**HOMECARE SYSTEM**

**Short-term product**

**SystemDesign Specification**

**by**

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# INTRODUCTION

Home-based medical care Home medical is low cost, portable equipment that has lower performance requirement. Clinical and hospital equipment is generally higher performance and therefore more expensive.

The objective of this project is to build an at home health monitoring system that will supplement one's healthcare needs. It is this projects goal that the Homecare System will:

* Monitor the health of users by measuring the physiological parameters of users, analyzing and tracking abnormal parameters, and suggesting recommendations for users.
* Automatically collect medical data without the user's medical knowledge.
* Use cloud system, with cloud servers, that communicates/processes data from remote users and the cloud database. This will facilitate the online storing/updatingofuser data and patient models.
* Utilize an application that can run on multiple platforms so as to promote inter-communication between measurement devices, users, and servers.
* Provide users with low cost, flexible medical device that is not only user friendly, but provides cloud systems, with a large database, for hospitals, private practices, and other medical facilities.

# HIGH LEVEL SYSTEM ARCHITECTURE



Figure 1High-Level System Architecture Diagram

The Homecare System is a healthcare aid that consists of a measurement device, base station, Homecare Server, Homecare Database, an external interface, and a Homecare web browser. The Homecare System starts with a measurement device that is worn on the user's wrist. Sensors on the measurement device record physiological data and transmit the information to a base station via BlueTooth technology.

A base station can be a cell phone, personal computer, lap top, iPad, etc. Certain base stations, such as cell phones and iPads, will have the ability to download the Homecare System app to facilitate communication and functionality. There may be future sensor, or data, integration capabilities as well. Also, it is important to note that the Homecare device does have data storage capabilities; however, internet access is required so that the user can maximize its functionality and benefits.

Once information is received by the base station, the data can be passed on to the internet using standard and/or secure web services. The data will then be transmitted to the Homecare Server, which will serve as a multifunctional host for user data, the Homecare website, etc. After information goes through the Homecare Server, it becomes stored in the Homecare Database. The Homecare Database stores such information as log-in information, contact information, measurement information, the user's profile, and configuration information. Users will be able to retrieve information from the database by submitting the request on the base station app, or through the Homecare website.

The user will also have the option to designate authorized parties, such as family, friends, and doctors, to view information and submit requests for data. There will be a MINT administrator overseeing the Homecare website as well. In the future, the Homecare System will have the capability of connecting to an external interface. This will allow parties, such as hospitals and private practices, the ability to access the Homecare Server information using their existing electronic medical records system. Overall, the HomecareSystem design is structured to facilitate the transfer of data from the user to providers, and other third parties, so as to augment the goal of total care.

# HOME CARE WEB SITE

## Public Home



Figure 2 Public Home PagesDiagram

When the user visits the Homecare website, they will be directed to the Public Home page. On the Public Home page, the system will display a Public Home Header and Public Home Footer. To the left of the Public Home Header, the user will see the Homecare logo. There will also be a Public Home Menu under the Public Home Header.

Below the Public Home Menu, the system will display a picture on the far left side of the screen. In the center of the screen, the user will see Homecare welcome text. On the far right portion of the screen, the system will display Username, Password, and other information to assist the user.

Below the Public Home Menu, on the far right portion of the page, the system will display the text Username. Under Username, the user will see an input field so that the user can enter their username. There will also be a link, below the input field, called "Forgot username?" that the user can click to retrieve their username. Under the "Forgot username?" link, the system will see a corresponding Password field so that the user can input their password information.

Below the Password input field, the user will see a "Forgot password?" link that can be selected to retrieve their password. Under the "Forgot password?" link, the user will be able to select the “Sign in”button. This will allow the user to be directed to the User Home page. However, if thesign in is not successful, then user will have to continue with the log-in process.

Under the Sign in button, the user will see the text "New User?," along with the Register link. The Register link will be to the right of the "New User?" text. Under the "New User?" text and Register link, the system will display the text "Learn more...," justified left. Below the text "Learn more..." text, the user should see three links listed vertically and justified right. Those links are FAQ's, Privacy Policy, and Terms and Conditions, in that order.

## Registration

In order to use the Homecare website, the user must first register by entering their information. The user can start the registration process by selecting the Register link on the Public Home page. Once the user selects the Register link, they will be directed to the Registration page. On the Registration page, the system will still display the Public Home Header, Public Home Footer, Homecare logo, and Public Home Menu features in their respective positions, as previously detailed.

Under the Public Home Menu, the system will display the word Registration on the left side of the screen. To the right of Registration, and centered, the user should see the text "\*Required." Below Registration, the user will see the following information listed vertically, in the specified order, and justified left: Create Homecare username, Create Homecare password, Confirm password, Password hint, First name, Last name, Date of birth, Gender, Your email address, and Confirm email address.

It is important to note that the above text phrases will begin will an asterisk and end with a colon since these are required fields. For example, "\*Create Homecare username:" will require that the user provide information in the input field in order to register. Below the required fields, the system will also display the following information listed vertically, in the specified order, and justified left: Street address, City, State, Zip code, County, Country, Home phone, and Mobile phone. These texts phrases will end with a colon and are not required fields.

To the right of all the listed text phrases, there will be input fields so that that user can enter their information. Only the Gender field will not have an input field. For the Gender field, the user will select Male or Female. Male should be listed on the left and Female on the right. To the left of each gender, there should be a circle that the user can select to indicate their gender. Also, the Create Homecare password input box will have a question mark tab, on the right of the box,that can be selected to show the password rules.

Below the Mobile phone field, the user should see a black line, which indicates a break in the Registration page. Under the black line, the system should display Emergency Contact on the left side of the screen. Below Emergency Contact, the user should see the following information listed vertically, in the specified order, and justified left: Name, Email, Phone, and Address.

These text phrases will also end with a colon and will have an input box positioned to the right. In the top right corner of the Emergency Contact section, the system should display an Add More button. By selecting this tab, the user will be allowed to add more emergency contacts via the Add Service.

Under the address field, the system should show a Register button. After the user has entered all their information, they will select the Register button; at which point the Register Service will determine if the registration was successful. If the registration was unsuccessful, the system will display a Fail Validation Notification. The user will then be prompted to retry their registration.

If registration is successful, then the Register Service will send an email confirmation to the user and direct them to the Public Home page. From the Public Home page, the user will be able to enter their log-in information to access the Homecare website.

One field added is Registration code (required). Based on the Registration code, system can recognize the User type and grant appropriate role for registering user.

## Log-in

On the Public Home page, the user can enter their username and password in the respective input fields. The user should then select the Sign in button in order to log-in to the Homecare website. If the log-in is unsuccessful, the LOGIN Service will show an Invalid Notification.

The user will only have a maximum of 5 attempts before their log-in privileges are disabled for one hour.A Max Try Exceeded Notification will display in that case. If the log-in is successful, then the LOGIN Service will transfer the user to the User Home page.

## Forgot username

On the Public Home page, the system will display a Forgot username link under the Username input box. If the user has forgotten their username, they can select the Forgot username link to be directed to the Forgot username page. The Forgot username page will look similar to the Public Home page, except the center portion of the page will have the following username request information:

"If you have an e-mail address on file, then your Homecare ID will be sent to your e-mail account.

If you do not remember any of this information, or you do not have a valid e-mail address on file, you will have to contact the Homecare Help Line at xxx-xxx-xxxx Monday through Friday, Xam to Xpm."

Also, on the far right portion of the page, under the Public Home Menu, the system should display the text "Recover your Homecare username." Below Recover your Homecare username, the user should see the following information listed vertically, in specified order, and justified left: First name, Last name, Date of birth, and Zip code. Under each piece of information, the system should display an input field so that the user can enter the requested information.After the user has entered the requested information, they should select the Submit button; which is displayed under the Zip code field.

If the username request is unsuccessful, the Forgot username Service will prompt the user to continue to enter the correct information. If the user does not remember any oftheir information, or they do not have a valid e-mail address, they will have to contact the Homecare Help Line. If the request is successful, the Forgot username Service will send the user's Homecare ID to their e-mail. The user will then be directed to the Public Home page so that they can enter the log-in information.

## Forgot password

On the Public Home page, the user can select the Forgot password link if they do not recall their password. After the user selects the Forgot password link, they will be transferred to the Forgot password page. The Forgot password page will look similar to the Public Home page, except the center portion of the page will have the following password request information:

"If you have an e-mail address on file then a temporary password will be sent to your e-mail account.

If you do not remember your Homecare username, please click on Forgot Homecare username."

Also, on the far right portion of the page, under Public Menu, the system should display the text "Recover your Homecare password." Below Recover your Homecare password, the user should also see text that states "Please verify your personal information." Under this text, the user should see the following information listed vertically, in specified order, and justified left: Username and Date of Birth.

Under each piece of information, the system should display an input field so that the user can enter the requested information. After the user has entered the requested information, they should select the Submit button; which is displayed under the Date of birth field. If the password request is unsuccessful, the Forgot password Service will prompt the user to continue to enter the correct information. If request is successful, the Forgot password Service will send a password hint to the user's e-mail. The user will then be directed to the Public Home page so that they can enter the log-in information.

## User Home



Figure 3 User HomePageDiagram

Once the user successfully logs into the system, they will be directed to the User Home page.

### User Home header

At the top of the page, the user will see the User Home Header. On the left side of the User Home Header, the system should display the Homecare logo. On the right side of the User Home Header, there should be text that welcomes the user by name. Under the welcome text, there will be a Logout link so that the user can exit the Homecare User Home page and be directed back to the Public Home page.

### User Home Menu

Below the User Home Header, on the far left side of the screen, the system should display User Home Menu.In User Home Menu,the system should also display the Home (button with text or icon) with the link to User Home page.

Under Home, the user should see the following information listed vertically, in specified order, and justified left: My Profile, Reports, Message Center, and My Account. The listed information should have a plus sign to the left of each phrase so that the user can select and expand each section. To the right of the User Home Menu, the system will display welcome text at the top of the page, below the User Home Header. The text should read:

"Welcome to...

To review portions of your personal health record and manage your Homecare account, please use the menu on the left."

Below the welcome text, the system shows picture icons for a New alarm notification and New message notification. The New alarm notification and New message notification text should be to the right of each icon. The New message notification picture icon should sit below the New alarm notification picture icon.

### New alarm notification

New alarm notification will be change to different color (red for example if there is unread alarm message in Message Center). Picture icon will be link to Message Center – Alarm Messages page.

### New message notification

New message notification: will be change to different color (red for example if there is unread message in Inbox of Message Center). Picture icon will be link to Message Center – Inbox page.

### User Home Footer

At the bottom of the User Home page, there is a User Footer. On the User Footer, there are several links that the user can select; namely, Home, Site Map, Terms and Conditions, and Log Out. The user can select any of these links to be directed to the respective pages.

## UserProfile

### My Profile: User information



Figure 4User Information Page Diagram

On the User Home page, the user can select the plus sign for My Profile to expand the section. Once My Profile is expanded, the system should display the following vertically, in specified order, and slightly indented right, beneath My Profile: User Information, Change Password, and Authorized Users. When the user selects User Information, the system should display a User Information page.

Below the User Home Header, the user should see a User Information sub-header. To the far right of the User Information sub-header, the system will show a print link for the user to utilize. Under the User Information sub-header, the remaining screen will be divided by a black line.

On the left side of the black line, the following information will be displayed vertically, in specified order, and justified left: Email, First name, Last name, Date of birth, Gender, Address, City, State, Zip code, County, Country, Home phone, Mobile phone, and User type. It must be noted that First name, Last name, Date of birth, and Gender will be grayed out fields to show that these fields are not allowed to edit.

On the right side of the black line, all of the corresponding information will be detailed and justified left. Below the User Information fields, the system will display an Edit, Cancel, and Save button.

If the user selects Edit, they can make changes to their information through the Edit Service. However, if the user does not want to save their edits, they do have the option to cancel their changes via the Cancel Service. If the user does make changes to their information, they can select the Save button and keep their changes via the Save Service.

### My Profile: Change password



Figure 5Change Password Page Diagram

In the user profile, the user does have the option to change their password. The user can do this by selecting Change Password on the User Home Menu. Once the user selects Change password, they will be directed to the Change Password page. On the Change Password page, the user will see the Change Password sub-header under the User Home Header.

Below the Change Password sub-header, the system will display the following information vertically, in specified order, and justified left: Current password, New password, Confirm new password, and Password hint. There will be corresponding input fields to the right of each piece of requested information. In the Password hint input field, there will be an old password hint displayed to assist the user in changing their password.

Under the password fields, the user should see a Save button and a Cancel button, side by side. Once user has changed their password, and selected Save, the Save Service will confirm if the update was successful.

If the update was successful, then the password will be changed and the user will remain on the Change Password page. If the change was unsuccessful, then the Save Service will display a Fail Validation Notification, and the user will have to resubmit a password change request. The user also has the option to cancel their password change request. If the user cancels their request, then the Cancel Service will cancel the attempt to update the password.

### My Profile: Authorized users



Figure 6Authorized Users Page Diagram

On the User Home Menu, the user can view authorized users on their account. They can do this by selecting Authorized users on the User Home Menu. Upon selecting Authorized users, the system should display the sub-header Authorized users under the User Home Header. Below the Authorized users sub-header, the user should see the text "Current authorized users." To the right of the "Current authorized users" text, there should be atext field that displays the current authorized parties.

Below the text field, the user can select Delete if they choose to remove someone, via the Delete Service, as an authorized user. Under the Delete button, the system should show the text "Add authorized user;" with a corresponding input field to the left. If the user wants to add an authorized user, then they input the username in the field and select the Add button.

The Add Service will then update the information in the Current authorized users field. If the submission is unsuccessful, then the Add Service will display a Fail Validation Notification with the reason why the Add service failed. In that case, the user will remain on the Authorized Users page, and they can choose to continue with adding an authorized user.

Below the Add authorized user field, the user should see the text "Invite new member:".To the right of the text, the system should display an input field for the user to invite new members. User can select Member type for their invited party, which, by default, is the monitor type. Under the input field, the user will see an Invite button. Once the user enters a party they would like to invite, they can select the invite button and the Invite Service will add the new individual. The Invite Service will send an invitation message, with a registration link and registration code, to the invited party.

## Features

### Temperature Monitoring

The Temperature Monitoring feature monitors the user's skin/body temperature and sets offalarms ifthe temperature values exceed the normal threshold. The results of the Temperature Monitoring feature will be analyzed and a diagnosis will be issued based on the skin/body temperature values. The Temperature Monitoring feature will also make recommendations based on the diagnoses supplied. On the Temperature Monitoring page, the user should be able to view and adjust settings, access reports, get help, export reports, etc.

### Body Measurement

The Body Measurement feature monitors the user's BMI, body fat percentage, basalmetabolic rate, calorie needs per day, metabolic age, lean body mass, and muscle percentage. The Body Measurement feature also measures the user's ideal weight and hip to waist ratio. The resultsof the Body Measurement feature will be analyzed and a diagnosis will be issued for conditions related to weight, such as obesity. The BodyMeasurement feature will also make recommendations based on the diagnoses supplied. On the Body Measurement page, the user should be able to view and adjust settings, access reports, get help, export reports, etc.

### Heart Rate Monitoring

The Heart Rate feature monitors heart rate, resting heart rate, and cardiographs the data to determine if they are in a normal range or not. The results of the Heart Rate feature will be analyzed and a diagnosis will be issued for conditions related to heart rate. The Heart Rate feature will also make recommendations based on the diagnoses supplied. On the Heart Rate page, the user should be able to view and adjust settings, access reports, gethelp, export reports, etc.

### Oxygen Monitoring

The Oxygen Monitoring feature measures the oxygen level of users and detects if the reading falls within a normal range, or not. The results of the Oxygen Monitoring feature will be analyzed and a diagnosis will be issued for conditions related to SpO2 level. The Oxygen Monitoring feature will also make recommendations based on the diagnoses supplied. On the Oxygen Monitoring page, the user should be able to view and adjust settings, access reports, get help, export reports, etc.

### Fitness Monitoring

The Fitness Monitoring feature provides heart rate tracking, pedometer tracking, and the calories burned during different fitness programs. The results of the Fitness Monitoringfeature willbeanalyzed and a diagnosis will be issued for conditions related to fitness. The Fitness Monitoring feature will also make recommendations based on the diagnoses supplied. On the Fitness Monitoring page, the user should be able to view and adjust settings, access reports, get help, export reports, etc.

### Mental Status/Stress Monitoring

The Mental Status/Stress Monitoring features tracks specific physiological signals of theuser, such as stress, mood, level of attention, and excitement. These signals are monitored by using heartrate and skin resistance sensors. The results of the Mental Status/Stress Monitoring feature will be analyzed and a diagnosis will be issued for conditions related to mental status, or stress. TheMental Status/Stress Monitoring feature will also make recommendations based on the diagnoses supplied. On the Mental Status/Stress Monitoring page, the user should be able to view and adjust settings, access reports, get help, export reports, etc.

### Sleep Monitoring

The Sleep Monitoring feature tracks the user's sleep activity and quality of sleep via heart rate, oxygen level, accelerometer, and skin resistance sensors. The results of the SleepMonitoringfeature will be analyzed to determine sleep duration. The system will then issue a diagnosis for conditions related to sleep, such as diabetes, obesity, sleep apnea, etc. The Sleep Monitoring feature will also make recommendations based on the diagnoses supplied. On the Sleep Monitoring page, the user should be able to view and adjust settings, access reports, get help, export reports, etc.

### Position Monitoring

The Position Monitoring feature is primarily for disabled individuals who need the support of family, friends, and medical professionals to move around. The movement of patients willbe tracked and an alarm will be set off for movements that fall outside a normal range of mobility. The results of the Position Monitoring feature will be analyzed and a diagnosis will be issued based on the range of movements recorded. The Position Monitoring feature willalsomakerecommendationsbased on the diagnoses supplied. On the Position Monitoringpage, the usershould be able to view and adjust settings, access reports, get help, export reports, etc.

### Fertility Monitoring

The Fertility Monitoring feature monitors the body temperature of the user over time andrecommends when they will be most fertile. The results of the Fertility Monitoring feature will be analyzed and diagnoses recorded so that that user can better forecast optimal fertility.The Fertility Monitoring feature will also make recommendations based on the diagnoses supplied. On the Fertility Monitoring page, the user should be able to view and adjust settings, access reports, get help, export reports, etc.

## Reports

### Reports:Track My Health



Figure 7Track My Health Section Diagram

On the User Home Menu, the user will be able to select the plus sign, by Reports, in order to expand that section. Once Reports is expanded, the system should display the following vertically, in specified order, and slightly indented right, beneath Reports: Track My Health and Track Others. If the user selects Track My Health, they will be directed to the Track My Health page.

