



POWER2DM

“Predictive model-based decision support for diabetes patient empowerment”

Research and Innovation Project

PHC 28 – 2015: Self-management of health and disease and decision support systems based on predictive computer modelling used by the patient him or herself

Deliverable 2.6

D2.4.2 Web based GUI Components for Visualization of Predictions/Simulations

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| PU | Public | X |
| PP | Restricted to other programme participants (including the Commission Services) | |
| RE | Restricted to a group specified by the consortium (including the Commission Services) | |
| CO | Confidential, only for members of the consortium (including the Commission Services) | |

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EXECUTIVE SUMMARY

This deliverable describes the results of the visualisation of predictions and simulation in the Shared Decision Making Application (SDMA). Main goal for the clinician is to create a patient treatment plan. A treatment plan has 3 components: an insulin, medication and a meal component. Insulin, medication and meals may be added in any combination. When the user has finished creating the treatment plan the system lets the user simulate this treatment plan against the user's stored blood glucose profile, by clicking the "simulate" button in the SDMA treatment plan editor. The predicted blood glucose profile as returned by the KADIS prediction service is then shown in the Blood Glucose Graph.

POWER2DM Consortium Partners

| Abbv | Participant Organization Name | Country |
|---------|---|-----------------|
| TNO | Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek | The Netherlands |
| IDK | Institute of Diabetes “Gerhardt Katsch” Karlsburg | Germany |
| SRDC | SRDC Yazilim Arastirma ve Gelistirme ve Danismanlik Ticaret Limited Sirketi | Turkey |
| LUMC | Leiden University Medical Center | The Netherlands |
| SAS | SAS Servicio Andaluz de Salud | Spain |
| SRFG | Salzburg Research Forschungs Gesellschaft | Austria |
| PD | PrimeData | The Netherlands |
| iHealth | iHealthLabs Europe | France |

OPEN ISSUES

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|-----|------|-----------------|----------|
| | | no known issues | |

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1 INTRODUCTION

The primary goal of work packed WP2 is to develop innovative programs, modules, and tools for short-term (Task 2.1) and long-term (Task 2.2) risk detection and risk prevention (Task 2.3) in personalized diabetes care and management by supporting patients efficiently in diabetes home monitoring and diabetes home care with patient-centered, real time decision support systems (DSS) which can finally be implemented into mobile-phone-based self-management equipment's (Task 2.4). To meet these goals WP2 comprises the following objectives, tasks, and deliverables.

Objectives

- Visualization of KADIS predictions and simulations
- Implement patient-focused visualizations of the risk scoring models

Tasks

- T2.4 Visualization of predictions and simulations – SRDC, IDK, PD, TNO, LUMC, SAS

Deliverables

- D2.1.1 Short-term predictive component – M10
- D2.2.1 Mid-and-long-term predictive component – M10
- D2.3.1 POWER2DM integrated prediction service and API – M15, 21, 28
- D2.4.1 Mockups for GUI components – M8
- D2.4.2 Web-based GUI components for visualization of predictions/simulations – M21, 28
- D2.4.3 Mobile GUI components for visualization of prediction/simulations - M21, 28

****This deliverable reports on Task 2.4****

1.1 Purpose and Scope

The purpose of task 2.4 “Visualization of predictions and simulations” is to create a web-based solution presenting patient-focused visualizations of the risk scoring models. A life-long timeline view will be designed and implemented to summarize all the short-medium-long term predictions and simulations in a coherent way. The GUI designs and implementations will cover both web based and mobile application environments. Work will be carried out in close cooperation with the Patient Organizations to be involved in the project under guidance of the IDF

1.2 Reference documents

- D4.8 - D4.5.1 Integrated eHealth Systems for Pilot Site

1.3 Definitions, Abbreviations and Acronyms

Table 1 List of Abbreviations and Acronyms

| Abbreviation/ Acronym | DEFINITION |
|--------------------------|---|
| CGM | Continuous glucose measurement |
| SMBG | Self-monitoring blood glucose |
| GUI | Graphical User Interface |
| API | Application Programming Interface |
| BG | Blood glucose |
| SDMA | POWER2DM Shared Decision Making Application |
| | |
| | |
| | |

2 VISUALIZATION OF KADIS PREDICTIONS AND SIMULATIONS

2.1 Implementation of KADIS based visualization of KADIS predictions and simulations

The KADIS treatment planning page was created as part of the Shared Decision Making Application for visualizing KADIS simulations and short term predictions. The page allows the clinician to create a treatment plan tailored to the patient and simulate this treatment plan against the patient's blood glucose fingerprint via the KADIS prediction services. The resulting simulation provides a short term prediction of the patient's blood glucose values if this treatment plan is followed.

