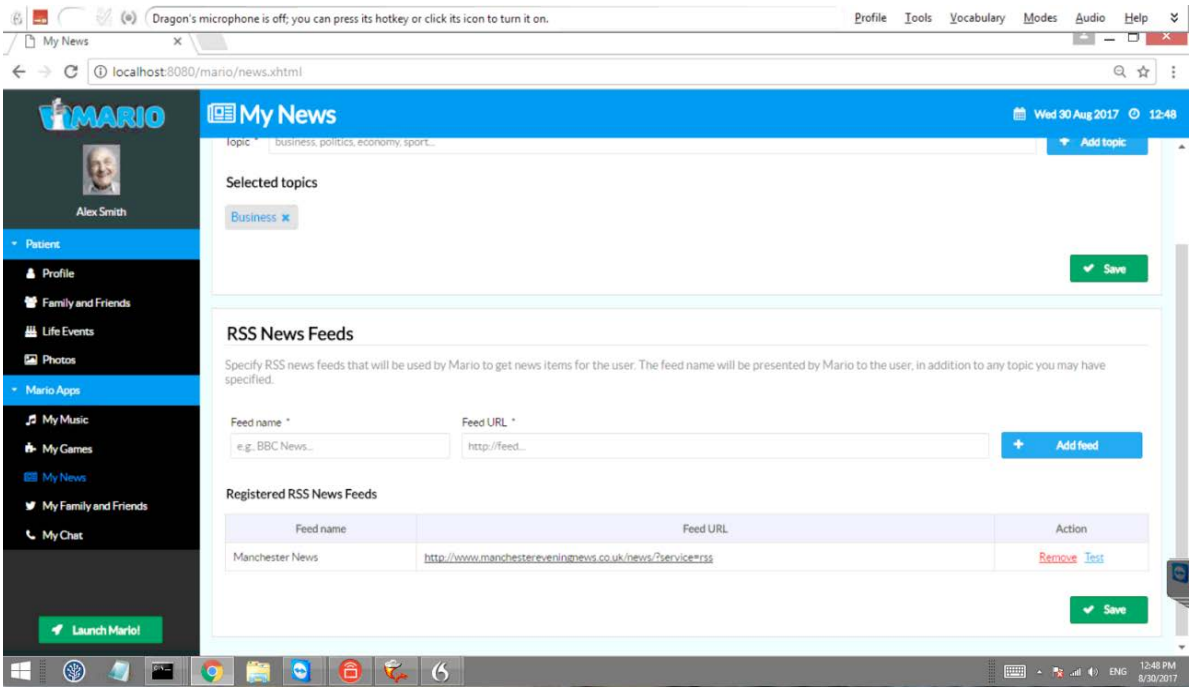


*Figure 3-30: **My News setup screen** lower part*

Topics available in the My News application can be set in the **Selected Topics** window. A new topic can be added by hitting the **Add Topic** button. This will place the cursor in the **Selected Topics** field and display a virtual keyboard as in Figure 3-31.

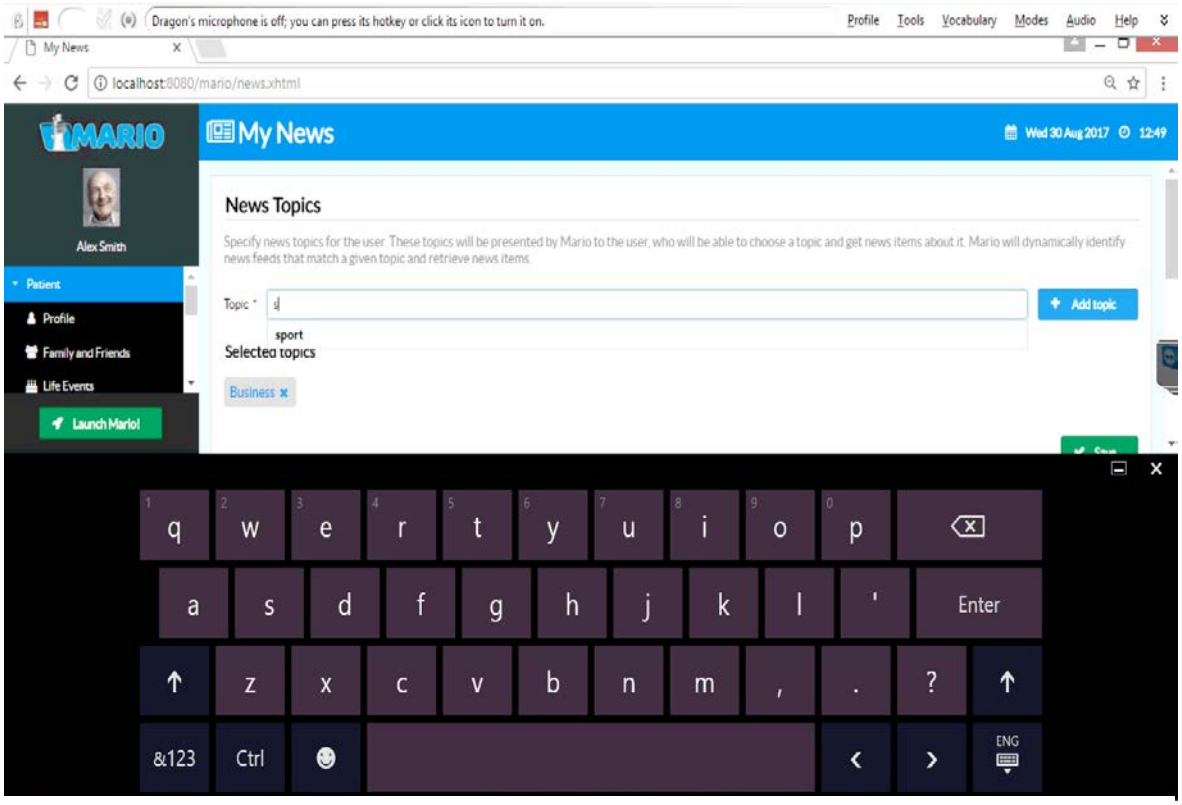


Figure 3-31: My News setup screen showing a new topic being selected

As soon as a keyboard character is entered, the system will search for matches from the topics list and display a dropdown box to show the matches. Figure 3-31 shows one topic ‘Sport’ available after a character ’s' has been entered.

Further characters will narrow down the list. Clicking on the **Sport** menu item will add that to the selected topics list, as shown in Figure 3-32. The **Save** button is used to confirm the changes.

Also, it can be seen that RSS news feeds can also be added in a similar way by entering the feed name and URL data into the forms provided and confirming the change via the **Add feed** button. The feeds can be removed and tested via the **remove** and **test** links provided.

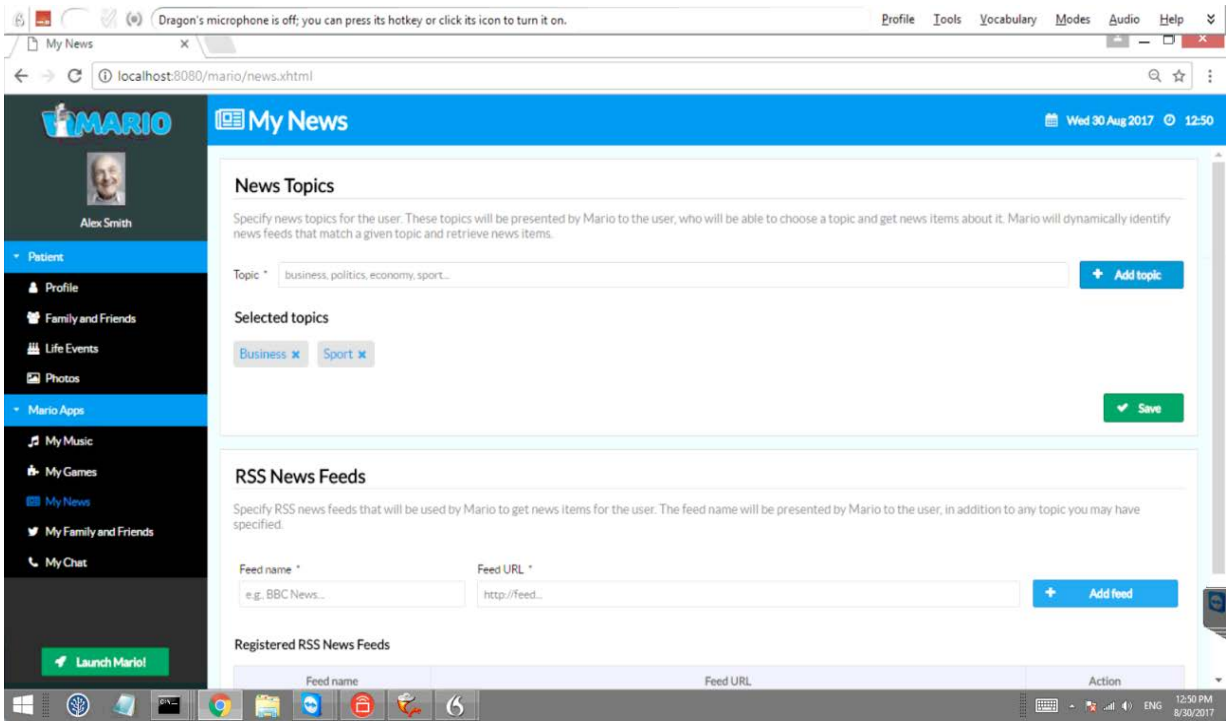


Figure 3-32: My News setup screen showing the 'Sports' topic added.

3.4.4 My Family & Friends

Figure 3-33 shows the My Family and Friends setup screen accessed via the **My Family and Friends** menu option.

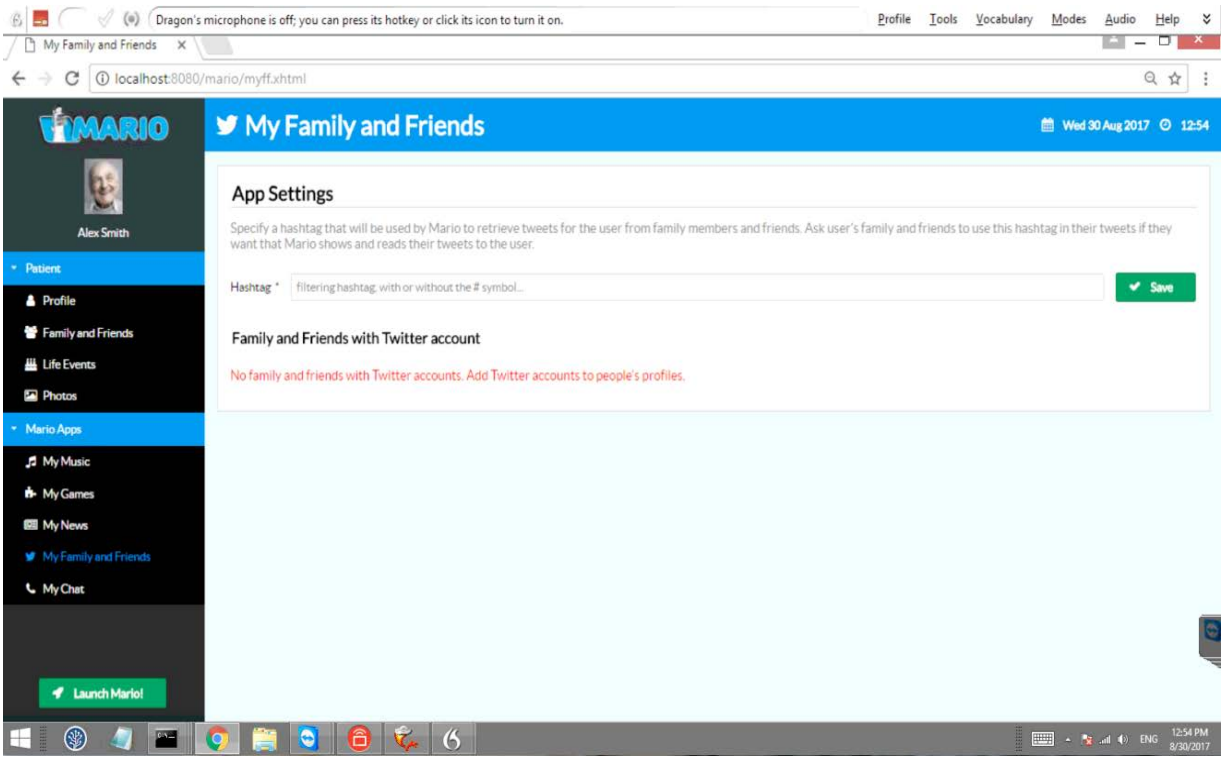


Figure 3-33: ***My Family and Friends setup*** *screen.*

This screen is used to add hashtags used to retrieve tweets for the patient.

3.4.5 My Chat

Figure 3-34 shows the My Chat setup screen accessed via the **My Chat** menu option.

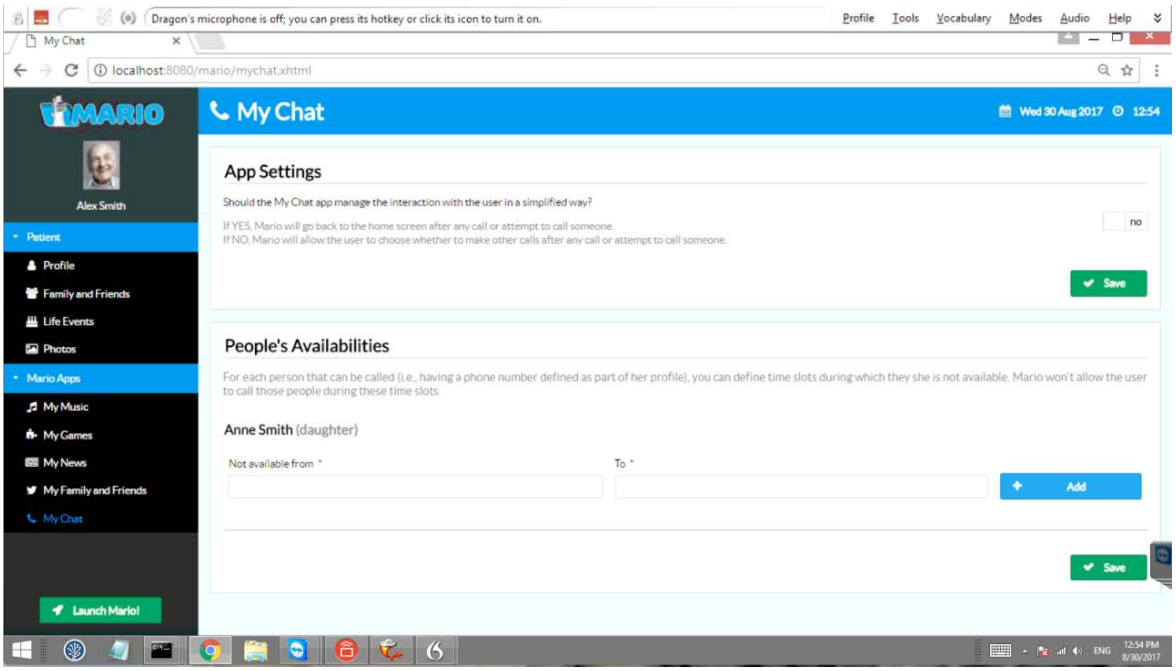


*Figure 3-34: **My Chat setup** screen.*

There are two settings for the MyChat application:

1) **App Settings**: If this option is set MARIO will go back to the home screen after any call or attempt to call someone. If not set, MARIO will allow the user to choose whether to make another call after a call has finished or after an attempt to call someone. This option is set by toggling the yes/no switch provided.
2) **People's Availabilities**: The application can limit the times that calls are allowed according to periods where the user is ***not*** allowed to call each person. This process is detailed below.

3.4.5.1 Setting up non-availability slots

All of the people from the Family & Friends list for the user (who are also setup to receive calls by having a phone number defined) will appear in the MyChat **People's Availabilities** form in Figure 3-35. It is possible to define periods where the user will **not** be allowed to call that person. Two form fields are provided: 1) The **Not Available from** and 2) the **To** field. Both fields must be completed.

Figure 3-35 shows the screen during the entry of a start time. On clicking the entry field a drop-down menu will appear which allows the start time to be entered by adjusting the Hour and Minute sliders as required. The end of the period is similarly entered into the 'To' box.

The availability period is confirmed by hitting the **Add** key. Figure 3-36 shows the screen at that point. Note that an entry can be removed using the **delete** link.