On the Track My Health page, the Track My Health sub-header will be listed below the User Home Header. To the far right of the Track My Health sub-header, the user should see a Help link in case the user needs further assistance. Under the Track My Health sub-header, the system should display the following:

"The reports listed below are available for your use. Click the name of the report you wish to use."

Below that notification, the nine features of the Homecare system should be listed; specifically, Heart Rate, Body Measurement, Fitness Monitoring, Oxygen Monitoring, Sleep Monitoring, Mental Status/Stress Monitoring, Temperature Monitoring, Fertility Monitoring, and Fitness Monitoring. Each feature will be represented by a picture icon that the user can select to enter each section. It must be noted that if no feature is enabled, then a notification will inform the user that "You have no feature enabled to view/track."

Under the feature icons, the system will display a Global Settings button and a Back to Home button, side by side. If the user selects an icon, they will be directed to a Homecare feature to track. However, if the user selects Global Settings, then they will be directed to the Global Setting page to manage the settings for the entire account.

### Track My Health: Temperature Monitoring Feature Example

Once a feature icon is selected, under the Reports section, the user will be directed to the feature page; for example, the Temperature Monitoring feature page. On the Temperature page, the user will see the Track My Health sub-header below the User Home Header. Also, the Temperature sub-header will be below the Track My Health sub-header. To the right of the Track My Health and Temperature sub-headers the user should see a Print and Help link.

On the Temperature report page, the user will be able see a specified sample of their skin temperature and the ambient temperature reading over a certain period of time. The information will be displayed on a graph or table. With the graph report, there will be an X axis that represents temperature.

On the Y axis, date and time will be listed to specify the time frame parameters for the desired sample. The date and time parameters can be set via a pop-up calendar when the user clicks date and time. If there is no data to track, the system will display a notification stating "You have no data to graph."

In the graph, the user will see Low, High, and Very High temperature limits. The user will also see their skin temperature and the ambient temperature graphed with two separate colored lines in order distinguish the two data sets. The skin temperature and ambient temperature data will be a reflection of the sample for the specified time frame.

Aside from a graph, the user can also choose to have their report displayed in table format. With the table format, the Date/Time, Skin Temperature, Ambient Temperature, and Diagnosis headings will be listed from left to right, respectively. On the table, the user will be able to see their sample data displayed chronologically for the time frames set. The date and time parameters can be set via a pop-up calendar when the user clicks date and time. Also, the most recent data will be listed at the top of the table.

Below the graph, or table, the user can view the scrollable Diagnosis and Recommendations section. This function displays scrolling text that will display current and previous diagnosis. It will also detail scrolling text for recommendations based on the diagnoses provided.

Below the Diagnosis and Recommendations section, the user should see a Settings tab and a Back to Track My Health tab, side by side. If the user selects the Settings tab, the system will transfer them to the Temperature Settings page. If the user selects the Back to Track My Health tab, then the user will go back to the Track My Health home page.

### Reports: Track Others



Figure 8Track Others Section Diagram

Aside from the Track My Health feature, the user can also chooseTrack Others to see reports of available granted users. By clicking on the Track Others section, the user will be able to view and track additional users of the Homecare system. On the Track Others page, the system should show the Track Others sub-header below the User Home Header. Under the Track Others sub-header the user will see a notification that states "Select other users that you want to view or track."

Below this notification, there will be a field that lists the users that can be viewed and tracked. If there are no users to view, or track, then the system will provide a notification. If there are other users displayed, then the user can select the user then click the Select button on the bottom left part of the Track Others page. Other users can also be selected by double-clicking their name in the field. The user can also choose to go back to the Home page by selecting the Back to Home button at the bottom right part of the Track Others screen.

Once another user is selected, the Select Service will direct the user to the features page for Track Others. On the Track Others features page, the user will see "Track Doe's, John Health" below the User Home Header. To the right of that text, the user should see a Help link in case the user needs further assistance. Under "Track Doe's, John Health", the system should display the following:

"The reports listed below are available for your use. Click the name of the report you wish to use."

Below that notification, the nine features of the Homecare system should be listed; specifically, Heart Rate, Body Measurement, Fitness Monitoring, Oxygen Monitoring, Sleep Monitoring, Mental Status/Stress Monitoring, Temperature Monitoring, Fertility Monitoring, and Fitness Monitoring. Each feature will be represented by a picture icon that the user can select to enter each section. It must be noted that if no feature is enabled, then a notification will inform the user that "You have no feature enabled to view/track."

Under the feature icons, the system will display a Global Settings button and a Back to Track Others button, side by side. The Global Settings button will be on the left, and the Back to Track Others button will be on the right. If the user selects an icon, they will be directed to a Homecare feature to track. However, if the user selects Global Settings, then they will be directed to the Global Setting page to manage the settings for the entire account. The Back to Track Others button will take the user back to the Track Others home page.

### Track Others: Temperature Monitoring Feature Example

Once a feature icon is selected, under the Reports section, the user will be directed to the feature page; for example, the Temperature Monitoring feature page. On the Temperature page, the user will see "Track Doe's, John Health" below the User Home Header. Also, the Temperature sub-header will be below "Track Doe's, John Health." To the right of "Track Doe's, John Health" and the Temperature sub-header, the user should see a Print and Help link.

On the Temperature report page, the user will be able see a specified sample of their skin temperature and the ambient temperature reading over a certain period of time. The information will be displayed on a graph or table. With the graph report, there will be an X axis that represents temperature.

On the Y axis, date and time will be listed to specify the time frame parameters for the desired sample. The date and time parameters can be set via a pop-up calendar when the user clicks date and time. If there is no data to track, the system will display a notification stating "User has no data to graph."

In the graph, the user will see Low, High, and Very High temperature limits. The user will also see their skin temperature and the ambient temperature graphed with two separate colored lines in order distinguish the two data sets. The skin temperature and ambient temperature data will be a reflection of the sample for the specified time frame.

Aside from a graph, the user can also choose to have their report displayed in table format. With the table format, the Date/Time, Skin Temperature, Ambient Temperature, and Diagnosis headings will be listed from left to right, respectively. On the table, the user will be able to see their sample data displayed chronologically for the time frames set. The date and time parameters can be set via a pop-up calendar when the user clicks date and time. Also, the most recent data will be listed at the top of the table.

Below the graph, or table, the user can view the scrollable Diagnosis and Recommendations section. This function displays scrolling text that will display current and previous diagnosis. It will also detail scrolling text for recommendations based on the diagnoses provided.

Below the Diagnosis and Recommendations section, the user should see a Settings tab and a Back to Track Otherstab, side by side. If the user selects the Settings tab, the system will transfer them to the Temperature Settings page. If the user selects the Back to Track Others tab, then the user will go back to the Track Others features page.

### Settings

On each feature page, under the Reports section, the user will be able to utilize the Settings tab. Upon selecting the Settings tab, the system will direct the user to the feature's Settings page. For example, on the Temperature feature, the user will see the "Temperature - Settings" sub-header below the Track My Health sub-header. For the Track Others section, the user will see the "Temperature - Settings" sub-header below "Track Doe's, John Health."

Under "Temperature - Settings," the system will show a notification stating "This page displays the current settings for this feature." Below this notification, the user should see their standard settings for the feature; for example, Sample rate time and Low, High, and Very High Threshold parameters on the Temperature feature. User can modify the settings of current feature using Edit, Cancel, and Save buttons. User can go back previous page using Back button.

For the Track Others section, currently user can see settings of the feature of other users only. The Back to Track Others buttonwill allow the user to go back to the Track Others, features page.

### Global Settings

From the Track My Health/Track Others features page, the user can select the Global Settings tab to be directed to the Global Setting page. On the Global Settings page, the user will see the Track My Health sub-header below the User Home header. For the Track Others section, the user will see "Track Doe's, John Health" below the User Home header. The user should also see the Global Settings sub-header under the Track My Health, or "Track Doe's, John Health," sub-header.

Below the Global Setting sub-header, the system should show a notification stating "This page displays the current global settings." Under this notification, the user will see the phrase "Measurement system:" listed on the left side of the Global Settings screen. To the right of the "Measurement system:" text, the system should have a Metric selection and a U.S. selection, side by side.

Metric will be on the left and U.S. will be on the right. Each option will have circular selection field, displayed on the left side of each choice that the user can choose. Once the user has made a selection, they can Edit, Cancel, or Save the changes. The Edit, Cancel, and Save button will be listed at the bottom of the Global Settings Screen; from left to right, respectively.

If the user chooses to edit their Global Settings, then the Edit Service will allow the user to make changes. If the user decides to save those changes, then the Save Service will save and update the edits. The user can also choose to cancel their edits. If the user chooses to cancel any edits, then the Cancel Service will not save and update any edits. In each scenario, the user will remain on the Global Settings page.

## Message Center

### Message Center: Inbox



Figure 9Message Center Diagram

From the User Home Menu, the user can click the plus sign on Message Center in order to expand the field. Once the Message Center field is expanded, the user can select the Inbox section. On the Inbox page, the system should display the Inbox sub-header below the User Home Header. To the left of the Inbox sub-header, the user should also see a Help link.

Under the Inbox sub-header, the system should display the following notification:

"Messages that the admin and other users have sent you are listed on this page.

You can view the complete text of any message by clicking on its message row.

Only messages that have been marked as read can be deleted."

Below this notification, the system should display an email field; with the headers Subject, From, and Received listed from left to right, respectively. Under the Subject header, the user will see the email subjects, along with a check box to the left of each message.

Below the From header, the system should show who the emails were received from. The system should also display the date and time that the message was received, under the Received header. Under the email section, the user will see a Delete button on the left side of the Inbox screen. With this feature, the user will select the check box for an email, or emails, then the Delete button. If a user deletes a message, the Delete Service will delete the message and display a confirmation notification.

At the bottom of the Inbox page, above the User Footer, the user should see a "Previous <<" tab on the left side of the screen. This will allow the user to view previous pages and/or messages. To the left of "Previous <<," there should be a Messages tab, along with the numerical sequence of numbers displayed per page. For example, "Messages 1-3."

On the bottom right part of the Inbox page, the user should see ">> Next" tab. This will allow the user to see the next page of messages on the Inbox page. With the "Previous <<," Message X-X," and ">> Next" tabs, the user will be able to maneuver through the Inbox page easily in order to see their messages.

### Message Center: Sent

On the User Home Menu, the user can select the Sent messages section. On the Sent messages page, the system should display the Sent messages sub-header below the User Home Header. To the left of the Sent messages sub-header, the user should also see a Help link.

Under the Sent messages sub-header, the system should display the following notification:

"Click on a message to view the text of the message.

Messages in bold have not yet been read by the remote users."

Below this notification, the system should display a sent message field; with the headers Subject, To, and Sent listed from left to right, respectively. Under the Subject header, the user will see the email subjects, along with a check box to the left of each message.

Below the Toheader, the system should show who the emails were sent to. The system should also display the date and time that the message was sent, under the Sent header. Under the sent messages section, the user will see a Delete button on the left side of the Sent messages screen. With this feature, the user will select the check box for an email, or emails, then the Delete button. If a user deletes a message, the Delete Service will delete the message and display a confirmation notification.

At the bottom of the Sent messages page, above the User Footer, the user should see a "Previous <<" tab on the left side of the screen. This will allow the user to view previous pages and/or sent messages. To the left of "Previous <<," there should be a Messages tab, along with the numerical sequence of numbers displayed per page. For example, "Messages 1-3."

On the bottom right part of the Sent messages page, the user should see ">> Next" tab. This will allow the user to see the next page of messages on the Sent messages page. With the "Previous <<," Message X-X," and ">> Next" tabs, the user will be able to maneuver through the Sent messages page easily in order to review their sent messages.

### Message Center: Alarm

From the User Home Menu, the user can select the Alarm messages section. On the Alarm messages page, the system should display the Alarm messages sub-header below the User Home Header. To the left of the Alarm messages sub-header, the user should also see a Help link.

Under the Alarm messages sub-header, the system should display the following notification:

"Click on a message to view the text of the message.

Message in bold have not yet been read by the remote users."

Below this notification, the system should display an alarm message field; with the headers Subject and Received listed from left to right, respectively. Under the Subject header, the user will see the email subjects, along with a check box to the left of each message.

Below the Received header, the system will display the date and time that the message was received. Under the Alarm messages section, the user will see a Delete button on the left side of the Alarm messages screen. With this feature, the user will select the check box for an email, or emails, then the Delete button. If a user deletes a message, the Delete Service will delete the message and display a confirmation notification.

At the bottom of the Alarm messages page, above the User Footer, the user should see a "Previous <<" tab on the left side of the screen. This will allow the user to view previous pages and/or alarm messages. To the left of "Previous <<," there should be a Messages tab, along with the numerical sequence of numbers displayed per page. For example, "Messages 1-3."

On the bottom right part of the Alarm messages page, the user should see ">> Next" tab. This will allow the user to see the next page of messages on the Alarm messages page. With the "Previous <<," Message X-X," and ">> Next" tabs, the user will be able to maneuver through the Alarm messages page easily in order to review their alarm messages.

## My Account

### Billing Account Summary



Figure 10 My Account diagram

A user can also look through their account information by clicking the plus sign next to the My Account sections. Once the user has expanded the My Account field, they will be able to select the Billing Account Summary section to be directed to the corresponding page. On the Billing Account Summary page, the user will see the Billing Account Summary sub-header below the User Home Header.

To the left of the Billing Account Summary sub-header, the user will see a Print link and a Help link, side by side. The Print link will be on the left, and the Help link will be on the right. Under the Billing Account Summary sub-header, the system will display the following notification:

"Click Account Details or See More Payments to see more information about a particular account. If you have an outstanding balance on an account, click Pay Bill to pay online using a credit."

Below the notification, the user will see a table with the headers Account Type, Last Payment, and Outstanding Balance; from left to right, respectively. Under the table headers, the user will see the following fields, from left to right, respectively: account number, account type fee schedule (e.g. monthly, 6 months, or yearly), the date of the last payment, and the actual outstanding balance.The account type fee schedule, the date of last payment, and actual outstanding balance fields will directly correspond to the Account Type, Last Payment, and Outstanding Balance headers.

Under the table, the user will see three buttons listed from left to right and in the respective order; namely, Account Details, See More Payments, and Pay Bill. If the user selects the Account Details button, they will be directed to the Account Details page. The user can also select the See More Payments button in order to be directed to the corresponding page.

If the user would like to pay their bill, they may select the Pay Bill button to be transferred to Pay Bill page. Below the Account Details, See More Payments, and Pay Bill buttons, the user will see the Back to Home button. The user can select this and be directed back to the User Home page.

### Billing Account Summary: Account Details

From the Billing Account Summary page, the user can select the Account Details button. Once the user selects the Account Details button, they will be directed to the Account Details page. On the account details page, the system should display the Accounts Details sub-header below the User Home Header. The Print and Help links will be to the left of the Account Details sub-header, as previously detailed.

Under the Account Details sub-header, user will see the text "Account Details information." Below the text, there will be a table with the headers Date, Description, Charge, Pay, and Balance listed from left to right, respectively. The table will also have corresponding information listed under the table headers, such actual dates, the Homecare Subscription Fee, the charge, amounts paid, and any balances owed. The final row of the table will list the Amount Due on the right side of the Account Details screen. The actual amount due will be listed to the right of Amount due and under the Balance column.

Below the Account Details table, the system will display a See Payments button and a Pay Bill button. If the user selects the See More Payments button, they will be directed to the Payment Information page. The user can also select the Pay Bill button to be taken to the Pay Bill page. Under the See Payments and Pay Bill buttons, there will be a note that states:

"There may be pending balances on your account that are not included on your current statement."

While on the Account Details page, the user can select the Back Home button, at the bottom of the page. This will take the user back to the User Home Page.

### Billing Account Summary: Payment Information

From the Billing Account Summary and Account Details pages, the user can select the See More Payments button. This will transfer the user to the Payment Information page. On the Payment Information page, the user should see the Payment Information sub-header below the User Home Header. The Print and Help links will be to the left of the Payment Information sub-header, as previously detailed.

Under the Payment Information sub-header, the user will see the text "Payment Information." The user will be able to select the Patient Information text to display a pop-up calendar. This will let this user specify a start and end date. Below Payment Information, the user will see a table with the following headers, listed left to right and in respective order: Date, Description, Payment ID, User, and Amount.

Under the these headers, the system will display the corresponding information; specifically, the actual date, a description, the payment ID, user first and last name, and an amount. On the last row of the table, on the right side of the screen, the system should display the text "Total." To the right of the text, the user should see a total of the amount owed. At the bottom of the page, the user can select the Back to Billing Account Summary button. This will take the user back to the Billing Account Summary page.

### Billing Account Summary: Pay Bill

On the Billing Account Summary page, the user can select the Pay Bill button and be directed to Pay Bill page. On the Pay Bill page, the user will see the Pay Bill sub-header below the User Home Header. The Print and Help links will be to the left of the Pay Bill sub-header, as previously detailed. Under Pay Bill, the user will see the text "Pay bill by credit card" on the left side of the screen.

Below "Pay bill by credit card," the system will display the following information on the left side of the screen, justified left, and in specified order: Account number, Account type, Amount due, and Amount to pay. Each piece of information will end in a colon and have the corresponding information listed to the right of the colon. For example, Amount due will list a monetary amount that is owed (i.e. $5, $10, etc.). However, for the Amount to pay; there will be an input field for the user to input how much they will be paying.

Under the Amount to pay field, the user will see "Billing information" displayed on the left side of the screen. The user will also see the text "\* is required." Below the text, the user will see the following information listed vertically, justified left, and in respective order: Name on card, Address, Address line 2, City, State, Zip code, Country, Phone, Email address, Card type, Card number, Expiration date, and Security code. All are required fields, except Address line 2 and Email address.

To the right of each piece of information, there will be input fields for the user to enter information. Every field, except State, Country, and Card type, will have an input box. Those exception fields listed will have a drop down for the user to select the values/choices.

The Expiration date field will have two input fields for the user to enter information. On the left input box, the user will enter the expiration month. In the right input box, the user will enter the expiration month. At the bottom of the page, the system will display the Continue and Cancel buttons, side by side. The Continue button will be on the left and the Cancel button will be on the right.

If the user wants to continue with paying their bill, then they can select the Continue button. This will direct the user to the Payment review screen. However, if the user does not want to send payment, then they can select Cancel button. This will take the user back to the Billing Account Summary page.

### Pay Bill: Payment Review

From the Pay Bill page, the user can select the Continue button to go to the Pay Bill Payment review page. On the Payment review page, the user will see the Pay Bill sub-header below the User Home Header. The Print and Help links will be to the left of the Pay Bill sub-header, as previously detailed. Under the Pay Bill sub-header, the system will display the text "Payment review."