2.2 Overview

The main views of the KADIS treatment planning page are the blood glucose profile graph (Figure 1) and the treatment plan editor (Figure 2).



Figure 1

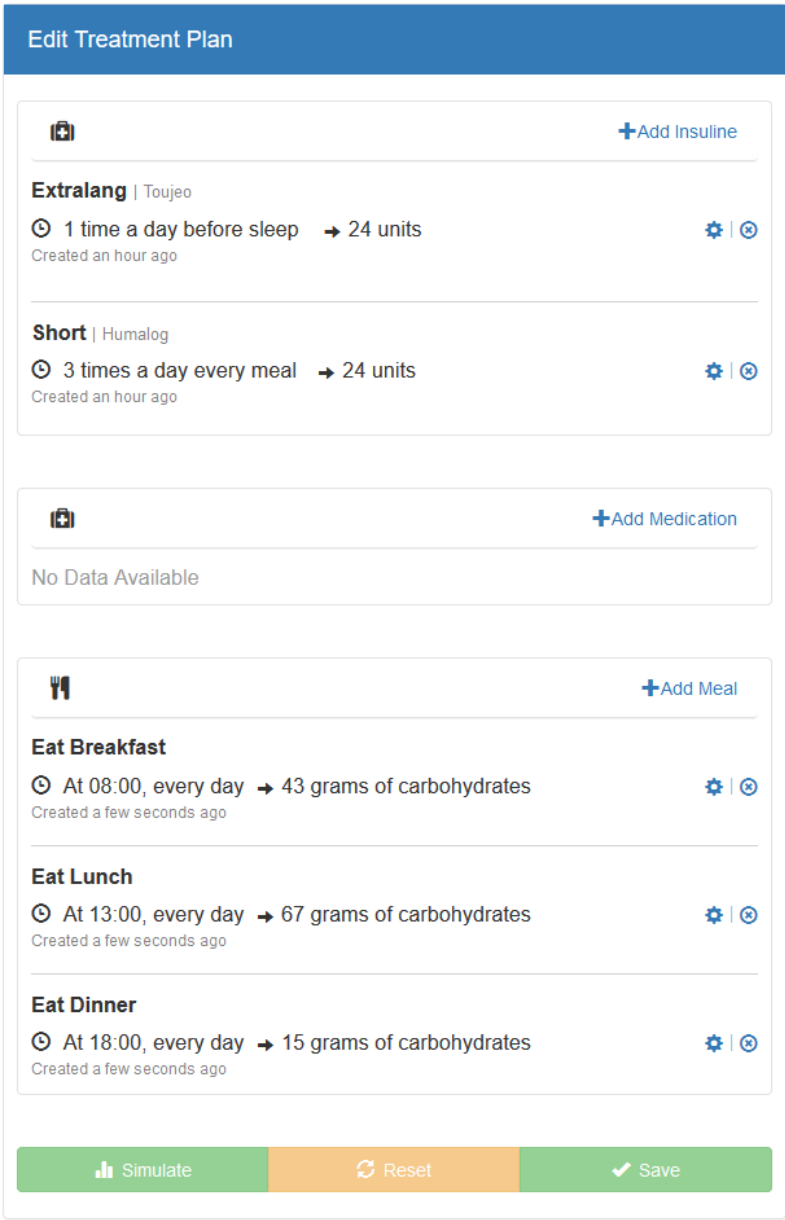


Figure 2

A treatment plan has 3 components: an insulin, medication and a meal component. Insulin, medication and meals may be added in any combination. To add a treatment component, the user clicks on the relevant ‘Add’ button indicated with a plus sign. This opens the Add component view as shown in Figure 3. To remove or change a treatment component the user clicks the blue X sign or the blue cog sign, respectively.

2.3 Adding Insulin

To add insulin to a treatment plan the user clicks the Add insulin button. In the add insulin view the user may search for a type of insulin in the search field, and adjust the prescribed dose in the Dose field. Finally, the user must select one or more timings from the given timing options. Optionally the user may enter specific instructions for the patient by enabling “Use medication as follows”.