Note that multiple periods can defined for individual persons e.g. to prevent calls from 1am - 6am and 4pm - 6pm for example.

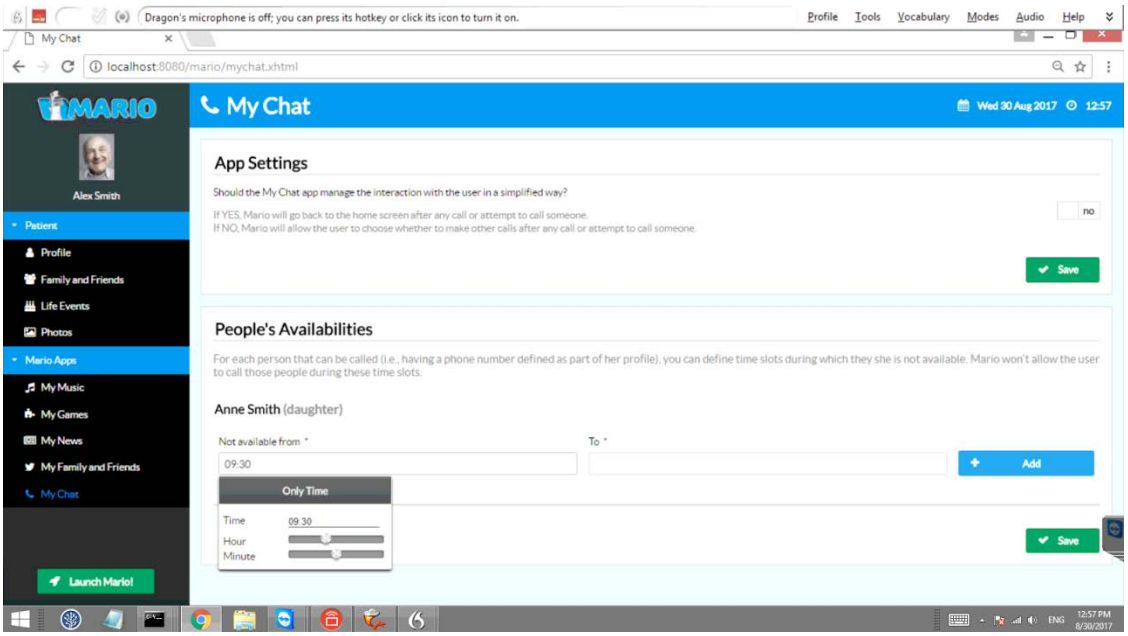


Figure 3-35: MyChat Availability form start time entry

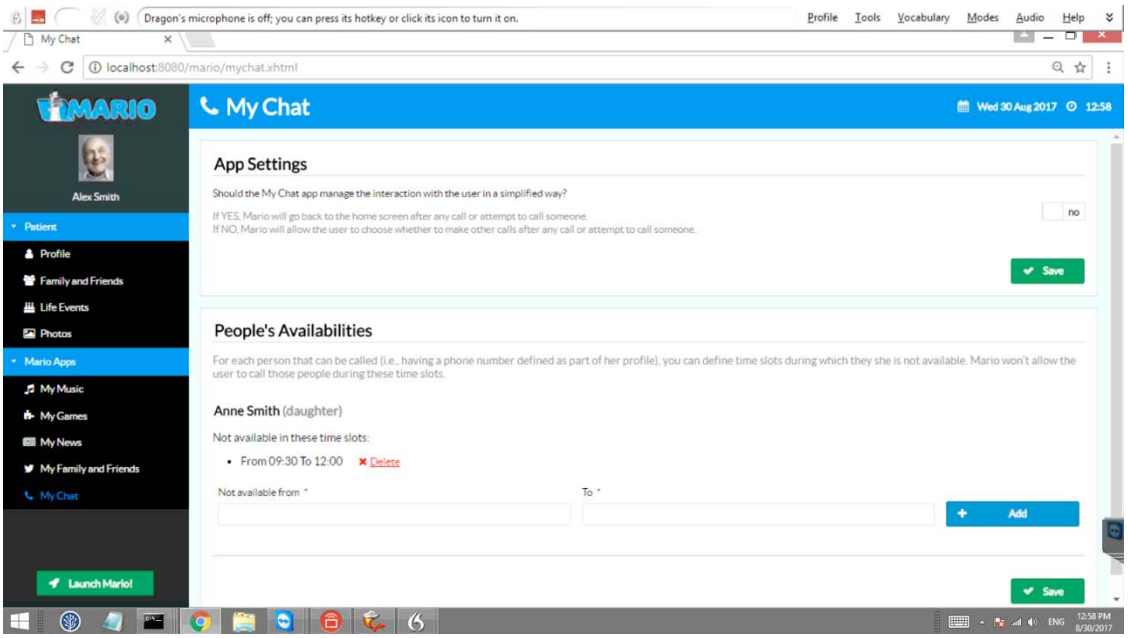


Figure 3-36: MyChat Availability form with new entry

3.5. MyCalendar App

Currently, events, appointments and reminders are added by accessing a separate webpage. Note also that the MARIO application must be fully launched in order to update the calendar.

First, open a new webpage tab in Google Chrome at ***http://localhost:3060/login***. This will result in a login page as shown in Figure 3-37. Be aware that the voice recognition system is active at this point, so it is recommended to work in a quiet room if possible:

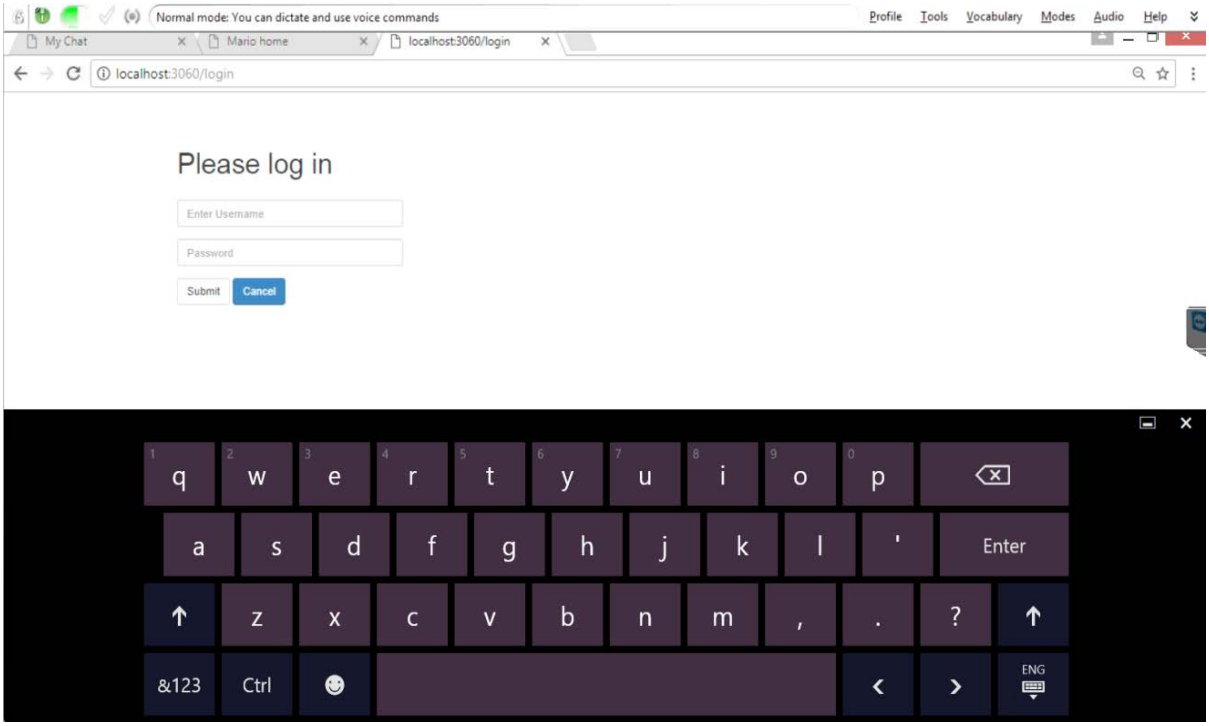


Figure 3-37: Calendar editor login page

Next, the user then logs in with the required credentials (obtained from the MARIO system administrators) to obtain the case shown in Figure 3-38. Note that user names are case sensitive.

Events can now be added. To add an event, use the Manage Calendar button for the appropriate user. This will result in a screen as shown in Figure 3-38:

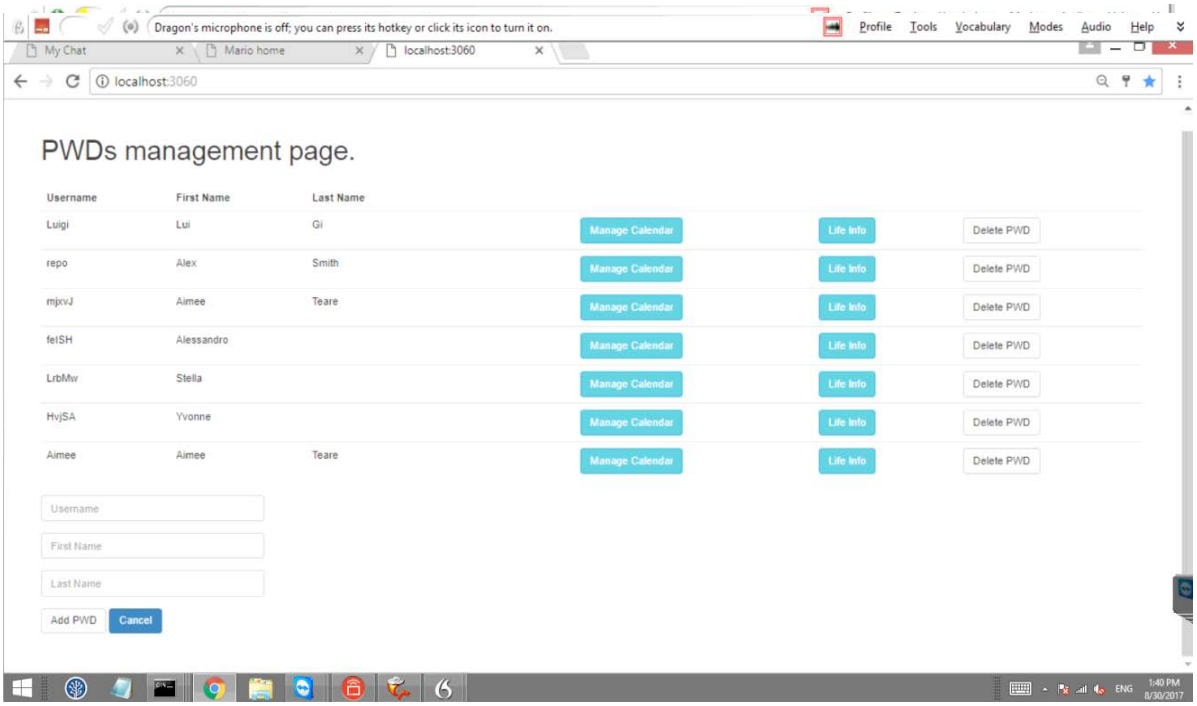


Figure 3-38: Calendar events page

Note that the calendar page can show events in a single day, week or month using the day/week/month buttons shown above.

Figure 3-38 shows the display set to show a month, with the current day highlighted in yellow. Other days can be highlighted by tapping the appropriate entry on the screen.

To add an event, tap on the desired entry in the diary display. An editing panel and keyboard will be shown as in Figure 3-39:

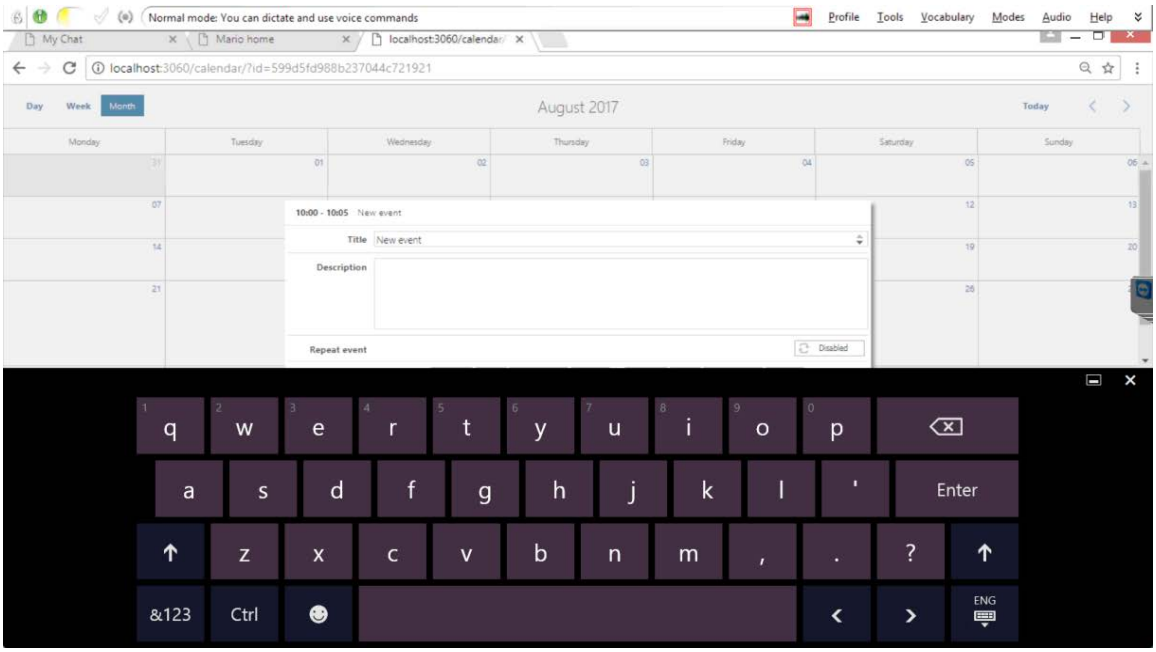


Figure 3-39: Calendar event editing

The event can be given a title and a description as shown in the MARIO application. The time of the event, whether it repeats, and the time of any associated alarms can also be set as shown in Figure 3-40:

The Save and Cancel buttons can be used to confirm the even or discard it. After this the screen returns to the state shown in Figure 3-38.

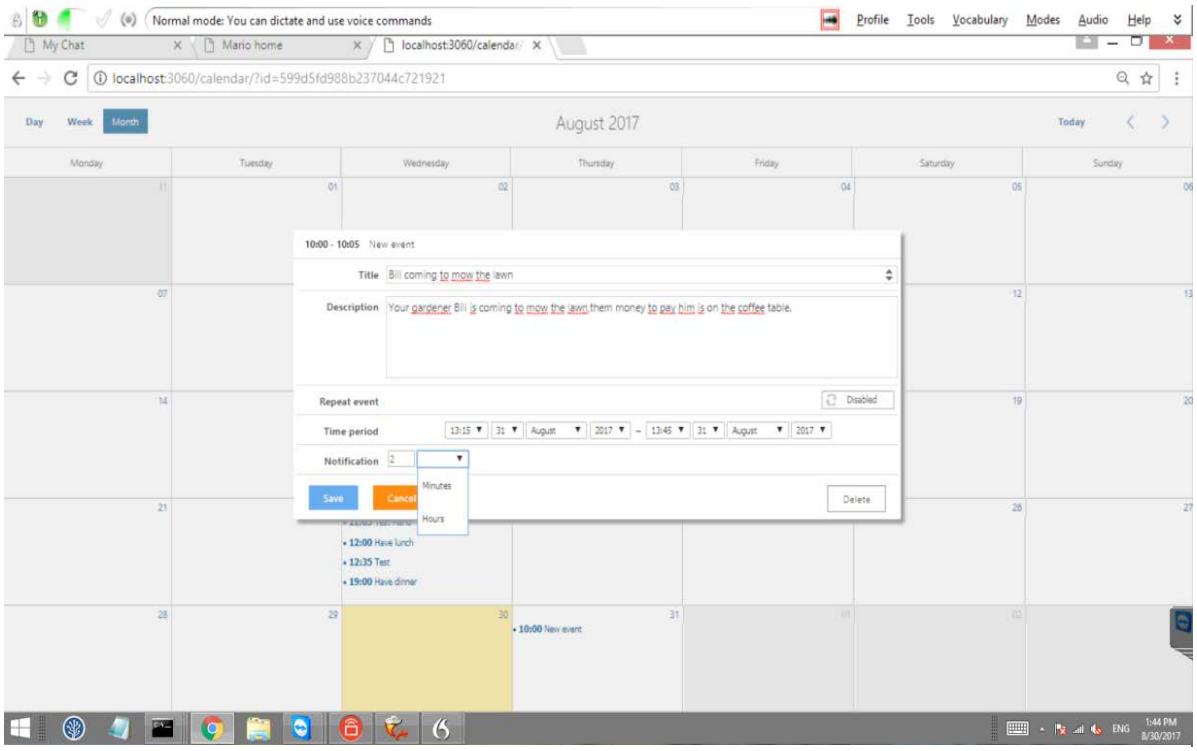


Figure 3-40: Calendar event time editing

To complete the event editing process, exit the webpage using the browser ‘close tab’ function.