Below "Payment review," the following information will be listed vertically, justified left, and in specified order: Account number, Account type, Amount due, and Amount to pay. Each piece of information will be followed by a colon. The user will also see the values listed to the right of the colon. For example, "Amount to pay: $10."

Under the "Amount to pay" field, the system should display the text "Billing address" on the left side of the screen. Below "Billing address," the user should see the following information: Name, Address, Phone, Email address, and Pay by credit card. This information should be displayed as detailed above; vertically, justified left, and in specified order.

Each piece of information will be followed by a colon. The user will also see the values listed to the right of the colon. For example, the Phone field will list the user's phone number. At the bottom of the page, there will be a Submit button and a Back button listed side by side.

The Submit button will be on the left side and the Back button will be on the right side. If the user selects the Submit button, then they will be transferred to the Pay Bill Payment receipt page. However, if the user selects the Back button, then they will be taken back to the Pay Bill page.

### Pay Bill: Payment Receipt

On the Pay Bill Payment review page, the user can select the Submit button to go to the Pay Bill Payment receipt page. On the Payment receipt page, the user will see the Pay Bill sub-header below the User Home Header. The Print and Help links will be to the left of the Pay Bill sub-header, as previously detailed. Under the Pay Bill sub-header, the system will display the text "Payment receipt."

Below "Payment receipt," the following information will be listed vertically, justified left, and in specified order: Account number, Account type, Amount due, and Amount to pay. Each piece of information will be followed by a colon. The user will also see the values listed to the right of the colon. For example, "Amount to pay: $10."

Under the "Amount to pay" field, the system should display the text "Billing address" on the left side of the screen. Below "Billing address," the user should see the following information: Name, Address, Phone, Email address, and Pay by credit card. This information should be displayed as detailed above; vertically, justified left, and in specified order.

Each piece of information will be followed by a colon. The user will also see the values listed to the right of the colon. For example, the Phone field will list the user's phone number. At the bottom of the page, there will be a Back to Billing Account Summary button. If selected, this will take the user back to the Billing Account Summary page.

## Administrative User

### User Management



Figure 11 Administrative User diagram

The Administrative User is an individual that is responsible for website administration and User Management. Administrative Users can access the Homecare System by logging in on the Public Home page. Once an Administrative User logs in to the Homecare System, they will be directed to the Admin Home page.

On the Admin Home page, the administrative user will see an Admin Home Header at the top of the page. On the far left side of the Admin Homepage, the system should display the text "Admin Home Menu:" below the Admin Home Header. Under the text, the following sections will be displayed vertically, justified left, and in specified order: User Management, Reports, Logs, System Tools, Message Center, and My Profile. Only Reports, Logs, System Tools, and Message Center will have a plus sign to the left of each section. If the administrative user selects the plus sign, this will expand each section and reveal sub-sections.

To the right of the Admin Home Menu, under the Admin Home Header, the system should display the User Management sub-header. The system should also display an "Add new user" button to the right of the User Management sub-header. To the left of the "Add new user" button, the user can select the Help link in order to get assistance regarding the User Management screen.

Under the User Management sub-header, the system will display the page number the user is on versus the number of available pages, how many entries the user can view per page, and the total number of records found. This information will be listed from left to right, in respective order. Below that information, there will be table that lists the headings ID, Name, Email, Status, and Note for the administrator to view.

These headings will be listed from left to right and in the specified order. Under each heading, the user will see the respective information displayed; such as the actual ID, name, email address, status, and the nature of each note. Under the ID section, the user will be able to select an ID link to see more detailed information. Also, to the left of each ID, there will be a check box that the user can select.

At the bottom of the page, above the Admin footer, the system will display an Activate account button and a Deactivate account button. If the user selects the Activate account button, then the ID that is selected, via the check box, will become activated. However, if Deactivate account is selected, then the user will deactivate the designated ID; according to the check box selected.

### User Management: User Management Details

Once the user selects an ID link, they will be directed to the User Management Details page. On the User Management Details page, the user will see the User Management sub-header below the Admin Home Header. To the right of the User Management Details sub-header, there will be a Print link and a help link displayed, side by side. The Print link will be on the left and the Help link will be on the right.

Under the User Management Details sub-header, the user will see the text "User overview:" on the far left side of the User Management Details screen. Below "User overview:," the following information will be listed in specified order, slightly indented right, and on the left side of the User Management Details screen: Username, Registered, Registered from IP, Last active, Warnings, Email, Confirm email, New password, Confirm new password.

Beneath this information, the system will display the text "User profile:" to the far left side of the User Management Details screen. Under "User profile:," all registration information, such as first name, last name, etc, will be detailed; slightly indent to the right. The system will also show "User preferences:" on the far left side of the User Management Details screen. Under "User preferences:," the user should see the information of Global settings.

Below "User preferences:," the text "Groups:" will be listed. Under Groups, the user will be able to see the Group information of user or if user does not belong to any group, "No group" will be displayed. The user will also be able to see the text "Permissions:" on the far left side of the User Management Details screen. Under "Permissions:," the text "Granted users" will be displayed, indented to the right. To the right of the "Granted users" text, there will be an input box that will display other users that have permissions.

At the bottom of the page, above the Admin Home Footer, the following buttons will be listed from left to right, respectively: Edit, Cancel, Save, and Back. If the user chooses to make edits, then they can select the Edit button and make the necessary changes. The user can also choose to cancel any changes by selecting the Cancel button. Once changes are made, the user does have the option to select Save in order to save any changes. After the user is finished viewing the User Management Details page, they can select the Back button to be directed back to the User Management page.

One more part added in this version is Billing management. User can check Auto bill box to automatically add bills to specified user monthly/haft-yearly/yearly. Or user can manually add one time bill to specified user by click on Add button.

### Reports: Statistics



Figure 12 Statistics report diagram

On the Reports section, under the Admin Home Menu, the user can select the plus sign in order to expand the field. Under Reports, the system will display a Statistics section. Upon selecting Statistics, the user will be transferred to the Statistics page. On the Statistics page, the user will see the Statistics sub-header below the Admin Home Header. The Print link and the Help link will be to the right of the Statistics sub-header, as previously detailed.

\*\*\*\*The rest will be defined later.

### Logs: Webadmin Logs



Figure 13Webadmin Logs diagram

Under the Logs section, on the Admin Home Menu, the user can select Webadmin Logs. On the Webadmin Logs page, the user will see the Webadmin Logs sub-header under the Admin Home Header. The Print link and the Help link will be to the right of the Webadmin Logs sub-header, as previously detailed.

Below the Webadmin Logs sub-header, the system will display the page number the user is on versus the number of available pages and how many entries the user can view per page. This information will be listed from left to right, in respective order. Below that information, there will be table that lists the headings Date, Username, and Notes. These headings will be listed from left to right and in the specified order. Under each heading, the user will see the respective information displayed; such as the actual Date, Username, and the nature of each note.

### Logs: Sync Logs



Figure 14 Sync Logs diagram

From the Logs section, on the Admin Home Menu, the user can select Sync Logs. On the Sync Logs page, the user will see the Sync Logs sub-header under the Admin Home Header. The Print link and the Help link will be to the right of the Sync Logs sub-header, as previously detailed.

Under the Sync Logs sub-header, the system will display the page number the user is on versus the number of available pages and how many entries the user can view per page. This information will be listed from left to right, in respective order. Below that information, there will be table that will detail Sync information.

\*\*\*The rest to be detailed later.

### System Tools: Security



Figure 15 Security diagram

On the Admin Home Menu, the user can expand the System Tools section in order to view the Security and Configure links. Once the user selects the Security link, they will be directed to the Security page. One the Security page, the system will display the Security sub-header under the Admin Home Header. The Print link and the Help link will be to the right of the Sync Logs sub-header, as previously detailed.

\*\*\*The rest will be defined later.

### Message Center: Inbox



Figure 16 Admin Inbox diagram

From the Admin Home Menu, the user can click the plus sign on Message Center in order to expand the field. Once the Message Center field is expanded, the user can select the Inbox section. On the Inbox page, the system should display the Inbox sub-header below the Admin Home Header. To the left of the Inbox sub-header, the user should also see a Help link.

Under the Inbox sub-header, the system should display the following notification:

"You can view the complete text of any message by clicking on its message row.

Only messages that have been marked as read can be deleted."

Below this notification, the system should display an email field; with the headers Subject, From, and Received listed from left to right, respectively. Under the Subject header, the user will see the email subjects, along with a check box to the left of each message.

Below the From header, the system should show who the emails were received from. The system should also display the date and time that the message was received, under the Received header. Under the email section, the user will see a Delete button on the left side of the Inbox screen. With this feature, the user will select the check box for an email, or emails, then the delete button. If a user deletes a message, the Delete Service will delete the message and display a confirmation notification.

At the bottom of the Inbox page, above the Admin Footer, the user should see a "Previous <<" tab on the left side of the screen. This will allow the user to view previous pages and/or messages. To the left of "Previous <<," there should be a Messages tab, along with the numerical sequence of numbers displayed per page. For example, "Messages 1-3."

On the bottom right part of the Inbox page, the user should see ">> Next" tab. This will allow the user to see the next page of messages on the Inbox page. With the "Previous <<," Message X-X," and ">> Next" tabs, the user will be able to maneuver through the Inbox page easily in order to see their messages.

### Message Center: Sent



Figure 17 Admin Sent diagram

On the Admin Home Menu, the user can select the Sent messages section. On the Sent messages page, the system should display the Sent messages sub-header below the Admin Home Header. To the left of the Sent messages sub-header, the user should also see a Help link.

Under the Sent messages sub-header, the system should display the following notification:

"Click on a message to view the text of the message.

Messages in bold have not yet been read by the remote users."

Below this notification, the system should display a sent message field; with the headers Subject, To, and Sent listed from left to right, respectively. Under the Subject header, the user will see the email subjects, along with a check box to the left of each message.

Below the To header, the system should show who the emails were sent to. The system should also display the date and time that the message was sent, under the Sent header. Under the sent messages section, the user will see a Delete button on the left side of the Sent messages screen. With this feature, the user will select the check box for an email, or emails, then the delete button. If a user deletes a message, the Delete Service will delete the message and display a confirmation notification.

At the bottom of the Sent messages page, above the Admin Footer, the user should see a "Previous <<" tab on the left side of the screen. This will allow the user to view previous pages and/or sent messages. To the left of "Previous <<," there should be a Messages tab, along with the numerical sequence of numbers displayed per page. For example, "Messages 1-3."

On the bottom right part of the Sent messages page, the user should see ">> Next" tab. This will allow the user to see the next page of messages on the Sent messages page. With the "Previous <<," Message X-X," and ">> Next" tabs, the user will be able to maneuver through the Sent messages page easily in order to review their sent messages.

### My Account



Figure 18 Admin My Account diagram

Under the Admin Home Menu, the user can select "My Account" in order to be directed to the My Account page. On the My Account page, the user will see the My Account sub-header below the Admin Home Header. The Print link and the Help link will be to the right of the My Account sub-header, as previously detailed. Below the My Account sub-header, the system will display the following information justified left, vertically, and in specified order: Password, Real name, Email, Language, Privileges, and Last login.

At the bottom of the page, above the Admin Home Footer, the following buttons will be listed from left to right, respectively: Edit, Cancel, Save, and Back. If the user chooses to make edits, then they can select the Edit button and make the necessary changes. The user can also choose to cancel any changes by selecting the Cancel button. Once changes are made, the user does have the option to select Save in order to save any changes. After the user is finished viewing the User Management Details page, they can select the Back button to be directed back to the User Management page.

## Additional Features

### Body Measurement



Figure 19 Body measurement diagram

#### Track My Health: Body Measurement

When the user selects the Body Measurement feature icon, they will be directed to the Body Measurement page. On the Body Measurements page, the system will display a Graph and a Table button so that the user can view their information in graph, or table, format. Under the Graph button, there will be a body measurement table with several body measurement categories; such as body mass index (BMI), waist-to-hip ratio (WHR), basal metabolic rate (BMR), body fat percentage (bf%), ideal weight, and metabolic age. Please refer to the formula document for more detail on any parameters, or measures, listed in this section.

It is important to note that body mass index measures body fat, based on height and weight, for males and females. Waist-to-hip ratio measures the circumference of the one's waist to their hips. Also, basal metabolic rate is the amount of energy (i.e. calories) expended by someone at rest. Body fat percentage is a measure of the total mass of one's fat divided by their total body mass. Finally, ideal weight suggests what a person of a given height and body frame should weigh; while metabolic age refers to a number that is calculated by comparing your basal metabolic rate to the basal metabolic rate average of your chronological age group.

On the Body Measurement graph, if there is no information to display, then a notification will state "You have no data to graph." Also, the graph's fields will be color coded to represent different health levels for body measurement. For instance, green is healthy, yellow is under/overweight, and orange is obese. Under the Body Measurement graph, there will be a date/time section that the user can select. If the user selects the date/time section, then a pop-up calendar will display for the user to select a start and end date/time.

Aside from a graph, the user can also choose to have their data displayed in table format. With the table format, the user will see various body measurement categories; such as body mass index (BMI), waist-to-hip ratio (WHR), basal metabolic rate (BMR), body fat percentage (BF%), lean body weight (LBW), percent muscle (%muscle), ideal weight (IW), metabolic age, activity level, and calorie needs. In order to add to previous definitions, please note that lean body weight refers to subtracting one's body fat weight from their total bodyweight.

Also, percent muscle is a measure that defines how much of a person's total mass is muscle mass. Activity Level is a function of the one's total energy expended in a day, divided by their Basal Metabolic Rate. Finally, Calorie Needs refers to the calories that one needs to maintain a healthy weight. This is calculated by accounting for one's height, weight, age, and activity level.

On the Body Measurement table, the user will also see two sets of Value and Diagnosis columns. In these columns, the system will display the values and diagnosis for each category of body measurement. Furthermore, there will be a section for Date/Time; which the user can click on and a pop-up calendar will display. The user can then select a start and end date/time. If there is no data available, then a notification will state "There is no data to display."

Below the graph/table section, the system will display a Diagnosis and Recommendations field. Initially, the Diagnosis and Recommendations section will have a notification that reads "This page displays your current medical issues and the date that they were noted in your medical record. Click on the issue name for more in-depth information on that particular issue." By following the notification directions, the user will be able to retrieve details about their current diagnosis and previous diagnoses. It will also detail recommendations based on the diagnoses provided.

Beneath Diagnosis and Recommendations, there will be a Settings button and a Back to Track My Health button. If the user selects the Settings button, they will be directed to the Body Measurement Settings page. However, if the user selects the Back to Track My Health button, then they will be transferred to the Track My Health home page.

#### Track My Health: Body Measurement - Settings

On the Body Measurement Settings page, the system will display a notification, under the Body Measurement Settings sub-header, that states "This page displays the current settings of this feature." Below the notification, the user will have the ability to change the Ideal Weight (IW) method to formula or medical. The user can also change the Body Fat Percentage calculation method to Deurenberg, CUN-BAE, or U.S. Navy. The user can also change the Body Fat Percentage evaluation method to WHO, Tanita, or Brainy. Furthermore, the user has the option to select Katch-McArdle, or Muffin, as the method to measure their Basal Metabolic Rate. The user can also change the Activity Factor based on their activity level. The user will make these changes by selecting a particular method via a drop-down list.

Under the body measurement methods section, the system will display separate fields for Weight, Height, Waist, Hip, and Neck. The user will need to accurately enter their information for these fields so that the Body Measurement feature can track and function appropriately. Below this information, the user will see Edit, Cancel, Save, and Back buttons.

If the user chooses to edit their settings, they will need to select the Edit button and make the desired changes. Once the changes are made, the user will select the Save button so that the desired settings are saved. However, if the user wants to cancel any changes, then they will select the Cancel button and no changes will be saved. The user can also choose to select the Back button. This will take them back to the Body Measurement page.

### Heart Rate Monitoring



Figure 20 Heart rate monitoring diagram

#### Track My Health: Heart Rate

From the Track My Health page, the user can select the Heart Rate icon. Upon selecting the Heart Rate icon, the user will be directed to the Heart Rate page. On the Heart Rate page, the system will display a Graph button and a Table button, below the Track My Health and Heart Rate sub-headers.

If the user selects the Graph button, they can opt to view their Heart rate data, or HRV data, via a drop-down button above the graph. With the Heart rate data, the user will see a heart rate graph with an x-axis and a y-axis. The x-axis will reflect the date/time of the data recordings, while the y-axis will show the heart rate beats per minute.

Within the Heart rate data graph, the user will see high threshold marker for heart beats recorded. The user will also see a low threshold marker for the heart beats recorded. The high threshold marker will be indicated by red hashed lines, while the low threshold marker will be represented by blue hashed lines.

If there is no data to display within the graph, the system will show a notification that states "You have no data to graph." However, if there is data to graph, then the user will see a solid light blue line that represents the user's raw heart rate voltage readings over time. Below the heart rate voltage data, the system will display the user's heart rate data over time; which is indicated a light red line. Finally, under the heart rate data, the user's resting heart rate data will be represented by orange dots. Please refer to the formula document for any measures, parameters, detailed in this section.

With the graph format, the user can also choose to view their HRV data by using the drop-down field above the graph. On the HRV data graph, there is also a x-axis and a y-axis. For the x-axis, the date/time of the data recordings will be displayed. For the y-axis, there will be several HRV parameters displayed; specifically, Mean HR, Std. HR, Mean RR, SDNN, RMSSD, and pNN50.

In the HRV data graph, each of these parameters will be represented by green bars displayed over time. Below the graph, there will be a date/time field that the user can click on. When the user clicks on the date/time field, a pop-up will display for the user to select the desired start and end date/time.

Aside from a graph, the user can select the Table format. As with the graph, the user can choose to view the Heart rate data, or HRV data, via the drop-down field above the graph/table. With the Heart rate data table format, the system will display several columns to represent Date/Time, heart rate (HR), Resting heart rate (Resting HR), Voltage, and Diagnosis (Diag.). Under each table header (i.e. Date/Time, HR, etc.), there will be several entry fields to reflect the data collected over time for each category. For the Date/Time field, the user can select Date/Time and a pop-up calendar will display for the user to select the desired start and end date/time.

If the user selects the HRV data table, via the drop-down above the graph/table, the user will see columns that represent Date/Time, Mean HR, Std. HR, Mean RR, SDNN, RMSSD, pNN50, and Diagnosis (Diag). Under each table header (i.e. Date/Time, Mean HR, etc.), there will be several entry fields to reflect the data collected over time for each category. For the Date/Time field, the user can select Date/Time and a pop-up calendar will display for the user to select the desired start and end date/time.