Add Insulin

Dosis units

Search

Use medication as follows

Options

| Name | Substance | Dosage | Information |
|-------------------|------------|---------|-------------|
| Humalog | Short | 1 units | |
| Humalog Basal | Basal | 1 units | |
| Humalog Mix 25/75 | Analogamix | 1 units | |
| Humalog Mix 50/50 | Analogamix | 1 units | |

Timing

Figure 3 Adding insulin

2.4 Adding insulin/medication

To add medication to a treatment plan the user clicks the Add medication button. In the add medication view the user may search for a type of medication in the search field, and adjust the prescribed dose in the Dose field. Finally, the user must select one or more timings from the given timing options. Optionally the user may enter specific instructions for the patient by enabling “Use medication as follows”.

 Add Medication

Dosis

1

Search

Use medication as follows

Options

| Name | Substance | Dosage | Information |
|------------------|--------------|--------------------|-------------------------|
| Januvia 100 | Sitagliptin | 1 tablets → 100 mg | |
| Januvia 25 | Sitagliptin | 1 tablets → 25 mg | |
| Januvia 50 | Sitagliptin | 1 tablets → 50 mg | |
| Rstaben 100 | Sitagliptin | 1 tablets → 100 mg | |
| Sitagliptina 100 | Sitagliptina | 1 tablets → 100 mg | substance not available |

Timing

every meal

Figure 4 Adding medication

The planned insulin and medication are also shown in a bar chart (Figure 5) showing the individual medications at their planned times and the amount of insulin units they contain on the y-axis.

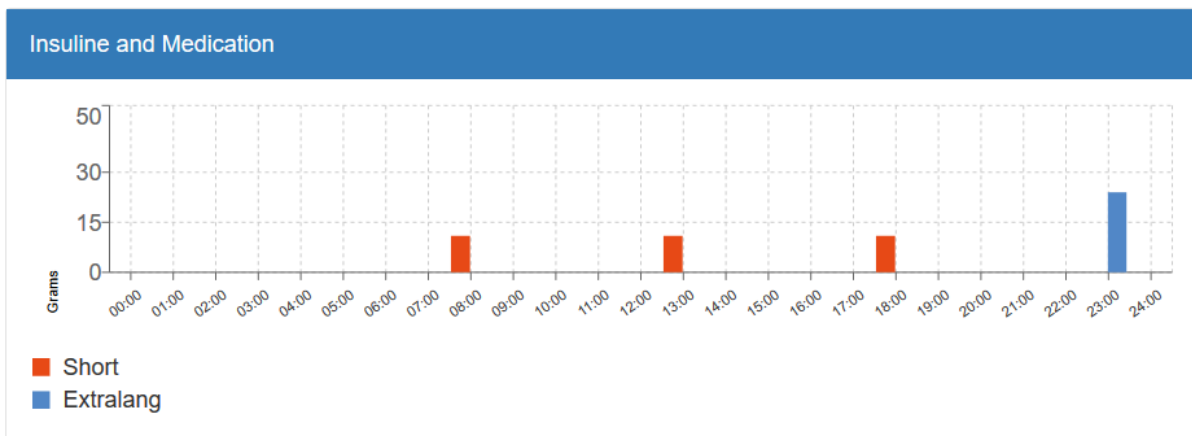
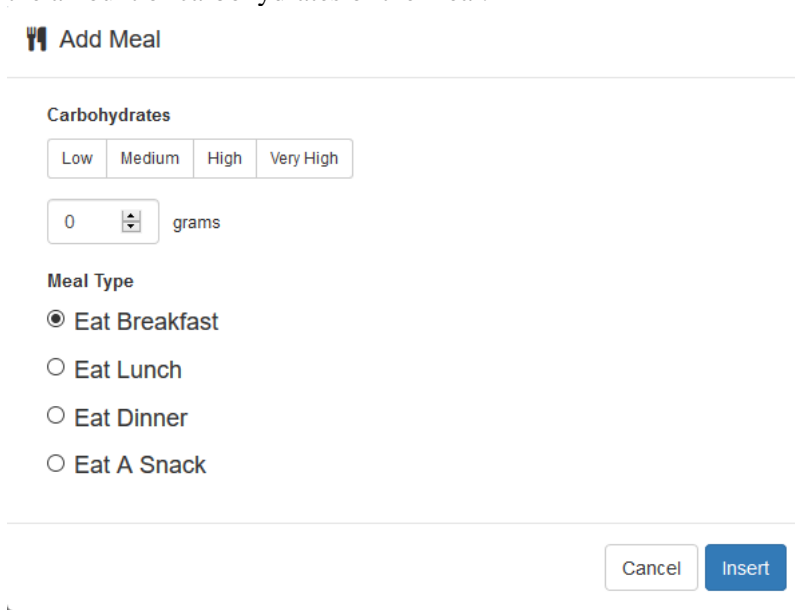