That completes the setup process.

4. The MARIO Application

To start the MARIO Application, the 'Launch MARIO!' button is pressed.

Figure 4-1 shows the screen after MARIO application starts:

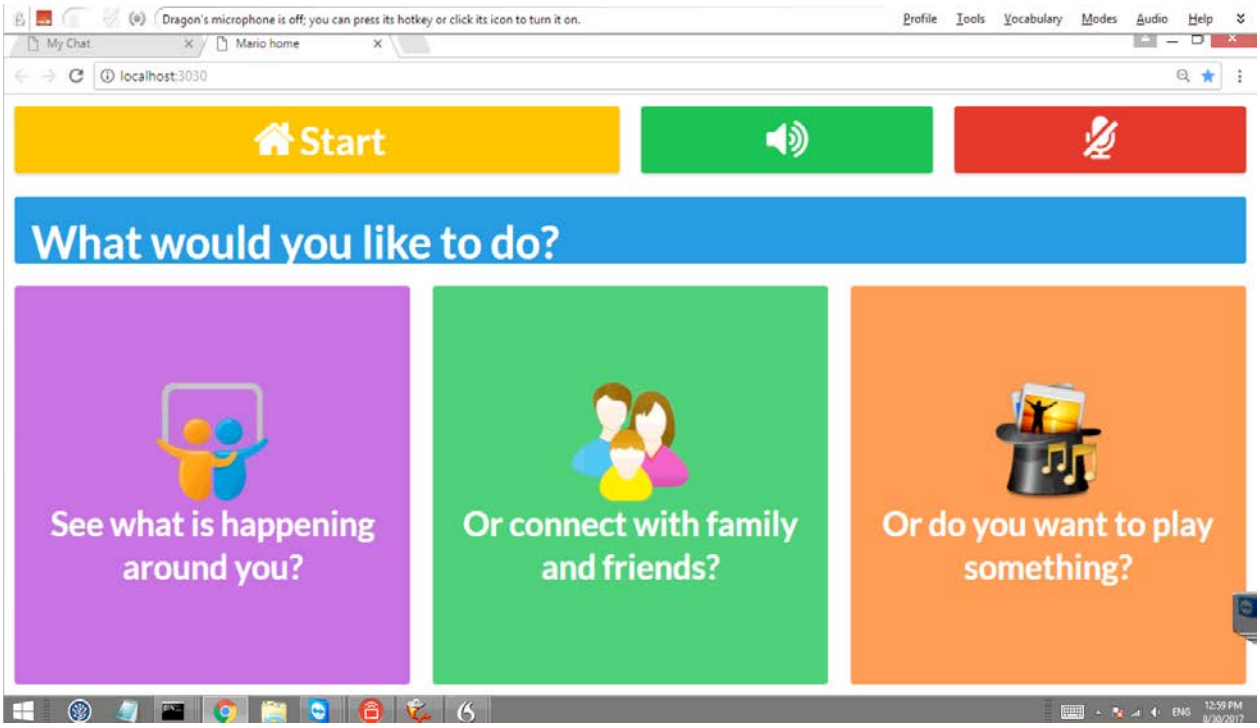
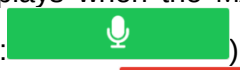


*Figure 4-1: MARIO **Home/Start** Screen*

There are four parts to this screen:

1) The **Start** Button. This is always shown and is used to return the user to the Home screen shown in Figure 4-1 above.
2) The **Speaker** button. This is used to mute or unmute the speaker.
3) The **Microphone status** icon/button. This performs two functions:
   a) Firstly, it displays when the MARIO system is listening for voice commands (when it appears thus: ) and when the system is not listening for voice commands (when it appears thus:). For example when MARIO is speaking itself - as shown in Figure 4-1 - the system will ignore any speech input it receives. While the MARIO Application is running it continually listens for commands as well as responding to button presses.
   b) This button can also be clicked to disable the microphone (but only for a short period).
4) The Applications buttons. There are three of these:
   a) The **See what is happening around you** button. This is used to read the news or to open the user's calendar (events can only be viewed but not changed or added to by the patient).
   b) The **Or connect with family and friends** button. This is used to connect to the contacts in the Friends and Family group including MyChat.
   c) The **Or do you want to play something** button. This is used to listen to music, play a game, or show a slideshow of photographs associated with the user.

The Applications are discussed in more detail below.

4.1. The ‘See What is Happening’ Application

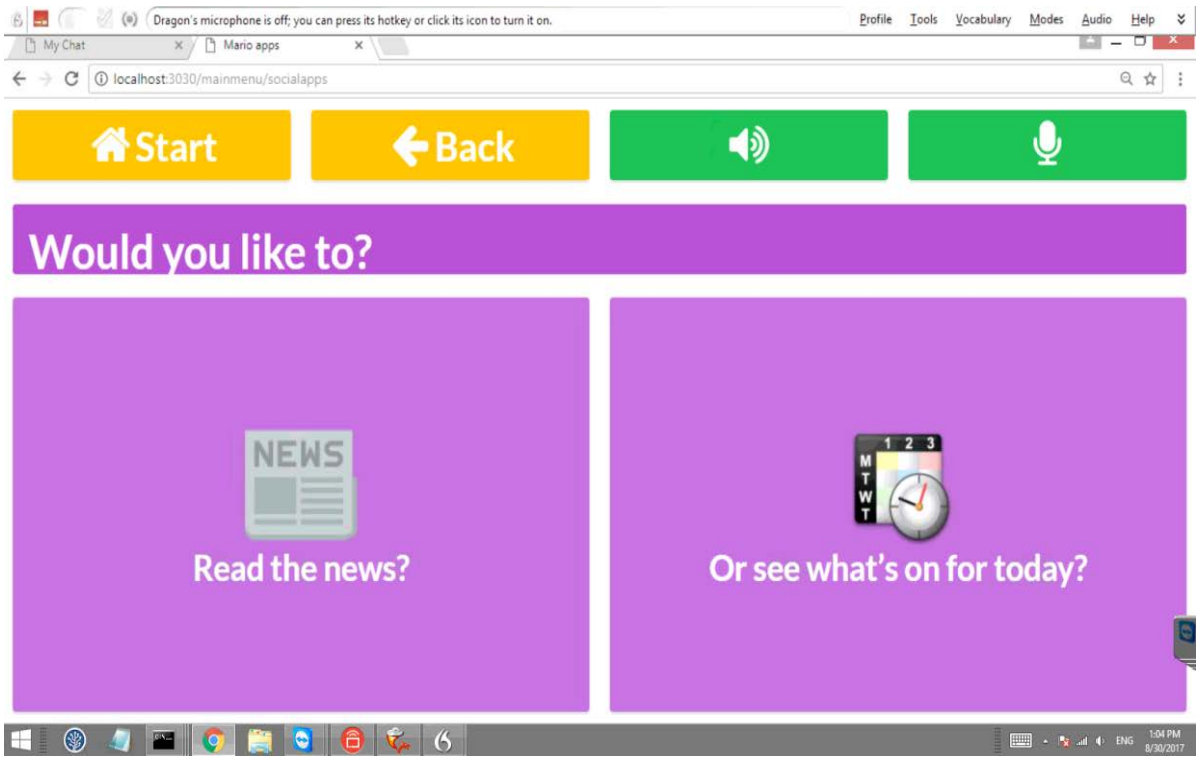


*Figure 4-2: MARIO **See What is Happening** Application Screen*

Figure 4-2 shows the screen after the **See What is Happening** application is activated:

There are two options which can be selected here: **Read the News?** and **Or see what’s on for today?** Which shows the calendar appointments or events that the patient has. A ‘**Back**’ button has been provided; this shows on all the **See What is Happening** screens, and serves to allow the user to navigate around the application without having to return to the Home Screen and reselect the **See What is Happening** application.

Figure 4-3 shows the screen after the **Read the news** button is pressed, or the user has given a verbal command (such as “Read the news, please MARIO”) to MARIO. Note that MARIO responds verbally to confirm receipt of the command.

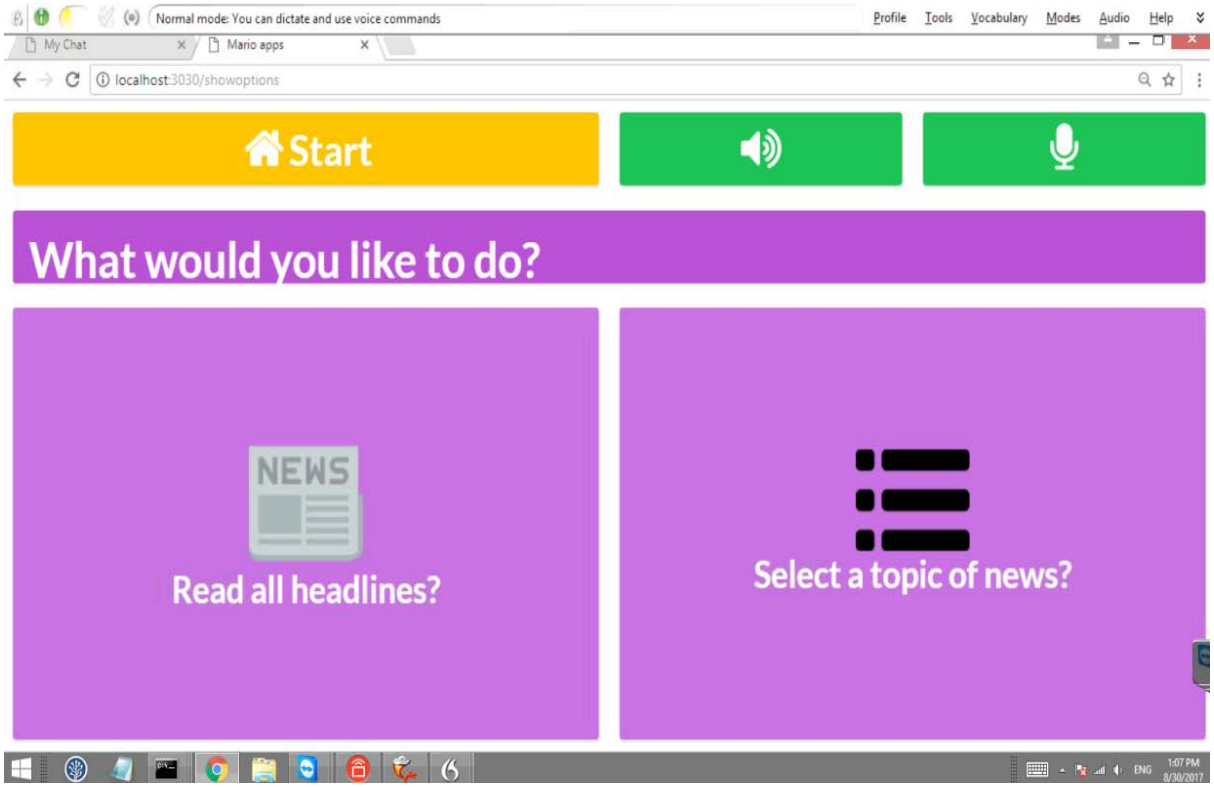


*Figure 4-3: MARIO **Read the news** Screen*

Figure 4-4 shows the screen after the **Read all Headlines** option is activated. At this point

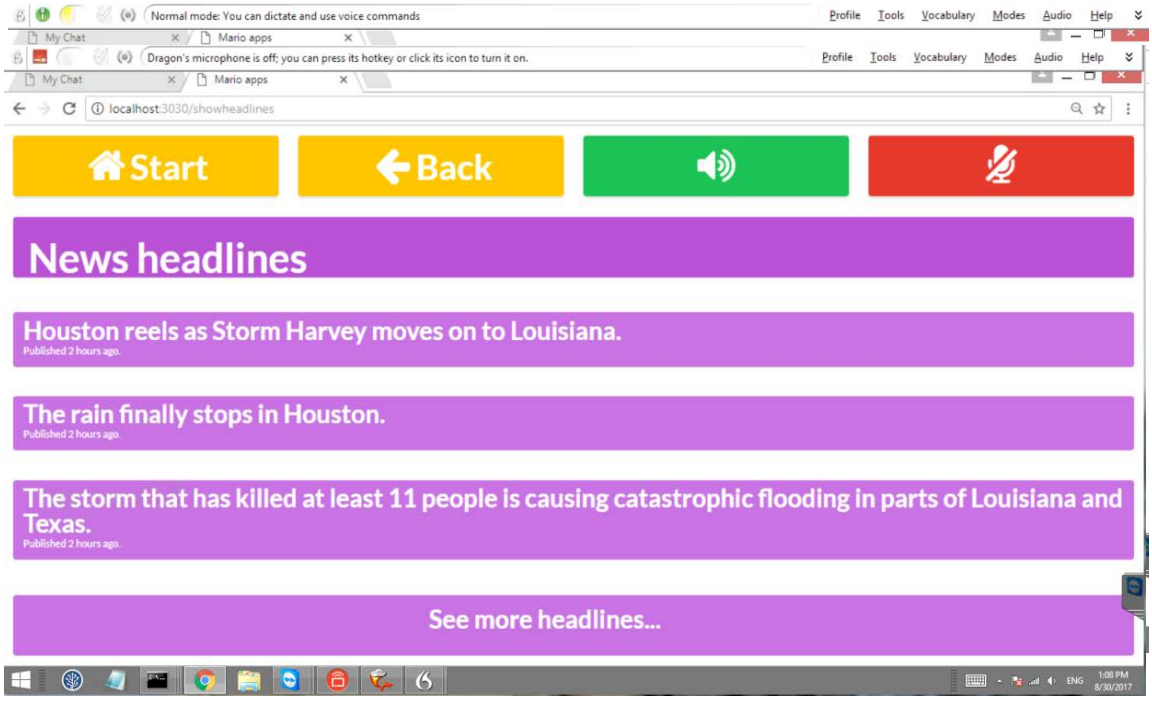


*Figure 4-4: MARIO **Read all Headlines** Screen*

MARIO is verbally reading through all the headlines and cannot respond to verbal commands - hence the microphone icon shows as .