Below the graph/table section, the system will display a Diagnosis and Recommendations field. Initially, the Diagnosis and Recommendations section will have a notification that reads "This page displays your current medical issues and the date that they were noted in your medical record. Click on the issue name for more in-depth information on that particular issue." By following the notification directions, the user will be able to retrieve details about their current diagnosis and previous diagnoses. It will also detail recommendations based on the diagnoses provided.

Beneath Diagnosis and Recommendations, there will be a Settings button and a Back to Track My Health button. If the user selects the Settings button, they will be directed to the Body Measurement Settings page. However, if the user selects the Back to Track My Health button, then they will be transferred to the Track My Health home page.

#### Track My Health: Heart Rate - Settings

On the Heart Rate Settings page, the system will display a notification, under the Heart Rate Settings sub-header, that states "This page displays the current settings of this feature." Below the notification, the user will see settings categories that the user can change; such as Sample rate, Maximum heart rate estimation (Max HR estimation), High Resting heart rate threshold (High Resting HR threshold), Low Resting heart rate threshold (Low Resting HR threshold), and heart rate variability analysis interval (HRV analysis interval). Please refer to the formula document for further details on any parameters, or measures, listed in this section.

For each category, the user can choose the desired settings. For example, the user can select a five minute interval for Sample rate. The user can also select Kolata, or Gatti, for Max HR estimation. Furthermore, High and low Resting HR threshold can be set for one hundred, or fifty, beats per minute, respectively. Finally, HRV analysis can be set for an interval of five minutes, or more, if the user desires. Each category will have different settings that the user can select from to effectively measure their heart rate.

Below the Heart Rate settings, the user will see Edit, Cancel, Save, and Back buttons. If the user chooses to edit their settings, they will need to select the Edit button and make the desired changes. Once the changes are made, the user will select the Save button so that the desired settings are saved. However, if the user wants to cancel any changes, then they will select the Cancel button and no changes will be saved. The user can also choose to select the Back button. This will take them back to the Heart Rate page.

### Oxygen Monitoring



Figure 21 Oxygen Monitoring diagram

#### Track My Health: Oximeter

On the Track My Health home page, the user can select the Oximeter feature icon. This will direct them to the Oximeter page. On the Oximeter page, the system will display a Graph button and a Table button, below the Oximeter sub-header.If the user selects the Graph button, then they will be able to see an oximeter graph with an x-axis and a y-axis.

The x-axis will reflect the date/time parameters of the data recordings, while the y-axis will show the blood oxygen saturation percentage (i.e. %SpO2). Please refer to the formula document for further details on any parameters, or measures, listed in this section. Within the graph, the system will display a black line that represents the user's blood oxygen saturation percentage over time. If there is no data to display, then there will be a notification that states "You have no data to graph."

Below the black line, the user will see a blue hashed line; which represents a low threshold for the user's blood oxygen saturation percentage. Under the graph, the user can select the Date/Time section to display a pop-up calendar. This will allow the user to select a desired start and end date/time.

Aside from a graph, the user can select the Table format. With the table format, the system will display several columns to represent Date/Time, blood oxygen saturation percentage (%SpO2), Threshold, Mode, and Diagnosis (Diag.). Under each table header (i.e. Date/Time, %SpO2, etc.), there will be several entry fields to reflect the data collected over time for each category. For the Date/Time field, the user can select Date/Time and a pop-up calendar will display for the user to select the desired start and end date/time.

Below the graph/table section, the system will display a Diagnosis and Recommendations field. Initially, the Diagnosis and Recommendations section will have a notification that reads "This page displays your current medical issues and the date that they were noted in your medical record. Click on the issue name for more in-depth information on that particular issue." By following the notification directions, the user will be able to retrieve details about their current diagnosis and previous diagnoses. It will also detail recommendations based on the diagnoses provided.

Beneath Diagnosis and Recommendations, there will be a Settings button and a Back to Track My Health button. If the user selects the Settings button, they will be directed to the OximeterSettings page. However, if the user selects the Back to Track My Health button, then they will be transferred to the Track My Health home page.

#### Track My Health: Oximeter - Settings

On the Oximeter Settings page, the system will display a notification, under the Oximeter Settings sub-header, that states "This page displays the current settings of this feature." Below the notification, the user will see settings categories that the user can change; such as Sample rate, Tracking mode, Warning threshold, and Measurement duration. Please refer to the formula document for further details on any parameters, or measures, listed in this section.

For each category, the user can choose the desired settings. For example, the user can select a five minute interval for Sample rate. The user can also select the appropriate Tracking mode, Warning threshold, and Measurement duration. Each category will have different settings that the user can select from to effectively track their Oximeter data.

Below the Oximeter settings, the user will see Edit, Cancel, Save, and Back buttons. If the user chooses to edit their settings, they will need to select the Edit button and make the desired changes. Once the changes are made, the user will select the Save button so that the desired settings are saved. However, if the user wants to cancel any changes, then they will select the Cancel button and no changes will be saved. The user can also select the Back button. This will take them back to the Oximeter page.

### Fitness Monitoring



Figure 22Fitness Monitoring diagram

#### [Track My Health - Fitness](System%20Feature%20formulae-ver%200.1.2.docx)

Chủ yếu là đo đi bộ. **Pedometer: thiết bị đo đi bộ.**

**(**an instrument for estimating the distance travelled on foot by recording the number of steps taken.)

From the Track My Health home page, the user can select the Fitness feature icon.

Once the Fitness feature icon is selected, the user will be directed to the Fitness page. On the Fitness page, the user will see a Graph button and a Table button; below the Track My Health and Fitness sub-headers.

**GRAPH REPORT**

If the user selects the Graph button, the user will see a Fitness graph with an x-axis and a y-axis.

The **x-axis** will reflect

the date/time of the data recordings, while the

y-axis will show several variables; such as

**Step counts,**

**Distance,**

**Average speed,**

**Calories burned, and**

**Pedometer duration.**

[Please refer to the formula document for further details on any parameters, or measures, listed in this section.](System%20Feature%20formulae-ver%200.1.2.docx)

The user will be able to select the desired y-axis variable via a drop down box above the Fitness graph.

Above the graph, the system will display a notification stating "Select parameter to draw." A drop down box, with the y-axis variables, will be positioned to the right of the notification.

**BODY OF GRAPH**

Within the graph, the user will see clustered bars that reflect the data over time (Clustered Bar Graph).

However, if there is no data to display, then there will be a notification that states "You have no data to graph." Nonetheless, if there is data to display, then **each piece of data will be represented by a color**.

For example,

the bar on the left will be orange, and will represent Step counts.

On the other hand, the bar on the right will be green, and will represent the target for each y-axis variable selected.

This will be reflected in the **legend** to the right of the graph, which details the variables and corresponding colors.

Below the graph, the user can select the Date/Time section to display a pop-up calendar. This will allow the user to select a desired start and end date/time.

**TABLE REPORT**

Aside from a graph, the user can select the Table format.

Below the Table button, the user can select

**+ the Heart Rate exercise table link (HR exercise table), or**

**+ the Pedometer table link.**

**HR exercise table**

On the HR exercise table, the system will display several columns to represent

**Date/Time,**

**Duration,**

**Exercise,**

**Time in zones,**

**Target HR,**

**Average HR,**

**and Maximum HR.**

**the Pedometer table,**

system will display several columns to represent

**Date/Time,**

**Target,**

**Steps,**

**Distance,**

**Average Speed,**

**Calories burned, and**

**Duration.**

Under each table header (i.e. Date/Time, Duration, etc.), there will be several entry fields to reflect the data collected over time for each category.

For the Date/Time field, the user can select Date/Time and a pop-up calendar will display for the user to select the desired start and end date/time.



**There is a second table** which reports the **daily pedometer** data. This table will display similar fields as the first Pedometer table.

**Diagnosis section**

Below the graph/table section, the system will display a Diagnosis and Recommendations field.

Initially, the Diagnosis and Recommendations section will have a notification that reads "This page displays your current medical issues and the date that they were noted in your medical record. Click on the issue name for more in-depth information on that particular issue."

By following the notification directions, the user will be able to retrieve details about their current diagnosis and previous diagnoses. It will also detail recommendations based on the diagnoses provided.

BUTTONS

Beneath Diagnosis and Recommendations, there will be a **Settings button** and a **Back to Track My Health button**.

If the user selects the Settings button, they will be directed **to the Fitness Settings page**.

However, if the user selects the Back to Track My Health button, then they will be transferred **to the Track My Health home page**.

#### Track My Health: Fitness - Settings

On the Fitness Settings page, the system will display a **notification**, under the Fitness Settings sub-header, that states "This page displays the current settings of this feature."

Below the notification, the user will see **two sets of settings categories** that the user can change.

The first set of settings pertains to **Heart rate exercise**.

Under Heart rate exercise, the user can modify the

Exercise mode,

Target HR method, and

the Custom exercise programs.

[Please refer to the formula document for further details on any parameters, or measures, listed in this section.](System%20Feature%20formulae-ver%200.1.2.docx)

With the Exercise mode setting,

the user can select

**single** only one Target Heart rate value during the exercise

**multi-stage**. There are multiple stages during the exercise. Each stage can be set with different Target Heart rate Zone and Time.

For the Target HR method,

the user can select General or Zoladz.

Under the Custom exercise programs setting,

the user will be able to pull up an exercise program table.

exercise program table

Above the table, there will be a **box that details the number of stages**.

To the right of the box, there will be a **Save button** for the user to save any changes.

Within the table,

|  |  |
| --- | --- |
| **HEADERS** | there will be three headers listed from left to right; namely, |
| **Stage** | Under Stage, the system will display  fields for  Warm up,  Fat burn, and  Recovery |
| **Target HR** | Below Target HR, the user will see  boxes for  Zone 1 or  Zone 2 |
| **Time** | beneath Time, the system will display **boxes** with time intervals; for example, 5, 10, or 20 minutes. |

Under the table, the user will see a **split box** that details "Transition Audio:" on the left and "file" on the right.

Below that box, there will be another **split box** that details "Program name:" on the left and "Daily" on the right.

The boxes on the right side can be categorized/labeled as the user desires.

**there are the Pedometer settings;**

such as

**Target setting,**

**Remind setting, and**

**Calories burned method.** [**(see formulae)**](System%20Feature%20formulae-ver%200.1.2.docx)

**Keytel05 method**

**Dugas05 method**

For each category, the user can choose the desired settings.

Each category will have different settings that the user can select from to effectively track their Pedometer data.

**BUTTONs**

Below the Fitness settings, the user will see **Edit, Cancel, Save, and Back buttons**.

If the user chooses to edit their settings,

they will need to select the Edit button and make the desired changes.

Once the changes are made, the user will select the **Save** button so that the desired settings are saved.

However, if the user wants to **cancel** any changes, then they will select the Cancel button and no changes will be saved.

The user can also select the **Back** button. This will take them back to the Fitness page.

### Stress Monitoring



Figure 23 Stress Monitoring diagram

#### Track My Health: Stress Monitoring

On the Track My Health home page, the user can select the Stress Monitoring feature icon. This will direct them to the Stress Monitoring page. On the Stress Monitoring page, the system will display a Graph button and a Table button, below the Stress Monitoring sub-header. If the user selects the Graph button, then they will be able to see a Stress Monitoring graph with an x-axis and a y-axis.

The x-axis will reflect the date/time parameters of the data recordings, while the y-axis will show the stress percentage (% Stress). Please refer to the formula document for further details on any parameters, or measures, listed in this section. Within the graph, the system will display bars (Bar graph) that represent the user's stress percentage over time.

However, if there is no data to display, then there will be a notification that states "You have no data to graph." To the right of the Bar graph, the user will see a Raw data button. If the user selects this, then they can view the graph information in raw data format. With the raw data format, the system will display several parameters on the y-axis; such as HR, HR voltage, GSR, and g-values (i.e. X, Y, and Z variables).

Each of these parameters will be represented a light red line, yellow line, black line, green line, red line, and a blue line, respectively. These lines will represent each parameter's data over time. Under the graph, the user can select the Date/Time section to display a pop-up calendar. This will allow the user to select a desired start and end date/time.

Aside from a graph, the user can select the Table format. With the table format, the system will display several columns to represent Date/Time, Stress level, and Diagnostics. Under each table header (i.e. Date/Time, Stress level, etc.), there will be several entry fields to reflect the data collected over time for each category.

As with the graph, the user can also view the table in Raw data format. By selecting the Raw data button, the user will see a raw data table that has columns to represent Date/Time, HR, HR voltage, GSR, g-values (i.e. X, Y, and Z), and Diagnosis (Diagn). Under each table header (i.e. Date/Time, HR, etc.), there will be several entry fields to reflect the data collected over time for each category. For the Date/Time field, the user can select Date/Time and a pop-up calendar will display for the user to select the desired start and end date/time.

Below the graph/table section, the system will display a Diagnosis and Recommendations field. Initially, the Diagnosis and Recommendations section will have a notification that reads "This page displays your current medical issues and the date that they were noted in your medical record. Click on the issue name for more in-depth information on that particular issue." By following the notification directions, the user will be able to retrieve details about their current diagnosis and previous diagnoses. It will also detail recommendations based on the diagnoses provided.

Beneath Diagnosis and Recommendations, there will be a Settings button and a Back to Track My Health button. If the user selects the Settings button, they will be directed to the Stress Monitoring Settings page. However, if the user selects the Back to Track My Health button, then they will be transferred to the Track My Health home page.

#### Track My Health: Stress Monitoring - Settings

On the Stress Monitoring Settings page, the system will display a notification, under the Stress Monitoring Settings sub-header, that states "This page displays the current settings of this feature." Below the notification, the user will see settings categories that the user can change; such as Measurement duration, Heart rate sample rate, GSR sample rate, and Accelerometer sample rate. Please refer to the formula document for further details on any parameters, or measures, listed in this section.

For each category, the user can choose the desired settings. For example, the user can select a two minute interval for Measurement duration. The user can also select the appropriate Heart rate sample rate, GSR sample rate, and Accelerometer sample rate. Each category will have different settings that the user can select from to effectively track their Stress Monitoring data.

Below the Stress Monitoring settings, the user will see Edit, Cancel, Save, and Back buttons. If the user chooses to edit their settings, they will need to select the Edit button and make the desired changes. Once the changes are made, the user will select the Save button so that the desired settings are saved. However, if the user wants to cancel any changes, then they will select the Cancel button and no changes will be saved. The user can also select the Back button. This will take them back to the Stress Monitoring page.

### Sleep Monitoring



Figure 24 Sleep Monitoring diagram

#### Track My Health: Sleep Monitoring

On the Track My Health home page, the user can select the Sleep Monitoring feature icon. This will direct them to the Sleep Monitoring page. On the Sleep Monitoring page, the system will display a Graph button and a Table button, below the Sleep Monitoring sub-header. If the user selects the Graph button, then they will be able to see a Sleep Monitoring graph with an x-axis and a y-axis.

The x-axis will reflect the date/time parameters of the data recordings, while the y-axis will show several color-coded variables; such as sleep duration (orange), deep sleep duration (blue), number of time the user woke up (purple), and sleep quality (green). Please refer to the formula document for further details on any parameters, or measures, listed in this section.

The user will be able to select the desired time interval parameters via a drop down box above the graph. If the user clicks on the drop down box, they will be able to change the time parameter to daily, weekly, or monthly; which will be displayed below the graph. To the right of the drop down, the user can choose the desired start and end date/time via the start and end tabs.

Within the graph, the user will be able to see a single bar, or clustered bars, that reflect data over time (Bar Graph/Cluster Bar Graph). However, if there is no data to display, then there will be a notification that states "You have no data to graph." Nonetheless, for daily tracking, the system will display just one bar that reflects the raw data parameters and associated colors. However, for weekly/monthly tracking, the graph will show two bars that represent the mean (left bar) and the standard deviation (right bar) for the data parameters and associated colors.

It is important to note that each sleep variable will be measured differently. For instance, sleep duration and deep sleep duration will be measured in hours. The number of times the user wakes up will be reflected by the actual numbers. Finally, Sleep quality will be measured using a scale from 1 to 10. Each variable will be tracked and reflected in the graph according to their particular color and measurement parameters.

To the right of the end tab, there will be a Raw data button. If the user selects this, then they can view the graph information in raw data format. With the raw data format, the system will display several parameters on the y-axis; such as HR, Skin temp., GSR, g-values (i.e. X, Y, and Z variables), and Activity level.

Each of these parameters will be represented a light red line, yellow line, black line, green line, red line, blue line, and a dark blue line, respectively. These lines will represent each parameter's data over time. Under the graph, the user can select the Date/Time section to display a pop-up calendar. This will allow the user to select a desired start and end date/time.

Aside from a graph, the user can select the Table format. With the table format, the system will display several columns to represent Day/Week/Month, Sleep duration, Deep sleep, Wake up number (Wake up #), and Sleep quality. Under each table header (i.e. Day/Week/Month, Sleep duration, etc.), there will be several entry fields to reflect the data collected over time for each category.

For the Date/Time parameter, the user will be able to select the desired time interval parameters via a drop down box above the graph. If the user clicks on the drop down box, they will be able to change the time parameter to daily, weekly, or monthly. With daily tracking, the table will display only one column per parameter to reflect the raw data.

However, with weekly/monthly tracking, the system will display two columns per parameter to show the mean and standard deviation for each parameter. The tracking time interval will be indicated by the title of the table (e.g. Monthly statistics). To the right of the drop down, the user can choose the desired start and end date/time via the start and end tabs.

As with the graph, the user can choose to view the table in Raw data format. With the Raw data Sleep Monitoring table, the system will display a number of columns that represent Date/Time, HR, skin temperature, GSR, g-values (X, Y, and Z variables), and Activity level. Under each table header (i.e. Date/Time, HR, etc.), there will be several entry fields to reflect the data collected over time for each category. For the Date/Time field, the user can select Date/Time and a pop-up calendar will display for the user to select the desired start and end date/time.

Below the graph/table section, the system will display a Diagnosis and Recommendations field. Initially, the Diagnosis and Recommendations section will have a notification that reads "This page displays your current medical issues and the date that they were noted in your medical record. Click on the issue name for more in-depth information on that particular issue." By following the notification directions, the user will be able to retrieve details about their current diagnosis and previous diagnoses. It will also detail recommendations based on the diagnoses provided.

Beneath Diagnosis and Recommendations, there will be a Settings button and a Back to Track My Health button. If the user selects the Settings button, they will be directed to the Sleep Monitoring Settings page. However, if the user selects the Back to Track My Health button, then they will be transferred to the Track My Health home page.