Figure 5 Insulin chart

2.5 Adding meals

To complete the input for a KADIS BG simulation the user must enter a meal schedule for the patient. Normally the meals are pre-filled by the system based on the meals the patient has entered in his or her mobile app during the KADIS 3-day data collection phase of POWER2DM. KADIS collects this data and calculates from it a typical meal schedule for the patient. This data is then pre-filled in the treatment plan.

If the user decides to add a meal component to the treatment plan the user clicks the Add meal button. In the add meal view the user must select the type of meal (Breakfast, Lunch, Dinner or Snack) and the amount of carbohydrates of the meal.



Add Meal

Carbohydrates

Low Medium High Very High

0 grams

Meal Type

Eat Breakfast

Eat Lunch

Eat Dinner

Eat A Snack

Cancel Insert

Figure 6 Adding meals

The planned meals are also shown in a bar chart (Figure 77) showing the individual meals at their planned times and the amounts of carbohydrates they contain on the y-axis.

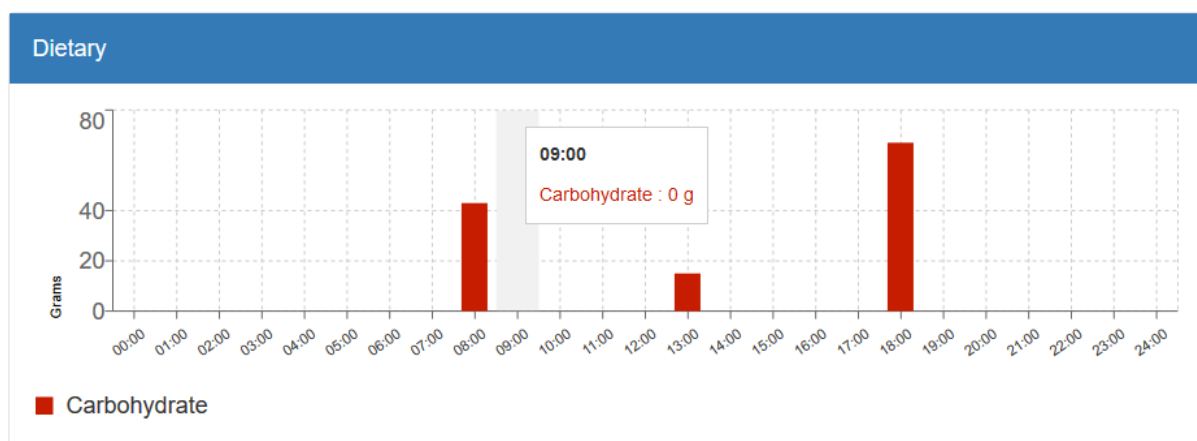


Figure 7 Dietary overview

2.6 Simulating a treatment plan

When the user has finished creating the treatment plan the system lets the user simulate the glycemic response resulting from this treatment plan against the user's stored blood glucose profile, by clicking the "simulate" button in the treatment plan editor. The predicted blood glucose profile as returned by the KADIS prediction service is then shown in the Blood Glucose Graph.

2.6.1 Blood glucose graph components

The blood glucose graph (See Figure 1) is a linear graph showing the patient's BG values over time and the result of the KADIS simulation when available. The graph shows the BG values in both mmol/L and mg/dL. When the BG values were collected via CGM the graph will show a continuous line between data points.

The graph shows a green zone which is the 'optimal range' for BG values. The dotted red line represents the value below which hypoglycemia will occur.

The user may zoom in on the chart using the blue scroll bar below the chart.

The various components of the graph may be enabled or disabled via the tick boxes on the bottom of the chart view.

2.7 Blood glucose summary

Lastly the treatment planning page contains the Blood Glucose Summary view. The blood glucose summary is described in D4.8 - D4.5.1 Integrated eHealth Systems for Pilot Site.

3 CONCLUSION

This deliverable describes T2.4 Visualization of predictions and simulations. In close consultation with the clinicians task 2.4 has resulted in a clear and responsive web based solution which creates a patient treatment plan based on insulin, medication and meals or a combination of those. The system lets the user simulate the effects of this treatment plan on glycemia against the user's stored blood glucose profile.