Figure 4-5 shows the screen after an item in Figure 4-4 is selected. Note again that MARIO is reading the text aloud to the user:

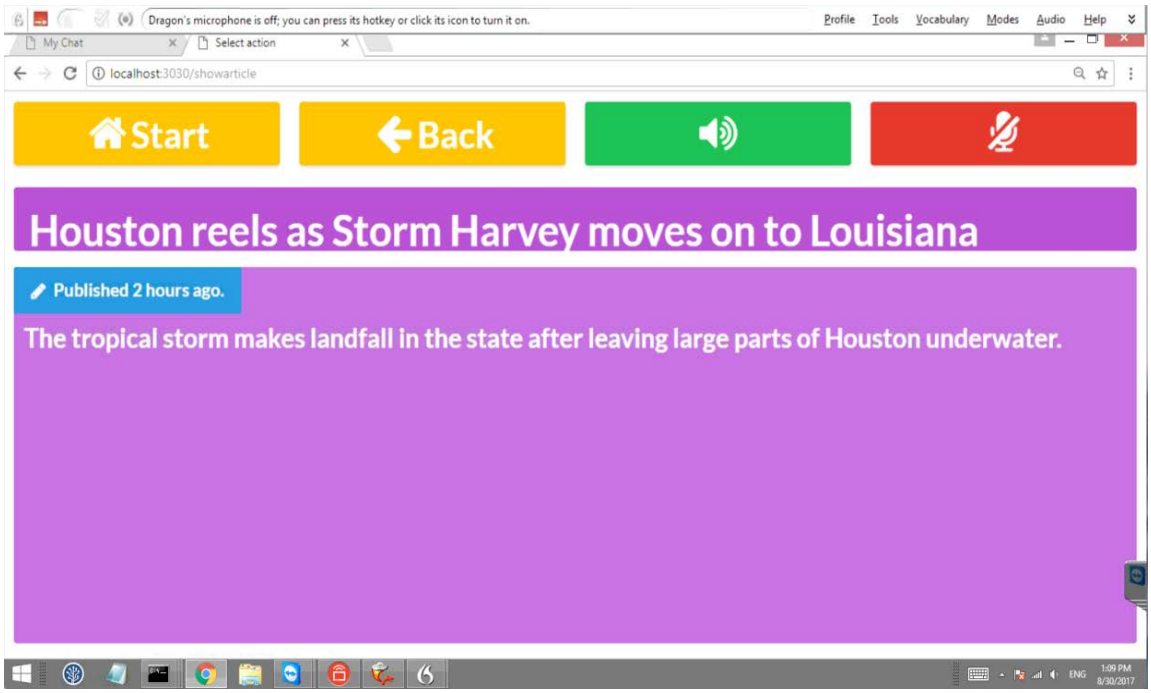


Figure 4-5: MARIO News item selected

Figure 4-6 shows the screen after the **Select a topic of news** option is activated in Figure 4-3. In this case two options are available: **Business** and **Manchester News**:

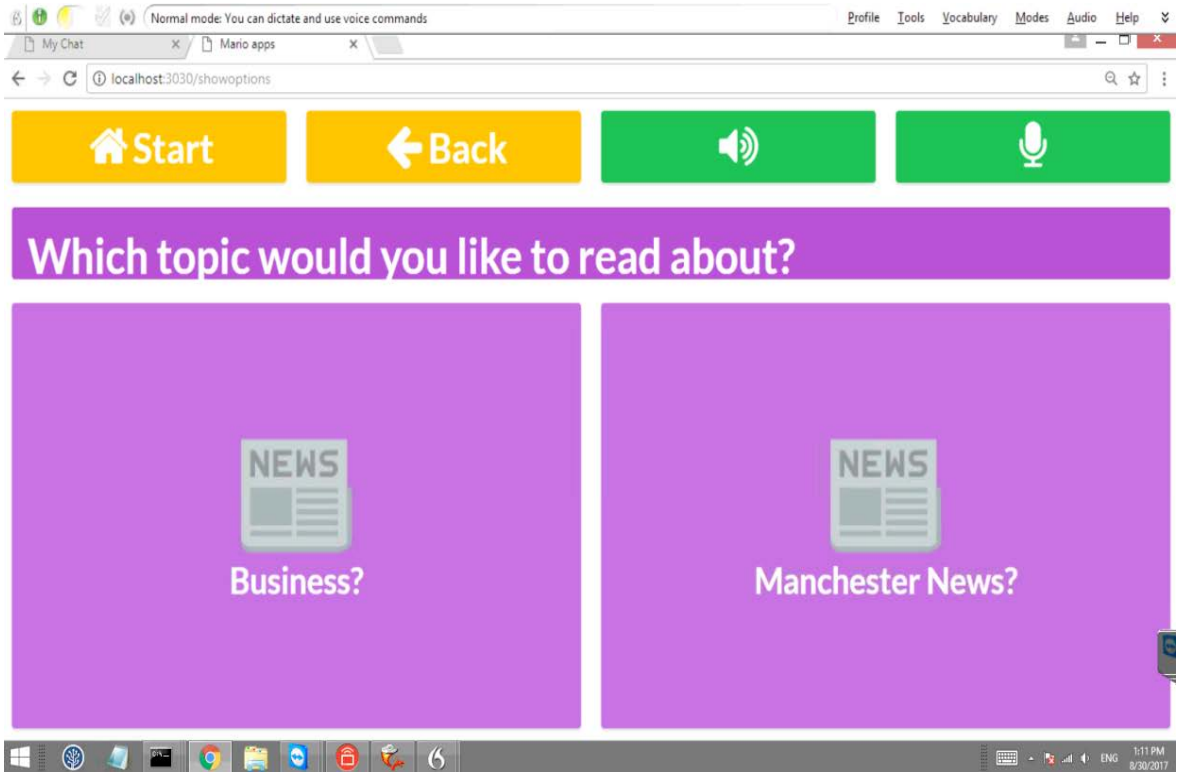


*Figure 4-6: MARIO **Select a topic of news** Screen*

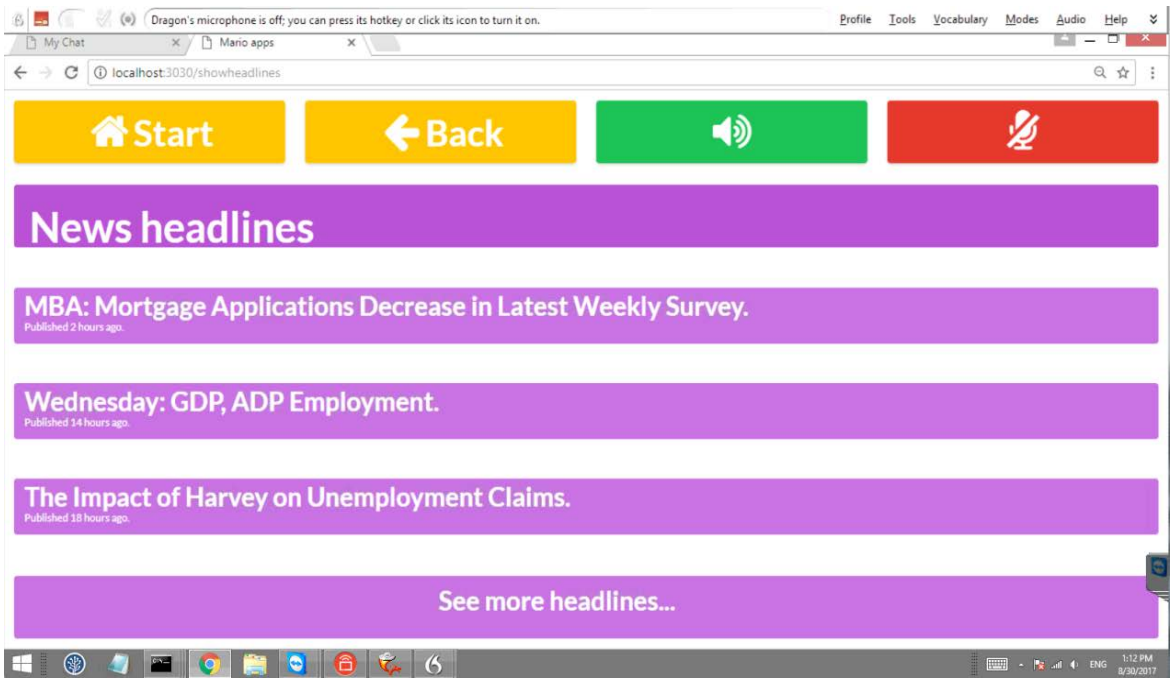


Figure 4-7: MARIO Business News item selected

Figure 4-7 shows the screen after the **Business** option is activated:

The **see what's on for today** button (see Figure 4-2) produces the screen shown in Figure 4-8:

The patient can choose to look at the current day's diary, or look ahead to upcoming events. Figure 4-9 shows the screen when the **Upcoming events** button is pressed. Note that the **Today's diary** button will produce a screen with exactly the same format, as will an event alert:

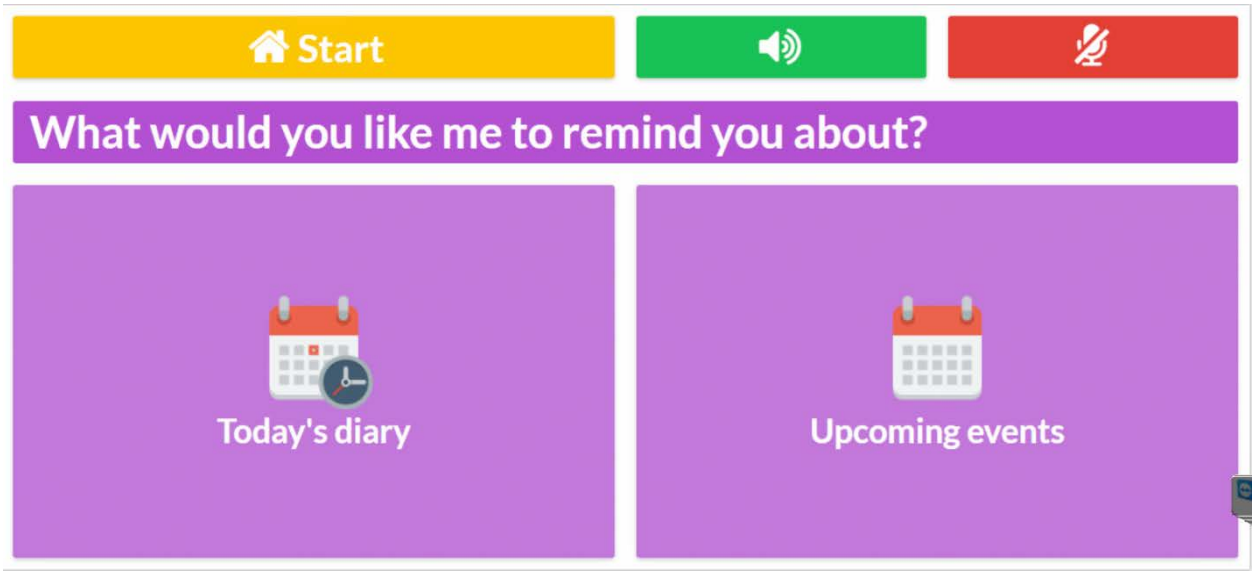


Figure 4-8: The What's on for today screen.

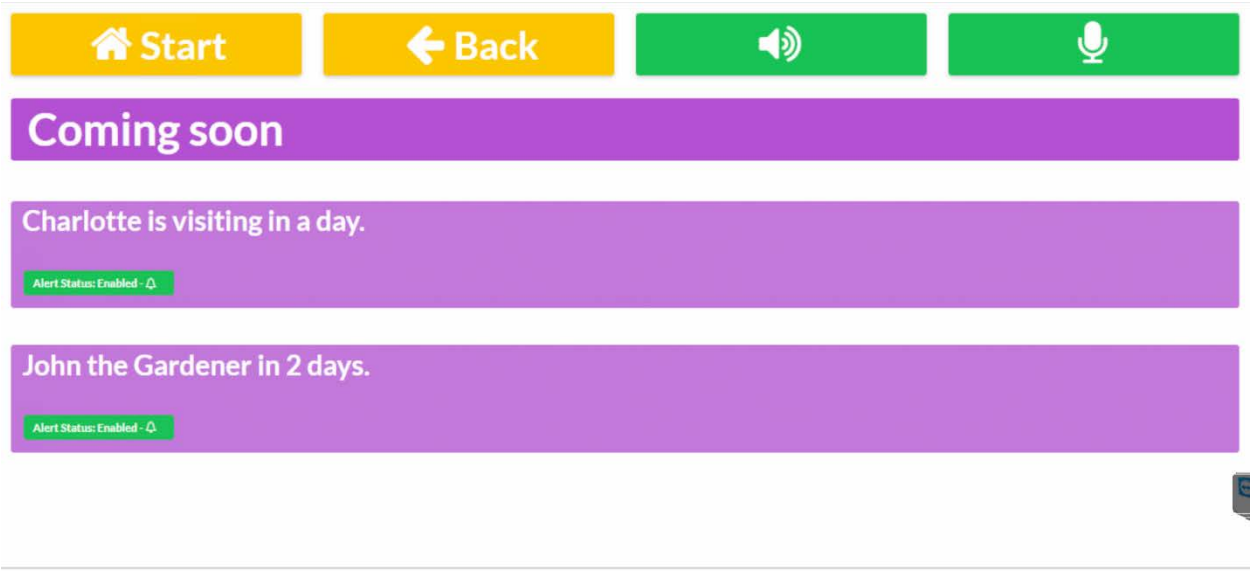


Figure 4-9: Upcoming Events screen

An event can be expanded to show more detail. For example, Figure 4-10 shows the screen when the '**Charlotte is visiting in a day**' button is pressed:

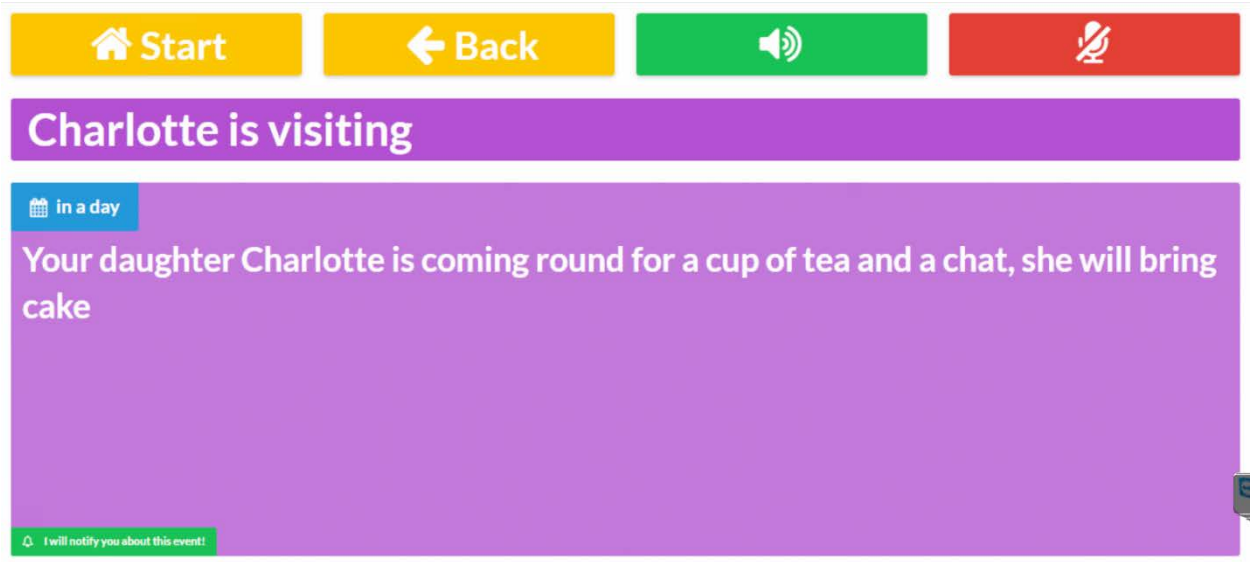


Figure 4-10: Event Details screen

Note also that the back button can be used to return to the **Upcoming events** screen, and the Start button returns to the home screen (Figure 4-1).