#### Track My Health: Sleep Monitoring - Settings

On the Sleep Monitoring Settings page, the system will display a notification, under the Sleep Monitoring Settings sub-header, that states "This page displays the current settings of this feature." Below the notification, the user will see settings categories that the user can change; such as Heart rate sample rate, GSR sample rate, Accelerometer sample rate, and Skin temperature sample rate. Please refer to the formula document for further details on any parameters, or measures, listed in this section.

For each category, the user can choose the desired settings. For example, the user can select a ten millisecond interval for Heart rate sample rate. The user can also select the appropriate GSR sample rate, Accelerometer sample rate, and Skin temperature sample rate. Each category will have different settings that the user can select from to effectively track their Sleep Monitoring data.

Below the above settings, the user has the option to modify the Alarm setting to Auto or Manual. The user can also automatically set their sleep duration parameter. For example, the user can set it to 8 hours. Also, the user can utilize the Manual setting to manually add alarms. The user can do this by selecting a desired Weekday and Time via clicking on the respective fields.

Below the Sleep Monitoring settings, the user will see Edit, Cancel, Save, and Back buttons. If the user chooses to edit their settings, they will need to select the Edit button and make the desired changes. Once the changes are made, the user will select the Save button so that the desired settings are saved. However, if the user wants to cancel any changes, then they will select the Cancel button and no changes will be saved. The user can also select the Back button. This will take them back to the Sleep Monitoring page.

### Position Monitoring



Figure 25 Position Monitoring diagram

#### Track My Health: Position Monitoring

On the Track My Health home page, the user can select the Position Monitoring feature icon. This will direct them to the Position Monitoring page. On the Position Monitoring page, the system will display a Graph button and a Table button, below the Position Monitoring sub-header. If the user selects the Graph button, they can opt to view their Position Monitoring graph, or their raw data Activity graph. They can view their the raw data Activity graph by selecting the Raw data button above the graph (on the right side of the screen).

With the Position Monitoring graph, the user will see a graph with an x-axis and a y-axis. The x-axis will reflect the date/time parameters of the data recordings, while the y-axis will show the user's color-coded sleep position; such as Supine (blue - lying with face up), Prone (red - lying with face down), Left (purple), Right (orange), Up (green), and Down (turquoise green). Please refer to the formula document for further details on any parameters, or measures, listed in this section.

Within the graph, the system will display dots that represent the user's sleep position over time. However, if there is no data to display, then there will be a notification that states "You have no data to graph." Under the graph, the user can select the Date/Time section to display a pop-up calendar. This will allow the user to select a desired start and end date/time.

In looking at the raw data Activity graph, the user will also see a x-axis and a y-axis. The x-axis will still reflect the date/time parameters of the data recordings. However, the y-axis will represent the raw g-values over time (i.e. X, Y, and Z variables). Within the graph, the system will detail a color-coded line for each variable. For example, X will be green, Y will be red, and Z will be blue. Each line will represent the raw g-value data recorded over time.

Aside from a graph, the user can select the Position Monitoring Table format. With the table format, the system will display several columns to represent Date/Time, Position, and Alarm. Under each column header (i.e. Date/Time, Position, etc.), there will be several entry fields to reflect the data collected over time for each category. For the Date/Time field, the user can select Date/Time and a pop-up calendar will display for the user to select the desired start and end date/time.

As with the graph, the user can view the Activity table in raw data format. With the raw data Activity table, the system will display several columns that represent Date/Time and the raw g-values (i.e. X, Y, and Z variables). Under each table header (i.e. Date/Time, X, etc.) there will be several entry fields to reflect the data collected over time for each category. For the Date/Time field, the user can select Date/Time and a pop-up calendar will display for the user to select the desired start and end date/time.

Below the graph/table section, the system will display a Diagnosis and Recommendations field. Initially, the Diagnosis and Recommendations section will have a notification that reads "This page displays your current medical issues and the date that they were noted in your medical record. Click on the issue name for more in-depth information on that particular issue." By following the notification directions, the user will be able to retrieve details about their current diagnosis and previous diagnoses. It will also detail recommendations based on the diagnoses provided.

Beneath Diagnosis and Recommendations, there will be a Settings button and a Back to Track My Health button. If the user selects the Settings button, they will be directed to the Position Monitoring Settings page. However, if the user selects the Back to Track My Health button, then they will be transferred to the Track My Health home page.

#### Track My Health: Position Monitoring - Settings

On the Position Monitoring Settings page, the system will display a notification, under the Position Monitoring Settings sub-header, that states "This page displays the current settings of this feature." Below the notification, the user will see settings categories that the user can change; such as Sample rate and Alarm position setting. Please refer to the formula document for further details on any parameters, or measures, listed in this section.

For each category, the user can choose the desired settings. For example, the user can select a five minute interval for Sample rate. Below the Sample rate setting, the user also has the option to modify the Alarm position setting by selecting the check box of any/all of the sleep positions that they wish to be alerted for (e.g. Supine, Prone, etc.).

Below the Position Monitoring settings, the user will see Edit, Cancel, Save, and Back buttons. If the user chooses to edit their settings, they will need to select the Edit button and make the desired changes. Once the changes are made, the user will select the Save button so that the desired settings are saved. However, if the user wants to cancel any changes, then they will select the Cancel button and no changes will be saved. The user can also select the Back button. This will take them back to the Position Monitoring page.

### Fertility Monitoring



Figure 26 Fertility Monitoring diagram

#### Track My Health: Fertility Monitoring

From the Track My Health page, the user can select the Fertility Monitoring feature icon. Upon selecting the Fertility Monitoring feature icon, the user will be directed to the Fertility Monitoring page. On the Fertility Monitoring page, the system will display a Graph button and a Table button, below the Track My Health and Fertility Monitoring sub-headers.

If the user selects the Graph button, the user will see a Fertility Monitoring graph with an x-axis and a y-axis. The x-axis will reflect the specific days, month and year of the data recordings, while the y-axis will show the user's temperature data. Please refer to the formula document for further details on any parameters, or measures, listed in this section.

Within the graph, the user should see various fertility parameters. However, if there is no data to display within the graph, the system will show a notification that states "You have no data to graph." Nonetheless, if there is data to graph, then the system should display black dots in chronological order; from left to right. The black dotswill detail the user's previous ovulation date. The dark green dot will predict the user's next ovulation date.

The system will also display a light green line within the chart, which predicts the user's most fertile time. On the green line, the user will be able to see a dark green segment that represents the user's greatest opportunity to get pregnant (2 day window). Below the green lines, there will be a red line that details the temperature data over time. At the bottom of the graph, the user will be able to see triangles. The black triangle reflects the start of the user's previous period. On the other hand, the red triangle represents the predicted start of the user's next period.

An important function of this graph is the days, month, and year section. Below the graph, the user will only be able to view a certain number of days at a time (i.e. 6 days). The system will display a "<<" before the first day shown, as well as a ">>" after the last day shown. By selecting these arrows, the user can move backward, or forward, in time as they track their fertility data. Below the number of days, the user can also view the desired month and year related to their data via selecting the arrow tabs.

Aside from a graph, the user can select the Table format. With the table format, the system will display three sections of data; namely, a Fertility section, an Advance Prediction section, and a Statistics section. In the first section of data (Fertility Section), the user will see several columns to represent months in sequence (e.g. October, November, and December).

There will also be rows of information that relate to Start of period, Ovulation date, Most fertile time, and Most pregnant time. Under each month column, there will be several entry fields to reflect the data collected over time for each category. The user can change the monthly time frames by selecting the designated arrow tabs displayed before the first month, as well as after the last month listed.

Under the Advance Prediction section, the system will similarly display several columns to represent months in sequence. However, the rows of data will pertain to Startof next period, Next ovulation date, Next most fertile time, and Next most pregnant time. The user can also change the monthly time frames by selecting the designated arrow tabs displayed before the first month, as well as after the last month listed.

Below the Advance Prediction data, the system will display a Statistics section. In the Statistics section, there will be a list of several fertility statistical measures; such as Cycles tracked N (number of cycles tracked), Average cycle length, Cycle length variation, Average ovulation time, Longest cycle, and Shortest cycle. Next to each statistical measure, there will be data entry fields that will display the respective statistical data.

Below the graph/table section, the system will display a Diagnosis and Recommendations field. Initially, the Diagnosis and Recommendations section will have a notification that reads "This page displays your current medical issues and the date that they were noted in your medical record. Click on the issue name for more in-depth information on that particular issue." By following the notification directions, the user will be able to retrieve details about their current diagnosis and previous diagnoses. It will also detail recommendations based on the diagnoses provided.

Beneath Diagnosis and Recommendations, there will be a Settings button and a Back to Track My Health button. If the user selects the Settings button, they will be directed to the Fertility Monitoring Settings page. However, if the user selects the Back to Track My Health button, then they will be transferred to the Track My Health home page.

#### Track My Health: Fertility Monitoring - Settings

On the Fertility Monitoring Settings page, the system will display a notification, under the Fertility Monitoring Settings sub-header, that states "This page displays the current settings of this feature." Below the notification, the user will be able to change the Input temperature setting to Automatic or Manual. Please refer to the formula document for further details on any parameters, or measures, listed in this section.

Below the Fertility Monitoring settings, the user will see Edit, Cancel, Save, and Back buttons. If the user chooses to edit their settings, they will need to select the Edit button and make the desired changes. Once the changes are made, the user will select the Save button so that the desired settings are saved. However, if the user wants to cancel any changes, then they will select the Cancel button and no changes will be saved. The user can also select the Back button. This will take them back to the Fertility Monitoring page.

# HOME CARE BASE STATION / APPLICATION



Figure 27Homecare App

Base station is the software which runs on computer or mobile client devices. Software is the user interface to communicate with users, receivesuser’s data from measurement device to process, analyze and diagnose diseases relating to detected abnormalities. Base station will display tracking data and analysis results as well.

## Device Search

To utilize the Homecare app, the user will need to select the app on the base station. Once the app opens, the application will begin searching for a device, or devices, via blue tooth technology. On this Search page, the user will see a navigation bar at the top of the page. Below the navigation bar, the system should display a Searching popover; with the Homecare picture in the background. At the bottom of the page the user will see a Global Settings tab.

If the device is detected, the app will recognize the Device ID and forward the user to a new page; with a popover that lists the available devices. After the Available Devices popover is displayed, the app will have the ability to identify the Profile ID and direct the user to the Profiles page. On the Profiles page, the user will see the appropriate profile, based on the Profile ID, listed as "connected" at the top of the profile list. On the Profile page, the user can then select the profile they wish to connect to. Once a profile is selected, the user will be "connected" to the desired profile; which will move to the top of the profile list.

However, if the device is not detected, then the user will be transferred to a new page; with a popover that states "Not connected to device(s)."In this mode, the user can still select available profiles, but the device's functionality will be limited. In this case, the app will be in un-connected mode.

## Connected Mode

In connected mode, the user will be able to use all functions; for example, real time data tracking, real time graphs/tables, device selection, Reports, Settings, Info, Global Settings, Follow-up questions, etc. The app will also support interactive features, such as video and voice chat with family, friends, and providers. Furthermore, the Homecare device will use various means to record data and communicate; for instance, desktops, laptops, cell phones, iPads, etc. In connected mode, the user will have access to all new and previous data, as well as all available user functions in the app.

## Un-connected Mode

In un-connected mode, the user can view previous data, but not real time data. The user can also utilize most functions, such as Reports, Settings, Info, Global Settings, Follow-up questions, etc.; however, the user will not have access to real time tracking, graphs, or data. If the user tries to use connected mode features, then they will receive a notification that states "Not connected to device(s)." In un-connected mode, the user will only be able maneuver through the app based on previous data.

## Profiles

Once the app connects to an available device, the user will be directed to the Profiles page. On the Profiles page, the system will display a list of available user profiles. When the app initially connects to the Homecare device, the app will list the first available profile, based on the identified Profile ID, as "connected;" at the top of the profile list. The user will have the option to select another profile to view, from the profile list. If the user does select a new profile, then the desired profile will be listed as "connected;" which will move it to the top of the profile list.

It must be noted that,when the Homecare device connects to the app, only data for the selected profile will be forwarded to the app. Other profile data can also be accessed; however, this will be historic data, not real time data. Also, the app will only support up to four profiles. Eachprofile will be a concatenation of the Device ID and the Profile ID(e.g. CKLWT-1). Finally, each profile will have an associated username and password to access the available data.

**4.5 Home Page**

When the user selects a profile, they will be transferred to the Homecare Home page. On the Homecare Home page, the user will see a navigation bar at the top of the page. Below the navigation bar, the system will display the Home header. Under the Home header, the user will see all nine Homecare features.

Each feature will be represented by a Feature Icon that the user can select. At the bottom left side of the Home page, the Global Settings tab will be listed. To the right of the Global Settings tab, the user will be able to see how much time it will table to load the data from measurement device.

## Global Settings

Global Settings will configure general properties for all features, such as Font size, Font color for the display, Measurement system that user wants to use. There are two selections: Metric or US.

On Global Settings page, users can select Account field. They will be transferred to the Account page.

## Account

By default, users do not login to their account. The Account page will show input fields, Username and Password, for user to login the system by pressing Login button. If the app have internet connection and the Username and Password are matched with the database records, the login service will success; otherwise, the system should show a message to notice that the login process failed and its possible reason such as “Login failed. No internet connection” or “Login failed. Username or password is invalid”. The message should be highlighted.

If the login successes, Account page will show the information of users such as Email, First name, Last name, Date of Birth, Gender, Address, and Phone numbers. There is the Logout button at the bottom of the information fields, which allows users to log out of their account.

## Data synchronization

The Homecare app will request new data from Measurement Device whenever it connected with the Measurement Device via Bluetooth. Data can be real-time data or new offline data which is stored in Measurement Device.

When Homecare app connects to the Internet and users login to their account, new data that stored in Homecare app storage will be uploaded to the global database. Users can select the data synchronization settings from a list. The options: Now, hourly, 3 hours, 6 hours, 12 hours, daily, 2 days, 3 days, weekly.

## Features

### Temperature Monitoring



Figure 28 Temperature Monitoring app

#### Home

From the Homecare home page, the user can select the Temperature Monitoring feature icon. Once the Temperature Monitoring feature icon is selected, the user will be directed to the Temperature Monitoring page. On the Temperature Monitoring page, the user will see a Home button, a Settings button, a Report button, and an Info button. Under these buttons, the system will display a Temperature graph with an x-axis and a y-axis.

The x-axis will reflect the date/time of the data recordings, while the y-axis will show the temperature recordings. Within the graph, the user will see a black line that represents the temperature data over the specified date/time. Under the graph, the user can select the Date/Time section to display a pop-up calendar. This will allow the user to select a desired start and end date/time.

Below the Date/Time section, the system will display a split box; with the user's skin temperature displayed on the left and the Ambient temperature (room temperature) listed to the right. The skin temperature reading will be the last reading of the user’s actual skin temperature. The ambient temperature will reflect the last room temperature reading.

Under the Skin temperature and Ambient temperature section, the user will see the Current Diagnosis and Follow-up Questions tabs. There will also be a Global Settings menu at the bottom of the page, which will allow the user to modify settings for the entire Homecare System application. The Current Diagnosis tab will report a live, immediate diagnosis based on the current skin temperature readings it receives. The Follow-up Questions tab will allow the user the ability to provide further information regarding any particular incident. This will allow the Homecare System to deliver a more accurate diagnosis and recommendation.

#### Settings

From the Temperature Home Screen, the user can select the Settings tab. On the Settings page, the user will see a thermometer icon above various settings; namely, Restore Defaults, Sample Rate, Very High Threshold, High Threshold, Low Threshold, Background Color, Skin Line Color, and Ambient Line Color. Restore Defaults allows the user to go back to the original settings on the Homecare System. The Sample Rate setting adjusts the sample time period to desired intervals. The user can select various sampling times, such as 10 minutes, 15 minutes, 30 minutes, etc.

Very High Threshold, High Threshold, and Low Threshold settings establish limit points to indicate when values have exceeded, or fallen below, certain parameters. The Background Color, Skin Line Color, Ambient Color, and other color settings adjust the color schemes for certain layouts on the Temperature Monitoringfeature. Once the user has picked his/her desired settings, they can select Calibrate to apply the updated settings to the Temperature Monitoring feature.

#### Report

On the Report page, the user will be able see a specified sample of their skin temperature and the ambient temperature reading over a certain period of time. The information may be displayed ingraph, or table, format via the respective Graph, or Table, buttons at the bottom of the Report page. With the graph report, there will be an y-axis that represents temperature. On the x-axis, date and time will be listed to specify the time frame parameters for the desired sample. The date and time parameters can be set via a pop-up calendar when the user clicks Date/Time.

In the graph, the user will see Very High, High, and Low temperature limits. The user will also see their skin temperature and the ambient temperature graphed with two separate colored lines in order distinguish the two data sets. The skin temperature and ambient temperature data will be a reflection of the sample for the specified time frame.

Aside from a graph, the user can also choose to have their report displayed in table format. With the table format, the Date/Time, Skin Temperature, Ambient Temperature, and Diagnosis headings will be listed from left to right, respectively, under the Report tab. On the table, the user will be able to see their sample data displayed chronologically for the time frames set. The most recent data will be list at the top of the table. As with the graph format, the date and time parameters can be set via a pop-up calendar when the user clicks Date/Time.

Below the graph, or table, the user can select the Scrollable Diagnosis and Recommendations tab. This function displays scrolling text that will display the current diagnosis and previous diagnoses. It will also detail scrolling text for recommendations based on the diagnoses provided.

#### Follow-up Questions

From the Temperature Home and Report pages, the user can select theFollow-up questions tab. The Follow-up questions tab, once selected, will take the user to the Follow-up Questions page. On the Follow-up Questions page, the user will see the Temperature Monitoring icon above a series of questions that the user will answer.

By answering specified questions, this will allow the Homecare System the ability to deliver more accurate diagnoses and recommendations. Once the user has completed the questionnaire, they will select the Submit button at the bottom of the page. This will direct the user back to the Report page, or the Home page; depending on the respective pages that the user was on when they answered the questions. If the user is taken back to the Report page, they can select the Export button at the bottom of the page. This will allow the user to receive the report by email, text, or local printer.

#### Info

On the Info page, the user will see a Temperature icon below the Info tab. The Info page will assist users by explaining certain functions and settings on the Temperature Monitoring feature. This will allow users to become more knowledgeable, comfortable, and proficient with the Temperature Monitoring feature, as well as the watch.

### Body Measurement

The Body Measurement feature monitors the user's BMI, body fat percentage, basal metabolic rate, calorie needs per day, metabolic age, lean body mass, and muscle percentage. The Body Measurement feature also measures the user's ideal weight and hip to waist ratio. The resultsof the Body Measurement feature will be analyzed and a diagnosis will be issued for conditions related to weight, such as obesity. The BodyMeasurement feature will also make recommendations based on the diagnoses supplied. On the Body Measurement page, the user should be able to view and adjust settings, access reports, get help, export reports, etc.