4.2. The Family and Friends Application

Figure 4-11 shows the screen after the **or Connect with Family and Friends** option is activated (from Figure 4-1):

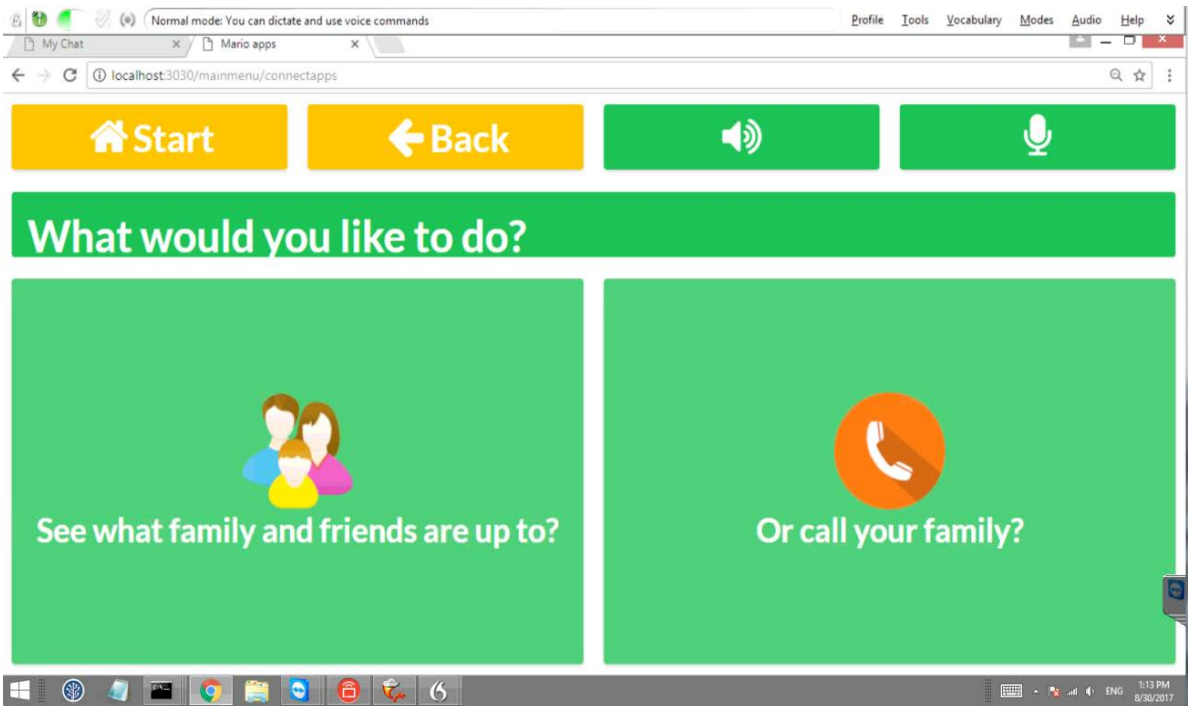


*Figure 4-11: MARIO **Family and Friends** Screen*

4.2.1 The 'See What Family and friends are up to' screen

Figure 4-12 shows the **See What Family and friends are up to** screen (in this example, only one Family and Friends member has been setup):

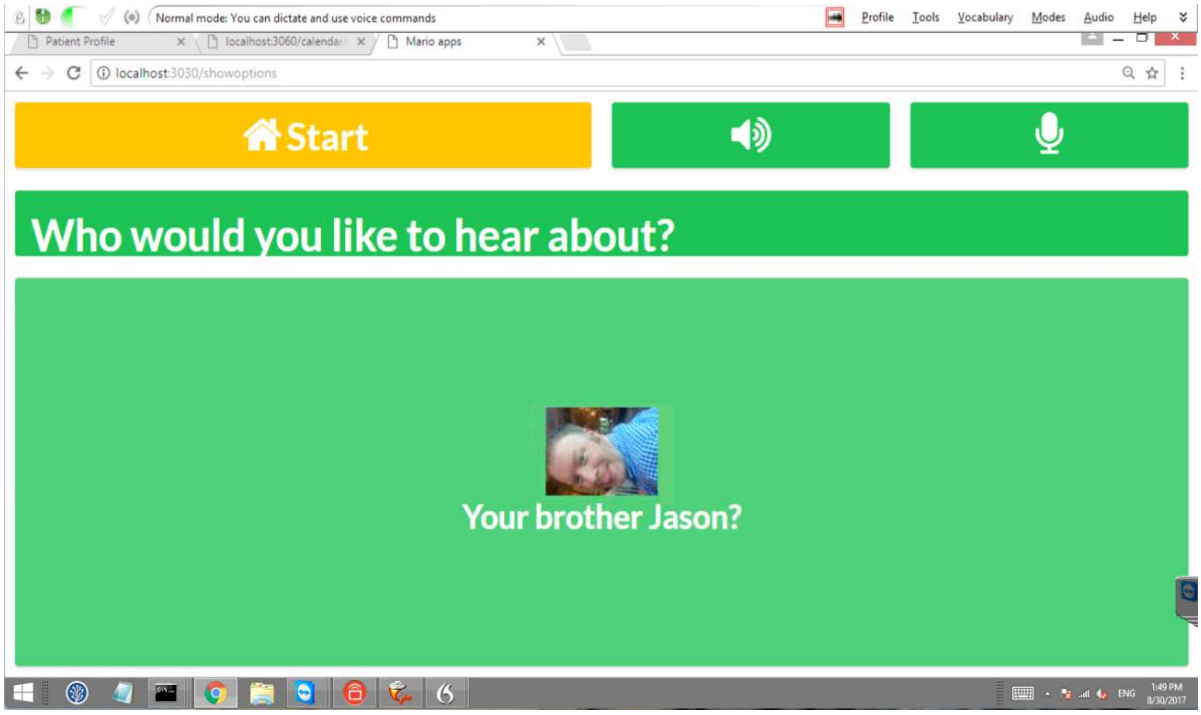


*Figure 4-12: MARIO **See What Family and friends** are up to Screen*

Figure 4-13 shows a sample screen where news from a specific person has been selected:

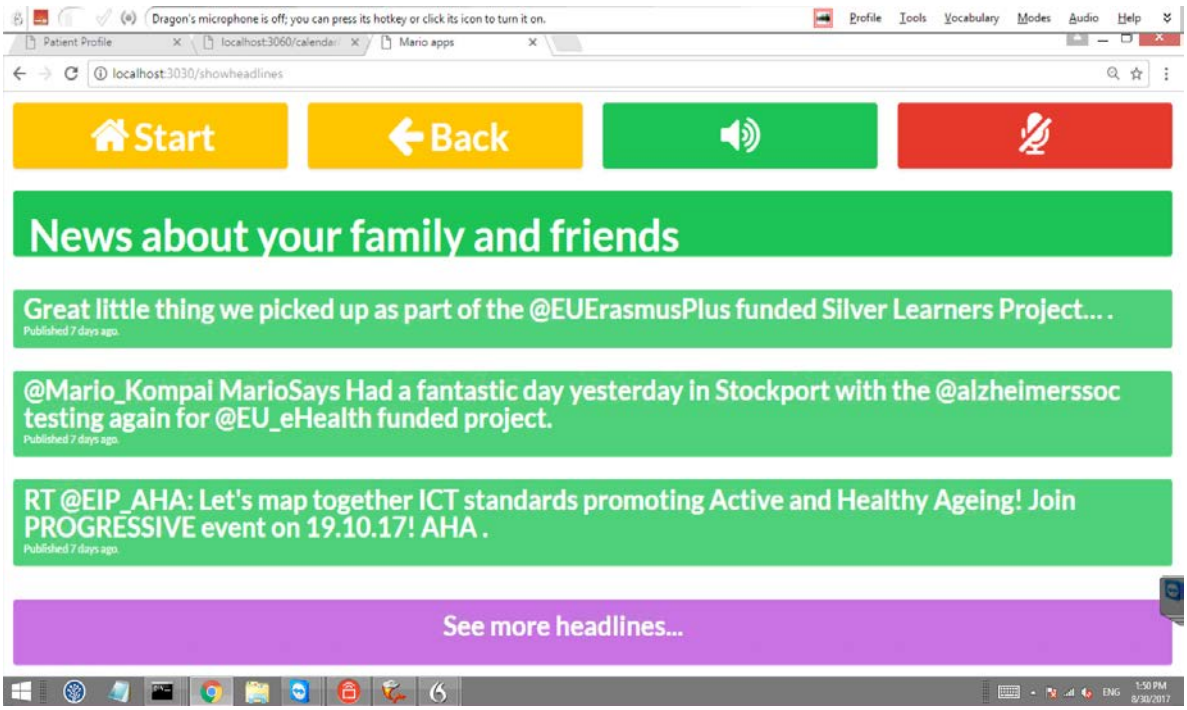


*Figure 4-13: MARIO **Family and friends news screen** for a selected person*

4.2.2 The ‘Or call your family’ screen

Figure 4-14 shows the screen after the **or call your family** option is activated. In this case, one option only is available, however more options can be shown if multiple Family and Friends contacts are setup:

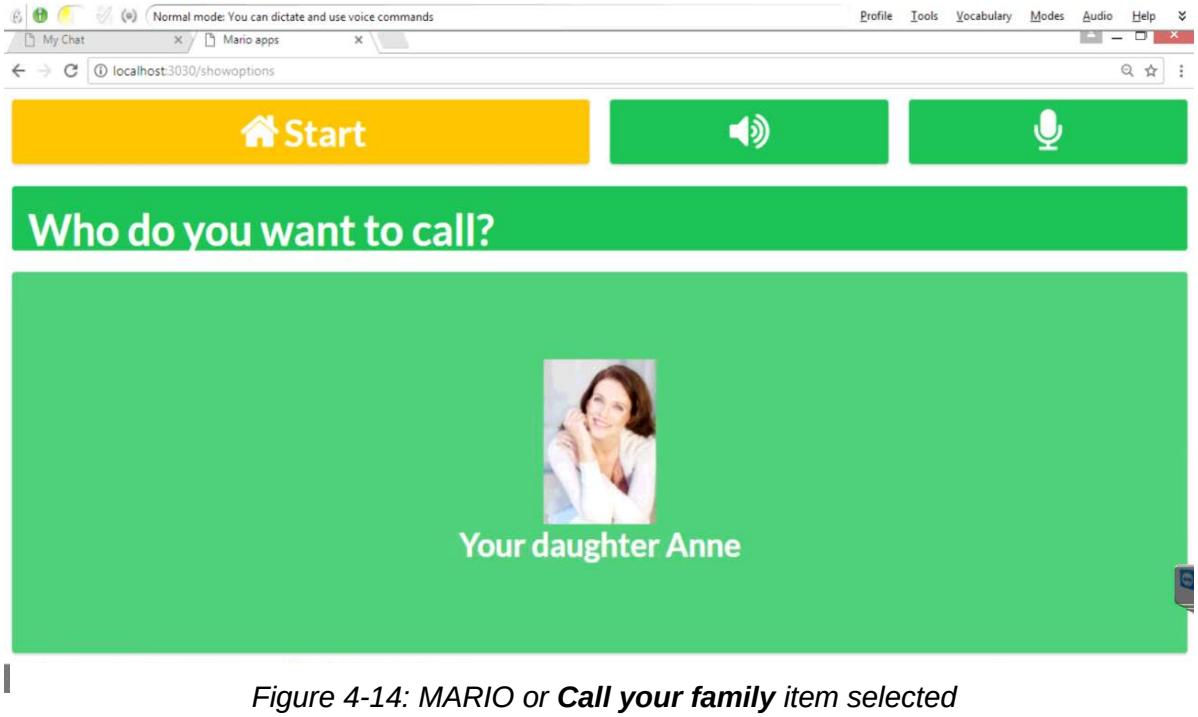


*Figure 4-14: MARIO or **Call your family** item selected*

MARIO can all any of the people displayed here. A call can be made either by tapping the Icon for Anne, or by giving the verbal command “call Anne”. Figure 4-15 shows the screen during the call.

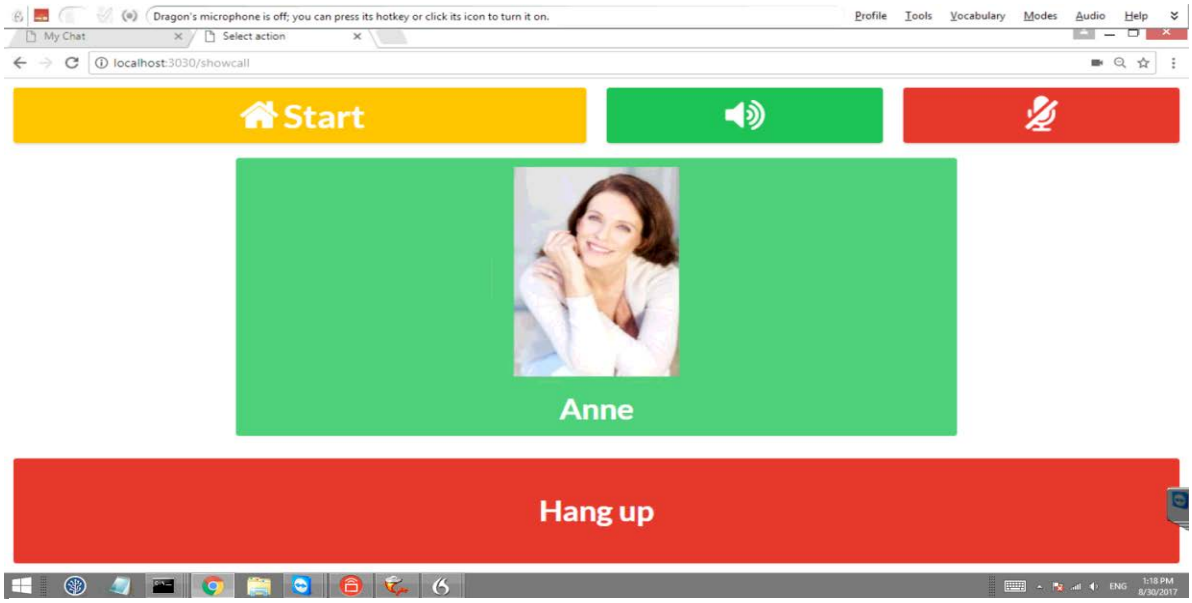


Figure 4-15: MARIO Call in progress

Note: during the call MARIO is not listening and therefore is unable to respond to verbal commands. To terminate the call the **Hang up** button must be pressed.

Figure 4-16 shows the screen after the call has been terminated (provided the settings for the Chat application allow a follow-on call to be made without reverting to the home page first, see Figure 3-34):

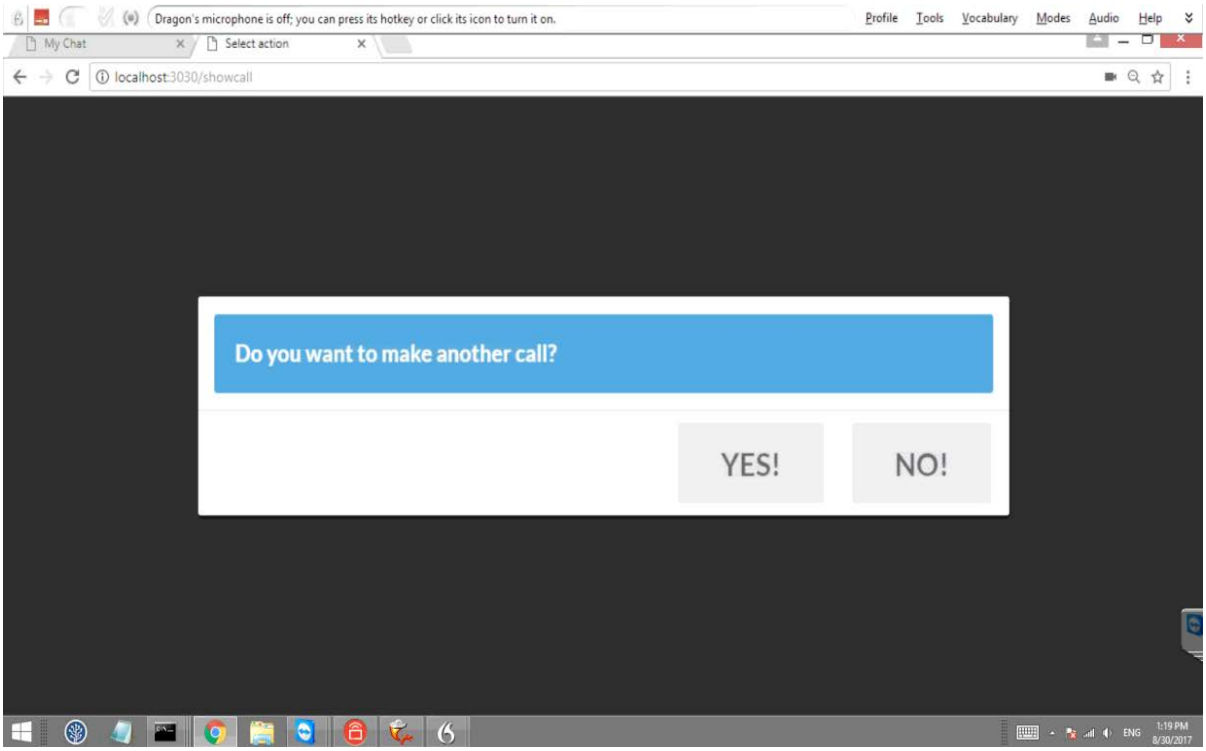


Figure 4-16: MARIO screen after a call has been terminated

Note also that if the patient has already called someone then a reminder is presented to say '*you called xxx 5 minutes ago*' with another yes/no option.

4.3. The Play Application

Figure 4-17 shows the screen which appears when the **or do you want to play something** option in the applications screen (Figure 4-1) is activated:

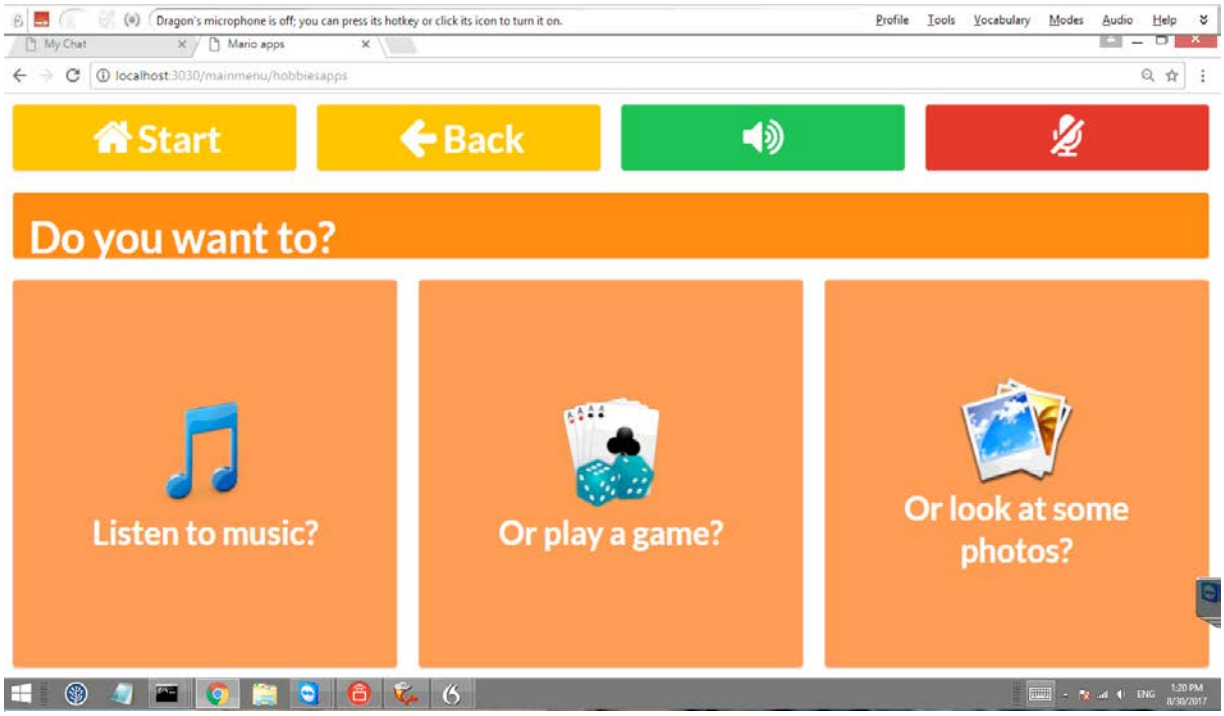


*Figure 4-17: MARIO **Play screen***

The **Listen to music** option produces the screen shown in Figure 4-18:

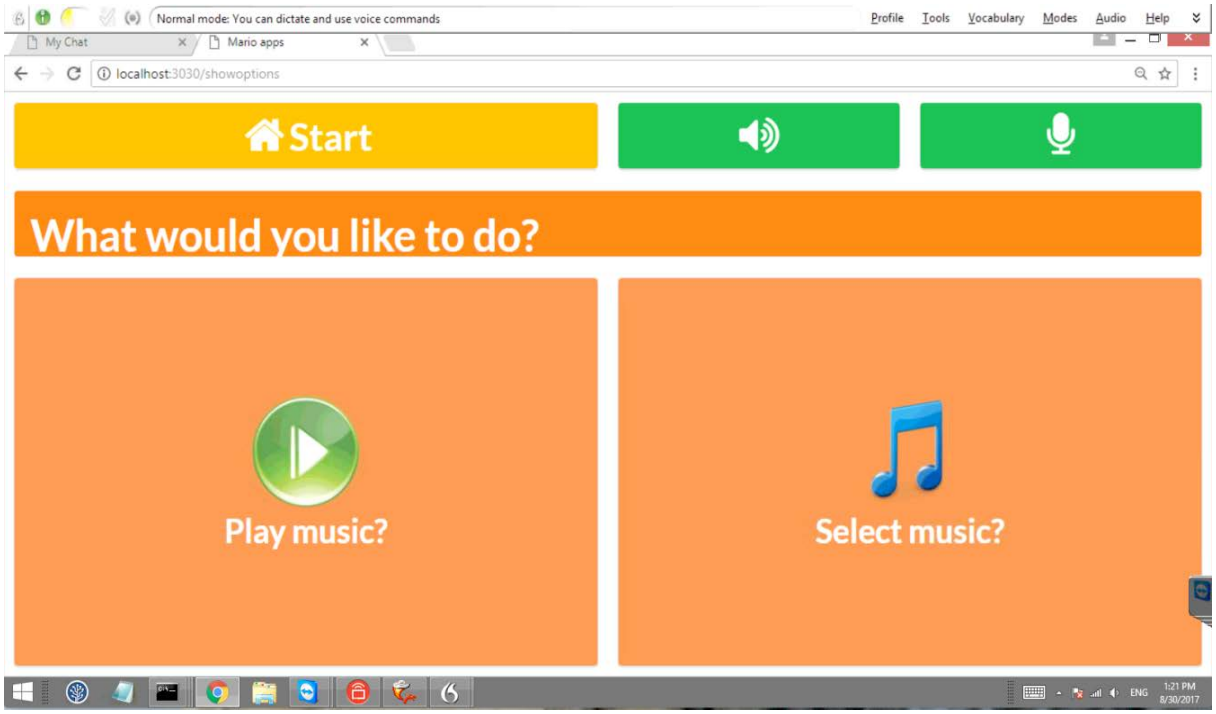


*Figure 4-18: MARIO **Listen to Music** screen*

The user can either tell MARIO to start playing music immediately, or move to a further selection screen. The Play Music button (or equivalent verbal command, e.g. '*MARIO, play some music*') will tell MARIO to immediately start playing music from the music library as shown in Figure 4-19. Note that when playing music MARIO stops listening so it will not respond to verbal commands - the next commands will need to be performed by touching the buttons on the screen:

The user can select a genre of music to be played by activating the Select music option in Figure

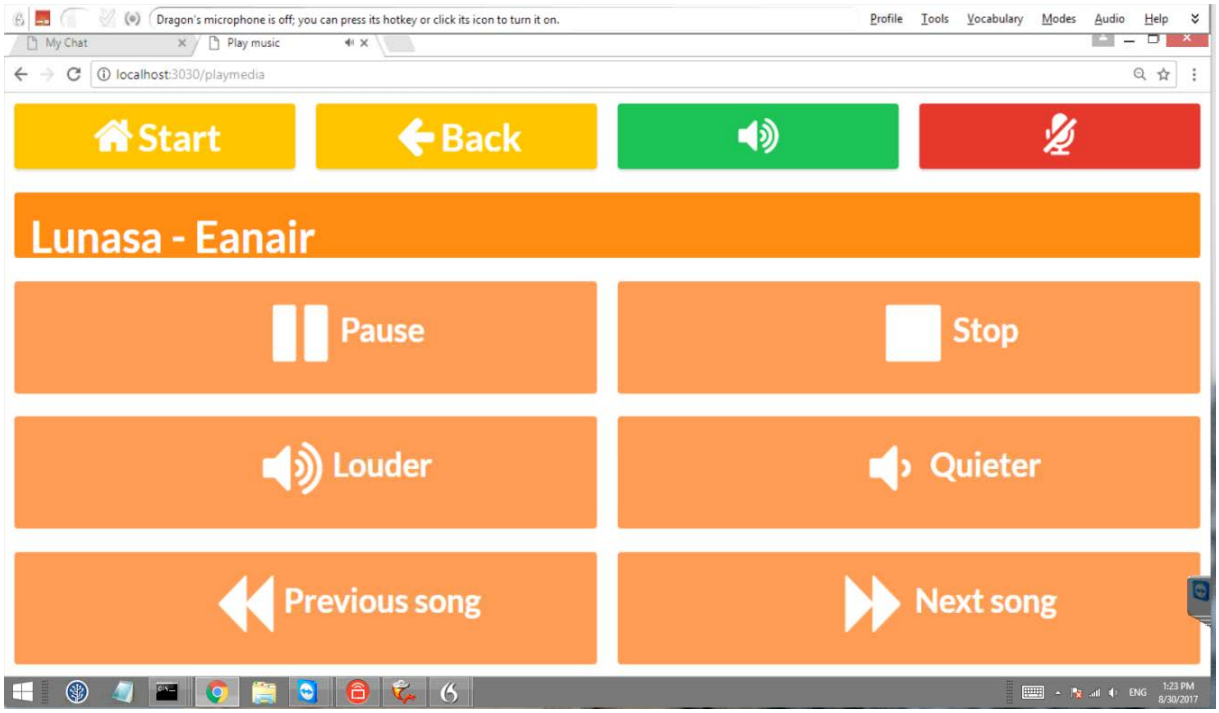


*Figure 4-19: MARIO **Play Music** screen*

4-18, provided this option is enabled in the patient setup (See Figure 3-25). MARIO will then display the preset genres setup for the user as shown in Figure 4-20:

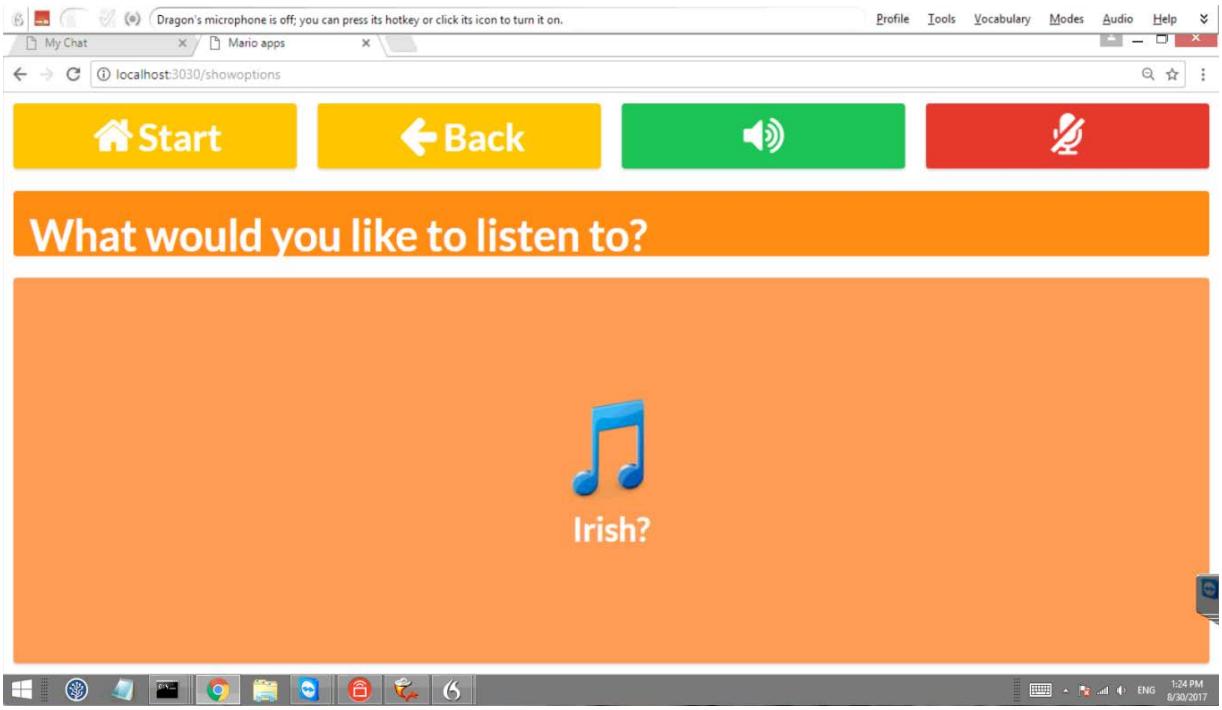


*Figure 4-20: MARIO **Music Genre Selection** screen*

The user can then select the desired genre (either by tapping the appropriate icon on the screen, or by verbal command) and the music will start playing as shown in Figure 4-19.

The user can also select a game to play by activating the **Or play a game** option in the Play screen (Figure 4-17). Figure 4-21 shows the game selection screen:

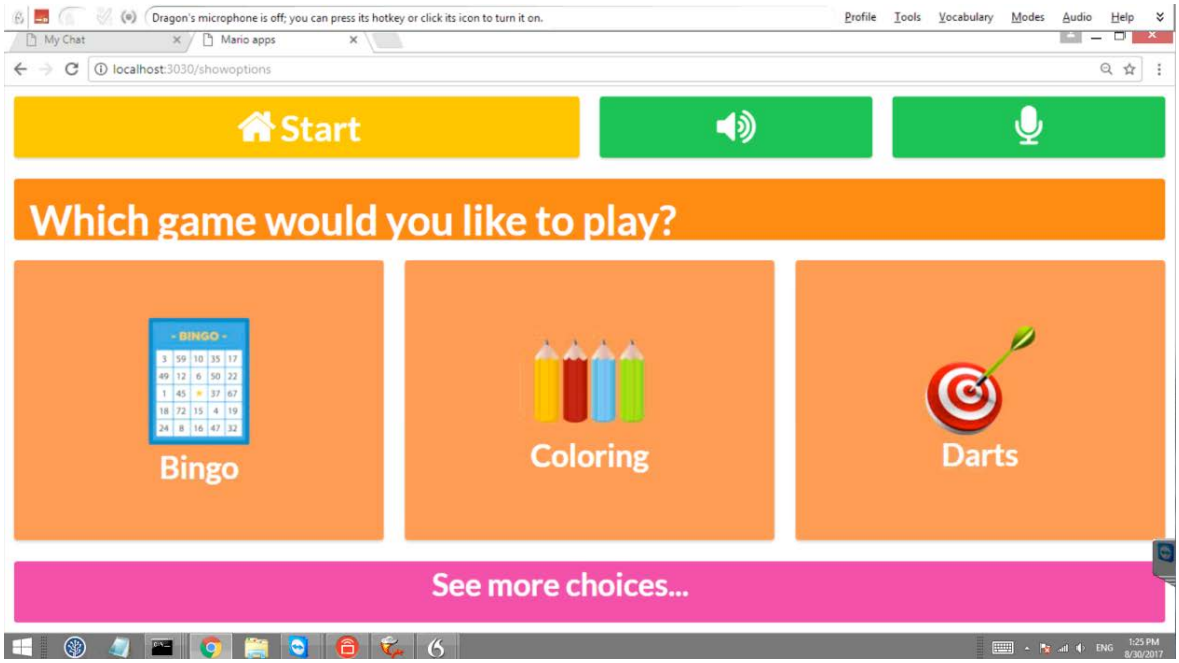


*Figure 4-21: MARIO **Game Selection** screen*

The user can select a game and start playing. Note that the **See more choices** button will bring up another page of games.The details of the games are not discussed further in this guide.

The user can use the **Or look at some photos** option in the Play screen which is the My Memories application (Figure 4-17). When this option is selected MARIO first shows a confirmation screen as in Figure 4-22:

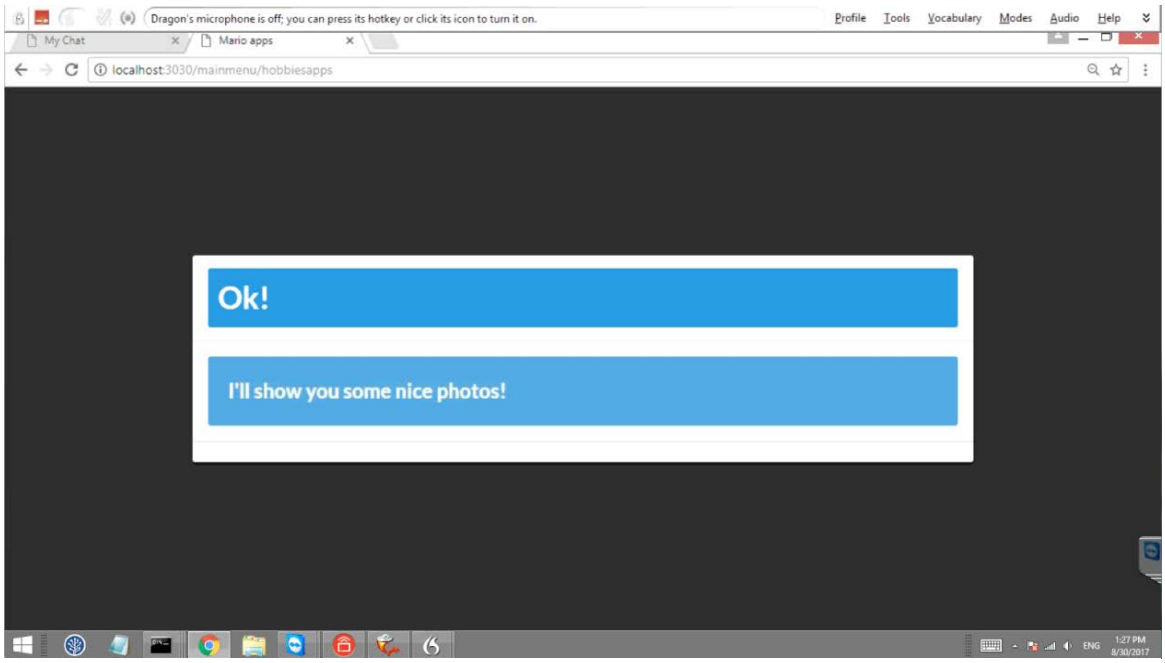


*Figure 4-22: MARIO **Look at Photos** screen*

MARIO then starts a slideshow of the photos, as shown in Figure 4-23.