Figure 29 Body Measurement app

#### Body Measurement: Home

On theHomecare home page, the user can select the Body Measurement feature icon. Once the Body Measurement feature icon is selected, the user will be directed to the Body Measurement Home page. On the Body Measurement Home page, the user will see a Home button, a Settings button, a Report button, and an Info button. Under these buttons, the system will display a bar scales for particular Body Measurement categories; specifically, Body Mass Index (BMI), Waist-to-Hip Ratio (WHR), Basal Metabolic Rate (BMR), and Body Fat percentage (BF%). Please refer to the formula document for more detail on measures, or parameters, listed in the Body Measurement feature section.

For each Body Measurement category, the corresponding bar scale will have color coded sections. Each color coded section, on the bar scale, will represent a particular value; for instance, for Body Mass Index, orange represents severely underweight, yellow indicates one is underweight, green is a healthy weight, orange represents overweight, and red means obese (reading the bar scale from left to right). Below these bar scales, the system will display two split boxes.

In the first split box, the user will see "Lean Body Weight:" and its corresponding value. The right split box will detail the "Ideal Weight:" and its corresponding value as well. Below these measurements, the system will display the second split box. This box will show the user's "%muscle:" within the left split box, in addition to "Metabolic age:" in the right split box. The corresponding values will be listed in each box.

Beneath the split boxes, there will be two additional boxes that will show the user's Activity level and Calorie needs per day. In the Activity level box, the system will display a sliding scale that will show a value; depending on where the user's activity level falls on the scale. As for the Calorie needs per day box, the user will be able to see a value that represents their daily calorie needs.

#### Body Measurement: Settings

From the Body Measurement Home screen, the user can select the Settings tab. On the Settings page, the user will see a Body Measurement icon above various settings; namely, Restore Defaults, Ideal Weight method (IW method), Body Fat percentage method (BF% method), and Basal Metabolic Rate method (BMR method). With regards to these settings, Restore Defaults allows the user to go back to the original settings on the Homecare System.

The Ideal Weight method setting allows the user to select the "formula" or "medical" methods. Furthermore, the Body Fat percentage method allows one to select among the Deurenberg, CUN-BAE, or U.S. Navy methods. The Body Fat percentage evaluation method allows one to select among the WHO, Tanita or Brainy evaluation methods. Finally, the Basal Metabolic Rate method lets the user select either the Muffin or Katch-McArdlemethods.

Below these settings, the user can enter their weight, height, waist, hip, and neck measurements on sliding scales. By entering this information, the Homecare System will be able to compare and analyze the data recorded against the user's measurements. Once the user has made the desired changes on the Settings page, the system will automatically save the modifications for the Body Measurement feature.

#### Body Measurement: Report

On the Report page, the user will be able see Body Measurement categories and their corresponding data. This information may be displayed in graph, or table, format via the respective Graph, or Table, buttons at the bottom of the Report page. However, if there is no information to display Body Measurement Report page, then a notification will state "You have no data to graph."

Nonetheless, with the graph report, there will be a y-axis that displays the Body Measurement categories. On the x-axis, date and time will be listed to specify the time frame parameters for the desired sample. With regards to the y-axis, the specific Body Measurement categories will be Body Mass Index (BMI), Waist-to-Hip ratio (WHR), Basal Metabolic Rate (BMR), Body Fat percentage (BF%), Ideal weight, and Metabolic age.In the Body Measurement graph, the graph's fields will be color coded to represent different health levels for each body measurement. For instance, green is healthy, yellow is under-weight/over-weight, and orange is obese.

Under the Body Measurement graph, there will be a date/time section that the user can select. If the user selects the Date/Time section, then a pop-up calendar will display for the user to select a start and end date/time. Below the Date/Time section, the user will see a Diagnosis field. In the Diagnosis field, the user can view scrollable diagnoses, based on the on the Body Measurement data recorded for specified time periods.

Aside from a graph, the user can also choose to have their data displayed in table format. With the table format, the user will see a column to the far left that lists BMI, WHR, BMR, BF%, LBW, %muscle, Ideal weight (Ideal W), Metabolic age (Meta. age), Activity level (Act. level), and Calorie needs (Cal. needs). To the right of this column, there will be three additional columns that display the Date/Time, Value, and Diagnosis. Each of these columns (Date/Time, Value, and Diagnosis) will correspond to the categories listed in the far left column.

Under these columns (Date/Time, Value, and Diagnosis columns), there will be several entry fields to reflect the data collected over time for each category. For the Date/Time field, the user can select Date/Time, and a pop-up calendar will display for the user to select the desired start and end date/time. Furthermore, for each Diagnosis field, the user can click on the diagnosis and view a scrollable report. Once the user has reviewed the Report page, they can select the Export button at the bottom of the page. This will allow the user to receive the report by email, text, or local printer.

#### Body Measurement: Info

On the Body Measurement Info page, the user will see a Body Measurement icon below the Info tab. The Info page will assist users by explaining the Body Measurement feature, parameters, and calculations. The Body Measurement Info page will also guide users on how to perform certain body measurements. This will allow users to become more knowledgeable, comfortable, and proficient with the Body Measurement feature, as well as the watch.

### Heart Rate Monitoring

The Heart Rate feature monitors heart rate, resting heart rate, and cardiographs the data to determine if they are in a normal range or not. The results of the Heart Rate feature will be analyzed and a diagnosis will be issued for conditions related to heart rate. The Heart Rate feature will also make recommendations based on the diagnoses supplied. On the Heart Rate page, the user should be able to view and adjust settings, access reports, gethelp, export reports, etc.



Figure 30 Heart Rate Monitoring app

#### Heart Rate: Home

From theHomecare Home page, the user can select the Heart Rate feature icon. Once the Heart Rate feature icon is selected, the user will be directed to the Heart Rate Home page. On the Heart Rate Home page, the user will see a Home button, a Settings button, a Report button, and an Info button.

Under these buttons, the system will display the text "Cardiograph" and a Start/Stop button. In order to utilize the Cardiograph, the user will need to select the Start/Stop button to begin tracking heart rate data. It is important to note that the Cardiograph will record data based on the HRV analysis interval set. For example, if the HRV analysis interval is five minutes, then the Cardiograph will record heart rate data for five minutes. At that point, the Cardiograph will stop recording data and the HRV analysis will begin.

Therefore, the HRV analysis is based on data recorded from the Cardiograph. This is a key distinction between the Cardiograph and the HRV analysis data. The data is related, but not one in the same. Please refer to the formula document for more detail on measures, or parameters, listed in the Heart Rate feature section.

Under the Cardiograph header and Start/Stop button, the system will display the user's Cardiograph with an x-axis and y-axis. On the x-axis, the date and time will be listed to specify the time frame parameters for the desired sample. The y-axis will represent the voltage of signals received from the user's heart beats. Within the graph, the user will be able to see a blue line that signifies the heart beat data recorded over a certain period of time.

Belowthe Cardiograph, the user can select the Date/Time section to display a pop-up calendar. This will allow the user to select a desired start and end date/time. Under the Time/Date field, there will be two split boxes. On the left side of the split boxes, the user will see their HR beats per minute (HR bpm) and Maximum Heart Rate (Maximum HR). On the right side on the split boxes, the system will display the Accuracy level and the user's Resting Heart Rate (Resting HR).

With respect to Resting HR, the user does have the ability to press the Resting HR button to save their current heart rate as the new resting heart rate. Below the split boxes, there will be a Current Diagnostic alarm field. This field will alert the user if there are any heart rate parameters that fall outside of normal ranges.

#### Heart Rate: Settings

From the Heart Rate Home screen, the user can select the Settings tab. On the Settings page, the user will see a Heart Rate icon above various settings; namely, Restore Defaults, Sample Rate, Max HR estimation, High Resting HR threshold, Low Resting HR threshold, HRV analysis interval, Background Color (BG color), HR Line Color, Resting HR Line Color, and HRV Point Color.With regards to these settings, Restore Defaults allows the user to go back to the original settings on the Homecare System.

The Sample Rate setting adjusts the sample time period to desired intervals. For example, the user can select various sampling times, such as five minutes, ten minutes, and fifteen minutes. Additionally,Max HR estimation allows the user to select either the Kolata or Gatti method. High Resting HR threshold and Low Resting HR threshold settings establish limit points to indicate when values have exceeded, or fallen below, certain parameters.

Furthermore, the HRV analysis interval sets the time limit for Cardiograph data recording. For instance, if the HRV analysis interval is five minutes, then the Cardiograph will record heart rate data for five minutes. At that point, the Cardiograph will stop recording data and the HRV analysis will begin. Finally, the Background Color, HR Line Color, Resting HR Line Color, and HRV Point Color settings adjust the color schemes for certain layouts on the Heart Rate feature. Once the user has picked their desired settings, they can select Calibrate to apply the updated settings to the Heart Rate feature.

#### Heart Rate: Report

On the Report page, the user will be able see Heart Rate parameters and their corresponding data. This information may be displayed in graph, or table, format via the respective Graph, or Table, buttons at the bottom of the Report page. However, if there is no information to display Body Measurement Report page, then a notification will state "You have no data to graph."

If the user selects the Graph button, they can opt to view their Heart rate data, or HRV data, via a drop-down button above the graph. With the Heart rate data, the user will see a heart rate graph with an x-axis and a y-axis. The x-axis will reflect the date/time of the data recordings, while the y-axis will show the heart rate beats per minute.

Within the Heart rate data graph, the user will see high threshold marker for heart beats recorded. The user will also see a low threshold marker for the heart beats recorded. The high threshold marker will be indicated by red hashed lines, while the low threshold marker will be represented by blue hashed lines.

Additionally, the user will see a solid light blue line that represents the user's raw heart rate voltage readings over time. Below the heart rate voltage data, the system will display the user's heart rate data over time; which is indicated a light red line. Finally, under the heart rate data, the user's resting heart rate data will be represented by orange dots. Please refer to the formula document for any measures, parameters, detailed in this section.

With the graph format, the user can also choose to view their HRV data by using the drop-down field above the graph. On the HRV data graph, there is also a x-axis and a y-axis. For the x-axis, the date/time of the data recordings will be displayed. For the y-axis, there will be several HRV parameters displayed; specifically, Mean HR, Std. HR, Mean RR, SDNN, RMSSD, and pNN50.

In the HRV data graph, each of these parameter's measurements will be represented by green bars displayed over time. Below the graph, there will be a date/time field that the user can click on. When the user clicks on the date/time field, a pop-up will display for the user to select the desired start and end date/time. Under the Date/Time section, the user will see a Diagnosis field. In the Diagnosis field, the user can view scrollable diagnoses, based on the on the Heart Rate data recorded for specified time periods.

Aside from a graph, the user can select the Table format. As with the graph, the user can choose to view the Heart rate data, or HRV data, via the drop-down field above the graph/table. With the Heart rate data table format, the system will display several columns to represent Date/Time, heart rate (HR), Resting heart rate (Resting HR), Voltage, and Diagnosis (Diag.).

Under each table header (i.e. Date/Time, HR, etc.), there will be several entry fields to reflect the data collected over time for each category. For the Date/Time field, the user can select Date/Time and a pop-up calendar will display for the user to select the desired start and end date/time. Also, under the Diagnosis column, the user can click on each Diagnosis field and view a scrollable report for each row of data collective over a specified time.

If the user selects the HRV data table, via the drop-down above the graph/table, the user will see columns that represent Date/Time, Mean HR, Std. HR, Mean RR, SDNN, RMSSD, pNN50, and Diagnosis (Diag). Under each table header (i.e. Date/Time, Mean HR, etc.), there will be several entry fields to reflect the data collected over time for each category. For the Date/Time field, the user can select Date/Time and a pop-up calendar will display for the user to select the desired start and end date/time. Also, under the Diagnosis column, the user can click on each Diagnosis field and view a scrollable report for each row of data collective over a specified time.

Once the user has reviewed the Report page, they can choose to export their data/results. The user will be able to export their information by selecting the Export button at the bottom of the page. This will allow the user to receive the report by email, text, or local printer.

#### Heart Rate: Info

On the Heart Rate Info page, the user will see a Heart Rate icon below the Info tab. The Info page will assist users by explaining the Heart Rate feature, in addition to guiding users on how to measure resting heart rate, estimate maximum heart rate, get RMSSD/SDNN information (please refer to formula document),and understand accuracy indicators. This will allow users to become more knowledgeable, comfortable, and proficient with the Heart Rate feature, as well as the watch.

### Oxygen Monitoring

The Oxygen Monitoring feature measures the oxygen level of users and detects if the reading falls within a normal range, or not. The results of the Oxygen Monitoring feature will be analyzed and a diagnosis will be issued for conditions related to SpO2 level. The Oxygen Monitoring feature will also make recommendations based on the diagnoses supplied. On the Oxygen Monitoring page, the user should be able to view and adjust settings, access reports, get help, export reports, etc.



Figure 31 Oxygen Monitoring app

#### Oxygen Monitoring: Home

On theHomecare home page, the user can select the Oxygen Monitoring feature icon. Once the Oxygen Monitoring feature icon is selected, the user will be directed to the Oxygen Monitoring Home page. On the Oxygen Monitoring Home page, the user will see a Home button, a Settings button, a Report button, and an Info button.

Under these buttons, the system will display the text "Pulse Oximetry Reading" and a Start/Stop button. In order to utilize the Pulse Oximeter, the user will need to select the Start/Stop button to begin tracking the SpO2 data. The Pulse Oximeter will stop tracking SpO2 data once the Measurement duration time frame has been met. Please refer to the formula document for more detail on measures, or parameters, listed in the Oxygen Monitoring feature section.

Under "Pulse Oximetry Reading" and the Start/Stop button, the system will display a Pulse Oximeter graph with an x-axis and y-axis. On the x-axis, the date and time will be listed to specify the time frame parameters for the desired sample. The y-axis will show the blood oxygen saturation percentage (i.e. %SpO2). Within the graph, the user will see the blood oxygen saturation percentage readings displayed in Area Graph format (the data points and everything below are colored in).

Underthe graph, the user can select the Date/Time section to display a pop-up calendar. This will allow the user to select a desired start and end date/time. Under the Time/Date field, there will be two split boxes. On the left side of the split boxes, the user will see their blood oxygen saturation percentage (i.e. %SpO2) and heart beats per minute (HR beats per minute).

On the right side on the split boxes, the system will display the Accuracy level and the Tracking mode (e.g. Nomal, etc). Below the split boxes, there will be a Current Diagnostic alarm field. This field will alert the user if there are any Pulse Oximeter SpO2 parameters that fall outside of normal ranges.

Beneath the Current Diagnostic alarm field, there will be a Follow-up Questions button. The Follow-up Questions button will allow the user the ability to provide further information regarding any particular incident. This will allow the Homecare System to deliver a more accurate diagnosis and recommendation.

#### Oxygen Monitoring: Settings

From the Oxygen Monitoring Home screen, the user can select the Settings tab. On the Settings page, the user will see an Oxygen Monitoring icon above various settings; namely, Restore Defaults, Sample Rate, Tracking mode, Warning threshold, Measurement duration, Background Color (BG color), SpO2 Line Color, and Threshold Line Color.Please refer to the formula document for more detail on measures, or parameters, listed in this section.

With regards to these settings, Restore Defaults allows the user to go back to the original settings on the Homecare System. The Sample Rate setting adjusts the sample time period to desired intervals. For example, the user can select various sampling times, such as five minutes, ten minutes, and fifteen minutes.

Additionally,Tracking mode lets the user adjust values to account for different health levels/conditions. For example, if the user selects a Tracking mode for an asthma patient, then the Warning threshold will adjust for that condition. The Warning threshold setting establishes the limit point to indicate when values have fallen below certain parameters.

Furthermore, the Measurement duration sets the length of time that the Pulse Oximeter will record data. For instance, if the Measurement duration is thirty minutes, then the Pulse Oximeter will track data for that exact time frame. At that point, the Pulse Oximeter will stop recording data until the Start/Stop button is selected again. Finally, the Background Color, SpO2 Line Color, and Threshold Line Color settings adjust the color schemes for certain layouts on the Oxygen Monitoring feature. Once the user has picked their desired settings, they can select Calibrate to apply the updated settings to the Oxygen Monitoring feature.

#### Oxygen Monitoring: Report

On the Report page, the user will be able see a specified sample of their SpO2 readings over a certain period of time. The information may be displayed in graph, or table, format via the respective Graph, or Table, buttons at the bottom of the Report page. With the graph report, there will be a y-axis that represents the user's blood oxygen saturation percentage (%SpO2). On the x-axis, date and time will be listed to specify the time frame parameters for the desired sample.

In the graph, the user will see a Low threshold SpO2 limit. The Low threshold marker will be represented by blue hashed lines. The user will also see their SpO2 readings represented with a solid black line. The SpO2 data will be a reflection of the sample for the specified time frame.

Below the graph, there will be a Date/Time field that the user can click on. When the user clicks on the date/time field, a pop-up will display for the user to select the desired start and end date/time. Under the Date/Time section, the user will see a Diagnosis field. In the Diagnosis field, the user can view scrollable diagnoses, based on the on the SpO2 data recorded for specified time periods.

Aside from a graph, the user can also choose to have their report displayed in table format. With the table format, the Date/Time, %SpO2, Threshold, Mode, and Diagnosis (Diag.) headings will be listed from left to right, respectively, under the Report tab. Under each table header (i.e. Date/Time, %SpO2, etc.), there will be several entry fields to reflect the data collected over time for each category. For the Date/Time field, the user can select Date/Time and a pop-up calendar will display for the user to select the desired start and end date/time. Furthermore, for each Diagnosis field, the user can click on the diagnosis and view a scrollable report.

At the bottom of the graph/table Report page, above the Graph, Table, and Export buttons, there will be a Follow-up Questions button. The Follow-up Questions button will allow the user the ability to provide further information regarding any particular incident. This will allow the Homecare System to deliver more accurate diagnoses.Once the user has reviewed the Report page, they can select the Export button at the bottom of the page. This will allow the user to receive the report by email, text, or local printer.

#### Oxygen Monitoring: Follow-up Questions

Like Temperature feature, from the Oxygen Monitoring Home and Report pages, the user can select the Follow-up questions tab. The Follow-up questions tab, once selected, will take the user to the Follow-up Questions page. On the Follow-up Questions page, the user will see the Oxygen Monitoring icon above a series of questions that the user will answer. Please refer to the formula document for the questions that pertain to the Follow-up Questions page.