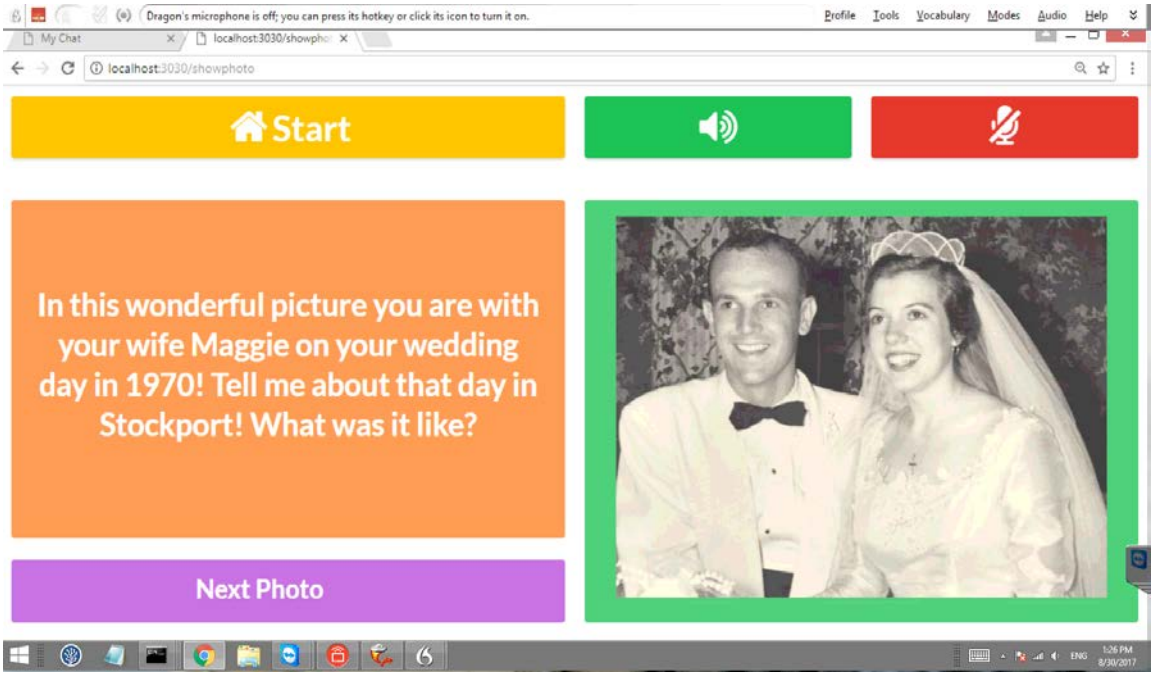


*Figure 4-23: MARIO **photo slideshow** screen*

While displaying this screen, MARIO asks the patient some questions about the photo which they can respond to. When ready for the next photo the patient touches the **Next Photo** button.

When the slideshow has shown all the images, the screen shown in Figure 4-24 is shown:

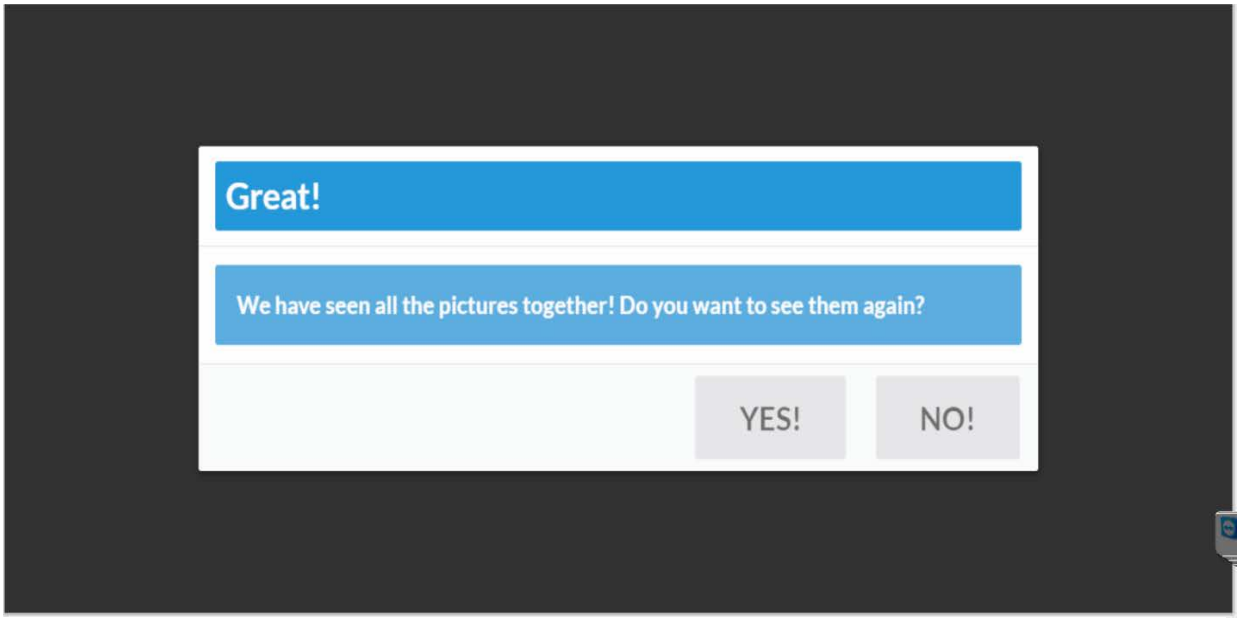


Figure 4-24: End of slideshow

The **No!** button in the **End of slideshow** screen returns control to the MARIO **Play** screen (Figure 4-17).

4.4. The Comprehensive Geriatric Assessment (CGA) Application

The CGA Application can be configured by accessing the corresponding item in the "MARIO Apps" section of the caregiver screen (see Figure 4-25).

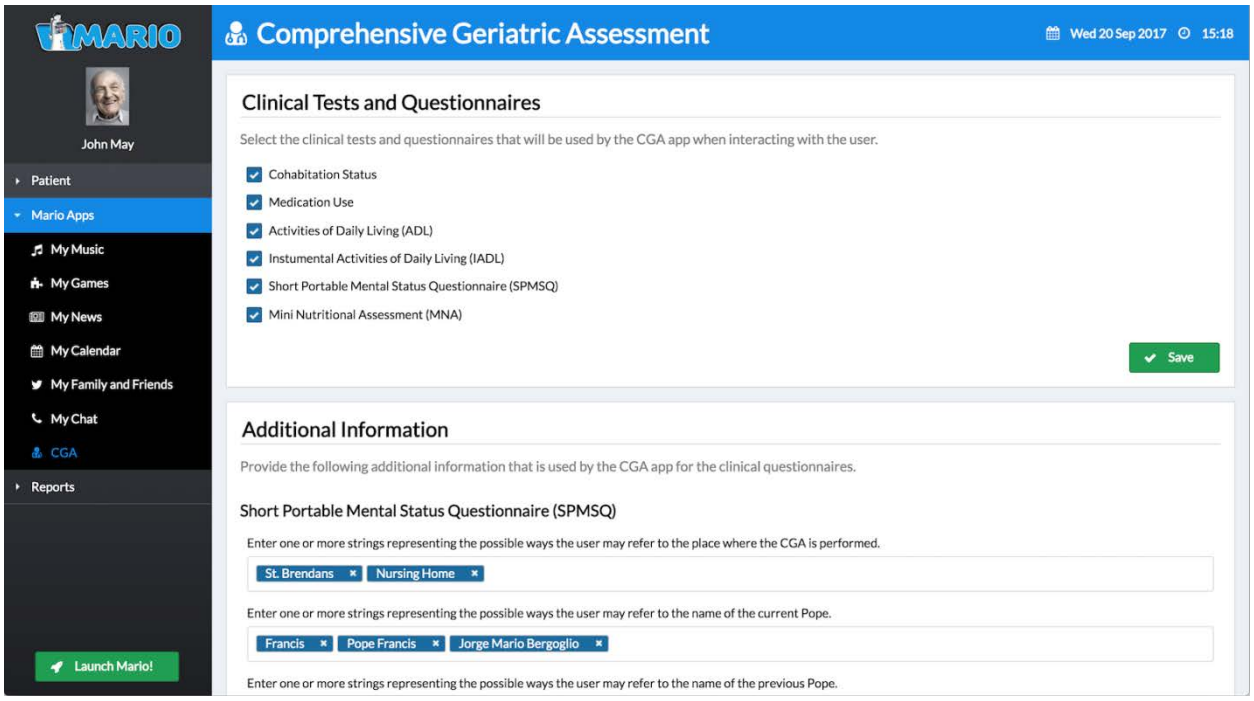


Figure 4-25 The CGA Application

The "Clinical Tests and Questionnaires" section of the configuration page allows the clinician to select the clinical tests and questionnaires that will be used by the CGA app when interacting with the user; by default all tests/questionnaires are selected (see Annex 1 of Deliverable 4.3 – "MARIO Robot CGA Module" for a description of the clinical tests and questionnaires).

If the "Short Portable Mental Status Questionnaire (SPMSQ)" is selected as part of the CGA tests, there is additional information may be defined in order to allow MARIO to interpret the user's answers and check the correctness of the replies, so as to assign a score according to the questionnaire's assessment logic. The SPMSQ assessment test includes questions that relate to user- and location-specific information; this holds in particular for the following questions: "What is the name of this place?", "Who is the current Pope/President?", "Who was the previous Pope/President?", "How old are you?", "What is your date of birth?", "What is your home address?", "What was your mother's maiden name?".

The "Additional Information" section of the CGA configuration page (again Figure 4-25) allows defining the possible ways the user may refer to the place where the CGA is performed, as well as the possible ways the user may refer to the name of the current/previous Pope and President. Those names should reflect what the caregiver considers as correct/acceptable answers to the corresponding questions.

Concerning the user-specific questions, the following information should be defined as part of the user profile (see Figure 4-26):

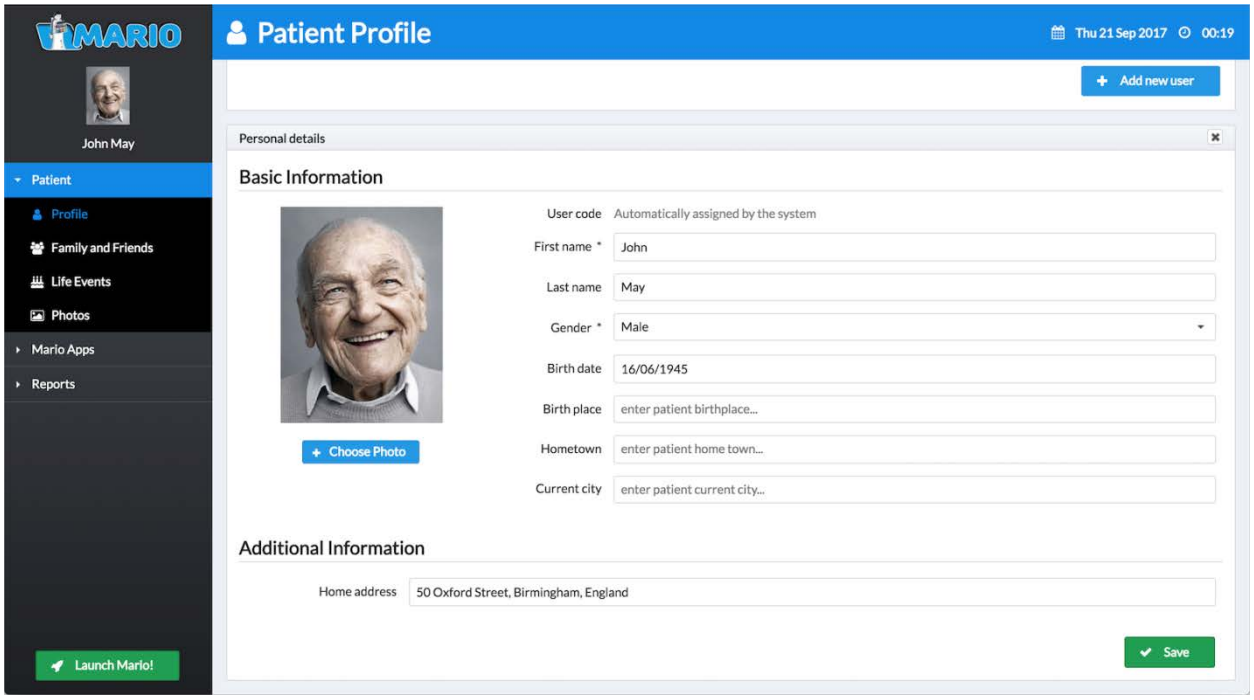


Figure 4-26 Basic CGA Information

- the user's birth date
- the user's home address

In addition, a specific profile should be defined for the user's mother under the "Family and Friends" section, where the lady's maiden name is explicitly defined (see screenshot Figure 4-27).

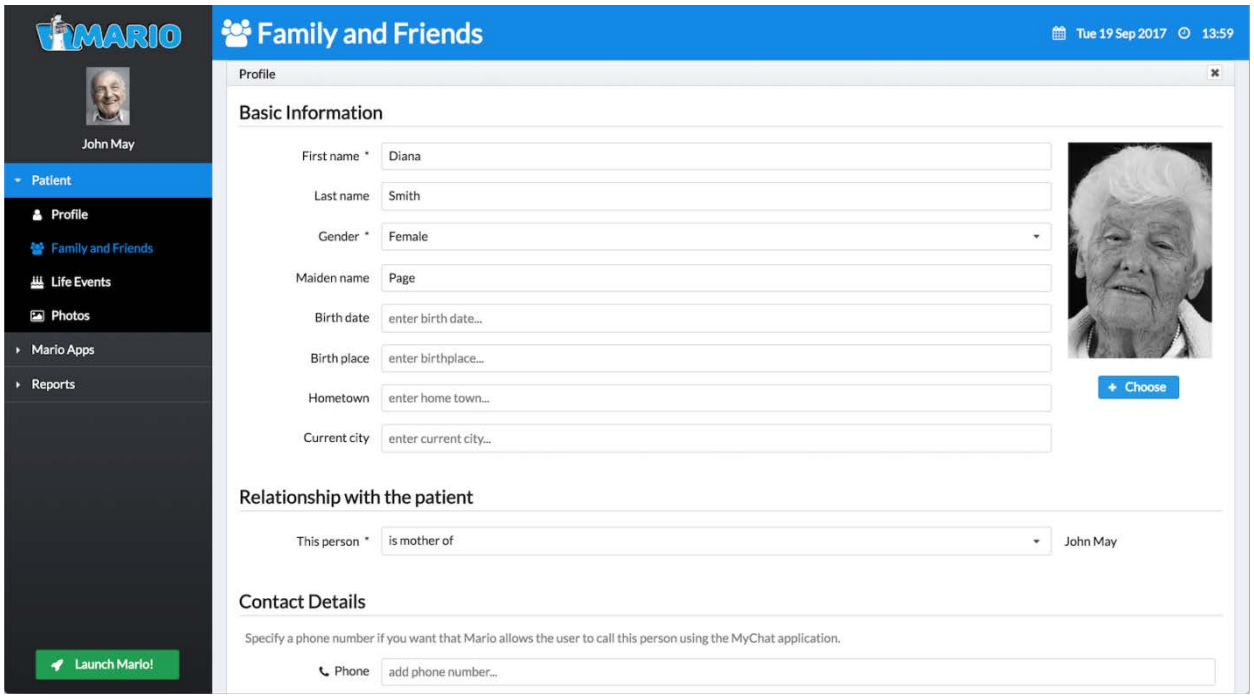


Figure 4-27 Profile for Patients mother

The CGA App is not directly accessible to the user in the MARIO user interface. The application is typically vocally triggered by the caregiver, who asks MARIO to make an assessment of the user/patient.