By answering specified questions, this will allow the Homecare System the ability to deliver more accurate diagnoses and recommendations. Once the user has completed the questionnaire, they will select the Submit button at the bottom of the page. This will direct the user back to the Report page, or the Home page; depending on the respective pages that the user was on when they answered the questions. If the user is taken back to the Report page, they can select the Export button at the bottom of the page. This will allow the user to receive the report by email, text, or local printer.

#### Oxygen Monitoring: Info

On the Oxygen Monitoring Info page, the user will see an Oxygen icon below the Info tab. The Info page will assist users by explaining the Oxygen Monitoring feature, in addition to guiding users on how to use the functions and settings in the Oxygen Monitoring feature. This will allow users to become more knowledgeable, comfortable, and proficient with the Oxygen Monitoring feature, as well as the watch.

### Fitness Monitoring

The Fitness Monitoring feature provides heart rate tracking, pedometer tracking, and the calories burned during different fitness programs. The results of the Fitness Monitoringfeature willbeanalyzed and a diagnosis will be issued for conditions related to fitness. The Fitness Monitoring feature will also make recommendations based on the diagnoses supplied. On the Fitness Monitoring page, the user should be able to view and adjust settings, access reports, get help, export reports, etc.



Figure 32Fitness Monitoring app

#### Fitness Tracking: Home

From theHomecare Home page, the user can select the Fitness Tracking feature icon. Once the Fitness tracking feature icon is selected, the user will be directed to the Fitness Tracking Home page. On the Fitness Tracking Home page, the user will see a Home button, a Settings button, a Report button, and an Info button.

Under these buttons, the system will display two sections; a Heart rate monitoring section and a Pedometer Monitor section. On the Heart rate monitoring section, the user will see the heading "Heart rate." Below "Heart rate," the system will display a table that details the Mode, Program, Stage, Target Heart Rate (Target HR), and Time.

For example, the user could be on the Multi-stage mode, on a default Program, on the warm up Stage, has a Target Heart Rate of 137-147, and there can be a 5 minute limit on that particular Stage. The user will have the ability to modify what is displayed and how the Fitness Tracking data is monitored. Please refer to the formula document for any measure, or parameters, listed in this section.

To the left of the Heart rate table, there will be a Start button that the user can select. When the user selects the Start button, the Heart rate data will begin to be tracked. It must be noted that once the Start button has been selected, it will change to a Stop button; in order to allow manual stoppage.

In Multi-stage Mode, the user can let the Heart rate data tracker continue until the specified time frame (per the settings) has been met. The user can also choose to select the stop button and stop the Heart rate data tracking manually (in Multi-stage Mode). For Single-stage Mode, the user can only start and stop the Heart rate data tracking manually.

Under the Start button, the user will see a field that displays the hours, minutes, and seconds. This is used to measure the time when the heart rate data is being tracked. Below time measurement field, the system will display the user's heart rate in red text. This helps the user monitor their heart rate, and ensures they are working toward their Heart rate goals.

Beneath the Heart rate section, the user will see a Pedometer section. On the Pedometer monitoring section, the user will see the heading "Pedometer." Below "Pedometer," the system will display a table that details the user's Pedometer monitoring for Steps, Target, Distance, Speed, and Calories.

To the left of the table, there will be a Start button that the user can select. When the user selects the Start button, the Pedometer data will begin to be tracked. It must be noted that once the Start button has been selected that it will change to a Stop button; in order to allow manual stoppage. With the Pedometer data tracker, the user will only be able to manually start and stop the data tracking.

Under the Start button, the user will see a field that displays the hours, minutes, and seconds. This is used to measure the time when the Pedometer data is being tracked. Below time measurement field, the system will display a Reset button.

When the Reset button is selected, it will allow the user to restart the Pedometer data tracking from a new point in time; if the Pedometer data tracker is still in Start mode. However, if the Pedometer data tracker has been stopped, then the reset button will clear out the data in the timer field. The user can then select the Start button to track new Pedometer data, if they desire.

Below the Pedometer table, there will be a field that displays each series of Pedometer tracking data for the day. There will also be text that reads "Overall:" on the left side of the screen. To the right of the text, the system will display the daily data for several categories; namely, Duration, Distance, Calories, Speed, Steps, and Target. By looking at each series of data for the day, the user can get a complete view of their Pedometer tracking data.

#### Fitness Tracking: Settings

From the Fitness Tracking Home screen, the user can select the Settings tab. On the Settings page, the user will see a Fitness Tracking icon above various settings; namely, Restore Heart Rate Defaults, Exercise mode, Target Heart Rate method (Target HR method), Custom exercise programs, Restore Pedometer Defaults, Target setting, Remind Setting, and Calories burned method.Please refer to the formula document for more detail on measures, or parameters, listed in this section.

With regards to these settings, Restore Heart Rate Defaults allows the user to go back to the original Heart Rate settings on the Fitness Tracking feature. The Exercise mode setting allows the user to select single or multi-stage. For the Target HR method, the user can select General or Zoladz. Under the Custom exercise programs setting, the user will be able to pull up an exercise program table. Above the table, there will be a drop-down box that displays the desired number of stages. To the right of the box, there will be a Save button for the user to save any changes.

Within the table, there will be three headers listed from left to right; namely, Stage, Target HR, and Time. Under Stage, the system will display fields for Warm up, Fat burn, and Recovery. Below Target HR, the user will see boxes for Zone 1 or Zone 2. Finally, beneath Time, the system will display boxes with time intervals; for example, 5, 10, or 20 minutes.

Under the table, the user will see a split box that details "Transition Audio:" on the left and "File.mp3" on the right. Users can click to the box on the right side to browse audio files and select an audio file for alarming between stages. Below that box, there will be another split box that details "Program name:" on the left and "Daily" on the right. The boxe on the right side can be labeled as the user desires.

Beneath the "Custom exercise programs" setting, the user will see the Pedometer settings detailed above; again, Restore Pedometer Defaults, Target setting, Remind setting, and Calories burned method. Restore Pedometer Defaults allows the user to go back to the original Pedometer settings on the Homecare System. For the other categories (Target setting, Remind setting, and Calories burned method), the user can choose the desired settings. Each category will have different settings that the user can select from to effectively track their Pedometer data. Once the user has made the desired changes on the Settings page, the system will automatically save the modifications for the Fitness Tracking feature.

#### Fitness Tracking: Report

On the Report page, the user will be able to see three tables; a Heart Rate exercise report table (HR exercise report), a Pedometer report table, and a Pedometer daily report table. In the Heart Rate exercise report table, the user will see a column to the far left that lists Duration, Exercise, Time in Zones, Target Heart Rate (Target HR), Average Heart Rate (Average HR), and Maximum Heart Rate (Maximum HR). To the right of this column, there will be three additional columns that display the Date/Time, Value, and Diagnosis. Below each of these columns (Date/Time, Value, and Diagnosis)there will be several entry fields to reflect the data collected over time for each category (Duration, Exercise, Time in Zones, Target Heart Rate, Average Heart Rate, and Maximum Heart Rate).Please refer to the formula document for more detail on measures, or parameters, listed in this section.

With regards to the Pedometer report table, there will also be a column listed on the far left. This column will detail Target, Steps, Distance, Speed, Calories, and Duration. To the right of this column, there will be three additional columns that display the Date/Time, Value, and Diagnosis. Under each of these columns (Date/Time, Value, and Diagnosis)there will be several entry fields to reflect the data collected over time for each category (Target, Steps, Distance, Speed, Calories, and Duration).

Finally, in looking at the Pedometer daily report, the user will see a similar column that displays Target, Steps, Distance, Speed, Calories, and Duration. To the right of this column, there will be three additional columns that display the Date/Time, Value, and Diagnosis. Under each of these columns (Date/Time, Value, and Diagnosis)there will be several entry fields to reflect the data collected over time for each category (Target, Steps, Distance, Speed, Calories, and Duration).

For each report table, the user can select Date/Time field(s) and a pop-up calendar will display for the user to select the desired start and end date/time. Furthermore, the user can select the Diagnosis field(s) and view a scrollable report for each row of data collective over a specified time. Once the user has reviewed the Report page, they can choose to export their data/results. The user will be able to export their information by selecting the Export button at the bottom of the page. This will allow the user to receive the report by email, text, or local printer.

#### Fitness Tracking: Info

On the Fitness Tracking Info page, the user will see a Fitness Tracking icon below the Info tab. The Info page will assist users by explaining the Fitness Tracking feature, in addition to helping users understand Target Heart Rate, Target Heart Rate Zones, Calories burned, and more. This will allow users to become more knowledgeable, comfortable, and proficient with the Fitness Tracking feature, as well as the watch.

### Mental Status/Stress Monitoring



Figure 33 Stress Monitoring app

The Mental Status/Stress Monitoring features tracks specific physiological signals of theuser, such as stress, mood, level of attention, and excitement. These signals are monitored by using heartrate and skin resistance sensors. The results of the Mental Status/Stress Monitoring feature will be analyzed and a diagnosis will be issued for conditions related to mental status, or stress. TheMental Status/Stress Monitoring feature will also make recommendations based on the diagnoses supplied. On the Mental Status/Stress Monitoring page, the user should be able to view and adjust settings, access reports, get help, export reports, etc.

#### Stress Monitoring: Home

On theHomecare home page, the user can select the Stress Monitoring feature icon. Once the Stress Monitoring feature icon is selected, the user will be directed to the Stress Monitoring Home page. On the Stress Monitoring Home page, the user will see a Home button, a Settings button, a Report button, and an Info button.

Below these buttons, the system will display an empty Stress Monitoring graph with a x-axis and a y-axis. If the user wishes to see graphed Stress Monitoring data, then they will select the Show graph button (below the empty graph). Once the user selects the Show graph button, data will populate on the x-axis and y-axis. The x-axis will reflect the date/time parameters of the data recordings, while the y-axis will show several Stress Monitoring categories/measures; specifically, Cardiograph, GSR, and g-values (i.e. X, Y, and Z). Please refer to the formula document for any parameters/measures listed in this section.

Within the graph, the system will display lines (Line graph) that represent each parameter's data over time. Each of these parameters/measures will be represented a light yellow line (Cardiograph), black line (GSR), green line (X value), red line (Y value), and a blue line (Z value). Under the graph, the user can select the Date/Time section to display a pop-up calendar. This will allow the user to select a desired start and end date/time.

To the left of the graph, there will be a Start button. If the user selects the Start button, then Stress Monitoring data will begin to be tracked. Data will stop being tracked once the Measurement duration has been met, or when the user selects the Stop button. It is important to note that when the Start button is selected, it becomes the Stop button. Also, the Stop button becomes the Start button when selected.

Below the Start/Stop button, the user will see a field that displays the hours, minutes, and seconds. This is used to measure the time when the Stress Monitoring data is being tracked. Below the time measurement field, the system will display the user's heart beats per minute in black text. This helps the user monitor their heart rate, and ensures they are working toward their Stress Monitoring goals.

Beneath the graph and the heart beats per minute section, there is a section that details the user's Stress level. The user's Stress level is displayed on a percentage bar; with various colors representing different levels of stress. For instance, if one's Stress level is 45%, then the percentage bar will reflect that percentage and the color orange.

To the right of the Stress level section, the user will see a Recommendation field. In the Recommendation field, there will be recommendations offered based on the Stress Monitoring data and Stress level information recorded. This will help the user develop ways to manage and monitor their stress.

#### Stress Monitoring: Settings

From the Stress Monitoring Home screen, the user can select the Settings tab. On the Settings page, the user will see a Stress Monitoring icon above various settings; namely, Restore Defaults, Measurement duration, Heart rate sample rate, GSR sample rate, Accelerometer sample rate, BG Color, BPV Line Color, and GSR Line Color.Please refer to the formula document for more detail on measures, or parameters, listed in this section.

With regards to these settings, Restore Defaults allows the user to go back to the original settings on the Homecare System. Measurement duration sets the length of time that the Stress Monitoring tracking instruments will record data. For instance, if the Measurement duration is thirty minutes, then the GSR/Cardiograph will track data for that exact time frame. At that point, the GSR/Cardiograph will stop recording data until the Start/Stop button is selected again.

The Heart rate sample rate setting adjusts the heart rate sample time period to desired intervals. For example, the user can select various sampling times, such as five minutes, ten minutes, and fifteen minutes. Similarly, the GSR sample rate and Accelerometer sample rate settings adjust the GSR, or Accelerometer, sample time periods to desired intervals (e.g. five, ten, or fifteen minutes). Finally, the Background Color, BPV Line Color, and the GSR Line Color settings adjust the color schemes for certain layouts on the Stress Monitoring feature. Once the user has picked their desired settings, they can select Calibrate to apply the updated settings to the Stress Monitoring feature.

#### Stress Monitoring: Report

On the Report page, the user will be able see Stress Monitoring categories and their corresponding data recordings over time. This information may be displayed in graph, or table, format via the respective Graph, or Table, buttons at the bottom of the Report page. However, if there is no information to display on the Stress Monitoring Report page, then a notification will state "You have no data to graph."

Nonetheless, if the user selects the Graph button, then they will see a Stress Monitoring graph with a x-axis and a y-axis. The x-axis will reflect the date/time parameters of the data recordings, while the y-axis will show the stress percentage (% Stress). Please refer to the formula document for further details on any parameters, or measures, listed in this section. Within the graph, the system will display bars (Bar graph) that represent the user's stress percentage over time.

Above the Bar graph, the user will see a Raw data button. If the user selects this, then they can view the graph information in raw data format via a Line graph. With the raw data format, the system will display several parameters on the y-axis; such as HR, HR voltage, GSR, and g-values (i.e. X, Y, and Z variables). Each of these parameters will be represented a light red line, yellow line, black line, green line, red line, and a blue line, respectively. These lines will represent each parameter's data over time.

Under each graph (Bar or Line graph), the user can select the Date/Time section to display a pop-up calendar. This will allow the user to select a desired start and end date/time. Under the Date/Time section, the user will see a Diagnosis field. In the Diagnosis field, the user can view scrollable diagnoses, based on the on the Stress Monitoring data recorded for specified time periods.

Aside from a graph, the user can select the Table format. With the table format, the system will display several columns to represent Date/Time, Stress level, and Diagnosis. Under each table header (i.e. Date/Time, Stress level, etc.), there will be several entry fields to reflect the data collected over time for each category. For the Date/Time field, the user can select Date/Time and a pop-up calendar will display for the user to select the desired start and end date/time. Also, under the Diagnosis column, the user can click on each Diagnosis field and view a scrollable report for each row of data collective over a specified time.

As with the graph, the user can also view the table in Raw data format. By selecting the Raw data button, the user will see a raw data table that has columns to represent Date/Time, HR, HR voltage, GSR, g-values (i.e. X, Y, and Z), and Diagnosis (Diagn). Under each table header (i.e. Date/Time, HR, etc.), there will be several entry fields to reflect the data collected over time for each category. For the Date/Time field, the user can select Date/Time and a pop-up calendar will display for the user to select the desired start and end date/time. Also, under the Diagnosis column, the user can click on each Diagnosis field and view a scrollable report for each row of data collective over a specified time.

Once the user has reviewed the Report page, they can choose to export their data/results. The user will be able to export their information by selecting the Export button at the bottom of the page. This will allow the user to receive the report by email, text, or local printer.

#### Stress Monitoring: Info

On the Stress Monitoring Info page, the user will see a Stress Monitoring icon below the Info tab. The Info page will assist users by explaining the Stress Monitoring feature, in addition to guiding users on how to measure GSR, estimate maximum HR, and get RMSSD/SDNN. This will allow users to become more knowledgeable, comfortable, and proficient with the Stress Monitoring feature, as well as the watch.

### Sleep Monitoring

The Sleep Monitoring feature tracks the user's sleep activity and quality of sleep via heart rate, oxygen level, accelerometer, and skin resistance sensors. The results of the SleepMonitoringfeature will be analyzed to determine sleep duration. The system will then issue a diagnosis for conditions related to sleep, such as diabetes, obesity, sleep apnea, etc. The Sleep Monitoring feature will also make recommendations based on the diagnoses supplied. On the Sleep Monitoring page, the user should be able to view and adjust settings, access reports, get help, export reports, etc.



Figure 34 Sleep Monitoring app

#### Sleep Monitoring: Home

On theHomecare Home page, the user can select the Sleep Monitoring feature icon. Once the Sleep Monitoring feature icon is selected, the user will be directed to the Sleep Monitoring Home page. On the Sleep Monitoring Home page, the user will see a Home button, a Settings button, a Report button, and an Info button.

Below these buttons, the system will show a Start button, Day/Night symbol, and an Awake/Asleep symbol from left to right, respectively. If the user selects the Start button, then the Sleep Monitoring data will begin to be tracked. Data will stop being tracked when the user selects the Stop button. It is important to note that when the Start button is selected, it becomes the Stop button. Also, the Stop button becomes the Start button when selected.

To the right of the Start button, there are the Day/Night and Awake/Asleep symbols. These symbols are able to change appropriately based on software detection technology. For example, if it is during the day and the user is awake, then a Day symbol and an Awake symbol will display.

Under these symbols, the system will display an empty Sleep Monitoring graph with a x-axis and a y-axis. If the user wishes to see graphed Sleep Monitoring data, then they will select the Show graph button (below the empty graph). Once the user selects the Show graph button, data will populate on the x-axis and y-axis. The x-axis will reflect the date/time parameters of the data recordings, while the y-axis will show several Sleep Monitoring categories/measures; specifically, GSR and g-values (i.e. X, Y, and Z). Please refer to the formula document for any parameters/measures listed in this section.

Within the graph, the system will display lines (Line graph) that represent each parameter's data over time. Each of these parameters/measures will be represented a black line (GSR), green line (X value), red line (Y value), and a blue line (Z value). Under the graph, the user can select the Date/Time section to display a pop-up calendar. This will allow the user to select a desired start and end date/time.

To the left of the graph, the system will display the user's heart beats per minute. This will be represented by a heart symbol, along with the actual number for heart beats per minute. Below the heart beats per minute, the user will see their actual temperature next to a temperature symbol.

Under the temperature section, there will be a bar scale that shows the user's Activity level. The user's activity level will be measured on a scale from 1-10; with 1 being the lowest and 10 being the highest. Beneath the Activity level scale, there will be an Alarm and Recommendation section.

For the Alarm portion, to the left of the Recommendations section, the user will receive notifications when their sleep duration is over. The user will also receive an alarm notification when Sleep Monitoring values fall outside of certain parameters. On the Recommendation section, the user can view recommendations offered based on the Sleep Monitoring data recorded and Alarm settings/notifications. This will help the user develop ways to manage and monitor their sleep.

#### Sleep Monitoring: Settings

From the Sleep Monitoring Home screen, the user can select the Settings tab. On the Settings page, the user will see a Sleep Monitoring icon above various settings; namely, Restore Defaults, Heart rate sample rate, GSR sample rate, Accelerometer sample rate, and Skin temperature sample rate.Please refer to the formula document for more detail on measures, or parameters, listed in this section.

With regards to these settings, Restore Defaults allows the user to go back to the original settings on the Homecare System.The Heart rate sample rate setting adjusts the heart rate sample time period to desired intervals. For example, the user can select various sampling times, such as five minutes, ten minutes, and fifteen minutes. Similarly, the GSR sample rate, Accelerometer sample rate, and Skin temperature sample rate settings adjust the GSR, Accelerometer, or Skin temperature sample time periods to desired intervals (e.g. five, ten, or fifteen minutes).

Below the above settings, the user has the option to modify the Alarm setting to Auto or Manual. The user can also automatically set their sleep duration parameter. For example, the user can set it to 8 hours.

Also, the user can utilize the Manual setting to manually add alarms. The user can do this by selecting a desired Weekday and Time via clicking on the respective fields.Once the user has picked their desired settings, they can select Calibrate to apply the updated settings to the Sleep Monitoring feature.

#### Sleep Monitoring: Report

On the Report page, the user will be able see a specified sample of their Sleep Monitoring data readings over a certain period of time. The information may be displayed in graph, or table, format via the respective Graph, or Table, buttons at the bottom of the Report page. With the graph report, the user will see a Sleep Monitoring graph with a x-axis and a y-axis.

The x-axis will reflect the date/time parameters of the data recordings, while the y-axis will show several color-coded variables; such as sleep duration (orange), deep sleep duration (blue), number of time the user woke up (purple), and sleep quality (green). Please refer to the formula document for further details on any parameters, or measures, listed in this section.

The user will be able to select the desired time interval parameters via a drop down box above the graph. If the user clicks on the drop down box, they will be able to change the time parameter to daily, weekly, or monthly; which will be displayed below the graph. To the right of the drop down, the user can choose the desired start and end date/time via the start and end tabs. Selecting the start, or end, tab will prompt a pop-up calendar to display so that that user can modify the start and end date/time.

Within the graph, the user will be able to see a single bar, or clustered/stacked bars, that reflect data over time (Bar Graph/Cluster/Stack Bar Graph). However, if there is no data to display, then there will be a notification that states "You have no data to graph." Nonetheless, for daily reporting, the system will display just one bar that reflects the raw data parameters and associated colors. However, for weekly/monthly reporting, the graph will show two bars that represent the mean (left bar) and the standard deviation (right bar) for the data parameters and associated colors. The type of reporting (daily, weekly, or monthly) will be noted below the graph.

It is important to note that each sleep variable will be measured differently. For instance, sleep duration and deep sleep duration will be measured in hours. The number of times the user wakes up will be reflected by the actual numbers. Finally, Sleep quality will be measured using a scale from 1 to 10. Each variable will be tracked and reflected in the graph according to their particular color and measurement parameters.

To the right of the end tab, there will be a Raw data button. If the user selects this, then they can view the graph information in raw data format. With the raw data format, the system will display several parameters on the y-axis; such as HR, Skin temp., GSR, g-values (i.e. X, Y, and Z variables), and Activity level.

Each of these parameters will be represented a light red line, yellow line, black line, green line, red line, blue line, and a dark blue line, respectively. These lines will represent each parameter's data over time. Under the graph, the user can select the Date/Time section to display a pop-up calendar. This will allow the user to select a desired start and end date/time.

Aside from a graph, the user can select the Table format. With the table format, the system will display several columns to represent Date/Week/Month, Sleep duration, Deep sleep, Wake up number (Wake up #), and Sleep quality. Under each table header (i.e. Day/Week/Month, Sleep duration, etc.), there will be several entry fields to reflect the data collected over time for each category.

For the Date/Time parameter, the user will be able to select the desired time interval parameters via a drop down box above the graph. If the user clicks on the drop down box, they will be able to change the time parameter to daily, weekly, or monthly. With daily tracking, the table will display only one column per parameter to reflect the raw data.

However, with weekly/monthly tracking, the system will display two columns per parameter to show the mean and standard deviation for each parameter. The tracking time interval will be indicated by the title of the table (e.g. Daily/Weekly/Monthly statistics). To the right of the drop down, the user can choose the desired start and end date/time via the start and end tabs.

As with the graph, the user can choose to view the table in Raw data format. With the Raw data Sleep Monitoring table, the system will display a number of columns that represent Date/Time, HR, skin temperature, GSR, g-values (X, Y, and Z variables), and Activity level. Under each table header (i.e. Date/Time, HR, etc.), there will be several entry fields to reflect the data collected over time for each category. For the Daily table report, only the raw data will be displayed. However, for the Weekly and Monthly report, the system will display the mean and standard deviation for the raw data recorded.

For the Date/Time field, the user can select Date/Time and a pop-up calendar will display for the user to select the desired start and end date/time. Under the Date/Time section, the user will see a Diagnosis field. In the Diagnosis field, the user can view scrollable diagnoses, based on the on the Sleep Monitoring data recorded for specified time periods.

Once the user has reviewed the Report page, they can choose to export their data/results. The user will be able to export their information by selecting the Export button at the bottom of the page. This will allow the user to receive the report by email, text, or local printer.

#### Sleep Monitoring: Info

On the Sleep Monitoring Info page, the user will see a Sleep Monitoring icon below the Info tab. The Info page will assist users by explaining the Sleep Monitoring feature, in addition to guiding users on how to measure GSR. This will allow users to become more knowledgeable, comfortable, and proficient with the Sleep Monitoring feature, as well as the watch.

### Position Monitoring

The Position Monitoring feature is primarily for disabled individuals who need the support of family, friends, and medical professionals to move around. The movement of patients willbe tracked and an alarm will be set off for movements that fall outside a normal range of mobility. The results of the Position Monitoring feature will be analyzed and a diagnosis will be issued based on the range of movements recorded. The Position Monitoring feature willalsomakerecommendationsbased on the diagnoses supplied. On the Position Monitoringpage, the usershould be able to view and adjust settings, access reports, get help, export reports, etc.



Figure 35 Position Monitoring

#### Position Tracking: Home

From theHomecare Home page, the user can select the Position Monitoring feature icon. Once the Position Monitoring feature icon is selected, the user will be directed to the Position Monitoring Home page. On the Position Monitoring Home page, the user will see a Home button, a Settings button, a Report button, and an Info button.

Below these buttons, the system will show a Start button and the text "Position Monitoring." If the user selects the Start button, then the Position Monitoring data will begin to be tracked. Data will stop being tracked when the user selects the Stop button. It is important to note that when the Start button is selected, it becomes the Stop button. Also, the Stop button becomes the Start button when selected.

Under the Start button and "Position Monitoring," the system will display the text "Activity graph" for the graph heading. Below "Activity graph," the user will see an empty graph with a x-axis and a y-axis. If the user wishes to see graphed Position Monitoring data, then they will select the Show graph button (below the empty graph).

Once the user selects the Show graph button, data will populate on the x-axis and y-axis. The x-axis will reflect the date/time parameters of the data recordings, while the y-axis will show the g-values on the Activity graph; specifically, g-values X, Y, and Z. Please refer to the formula document for any parameters/measures listed in this section.

Within the graph, the system will display lines (Line graph) that represent each parameter's data over time. Each of these parameters/measures will be represented a green line (X value), red line (Y value), and a blue line (Z value). Under the graph, the user can select the Date/Time section to display a pop-up calendar. This will allow the user to select a desired start and end date/time.

Below the graph section, there will be a split box that has the text "Current position" in the left box, and the actual current position in the right box (e.g. Supine). Under the Current position section, there will be a Current Alarm field. In the Current Alarm field, the user can view a scrollable report regarding alarms that were triggered when certain positions occurred. This will be based on the user's desired settings. The Current Alarm field may also alert the user when certain values have fallen outside of designated parameters.

#### Position Tracking: Settings

From the Position Tracking Home screen, the user can select the Settings tab. On the Settings page, the user will see a Position Tracking icon above various settings; namely, Restore Defaults, Sample Rate, and Alarm position setting.Please refer to the formula document for any parameters/measures listed in this section.

With regards to these settings, Restore Defaults allows the user to go back to the original settings on the Homecare System.The Sample rate setting adjusts the Position Tracking sample time period to desired intervals. For example, the user can select various sampling times, such as five minutes, ten minutes, and fifteen minutes.

Below the Sample rate setting, the user can also modify the Alarm position setting by selecting the check box of any/all of the sleep positions that they wish to be alerted for (i.e. Supine, Prone, Left Lateral, Right Lateral, Up, and Down). Once the user has picked their desired settings, they can select Calibrate to apply the updated settings to the Position Tracking feature.

#### Position Tracking: Report

On the Report page, the user will be able see a specified sample of their Position Monitoring data readings over a certain period of time. The information may be displayed in graph, or table, format via the respective Graph, or Table, buttons at the bottom of the Report page. With the graph report, the user will see a Position Monitoring graph with a x-axis and a y-axis.

The x-axis will reflect the date/time parameters of the data recordings, while the y-axis will show the user's color-coded sleep position; such as Supine (blue - lying with face up), Prone (red - lying with face down), Left (purple), Right (orange), Up (green), and Down (turquoise green). Please refer to the formula document for further details on any parameters, or measures, listed in this section.

Within the graph, the system will display dots that represent the user's sleep position over time. However, if there is no data to display, then there will be a notification that states "You have no data to graph." Under the graph, the user can select the Date/Time section to display a pop-up calendar. This will allow the user to select a desired start and end date/time.

Above the Position Monitoring graph, the user will see a Raw data button. If the user selects this, then they can view the graph information in raw data format via a Line graph. In looking at the raw data Activity graph (Line graph), the user will also see a x-axis and a y-axis. The x-axis will still reflect the date/time parameters of the data recordings. However, the y-axis will represent the raw g-values over time (i.e. X, Y, and Z variables).

Within the graph, the system will detail a color-coded line for each variable. For example, X will be green, Y will be red, and Z will be blue. Each line will represent the raw g-value data recorded over time. Under the graph, the user can select the Date/Time section to display a pop-up calendar. This will allow the user to select a desired start and end date/time.

Below the graphs (Position Monitoring and Activity graph), the user will see an Alarm field. The Alarm field will alert the user when certain positions have occurred. This will be based on the user's desired settings. The Alarm may also alert the user when certain values have fallen outside of designated parameters.

Aside from a graph, the user can select the Position Monitoring Table format. With the table format, the system will display several columns to represent Date/Time, Position, and Alarm. Under each column header (i.e. Date/Time, Position, etc.), there will be several entry fields to reflect the data collected over time for each category. For the Date/Time field, the user can select Date/Time and a pop-up calendar will display for the user to select the desired start and end date/time. The user can also select the Alarm fields and view a scrollable report for each row of data.

As with the graph, the user can view the Activity table in raw data format. With the raw data Activity table, the system will display several columns that represent Date/Time and the raw g-values (i.e. X, Y, and Z variables). Under each table header (i.e. Date/Time, X, etc.), there will be several entry fields to reflect the data collected over time for each category. For the Date/Time field, the user can select Date/Time and a pop-up calendar will display for the user to select the desired start and end date/time.

Once the user has reviewed the Report page, they can choose to export their data/results. The user will be able to export their information by selecting the Export button at the bottom of the page. This will allow the user to receive the report by email, text, or local printer.

#### Position Tracking: Info

On the Position Tracking Info page, the user will see a Position Tracking icon below the Info tab. The Info page will assist users by explaining the Position Tracking feature, in addition to helping users understand and utilize position monitoring (e.g. identifying sleep positions via labeled picture representations). This will allow users to become more knowledgeable, comfortable, and proficient with the Position Tracking feature, as well as the watch.

### Fertility Monitoring

The Fertility Monitoring feature monitors the body temperature of the user over time andrecommends when they will be most fertile. The results of the Fertility Monitoring feature will be analyzed and diagnoses recorded so that that user can better forecast optimal fertility.The Fertility Monitoring feature will also make recommendations based on the diagnoses supplied. On the Fertility Monitoring page, the user should be able to view and adjust settings, access reports, get help, export reports, etc.



Figure 36 Fertility Monitoring app

#### Fertility Tracking: Home

From theHomecare Home page, the user can select the Fertility Tracking feature icon. Once the Fertility Tracking feature icon is selected, the user will be directed to the Fertility Tracking Home page. On the Fertility Tracking Home page, the user will see a Home button, a Settings button, a Report button, and an Info button.

Below these buttons, the user will see a Temperature graph with an x-axis and a y-axis. The x-axis will reflect the specific days, month, and year of the data recordings, while the y-axis will show the user's temperature data. Please refer to the formula document for further details on any parameters, or measures, listed in this section.

Within the graph, the user should see various fertility parameters. However, if there is no data to display within the graph, the system will show a notification that states "You have no data to graph." Nonetheless, if there is data to graph, then the system should display a red line that details the user's temperature data over time. It is important to note that the hashed red line segments, on the red line, represent interpolated temperature values for an omitted day. The interpolated temperature will be based on the previous temperature value and next recorded temperature value (after the omitted day).

At the bottom of the graph, the user will be able to see a red triangle. The red triangle represents the predicted start of the user's period. An important function of this graph is the days, month, and year section. Below the graph, the user will only be able to view a certain number of days at a time due to screen limitation.

The system will display a "<<" before the first day shown, as well as a ">>" after the last day shown. By selecting these arrows, the user can move backward, or forward, in time as they track their fertility data. Below the number of days, the user can also view the desired month and year related to their data via selecting the arrow tabs.

Under the days, month, and year section, the system will display a Measure button and a Start of Periods button. With the Measure button, the user will have the ability to manually enter their temperature. If the user has selected the Manual Input temperature setting, then the user will need to input their temperature data manually by selecting the Measure button. The user does also have the ability to manually input their temperature data, via the Measure button, while the Auto Input temperature setting is running.

Finally, with regards to the Start of periods button, the user can record when their period(s) start(s). In order to record this data, the user will need to select the Start of periods button. Once the button is selected, a pop-up calendar will display for the user to select the date that their period started. Once this information is entered, it will be tracked over time to aid in the Fertility Tracking feature's ability to accurately analyze data and predict/forecast possible outcomes.

#### Fertility Tracking: Settings

From the Fertility Tracking Home screen, the user can select the Settings tab. On the Settings page, the user will see a Fertility Tracking icon above a couple settings; namely, Restore Defaults and Input temperature method. Please refer to the formula document for any parameters/measures listed in this section.

With regards to these settings, Restore Defaults allows the user to go back to the original feature settings on the Homecare System. The Input temperature method setting will give the user the option to track their temperature data Automatically or Manually. With the Automatic setting, the Homecare medical device will input the recorded temperature values for the user.

However, with the Manual setting, the user will input their own temperature values when they desire. The values the user inputs will be based on previous temperature recordings the user noted on the watch. Once the user has picked his/her desired settings, they can select Calibrate to apply the updated settings to the Fertility Tracking feature.

#### Fertility Tracking: Report

On the Report page, the user will be able see their Fertility Tracking data over a certain period of time. The information may be displayed in graph, or table, format via the respective Graph, or Table, buttons at the bottom of the Report page. If the user selects the Graph button, the user will see a Fertility Monitoring graph with an x-axis and a y-axis. The x-axis will reflect the specific days, month, and year of the data recordings, while the y-axis will show the user's temperature data. Please refer to the formula document for further details on any parameters, or measures, listed in this section.

Within the graph, the user should see various fertility parameters. However, if there is no data to display within the graph, the system will show a notification that states "You have no data to graph." Nonetheless, if there is data to graph, then the system should display dots in chronological order; from left to right. The black dot will detail the user's previous ovulation date. The dark green dot will predict the user's next ovulation date.

The system will also display a light green line within the chart, which predicts the user's most fertile time. On the green line, the user will be able to see a dark green segment that represents the user's greatest opportunity to get pregnant (2 day window). Below the green lines, there will be a red line that details the user’s temperature data over time. It is important to note that the hashed red line segments, on the red line, represent interpolated temperature values for an omitted day. The interpolated temperature will be based on the previous temperature value and next recorded temperature value (after the omitted day).

At the bottom of the graph, the user will be able to see triangles. The black triangle reflects the start of the user's previous period. On the other hand, the red triangle represents the predicted start of the user's next period.

An important function of this graph is the days, month, and year section. Below the graph, the user will only be able to view a certain number of days at a time. The system will display a "<<" before the first day shown, as well as a ">>" after the last day shown. By selecting these arrows, the user can move backward, or forward, in time as they track their fertility data. Below the number of days, the user can also view the desired month and year related to their data via selecting the arrow tabs.

Aside from a graph, the user can select the Table format. With the table format, the system will display three sections of data; namely, a Fertility section, an Advance Prediction section, and a Statistics section. In the first section of data (Fertility Section), the user will see a column to represent the month and year of interest (e.g. October, 2013).

To the left of this column (month and year column), there will be rows of information that relate to Start of period, Ovulation date, Most fertile time, and Most pregnant time. Under the month and year column, there will be several entry fields to reflect the data collected over time for each category. The user can change the month and year by selecting the designated arrow tabs displayed before and after the month and year of interest.

Under the Advance Prediction section, the system will similarly display a column to represent the month and year of interest. However, the rows of data will pertain to Start of next period, Next ovulation date, Next most fertile time, and Next most pregnant time. Under the month and year column, there will be several entry fields to reflect the data collected over time for each category. The user can also change the month and year by selecting the designated arrow tabs displayed before and after the month and year of interest.

Below the Advance Prediction data, the system will display a Statistics section. In the Statistics section, there will be a list of several fertility statistical measures; such as Cycles tracked N (number of cycles tracked), Average cycle length, Cycle length variation, Average ovulation time, Longest cycle, and Shortest cycle. Next to each statistical measure, there will be data entry fields that will display the respective statistical data for the month and year of interest. The user can change the month and year by selecting the designated arrow tabs displayed before and after the month and year of interest.

Once the user has reviewed the Report page, they can choose to export their data/results. The user will be able to export their information by selecting the Export button at the bottom of the page. This will allow the user to receive the report by email, text, or local printer.

#### Fertility Tracking: Info

On the Fertility Tracking Info page, the user will see a Fertility Tracking icon below the Info tab. The Info page will assist users by explaining the Fertility Tracking feature, in addition to guiding users on how to use and understand various measures/functions. For example, the Fertility Tracking Info page will provide tips for the user on how to take their basal body temperature.Overall, the Fertility Tracking Info page will allow users to become more knowledgeable, comfortable, and proficient with the Fertility Tracking feature, as well as the watch.

# WEB SERVICES

# DATABASE