The assessment questions are shown on screen and depending on the type of question the user/patient can answer vocally or, in the case of closed-ended questions, through the touchscreen by selecting one of the available options (see screenshots Figure 4-28 and Figure 4-29).

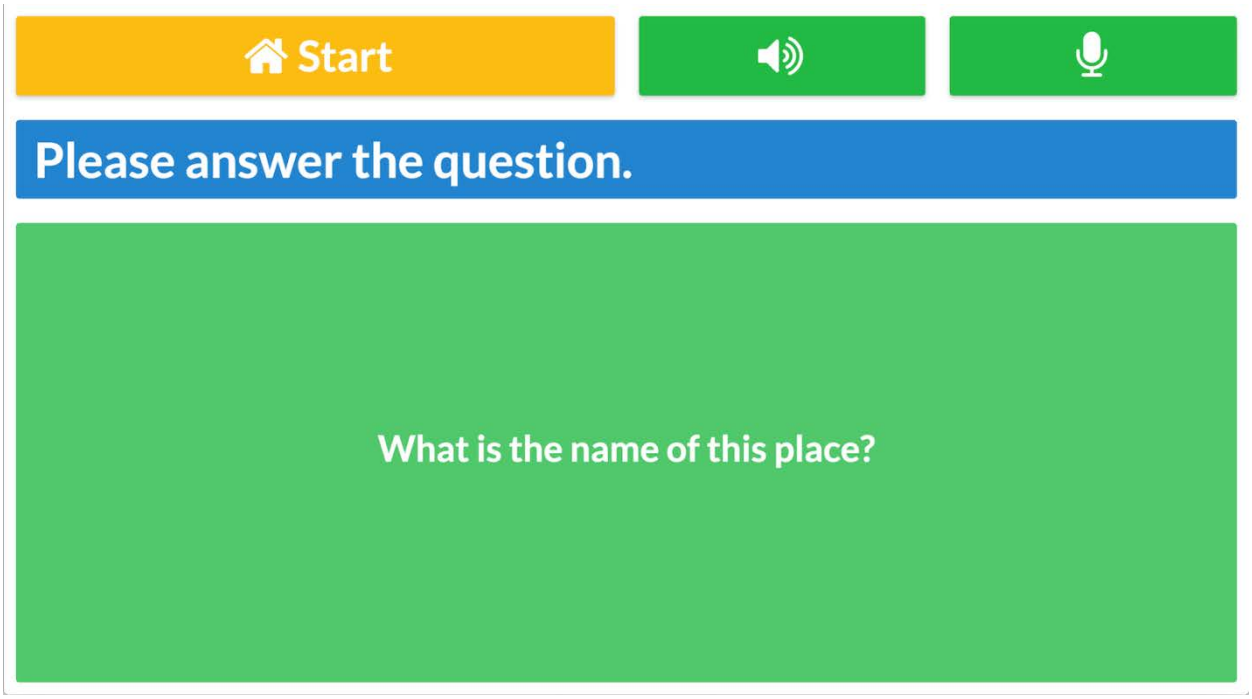


Figure 4-28 Sample CGA assessment question (1)

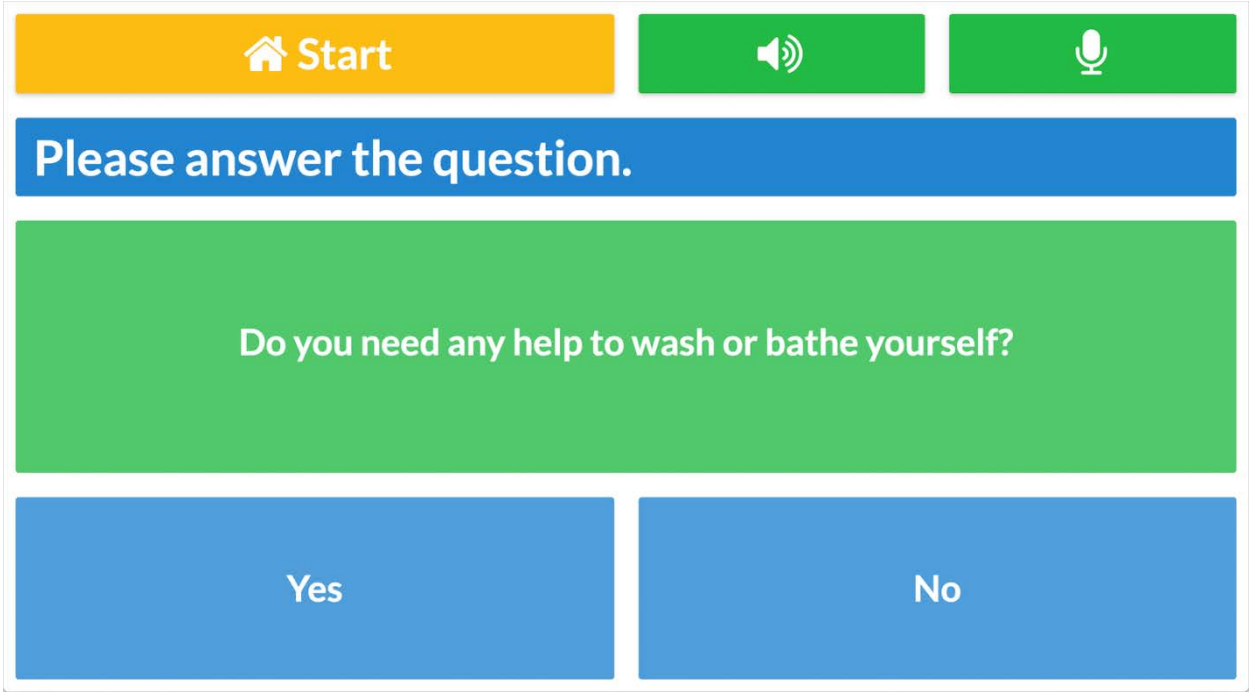


Figure 4-29 Sample CGA Assessment (2)

CGA sessions are available to the caregiver by accessing the corresponding item in the "Reports" section of the menu (see Figure 4-30). The "CGA Sessions" page provides an overview of the recorded sessions, with the starting/ending date and time and their duration. The caregiver can then access the details of each session using the corresponding button. This leads to a page (see Figure 4-31) where the details of the interaction are reported, including the questions posed by MARIO and user's answers, with the corresponding interpretation or score.

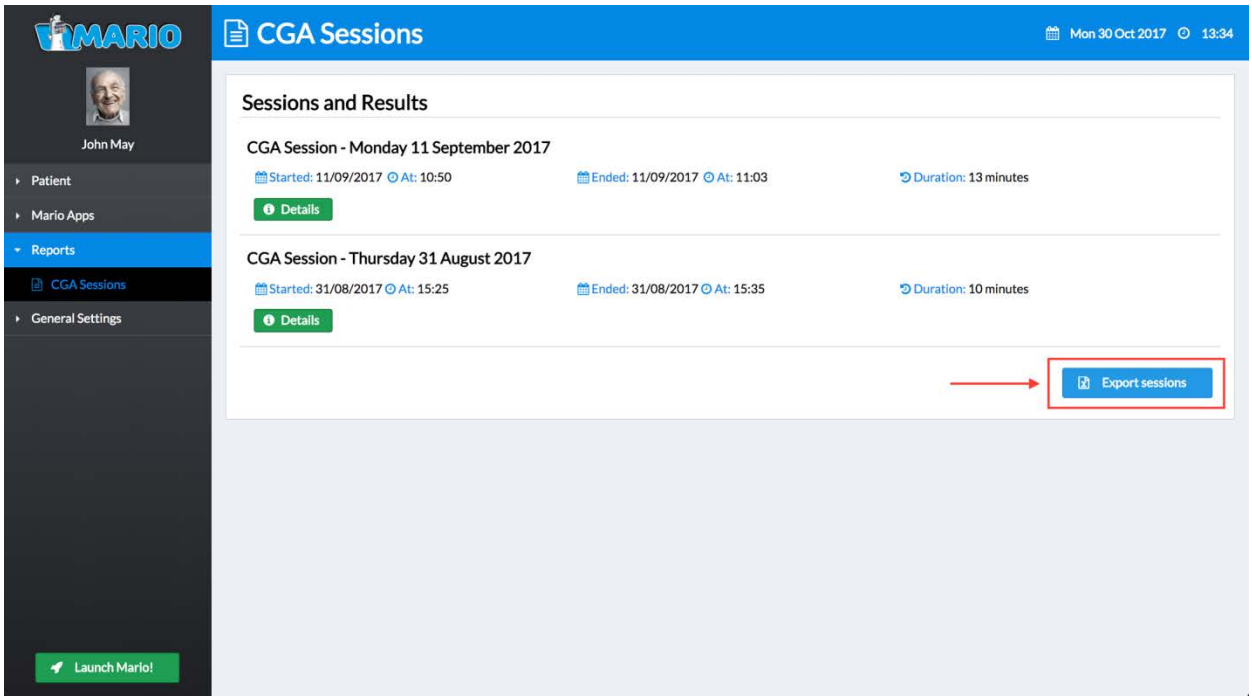


Figure 4-30 CGA Reports

As shown in Figure 4-30, the caregiver also has the possibility to export the CGA session for a given user by pressing the “Export Sessions” button. All recorded sessions for the user are exported to an Excel file, whose specific path and location on the robot are shown to the user in a confirmation dialog when the export process finishes. The resulting Excel file includes a sheet where the different sessions are summarised and, for each CGA session, a dedicated sheet where the details of the session are reported.

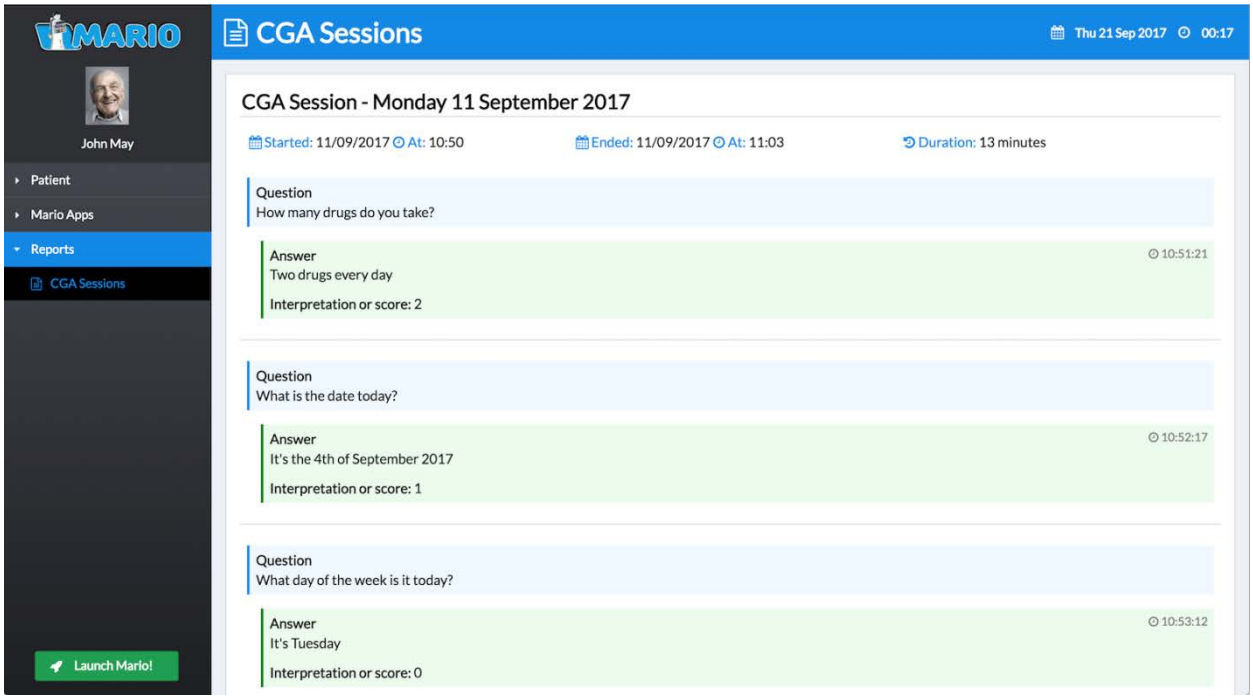


Figure 4-31 CGA Session

4.5. Controlling MARIO's Motion Subsystem and Approach Behaviour

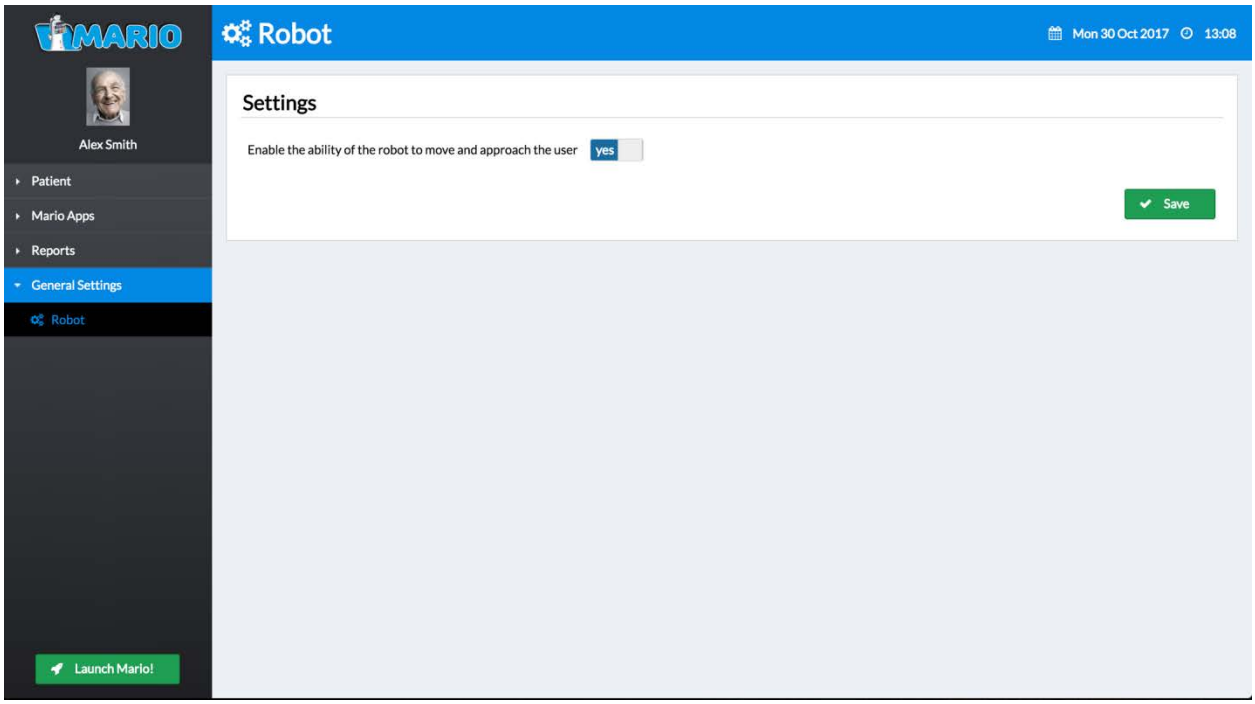


Figure 4-32 Motion Subsystem Settings

Figure 4-32 shows the setup screen accessed via the General Settings > Robot menu option. The screen allows enabling or disabling the ability of MARIO to approach the user. When this feature is enabled via the corresponding input switch (as shown in the Figure), the robot will be able to autonomously move and approach a user. Although this setting is not user-specific and can be enabled/disabled dynamically while MARIO is operating, it is recommended to enable/disable this capability as part of the overall setup performed before activating the robot for a specific user.

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Appendix A Technical Data

Designation	Specification
Span	450mm
Height	1330 mm
Weight	45 Kg
Torso Rotation	180°
On-board Energy	960 Wh
Autonomy	4h
Slope	8%
Maximum Speed	1 ms^{-1} in manual mode, 0.5ms^{-1} in automatic mode
Clearance	20mm
Security	Anti-collision laser, Emergency stops, Bumper
Communication	Wi-Fi, 4G Key

Table 6 MARIO Technical Data

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Appendix B Changing the hand controller battery

Batteries are installed or changed as follows:

1) Open the compartment underneath the controller.
2) Insert two AA batteries in the allocated compartment, making sure that the positive and negative polarities are properly in placed.
3) Replace the battery compartment in the controller.

Figure B-33: Opening the Hand Controller battery compartment

Figure B-34: Replacing the Hand Controller batteries